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Triunia kittredgei Olde (Proteaceae: Grevilleoideae: Roupaleae), a new name for *Triunia robusta sensu* Foreman misapplied.

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Abstract

The name *Triunia kittredgei* Olde replaces *Triunia robusta sensu* Foreman (1986) following an invalid lectotypification. *Triunia erythrocarpa* Foreman is transferred to the synonymy of *Triunia robusta,* correctly applied. The lectotypes of *T. robusta* and *T. montana,* designated unseen by Sleumer (1955), do not appear to have been distributed to NSW. Replacement lectotypes are here designated from among the existing isolectotypes. Details of the type collection of *Triunia youngiana* are clarified. A new key to the genus *Triunia* L.A.S.Johnson & B.G.Briggs and a detailed description of the newly named *Triunia kittredgei* are provided, as well as a nomenclatural synopsis of the genus.

Introduction

Helicia youngiana (Moore and Mueller 1864, p. 84) was described from a collection made at Duck Creek on the Richmond River, New South Wales. The description concluded with the words 'Fructus ignoti'. Charles Moore was given as the collector. Bentham (1870, p. 406) transferred *Helicia youngiana* to *Macadamia* F.Muell. F.M. Bailey (1892, p. 26) completed the diagnosis with a description of the fruit from a plant at Eumundi, south-east Queensland. C.T. White (1933, p. 23) followed Moore and Mueller in treating this species as *Helicia youngiana* and treating Bentham's *Macadamia* as a synonym. White also recognised that *Helicia youngiana* comprised three varieties, the autonymic var. *youngiana*, var. *montana* C.T.White and var. *robusta* C.T.White. He cited the following syntypes for var. *robusta* 'Maroochy (most southerly record), *F.M. Bailey, J. Low*. Yandina Eumundi, *F.M. Bailey, J.F. Bailey, J.H. Simmonds, J.B. Staer.* East Malanda, Atherton Tableland, alt. 700 m., common in rain-forest, *S.F. Kajewski, no. 1219* (flower buds), Sep 22, 1929'. White also cited two syntypes for *Helicia youngiana* var. *montana*: Bellenden Ker, Palm Camp, *F.M. Bailey* (Meston's Bellenden Ker Exped. 1889); Bellenden Ker (near the summit), *C.T. White*, Jan 1923. He, however, did not cite herbaria in which the specimens were held.

Sleumer (1955, p. 8) divided *Helicia* into three sections. *Helicia youngiana* was nominated as the type of his Sect.1 *Macadamiopsis*, distinguished in his species conspectus by its inflorescence with involucral bracts; perianth slightly curved, the three lower segments longer coherent, the upper segment less revolute; leaves very often 3- or 4-verticillate. Sleumer (1955, p. 15) designated the syntype specimen *S.F. Kajewski 1219* at NSW (*haud vidi*) as the lectotype. He also lectotypified *H. youngiana* var. *montana* with the syntype collected by *C.T. White* (also at NSW and not seen).

L.A.S. Johnson and B.G. Briggs (1975, p. 175) recognised *Helicia* Sect.1 *Macadamiopsis* Sleumer as a distinct genus (*Triunia*) and typified it with the newly combined *Triunia youngiana* (C.Moore & F.Muell.) L.A.S.Johnson & B.G.Briggs. The genus was superficially characterised in their generic etymology: 'The name is derived from the Latin (alluding to the perianth in which three tepals are coherent to a higher level than the fourth)'. Although Johnson and Briggs (1975) suggested that there were three species 'in tropical and subtropical eastern Australia', they did not describe any additional taxa. At that time *Triunia youngiana* was the only described species, but they classified *Triunia* in its own monospecific subtribe *Triuniinae* L.A.S.Johnson & B.G.Briggs, within their new tribe *Helicieae* L.A.S.Johnson & B.G.Briggs, differentiating it (*ibid.* p. 173) from their other two subtribes (subtribe *Hollandaeinae* L.A.S.Johnson & B.G.Briggs and subtribe *Heliciinae* L.A.S.Johnson & B.G.Briggs) by its lack of peduncles and floral bracts, its zygomorphic flowers by virtue of its style and perianth curved, three of its tepals longer coherent than the less strongly revolute rear one, its two ovules hemitropous and laterally inserted, its indehiscent, fleshy fruits and by its seed being solitary, thick and unwinged.

Foreman (1986, pp 195–196) transferred C.T. White's varieties of *Helicia youngiana* to *Triunia* and recognised them as the distinct species *T. robusta* (C.T.White) Foreman, and *T. montana* (C.T.White) Foreman. Subsequently, Foreman (1987, p. 302) described the new species *T. erythrocarpa* Foreman.

In the most recent suprageneric cladistic classification of the Proteaceae based on a supertree analysis of molecular phylogenetic trees, Weston and Barker (2006) placed *Triunia* in their Tribe *Roupaleae* Meisner along with subtribe *Heliciinae* L.A.S.Johnson & B.G.Briggs in which subtribe *Hollandaeinae* had been incorporated, plus additional subtribes. However, they were unable to further classify *Triunia* to subtribe, treating it as one of several *genera incertae sedis*, noting also (*ibid.* p. 325) that 'it would not be surprising if future discoveries also demonstrated our *Roupaleae* to be polyphyletic, thus necessitating further taxonomic change at tribal level. However, our *Roupaleae* is better supported than alternative tribal circumscriptions in this part of the family, given available evidence'. Subsequently, the supermatrix analyses of Sauquet *et al.* (2009) corroborated the monophyly of the tribe Roupaleae with high parsimony bootstrap support (92%) and a significant Bayesian posterior probability (PP=1.0).

The recognition of C.T. White's varieties of *Helicia youngiana* as a distinct species by Foreman (1986), foreshadowed by Johnson and Briggs (1975), is followed here. The taxa are nonetheless sometimes difficult to distinguish using dried specimens alone and a thorough comparative study of the morphology of all taxa, which is outside the scope of this paper, is recommended.

Herbarium specimens held at CANB, NSW and images on JSTOR were used in the construction of the key to species and in the delimitation and description of *Triunia kittredgei*.

Morphology

Phyllotaxis in *Triunia* is described as pseudoverticillate because the 'whorls' are really just very crowded bunches of spirally inserted leaves. Each pseudoverticel consistently ends a seasonal growth unit and the lowest leaf of a pseudoverticel is often separated from the other leaves by a very short but visible internode. A very similar mode of growth is found in *Eidothea* except that there the long, leafless sections of stem at the base of each SGU bear spirally inserted, minute cataphylls. At the end of each seasonal growth unit, just above the pseudoverticel, several cataphylls enclose the dormant apical bud. The cataphylls are subtended by leaf-like bracts rather than bractiform leaves. In cases where the apical bud develops into an inflorescence, those cataphylls grow in size and develop into involucral bracts, not leaves concordant with those in the pseudowhorl below them.

Venation terminology follows Hickey (1973).

There are three aspects to floral orientation; orientation of the carpel with respect to the inflorescence axis; orientation of the flower with respect to its twin; and orientation of the carpel with respect to its own axis. Douglas and Tucker (1996) outline a precise terminology of floral orientation in the Grevilleoideae. According to them (*ibid.*, p. 377), in *Triunia robusta* (as *T. erythrocarpa*), 'the carpel cleft faces the lateral tepal closest to the primary inflorescence axis. The carpel thus has 'lateri-axial orientation', in which "the dorsiventral plane of the carpel is aligned on the median frontal plane of each flower and the carpel cleft faces the lateral tepal on the primary inflorescence side." The terminology is applicable to all *Triunia* species. The flowers of each pair diverge at an acute angle from each other, with the axis of curvature of their styles (i.e. the dorsiventral axis of the carpel) parallel to the primary conflorescence axis. The table A1 (*ibid.*, p. 396) also indicates that the carpel primordia have terminal inception i.e. the floral apex is converted completely into the carpel and the floral apex/carpel primordium aspect ratio ranges from 0.89 to 0.93. Grevilleoid flower pairs render the concepts adaxial and abaxial sides of the flower problematic. The side of the flower that might be called adaxial is

actually one of the lateral sides. It is only adaxial with respect to the common bract and primary conflorescence axis, not to the suppressed floral bract and uniflorescence axis.

Triunia flowers can reasonably be described as 'bilabiate', consisting of a free tepal and a partly fused triconnate tepal structure which is here termed a labellum. The proximal half of the labellum has three midline staminal filaments which are mostly adnate to the tepal but very conspicuously raised. The adaxial surface of the perianth has previously been described as glabrous. However, erect hairs emergent in the interstices between the filaments, i.e. in the proximal half of the labellum, show this to be incorrect.

Revised key to species of *Triunia*

1 Abaxial lamina of adult leaves with a sparse indumentum of appressed hairs; adaxial surface of leaves subbullate; involucral bracts *c.* 3 mm long, glabrous on the adaxial surface; mature fruits 12–15 mm diam. ..... **1. *T. youngiana***

1* Abaxial lamina of adult leaves glabrous (hairs restricted to midvein or absent); adaxial surface of leaves smooth, not or rarely sub-bullate; involucral bracts ≥ 5 mm long, hairy on the adaxial surface; mature fruits mostly > 15 mm diam.

2 Mature fruits red; adult leaves sparingly toothed or entire; hairs quickly evanescent from the abaxial surface of juvenile leaves

3 Adaxial surface of leaves not blotchy green *in vivo*, olive green when dry and with raised asperities and impressed dimples evident, the reticulum obscure; involucral bracts with a dense, appressed ferruginous indumentum on the adaxial surface; habit a tree (5–)10–20 m high ..... **2. *T. robusta***

3* Adaxial surface of leaves blotchy green *in vivo*, dark green when dry, smooth, with reticulum evident to slightly raised; involucral bracts with a moderately sparse indumentum on the adaxial surface; habit a multi-stemmed shrub to 4 m ..... **3. *T. kittredgei***

2* Mature fruits black, maroon or purple; adult leaves entire; hairs long persistent along the midvein on the abaxial surface of leaves ..... **4. *T. montana***

Taxonomy

Triunia L.A.S.Johnson & B.G.Briggs, *Botanical Journal of the Linnean Society* 70: 195 (1975).

Replaced synonym: *Helicia* sect. *Macadamiopsis* H.O.Sleumer, *Blumea* 8: 8 (1955).

Type designated: *Triunia youngiana* (C.Moore & F.Muell.) L.A.S.Johnson & B.G.Briggs.

Triunia youngiana (C.Moore & F.Muell.) L.A.S.Johnson & B.G.Briggs, *Botanical Journal of the Linnean Society* 70: 195 (1975).

Helicia youngiana C.Moore & F.Muell. in F. Muell. *Fragmenta phytographiae Australiae* 4: 84 (1864).

Macadamia youngiana (C.Moore & F.Muell.) Benth., *Flora australiensis* 5: 406 (1870).

Helicia youngiana var. *youngiana* C.T.White, *Contributions from the Arnold Arboretum of Harvard University* 4: 23 (1933) (as 'var. *typica*')

Type citation: [New South Wales] Ad amnem Duck Creek fluminis Richmond River. *C. Moore.*

Holotype: New South Wales: North Coast: Duck Creek, Richmond River: *Richards 4,* anno 1863 MEL93852A (photo seen).

Notes: According to the protologue, the type of *Triunia, T. youngiana,* was collected by or sourced from Charles Moore. Sleumer (1955, p. 15) cited '*Moore 4*' (MEL) as the type and indicated that there was a syntype at K. The existence of this specimen needs corroboration because it is not currently listed among the type specimens held at K. There is no specimen of *Triunia youngiana* at MEL collected by *Moore* with the collection number 4. Although Sleumer (1955) cited *Moore 4* as the type of *H. youngiana*, he annotated a specimen collected in 1863 by *Richards,* (*Richards 4,* MEL93852A) as the 'holotype'. Foreman subsequently confirmed this specimen as the holotype (with a determinavit slip dated 23 July 1986). To this annotated specimen also is attached a label written by C. Moore disavowing himself as collector, which states 'No. 4. Richmond River, Richards 1863. This was not observed by me. It was found in Duck Creek, so prolific in Proteaceous plants'. Note that there is a collection number 4 collected by Moore (MEL565777) that is a residual syntype (paralectotype) of *Endiandra*

discolor Benth. Although C. Moore is given as the first author of *Helicia youngiana*, I believe that Mueller accorded this honour out of deference to Moore's position as government botanist and director of the Botanic Gardens in Sydney. Although Moore may have recognised the specimens supplied as an undescribed species, he is not known to have published any species description and, according to his biographer (King 1974) had an intense hatred of writing. Richards is here accepted as the collector of the type of *Triunia youngiana*. He is a mysterious figure, known only from his few collections deposited at MEL. George (2009) provides no further biographical information.

The specimen of *Helicia youngiana* collected by Charles Moore in 1868 'from Richmond to Tweed River in thick brushes' (BM915589) was erroneously labelled as an isotype by Sleumer. However, it is not type material.

Morphological comparisons: *Triunia youngiana* can be differentiated by its leaves generally smaller (5–13 mm long, 3–3.5 cm wide), with numerically more teeth (1–9) distributed mostly in the distal half, conspicuously sub-bullate on the adaxial surface, sparsely hairy on the abaxial leaf blade, and by its smaller fruits 12–15 mm diam. It generally has a smaller perianth (c. 15 mm long including the limb), is more densely hairy on the abaxial surface and has pistils 15–17 mm long. It has ovate bracts about the same length as their width (3 mm x 2.5 mm). Triunia *youngiana* is the only *Triunia* species distributed in New South Wales, but it also occurs in the McPherson Range and as far north as Southport, in southern Queensland, where its leaves are mostly at the larger end of the spectrum (up to 14 mm long and up to 5 cm wide). This tendency did not appear to justify any formal taxonomic recognition.

Triunia robusta (C.T.White) Foreman, *Muelleria* 6: 196 (1986). **Fig. 1.**

Basionym: *Helicia youngiana* var. *robusta* C.T.White, *Contributions from the Arnold Arboretum of Harvard University* 4: 23 (1933).

Protologue: Rachis et pedicelli subdense pilis brevibus induti. Perulae ciliatae in facie glabrae. Folia usque ad 20 cm longa et 5.5 cm lata. [Trans. Rachis and pedicels with a moderately dense indumentum of short hairs. Bracts ciliate glabrous on the surface. Leaves up to 20 cm long and 5.5 cm wide].

Type citation: [Queensland] 'Maroochy (most southerly record), *F.M. Bailey, J. Low*. Yandina Eumundi, *F.M. Bailey, J.F. Bailey, J.H. Simmonds, J.B. Staer.* East Malanda, Atherton Tableland, alt. 700 m., common in rain-forest, *S.F. Kajewski, no. 1219* (flower buds), Sept. 22, 1929'.

Lectotype designated by H.O. Sleumer, *Blumea* 8: 15 (1955): [Queensland] East Malanda, Atherton Tableland, alt. 700 m., common in rain-forest, *S.F. Kajewski, no. 1219* (flower buds), Sept. 22 1929 (NSW – 'lecto-*typus*, haud vidi'); isolectotypes cited by Sleumer (*ibid.*): A589471; B; K; NY; S-G7589; isolectotypes not cited and presumably not seen by Sleumer: BRI-AQ317458; MEL2277218A.

Lectotype *fide* Foreman, *Muelleria* 6: 196 (1986): *lectotypus superfl.*

Replacement lectotype (here designated): Queensland: Cook: Malanda, Atherton Tableland, *S.F. Kajewski 1219*, 22 Sep 1929 (BRI-AQ317458 – photo seen); isolecto: A589471 (photo seen); B (*n.v.*); K (*n.v.*); MEL2277218A (*n.v.*), NY (*n.v.*); S-G7589 (photo seen).

Residual syntypes: *F.M. Bailey, J. Low, J.F. Bailey, J.H. Simmonds, J.B. Staer* (all cited fully under *Triunia kittredgei*).

Triunia erythrocarpa Foreman, *Muelleria* 6: 302, fig. 3 (1987).

Holotype: Queensland: Cook: State Forests Reserve 310, Swipers Logging Area. *B. Hyland 6919*, 8 Oct 1973 (QRS82569 – photo seen); isotypes: BRI-AQ118621 (photo seen); NSW621510; QRS38142 (photo seen); QRS82567 (photo seen); QRS82568 (photo seen).

Fig. 1. *Triunia robusta*. Fruiting branchlet showing the bright red globular fruits. Note the leaf pitting and asperities. Photo. Garry Sankowsky.

Notes: In lectotypifying *Helicia youngiana* var. *robusta* with the syntype specimen collected by Simmonds, Foreman (1986) apparently overlooked the earlier lectotypifications by Sleumer (1955). The question of whether Sleumer's lectotypifications are valid must be first addressed, since he cited specimens he did not see and gave the location of the lectotype as NSW that has no record of receiving this material. The International Code of Nomenclature for algae, fungi, and plants (Melbourne Code) (McNeill *et al.* 2012), does not require a lectotype to be seen by its designator. However, if the lectotype is effectively lost, under Article 9.11, a lectotype as a substitute for it may be designated and the order of precedence in Article 9.12 states that 'an isotype must be chosen if such exists.'

Sleumer published a distribution list for each lectotype/isolectotype but it remains unclear whence he adduced this information since White did not formally list the distribution of specimens in the protologue, and the isolectotypes themselves do not have distribution data.

The syntypes of *Helicia youngiana* var. *robusta* represented by *Kajewski 1219* and *Simmonds s.n.* belong to different species of *Triunia* as recognised by Foreman but in citing the lectotype of *Helicia youngiana* var. *robusta* among the examined specimens of his new *Triunia erythrocarpa*, Foreman (1987) effectively synonymised it under *Triunia robusta,* thereby invalidating his new name. The species represented by Foreman's lectotype (*Simmonds s.n.* from the Maroochy catchment) thus remains effectively unnamed and is here described as *Triunia kittredgei* Olde. *Triunia robusta* is the name applicable now to one of two species of *Triunia* in far north-east Queensland.

Although Sleumer saw duplicates of *Kajewski 1219,* he cited as lectotype a specimen at NSW that he had not seen and which cannot now be found. It seems likely that a duplicate of this collection was never sent to NSW and that Sleumer simply assumed its existence. At least two specimens of *Kajewski 1219* (at A and S) have been labelled as 'lecto-isotype' by Sleumer. The Queensland Herbarium (BRI) specimen of *Kajewski 1219* has been chosen as the lectotype because this was available to C.T. White when he was preparing the protologue.

Morphological comparisons: *Triunia robusta* differs from *T. kittredgei* in the adaxial surface of its leaves which when dry, are olive green and usually both dimpled and with raised asperities visible, and with obscure reticulum. *In vivo*, they are neither noticeably sub-bullate nor blotchy in colouration. In his description of its synonym *T. erythrocarpa,* Foreman (1987) indicated its leaf length ranges from 6.5–10 cm, which would clearly distinguish it from *T. kitteredgei*, but several specimens have been seen in this overview with leaves up to 15 cm long. Cooper and Cooper (2004, p. 611) record them up to 19 cm long, substantially overlapping the length range of *T. kittredgei. Triunia robusta* has involucral bracts that are wider (*c.* 5 mm wide), not much acuminated at the apex, and with a dense ferrugineo-sericeous indumentum on the adaxial surface which Foreman (1987) described as 'velutinous'. Its common bracts are early caducous. Both species have red fruits but those of *T. robusta* are usually described as 'bright'. Triunia *robusta* also has ferrugineo-tomentose new growth that soon becomes glabrous and green. It is distributed in north-east Queensland in rainforest below 1200 m usually in well-developed upland and montane rainforest and is recorded growing in red soils derived from basalt and forms a tree 10–20 m high under natural conditions.

Triunia kittredgei Olde, **sp. nov. Figs 2, 3.**

Triunia robusta sensu Foreman (1986) misapplied.

Vernacular name: Glossy Spice Bush.

Diagnosis: Affinis *Triuniae robustae* sed foliis adaxialiter laevibus, viridibus, reticulo visibile, perulis angustioribus (2–3 mm latis) ovatis-acuminatis, adaxialiter sparse sericeis differt.

Holoype: Queensland: Moreton: Brolga Park, 6 km W of Woombye, *A.R. Bean 2538*, 27 Oct 1990 (NSW621498!); iso: BRI-AQ0501996 (n.v.); MEL1597776A (n.v.).

A spindly multi-stemmed shrub or small tree 2–4 m high with dark trunk bearing small white corky lenticels, light pink when cut. *Seedlings* with leaves toothed, cataphylls above cotyledons not seen. *New growth* ferruginous, soon glabrous and red, fading ultimately to green. *Branchlets* terete, ferruginous-pubescent, soon glabrescent; phyllotaxy opposite or 3- or 4-pseudo-verticillate, the node often also with cataphylls subtended by leaf-like bracts. *Leaves* with petiole 3–10 mm long, stout, glabrous; lamina elliptic to oblong-elliptic or obovate-cuneate (4.5–)10–21 cm long, (1.5–)3.5–7.2 cm wide, glabrous, base cuneate; margin usually entire, sometimes with 2–4 coarse, irregularly spaced, shallow teeth near apex, often sinuous; apex obtuse to retuse, more usually acute or attenuated into a short drip tip; leaf surfaces discolorous; abaxial surface glabrous, dull, a few evanescent ferruginous hairs when young, the midvein protuberant to prominent in the proximal two-thirds, gradually becoming narrower and much less prominent distally, the higher order venation more prominent than on the adaxial surface; adaxial surface glossy, smooth, often sub-bullate, light green to mid-green, blotchy *in vivo*, midvein impressed, secondary and higher order venation including anastomosing reticulum evident to prominent, dark green; venation brochidodromous; texture coriaceous. *Conflorescence* 6–10 cm long, 3–4 cm wide, erect, cylindrical, simple, sessile, terminal, loose, acropetal; buds ovoid, imbricate; involucral bracts 5–10 mm long, 2–3 mm wide, persistent, ovate-acuminate, margin ciliate, with abaxial surface openly sericeous, glabrescent, and adaxial surface variable, sometimes sericeous on distal third and with a mid-line longitudinal strip of appressed, ferruginous hairs, sometimes only a few scattered hairs; common bracts persistent to just before anthesis, falling acropetally, otherwise similar to involucral bracts; floral rachises densely sericeo-tomentose, with a slightly raised outgrowth below each flower pair. *Flowers* in grevilleoid pairs, adaxially oriented with respect to conflorescence axis, ascending to subpatent, perfumed, pedicellate; pedicels 4.5–8 mm long, 0.6 mm wide, densely subsericeous, hairs ferruginous, sometimes intermixed with cream-coloured hairs; torus c. 1 mm across, squarish, transverse; hypogynous glands 2–3 (–?4), oblong, erect, adaxial, free, rising c. 0.5 mm above torus; *pistils* (18–)22–24 mm long; ovary 1.25 mm long, sessile, with a dense ferruginous indumentum of straight ascending to erect basifixed hairs; ovules 2, hemitropous; style 0.4 mm wide, wiry, exserted between abaxial or adaxial and lateral tepals, through a suture below the limb before anthesis, incurved, sparsely ferrugineo-pubescent in the proximal third, the hairs c. 0.2 mm long, glabrous distally; pollen-presenter 1 mm long 0.75 mm wide, rhomboidal, swollen, glossy; stigma subterminal; *perianth* (16–)22 mm long, 1.5 mm wide at base, 1.8 mm wide about middle, 0.5 mm wide below limb, zygomorphic, oblong-ovoid, longitudinally indented between tepals, dilated slightly about middle, sparsely to moderately densely white-rusty subsericeous on abaxial surface below limb, with hairs c. 0.2 mm long; adaxial surface glabrous or a few scattered erect hairs on tri-connate tepal labellum in interstices between the conspicuously protuberant filaments adnate to midrib of each tepal, filaments alate in proximal half; perianth limb 2.5 mm long, 1.5–2.25 mm wide, discolorous, suberect to nodding, ovoid-apiculate, with erect ferruginous hairs extended beyond apex 0.5–1 mm, indumentum on limb sparsely to moderately dense interspersed often with glabrous patches; anthers bilocular, with white locules, antrorse, basifixed with a short discolorous free filament tip 0.1 mm long, connective brown, apex with an apically obtuse oblong apiculum 0.7–0.8 mm long; pollen creamy yellow, triporate. *Fruit* (*fide* Bailey 1892; Foreman 1986) 25(–45) mm long, 20–25(–38) mm diam., vermilion to reddish, with evanescent short, sparsely distributed erect hairs, globose to ovoid with a pointed base and apiculum, follicular, indehiscent, drupaceous,

monospermous; suture prominent; epicarp rugose when dry, outer mesocarp fleshy, inner mesocarp not tightly enclosing the seed. *Seeds* (*fide* Everist 1981; Bailey 1892) poisonous, subglobose, fleshy, unwinged with thin, felt-like testa.

Summary of distinguishing features: Shrubby, multi-stemmed habit to 4 m high.; bark dark, blackish-grey with white corky lenticels; largest adult leaves up to 21 cm long, 7.5 cm wide, glabrous, elliptic to oblong-elliptic, margin entire or distally 2–4-toothed, adaxial surface dark green along the veins, the intervening lamina usually lighter green, glossy, sometimes sub-bullate, secondary venation and reticulum slightly raised, lamina surface discolorous, glabrous; floral indumentum subsericeous; conflorescences sessile, imbricate in bud, involucral bracts 5–10 mm long, 2–3 mm wide, ovate-acuminate, ciliate, with a patchy appressed indumentum on adaxial surface; common bracts persisting almost to anthesis and falling acropetally; perianth zygomorphic, adaxial surface pilose proximally (between raised alate filaments adnate to tepal midribs); abaxial surface sparsely subsericeous; ovary rusty villous, sessile; style tomentose in the proximal third, the hairs c. 0.2 mm long; fruits red, 20–38 mm diameter.

Fig. 2. *Triunia kittredgei*. Flowering branch showing leaves, inflorescence and flowers. Note the distinctive blotchy appearance of the leaves. Photo. Hugh Nicholson.

Notes: The fruit size for *Triunia kittredgei,* given by F.M. Bailey (1892) (as *Macadamia youngiana* misapplied) 'attaining 1¾ in. [44.5 mm] long and 1½ in. [38 mm] diameter' was based on 'fruit specimens' from 'Eumundi' but has not been corroborated by subsequent collections. The fruit size provided by Bailey is here accepted because of the exactness of the mensuration (to the ¼ inch) and because substantial clearing of the Eumundi–Yandina scrubs has mitigated against any corroboration. The argument by Foreman (1987) that his *T. erythrocarpa* is distinguished in part by its fruits at 3.5 cm maximum diameter being maximally larger than those of all other species including *T. robusta,* is not supported and differentiation on this character is regarded as doubtful.

Distribution: South-east Queensland, mainly in the Maroochy River catchment, between Pomona and Woombye, covering a road distance of approximately 40 km.

Phenology: Flowering has been recorded in October and November. Fruits have been collected in March and May. Flowers are sweetly perfumed, white, the perianth limb green when young, ageing to creamy yellow, rusty-hairy, the anthers creamy with brown free filament and apiculum, the style green to red.

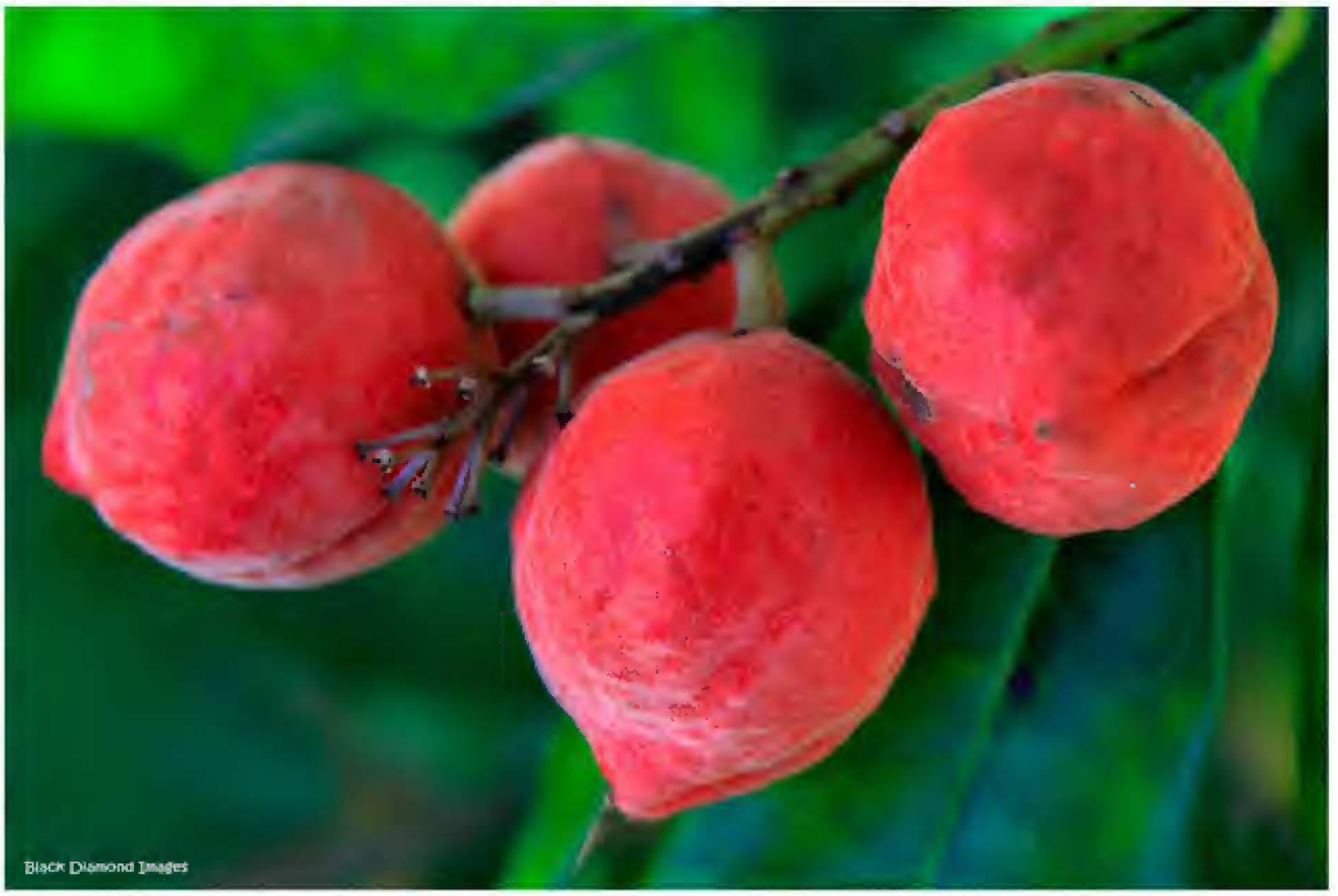

Fig. 3. *Triunia kittredgei.* Infrutescence showing vermilion to reddish fruits of a cultivated plant (as *T. robusta*), at the Wollongong Botanic Garden, New South Wales. Photo. Black Diamond Images.

Habitat and ecology: The Commonwealth Department of Environment (2008) states that *T. kittredgei,* under the name *Triunia robusta*, 'grows in the lower stratum of subtropical rainforest where it mainly occurs in notophyll vine forest or in mixed tall open forest developing a rainforest understorey in the absence of fire (Powell *et al.*, 2005). Most populations occur within 25 m of streams, on south or south-east facing slopes or river terraces, with a few populations at higher topographic positions away from watercourses (Powell *et al.*, 2005). It occurs on well-drained soil, either clayey sand, loamy sand or loams, derived from felsite substrate, alluvium or arenite mudrock (Shapcott, 2002; Powell *et al.*, 2005)'. Associated species recorded on label data include *Alchornia ilicifolia, Archontophoenix cunninghamii, Argyrodendron trifoliata, Arytera divaricata, Elaeocarpus eumundi, Canarium sp., Castanosperma australe, Dysoxylum rufum, Drypetes deplanchei, Harpullia pendula, Lophostemon confertus, Planchonella sp., Pseudoweinmanniana sp., Wilkea macrophylla;* Vines: *Cissus antarctica, Embelia australiana.* The altitudinal range is generally just above sea-level to 200 m.

Conservation status: *Triunia kittredgei,* under the name *Triunia robusta,* is listed as 'endangered' by ALA (2015) and the Commonwealth Department of Environment (2008). Foreman (1986) suggested the possibility that this species was extinct but later (1995) revealed the discovery of a population at Woombye. The Commonwealth Department of Environment (2008) states that there are 16 known populations with around 900 individual

plants, most of which occur in the Noosa Biosphere Reserve. Subsequently plants have been recorded from up to 43 sites (K. Kupsch pers. comm.).

Etymology: The species is named for Walter T. Kittredge, senior curatorial assistant at Harvard University Herbaria (A, GH) at the time of writing, who first drew attention to the nomenclatural problem associated with *Triunia robusta*.

Specimens examined: Queensland: Eumundi, *J. F. Bailey s.n.*, Nov 1900 (A589477; BRI-AQ317470; MEL2277219A; MEL2277220A; NSW169006!); *J.B. Staer s.n.*, Oct 1911 (NSW169005!); Brolga Park, 6 km W of Woombye, *P.I.Forster 6145, A.R.Bean & M.C.Tucker,* 27 Dec 1989 BRI-AQ467494; CANB!; CBG!; K; MEL695274; MEL695275; NE61106; NSW621500!; QRS92961.1.; QRS92962.2); Brolga Environmental Park, c. 6 km WNW of Nambour, *F.E. Davies 1542 & M. Richardson,* 23 Feb 1990 (BRI-AQ517041; CBG9003519!; MEL230031; NSW621497!); *P.I. Forster 7579 & P Sharpe,* 17 Nov 1990 (BRI-AQ500702; K; L; MEL1597085; NSW621499!; QRS96103); Rocky Road, Kiamba State Forest, *A. Moran s.n.*, 13 Nov 1992 (BRI-AQ549314; NSW621496!);

Other specimens assigned to this species: Queensland: Eumundi, *Bailey s.n.*, May 1892 (BRI-AQ104858); Nov 1894 (BRI-AQ317466); *J.H. Simmonds s.n.*, Nov 1892 (A589475; BRI-AQ317462); *J.B. Staer s.n.*, Nov 1892 (BRI164312 *fide* Foreman (1986: 196); Maroochie [Yandina], *F.M. Bailey s.n.*, Nov 1879 (BRI-AQ317456; MEL93791A); *J.F. Bailey & J.H. Simmonds s.n.*, Nov 1894 (BRI164313; MEL2277221A); *F.M. Bailey s.n.*, Jul 1888 (BRI022471; MEL2277223); Nov 1892 (MEL2277217); *J. Low s.n.,* undated (BRI164316; MEL2277222A); Eumundi, State Forest 351, 4 km SE of Eumundi, *A.R. Bean 7073*, 27 Nov 1993 (BRI-AQ622185); Gold Creek Road., N arm 5 km NW of Yandina, *L.H. Bird s.n.*, 2 Jan 1990 (BRI-AQ459391); State Forest Cooloolabin, *R.T. Henderson s.n.,* 24 Mar 1994 (BRI-AQ626260); Eumundi-Noosa road, Eumundi, 2.5 km E of Eumundi township, *J.G. Jeffreys s.n.*, 23 May 2006 (BRI-AQ737322); Rocky Creek, 3 km W of Wappa Dam near Yandina, *M. Powell TR16*, 26 Sep 2002 (BRI-AQ772239); Triunia National Park, Sunshine Coast, site TR11, *A. Shapcott s.n.*, 2000 (BRI-AQ667437); Ringtail State Forest Sunshine Coast, *A. Shapcott s.n.*, Dec 1999 (BRI-AQ667440); Cooloolabin State Forest, Sunshine Coast, Rocky Creek, site TR3. *A. Shapcott s.n.*, Nov 1999 (BRI-AQ667444); Blackensee Road, Sunshine Coast, site TR4, *A. Shapcott s.n.*, Dec 1999 (BRI-AQ667443); State Forest 351, Yandina Creek, c. 12 km NE of Yandina, *P.R. Sharpe 5010*, 5 Apr 1991 (BRI-AQ543240); Yandina Creek, Sunshine Coast, site TR8, *A. Shapcott s.n.*, Dec 1999 (BRI-AQ667439); Dulong, *G. Thomas MS119*, 22 Jun 2007 (BRI-AQ769018); Towen Mt, Triunia Bushland Conservation Reserve, *G. Thomas MS154*, 19 Aug 2008 (BRI-AQ840760); Garderers Road, S of Bruce Highway, 4 km SW of Pomona, *G. Thomas 28,* 19 Apr 1995 (BRI-AQ635588); Pryors Road., Yandina Creek, 6 km SSE of Eumundi, *G. Thomas 124*, 27 Oct 1992 (BRI-AQ625346); Wappa Dam, Wappa Pump Station Road, 3.5 km SSW of Yandina, *G. Thomas s.n.*, 18 Jan 1993 (BRI-AQ636322); Mt Ninderay, Maroochy Shire, *G. Thomas 406M*, 17 Aug 1999 (BRI-AQ666212); Mt Ninderry Environmental Reserve, Sunshine Coast Council, Near Waterfall Road., *G. Thomas MTN3*, 11 Sep 2013 (BRI-AQ824775); Blackensee Road Reserve, NW of Cooroy, S of Pomona, *G. Thomas 39*, 1 Feb 1996 (BRI-AQ585611); Skyring Creek, Federal. *N. Willis s.n.*, 3 Jul 2012 (BRI-AQ834014).

Triunia montana (C.T.White) Foreman, *Muelleria* 6: 195 (1986). **Figs 4–7.**

Helicia youngiana var. *montana* C.T.White, *Contributions from the Arnold Arboretum of Harvard University* 4: 24 (1933).

Protologue: A typo bracteis 8–10 mm longis differt.

Type citation: [Queensland] Bellenden Ker, Palm Camp, *F.M. Bailey* (Meston's Bellenden Ker Exped. 1889); Bellenden Ker (near the summit), *C.T. White*, Jan 1923.

Lectotype designated by H.O. Sleumer, *Blumea 8*: 15 (1955): Bellenden-Ker, near the summit: [*C.T.*] *White* [Jan. 1923] (NSW – '*typus,* haud vidi' [*typus,*'not seen']). No isolectotypes were cited by Sleumer.

Lectotype *fide* D. Foreman, *Muelleria 6*: 195 (1986): *lectotypus superfl.*

Replacement lectotype (here designated): Queensland: Cook: Bellenden-Ker, near the summit, *C.T. White s.n.*, Jan 1923 (BRI-AQ317460 – photo seen); isolectotypes MEL2277215A (*n.v.*); MEL2277216A (*n.v.*).

Notes: The lectotype designated by Sleumer cannot be located at NSW and may never have been sent there. From an examination of existing isolectotypes and some additional collections listed on ALA website (accessed 2 June 2015) and JSTOR website (accessed 29–31 May 2015), a replacement lectotype has been selected from the material held at BRI that was available to C.T. White.

Residual syntypes: Bellenden Ker, Palm Camp, *F.M. Bailey* (Meston's Bellenden Ker Exped. 1889), BRI-AQ317454 (photo seen); MEL2277213 (*n.v.*).

Notes: In lectotypifying *Helicia youngiana* var. *montana* with the syntype specimen collected by F.M. Bailey, Foreman (1986) apparently overlooked the earlier lectotypifications by Sleumer (1955). Fortunately the syntypes of *H. youngiana* var. *montana*, as recognised by Foreman, do not alter the application of the name of this taxon.

Morphological comparisons: *Triunia montana* can be characterised by its habitat preference for high altitude tropical rain forest above 1500 metres, where it grows on ridges and gullies in sandy, granite-derived soils. Morphologically it can be differentiated from *T. kittredgei* (and *T. robusta)* by its bright pink new growth, its adult leaves always entire and slightly thinner, the margins frequently ciliate, the abaxial surface usually with appressed hairs persistent along the midvein, its common bracts narrowly ovate-acuminate and longer (to 12 mm) and narrower (*c.* 2 mm wide), its pedicels and floral rachises densely red-tomentose. Triunia *montana* also has cataphylls between the cotyledons and the first true leaves, but, from limited observation, *T. kittredgei* does not. Diagnostically, *T. montana* also differs in its fruits that range from blackish through purple to maroon in colour, though the Australian Tropical Herbarium (2015) also doubtfully record fruit colour as sometimes red. Cooper and Cooper (2004, p. 293) depict a maroon fruit. One specimen sheet records fruit colour as yellow. The perianth of *T. montana* also has the adaxial surface with a denser indumentum of longer hairs (to 0.5 mm long) located within the interstices created by the raised filaments on the adaxial surface of the tri-connate perianth labellum. The stylar hairs appear to be consistently longer (to 0.5 mm) than those of *T. kittredgei*. According to the Australian Tropical Herbarium (2010) 'terminal buds and young shoots are densely clothed in rusty red hairs, which usually persist on the petiole and the midrib on the underside of the leaf blade'. Mr Garry Sankowsky (pers. comm.) suggests there are three distinct forms of *T. montana*: 'Mt. Lewis' pink-flowered form; 'Mt. Misery' large-fruited form and the typical cream-flowered form from Mt. Bartle Frere in the Bellenden-Ker Range (Figs 3–5). Leaves with at least two teeth persistent have been collected from saplings of the Mt Lewis form by *I. Telford and R.J. Rudd* (CBG9102554).

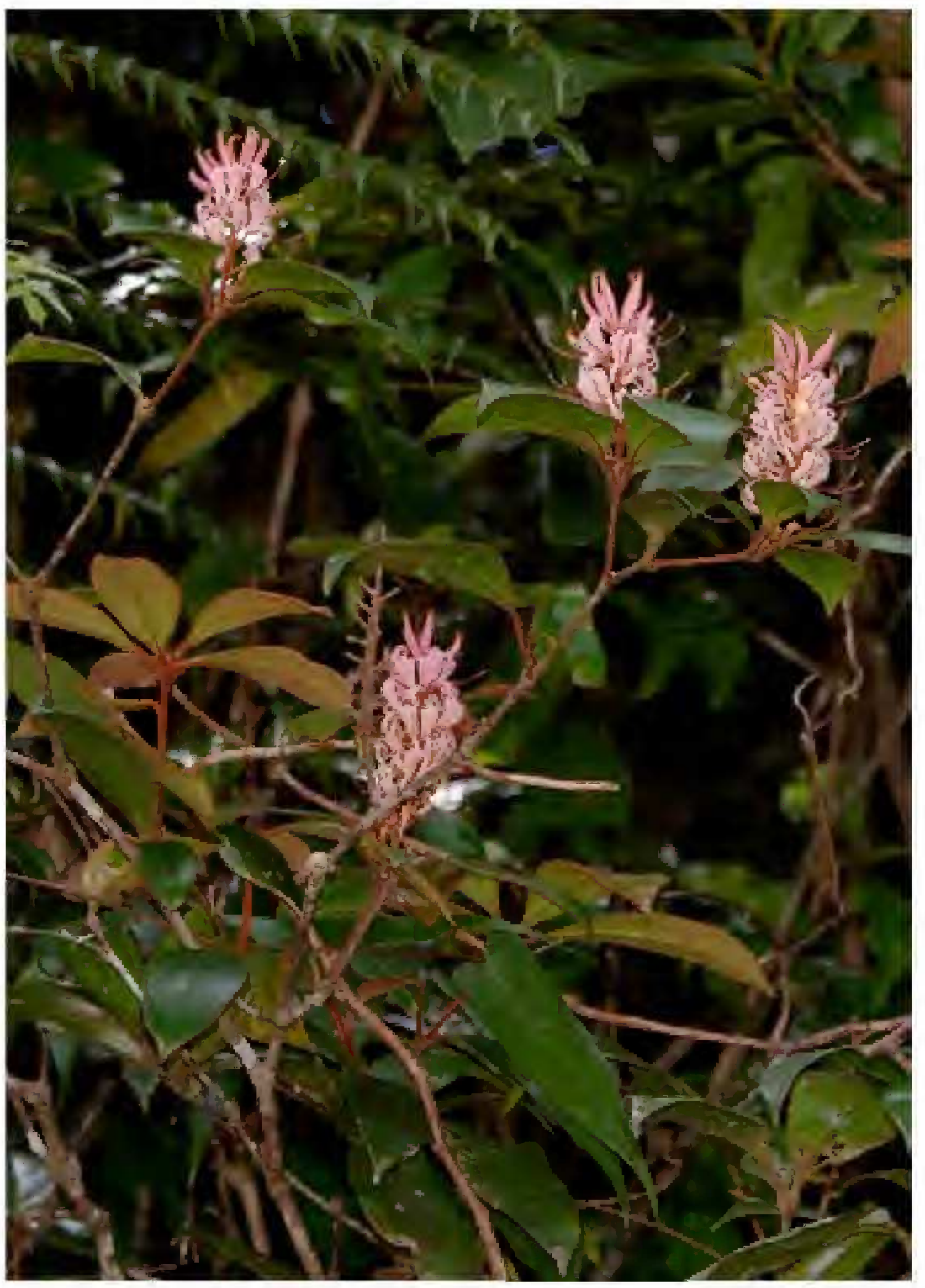

Fig. 4. *Triuna montana*. Flowering branchlets of the pink-flowered form growing at Mt Lewis, Queensland. Photo. Garry Sankowsky.

Fig. 5. *Triunia montana*. Flowering branchlets of the typical cream-coloured flowered form growing at Mt Bartle Frere, Bellenden-Ker Range, Queensland. Photo. Garry Sankowsky.

Fig. 6. *Triunia montana*. Fruiting branchlet showing leaves and the large blackish fruits of the Mt Misery form. Photo. Garry Sankowsky.

Fig. 7. *Triunia montana*. Colour variation in fruits. Illustration by W.T. Cooper. Reproduced by permission from Wendy Cooper and Nokomis Editions, *Fruits of the Australian Tropical Rainforest* © William T. Cooper.

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