

A taxonomic revision of *Polyosma* Blume (Escalloniaceae) in Australia

A.R. Bean & Paul I. Forster

Summary

Bean, A.R. & Forster, P.I. (2021). A taxonomic revision of *Polyosma* Blume (Escalloniaceae) in Australia. *Austrobaileya* **11**: 89–114. *Polyosma* in Australia comprises eight endemic species that occur in rainforests along the east coast. All eight species are here fully described, including two new species from the Wet Tropics of Queensland (*P. globosa* A.R.Bean & P.I.Forst., *P. nigrescens* A.R.Bean & P.I.Forst., both illustrated with line drawings), with notes on distribution (including maps) and habitat, typification and suggested conservation status. Lectotypes are selected for *Polyosma alangiacea* F.Muell., *P. cunninghamii* Benn., *P. reducta* F.Muell. and *P. rigidiuscula* F.Muell. & F.M.Bailey. A dichotomous identification key to the species is provided.

Key Words: Escalloniaceae; Polyosmaceae; Saxifragaceae; *Polyosma*; *Polyosma alangiacea*; *Polyosma cunninghamii*; *Polyosma globosa*; *Polyosma hirsuta*; *Polyosma nigrescens*; *Polyosma reducta*; *Polyosma rhytphloia*; *Polyosma rigidiuscula*; Australia flora; New South Wales flora; Queensland flora; Wet Tropics; new species; taxonomy; identification key; conservation status

A.R. Bean & Paul I. Forster, Queensland Herbarium, Department of Environment and Science, Brisbane Botanic Gardens, Mt Coot-tha Road, Toowong, Queensland 4066, Australia. Email: tony.bean@des.qld.gov.au; paul.forster@des.qld.gov.au

Introduction

The genus *Polyosma* Blume was originally described based on material collected in Java (Blume 1826). Species of *Polyosma* have been subsequently described from a wide area of mainland Asia (China, India, Thailand, Vietnam), Malesia (Indonesia, Malaysia, New Guinea, Philippines) and Australasia (Australia, New Caledonia, Solomon Islands) (Lundberg 2016). There is no monograph of the genus, and the current species estimate of c. 90 (Lundberg 2016), is likely to rise with recent descriptions of novelties adding to this total (Esser & Saw 2015; Esser 2017; Pillon 2018; Saw 2020a,b).

The family placement of *Polyosma* has been relatively unstable with the genus variously classified in Escalloniaceae (Hutchinson 1967; Hyland 1982; Stanley 1983; Thorne 1992; Christophel & Hyland 1993; Hyland & Whiffin 1993; Hyland *et al.* 1994, 1999; Takhtajan 1997; CHAH 2007; Forster 2007, 2010, 2019; Heywood *et al.* 2007; APG III 2009; APG IV 2016; Zich *et al.* 2018; Saw 2020a,b), Grossulariaceae

(Cronquist 1981; Henderson 1997, 2002), Saxifrageae/Saxifragaceae (Bentham 1864; Engler 1890, 1928; Bailey 1900; Schlechter 1914; Reeder 1946; Francis 1951; Morley 1983), or in Polyosmaceae (Blume 1851; Willis & Shaw 1966; APG 1998; APG II 2003; Lundberg 2001, 2016; Esser 2017). The placement as the sole genus in Polyosmaceae is dependent on interpretation of inferred relationships from molecular analyses, with analysis of plastid markers indicating a sister relationship to other Escalloniaceae (Lundberg 2001; Tank & Donoghue 2010). By comparison, mitochondrial markers indicate a closer sister relationship to *Quintinia* DC. (Soltis *et al.* 2011). The most recent consensus classification of plant families based on sequence data maintains the placement of *Polyosma* in Escalloniaceae (APG IV 2016).

For Australia, the first record of *Polyosma* was by J.J. Bennett when he described *P. cunninghamii* Benn. (Bennett *et al.* 1840). Bentham (1864) included only *P. cunninghamii* in the *Flora Australiensis*; further species

were added by Mueller (1872, 1892) with *P. alangiacea* and *P. reducta* respectively, Bailey (1890) with *P. rigidiuscula* F.Muell. & F.M.Bailey, White (1918) with *P. hirsuta* C.T.White, White & Francis (1926) with *P. rhytophloia* C.T.White & Francis and Domin (1926) with *P. brachyandra* Domin (as ‘brachyandrum’). The last overall flora account was by Bailey (1900); however, at that time only *P. alangiacea*, *P. cunninghamii*, *P. reducta* and *P. rigidiuscula* were included. Most modern (last forty years) accounts or listings of species have indicated that between five to eight species are present, with several known only by phrase names (Hyland 1982; Morley 1983; Thomas & McDonald 1987, 1989; Hyland & Whiffin 1993; Hyland *et al.* 1994; Henderson 1997, 2002; Hyland *et al.* 1999; Cooper 1994; Cooper & Cooper 2004; CHAH 2007; Forster 2007, 2010, 2019).

The Australian species are all shrubs or small to medium sized trees, invariably in the understorey or midstorey of rainforest or closed forest communities. The eight species endemic to eastern Australia occur in diverse rainforest types at higher altitudes, generally above 600 m, and often near or on the tops of the highest peaks in tropical parts of the continent. Substrates are not particularly diverse, being predominantly on volcanics (basalt, granite) or metasediments, although several species are restricted to only one substrate. The overall distribution in Australia ranges from the Wet Tropics of north-east Queensland (northern limit at Mt Hartley), to southern New South Wales (southern limit at Kioloa State Forest, N of Batemans Bay) through nearly 19° of latitude.

Materials and methods

This revision is based largely on collections at the Queensland Herbarium (BRI), together with examination of material at AD, CANB, CNS, MEL and NSW (either *in situ* or on loan) and online images at BM, K, L, MEL and PR via JSTOR Global Plants or directly from herbaria. The majority of species were examined and/or collected in habitat by one or both authors.

Common abbreviations used in the collection data are LA (Logging Area), Mt (Mountain, except where an official National Park name), NP/NPR (National Park/National Park Reserve), SF/SFR (State Forest/State Forest Reserve) and TR (Timber Reserve). Online images of specimens are cited as *i.d.v.* (*imago digitalis visa*). Specimens are cited within Queensland pastoral districts running north to south, with general mention made of the Queensland bioregions in which they occur (<https://apps.des.qld.gov.au/regional-ecosystems/>).

Measurements are inclusive, *viz.* 0.2–1.0 given as 0.2–1.

Species treatments are in alphabetical order with no phylogeny inferred.

Suggested conservation status codes are as defined by the IUCN (2012).

Taxonomy

Polyosma Blume, *Fl. Ned. Ind.* 13: 658 (1826).

Type: *Polyosma ilicifolia* Blume (lectotype, *vide* Hutchinson 1967: 31).

Shrubs, small trees or canopy trees, hermaphrodite. Indumentum of simple hairs. Leaves simple, opposite (or sometimes sub-opposite), decussate, margins entire or toothed. Stipules absent. Leaf venation pinnate, secondary veins joined by prominent loops. Domatia absent. Leaves without translucent dots or flecks, glands and nectaries absent. Inflorescences elongate, racemose or spicate, terminal; flowers bisexual, actinomorphic, sessile to pedicellate. Bracts persistent or deciduous, at base of inflorescence; bracteoles 3, inserted at or near base of calyx, persistent. Calyx with a fused basal part (hypanthium) and 4 lobes. Corolla fused into a long tube (not in Australia), with 4 valvate lobes, reflexed at anthesis, or corolla tube with 4 sutures, initially splitting to the 4 valvate lobes, but sometimes splitting almost to base. Hypogynous disc present. Stamens 4, not attached to perianth, antesealous; anthers basifixed, dehiscing by longitudinal slits; filaments with antrorse or spreading hairs throughout. Ovary inferior, 1-locular, glabrous, ovules numerous. Style simple,

unbranched, stigma capitate or truncate. Fruit an indehiscent 1-seeded drupe, aril absent, sepals persistent at the apex. About 90 species, Old World tropics and subtropics. Eight species endemic to Australia.

Key to the Australian species of *Polyosma*

- 1 Leaf venation densely reticulate, with many tertiary veins visible (and often raised) on lower leaf surface **2**
- 1. Leaf venation not densely reticulate, few or no tertiary veins visible on lower leaf surface **6**
- 2 Petioles short (3–11% of lamina length) **3**
- 2. Petioles long (9–37% of lamina length) **4**
- 3 Branchlet hairs 0.1–0.2 mm long, white, confined to new growth; mature fruits 7–10 × 5–6 mm **8. P. rigidiuscula**
- 3. Branchlet hairs 0.2–0.5 mm long, yellow or brown, persistent on older stems; mature fruits 10–11 × 7–8 mm **4. P. hirsuta**
- 4 Leaf margins (on mature plants) toothed **7. P. rhytophloia**
- 4. Leaf margins (on mature plants) entire **5**
- 5 Leaf midrib, petioles and branchlets with brown rusty hairs; pedicels 0.8–1.4 mm long at anthesis **1. P. alangiacea**
- 5. Leaf midrib, petioles and branchlets with yellow to yellow-brown hairs; pedicels absent at anthesis **3. P. globosa**
- 6 Leaves with 4–7 pairs of prominent teeth; fruits ribbed **2. P. cunninghamii**
- 6. Leaves entire or with 1–3 pairs of very small teeth; fruits without ribs **7**
- 7 Branchlets persistently hairy; leaf margins often with 1–3 pairs of tiny teeth; fruiting pedicels 2.5–3.5 mm long **6. P. reducta**
- 7. Branchlets glabrous except on very young growth; leaf margins entire; fruiting pedicels 4–5 mm long **5. P. nigrescens**

1. *Polyosma alangiacea* F.Muell., *Fragm.* 8: 8 (1872). **Type citation:** “In silvis densis montium prope Rockingham’s Bay ubi, quoque Bischoffia Javanica nascitur, Dallachy”. **Type:** Queensland. NORTH KENNEDY DISTRICT: Coast Range, 27 July 1868, *J. Dallachy s.n.* (lecto [here designated]: MEL 568240; isolecto: BRI [AQ291331]; K 000739774 *i.d.v.*; L 0035068 *i.d.v.*; MEL 568242; MEL 568243).

Illustrations: Cooper (1994: 231); Cooper & Cooper (2004: 225).

Tree 4–26 m tall. **Branchlets** ± terete, indumentum persistent, brown or rusty-coloured, hairs 0.2–0.4 mm long, straight to somewhat crisped, antrorse to spreading. **Leaves:** petioles terete, 14–40 mm long, 18–37% of lamina length, densely pubescent with rusty hairs; lamina elliptical, 93–158

× 28–67 mm, 2.3–3.5 times longer than wide, base cuneate, apex acuminate, margins entire, younger leaves densely hairy on midvein (lower), leaf margin, and sparsely hairy on lower surface, soon glabrescent; secondary veins distinct on both sides, 6–10 pairs, diverging at 60–85° from the midvein; reticulate tertiary venation visible on lower surface, raised or not raised. Juvenile specimens very similar but with larger leaves. **Inflorescence** rachis densely rusty-hairy, 57–130 mm long (basal 5–12 mm without flowers), bracts 4 or 5, ternate, 7.5–10 mm long; flowers 65–85; bracteoles unequal, middle one longer than lateral ones, middle bracteole lanceolate to elliptical, 1.7–2.8 mm long. **Flowers:** pedicels 0.8–1.4 mm long at anthesis; calyx 2.3–2.7 mm long, densely rusty-hairy, lobes 0.5–0.8 mm long; corolla

tube with longitudinal sutures, sometimes splitting to base, 9–11 mm long, with dense rusty hairs on outer surface, sparse white hairs on inner surface; corolla lobes 1.5–2.5 mm long, 0.8–1.2 mm wide at base, creamy, apex obtuse; staminal filaments c. 5 mm long, anthers 1.6–2.2 mm long; style about as long as corolla, with moderately dense antrorse hairs 0.05–0.1 mm long, exerted from corolla tube by 1–2 mm. **Fruits:** pedicels 1.5–2.6 mm long, articulated at the base; immature fruits ellipsoid, 6.5–11 × 5–7.5 mm, obscurely ribbed or rugose, sparsely pubescent, green, not fleshy; mature fruits ellipsoid, c. 15 mm long and 11 mm diameter, base obtuse, dark blue, smooth, glabrous, significantly fleshy.

Additional selected specimens examined: Queensland. COOK DISTRICT: TR 176 Monkhouse, Lorna Doone LA, Oct 1982, *Hyland 12223* (CNS); Mt Windsor Road, c. 1 km E of Mt Windsor Station gate, Jun 2019, *Worboys et al. 1775* (BRI, CNS); May Peak, Oct 1994, *Jago 3214* (BRI); SFR 607, Bridle LA, Aug 1982, *Hyland 11847* (CNS); Westcott Road, Topaz, Jan 1993, *Cooper 482 & Cooper* (CNS); SFR 607, Emerald LA, Apr 1983, *Gray 3031* (CNS, L); SF 185 Danbulla, Jun 1992, *Forster PIF10652 & Tucker* (BRI, CNS, MEL); SF 185 Danbulla, Kauri Creek Road, Nov 1995, *Forster PIF18098 & Spokes* (BRI); SFR 185, Mt Haig, Feb 1986, *Altena s.n.* (CNS [QRS503950]); SFR 607, Emerald LA, Feb 1981, *Gray 1918* (BRI, CANB, CNS, L, MEL, NSW); SFR 194, Western, Cpt. 59, EP/43, Sep 1978, *Unwin 704* (CNS); SFR 194, Hugh Nelson Range, Parish of Herberton, May 1982, *Gray 2594* (CNS); SFR 194, Western, Jan 1982, *Gray 2388* (BRI, CANB, CNS, L); SFR 650 (Mt Fisher), E/P 29, Nov 1975, *Sanderson 834* (CNS). NORTH KENNEDY DISTRICT: 27 km S along Culpa Road, SF 605 Koombuloomba, May 2002, *Forster PIF28784 & Booth* (BRI); Saddle below main Mt Bowen ridge, Hinchinbrook Island, Jul 1988, *Fell DF1220 & Swain* (BRI); Mt Fox, May 1964, *Stark s.n.* (CNS [QRS507596]); SFR 605, Dawson LA, Dec 1981, *Hyland 11361* (BRI, CNS); Mt Spec forestry camp, Nov 1933, *Francis s.n.* (BRI [AQ291333]); Mt Spec, Jun 1952, *Volck & White AFO 00292* (CNS); Mt Elliot, 30 km SE of Townsville, Sep 1998, *Cumming 17825* (BRI); Birthday Creek Falls, Feb 2002, *Cumming s.n.* (BRI [AQ559852]); Burgoon LA, Garrawalt, Jul 1975, *Garraderson 647* (CNS). SOUTH KENNEDY DISTRICT: Crediton Loop road, Eungella NP, *s.dat.*, *Pearson SP440* (BRI); SFR 62, Gamma, Jul 1974, *Hyland 4028* (BRI, CANB, L, NSW); SFR 411 Mia Mia, Apr 1979, *Qualischefski 135* (CNS).

Distribution and habitat: *Polyosma alangiacea* is endemic to Queensland, extending from Shiptons Flat (south of Cooktown) to Mt Elliott in the Wet Tropics bioregion, and with a southern disjunction to Eungella National Park (west of Mackay)

in the Central Coast bioregion (**Map 1**). It inhabits tropical rainforest (complex notophyll vineforest) at altitudes between 400 and 1100 metres on volcanic substrates (basalt, granite).

Phenology: Flowers have been recorded from April to July; fruits from October to February.

Typification: Dallachy collected widely in the area known as Rockingham Bay (Dowe & Maroske 2020) with the collections sent to Ferdinand Mueller in Melbourne. Many of these specimens are only labelled with this location, although if they are dated then a more specific location can be inferred. The specimens that he collected of this species are deposited in the herbaria BRI, K, L and MEL and most have been annotated previously as representing isotype or syntype material by R.D. Hoogland, G.K. Schultze-Menz or other herbarium curators. Originally this material would have been kept unmounted in folders at MEL, prior to distribution, followed by mounting and eventual allocation of firstly sheet numbers, and then accession numbers (not necessarily the same numbers) in the different herbaria. Mueller indeed sent material to K soon after he received it from Dallachy. The accession K 000739774 bears the annotation ‘Rec. 3/69’.

The dispersal and separate mounting and accessioning of Dallachy’s collection has meant that the different specimens are accompanied by a variety of label data. Many just have ‘Rockingham(s) Bay’ and no date. The accession MEL 568240 has a note written in Dallachy’s hand stating that the collection is from the Coast Range and was collected on 27 July 1868. This fertile specimen is the only accession with these data and is selected as the lectotype for the name. Other accessions in BRI, K, L and MEL only have Rockingham(‘s) Bay written in Mueller’s hand on a label, no date and often no mention of Dallachy, although they were clearly handled by Mueller. It is known that Mueller reverted to more generalised localities when writing labels for duplicates (Bean 2019: 87), and he often omitted Dallachy’s name from the ‘Rockingham Bay’ labels as Dallachy was his only collector in that area. The specimens at BRI, K and L are very similar to the lectotype

in flower maturity, leaf size and indumentum and it is highly likely that they were part of the same gathering. They are here considered isolectotypes.

Dallachy's location of 'Coast Range' is most likely to be somewhere west of Cardwell, perhaps more in the Cardwell Range where the species has been subsequently collected, than the actual Coast Range of modern geography.

Notes: The flowers of *Polyosma alangiacea* are reportedly strongly perfumed (Gray 2594). It is a distinctive species by virtue of its long petioles, rusty tomentum on the branchlets and flowers, and the entire leaf margins. It is unlike any other Australian species but is rather similar to *P. cestroides* Schltr. from Papua New Guinea. However, the corolla of the latter is glabrous and lacks sutures, and its leaves are glabrous.

Conservation status: *Polyosma alangiacea* is widespread with extant subpopulations occurring mainly in locations that are part of National Parks and State Forest Reserves. This species is usually locally common at collection locations, most of which are concentrated along roads or access tracks. There are no pressing threatening processes identified for this species and it can be categorised as **Least Concern**.

2. *Polyosma cunninghamii* Benn. in J.J. Bennett, R. Brown & T. Horsfield, *Pl. Jav. Rar. [Bennett]* 2:196, Tab XL, figs. 8–12 (1840). **Type citation:** "in Novâ Cambriâ Australi prope Five Islands, in sylvis umbrosis submontosis: arbor 12–25-pedalis, *A. Cunningham* (1818). (*exam. s. in Herb. Banks.*)" **Type:** New South Wales. Five Islands, [October–November] 1818, *A. Cunningham* 84 (lecto [here designated]; BM 000906246 *i.d.v.*; isolecto: NSW 628702).

Illustrations: Maiden (1917, t. 193); Stanley (1983: 223, Fig. 35B); Floyd (1989: 129); Leiper *et al.* (2008: 332); NSWFO (2020).

Shrub or tree 3–10 m tall. **Branchlets** ± terete, young branchlets with moderately dense white hairs 0.1–0.25 mm long, straight, appressed. **Leaves:** petioles terete, 4–14 mm long, 7–19% of lamina length, sparsely to

densely pubescent with white hairs; laminae elliptical to oblanceolate, 55–105 × 19–30 mm, 2.7–3.5 times longer than wide, base cuneate, apex acute to acuminate, margins with 4–7 pairs of prominent teeth, younger leaves moderately hairy on midvein (lower) and sparsely hairy on lower surface, soon glabrescent; secondary veins distinct on both sides, 5–7 pairs, diverging at 60–80° degrees from the midvein; tertiary venation not visible on either surface. Juvenile specimens very similar but with larger leaves. **Inflorescence** rachis with dense white appressed hairs, 18–68 mm long (basal 0–16 mm without flowers), bracts 2–4 ternate or in groups of 2, 1.5–5 mm long; flowers 15–47; bracteoles unequal, middle one longer than lateral ones, middle bracteole lanceolate, 0.5–1.2 mm long. **Flowers:** pedicels 3–4 mm long at anthesis; calyx 2.2–3 mm long, with appressed white hairs, lobes 0.3–0.6 mm long; corolla tube with longitudinal sutures, 6.5–12 mm long, sometimes splitting to base, yellow-green, appressed hairy on outer surface, more or less glabrous on inner surface; corolla lobes 1.8–2.4 mm long, 0.6–1(–1.2) mm wide, apex obtuse; staminal filaments *c.* 5 mm long, anthers 1.6–2 mm long; style about as long as corolla, sparsely hairy, exerted from the corolla tube by 1–2 mm. **Fruits:** pedicels 4–6 mm long, articulated at the base; mature fruits ellipsoidal, 13–18 × 8–11 mm, with 8 prominent longitudinal ribs, glabrous or sparsely pubescent, significantly fleshy at maturity, purple. **Fig. 1.**

Additional selected specimens examined: **Queensland.** WIDE BAY DISTRICT: Fireclay Scrub, Wrattens SF (SF 639 Widgee), *c.* 20 km N of Mary Rivers Field Studies Centre, Feb 1988, McDonald 4163 (BRI); Eumundi, Mar 1894, *Field Naturalists* (BRI [AQ291345]); Mary Cairncross Scenic Reserve, Blackall Range, 3 km SE of Maleny, Dec 2004, Forster PIF30427 *et al.* (BRI, L, MEL, NSW). DARLING DOWNS DISTRICT: Goomburra SF, *c.* 1.5 km W of Mt Castle Lookout carpark, NE of Warwick, Jan 2003, Bean 19935 (BRI); Bare Rock Track from Mt Cordeaux, Aug 1992, Forster PIF11189 & Reilly (BRI, CNS, L, MEL); E of Bald Mt, *c.* 23 miles [38.3 km] E of Warwick, Apr 1962, Smith *s.n.* (BRI [AQ200765]); adjacent to Gambubal SF, NE of Killarney, Oct 2000, Bean 16887 (BRI); The Head – Killarney Road, 0.7 km W of the Moss Garden, Apr 2002, Bean 18599 (BRI); Spring Creek Road, between the Moss Gardens & Carr's Lookout, near The Head, Dec 2004, Forster PIF30516 *et al.* (BRI, MEL, NSW). MORETON DISTRICT: Mt Glorious, Mar 1943, White 12065 (BRI); forestry road



Fig. 1. *Polyosma cunninghamii*. Flowering and fruiting branchlet. [Repeater Station Road, Springbrook, 10 April 2019]. Photo: G. Leiper.

to Lepidozamia Grove, D'Aguilar Range, Oct 1997, *Phillips 55* (BRI); On bank of Advancetown Lake, Hinze Dam, c. 2 km from dam wall, western side of Tallai Range, May 2001, *Halford Q7058 & McDonald* (BRI); Mt Barney, saddle between peaks, Oct 1992, *Forster PIF1902 et al.* (BRI); Tomewin Conservation Park, adjacent to Tomewin Mountain Road, McPherson Range, Mar 2019, *Forster PIF46057 & Leiper* (BRI, MEL). **New South Wales.** Cox's Road, near junction with N end of Murray Scrub Track, Richmond Range, Oct 2006, *Phillips 1647 & Phillips* (BRI); Willi Willi NP, Banda Road, 300m E of junction with Hastings Forest Way, Sep 2003, *Donaldson 2684 & Golson* (CANB, NSW); Vicinity of Forestry Hut, Oaks SF, c. 15 miles [25 km] W of Bowraville, May 1964, *Schodde 3521 & Hayes* (AD, CANB, NSW); Cockerawombeeba Creek, Mt Boss SF, 46 km NW of Wauchope, Oct 1978, *Streimann 8229* (BRI, CANB); Fitzroy Falls, E of Moss Vale, Nov 1962, *Schodde 3177* (CANB); Budderoo NP, c. 1 km E of Knights Hill, head of Minnamurra Creek, Oct 1993, *Gilmour 7509* (BRI, CANB, NSW); Kioloa SF, Higgins Creek, Apr 1979, *Russell-Smith s.n.* (CANB [CBG7906459]).

Distribution and habitat: *Polyosma cunninghamii* is endemic to Queensland (within the South East Queensland bioregion) and New South Wales and has the greatest

latitudinal range of any of the Australia species, extending from Wrattens SF (S of Kilkivan) in Queensland, to Kioloa SF (N of Batemans Bay) in New South Wales (**Map 2**). It inhabits subtropical to temperate rainforest (simple to complex notophyll vineforest) at low to high altitudes (from 60 to 1300 metres), on a variety of soil types, predominantly of volcanic origin (basalt, granite, granophyre), although it may also occur on metasediments.

Phenology: Flowers and fruits have been collected in every month of the year.

Affinities: *Polyosma cunninghamii* has leaves with relatively long petioles and conspicuously toothed margins (more so than any other Australian species), and prominently ribbed fruits. Sterile specimens closely resemble the Javanese species *P. ilicifolia* Blume, but the fruits of the latter are not ribbed.

Typification: Cunningham appears to have only collected this species once, as represented by his collection #84 from the

Five Islands location in 1818. This collection is represented in two herbaria (BM and NSW) and a lectotype is selected based on the BM sheet.

Conservation status: There has been widespread habitat destruction throughout the range of *Polyosma cunninghamii* for agriculture and forestry and this has undoubtedly caused a reduction and fragmentation of the overall species population. However, the species is still commonly encountered in multiple locations. It is present in numerous National Parks, State Forest Reserves and other conservation reserves and can be categorised as **Least Concern**.

3. *Polyosma globosa* A.R.Bean & P.I.Forst. sp. nov.

With affinity to *P. hirsuta*, but differing by the entire leaf margins, the sessile flowers and fruits, and the much longer petioles. **Typus:** Queensland. COOK DISTRICT: State Forest Reserve 143, Kanawarra, Carbine Logging Area, 24 November 1987, B. Hyland 2524IRFK (holo: CNS [QRS085532]; iso: BRI, CNS [QRS085533]).

Polyosma sp. (Mt Lewis BH 2524IRFK); Hyland *et al.* (1994: 305); Hyland *et al.* (1999: 68); Zich *et al.* (2018).

Polyosma sp. (Mt Lewis B.Hyland RFK25241); Henderson (1997: 93, 2002: 91); Forster (2007: 69, 2010: 64, 2019).

Polyosma sp. (Mt Lewis); Cooper & Cooper (2004: 226).

Polyosma sp. Mt Lewis (B.P.Hyland RFK25241) Qld Herbarium; CHAH (2007).

Tree 5–15 m tall. **Branchlets** ± terete, indumentum persistent, yellow-brown or yellow, hairs 0.2–0.4 mm long, straight to somewhat crisped, antrorse to spreading. **Leaves:** petioles terete, 13–24 mm long, 20–27% of lamina length, densely pubescent with yellow or rusty hairs; lamina elliptical, 58–112 × 20–42 mm, 2.3–3.1 times longer than wide, base cuneate, apex acuminate, margins entire; younger leaves densely hairy on midvein (lower), leaf margin, and sparsely

hairy on lower surface, hairs persisting on midrib, lower side; secondary veins distinct on both sides, 5–7 pairs, diverging at 60–80° from the midvein; reticulate tertiary venation visible on upper and lower surface, raised. Juvenile specimens very similar but with larger leaves, and presence of 6–9 pairs of marginal teeth. **Inflorescence** rachis sparsely to densely yellow or rusty-hairy, 57–90 mm long (basal 4–7 mm without flowers), bracts 2, opposite, 3.5–5 mm long; flowers 76–94; bracteoles unequal, middle one somewhat longer than lateral ones, middle bracteole ovate, 0.8–1.3 mm long. **Flowers:** pedicels absent; calyx 2.2–2.6 mm long, densely rusty-hairy, lobes 0.3–0.6 mm long; corolla tube with longitudinal sutures, sometimes splitting to base, 5.5–7.5 mm long, appressed hairy on outer surface, glabrous on inner surface; corolla lobes 2.4–3 mm long, 0.9–1.2 mm wide, colour unknown, apex obtuse to acute; staminal filaments 4.5–5 mm long, anthers 1.9–2.2 mm long; style about as long as corolla, exerted from corolla tube by 1–2 mm, with sparse antrorse hairs 0.05–0.2 mm long. **Fruits:** pedicels absent; mature fruits globose, 9.5–10.5 × 9–10 mm, not ribbed, slightly rugose, sparsely pubescent, purple or blue-black, not fleshy. **Fig. 2.**

Additional selected specimens examined: Queensland. COOK DISTRICT: Daintree NP, NW of Black Mountain, May 1998, Forster PIF22891 *et al.* (BRI); Near Schillers Hut, Mt Spurgeon, Sep 1972, Webb & Tracey 11764 (BRI); SFR 143, North Mary LA, May 1977, Gray 481 (BRI, CANB, CNS, NSW); SFR 143 Parish of Kanawarra, Carbine LA, Jun 1988, Gray 4855 (BRI, CNS); *ibid*, Jul 1988, Gray 4889 (BRI, CNS); Mt Lewis (Bunya site), Sep 1973, Webb & Tracey 11458 (BRI); Mt Lewis, Oct 1967, Hyland 1047RFK (BRI, CNS); *ibid*, Aug 1968, Hyland 1898 (BRI); *ibid*, Aug 1968, Hyland 1900 (BRI); Mt Lewis Forest Reserve, 22 km along Mt Lewis road, May 2003, Forster PIF29365 & Jensen (BRI); SFR 143, Kanawarra, Carbine LA, Dec 1988, Hyland 13742 (BRI, CNS); *ibid*, Dec 1988, Hyland 13744 (BRI, CNS); *ibid*, Oct 1988, Hyland 13593 (BRI, CNS); *ibid*, Dec 1990, Hyland 14092 (BRI, CNS); Mt Lewis road, 35 km from junction with Mareeba – Mossman road, Oct 1987, Foreman 1859 (BRI, CNS, MEL, NSW).

Distribution and habitat: *Polyosma globosa* is endemic to the Wet Tropics bioregion of north Queensland north of the Black Mountain Corridor (BMC) (Bryant & Krosch 2016). The species is known from four general locations (Windsor Tableland, Mt Lewis, Black Mt in

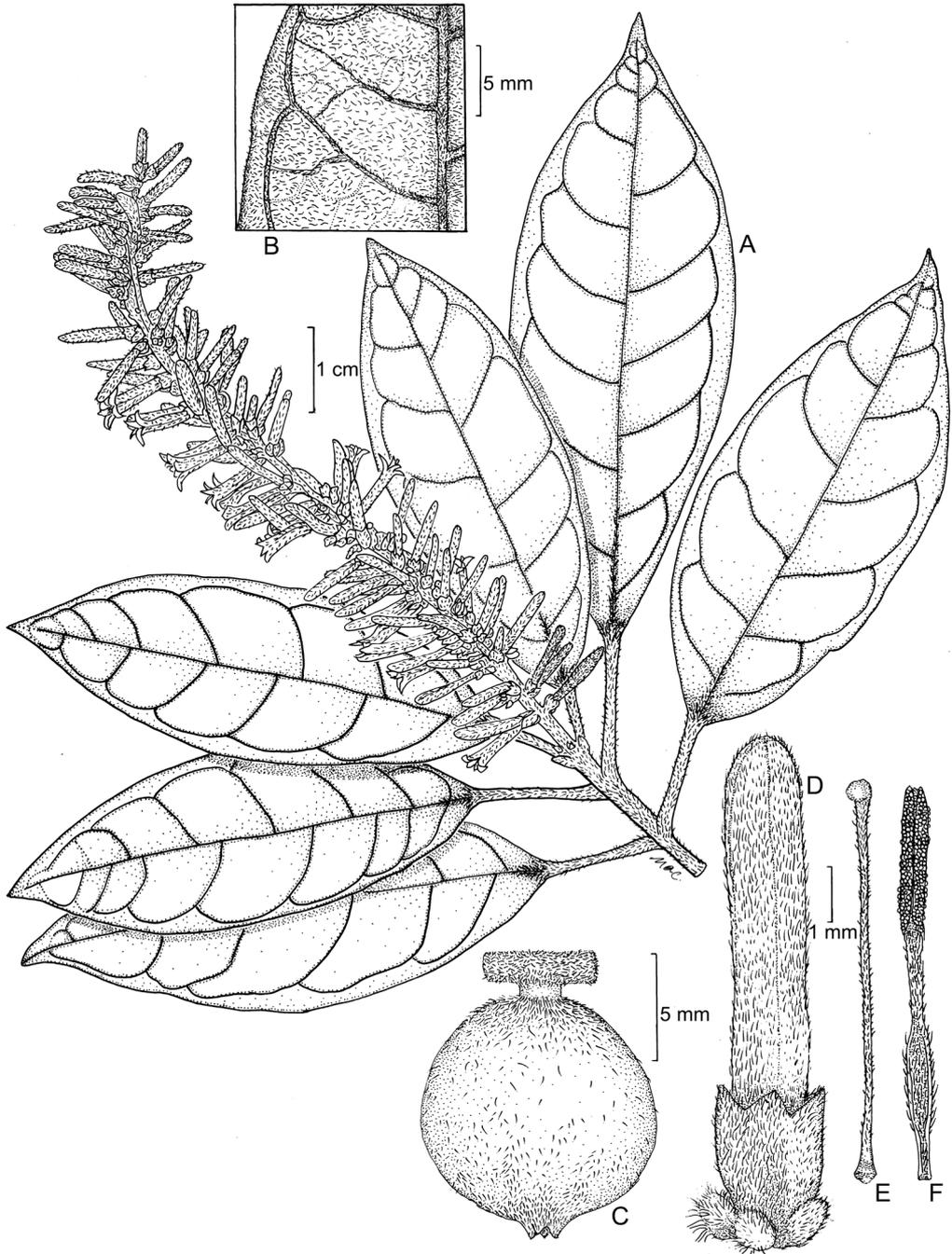


Fig. 2. *Polyosma globosa*. A. flowering branchlet. B. portion of leaf lower surface. C. mature fruit. D. flower and bracteoles, just prior to anthesis. E. style and stigma. F. stamen. All from *Hyland 2524IRFK* (BRI). Scales as indicated. Del. N. Crosswell.

the Daintree NP and Mt Spurgeon) (**Map 3**), at altitudes between 1000 and 1260 metres in montane tropical rainforest (complex notophyll vineforest, microphyll fern/moss vineforest) on the tops of exposed ridges and mountain tops with an underlying substrate of granite.

Phenology: Flowers are recorded from September to December; fruits from May to December.

Affinities: *Polyosma globosa* is clearly allied to *P. hirsuta* but differs by the mature plants having entire leaf margins, sessile flowers and fruits (flowering pedicels 1.3–2.5 mm long, fruiting pedicels 2.5–6 mm long for *P. hirsuta*), and the petioles 20–27% of lamina length (5–11% of lamina length for *P. hirsuta*).

Conservation status: *Polyosma globosa* occurs in effectively four locations with multiple sublocalities. It is generally locally abundant at the known locations. Further exploration of the largely inaccessible area between Mt Spurgeon and the Black Mt in the Daintree NP is likely to reduce this apparent geographic disjunction. The likelihood of extinction from stochastic change (i.e. a drier and hotter climate) is extreme. The climate is predicted to become hotter and drier with more variable conditions (McInnes *et al.* 2015). The plants that occur on mountain tops in the Wet Tropics of Queensland are under direct threat from a changing climate with modelled projections of widespread species extinction by 2080 (Costion *et al.* 2015; Hoffman *et al.* 2019). *Polyosma globosa* has a small and fragmented distribution and is probably already well advanced on its natural journey towards eventual extinction (Levin 2000) due to being unable to escape from its refugial habitat that is anchored to geology and topography (Cartwright 2019). A formal assessment of the conservation status of this species will be undertaken elsewhere and is likely to recommend a conservation status of **Endangered**.

Etymology: The species epithet is from the Latin *globosus* and refers to the globular fruits of this species.

4. *Polyosma hirsuta* C.T.White, *Bot. Bull. Dept. Agric. Queensland* 20: 14 (1918). **Type:** Queensland. COOK DISTRICT: Johnstone River, December 1915, *N. Michael s.n.* (holo: BRI [AQ342399]; iso: MEL 568356).

Polyosma brachyandra Domin, *Biblioth. Bot.* 89: 152 (1926) (as '*brachyandrum*'), **synon. nov.** **Type citation:** "Nordost-Queensland: Regenwalder bei Harveys Creek (DOMIN XII. 1909)". **Type:** Queensland. COOK DISTRICT: Harvey's Creek, December 1909, *K. Domin s.n.* (syn: PR 526856 *i.d.v.*, PR 526857 *i.d.v.*, PR 526858 *i.d.v.*).

Illustrations: White (1918: 15); Cooper (1994: 231); Cooper & Cooper (2004: 226).

Shrub or tree 3–10 m tall. **Branchlets** ± terete, indumentum persistent, yellow-brown or yellow, hairs 0.2–0.5 mm long, ± straight, antrorse to spreading. **Leaves:** petioles terete, 4–11 mm long, 5–11% of lamina length, densely pubescent with yellow or rusty hairs; lamina elliptical to obovate, 52–132 × 23–57 mm, 2.2–3.1 times longer than wide, base cuneate, apex acuminate, margins with 3–6 pairs of teeth, 0.6–1.2 mm long; younger leaves densely hairy on midvein (lower), leaf margin, and sparsely hairy on lower surface, soon glabrescent; secondary veins distinct on both sides, 6–9 pairs, diverging at 60–80° from the midvein; reticulate tertiary venation visible on lower surface, raised. Juvenile specimens very similar but with larger leaves. **Inflorescence** rachis sparsely to densely yellow or rusty-hairy, 40–77 mm long (basal 3–37 mm without flowers), bracts 2 or 4, ternate, 1.5–5 mm long; flowers 14–32; bracteoles unequal, middle one longer than lateral ones, middle bracteole linear to lanceolate, 0.9–2.1 mm long. **Flowers:** pedicels 1.3–2.5 mm long at anthesis; calyx 2.2–3.8 mm long, densely rusty-hairy, lobes 0.5–1.9 mm long; corolla tube with longitudinal sutures, sometimes splitting to base, 7–11 mm long, pale green, appressed hairy on outer surface, sparsely hairy on inner surface, corolla lobes 1.3–2.2 mm long, 0.5–0.7 mm wide, apex obtuse; staminal filaments 5.5–6 mm long, anthers 1.3–2.4 mm long; style about as long as corolla, sparsely hairy; exserted from corolla tube by < 1 mm.

Fruits: pedicels 2.5–6 mm long, articulated at the base; immature fruits ellipsoidal, 7.5–8 × 4.5–5 mm, not ribbed, sparsely pubescent, green, not fleshy; mature fruits ellipsoidal, significantly fleshy, 10–11 mm long, 7–8 mm diameter, base obtuse, dark blue, smooth, sparsely hairy.

Additional selected specimens examined: Queensland. COOK DISTRICT: Mt Misery, Jun 1992, *Forster 10758 et al.* (BRI, L, MEL); c. 2 km SW of The Pinnacles & c. 13 km SSE of Mossman, Aug 1978, *Moriarty 2401* (BRI, CANB, CNS); SFR 143, Kanawarra, Carbine LA, Nov 2003, *Gray 8870* (BRI, CANB, CNS); Rex Range, SF 42, Telecom access track, Jul 1994, *Forster PIF15521 et al.* (BRI); SF 1229 Kuranda, 27 km along Black Mt Road from Kuranda end, Sep 2001, *Forster PIF27534 et al.* (BRI, MEL); Cairns, Hills Creek, May 1989, *Lyons 62* (BRI); c. 0.5 km S of Copperlode Falls Dam, Mar 2009, *Jago 7254* (BRI); SFR 185, Robson LA, Jan 1979, *Gray 1234* (BRI, CNS); Head of Robson Creek, 5.8 km past Hoop Pine Triangle, NE end of Tinaroo Falls Dam, Mar 1988, *Forster PIF3939* (BRI, DNA, MO); Moomin Forest Reserve, c. 10 miles [16.6 km] SW of Atherton, Atherton Tableland, Aug 1963, *Schodde 3274* (BRI, CANB); Harveys Creek, Jul 1889, *Bailey s.n.* (BRI [AQ291372]); SFR 755, Palmerston, Brewer LA, Dec 1987, *Hyland 13376* (BRI, CNS); W foothills of Bellenden Ker Range, track to Mt Bartle Frere, c. 1 km W of Bobbin Bobbin Falls, May 1991, *Telford IRT11400 & Rudd* (BRI, CANB, NSW); SF 756 Mt Father Clancy, May 2000, *Forster PIF25714 & Booth* (BRI, L, MEL, NSW); Lacey's Creek, Mission Beach, 6 km W of Clump Point, Jun 1972, *Crome 467* (CANB). NORTH KENNEDY DISTRICT: Arthur Bailey Road, S of Ravenshoe, Jun 1995, *Forster PIF16742* (BRI, CNS).

Distribution and habitat: *Polyosma hirsuta* is endemic to the Wet Tropics bioregion of north-east Queensland, extending from Stuckey's Gap (south of Cooktown) to Mission Beach (**Map 4**). Unlike *P. globosa* it occurs both sides of the BMC. It grows in lower montane tropical rainforest (complex notophyll vineforest), at altitudes between 400 and 1100 metres on both metasediments and volcanic substrates (basalt, granite).

Phenology: Flowers and fruits have been recorded for almost every month of the year.

Affinities: Three of the Australian species (*Polyosma alangiacea*, *P. globosa* and *P. hirsuta*) have relatively long spreading hairs on the branchlets. In the remaining species, the branchlet hairs are shorter and appressed, or absent. In *P. alangiacea*, the hairs are rusty-brown, while in *P. globosa* and *P. hirsuta*,

they are yellow to yellow-brown. *Polyosma hirsuta* is the most noticeably pubescent of the Australian species.

Conservation status: There has been widespread habitat destruction over the last 100 years throughout the range of *Polyosma hirsuta* for agriculture and forestry and this has undoubtedly caused a reduction and fragmentation of the overall species population. However, the species is still commonly encountered in multiple locations. It is present in numerous National Parks, State Forest Reserves and other conservation reserves and can be categorised as **Least Concern**.

5. *Polyosma nigrescens* A.R.Bean & P.I.Forst. **sp. nov.**

With affinity to *P. reducta*, but differing by the glabrous branchlets, the consistently entire leaf margins, the larger fruits and the longer fruiting pedicels. **Typus:** Queensland. COOK DISTRICT: State Forest Reserve 143, Riflemead, North Mary Logging Area, 21 December 1988, *B. Hyland 13794* (holo: BRI; iso: CANB, CNS [QRS073543]; CNS [QRS071737], NSW).

Polyosma sp. (Mt Windsor Tableland L.W.Jessup+ GJM1374); Forster (2010: 64; 2019).

Polyosma sp. Mt Spurgeon (L.W.Jessup GJM1375); Thomas & McDonald (1989: 26).

[*P. reducta* auct. non F.Muell.; Zich *et al.* (2018)].

Illustration: Zich *et al.* (2018) [as *P. reducta*].

Tree 6–18 m tall. **Branchlets** ± terete, indumentum absent except on very young growth, hairs white, 0.1–0.15 mm long, straight, appressed. **Leaves:** petioles terete, 11–23 mm long, 10–24% of lamina length, glabrous except on young leaves; lamina elliptical to oblanceolate, 65–134 × 20–41 mm, 2.8–3.3 times longer than wide, base cuneate or attenuate, apex acuminate, margins entire, younger leaves sparsely hairy on midvein (lower), soon glabrescent; secondary veins obscure on upper side, distinct on lower side, 7–11 pairs, diverging

at 50–70° from the midvein; tertiary venation obscure or scarcely visible on either surface, not raised. Juvenile specimens very similar but with larger leaves and 3–10 pairs of marginal teeth. Inflorescence rachis 25–80 mm long (basal 11–16 mm without flowers), glabrous; bracts 2, opposite, 4–7 mm long; flowers 32–49; bracteoles all about the same length, middle bracteole ovate, 0.6–0.8 mm long. **Flowers:** pedicels 1.1–1.6 mm long at anthesis; calyx 1.7–2.2 mm long, lobes 0.4–0.6 mm long; corolla tube with longitudinal sutures, sometimes splitting to base, 4.5–5.5 mm long, mauve, sparsely appressed-hairy on outer surface, sparsely hairy on inner surface; corolla lobes 1.2–2 mm long, 0.5–0.8 mm wide, apex obtuse; staminal filaments *c.* 4 mm long, anthers 0.9–1.4 mm long; style about as long as corolla, sparsely hairy, exserted from the tube by < 1 mm. **Fruits:** pedicels 4–5 mm long, articulated at the base; immature fruits ellipsoidal, 8–9 × 6–8 mm, obscurely ribbed and rugose, glabrous, green, not fleshy; mature fruits ellipsoidal, *c.* 13 mm long and 10 mm diameter, base obtuse, dark blue to black, smooth, glabrous, significantly fleshy. **Fig. 3.**

Additional selected specimens examined: Queensland.

COOK DISTRICT: Windsor Tableland, NE of Mt Carbine, Jun 1969, *Hyland 2309* (BRI, L); SFR 144, Windsor Tableland, Oct 1971, *Hyland 5542* (CNS); 1.2 km before West Spencer Creek Forestry Camp, SF 144, Chowchilla LA, 1.5 km SE of Mt Carbine, Mt Windsor Tableland, Nov 1988, *Jessup et al. GJM1374* (BRI); *ibid.*, Nov 1988, *Jessup et al. GJM1375* (BRI); 0.4 km before West Spencer Creek forestry camp, SF 144, Cockatoo LA, 0.3 km E of Mt Carbine, Mt Windsor Tableland, Nov 1988, *Jessup GJM1291 et al.* (BRI); SFR 143, Carbine LA, Dec 1974, *Hyland 3156* (BRI, CNS); SFR 143, Parish of Riflemead, North Mary LA, Jul 1988, *Gray 4898* (CNS); SFR 143, North Mary LA, Feb 1976, *Hyland 3391RFK* (CNS, L, MEL); *ibid.*, Mar 1988, *Hyland 25416RFK* (BRI, CNS, L); *ibid.*, Mar 1988, *Hyland 25418RFK* (BRI, CNS, L); *ibid.*, Oct 1988, *Hyland 13599* (CNS); SFR 143, North Mary LA, hill '1262' N of swamp/weather station, Jul 2001, *Ford 2917 & Holmes* (CNS).

Distribution and habitat: *Polyosma nigrescens* is endemic to the Wet Tropics bioregion of north-east Queensland north of the BMC and is known from just three general locations with multiple sublocalities (Mt Lewis, Mt Spurgeon and Windsor Tableland (**Map 5**). It inhabits montane rainforest (complex notophyll rainforest, microphyll

fern/moss vineforest) on granite, at altitudes between 1000 and 1300 metres on often exposed ridges and mountain tops.

Phenology: Flowers have been recorded in March; fruits have been recorded in February, July, and from October to December.

Affinities: *Polyosma nigrescens* appears to be closely related to the allopatric *P. reducta*, but differs by the glabrous branchlets, the always entire leaf margins, the larger fruits and the longer fruiting pedicels.

Conservation status: *Polyosma nigrescens* occurs in effectively three locations with multiple sublocalities; it is locally common at both the Windsor Tableland (now Mount Windsor NP) and North Mary LA (now Mount Lewis NP) localities. Further exploration of the largely inaccessible area between Mt Spurgeon and the former North Mary LA is likely to reduce this apparent geographic disjunction to two broad locations. The likelihood of extinction from stochastic change (i.e. a drier and hotter climate) is high to extreme for some locations. The climate is predicted to become hotter and drier with more variable conditions (McInnes *et al.* 2015). The plants that occur on mountain tops in the Wet Tropics of Queensland are under direct threat from a changing climate with modelled projections of widespread species extinction by 2080 (Costion *et al.* 2015; Hoffman *et al.* 2019). *Polyosma nigrescens* has a small and fragmented distribution and is probably already well advanced on its natural journey towards eventual extinction (Levin 2000) due to being unable to escape from its refugial habitat that is anchored to geology and topography (Cartwright 2019). A formal assessment of the conservation status of this species will be undertaken elsewhere and is likely to recommend a conservation status of **Endangered**.

Etymology: From the Latin *nigrescens*, 'becoming black'. This refers to the fruits that darken from blue to black at maturity.

6. *Polyosma reducta* F.Muell., *Vict. Nat.* 9: 42 (1892). **Type citation: "Sources of the Russell-River; W. Sayer". **Type:** Queensland. COOK DISTRICT: Sources of the Russell**

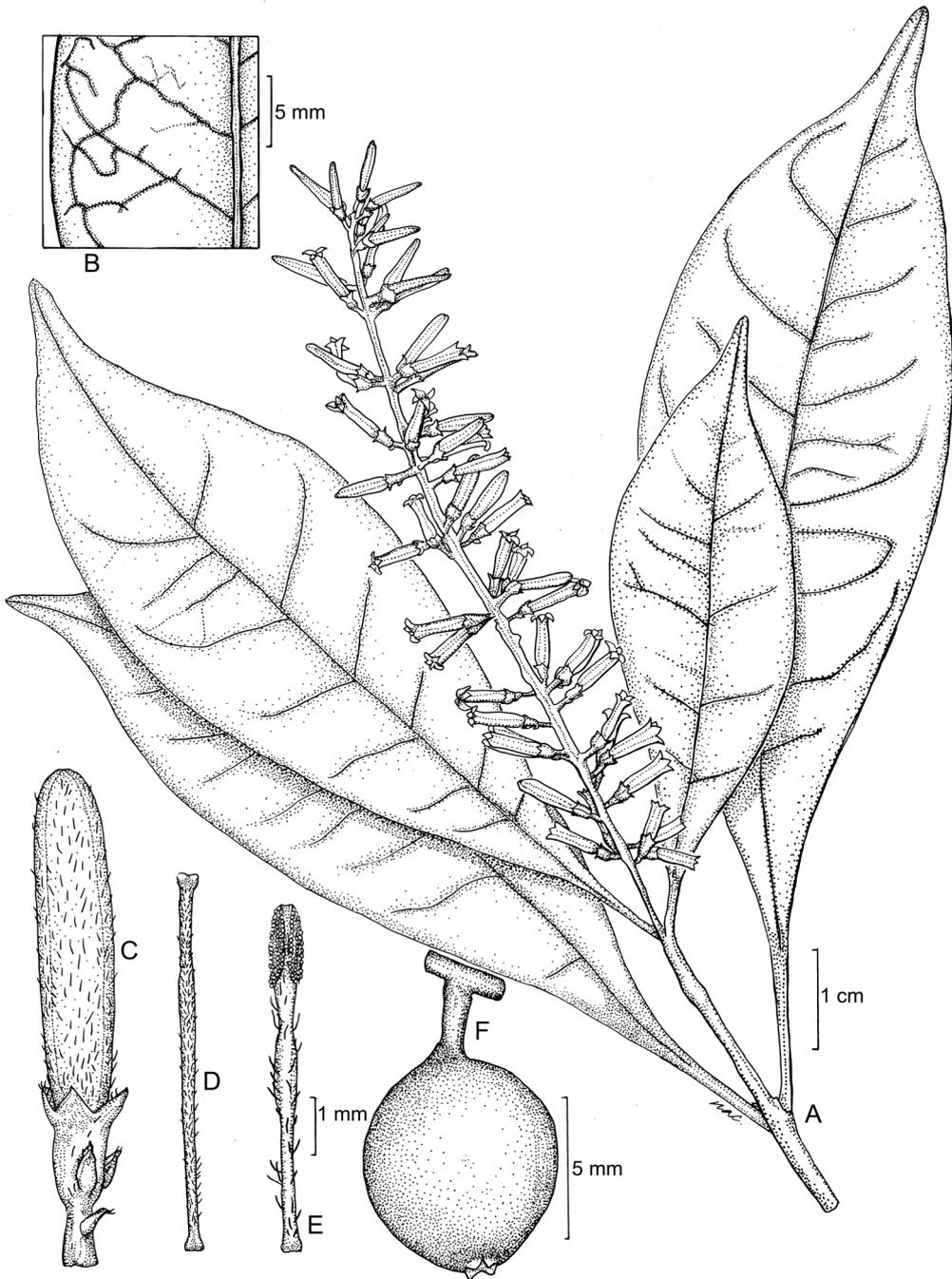


Fig. 3. *Polyosma nigrescens*. A. flowering branchlet. B. portion of leaf lower surface. C. flower and bracteoles, just prior to anthesis. D. style and stigma. E. stamen. F. immature fruit. A–E from *Hyland 25416RFK* (BRI); F from *Hyland 13599* (CNS). Scales as indicated. Del. N. Crosswell.

River, in 1887, *W.A. Sayer s.n.* (lecto [here designated]: K 000739773 *i.d.v.*; isolecto: BRI [AQ342409]).

Polyosma sp. (=RFK/2524); Hyland (1982: 88, 129, 145); Christophel & Hyland (1993: 7, 37, 116, pl. 54d); Hyland & Whiffin (1993, 1: 103, 119, 180; 2: 169); CHAH (2007).

Polyosma sp. ‘Bellenden Ker’ (B.Hyland 2524 RFK); Thomas & McDonald (1987: 25).

Polyosma sp. (Mt Bellenden Ker BH 2524RFK); Hyland *et al.* (1994: 305; 1999: 68); Zich *et al.* (2018).

Polyosma sp. (Mt Bellenden Ker); Cooper & Cooper (2004: 226).

Illustrations: Christophel & Hyland (1993: 116, pl. 54d) [as *P.* sp. (=RFK/2524)]; Zich *et al.* (2018) [as *P.* sp. (Mt Bellenden Ker BH 2524RFK)].

Small tree to 8 metres. **Branchlets** ± terete, indumentum persistent, hairs white or yellowish, 0.1–0.25 mm long, straight, appressed. **Leaves:** petioles terete, 7–16 mm long, 13–24% of lamina length, sparsely pubescent with appressed hairs; lamina elliptical, 47–70 × 15–22 mm, 2.6–3.8 times longer than wide, base cuneate, apex acuminate, margins entire or with 2 or 3 pairs of small marginal teeth, younger leaves sparsely hairy on midvein (lower) and lower surface, soon glabrescent; secondary veins obscure on both sides, 7–8 pairs, diverging at 60–70° from the midvein; tertiary venation not visible on either surface, not raised. Juvenile specimens similar, but leaves larger, sparsely hairy (especially on lower surface) and with 5–7 pairs of marginal teeth. **Inflorescence** rachis with moderately dense white appressed hairs, 30–45 mm long (basal 8–14 mm without flowers), bracts 2, opposite, c. 3 mm long; flowers 16–25; bracteoles all about the same size, middle bracteole ovate, 0.5–0.7 mm long. **Flowers:** pedicels 1.5–2.5 mm long at anthesis; calyx 1.5–2 mm long, with appressed white hairs, lobes 0.5–0.7 mm long; corolla tube with longitudinal sutures, 6–7 mm long, often splitting to base, cream-coloured, with very sparse appressed hairs on outer surface, densely hairy on inner surface;

corolla lobes of indeterminate length, apex obtuse; staminal filaments c. 3 mm long, anthers 2.2–2.5 mm long; style about as long as corolla, very sparsely hairy, slightly exerted from the corolla tube. **Fruits:** pedicels 2.5–3.5 mm long, articulated at the base; mature fruits ellipsoidal, 4.5–6 × 3.2–4.6 mm, obscurely ribbed and rugose, sparsely pubescent, colour unknown, not fleshy.

Additional specimens examined: Queensland. COOK DISTRICT: SFR 310, Bellenden Ker, Upper Goldsborough LA, Oct 1988, *Hyland 25566RFK* (CNS); *ibid.*, Feb 1990, *Hyland 13984* (BRI, CNS); Mt Bellenden Ker, in 1887, *Sayer 133* (MEL 0568079A, MEL 0568080A, MEL 0568081A, MEL 0568082A); Bellenden Ker, Aug 1971, *Hyland 2524RFK* (CNS); Bellenden Ker main ridgeline between Centre Peak and North Peak, Aug 2016, *Worboys et al. 1205* (CNS); Bellenden Ker main ridgeline between Centre Peak and North Peak, Aug 2016, *Worboys et al. 1207* (CNS).

Distribution and habitat: *Polyosma reducta* is endemic to the Wet Tropics of north-east Queensland, and confined to the Bellenden Ker Range south of the BMC (Bryant & Krosch 2016) (**Map 3**). It grows in dense montane tropical rainforest (microphyll fern/moss vineforest) on the highest ridgeline points between 1450 and 1550 metres altitude.

Phenology: Poorly known. Flowers are recorded for October; fruits have been collected in February.

Typification: There appear to be two separate collections of this species made by Sayer in 1887; these have been variously labelled as being “part of type collection” or “syntype” by R.D. Hoogland. One is unnumbered and states “sources of the Russell River”, whereas the other has the number 133 and states “Mt Bellenden Ker” or “B Ker”; the latter specimens are not considered to be syntypes as the locality does not agree with that given in the protologue. Specimens bearing the locality “sources of the Russell River” are present at K and BRI. The K specimen is chosen as lectotype as it is the more complete.

Affinities: *Polyosma reducta* and *P. nigrescens* appear to be most closely related to *P. amygdaloides* Reeder from New Guinea on the basis of morphology. The latter species shares the sparse appressed hairs of the branchlets, and the glabrous

leaves with indistinct tertiary venation, but it differs by the corolla tube *c.* 12 mm long, the fruiting pedicels 6–7 mm long, and the middle bracteole 1.2–1.4 mm long. *Polyosma cestroides* Schltr. is also similar; however, it differs by the broad leaves (about twice as long and wide), the corolla without sutures and *c.* 18 mm long, and the pedicels 4–5 mm long at anthesis.

Conservation status: *Polyosma reducta* occurs in one location with probably multiple sublocalities where it can be locally common. This location is one of the highest places in Queensland. The likelihood of extinction from stochastic change (i.e. a drier and hotter climate) is extreme as the climate is predicted to become hotter and drier with more variable conditions (McInnes *et al.* 2015). The plants that occur on mountain tops in the Wet Tropics of Queensland are under direct threat from a changing climate with modelled projections of widespread species extinction by 2080 (Costion *et al.* 2015; Hoffman *et al.* 2019). *Polyosma reducta* has a very small distribution and is probably already well advanced on its natural journey towards eventual extinction (Levin 2000) due to being unable to escape from its refugial habitat that is anchored to geology and topography (Cartwright 2019). A formal assessment of the conservation status of this species will be undertaken elsewhere and is likely to recommend a conservation status of **Critically Endangered**.

7. *Polyosma rhytophloia* C.T.White & W.D.Francis, *Proc. Roy. Soc. Queensland* 37: 158 (1926). **Type citation:** “Eungella Range, about 40 miles westward of Mackay, W.D. Francis, October 3rd to 12th, 1922 (flowering specimens, type)”. **Type:** Queensland. SOUTH KENNEDY DISTRICT: Eungella Range, west of Mackay, 3–12 October 1922, *W.D. Francis s.n.* (holo: BRI [AQ291358]; iso: K 000739772 *i.d.v.*).

Illustrations: White & Francis (1926: 158, pl. V); Francis (1951: 414); Christophel & Hyland (1993: 116, pl. 54b); Cooper (1994: 231); Cooper & Cooper (2004: 226).

Shrub or tree 1.5–12 m tall. **Branchlets** flattened near growing point, indumentum

present only on young growth, brown or white-coloured, hairs 0.05–0.1 mm long, straight, appressed. **Leaves:** petioles terete, 10–21 mm long, 9–17% of lamina length, sparsely pubescent with appressed hairs; lamina elliptical to oblanceolate, 99–190 × 29–54 mm, 2.6–3.9 times longer than wide, base cuneate, apex acute to acuminate, margins with 7–11 pairs of teeth, 0.4–1 mm long; younger leaves densely hairy on midvein (lower) and sparsely hairy on lower surface, soon glabrescent; secondary veins distinct on both sides, 6–12 pairs, diverging at 60–70° from the midvein; reticulate tertiary venation visible on lower surface, raised or not raised. Juvenile specimens very similar but with larger leaves and more teeth. **Inflorescence** rachis with dense white appressed hairs, 42–140 mm long (basal 5–26 mm without flowers), bracts 2, opposite, 2.5–9 mm long; flowers 22–66; bracteoles unequal, middle one somewhat longer than lateral ones, middle bracteole broadly ovate to orbicular, 0.3–0.6 mm long. **Flowers:** pedicels absent; calyx 1.9–2.7 mm long, with dense appressed white hairs, lobes 0.4–1 mm long; corolla tube with longitudinal sutures, occasionally splitting to base, 10.5–14 mm long, yellow or mauve, appressed hairy on outer surface, glabrous on inner surface; corolla lobes 2.1–3.5 mm long, 0.9–1.2 mm wide, apex obtuse; staminal filaments 9–9.5 mm long, anthers 2.1–3.2 mm long; style about as long as corolla, with moderately dense antrorse hairs 0.05–0.1 mm long; exerted from corolla tube by < 1 mm or 1–2 mm. **Fruits:** pedicels 0–0.5 mm long, articulated at the base; immature fruits ellipsoidal, 6–9.5 × 4.5–6 mm, not ribbed, rugose, sparsely pubescent, green, not fleshy; mature fruits ellipsoidal, 10.5–12 mm long, 8–9 mm diameter, base cuneate, black, rugose, sparsely hairy, slightly fleshy.

Additional selected specimens examined: Queensland. COOK DISTRICT: Mt Hartley W slopes, TR 165, Jul 1995, *Forster PIF17304 & Figg* (BRI); Mt Finnigan, west slopes, Sep 1948, *Brass 20349* (BRI, CANB); SF 185 Danbulla, Tinaroo LA, 7.5 km past western boundary of Forestry grid, Dec 1993, *Forster PIF14344* (BRI); SF 185 Danbulla, 7.3 km along Kauri Creek Road from Tinaroo Dam end, Aug 2003, *Forster PIF29576 & Jensen* (BRI, MEL, NSW); Boonjee near Malanda, Aug 1943, *Blake 15182* (BRI); Westcott Road, Topaz, Aug 2005, *Cooper WWC1927* (BRI, MEL); Moomin FR,

c. 10 miles SW of Atherton, Atherton Tableland, Aug 1963, *Schodde 3272* (BRI, CANB); SFR 194, Cpt. 53, Feb 1975, *Irvine 1169* (BRI, CNS); SF 194 Mt Baldy, 7 km from Rifle Range end, Jun 1996, *Forster PIF19221 et al.* (BRI, CNS, MEL); SF 194 Mt Baldy, Herberton Range, 5 km from southern entrance, May 2003, *Forster PIF29332* (BRI, MEL); Portion 6, Parish of Bartle Frere, Aug 1998, *Hyland 16056* (BRI, CNS); SFR 650 Mt Fisher, Aug 1975, *Stocker 1421* (BRI, CANB, CNS). NORTH KENNEDY DISTRICT: Kirrama Range, W of Kennedy, Aug 1947, *Smith & Webb 3206A* (BRI); Saddle Mt, Bowling Green Bay NP, S of Townsville, Aug 1991, *Bean 3632* (BRI). SOUTH KENNEDY DISTRICT: Eungella Range, Sep 1938, *White 12968* (BRI, CANB); Mt David, Eungella NP, Aug 1992, *Bean 4933* (BRI); Mt Dalrymple, Aug 1975, *Hansen 124* (CNS); Dalrymple Heights, Coles Property off Blacks Road, Oct 1991, *Champion 548* (BRI); Diggings Road, Eungella NP, Aug 1990, *Pearson 392* (BRI); Broken River – Crediton Walking Track, Eungella NP, Mar 1990, *Pearson 227* (BRI); S end of Broken River Walking Track, Eungella NP, *McDonald 4479* (BRI, CNS).

Distribution and habitat: *Polyosma rhytophloia* is endemic to Queensland in the Wet Tropics and Central Queensland Coast bioregions in two subpopulation centres. It extends from Mt Hartley (S of Cooktown) to Eungella NP (W of Mackay) (**Map 6**). It grows in tropical rainforest (complex notophyll rainforest) on metasediments or volcanic (basalt, granite) substrates. Altitude ranges from 550 to 1270 metres, except for a sterile specimen collected at 15 m altitude near El Arish (*Webb & Tracey 6902*, BRI).

Phenology: Flowers are borne from June to September, with an apparent peak in August; fruits are from November to March.

Affinities: *Polyosma rhytophloia* can be distinguished from other Australian species by the toothed leaf margins on mature plants, the raised veins on the lower leaf surface, and the sessile flowers and fruits.

Conservation status: *Polyosma rhytophloia* is quite widespread and most locations of its extant range are now in National Parks or other conservation reserves. Historic land clearing of rainforest throughout its range has undoubtedly reduced its overall occurrence and caused fragmentation of habitat particularly on the Atherton and Evelyn Tablelands and Dalrymple Heights at Eungella. It remains a common species throughout its range with no obvious

immediate threatening processes and should continue to be listed as **Least Concern**.

Etymology: The species epithet *rhytophloia* (meaning wrinkled bark) is derived from the Greek, and hence the correct connecting vowel is -o- (Turland *et al.* 2018, Art. 60.10).

8. *Polyosma rigidiuscula* F.Muell. & F.M.Bailey in F.M. Bailey, *Bot. Bull. Dept. Agric. Queensland* 1: 4 (1890). **Type citation:** “Summit of Mt. Bartle Frere, Bellenden-Ker Expedition, August 1889”. **Type:** Queensland. COOK DISTRICT: top of Mt Bartle Frere, Bellenden-Ker expedition, in [August] 1889, *A. Meston s.n.* (lecto [here designated]); MEL 2288068: comprising 2 sheets and lacking month; isolecto: BRI [AQ342411: with August].

Illustrations: Christophel & Hyland (1993: 116, pl. 54c); Cooper & Cooper (2004: 226).

Shrub or tree 2–12 m tall. Branchlets ± terete, indumentum absent except on young growth, hairs white, 0.1–0.2 mm long, straight, appressed. **Leaves:** petioles terete, 3–8 mm long, 4–9% of lamina length, glabrous or with short white appressed hairs; lamina elliptical to oblanceolate, 55–158 × 21–43 mm, 2.1–3.9 times longer than wide, base cuneate, apex acute to acuminate, margins entire or with 1–4 pairs of marginal teeth, 1–1.3 mm long, younger leaves sparsely hairy on midvein (lower), and lower surface, soon glabrescent; secondary veins obscure on upper side, distinct on lower side, 6–8 pairs, diverging at 60–85° from the midvein; reticulate tertiary venation readily visible on either surface, raised. Juvenile specimens very similar but with larger leaves and more consistently toothed. **Inflorescence** rachis sparsely white-hairy, 43–117 mm long (basal 13–18 mm without flowers), bracts 4, ternate or disjunct, 2.5–5 mm long; flowers 45–58; bracteoles all about same length or middle one longer, middle bracteole lanceolate to narrowly elliptical, 0.8–1.4 mm long. **Flowers:** pedicels 0.5–1.2 mm long at anthesis; calyx 2–2.5 mm long, very densely hairy, lobes 0.5–0.8 mm long; corolla tube with longitudinal sutures, sometimes splitting to base, 5–9 mm long, cream to greenish-yellow, appressed-hairy

on outer surface, glabrous or sparsely hairy on inner surface; corolla lobes 1.2–1.8 mm long, 0.5–0.8 mm wide, apex obtuse; staminal filaments 5–6 mm long, anthers 1.2–1.4 mm long; style about as long as corolla, exerted from the tube by < 1 mm, with dense antrorse hairs 0.05–0.1 mm long. **Fruits:** pedicels 1.2–4 mm long, articulated at the base; immature fruits ellipsoidal, 7–9 × 5–7 mm, not or obscurely ribbed, rugose, sparsely pubescent, green, not fleshy; mature fruits ellipsoidal to globose, 10–13 mm long, 9.5–11 mm diameter, base cuneate, dark blue to black, smooth, sparsely hairy, slightly fleshy.

Additional selected specimens examined: Queensland.

COOK DISTRICT: Cedar Bay NP, Mt Finnigan summit area, Horans Creek, Oct 1999, *Forster PIF25040 & Booth* (BRI, MEL); Thornton Peak, Mar 1932, *Brass 2283* (BRI); NPR 164, Thorntons Peak, Nov 1973, *Stocker 1103* (BRI, CANB, CNS, L); Daintree, upper slopes of Mt Alexandra, Nov 1967, *Boylard 519 & Gillieatt* (BRI); Daintree NP, WNW of Black Mt, May 1998, *Forster PIF22912 et al.* (BRI, CNS, MEL); Mt Spurgeon, Sep 1936, *White 10549* (BRI); c. 1 km NE of Cooper's Camp, Mount Spurgeon FR, Carbine Tableland, Oct 2009, *Worboys 850* (BRI, CNS); Pinnacle Rock Track, 4.5 km W of Karnak, Jun 1992, *Forster PIF10706 et al.* (BRI, CNS, DNA, MEL); Mt Lewis, North Mary LA, Aug 1973, *Risley 109* (BRI, CNS, L); SFR 143, North Mary LA, May 1973, *Hyland 6746* (BRI, CNS, L); Mt Lewis forestry road, Mar 1999, *Jago 5149* (BRI); Mt Lewis FR, 13 km along Mt Lewis Road, Aug 2003, *Forster PIF29558 & Jensen* (BRI, L, MEL); Platypus Creek, Sep 1936, *Flecker CAIRNS 2298* (CNS); Daintree NP, Mossman Bluff Track, Jul 2010, *Baba 466 & Kilgour* (BRI, CNS); Summit of Mt Bellenden Ker, Aug 1971, *Hyland 5308* (BRI, L); Wooroonooran NP, Mt Bellenden Ker summit area, May 2001, *Forster PIF27125 et al.* (BRI, L, MEL); Mt Bellenden Ker, c. 0.5 miles [0.8 km] SW of centre peak, Jun 1969, *Smith 14628* (BRI); NPR 904, Wooroonooran, just S of tower No 9, Mt Bellenden Ker cableway, May 2003, *Ford AF3962 & Green* (BRI, CNS, L, MEL); Wooroonooran NP, S of communication building, site 243, Apr 2011, *Ford 5835 & Torello* (BRI, CNS, L, MEL, NSW); SFR 1230, Bartle Frere, Boonjee LA, Oct 1991, *Gray BG5342* (BRI, CNS); Mt Bartle Frere, Jan 1891, *Johnson s.n.* (BRI [AQ385155], MEL 607244A); Bartle Frere, upper E face on walking track, Nov 1986, *Godwin C2954* (BRI, CNS); Wooroonooran NP, Bartle Frere, Lookout between NW Peak and creek, Oct 1997, *Forster PIF21780 et al.* (BRI); Mt Bartle Frere, S slope of North Peak, Aug 1943, *Blake 15234* (BRI); Bellenden Ker, South Peak, Aug 1971, *van Balgooy 1450* (CANB); Broken Nose on Mt Bartle Frere, Bellenden Ker [sic] NP, Apr 2002, *Jago 6197 & Wannan* (BRI); SFR 755, Gosschalk LA, Sep 1977, *Gray 701* (BRI, CNS).

Distribution and habitat: *Polyosma rigidiuscula* is endemic to Queensland in the Wet Tropics bioregion, extending from Mt Finnigan, S of Cooktown, to Mt Bartle Frere, W of Innisfail (**Map 7**). Unlike the other species of *Polyosma* that inhabit the tops of the highest peaks in the Wet Tropics, this species occurs both side of the BMC (Bryant & Krosch 2016). It inhabits montane tropical rainforest (complex notophyll vineforest, microphyll fern/moss vineforest) on granite substrates at altitudes between 800 and 1560 metres.

Phenology: Flowers are recorded for every month of the year; fruits mainly July to December, and a single record in March.

Typification: The type collection of *Polyosma rigidiuscula* is represented in two herbaria BRI and MEL. The BRI specimen is poor, consisting of a stem, several detached leaves and fragments in a packet. It also has the note “No. 16 sent to Baron Mueller” and the full date of August 1889. By comparison the MEL specimen is in good condition comprising several pieces with fruit mounted on two sheets with the same accession number and has “Syntype of *Polyosma rigidiuscula*”, but lacks the ‘August’ of the collection date.

The locality given on the label of the lectotype (summit of Mt Bartle-Frere) is erroneous. The mountain explored by Meston and Bailey in 1889 was Mt Bellenden Ker (Dowe & Broughton 2007).

Affinities: *Polyosma rigidiuscula* is a glabrous or glabrescent species with toothed leaves on mature plants, and short petioles. The fruits can be ribbed or not. The more northerly populations tend to have narrower leaves than those from Mt Bellenden Ker and Mt Bartle Frere. Its affinities are hard to suggest but may lie with species in New Guinea.

Note: The authorship of *Polyosma rigidiuscula* has often been given as “F.Muell. & F.M.Bailey ex F.M.Bailey”, but that is incorrect. This would have been the case where an invalid description was later validated by Bailey; however, it is the

case where a perfectly valid description was published in a more extensive paper authored by Bailey. Therefore the correct authorship is “F.Muell. & F.M.Bailey in F.M.Bailey”, or where the name stands alone, “F.Muell. & F.M.Bailey”.

Conservation status: *Polyosma rigidiuscula* is quite widespread and most locations of its extant range are now in National Parks or other conservation reserves. Historic land clearing and logging of rainforest throughout its range would have had relatively little impact on its overall occurrence due to its occurrence at higher and more inaccessible altitudes. It remains a common species throughout its range with the most obvious immediate threatening process being that of loss of suitable habitat due to climate change. The likelihood of extinction from stochastic change (i.e. a drier and hotter climate) is extreme as the climate is predicted to become hotter and drier with more variable conditions (McInnes *et al.* 2015). The plants that occur on mountain tops in the Wet Tropics of Queensland are under direct threat from a changing climate with modelled projections of widespread species extinction by 2080 (Costion *et al.* 2015; Hoffman *et al.* 2019). *Polyosma rigidiuscula* has some way to go on its natural journey towards eventual extinction (Levin 2000) due to currently inhabiting a habitat band of *c.* 600 m that may enable it to persist in its refugial habitat that is anchored to geology and topography (Cartwright 2019). A formal assessment of the conservation status of this species will be undertaken elsewhere and is likely to recommend a conservation status of **Vulnerable**.

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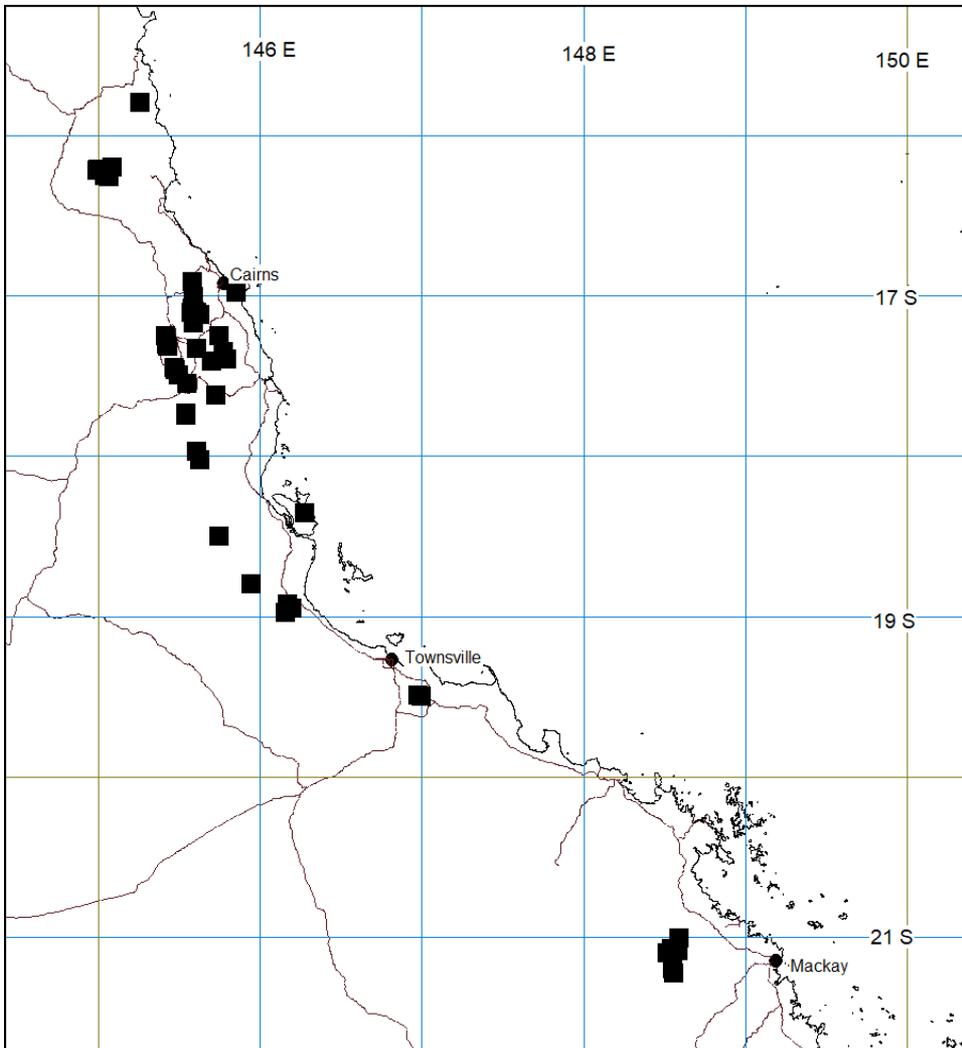
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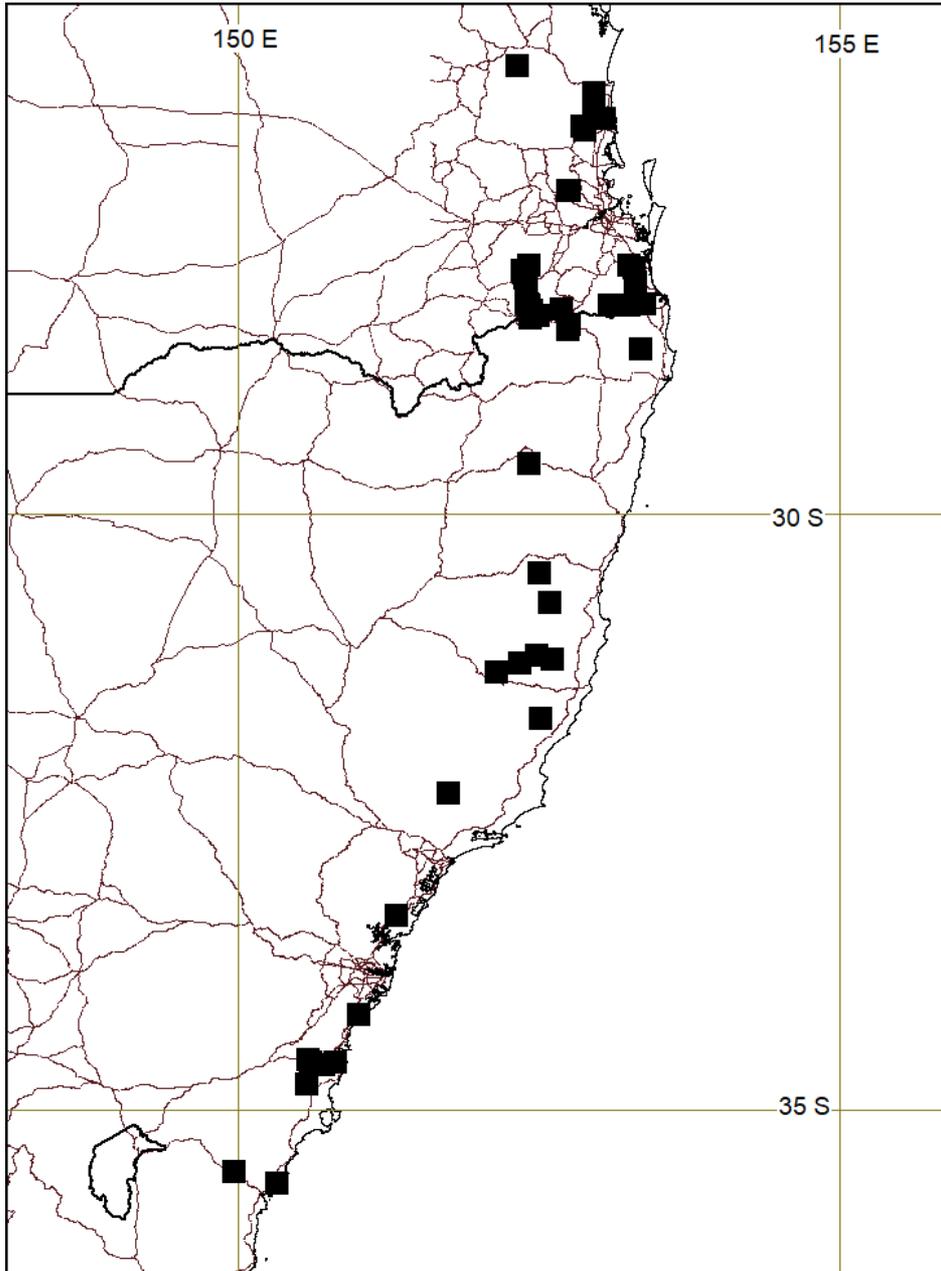
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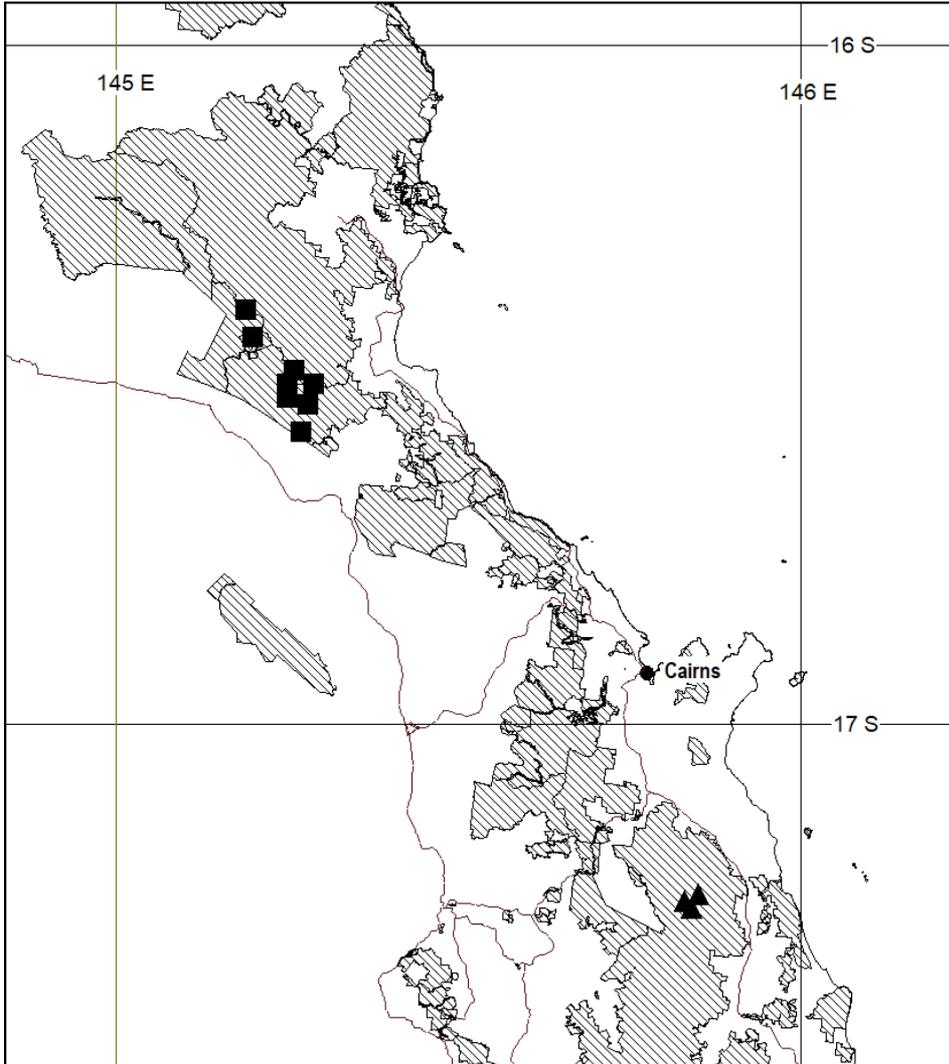
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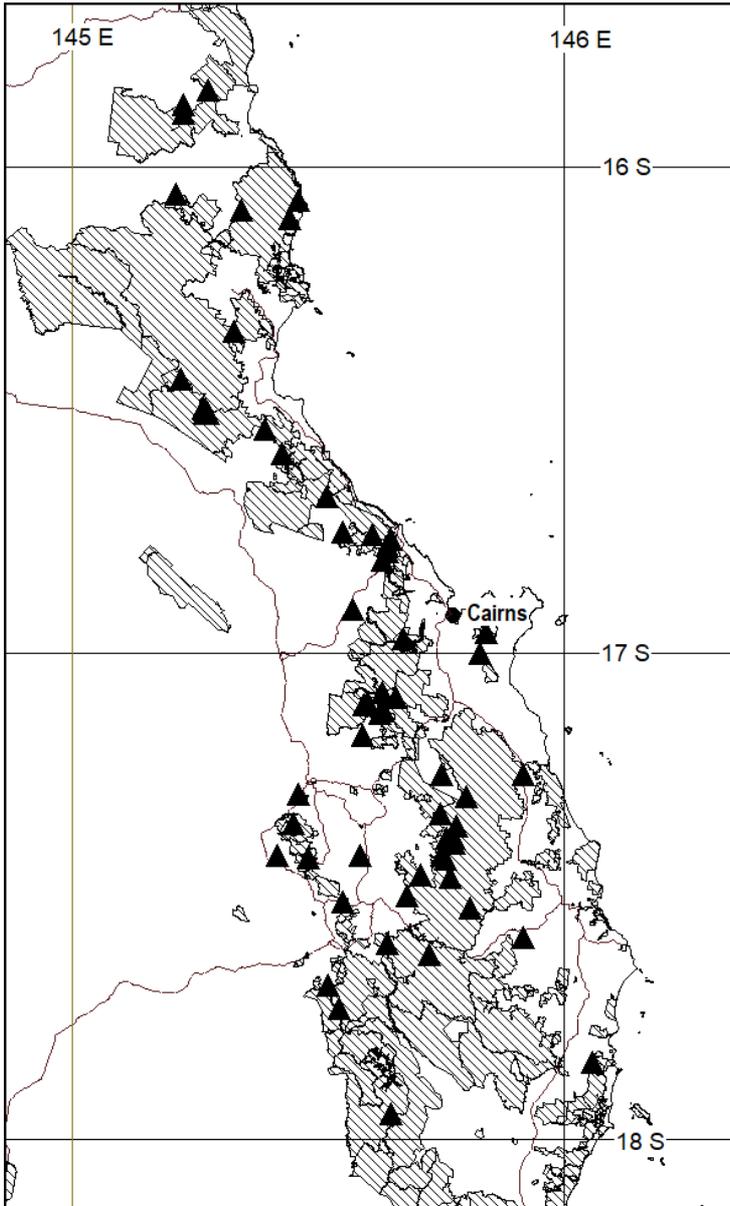
Map 1. Distribution of *Polyosma alangiacea* (major roads indicated).



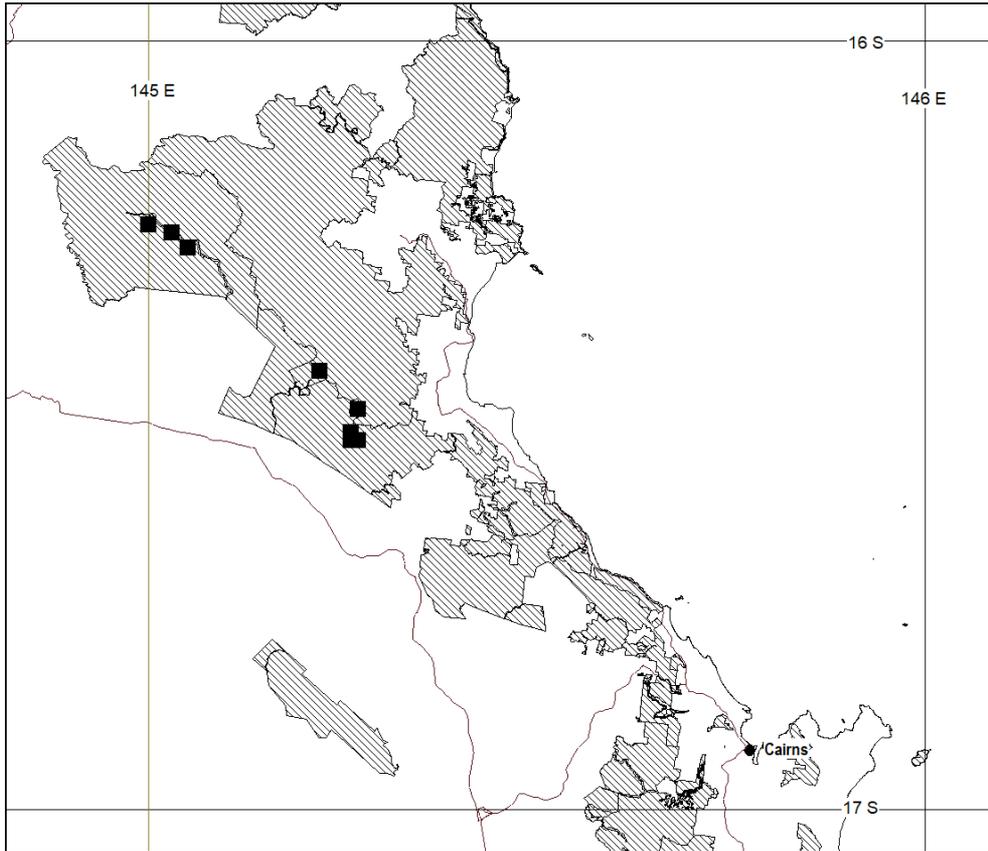
Map 2. Distribution of *Polyosma cunninghamii* (major roads indicated).



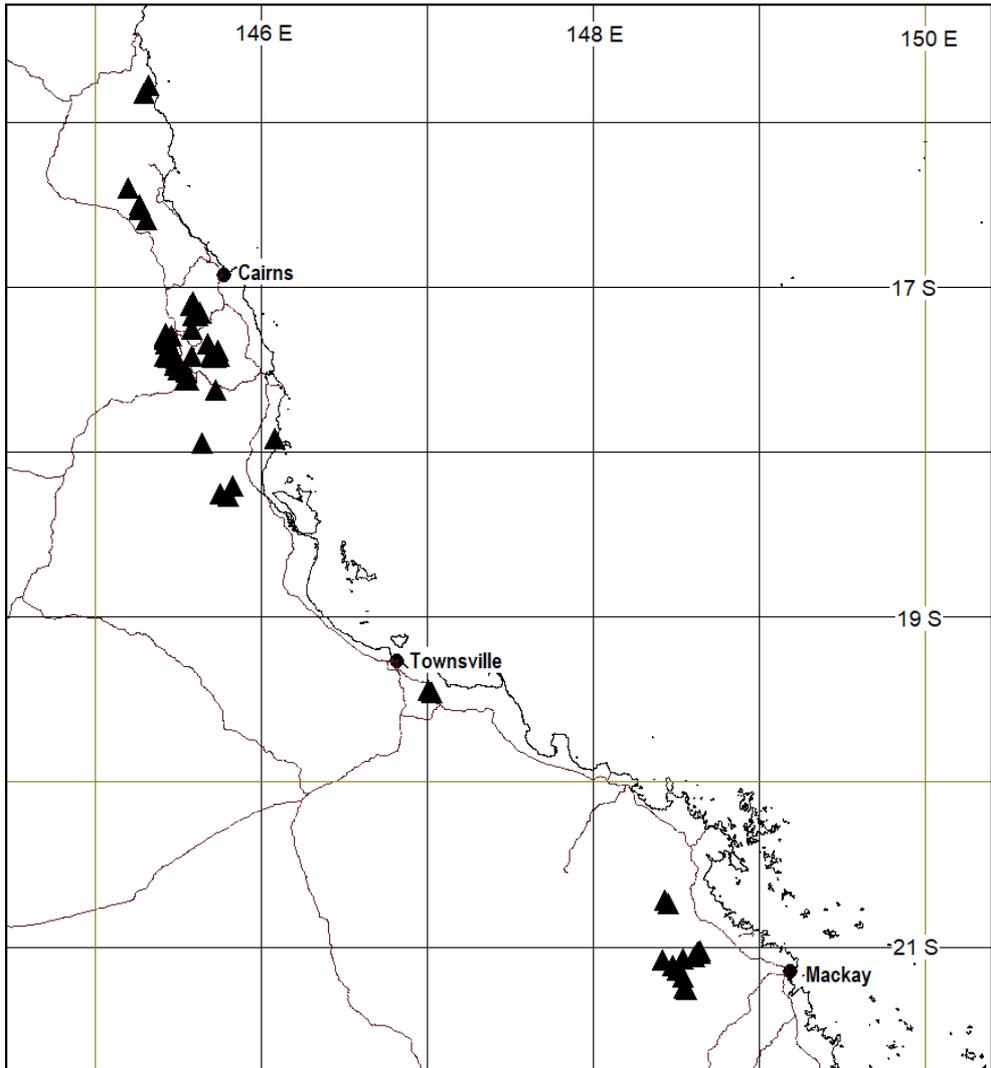
Map 3. Distribution of *Polyosma globosa* (■) and *P. reducta* (▲), shaded areas indicate conservation reserves.



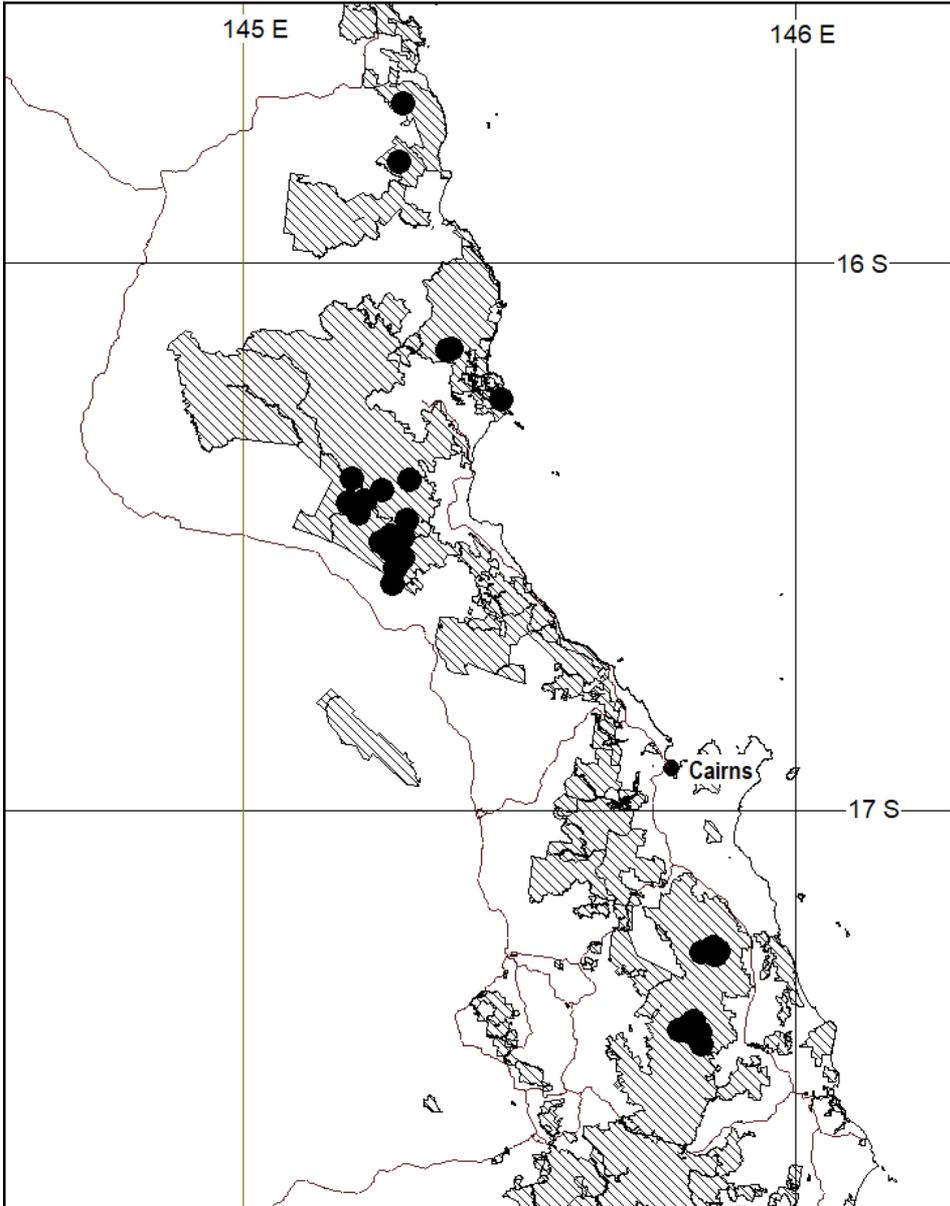
Map 4. Distribution of *Polyosma hirsuta*, shaded areas indicate conservation reserves.



Map 5. Distribution of *Polyosma nigrescens*, shaded areas indicate conservation reserves.



Map 6. Distribution of *Polyosma rhytophloia* (major roads indicated).



Map 7. Distribution of *Polyosma rigidiuscula*, shaded areas indicate conservation reserves.