

A revision of *Alphitonia* (Rhamnaceae) for Australia

A.R. Bean

Queensland Herbarium, Brisbane Botanic Gardens, Mt Coot-tha road, Toowong, Queensland 4066, Australia;
e-mail: tony.bean@derm.qld.gov.au

Introduction

Alphitonia Endl. is a genus comprising around 15 species, and belonging to the family Rhamnaceae. It was described by Endlicher (1840), with the description based on *Colubrina excelsa* Fenzl. (= *A. excelsa* (Fenzl) Benth.).

Within the family Rhamnaceae, *Alphitonia* is characterised by its leaves with a bright green upper surface and a strikingly white (or sometimes greyish-white or yellowish) lower surface; tardily dehiscent fruits, usually with a powdery mesocarp; seeds persistent on the torus after the endocarp has shed, and enveloped by a membranous aril. Most species are fast-growing pioneers with pagoda-type branching, filling canopy gaps in evergreen notophyll or mesophyll rainforest.

Bentham (1863) recognised only *A. excelsa* for Australia, and considered that the genus was ‘probably limited to a single species, ranging from Australia to the Pacific islands’. The genus was revised by Braid (1925), who enumerated 13 species. He recognised five species as occurring in Australia (*A. excelsa*, *A. petriei* Braid & C.T.White, *A. obtusifolia* Braid, *A. whitei* Braid and *A. moluccana* Braid). In this paper, five species are also recognised (*A. excelsa*, *A. petriei*, *A. pomaderroides* (Fenzl) A.R.Bean, *A. whitei* and *A. oblata* sp. nov.). No species is presently thought to be rare or threatened.

Alphitonia franguloides A.Gray, *A. incana* (Roxb.) Kurz, *A. moluccana* and *A. philippinensis* Braid are here excluded from the Australian flora. The Malesian species *A. incana* is lectotypified, and its identity discussed, particularly with respect to *A. oblata*.

Materials and methods

This revision is based upon a morphological study of herbarium material from BR, BRI, MEL and QRS, as well as images from K, and field observations in Queensland, Northern Territory and New South Wales. Indumentum characters were assessed on dried herbarium specimens, with all stem indumentum measurements made at a point 10 cm below the growing point (or the insertion point of the most terminal leaf).

Abstract

The taxonomy of the genus *Alphitonia* Endl. is reassessed for Australia, and five species are recognised. *Alphitonia oblata* A.R.Bean sp. nov. is described, illustrated and diagnosed against related taxa. Descriptions, distribution maps and miscellaneous notes are provided for all species. Lectotypes are selected for *A. excelsa* (Fenzl) Benth., *A. petriei* Braid & C.T.White, and *A. whitei* Braid. The identity of *A. incana* (Roxb.) Kurz is discussed and the name lectotypified. The names *A. franguloides* A.Gray, *A. incana*, *A. moluccana* Braid and *A. philippinensis* Braid are excluded from the Australian flora.

Keywords: Rhamnaceae, rainforest, taxonomy, keys, lectotypes.

Muelleria 28(1): 3-17 (2010)



'Adult' material is that which bears flowers or fruits, while material accepted here as 'juvenile' is sterile and labelled as belonging to a young plant. Leaf and fruit measurements are based on dried material, while floral measurements are based on material preserved in spirit or reconstituted. Only authors of validly published names are reported in this paper.

Results and discussion

Generic relationships

Richardson *et al.* (2000) published a classification of the Rhamnaceae based on DNA sequences. Medan and Schirarend (2004) provided a taxonomic summary of the family, and listed 52 genera and 11 tribes, utilising the classification of Richardson *et al.* (2000). *Alphitonia* was one of seven genera not assigned to a Tribe, along with five other genera that occur in Australia.

Rye (1996) established the genus *Granitites*, and stated that it is most closely related to *Alphitonia*. Although *Granitites intangendus* (F.Muell.) Rye (the only species) is a small spinescent shrub endemic to south-west Western Australia, its close relationship with *Alphitonia* has been confirmed by Fay *et al.* (2001) using DNA sequence data. Both genera have a mealy mesocarp, anther appendages, similar disc shape and arillate seeds.

Alphitonia is also closely related to *Emmenosperma* F.Muell. Both genera are unarmed, with entire leaves and seeds persisting on the torus after the rest of the fruit has fallen. *Emmenosperma* differs by the yellow to orange fruits that lack a powdery mesocarp, the flowers with a much thinner nectary disc that does not fill the hypanthium, and the seeds without an enveloping aril.

Discussion of morphological characters

The leaf size and shape provide some diagnostic features in *Alphitonia*, but must be used cautiously, as environmental factors may greatly influence them. The colour of the indumentum on the lower surface, excluding the veins, is usually white but can be yellowish (*A. pomaderroides*) or greyish-white (*A. whitei*). Leaf venation is of the same pattern throughout the genus. Stipule size is diagnostic for some species. Trichomes are always simple, but there are differences between species in the density, colour, length and

straightness of the hairs. The flowers are remarkably constant within the genus; only the ornamentation of the disc and the amount and density of indument on the disc are of taxonomic value.

Fruiting characters appear to offer the greatest potential for taxonomic discrimination. The size, and more particularly the shape, of the mature fruits is consistent for a species. For instance, the fruits of *A. excelsa* are always globose, while the fruits of *A. petriei* are always conspicuously oblate. Unfortunately, these characters are difficult to assess from herbarium material. Very soon after maturity, the mesocarp and exocarp of *Alphitonia* fruits disintegrate, so that the former shape of the fruits is lost. Conversely, when the fruits on a herbarium specimen are intact, one must be suspicious that they have not reached their mature size and shape.

The size of the endocarpids (and their apicula) and the length of the seeds are also taxonomically useful, and these can be readily measured from herbarium specimens. The endocarp in *Alphitonia* is a hard, bony or woody persistent layer that protects the seeds during their development. Partitions in the endocarp can be readily seen in an immature fruit and, at maturity, they become separate entities, termed endocarpids. The number of endocarpids corresponds to the number of styles in the flower, and each encloses a single seed. The endocarpid opens widely along its ventral surface, and it sometimes splits partially along the dorsal surface. It is not in contact with the seed, and when it is shed from the fruit, the seed is often still attached to the torus. The endocarpid frequently has a sharp apiculum on its distal end. In Australian species, the apiculum is not visible while the fruit is intact, being obscured by the mesocarp and epicarp tissue.

The other very useful and species-specific character is the branching structure of the tree. In many species (e.g. *A. zizyphoides* A.Gray, *A. petriei*, *A. oblata*), trees exhibit a pagoda-type branching habit, with layers of large horizontal branches, and conforming to Roux's model of tree architecture (Hallé *et al.* 1978). This model is characterised by a monopodial orthotropic trunk, branches that are plagiotropic and inserted continuously, and spiral leaf arrangement on the trunk but distichous on the branches. Other species (e.g. *A. excelsa*, *A. pomaderroides*, *A. whitei*) have ascending

primary and secondary branches and a more haphazard arrangement of smaller branches, resulting in a more evenly distributed canopy.

The branching structure can be assessed only by field examination, and collectors of herbarium specimens rarely note the canopy structure of the tree. It cannot be inferred by the arrangement of the leaves on the ultimate branchlets (spiral or distichous). With the exception of *A. whitei*, the branchlets of all Australian species bear leaves that are consistently distichous.

Taxonomy

***Alphitonia Reissek ex Endl., Gen. Pl. [Endlicher] 1098 (1840). Type:* *A. excelsa* (Fenzl) Benth.**

Trees, or rarely shrubs, evergreen. *Spines* absent. *Branches* (in most species) horizontal, in layers ('pagoda-type' branching). *Indumentum* of simple, unbranched trichomes, straight, flexuose, tortuous or crisped; glands absent. *Leaves* simple, alternate, petiolate, distichous on smaller branches (except sometimes *A. whitei*), penninerved, intramarginal veins absent, margins entire, straight or undulate; translucent dots absent; upper surface green, glabrous or glabrescent; lower surface with dense short tomentum, often white; domatia absent; stipules two per leaf, free from each other, entire, caducous. *Inflorescences* dichasially or trichasially cymose, arranged into axillary racemes; flowers bisexual, protandrous, 5-merous; *calyx* 5-lobed, spreading, adaxially keeled; petals 5, cymbiform, caducous; *stamens* 5, each enclosed within a petal; anthers broadly sagittate with an appendage, versatile, basifixed, dehiscent by longitudinal slits; *nectary disc* thick, fleshy, filling the floral tube; *style* solitary, 2–3(–4)-fid, rudimentary before anthesis, elongating after anthesis; *ovary* partly inferior, 2–3(–4)-locular. *Fruits* drupaceous, tardily dehiscent, the lower portion united with the calyx tube; epicarp thin, black, shiny, with ring-scar marking position of fallen sepals; mesocarp (when present) spongy to powdery, reddish; endocarps hard, woody, often apiculate, dehiscing along the ventral suture and partly down the dorsal suture, each enclosing a single seed. *Seeds* often persistent on torus after remainder of fruit has fallen away, grey, with glossy hard testa, enclosed by membranous reddish-brown aril.

Distribution

Alphitonia is a western Pacific genus. Natural stands of *Alphitonia* occur as far north as Hainan (southern China), west to Borneo, east to Tahiti, Hawaii and the Marquesas Islands, and to southern coastal New South Wales in the south. The map by Balgooy (1966) provides an accurate portrayal of the generic distribution, except for an alleged occurrence of the genus in the Pilbara region of Western Australia. The greatest species diversity is in New Guinea, Australia and New Caledonia.

1. *Alphitonia excelsa* (Fenzl) Benth., *Fl. Austral.* 1: 414 (1863)

Colubrina excelsa Fenzl in Endl., *Enum. Pl. [Endlicher]* 20 (1837); *Ceanothus excelsus* (Fenzl) Steud., *Nomencl. Bot. [Steudel]*, ed. 2, 2: 313 (1841).

Ceanothus excelsus A.Cunn., *nom. nud.*

Type: [Queensland] Moreton Bay, undated, *A. Cunningham* (lectotype W, here designated; ?isolectotype BRI).

Alphitonia excelsa var. *acutifolia* Braid, *Bull. Misc. Inform. Kew* 177 (1925). Type: Queensland. MORETON: Ipswich, undated, *T.F. Hall* 9 (holotype K, image!; isotype BRI).

Alphitonia sp. (Selwyn Ranges L.P.Conroy 3) in Bean (2002), Bean (2007).

Alphitonia sp. (Little Crystal Creek A.R.Bean 5237) in Bean (2002), Bean (2007).

Illustrations: T.D. Stanley & E.M. Ross, *Flora of south-eastern Queensland* 2: 49, fig. J1, J2 (1986); Logan River Branch SGAP, *Mangroves to Mountains* 1: 57 (2002); G.J. Harden *et al.*, *Rainforest Trees and shrubs, A field guide to their identification* 152 (2006); R. Melzer and J. Plumb, *Plants of Capricornia* 284 (2007).

Tree 4–20 m high. Bark persistent, tessellated and dark at base of large trees; otherwise smooth, dappled white and grey. *Primary branches* ascending, with secondary and tertiary branches on different planes. *Branchlets* not prominently ridged near growing point; stipules 3–14 mm long, linear to narrowly-triangular. Juvenile stem *indumentum* in some forms dense, rusty, straight to flexuose, patent, to 0.6 mm high; in other forms with moderately dense white crisped hairs to 0.1 mm high, and scattered brown straight

Key to flowering specimens of Australian *Alphitonia*

1	Young branchlets prominently furrowed, hairs dark brown; stipules 1–2(–4) mm long.....	4. <i>A. petriei</i>
1:	Young branchlets terete or angular, but not furrowed, hairs pale to mid-brown; stipules 3–14 mm long.....	2
2	Leaves broadest at or above midpoint, dirty greyish-white on underside; pedicels 0.8–2 mm long at anthesis.....	3. <i>A. whitei</i>
2:	Leaves broadest below midpoint, white or yellowish on underside (except veins); pedicels 1.7–4 mm long at anthesis.....	3
3	Leaf bases obtuse (sometimes slightly cordate); disc with 10 prominent radial furrows; all flowers with 3-fid styles.....	5. <i>A. oblata</i>
3:	Leaf bases cuneate (sometimes obtuse); disc flat or undulate, without prominent furrows; the majority of flowers with 2-fid styles.....	4
4	Leaves 1.4–2.4 times longer than wide, yellowish on underside, apex mostly obtuse; styles 1.1–1.7 mm long after elongation.....	2. <i>A. pomaderroides</i>
4:	Leaves 2.2–4.6 times longer than wide, white on underside, apex mostly acute; styles 0.8–1.2 mm long after elongation.....	1. <i>A. excelsa</i>

Key to fruiting specimens of Australian *Alphitonia*

1	Fruits without powdery mesocarp; apiculum on distal end of endocarpid 0–0.5 mm long.....	3. <i>A. whitei</i>
1:	Fruits with powdery mesocarp; apiculum on distal end of endocarpid 0.5–2 mm long.....	2
2	Fruits oblate, considerably broader than long, 13–15 mm diameter, consistently 3-locular.....	3
2:	Fruits globose, 7–12 mm diameter; majority of fruits 2-locular, but with some 3-locular ones present.....	4
3	Seeds (aril removed) 2.9–3.4 mm long; endocarpids (excl. apiculum) 4.5–5.5 mm long; new growth dark brown.....	4. <i>A. petriei</i>
3:	Seeds (aril removed) 4.1–5.0 mm long; endocarpids (excl. apiculum) 6.5–8 mm long; new growth pale to mid-brown.....	5. <i>A. oblata</i>
4	Mature fruits 7–10 mm long; seeds 4–5.7 mm long; leaves 2.2–4.6 times longer than wide, white underneath, apex mostly acute.....	1. <i>A. excelsa</i>
4:	Mature fruits 9.5–11 mm long; seeds 5.4–6.3 mm long; leaves 1.4–2.4 times longer than wide, yellowish underneath, apex mostly obtuse.....	2. <i>A. pomaderroides</i>

Field key to Australian *Alphitonia*

1	Canopy widely spreading, comprising numerous layers of horizontal branches.....	2
1:	Canopy not widely spreading, branches ascending and not in distinct layers.....	3
2	Leaf base frequently obtuse; trees flowering in autumn (March–May); young branchlets with pale to mid-brown tomentum.....	5. <i>A. oblata</i>
2:	Leaf base usually broadly cuneate; trees flowering in spring (August–November); young branchlets with dark brown tomentum.....	4. <i>A. petriei</i>
3	Tree of climax rainforest; leaves broadest at or above the midpoint.....	3. <i>A. whitei</i>
3:	Shrubs or trees of open forest and woodland, sometimes rainforest edges; leaves broadest below midpoint.....	4
4	Shrub or tree to 7 metres; leaves 1.4–2.4 times longer than wide, yellowish-white underneath, apex mostly obtuse; inhabiting flats or lower hillslopes.....	2. <i>A. pomaderroides</i>
4:	Tree 4–20 metres high; leaves 2.2–4.6 times longer than wide, white underneath, apex mostly acute; inhabiting flats, riverbanks, hills and ridges.....	1. <i>A. excelsa</i>

or flexuose hairs to 0.4 mm high. Juvenile *leaves* variable, sometimes broadly elliptical, lower surface with white hairs throughout, apex obtuse, petioles very short; sometimes narrowly ovate, lower surface with abundant rusty hairs on veins, apex acute to acuminate. Adult stem *indumentum* sparse to dense, grey to creamy-white, crisped hairs c. 0.1 mm high, and scattered erect flexuose hairs to 0.3 mm high. *Leaves* 2-ranked, elliptic, narrowly-elliptic, narrowly-ovate or lanceolate, 6.1–18.5 × 1.8–6 cm (L/B ratio 2.2–4.6), apex acute or obtuse, sometimes mucronate; base cuneate, occasionally obtuse, symmetrical or not; newly expanded leaves mid-brown to pale brown; petioles 0.8–2.3 cm long, hair cover 0.1–0.5 mm high. Upper leaf surface dark green, glossy, glabrous except when very young, when numerous white or pale brown tortuous hairs cover the surface; lower leaf surface with abundant tiny white crisped hairs in the areoles, obscuring the lamina, and scattered pale brown tortuous hairs to 0.6 mm long along the veins and veinlets. *Cymes* occurring in up to 7 leaf axils per branchlet, each 3.5–9 cm long when flowering, none truly terminal. *Pedicels* 1.7–4 mm long at anthesis. *Bracts* ovate, c. 0.5–1.5 × 0.5–1.2 mm. *Flowers* 4–6 mm across; sepals deltate, 1.4–1.7 mm long, 1.2–1.7 mm wide at base, glabrous internally; petals white, 1.2–1.7 mm long; filaments 1.0–1.4 mm long; anthers 0.2–0.4 mm long, tail 0.05–0.1 mm long. *Disc* pentagonal to circular, grey, not papillose, surface flat or undulate, radial furrows absent or present (10); densely or sparsely hairy (erect brown or white hairs close to style) or glabrous. *Style* 2(–3)-fid, 0.8–1.2 mm long after elongation. Fruiting pedicels 1.5–5 mm long, 0.7–0.9 mm diameter. Mature *fruits* black and somewhat glossy at maturity or occasionally with a glaucous bloom, glabrous, globose, 2(–3)-locular, 7–10 mm long, 7–11 mm diameter; calyx scar close to pedicel end, or sometimes almost halfway along; powdery mesocarp abundant. Endocarpids (when opened) 6–8.2 mm long (excluding apiculum), 6–6.5 mm wide, radius 3–5 mm; apiculum 0.5–1 mm long, terminal. Aril maroon; *seeds* grey, 4–5.7 × 2.9–4 × 1.8–2.4 mm. *Soap Tree, Red Ash.*

Distribution and habitat: *Alphitonia excelsa* is a very widespread and common species, occurring in eastern New South Wales, throughout much of Queensland, in the northern one-third of the Northern Territory and in the Kimberley region of Western Australia (Fig.

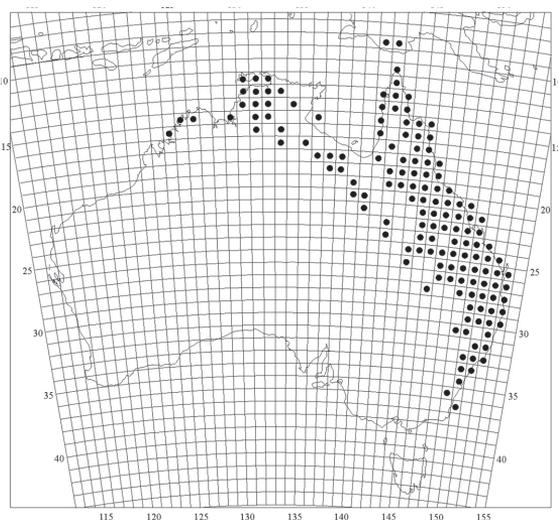


Figure 1. Distribution of *Alphitonia excelsa* in 1° grids.

1). It also occurs in southern lowland New Guinea. It grows over a wide range of climatic conditions. In more coastal areas, it grows on a range of well-drained sandy or loamy soils, usually in eucalypt forest, but sometimes on the edges of notophyll rainforest. In drier inland areas, it is confined to low-lying areas with very sandy soils or small sheltered gorges.

Phenology: The great majority of flowering records are from January to April, but there are some for December and May, and an occasional record from other months of the year. Ripe fruits and/or persisting seeds are found from June to December.

Typification: The type of *Colubrina excelsa* at W was annotated as '(LECTO-) HOLOTYPE' by Johnston in 1968, and as 'HOLOTYPE' by Thiele in 2001. Since there is a specimen at BRI that may be a part of the same gathering as the W specimen, and because Cunningham's specimens are so widely distributed, it seemed wise to choose the W specimen as the lectotype, to avoid any ambiguity in the future.

Notes: *Alphitonia excelsa* is a very polymorphic species, but despite its huge range of variability, it has not proved possible to split any species from it or distinguish subspecies within it. Specimens at BRI included under the preliminary taxon names 'sp. Selwyn Ranges' and 'sp. Little Crystal Creek' are distinctive when viewed in isolation, but there is a gradual transition between these specimens and

others that are nearer to the typical form of the species. The Cape York Peninsula form of *A. excelsa* is very similar to specimens of *A. philippinensis* from the Philippines, but the latter has smaller endocarpids with a long apiculum, and conspicuous radial furrows on the disc. Fruits of *A. excelsa* are consistently globose. There is a predominance of flowers with 2-locular ovaries and 2-fid styles, but some flowers with 3-fid styles can usually be found on any given plant or flowering specimen.

Alphitonia excelsa, in contrast to some other Australian species, has ascending primary branches and more-or-less evenly distributed leaf canopy. This canopy type is consistent even for those forms that occur in rainforest environments.

The relationship between *A. excelsa* and *A. oblata* in Northern Territory and Western Australia requires further study. In 1994, K. Thiele determined all Kimberley specimens of *Alphitonia* at BRI as *A. incana*, while Wheeler (1992) included only *A. excelsa* for this region. According to Booth *et al.* (2001), *A. excelsa* and *A. 'incana'* (i.e. *A. oblata*) intergrade in the Darwin area, and this may account for differing names applied in the Northern Territory and Kimberley region of Western Australia.

Alphitonia excelsa is the food plant for the larvae of the Small Green-banded blue butterfly (*Psychonotis caelius*). The timber has a density of 770 kg/m³ and has been used for fencing and ornamental panelling. It is pale when cut, but upon exposure turns to a bright red (Fairbairn 1999).

Selected specimens examined: WESTERN AUSTRALIA. 1 km E of Mitchell Falls, Mitchell Plateau, 30.v.1992, *D. Halford Q1431* (BRI, DNA, PERTH); Morgan River, near old 'Theda' homestead, 24.vii.1977, *I.R. Telford 6102 & G. Butler* (BRI, CANB). **NORTHERN TERRITORY.** Elcho Island, 2.vii.1975, *J.R. Maconochie 2094* (BRI, CANB, K, L); Waldunga road/Old Plains track junction, Murgentella, 10.vii.1984, *G. Wightman 2004* (BRI, CANB, DNA); 1 km SE of Angurugu, Groote Eylandt, 7.iii.1988, *J. Russell-Smith 5136 & D. Lucas* (BRI, DNA). **QUEENSLAND.** BURKE: c. 5 km S of Lake Moondarra, just 2.5 km off the Mt Isa to Lake Moondarra Road, 23.viii.2001, *D.T. Kelman DTK16 & J.E. Kelman* (BRI). COOK: Olive River, 72.9 km NNW of Lockhart River community, 26.iv.1994, *D.G. Fell DGF4235* (BRI, DNA, NSW). NORTH KENNEDY: 40 Mile Scrub N.P., 1.6 km N of Mt Surprise road junction, 11.iii.1987, *J.R. Clarkson 6878 & W.J. McDonald* (BRI, L, QRS, PERTH). SOUTH KENNEDY: Keswick Island, Basil Bay, 6.ix.1996, *G.N. Batianoff 9609172 et al.* (AD, BRI, CANB, DNA, MEL, NSW). MITCHELL: 1.5 km NW of Betanga on Capricorn Hwy E of Jericho, 31.iii.1992, *E.J. Thompson JERS & B.K. Simon*

(AD, BRI, DNA, PERTH). LEICHHARDT: c. 20 miles [32 km] ESE of Rolleston, 30.viii.1961, *M. Lazarides & R. Story 110* (BRI, CANB). PORT CURTIS: Shoalwater Bay Military Reserve, 2 km W of Sabina Point, 13.vii.1977, *J.R. Clarkson 1088 & T.D. Stanley* (BRI). BURNETT: northern slopes of Mulgildie Plateau, SSE of Monto, 11.ii.1996, *A.R. Bean 9744* (BRI, MEL). WIDE BAY: Waddy Point, S of Orchid Village, Fraser Island, 14.i.1973, *T. Whaite 3504 & J. Whaite* (BRI). MARANO: c. 89 km W of Condamine toward Surat, near Back Creek crossing, 13.x.1983, *E.M. Canning 5952 & B. Rimes* (BRI, NSW). DARLING DOWNS: Leichhardt Hwy, c. 23 km N of Miles, 17.v.1988, *P.C. Jobson 266* (BRI, MEL). MORETON: Mt Mellum, Glasshouse Mountains, 10.xii.1987, *D.E. Albrecht 3457* (BRI, MEL). **NEW SOUTH WALES.** Pike's Gap, Denman to Sandy Hollow road, 11.ix.1948, *E.F. Constable NSW 121556* (BRI, NSW); Yellow Rock Creek road, c. 4 miles [6 km] SW of Albion Park, 28.ii.1967, *M. Evans 2585* (AD, BRI, CANB, NSW); 'Lowry', above Namoi River, Namoi River road, 13.i.1992, *J.R. Hosking 467* (BRI, NSW).

2. *Alphitonia pomaderroides* (Fenzl) A.R.Bean, *Austrobaileya* 7: 377 (2006)

Ziziphus pomaderroides Fenzl in Endl., *Enum. Pl. [Endlicher]* 20 (1837).

Type: [Queensland] Cape Van Diemen, December 1802, *F. Bauer s.n.* (holotype W, photo at BRI).

Alphitonia obtusifolia Braid, *Bull. Misc. Inform. Kew* 182 (1925).

Caenothoides obtusifolia R.Br., *nom. nud.*

Type: [Queensland] 'Carpentaria', undated [17–27.xi.1802], *R. Brown* [Bennett No. 5364] (holotype K, image!; isotype BM, BRI [AQ 317590]).

Alphitonia obtusifolia var. *tenuis* Braid, *Bull. Misc. Inform. Kew* 183 (1925). **Type:** [Queensland] 'North Coast', [xi.1802], *R. Brown* (syntype K, image!).

Shrub or tree to 7 m high. Bark persistent, tessellated and dark at base of large trees; otherwise smooth, dappled white and grey. Primary branches ascending, with secondary and tertiary branches on various planes. Branchlets not noticeably ridged near growing point; stipules 3–6 mm long. Juvenile stem *indumentum* and juvenile leaves unknown. Adult stem *indumentum* dense, with abundant pale brown to creamy-white crisped hairs c. 0.1 mm high, and infrequent straight or curved patent hairs to 0.3 mm high. Adult leaves 2-ranked, ovate to elliptical, 5.6–15.5 × 3.2–8.0 cm (L/B ratio 1.4–2.4); apex obtuse, acute or retuse; base obtuse to cuneate, symmetrical; newly expanding leaves dark

brown; petioles 0.7–2.1 cm long, hairs to 0.4 mm long. Upper leaf surface dull green, with persisting flexuose hairs to 0.4 mm long, glabrescent; lower leaf surface white or yellowish, with abundant tiny white crisped hairs in the areoles, obscuring the lamina, and brown flexuose to straight hairs to 0.4 mm long along the veins and veinlets; midrib and secondary veins sparsely to densely hairy, brown. *Cymes* occurring in up to 5 leaf axils per branchlet, each 2–6 cm long, none truly terminal (terminal only by abortion of the terminal vegetative shoot). Pedicels 2.5–3.5 mm long at anthesis. *Bracts* and bracteoles broadly ovate, 0.7–1 × 0.4–0.8 mm. *Flowers* 5.5–7.0 mm across; sepals deltate, 1.7–2.3 mm long, 1.7–2.0 mm wide at base, glabrous internally; petals white, 1.5–1.8 mm long; filaments 1.2–1.6 mm long; anthers 0.35–0.5 mm long, tail 0.1–0.15 mm long. *Disc* circular to pentagonal, grey, not papillose, surface undulating or flat, radial furrows absent; glabrous or with a few hairs at the base of the style. *Style* 2-fid (rarely 3-fid), 1.1–1.7 mm long after elongation. Fruiting pedicels 2.5–5.5 mm long, c. 0.8 mm diameter at midpoint. *Fruits* black at maturity, somewhat glossy, glabrous, globose, 2(–3)-locular, 9.5–11 mm long, 10–12 mm diameter, calyx scar close to pedicel end; powdery mesocarp abundant. Endocarpids 7–8.5 mm long (excluding apiculum), 6.5–9 mm wide, radius 5–6 mm, apiculum 0.5–1 mm long, terminal or subterminal. Aril orange to reddish-brown; *seeds* grey, 5.4–6.3 × 3.7–4.5 × 2–2.3 mm.

Distribution and habitat: *Alphitonia pomaderroides* is common in north-eastern Australia, from Mareeba (Qld) in the east to Roper River (Northern Territory) in the west. It grows throughout most of Cape York Peninsula and extends south to near Croydon and Pentland (Fig. 2). It is an understorey species in eucalypt or melaleuca-dominated woodlands, where the surface soil is sandy to sandy-loam.

Phenology: Flowers are recorded between November and May. Ripe fruits and/or persisting seeds are found from between May and September.

Typification: The types of *A. obtusifolia* and *A. obtusifolia* var. *tenuis*, while collected around the same time, are apparently not from the same gathering, as the leaf shape on these specimens is somewhat different.

Notes: Although there are no definitive characters

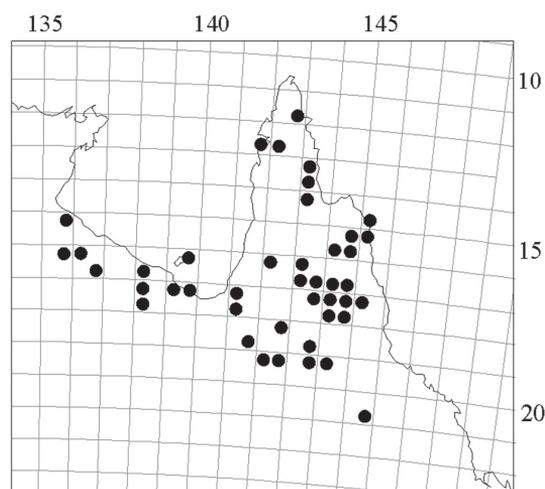


Figure 2. Distribution of *Alphitonia pomaderroides* in 0.5° grids.

to separate *A. pomaderroides* and *A. excelsa* in the herbarium, they are rarely confused in the field. *A. pomaderroides* differs by its rather shrubby habit, the relatively broader leaves (L/B ratio of 1.4–2.4), and leaf undersides with a yellowish tint, and the mostly larger endocarpids and seeds. It tends to inhabit sandy flats or lower slopes in undulating terrain, in areas that have poor sub-surface drainage during the wet season. *A. excelsa* is a larger tree with relatively narrow leaves with pure white undersides. Where the two species occur in the same region, *A. excelsa* will be found on well-drained stony ridges or on riverbanks. No hybridisation or intergradation between these species has been noted in the field or recorded on herbarium labels.

Selected specimens examined: **NORTHERN TERRITORY.** Mt Young, Nathan River station, 20.i.1989, *J. Russell-Smith* 6728 & *D. Lucas* (BRI, DNA); Caranbirini Waterhole, 45 km W of Borroloola, 5.ix.1981, *T. Whaite* 3974 & *J. Whaite* (BRI, NSW); 7 km W of Borroloola, 27.vi.1977, *J. Must* 1542 (BRI, CANB, DNA, K, L). **QUEENSLAND.** **COOK:** Cholmondelay Ck crossing, on Telegraph Line road, 11 km SW of Heathlands, 6.iii.1992, *R.W. Johnson* 5137 (BRI, DNA, MEL, NSW); 23.5 km ENE of Weipa Mission, 9.xii.1974, *R.L. Specht* W188 & *R.B. Salt* (BRI); 8.2 km from Kennedy River on the Fairview to Kimba road, 20.iv.1980, *J.R. Clarkson* 3185 (K, MO, QRS); near granite gorge off Chewko road, near Mareeba, 10.iv.1990, *H. van der Werff* 11509 (MO, QRS); Pannikan Springs area, 29 km west of Mungana, 26.i.1993, *A.R. Bean* 5624 & *P.I. Forster* (BRI, K, MEL); Chillagoe, i.1918, *N. Michael* 303 (BRI); 6 km by road W of Petford, 22.vi.2006, *K.R.*

McDonald KRM5312 (BRI); 20 km NW of Mt Garnet, on road to Lappa, 19.i.1993, A.R. Bean 5484 & P.I. Forster (BRI, DNA, MEL). BURKE: Sweers Island, South Wellesley Islands, southern Gulf of Carpentaria, 15.xi.2002, M.B. Thomas SW155 & L. Pedley (BRI, DNA, UPNG); 0.4 km SSE of Hell's Gate roadhouse, 9.vi.2006, E.J. Thompson WES769 (BRI, DNA); 33.5 km NNE of Normanton on road to Lotus Vale Station, 16.vii.1974, P. Ollerenshaw 1460 & D. Kratzing (BRI, CANB); 15 km NE of Claraville HS, on road to Croydon, 9.viii.1987, C. Dalliston HC383 (BRI); eastern side of 'Pioneer', about 150 km NNE of Julia Creek, 8.iv.2001, D.C. Johnson & D.T. Kelman s.n. (BRI [AQ 752837]). SOUTH KENNEDY: c. 57 km SE of Pentland, 29.vi.1998, E.J. Thompson CHA425 & G.P. Turpin (BRI).

3. *Alphitonia whitei* Braid, *Bull. Misc. Inform. Kew* 181 (1925)

Type citation: 'Near Barron River, Bailey (24)*; Innisfail, Ladbrook 26, Michael 400; Jordan Creek, Mocatta 23*.'

Type: Queensland. Jordan Creek, Innisfail district, xi.1912, H.W. Mocatta 23 (**lectotype** K, here designated; **isolectotype** BRI [AQ 317596]).

[*A. excelsa* var. *franguloides* auct. non (A.Gray) F.M.Bailey: *Compr. Cat. Queensland Pl.* 837 (1913)]

Illustration: K.A. Williams, *Native Plants of Queensland* 4: 47 (1999).

Tree 18 m high. Bark smooth, dappled white and grey. Crown ascending, with secondary and tertiary branches on various planes. Branchlets not noticeably ridged near growing point; stipules 5.5–12 mm long. Juvenile stem *indumentum* absent or sparse, hairs grey to brown, all crisped, to 0.1 mm high. Juvenile leaves elliptic, 18–27 × 7–10 cm. Adult stem *indumentum* absent or sparse, hairs grey, all crisped, to 0.1 mm high. Adult leaves spirally arranged or distichous, obovate or broadly elliptic, 13–23 × 5.3–9.7 cm (L/B ratio 2.2–3.9), apex acute, acuminate or mucronate; base cuneate, symmetrical; petioles 1.5–2.5 cm long, hairs <0.1 mm long. Upper leaf surface dark green, glossy, glabrous except when very young, when numerous brown tortuous hairs cover the surface; lower leaf surface usually a dirty-grey colour, sometimes white, with abundant tiny white cobwebby hairs in the areoles, often completely obscuring the lamina, tortuous hairs absent or very infrequent, to 0.5 mm long; midrib and secondary veins glabrescent, brown. *Cymes* occurring in up to 5 leaf axils per branchlet, each 6–21 cm long, often appearing terminal due to abortion of the

uppermost leaves; rachises, peduncles and pedicels consistently rusty-brown in colour. Pedicels 0.8–2 mm long at anthesis. Bracts ovate, concave, 3.5–4 × 2–2.2 mm; bracteoles linear, 1.5–2 × 0.3 mm. *Flowers* 3.5–4.8 mm across; sepals deltate, 1.3–1.7 mm long, 1.3–1.6 mm wide at base, glabrous internally; petals white, 1.0–1.4 mm long; filaments 0.8–1.0 mm long; anthers 0.25–0.3 mm long, tail c. 0.05 mm long. *Disc* pentagonal, grey, not papillose, surface flat or undulate, radial furrows absent; glabrous, except for inner one-third to one-half where there is a dense cover of pale brown flexuose trichomes close to style. *Style* 2-fid, 0.7–1.0 mm long after elongation, glabrous throughout, fused for half of length. Fruiting pedicels 1.3–4 mm long, 1.0–1.4 mm diameter. *Fruits* black at maturity, somewhat glossy, glabrous, slightly longer than wide, 2-locular, 7–9 mm long, 6–8 mm diameter, calyx scar 30–50% of distance from pedicel end; mesocarp absent. Endocarps (when opened) 6.5–8 mm long (excluding apiculum), 6.5–8 mm wide, radius 3.3–4 mm, apiculum 0–0.5 mm long, terminal. Aril maroon; seed dark grey, 4.2–5.3 × 3.8–4.9 × 1.6–1.8 mm.

Distribution and habitat: *Alphitonia whitei* is endemic to Queensland where it extends from near Townsville to Bloomfield River (south of Cooktown), with a disjunct occurrence in the MacIlwraith Range east of Coen (Fig. 3). It inhabits primary or climax rainforest on a variety of soils with a vast range of other tree species. It extends from sea level to around 1200 metres.

Phenology: *Alphitonia whitei* flowers from September to November, and mature fruits are recorded from December to March.

Typification: In his *Alphitonia* paper, Braid (1925) indicated type specimens in the protologue by means of an asterisk. For *A. whitei*, there are two specimens annotated by an asterisk (*Mocatta 23* and *Bailey 24*). The *Mocatta* specimen at K bears adult leaves and flowers, and is chosen as the lectotype as it better fits the protologue. The *Bailey* specimen (sheets at BRI and K) bears adult leaves, fruits and seeds. Braid in the protologue stated 'Fructus non visus'. The '23' associated with the lectotype is probably not a collection number assigned by the collector. It could have been assigned by C.T. White when preparing specimens to be sent to Braid.

Notes: Unlike other Australian *Alphitonia* spp., *A. whitei* is an inhabitant of climax rainforest, and shows

no inclination to dominate regrowth. It does not seem closely related to any other Australian species, and it may be closest to *A. macrocarpa* Mansf. from Papuaia; *A. whitei* and that species are both remarkable for their fruits with short pedicels and a total lack of mesocarp. The lower leaf surface of both species has indumentum so thick and appressed that no individual hairs are discernable, and to the naked eye the greyish-white colouration could easily be interpreted as due to surface wax rather than hairs.

Selected specimens examined: QUEENSLAND. COOK: Leo Creek Mine area, T.R. 14, Macclwraith Range, 20.vi.1995, *P.I. Forster PIF16876* (BRI); 1 mile [1.6 km] NW of Stuckies Gap, Bloomfield River area, 17.v.1969, *L.J. Webb & J.G. Tracey 8442* (BRI); SF144, Mt Windsor Tableland, 3.5 km past barracks, 31.x.1999, *P.I. Forster PIF25134* (A, BRI, K, L, MEL, QRS); Daintree River, 13.xii.1929, *S.F. Kajewski 1477* (BRI); Rex Range, NE of Julatten, 28.i.1993, *A.R. Bean 5674 & P.I. Forster* (BRI, L); O'Donoghue's cane farm, Saltwater Creek, Mossman, 12.x.1982, *K.A. Williams 82163* (BRI); Copper Lode Dam, Whitfield Range, 19 km W of Cairns, 11.ix.1970, *C.H. Gittins 2208* (BRI); Atherton Tableland, Gadgarra, iii.1932, *W.D. Francis s.n.* [AQ 109227] (BRI); 12 km N along the perimeter road from its junction with the Gillies Hwy (Atherton to Gordonvale road), 14.x.1987, *D.B. Foreman 1697* (AD, BRI, CANB, MEL, NSW, QRS); Elinjia Logging Area, 7.4 km NE of Millaa Millaa, x.1988, *L.W. Jessup et al. GJM2140* (BRI). NORTH KENNEDY: Kirrama Range, W of Kennedy, 31.vii.1947, *L.S. Smith 3212* (BRI); 6 km NW of Paluma, 26.ix.1992, *A.R. Bean 5040* (BRI, K, L, MEL, NSW); Bluewater S.F., NW of Townsville, 4.x.1992, *A.R. Bean 5078* (BRI, K, L, MEL).

4. *Alphitonia petriei* Braid & C.T.White in Braid, *Bull. Misc. Inform. Kew* 178 (1925).

Type citation: 'Johnston River, *Ladbrook 46**; Kuranda, *White* (1525) 43*'. **Type:** Queensland. Johnstone River, x.1917, *H.G. Ladbrook 46* (lectotype K, here designated; isolectotype BRI [AQ 317594]).

Illustrations: S. Pearson and A. Pearson, *Rainforest Plants of eastern Australia* 24 (1992), both photos; P. Radke, A. Radke, G. Sankowsky and N. Sankowsky, *Growing Australian Tropical Plants* 17 (1993); Logan River branch SGAP, *Mangroves to Mountains*, 2: 288 (2005); G.J. Harden *et al.*, *Rainforest Trees and shrubs, A field guide to their identification* 152 (2006); N. Nicholson and H. Nicholson (2007). *Australian Rainforest Plants I* (6th ed.) p. 6 (2007); R. Melzer and J. Plumb, *Plants of Capricornia* 285 (2007).

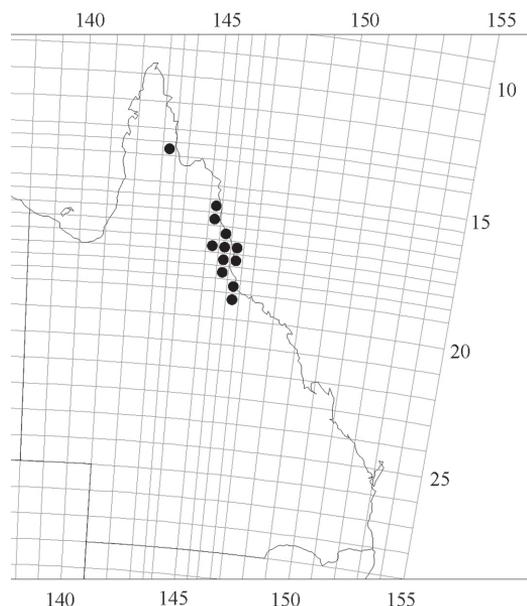


Figure 3. Distribution of *Alphitonia whitei* in 0.5° grids.

Tree 4–15 m high, bark smooth, dappled white and grey. Crown with numerous spreading, horizontal branches. Branchlets strongly ridged near growing point. Stipules 1–2(–4) mm long. Juvenile stem indumentum not known. Juvenile leaves broadly elliptical, c. 14 × 6.5 cm. Adult stem indumentum absent or sparse, hairs all crisped (no straight hairs), white, 0.05–0.1 mm high. Leaves 2-ranked, narrowly-elliptic, 8.6–17.1 × 3–5.7 cm (L/B ratio 2.5–3.1), apex acute, sometimes shortly mucronate; base usually broadly cuneate, rarely obtuse, symmetrical or asymmetrical; newly expanding leaves dark brown; petioles 1.2–2.1 cm long, with hairs c. 0.1 mm long. Upper leaf surface dark green, glossy, glabrous except when very young, when numerous brown tortuous hairs cover the surface; lower leaf surface with abundant tiny white crisped hairs in the areoles, obscuring the lamina, and sparse to dense brown tortuous hairs to 0.25 mm long along the midrib, secondary veins and veinlets. Cymes occurring in upper leaf axils, each 4–11 cm long, none truly terminal (terminal only by abortion of the terminal vegetative shoot). Pedicels 3–5.5 mm long at anthesis. Bracts and bracteoles extremely small, brown, linear. Flowers 4.0–5.2 mm across; sepals deltate, 1.5–1.9 mm long, 1.1–1.6 mm wide at base, glabrous internally; petals white, 1.4–1.8 mm long; filaments 1.3–1.8 mm

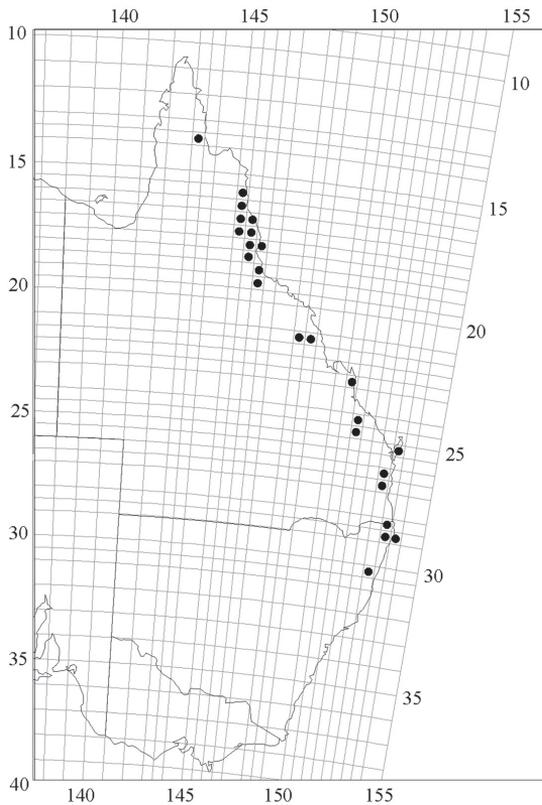


Figure 4. Distribution of *Alphitonia petriei* in 0.5° grids.

long, anthers 0.3–0.5 mm long, tail c. 0.1 mm long. Disc pentagonal, grey, not papillose, surface flat or undulate, radial furrows obscure or absent, glabrous except for inner one-third, having brown hairs overlying white flexuose trichomes close to style. Style (2–)3(–4)-fid, 0.7–1.3 mm long after elongation, lower part hairy. Fruiting pedicels 3.5–6 mm long, 0.5–0.6 mm diameter at midpoint. *Fruits* black at maturity, rather glossy, glabrous, oblate, (2–)3(–4)-locular, 8–9.5 mm long, 13–14 mm diameter, calyx scar close to pedicel end; powdery mesocarp abundant. Endocarpids 4.5–5.5 mm long (excluding apiculum), c. 4.2 mm wide (when open), radius 3–3.3 mm, apiculum 0.7–1.4 mm long, terminal. Aril maroon; *seed* grey, 2.9–3.4 × 2.1–2.5 × 1.5–1.8 mm. *Sarsaparilla*, *Pink Ash*, *White Ash*.

Distribution and habitat: *Alphitonia petriei* is endemic to Australia, with a discontinuous distribution along the east coast, being absent from lower rainfall areas. It extends from the MacIlwraith Range in far north Queensland to Lennox Head in northern New South Wales, and was reported by Floyd (1989) to also

occur near the Orara River west of Coffs Harbour (Fig. 4). It grows along the margins of notophyll rainforest or as a pioneer species in rainforest regrowth. In north Queensland, it occurs most commonly between altitudes 800 and 1200 metres, although it has been recorded on top of Mt Bellenden Ker (1600 m) and extends almost to sea level where rainfall is high enough. In southern Queensland and New South Wales, it does not exceed 550 metres altitude.

Phenology: *Alphitonia petriei* flowers between August and November (September to November in southern Queensland and New South Wales), while ripe fruits and/or persisting seeds are found from December to May.

Typification: Braid (1925) indicated two type specimens in the protologue (*Ladbrook 46* and *White 43*). The Ladbrook specimen at K is chosen as the lectotype. It consists of a flowering branchlet and a single leaf separately mounted. It is duplicated at BRI, whereas *White 43* is present only at K.

Notes: *Alphitonia petriei* is comparatively distinctive because of its very small stipules, ribbed branchlets and small seeds. In the field, it may be readily confused with *A. oblata*; both have pagoda-like branching and are of similar size and stature, and both have conspicuously oblate fruits. However, *A. petriei* has a very different flowering time, and the indumentum is darker brown and is more quickly lost from the stems. In north Queensland, *A. petriei* prefers higher altitude sites, although the two species do sometimes occur together.

Selected specimens examined: QUEENSLAND. COOK: TR 14 [MacIlwraith Range], 18.ix.1975, *B. Hyland 3272* (BRI); c. 2 km SW of 'The Pinnacle', 13 km SSE of Mossman, iv.1978, *V.K. Moriarty 2289* (QRS); 2 miles [3 km] west of Rumula, Mt Lewis range, 8.x.1964, *R. Schodde 4142* (BRI); Malanda, 22.viii.1943, *S.T. Blake 15173* (BRI); Garners Beach Rd., 6 km NNW of Clump Point, 33 km SSE of Innisfail, 20.ix.1993, *D.G. Fell DGF3597* & *M. Geyle* (BRI, CANB, MEL). NORTH KENNEDY: Coochemberum area near Ravenshoe, viii.1962, *L.J. Webb* & *J.G. Tracey 6182* (BRI); Princess Hills section of Lumholtz N.P., 314 km NNW of Charters Towers, 5.ix.2002, *M.B. Thomas 2395* (BRI, DNA); 6 km NW of Paluma, 26.ix.1992, *A.R. Bean 5043* (BRI, K, MEL). SOUTH KENNEDY: Mount Blackwood, c. 25 km NW of Mackay, close to TV transmitter, 26.xi.1986, *P.R. Sharpe 4555* & *G.N. Batianoff* (BRI, CANB, NSW); Dalrymple Heights, vii–xi.1947, *M.S. Clemens s.n.* (BRI [AQ 109200]). PORT CURTIS: Byfield, N of Yeppoon, near Upper Stony Creek, 20.iii.1997, *J. Plumb*

JP39 (BRI); Timber Reserve 353, west of Many Peaks, 9.xi.1995, A.R. Bean 9132 & G. Turpin (BRI, MEL). BURNETT: Kroombit Tops, Cedarvale road, 20.vii.1978, W.J. McDonald 2283 & J.P. Stanton (BRI). WIDE BAY: Fraser Island, x.1921, C.T. White 1198 (BRI); Goods Road, Conondale range, SF 274, 18.x.1982, W.J. McDonald 3574 & J.B. Williams (BRI, NSW); 6.7 km NE of Kin Kin, 9.x.1993, A.R. Bean 6768 (BRI, CANB, MEL). MORETON: Rocky Creek, 3 km W of Wappa Dam, near Yandina, 6.iii.1993, A.R. Bean 5814 (BRI); Upper Mudgeeraba Creek, c. 12 km SW of Mudgeeraba, 26.x.1976, W.J. McDonald 1642 & J.A. Elsol (BRI). **NEW SOUTH WALES.** NORTH COAST: Dungay Creek, N of Murwillumbah, 1.x.1980, A.G. Floyd 1593 (BRI, NSW); Terania Creek, 14.ii.1980, A.G. Floyd 1431 (BRI); c. 6 km N of Lennox Head on road to Byron Bay, 5.xi.1981, J.B. Williams s.n. (BRI [AQ 510594], NE, NSW).

5. *Alphitonia oblata* A.R.Bean, sp. nov.

A. excelsae affinis sed conopeo patente e ramis horizontalibus in stratis dispositis constanti, foliis longioribus oblongis apicibus breviter acuminatis, ovario semper 3-loculari et fructibus conspicue oblatis usque ad 15 mm diametro differens.

Type: Queensland. NORTH KENNEDY: Bruce Highway, 10.5 km NNE of Tully, 30 December 1992, A.R. Bean 5324 (holotype BRI; isotypes K, MEL).

[*A. incana* auct. non (Roxb.) Kurz; Hyland et al. (2002); Bean (2007)]

Illustrations: G.M. Wightman and M. Andrews, *Plants of the Northern Territory Monsoon Vine forests* 19 (1989), as *A. excelsa*; Logan River branch SGAP, *Mangroves to Mountains*, 2: 245 (2005), as *A. incana*; G.J. Harden et al., *Rainforest Trees and shrubs, A field guide to their identification* 152 (2006), as *A. incana*.

Tree 6–15 m high. Bark smooth, dappled, blotchy, white and grey. Crown with numerous spreading, horizontal branches. Branchlets ridged near growing point; stipules linear, 2–6 mm long. Juvenile stem *indumentum* moderate to dense, with small white crisped hairs 0.1–0.2 mm high, and more-or-less straight, patent or antrorse, pale brown or rusty hairs to 1.0 mm long. Juvenile leaves narrowly-ovate to ovate, to c. 20 cm long. Adult stem *indumentum* sparse to dense, hairs all crisped (no straight hairs), pale brown to creamy-white, 0.1–0.2 mm high. Leaves 2-ranked, narrowly-ovate, narrowly-oblong or oblanceolate (more-or-less parallel-sided), 12.8–19 × 4.5–7.0 cm (L/B ratio 2.4–3.4), apex shortly acuminate, often with

short mucro, sometimes acute; base frequently obtuse, sometimes cuneate or rarely cordate, symmetrical or rarely oblique; newly expanding leaves pale to mid-brown; petioles 1.0–1.8 cm long, hairs c. 0.2 mm long. Upper leaf surface dark green, glossy, glabrous except when very young, when numerous brown tortuous hairs cover the surface; lower leaf surface with abundant tiny white crisped hairs in the areoles, obscuring the lamina, and brown tortuous hairs to 0.5 mm long along the veins and veinlets. *Cymes* occurring in up to 9 leaf axils per branchlet, 6–12 cm long, none truly terminal. Pedicels 2.0–4.5 mm long at anthesis. *Flowers* 4.5–6.2 mm across; sepals deltate, 1.5–2.0 mm long, 1.3–1.6 mm wide at base, glabrous internally; petals white, 1.1–1.8 mm long; filaments 1.2–1.8 mm long, anthers 0.3–0.5 mm long, tail 0.1–0.2 mm long. *Disc* pentagonal, grey, covered by minute papillae, radial furrows present, 10; inner half of disc with dense erect brown hairs overlying tiny white crisped hairs. *Style* consistently 3-fid, 1.0–1.3 mm long after elongation. Fruiting pedicels 3–4 mm long, 0.7–0.8 mm diameter. Mature *fruits* black, somewhat glossy, glabrous, oblate, 3-locular, 9–11 mm long, 13–15 mm diameter, soon disintegrating, calyx scar close to pedicel end; powdery mesocarp abundant. Endocarpids (when opened) 6.5–8 mm long (excluding apiculum), 6.5–7.5 mm wide, radius 3.5–4 mm, apiculum 1–2 mm long, terminal. Aril maroon; *seed* grey to black, 4.0–5.0 × 3.5–4.4 × 1.8–2.3 mm. Fig. 5.

Distribution and habitat: *Alphitonia oblata* occurs along the Queensland coast from Bamaga to Buderim, and in parts of Northern Territory and the Kimberley region of Western Australia (Fig. 6). It inhabits rainforest edges or canopy breaks where annual rainfall exceeds around 1500 mm, although it may occur in sheltered gorges where rainfall is lower. It is usually found at altitudes of less than 200 metres, but may occasionally be found up to 500 metres above sea level.

Phenology: In Queensland it flowers from March to May, while ripe fruits and/or persisting seeds are found from August to February. In Northern Territory and Western Australia it flowers from February to April and ripe fruits and/or persisting seeds are found from June to September.

Notes: Specimens of *A. oblata* from between Cairns and Buderim in Queensland have more-or-less

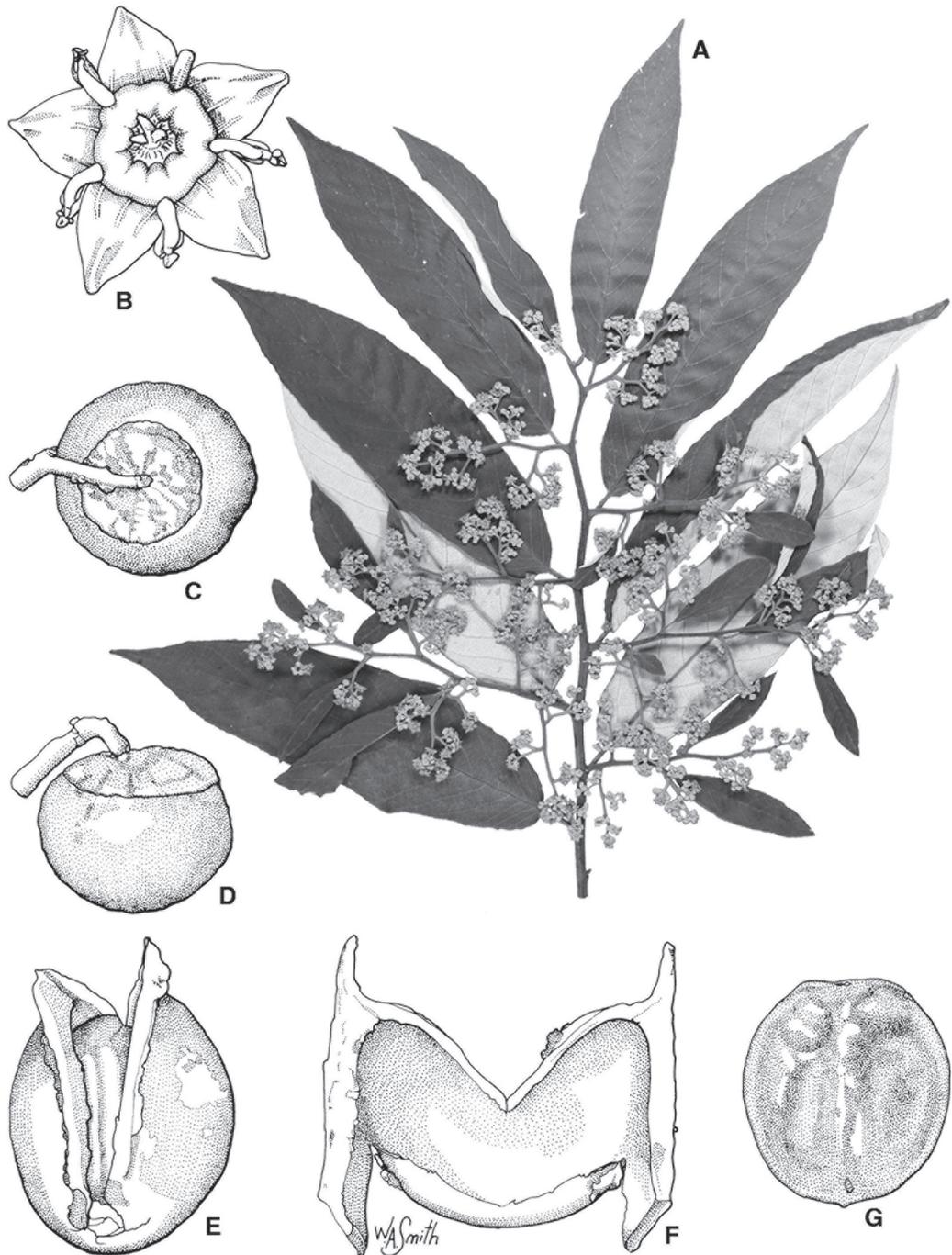


Figure 5. *Aliphtonia oblata*. A. flowering branchlet $\times 0.4$ (Bean 18708, BRI); B. flower from above $\times 7$ (Bean 18708, BRI); C. mature fruit from above $\times 2$ (from photo of fruits of Bean 5774, BRI); D. mature fruit, lateral view $\times 2$ (from photo of fruits of Bean 5774, BRI); E. endocarpid, enclosing arillate seed $\times 6$ (Bean 5731, BRI); F. fully expanded endocarpid $\times 6$ (Bean 5731, BRI); G. seed with aril removed $\times 8$ (Bean 5731, BRI).

parallel-sided adult leaves with a shortly acuminate apex and relatively long stipules, while specimens from Cape York Peninsula, Northern Territory and Western Australia tend to have narrowly-ovate adult leaves with an acute apex, and shorter stipules.

The shape of the mature fruits in *A. oblata* and *A. petriei* is the same, and yet *A. oblata* can be readily distinguished by the larger endocarps and larger seeds.

Etymology: The specific epithet is from the Latin *oblatus* meaning 'flattened at the poles'. This is a reference to the shape of the mature fruit in this species.

Selected specimens examined: WESTERN AUSTRALIA.

Mornington Wildlife Sanctuary, NE of Fitzroy Crossing, 20.iv.2005, *S. Murphy* MULE421 & *S. Legge* (BRI). **NORTHERN TERRITORY.** 19 miles [31 km] NW of Mountnorris Bay, 17.vii.1961, *G.M. Chippendale* 8163 (BRI); Butterfly Gorge, 29.ix.1991, *M.J. Barritt* 909 (AD, BRI, CANB, DNA, K, L, MEL, MO); Angurugu River, Groote Eylandt, 27.ix.1981, *F.R. Fosberg* 62384 & *R.C. Buckley* (BRI); Wessel Islands, 28.ix.1972, *P.K. Latz* 3221 (BRI, DNA). **QUEENSLAND.** COOK: West side of Cape York road, 6 km N of turnoff near Bamaga, 27.viii.1989, *P.C. Jobson* 758 & *G.C. Power* (BRI, MEL); Currunda Creek, 9 km W of Cairns, 30.i.1993, *A.R. Bean* 5731 & *P.I. Forster* (BRI); Russell River, N.P. 1353, 15.x.1981, *B. Gray* 2187 (BRI, QRS); near Japoon, 22.iv.1959, *R.F. Thorne* 20719 & *W.T. Jones* (BRI); 4 km W of Cook Hwy along Kennedy Hwy, Macalister Range, 4.xii.1991, *D. Halford* Q792 (AD, BRI, CANB, DNA, MEL, NSW); NPR 1353, Bellenden Ker, 19.viii.1981, *B. Hyland* 11108 (BRI, QRS); Golf Course St., El Arish, N of Tully, 17.iv.2002, *A.R. Bean* 18708 (BRI, NY). NORTH KENNEDY: Cardwell Range, 12 km N of Ingham on Bruce Highway, 24.xi.1992, *A.R. Bean* 5256 (BRI, DNA, L). SOUTH KENNEDY: 12.6 km from Gargett, towards Mt Charlton (W of Mackay), 15.iv.2002, *A.R. Bean* 18671 (BRI, DNA, L); Dolphin Heads, Mackay, 26.ix.1994, *G.N. Batianoff* 94099 & *S. Saltman* (AD, BRI, L). MORETON: Gold Creek, North Arm, near Nambour, 12.ix.1993, *A.R. Bean* 6517 (BRI, CANB, DNA, L, MEL); Dunethin Rock, 6 km E of Yandina, 17.ii.1993, *A.R. Bean* 5774 (BRI, NSW); Mons Road, Buderim, 29.iii.1993, *A.R. Bean* 5890 (BRI, BISH, DNA, K, L, MEL).

Excluded names

***Alphitonia franguloides* A.Gray, Bot. U.S. Expl.**

Exped. 1: 280 (1854); *A. excelsa* var. *franguloides*

(A.Gray) F.M.Bailey, *Compr. Cat. Queensland Pl.* 837 (1913).

When naming *A. excelsa* var. *franguloides*, Bailey stated 'this is the *A. franguloides*, Gray, ...'. Hence Bailey's name

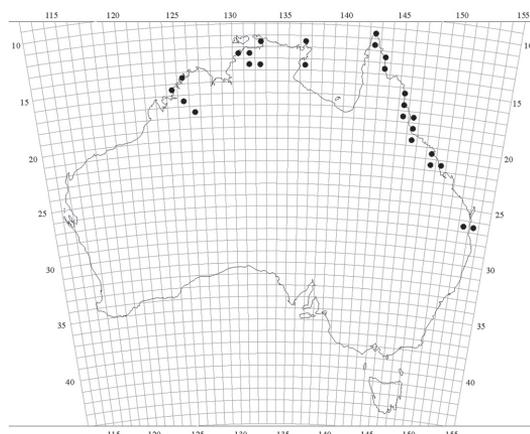


Figure 6. Distribution of *Alphitonia oblata* in 1° grids.

must be interpreted as a new combination rather than a new taxon, and the type of Bailey's name is that of *A. franguloides*. The latter was named from Fiji, and is a small-leaves species that is thought to be endemic to that island nation. No specimens matching *A. franguloides* are known from Australia. The Australian specimens cited by Bailey are *A. whitei*.

***Alphitonia incana* (Roxb.) Kurz, J. Bot. 11: 208 (1873)**

Rhamnus incanus Roxb., *Fl. Ind. (Roxburgh)* 2: 350 (1824), 1: 603 (1832). *Type citation:* 'Reared in the botanic garden at Calcutta from seed received from the Moluccas.' **Type:** without location, without date, *W. Roxburgh s.n.* (lectotype BR [506281], here designated; isolectotype K-WALL no. 4261).

The protologue for *Rhamnus incanus* includes a fairly detailed description of the plant, compiled from a live specimen growing at the Calcutta Botanic Gardens, from seed received from the Moluccas. The known extant original material comprises 1. a Roxburgh drawing (n. 1371) held at Kew; 2. a specimen in the Wallich herbarium at Kew; and 3. a specimen in the Roxburgh herbarium at Brussels (Forman 1997).

The drawing is somewhat stylised and probably does not accurately portray the features of the plant, and it is certainly not a good match for the two specimens noted above. It includes a transverse view of a fruit, which appears to be somewhat oblate; the leaves in the drawing are narrowly ovate on very short petioles, and the stipules very long and slender.

The specimen at BR comprises a pressed and mounted branchlet, bearing several leaves and a few inflorescences. It bears both flower buds and open flowers. All of the flowers have 3-fid styles. This specimen is fully in accord with the protologue and is here chosen as the lectotype of the name.

The specimen in the Wallich herbarium has not been examined by the present author, but the microfiche (K-WALL no. 4261) has been seen. It appears almost identical to the Brussels specimen in leaf size and shape; shape of leaf base and apex; size, placement and maturity of inflorescences; and even size and shape of the specimen as a whole. It is here considered part of the same gathering. It is unfortunate that neither of the original specimens bears fruits, as most taxonomically useful characters are associated with the fruits. In the protologue, Roxburgh described the fruits thus: 'Berries round, ..., the size of a small cherry, when ripe black'.

I have examined two fruiting specimens from the Moluccas Islands (*Kostermans 1221* (BRI); *Kostermans 925* (BRI)). These specimens have consistently 3-locular fruits (hence in accord with the lectotype which has flowers with 3-fid styles). The mesocarp and exocarp of these fruits have disintegrated, indicating that the fruits are fully mature, but also masking the original shape of the fruits. Judging by the small quantity of mesocarp material present, the intact fruits are likely to have been globular or perhaps slightly oblate. The endocarpids are 4.4–5.2 mm long with an apiculum 0.4–0.7 mm long. The seeds are grey, 3.4–3.6 mm long and 2.7–2.9 mm wide. The leaves have a cuneate base, and an acute or rarely slightly acuminate apex, and the stipules brown, linear, c. 3 mm long. In these vegetative features, the two *Kostermans* specimens are an excellent match for the lectotype.

There is no doubt in my mind that these specimens belong to *Alphitonia incana sens. str.* Other specimens matching the lectotype occur in the Moluccas and lowland areas of New Guinea, but the shapes and measurements given above are at odds with specimens from Australia that have previously gone by the name *A. incana*. Therefore, the Australian taxon has been described in this paper as a new species (*A. oblata*). The precise distribution and ecology of *A. incana sens. str.* will become clear only upon a revision of the Malesian species.

***Alphitonia moluccana* Braid, *Bull. Misc. Inform. Kew* 184 (1925).**

Braid (1925) cited one Australian specimen under the name of *A. moluccana*, i.e. 'Cairns, C.T. White 35'. This specimen is held at BRI and represents *A. oblata*. A type specimen of *A. moluccana*, collected by J.E. Teijsmann from the Moluccas islands, is present at K. There are apparently no types for that name at L or BO. The Kew specimen is in flower, but bears no fruits. Its leaves are very broad (measuring c. 16 × 9 cm), some are conspicuously cordate at the base, and petioles c. 1.3 cm long with short rusty tomentum. Since the branchlet that bears these leaves is a flowering one, the specimen was evidently not from a juvenile plant. These leaves are broader and more cordate than any to be found on flowering plants of *A. oblata*, and so it is concluded that these species are not synonymous. In fact, none of the Indonesian or New Guinean specimens at BRI matches the leaf dimensions and indumentum pattern of the syntype of *A. moluccana*. It may prove to be a species of restricted distribution, perhaps endemic to the Moluccas.

Hoogland (1960) placed *A. moluccana* into synonymy with *A. incana*, and the latter name has been widely misapplied in Australia to *A. oblata*.

***Alphitonia philippinensis* Braid, *Bull. Misc. Inform. Kew* 183 (1925).**

This name was first used for Australian populations of *Alphitonia* by White (1939). Australian specimens determined by White as *A. philippinensis* are considered by the current author to be *A. excelsa*. The name *A. philippinensis* was later misapplied to specimens of *A. oblata* (Hyland *et al.* 2002). Kellermann and Thiele (2008, p. 33) stated 'all Australian material previously referred to *A. philippinensis* is *A. incana* (Roxb.) Teijsm. & Binn. ex Kurz, and it is possible that the two taxa are conspecific'. Whether *A. philippinensis* and *A. incana* are conspecific remains to be seen, but certainly neither name is applicable in Australia.

Acknowledgements

I am grateful to Juergen Kellermann (AD) for sending images of type specimens, to the Director of the herbarium at the National Botanic Garden of Belgium (BR) for the loan of the type of *Rhamnus incanus*, and to Tony Orchard (Australian Botanical Liaison Officer 2008–09) for sending an image of the Roxburgh drawing of *Rhamnus incanus*. Will Smith (BRI) produced the illustrations and distribution maps, and Peter Bostock (BRI) translated the diagnosis of *A. oblata* into Latin.

References

- Balgooy, M.M.J. van (1966). Pacific plant maps. *Blumea*, Supplement V: 82–3.
- Bean, A.R. (2002). Rhamnaceae. In R.J. Henderson (ed.), *Names and distribution of Queensland plants, algae and lichens*, pp. 171–172. Queensland Herbarium, Environmental Protection Agency: Brisbane.
- Bean, A.R. (2007). Rhamnaceae. In P.D. Bostock and A.E. Holland (eds), *Census of the Queensland flora 2007*, pp. 307–309. Queensland Herbarium, Environmental Protection Agency: Brisbane.
- Bentham, G. (1863). *Alphitonia*. In Bentham, G., *Flora Australiensis*, vol. 1, p. 414. L. Reeve and Co.: London.
- Booth, R., Harwood, R.K. and Mangion, C.P. (2001). *Field key for the monsoon rainforest flora of the Darwin Region*. Northern Territory University Press and The Herbarium: Darwin.
- Braid, K.W. (1925). Revision of the genus *Alphitonia*. *Bulletin of Miscellaneous Information Kew 1925*, 168–186.
- Endlicher, S.L. (1840). *Genera Plantarum secundum ordines naturales disposita*. Fr. Beck Universitatis Bibliopolam: Vienna.
- Fairbairn, E. (1999). *Australian timbers*, vol. 2: *Western Queensland trees and their timbers*. Department of Natural Resources: Indooroopilly.
- Fay, M.F., Lledó, M.D., Richardson, J.E., Rye, B.L. and Hopper, S.D. (2001). Molecular data confirm the affinities of the south-west Australian endemic *Granitites* with *Alphitonia* (Rhamnaceae). *Kew Bulletin* **56**, 669–675.
- Floyd, A.G. (1989). *Rainforest trees of mainland south-eastern Australia*. Inkata Press: Melbourne.
- Forman, L.L. (1997). Notes concerning the typification of names of William Roxburgh's species of Phanerogams. *Kew Bulletin* **52**, 513–534.
- Hallé, F., Oldeman, R.A.A. and Tomlinson, P.B. (1978). *Tropical trees and forests: an architectural analysis*. Springer-Verlag: Berlin.
- Hoogland, R.D. (1960). The identity of *Glochidion ?cinarescens* Miq. and of *Rhamnus incanus* Roxb. *Kew Bulletin* **14**, 33.
- Hyland, B.P.M., Whiffen, T., Christophel, D.C., Gray, B. and Elick, R.W. (2002). *Australian tropical rain forest plants: trees, shrubs and vines*. CD_ROM, Centre for Plant Biodiversity Research: Canberra.
- Kellermann, J. and Thiele, K.R. (2008). Lectotypifications and nomenclatural notes on Rhamnaceae from northern Australia. *Journal of the Adelaide Botanic Gardens* **22**, 33–35.
- Medan, D. and Schirarend, C. (2004). Rhamnaceae. In K. Kubitzki (ed.), *The families and genera of vascular plants*, vol. VI, pp. 320–338. Springer-Verlag: Berlin.
- Richardson, J.E., Fay, M.F., Cronk, Q.C.B., Bowman, D. and Chase, M.W. (2000). A Phylogenetic analysis of Rhamnaceae using *rbcl* and *trnL-F* plastid DNA sequences. *American Journal of Botany* **87**, 1309–1324.
- Rye, B.L. (1996). *Granitites*, a new genus of Rhamnaceae from the south-west of Western Australia. *Nuytsia* **10**, 451–457.
- Wheeler, J.R. (1992). Rhamnaceae. In J.R. Wheeler (ed.), *Flora of the Kimberley Region*, pp. 629–633. Department of Conservation and Land Management: Como.
- White, C.T. (1939). Contributions to the Queensland flora, no. 6. *Proceedings of the Royal Society of Queensland* **50**, 66–87.