

## A new species of *Melaleuca* (Myrtaceae) from north-east Queensland

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### Abstract

*Melaleuca lophocoracorum* A.J.Ford, Craven & Brophy is described, illustrated and diagnosed against the allied species *M. styphelioides* and *M. squamophloia*. Notes on habitat, distribution, conservation status and leaf essential oil content are provided.

### Introduction

During fieldwork in the Ravenshoe area of northern Queensland (Australia) by the first author, an unusual *Melaleuca* was noticed. The leaves were conspicuously twisted, similar in appearance to those of *M. styphelioides* Sm., yet the bark was rough and scaly rather than being flaky and papery. Subsequent visits secured fruiting collections for examination and leaf samples which were analysed for component oils. The oil analysis showed that the Ravenshoe plant produced an aromatic oil with a qualitatively different essential oils profile to that of *M. styphelioides* which produces a terpenoid oil. *Melaleuca squamophloia* (Byrnes) Craven, produced an aromatic oil also, however the analysis reveals entirely different components (see Table 2). Subsequently, flowering specimens were obtained for further examination and comparison with *M. styphelioides* and *M. squamophloia*. Taking into account the essential oils evidence, and evidence from the morphological studies, it became apparent that the Ravenshoe plant represents an undescribed species of *Melaleuca* related to *M. styphelioides* and *M. squamophloia*. Geographically, this new species occurs 700 km and 1100 km north of the most northerly populations of *M. styphelioides* and *M. squamophloia*, respectively.

Byrnes (1984, 1986) originally described *M. squamophloia* as a variety of *M. styphelioides*, based primarily upon its geographic range being between the known ranges of *M. styphelioides* and *M. bracteata* F.Muell. This variety held features linking the two, suggesting a possible “past hybridisation event” (Craven and Barlow 1997, p. 118). Craven and Barlow (1997) and Brophy *et al.* (1999) suggest a relationship between *M. styphelioides*, *M. squamophloia* and *M. bracteata*. Molecular data (Edwards *et al.* 2010) supports *M. bracteata* and *M. squamophloia* being closely related. The species described below as *M. lophocoracorum* is compared to *M. squamophloia* and *M. styphelioides* on the basis of having twisted leaves, which are lacking in *M. bracteata*.

## Taxonomic Treatment

*Melaleuca lophocoracorum* A.J.Ford, Craven and Brophy, *sp. nov.*

Distinguished from *M. squamophloia* by the staminal filament length (0.9–3.9 mm versus 5.5–10.2 mm), indumentum of bract subtending triad (pubescent versus glabrous), number of ovules per locule (28–44 versus 40–55), embryonic cotyledon form (obvolute versus planoconvex) and dominant oil type (methyl eugenol versus elemicin and isoelemicin).

**Holotype: Queensland:** North Kennedy: Ravenshoe State Forest, off track to Bally Knob via Wooroora road, A. Ford 6106, 27 Dec 2012 (BRI); *isotype:* CANB, CNS, DNA, HO, L, MEL, MO, NSW.

Shrub (single-stemmed or multistemmed) or small tree (often multistemmed), 2–10 m high, stem diameter up to 30 cm (dbh); bark hard, fibrous to scaly, neither papery or flaky. *Branchlets* glabrescent, pilose to puberulous with short and long simple, colourless hairs (longest hairs 4 mm long). *Leaves* alternate, twisted, 2.8–8.5 mm long, 2.7–3.8 mm wide, 1.1–3.7 times as long as wide, sessile, colleters present; *lamina* glabrescent, ciliate, ovate to narrowly ovate-elliptic or elliptic, base obtuse to cuneate-obtuse, apex acute to narrowly acuminate, acumen slightly thickened, veins longitudinal; obscure, 3–10, both surfaces sparsely clothed when young in colourless sericeous to puberulous hairs, minor venation invisible, oil glands dense, distinct, 2–6 diameters apart, mostly in longitudinal rows. *Inflorescences* spicate, pseudoterminal or interstitial, with 3–9 triads, up to 25 mm long and 18 mm diameter; each triad subtended by a gland dotted and pubescent broadly ovate leaf-like bract 3.5–4 mm long and 2.5–3.5 mm wide, moderately persistent; middle flower of the triad ebracteolate; lateral flowers of the triad subtended by a single deciduous, narrowly ovate bract 1.8 mm long and 0.8 mm wide, adaxial surface glabrous, abaxial surface pubescent and also with two subulate to broadly lanceolate bracteoles 1.3 mm long and 0.6 mm wide, adaxial surface glabrous, abaxial surface pubescent. *Hypanthium* puberulous, 1.3–1.6 mm long, 1.8 mm diameter, urceolate. *Calyx lobes* ovate-triangular, costate on abaxial surface, minutely puberulous more so proximally, ciliate, scarious, 0.9–1.4 mm long, 1–1.5 mm wide, apex pointed. *Petals* cream, caducous, 1.8–2 mm long, conchiform. *Stamens* 15–25 per bundle; filaments cream, 0.9–3.9 mm long, bundle claw 2.6–3.1 mm long and 0.5 mm wide, 0.7–3.5 times as long as filaments. *Style* 6.7–7.5 mm long, curved, glabrous. *Ovary* usually 3-locular, densely hairy, ovules 28–44 per locule. *Fruit* persistent, lasting >3 years, 2.6–3.1 mm long, 3 mm diameter, calyx lobes persistent (lasting >12 months) but eventually weathering away and leaving low undulations around rim of hypanthium; *testa* brown, membranous, *seed* straight or slightly curved, oblong, c.1 mm long, *embryo* straight or slightly curved, cotyledons about same length as radicle, cotyledons obvolute. *Specific wood density* 870 kg/m<sup>3</sup>. *Seedlings* (at the tenth leaf stage) with stems puberulous with antrorse colourless hairs; leaves glabrous on both surfaces, elliptic to narrowly elliptic-obovate, apex acute, base attenuate; one longitudinal vein on each side of midvein, secondary venation difficult to discern; oil dots in more or less longitudinal rows, distinct. *Coppice/resprout growth* with stems red-pink, densely pilose, hairs white to 1.5 mm long; leaves similar to adult leaves except longer and narrower on coppices, glabrous on both surfaces, margin ciliate-fimbriate, oil dots distinct and in longitudinal rows, 7–10 longitudinal veins conspicuous. (Fig. 1a–d).

**Distribution:** Only known from the Ravenshoe area where all collections come from Ravenshoe State Forest, Queensland, Australia.

**Phenology:** Flowers reported in December and January, fruits are persistent and only dehisce if burnt or the twig/branch dies.

**Habitat:** This species has been recorded from three vegetation types. 1. Open woodland 12–16 m high on rhyolite slopes above creeklines; dominated by *Eucalyptus portuensis* and *Syncarpia glomulifera*, understory of *Acacia calyculata*, *Pimelea linifolia*, *Platysace valida*, *Themeda triandra* and *Xanthorrhoea johnsonii*. 2. Riparian community 6–10 m high on seasonal creek with much rhyolite rock; *Lophostemon suaveolens* and *Melaleuca viminalis*. *Lepidosperma laterale* and *Gahnia* conspicuous. 3. Closed, or nearly so, tall woodland 12–20 m high on rhyolitic alluvium, poorly drained and swampy. The soil in this habitat is relatively deep and stays damp for a substantial period of the year. Although in close proximity to a creek, this habitat is not along the creek. Dominated by *Lophostemon suaveolens* and *Melaleuca*. Understorey of *Lantana camara*, *Gahnia aspera*, *Rhynchospora corymbosa* and small herbs. Altitude range: all collections currently come from 900m.

**Etymology:** The epithet *lophocoracorum* is arbitrarily derived from the Greek *lophos*, ridge, crest, and *corax*, raven, in reference to the novel Ravenshoe by Henry Kingsley (1830–1876) in which both the primary family dealt with in the novel and their home were named Ravenshoe, the name Ravenshoe apparently itself derived from the words ravens and hoe, the latter being a projecting ridge of land.



**Fig. 1.** *Melaleuca lophocoracorum*. **a**, habit of mature plant growing on rocky creek sides. **b**, branch resprout following fire. **c**, basal resprout following fire, also showing scaly bark. **d**, apical section of branchlets with inflorescences.

**Affinities:** Using morphological features alone *M. lophocoracorum* is related to both *M. styphelioides* and *M. squamophloia*. All three species are compared in Table 1. An oil analysis of *M. lophocoracorum* (Table 2) contrasts sharply against the analyses of the two putatively related species (Brophy *et al.* 1999).

**Notes:** *Melaleuca lophocoracorum* exhibits substantial growth form and habit variation between the three habitats outlined above. In the first two habitats (1 & 2, above), individuals of *M. lophocoracorum* are shrub-like, usually multistemmed (see fig. 1a) and attain heights of 2–4 m. In habitat three (3, above), plants are usually more tree-like, and attain heights of 10 m and stem diameters of 30 cm, although they can also be multistemmed (see figs 1b and c). Soil depth appears to play the major role in determining plant height and diameters, with habitat 3 having a much deeper soil profile, which retains moisture in the driest times of the year. The other two habitats (1 & 2), however, have much shallower soils, although moisture appears to play an insignificant role in habitat two as plants there are similar to those in habitat one. At this stage it is not apparent what role fire plays in the population dynamics of *M. lophocoracorum*, although given the restricted population size and extent of occurrence it is worth future monitoring (see below for more details).

*Melaleuca lophocoracorum* is fire tolerant, surviving by basal and branch resprouting (see figs 1b and c). However, although the bark is rough and thick, a large proportion of large diameter stems in habitat 3 were killed following the fire in 2012. No recruitment of seedlings was observed.

*Melaleuca lophocoracorum* germinates easily and grew vigorously under shadehouse conditions in Atherton, north Queensland. However, it can also be added to the list of Myrtaceae species that are susceptible to myrtle rust whilst growing in a shadehouse.

The leaves of *M. lophocoracorum* are softly prickly to touch and lack a pungent point at the apex. Both the flowers and leaves lack any distinctive or substantial aroma.

**Table 1.** Morphological, distributional and chemical comparison of *Melaleuca lophocoracorum*, *M. squamophloia* and *M. styphelioides*.

	<i>M. lophocoracorum</i>	<i>M. squamophloia</i>	<i>M. styphelioides</i>
Bark type	fibrous to scaly	fibrous to scaly	papery
Leaf blade indumentum	sericeous to pubescent, glabrescent	pubescent to puberulous, glabrescent	pubescent, sericeous-pubescent or puberulous, glabrescent
Leaf longitudinal veins	3–10	7–15	15–30
Number of triads in inflorescence	3–9	5–16	4–15
Bract subtending triad	pubescent	glabrous	pubescent
Staminal filament length (mm)	0.9–3.9	5.5–10.2	8.5–12.5
Stamen bundle claw length (mm)	2.6–3.1	3–4	4–5.5
Style length (mm)	6.7–7.5	7.5–8.5	7–11
Ovules per locule	28–44	40–55	45–55
Cotyledon form	obvolute	planoconvex	obvolute
Leaf oil type	aromatic, major component methyl eugenol	aromatic, major components elemicin and isoelemicin	aromatic, terpenoid, major component caryophyllene oxide
Distribution range (°latitude)	17	26–28	22–35

**Table 2.** Results of leaf oil analysis of *Melaleuca lophocoracorum* (voucher: Ford 6000)

Compound	%
$\alpha$ -pinene	trace
$\Delta$ -3-carene	trace
myrcene	trace
limonene	trace
p-cymene	trace
$\beta$ -elemene	0.1
$\beta$ -caryophyllene	0.6
aromadendrene	trace
allo-aromadendrene	0.1
$\alpha$ -humulene	0.1
bicyclogermacrene	0.1
$\gamma$ -cadinene	trace
$\delta$ -cadinene	0.1
caryophyllene oxide	0.6
methyl eugenol	91.3
globulol	0.1
viridiflorol	0.1
spathulenol	0.3
eugenol	4.0
elemicin	0.7
Oil Yield % (w/w, dry weight)	2.4

**Conservation Status:** All existing collections have been made in the Ravenshoe State Forest within the Wet

Tropics bioregion (Department of the Environment 2012). *Melaleuca lophocoracorum* has a very narrow geographical range, with an extent of occurrence estimated to be less than 1 km<sup>2</sup> and an area of occupancy estimated to be less than 1 hectare, and is considered at risk at this time. An approximate estimate of the population sizes is not known, but an optimistic guess of less than 600 mature individuals is neither conservative nor extravagant. Nonetheless, due to the extremely limited distribution and estimated population sizes we suggest that *M. lophocoracorum* be listed at least as “Vulnerable” under the IUCN (2012) as it fulfils the criteria under categories VU D1 and D2. We recommend a thorough search of adjacent areas to ascertain more accurate population and occurrence estimates.

**Other specimens examined: Queensland: North Kennedy:** Ravenshoe State Forest (ex-State Forest Reserve 488), off Wooroora Road NNW of Bally Knob, *Ford 5977 & Collins*, 6 Feb 2012 (BRI, CANB, CNS); *loc. cit.*, *Ford 6000*, 2 May 2012 (BRI, CANB, CNS)

### Acknowledgments

This research was conducted with the support of funding from the Australian Government’s National Environmental Research Program. Peter Wilson (NSW) and an anonymous referee are thanked for reviewing earlier manuscripts. Robin Hide (Australian National University – ANU) is thanked for his advice that Ravenshoe is probably derived from the two words “ravens” and “hoe”. Elizabeth Minchin (also ANU), is thanked for checking the etymology for us. Permits to collect in Ravenshoe State Forest were issued by Queensland Parks and Wildlife Service (now NPRSR).

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Manuscript received 4 September 2013, accepted 31 October 2013

