

# The strange case of Queensland Peppermint (*Eucalyptus exserta*) on Dunk Island

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## Abstract

In 1951, botanist Stanley Blake visited Dunk Island for a day, subsequently lodging 33 collections of 16 plant species from there with Australian herbaria. Among those collections are three of *Eucalyptus exserta* (Queensland Peppermint). This struck us as strange because Queensland Peppermint is a small tree in north Queensland otherwise associated with harsh woodland sites with 500 to 1,400 mm mean annual rainfall and a long dry season, whereas Dunk Island has a mean annual rainfall of 2,800 mm, a muted dry season and dense vegetation. Eucalypt specialists confirmed the correctness of Blake's identification from his specimens and agreed that the location was quite out of character.

We visited Dunk Island twice to search for the species. On the second occasion we had the information that Blake's specimens are labelled as being 4 m above sea level (no other specific location information being available), and found the species readily. On Dunk Island, Queensland Peppermint occurs along the walk to, and behind, Muggy Muggy Beach at the north end of the island along at least 850 m of coastline, and the population is likely to number several hundred mature individuals. Many are scarcely above the high-tide mark and overhang the sea, but others grow on the adjacent slope to about 40 m ASL. The species is associated there with jagged upturned outcrops of strongly-metamorphosed layered rocks that generate harsh growing conditions.

The occurrence of Queensland Peppermint on Dunk Island raises intriguing ecological and biogeographical questions.

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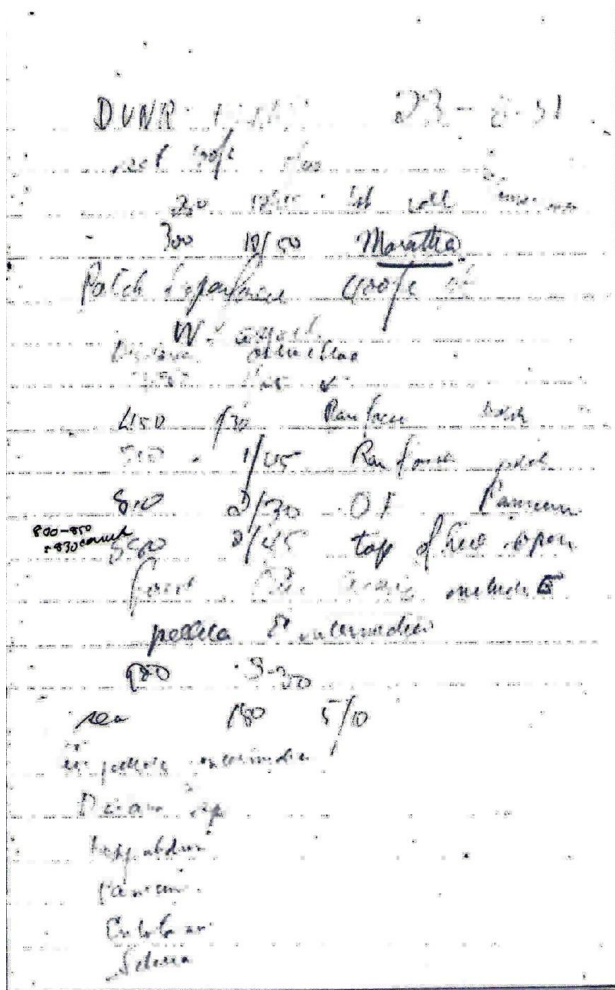
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## Introduction

Day-tripping to Dunk Island has good precedent. On 23 Aug. 1951, botanist Stanley ('Stan') Blake visited the island. His pencil-written, faded and now scarcely legible notebook entry for the day records that he explored rainforest and open forest including "top of hill open forest ~ [illegible] *E. pellita* *E. intermedia*" (Fig. 1). "*E. pellita*" is the Large-fruited Red Mahogany (*Eucalyptus pellita* F.Muell.) and "*E. intermedia*" is the Pink Blood-

wood (*Eucalyptus intermedia*, now *Corymbia intermedia* (R.T.Baker) K.D.Hill & L.A.S.Johnson). Blake's notebook entry also lists a number of other plants, although not his entire collections for the day, which number 33 specimens of 16 species held by Australian herbaria (AVH 2017) (Table 1). These collections include three species of eucalypt, two sedges, and six grasses.



**Figure 1. Extract from Stanley Blake's field notebook for his day trip to Dunk Island on 23 Aug. 1951.**

Blake's notebook is held in the archives of the Queensland Herbarium and this copy was provided to us by Tony Bean. This version has been enhanced in Photoshop.

Stanley Thatcher Blake (1911–1973) was a botanist who, at the time of his visit to Dunk Island, worked for the Queensland Herbarium (Everist 1974). Before then he was the botanist for CSIRO Northern Australia Regional Survey. His special interests were the taxonomy of tropical sedges, grasses and eucalypts. Although “a reserved and serious man” (ANH 2017) and an eminent taxonomist, he shared his knowledge freely and for a time served both as President and Editor for The Queensland Naturalists' Club.

When we reviewed eucalypt records for far north Queensland whilst preparing a field guide, one of Blake's Dunk Island collections struck us as odd – that of *Eucalyptus exserta* F.Muell., the

Queensland Peppermint. In far north Queensland at least, it is normally a tree of sandy, rocky or infertile soils in districts with a mean annual rainfall of c. 500 to 1,400 mm and a long, harsh dry season (Fig. 2). In contrast, Dunk Island has a mean annual rainfall of a little over 2,800 mm and the driest three months (Aug.–Oct.) average 220 mm combined, so there is little or no effective dry season (BOM 2017). Although the nearest other record of the species, at Yourka Reserve south of Innot Hot Springs, is only 72 km away to the west, the climate of the two sites could hardly be more different – Yourka being on the western slopes of the coastal ranges – and the species occurs there in stunted open woodland on the poorest of soils (DCF personal observation). It was difficult to envisage how this small woodland tree could obtain enough light amidst the rainforest, vine-thicket and moist open forest with a well-developed rainforest understorey that cloak Dunk Island luxuriantly.

Queensland Peppermint does occur in coastal areas and on islands, but in drier areas than Dunk. It occurs on Magnetic Island near Townsville (Fig. 2), which has a mean annual rainfall of 1,204 mm (Island Impressions 1996-2003). Further south again, the species occurs on the Whitsunday Islands (Genever *et al.* 2003) and coastal areas near Yeppoon (Batianoff & McDonald 1980).

We noted that the identity of at least two of Blake's specimens had been verified by current eucalypt experts (Tony Bean at the Queensland Herbarium and Andrew Slee from the Australian National Herbarium), and that Blake's description on the collections “Tree 5-7 m tall with rough grey brittle flaky bark to small branches; leaves dull green” is consistent with Queensland Peppermint. We approached Tony Bean and Andrew Slee and they agreed that a wet tropical island was a seemingly unlikely location for the species. Blake's field notebook entry for the day (Fig. 1) confirms that he was indeed on Dunk Island on the date recorded on the herbarium collections, although there is no mention of *Eucalyptus exserta*.

The Beachcomber (Edmund Banfield) and his wife Bertha lived on Dunk Island from 1900 until 1923. Banfield was an eminent naturalist who described the vegetation of the island at length. For example, he describes the effects of consecutive tropical cyclones that struck 50 days apart in 1918 on the vegetation, systematically detailing the response of

**Table 1. Plants collected on Dunk Island by Stanley Blake on 23 Aug. 1951 and held by Australian herbaria.**

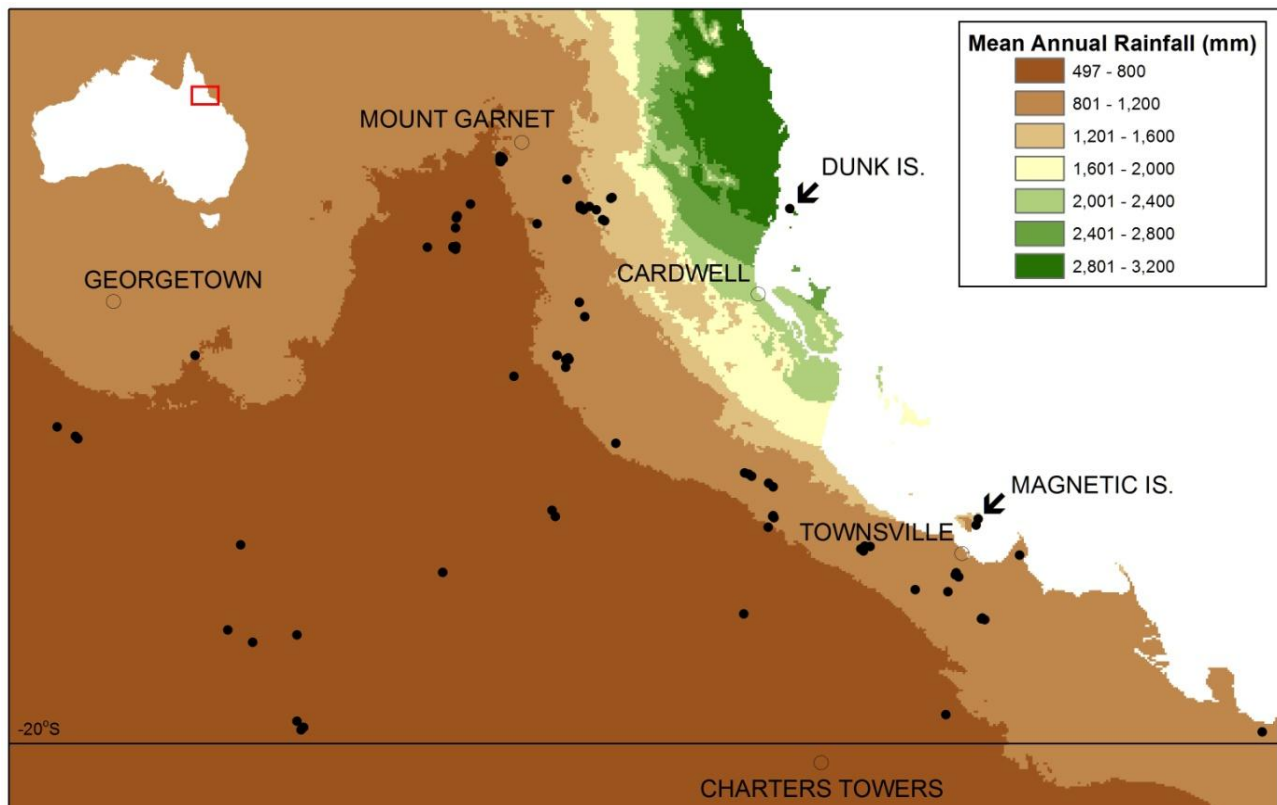
Herbaria are: BRI = Queensland Herbarium, Brisbane; CANB = Australian National Herbarium, Canberra; DNA = Northern Territory Herbarium, Darwin; NSW = National Herbarium of New South Wales; PERTH = Western Australian Herbarium, Perth.

Family	Species	Notes	Herbarium holdings
Arecaceae	<i>Calamus australis</i>	Hairy Mary, a climbing palm	BRI x1, CANB x1, NSW x1, the latter as " <i>Calamus sp</i> " (assumed <i>C. australis</i> )
Celastraceae	<i>Salacia disepala</i>	Lolly Vine, a rainforest species	BRI x1
Cyperaceae	<i>Scleria mackaviensis</i>	a tufted sedge	BRI x1
Cyperaceae	<i>Scleria polycarpa</i>	Nutrush, a sedge of marshy places and stream banks	BRI x1, CANB x1
Malvaceae (Sparrmanniaceae)	<i>Triumfetta pilosa</i>	an introduced shrub of forest edges	BRI x1, CANB x1
Marattiaceae	<i>Ptisana oreades</i>	Potato Fern	BRI x1, NSW x1
Myrtaceae	<i>Corymbia intermedia</i>	Pink Bloodwood, a large tree of moist open forest	BRI x1
Myrtaceae	<i>Eucalyptus exserta</i>	Queensland Peppermint, a small tree of dry woodlands	BRI x1, CANB x1, NSW x1
Myrtaceae	<i>Eucalyptus pellita</i>	Large-fruited Red Mahogany, a large tree of moist open forest	BRI x1
Poaceae	<i>Digitaria orbata</i>	a perennial woodland grass	BRI x1, CANB x1
Poaceae	<i>Digitaria parviflora</i>	Small-flower Finger Grass, a perennial	BRI x1, CANB x1, DNA x1, PERTH x1
Poaceae	<i>Entolasia marginata</i>	Bordered Panic, a perennial grass	BRI x1, CANB x1
Poaceae	<i>Ischaemum muticum</i>	Seashore Centipede Grass, a perennial coastal species that is uncommon in Australia	BRI x1, CANB x1, PERTH x1
Poaceae	<i>Panicum mitchellii</i>	a robust perennial grass of high-rainfall areas	BRI x1, CANB x1
Poaceae	<i>Paspalidium distans</i>	Shotgrass, a tufted perennial	BRI x1, NSW x1
Sapindaceae	<i>Guioa acutifolia</i>	Glossy Tamarind, a pioneer rainforest tree	BRI x1, CANB x1

the dominant plant species (Banfield & Chisholm 1925). In this discourse, he details three eucalypts species, "bloodwood" (= *Corymbia intermedia*), "Moreton Bay ash-trees" (= *C. tessellaris* (F.Muell.) K.D.Hill & L.A.S.Johnson) and "forest mahogany, or mess-mate" (= *Eucalyptus pellita*) but makes no mention of Queensland Peppermint. We have searched his entire written works and found no possible mention of it.

## Survey

Dunk Island (17°57'S, 146°10'E) is a continental island of c. 1,000 ha 4.5 km offshore from the mainland at Wongaling Beach in the heart of north Queensland's Wet Tropics. Nearest the mainland and as the point of access for boat tours, a sandy flat of recent (Quaternary) marine origin occupies about 10% of the island in the north-west (Fig. 3). However, the majority of the island is steep with a



**Figure 2. Queensland Peppermint records (black spots) in Queensland north of 20° South.**

Records have been collated from the Australian Virtual Herbarium and DCF's personal observations, the former subject to heavy vetting because prior to its description in 1991, records of *Eucalyptus lockyeri* Blaxell & K.D.Hill (Northern Peppermint, a close but distinct relative of *E. exserta*) were attributed to *E. exserta* and many herbarium records have not been updated since. Map prepared by Steve Murphy.

surface geology divided almost evenly between that of metamorphic origin in the north and centre-west, and of granitic origin in the south-east. A steep-sided ridge runs along the spine of the island with several points including Mt Kootaloo being just over 240 m in elevation. Most of the island retains original forest and forms part of the Family Islands National Park. However, areas to the east and especially the sandy flat have been heavily disturbed by a European history that began with the Banfield family, was followed by use of the area as a radar station by the Army in World War II including construction of an airstrip, and subsequently by development as a resort. Forest cover is predominantly an open canopy of eucalypts (*C. intermedia*, *E. pellita*) over a well-developed rainforest understorey and (often) mid-storey, with extensive patches of rainforest and coastal vine-thicket.

Walking trails along the beach and through the national park provide access to the metamorphic coast, slopes and ridges (Fig. 3), but the granitic

portion of the island is effectively inaccessible by land except for a small portion near Coconut Beach (see map in Willmott 2009, p30).

The only firm information about the course of Blake's travel on the island was that he climbed to "top of hill" (Fig. 1). We considered that he was likely constrained, in the course of a single day trip, to similar areas to those now accessible as these substantially reflect the activities of the Army during World War II before he visited. Our first thought was that, given the association of Queensland Peppermint with harsh, open sites, that the main ridge might be a plausible location for his record. Accordingly, on 18 June 2017 we day-tripped to the island and walked the loop track with a small diversion to Mt Kootaloo (Fig. 3). We saw no sign of Queensland Peppermint. Along the ridge, few places seemed even likely as most was densely forested. More plausibly open, rocky habitat was encountered on headlands on the central-western coast, but the peppermint was not found. Although we could have overlooked one or



**Figure 3. Dunk Island showing areas searched for Queensland Peppermint (*Eucalyptus exserta*) (blue line) and where it was found (pink line).**

The offset of the pink line from the coast is because the underlying geology mapping includes the reef below the high-tide mark. The image is from Google Earth with geology overlain from Queensland Globe. The geological formations are: red = coastal sands (Quaternary alluvium); bright green = Barnard metamorphics; dark green = Dunk Island granite. The dividing line between metamorphics and granite is approximate only – see map in Willmott (2009, p30) for more precise mapping.

two isolated individuals amongst the dense vegetation, we were confident that no significant stands occurred in the areas we searched.

Further communication with Tony Bean yielded the information that Blake's label stated that the tree from which he collected fruit was 4 m above sea level. We therefore obtained permission to search the private land around the currently defunct (severely cyclone-damaged) resort, golf course and

airstrip that occupies the low-lying portion of the island, and returned to continue the search on 12 Sept. 2017. But first, we checked the national park track which follows close to the coast to Muggy Muggy Beach as we had had no time to explore this on the previous occasion. Within five minutes of entering the forest at the ENE end of the Brammo Bay Beach just past the resort, we spotted by the track a small, rough-barked eucalypt with



fruits whose valves were strongly exerted. Shortly thereafter we located more trees with similar fruit (Fig. 4), and confirmed to our satisfaction that these were indeed Queensland Peppermint. Our photos have been examined by Tony Bean and Andrew Slee, both of whom were satisfied that they were indeed *E. exserta*.

### Queensland Peppermint on Dunk Is.

We found Queensland Peppermint growing more or less continuously along and behind c. 850 m of the Dunk Island coast along the track to Muggy Muggy Beach, immediately behind the beach, and along the shoreline for several hundred metres beyond the beach (Fig. 3). We were unable to explore further along the north coast although the population was becoming sparser and may not continue much further. Within the searched area the stand of peppermints was in places confined to a single-tree width immediately above the high-



**Figure 4. The strongly exerted valves at the summit of the seed capsules of Queensland Peppermint – they become even more exerted when they dry – led to its specific name, *Eucalyptus exserta*.**

Photo: Don Franklin, Dunk Island, 12 Sept. 2017.

tide mark, with trees often leaning out over the reef (Fig. 5), but in places it extended to c. 40 m ASL on adjacent steep hillsides. We estimate that at least several hundred mature individuals were present.

Queensland Peppermint was growing on exposed, jagged, layered (the layers upturned) rocks that are strongly-metamorphosed muscovite-biotite-quartz schist (Willmott 2009). It is of possible relevance that the metamorphic rocks on the central-western coast where we failed to find the species are blocky rather than layered, these being of different origin – probably “dirty sandstone or greywacke (rather than shale or siltstone) that have kept their integrity to some extent during metamorphism” (Willmott 2009).

The vegetation containing Queensland Peppermint on Dunk Island is mixed in nature and might be described as coastal vine-thicket with frequent eucalypts interspersed. It was distinctly lower and somewhat more open than forest nearby, no doubt driven by the exposed bedrock and skeletal soil on which it was growing. In one place, dried grasses were present in the ground layer. Some Queensland Peppermint trees were scarcely above the high-tide mark, their bases surrounded by Sea Lettuce (*Scaevola taccada*), a salt-tolerant coastal species, and the rock surface covered with fragmented dead coral. Other species on this exposed coast and interspersed with Queensland Peppermint included Coconut Palms (*Cocos nucifera*), tall paperbarks (*Melaleuca* sp., possibly *M. leucadendra*) and a variety of vine-thicket species including Umbrella Tree (*Schefflera actinophylla*). Several tall specimens of Moreton Bay Ash (*Corymbia tessellaris*) were present. This vegetation was replaced upslope and along the coast to the south by forest of Pink Bloodwood (*Corymbia intermedia*) and Large-fruited Red Mahogany (*Eucalyptus pellita*) with a well-developed rainforest understorey. In the statewide vegetation mapping scheme the stands are shown as mostly Regional Ecosystem (RE) 7.11.5b – “*Eucalyptus pellita*, *Corymbia intermedia*, *C. tessellaris* open forest with *Acacia celsa*, *A. cincinnata*, *A. mangium* and *A. flavescens* and with a very well-developed vine forest understorey”, which matches the adjacent vegetation well, with some as RE 7.11.1a – “Mesophyll vine forest. ... Very wet and wet rainfall zones” (DEHP 2016). The resolution of Regional Ecosystem mapping is such





**Figure 5. Queensland Peppermint (*Eucalyptus exserta*) leaning out over the beach, far end of Muggy Muggy Beach, Dunk Island.** Photo: Don Franklin, 12 Sept. 2017.

that a stand that is one tree wide is unlikely to be detected (Neldner *et al.* 2012).

We estimated the Queensland Peppermint trees to be mostly about 8 m tall, occasionally taller, mostly single-trunked with trunk diameters of about 30 cm or sometimes more. The bark was often reddish, sometimes grey, rather thin and nondescriptly scaly, rough all the way to the small branches. The foliage was variable, some quite green (but never shiny) and some grey-green, no more than 1.5 cm wide on some trees but to about 2.5 cm wide on others. With its narrow, pendant, sclerophyllous leaves, this species stands out in a wet forest context. Of the other three eucalypt (*Eucalyptus*, *Corymbia*) species present on the island, Moreton Bay Ash also has narrow leaves but they are a brighter paler green, the tree is much taller and more erect, and the bark on the branches and much of the trunk is smooth and white. The bark of Queensland Peppermint might be confused with that of Pink Bloodwood and Large-fruited Red Mahogany but those species have broader, shiny leaves held somewhat to quite horizontal. The seed capsules of Queensland

Peppermint (Fig. 4) are also quite distinct among the eucalypt species present in having a raised, convex disc and valves exerted prominently from the summit.

### Discussion

That Queensland Peppermint was not reported by The Beachcomber is a little surprising but demonstrates how the species fails to stand out amidst vegetation that is unusually dense for the habitat of this species. It took the eye of an experienced botanist and eucalypt specialist, Stan Blake, to detect the species on Dunk Island. Nevertheless, if aware of its presence and looking for it, naturalists walking to Muggy Muggy Beach should have no problems locating the species as it stands in good contrast to the three other eucalypt species known from the island.

The occurrence of Queensland Peppermint near the coast on a continental island is, in itself, not at all unusual. On the Whitsunday Islands the species occurs on bedrock and coastal sands (Genever *et al.* 2003). On the mainland in the Yeppoon area, it occurs in Foredune heath and scrub, Parallel beach

ridge vegetation, Rocky shore and headland vegetation and Parabolic dune vegetation (Batianoff & McDonald 1980). However, two aspects of its occurrence on Dunk Island are surprising: that it occurs in such luxuriant forest with high rainfall, and that many of the trees there are growing scarcely above the high tide mark and surrounded by salt-tolerant plants and coral fragments. Queensland Peppermint seedlings have been tested for salt tolerance and were not among the 20% of most salt-tolerant provenances of 40 eucalypt species tested (van der Moezel *et al.* 1991).

It is likely that the relatively harsh edaphic conditions of the site on Dunk where we found the species, along with its occurrence on the seaward fringe and even leaning out over the reef, provide sufficient exposure to light for Queensland Peppermint to cope with competition from broad-leaved species. Cyclones might have created openings and thus opportunities for regeneration. We propose that two features might have facilitated its success seemingly exposed to salt water and salty air. The first is that the observed occurrence is along a north-west facing section of coast sheltered from the prevailing dry season winds from the ESE, thus reducing exposure to windborne salt, though we acknowledge we have not checked more exposed sections of coast – this would require a boat. Secondly, the very high rainfall of Dunk Island may serve to dilute exposure to salt in the soil.

Thus, sheltered but rocky coasts of other islands in the Family Islands group and nearby might also support the species. It is noteworthy, therefore, that Simon Gleed and Mark Heaton, themselves considerably experienced in the identification of eucalypts, found puzzling eucalypts on the north shore of Goold Island when they visited on 9 October 2005. These were small trees with rough bark, pendulous foliage and seed capsules with strongly exerted valves (personal communication to Don Franklin). Goold Island is 25 km south of Dunk Island. Having examined the photographs in this paper, Simon Gleed is confident that their sighting was also of Queensland Peppermint.

Is Queensland Peppermint on Dunk Island a persistent remnant from the drier times that prevailed during glacial ('ice age') periods, or a recent colonist? Probably only genetic testing can shed light on this. However, we note that seeds of

eucalypts in general have little adaption to dispersal (Booth 2017) and, to our knowledge, no ability to cope with prolonged exposure to salt water. This suggests that the Queensland Peppermints on Dunk Island might have been there for tens of thousands of years or longer, harking back to a period when the climate was drier and the island was part of the mainland.

## Acknowledgements

We are grateful to Tony Bean of the Queensland Herbarium and Andrew Slee of the Australian National Herbarium for their feedback on the topic both before and after finding Queensland Peppermint on Dunk Island. Adam Bond, owner of the private land on Dunk Island, kindly gave permission to explore it, Steve Murphy drafted the map (Fig. 2), and Pauline Ladiges commented helpfully on a draft of the manuscript.

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