

Naturalised African olives (*Olea europaea* subsp. *cuspidata*) in New Zealand

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Introduction

The first published naturalised record of African olive (*Olea europaea* subsp. *cuspidata*, syn. *O. africana*) in New Zealand was for Raoul Island in the Kermadec Islands (as *O. africana*) by Bill Sykes (1977). This distribution was extended by Sykes (1988: 881) to include: "occasional in N. Auckland, and the offshore islands around the Hauraki Gulf". This wrong impression for the Hauraki Gulf was corrected by Heenan et al. (1999) who pointed out that the naturalised olives in Auckland and the Hauraki Gulf were the European olive (*O. europaea* subsp. *europaea*) and not the African olive. However, the N. Auckland record was correctly based on wild African olives at Waitangi and Paihia in the Bay of Islands (see Appendix). Wilcox (2007) discussed the Auckland wild European olives on Mt Richmond. He also mentioned the cultivated African olives on Mt Wellington (Winifred Huggins Woodland), and concluded that despite abundant fruit, the African olive doesn't appear to have become naturalised in Auckland. This account is based on: 55 New Zealand African olive herbarium specimens (26 cultivated, 30 naturalised); field observations by the author in Northland, Auckland and Sydney; and published accounts.

Olives (*Olea europaea* taxa) in New Zealand

As pointed out by Wilcox (2007) there are three forms of olives in Auckland, and now also evidence of hybridisation:

- The cultivated European olive (*Olea europaea* subsp. *europaea*) represented by various commercial clones, grown on grafted root stock, and has large fruit. It is widely cultivated in parts of New Zealand for olive oil and table olives.

- The wild version of *O. europaea* subsp. *europaea*, or oleaster, are seed grown, small fruited, occasionally cultivated, e.g. the historical Olive Grove at Cornwall Park, and locally naturalised, mainly on some of the Auckland volcanic cones and inner Hauraki Gulf Islands near where oleaster has been planted. It probably originated in the Mediterranean region or SW Asia (Mei-chen et al. 1996).
- African olive (*O. europaea* subsp. *cuspidata*) occurs, or has occurred, in: Kermadec Islands (Raoul I.); Bay of Islands (Waitangi to Paihia); at least 14 Auckland region sites; Bay of Plenty (McLaren Falls); Gisborne (Eastwoodhill); Hawkes Bay (Puketapu); Whanganui; Wellington (Matiu /Somes I.); and Christchurch (Woodham Park, and Nicholson Park at Sumner). It is native to E and S Africa, SW Asia, Afghanistan, Pakistan, India, Kashmir, Nepal, and Yunnan in China (Mei-chen et al. 1996). For the differences between the two wild subspecies see Table 1 and Figs. 4-11.
- Strong evidence of hybridisation between the two subspecies has been recognised by a wide genetic study by Besnard et al. (2014) in the early olive introduction sites for both NSW and South Australia.

Wild African olives in New Zealand

Kermadec Islands (see Appendix)

The first collection for New Zealand appears to be by Robert (Bob) Cooper on Raoul Island in 1956 (AK 44338), and the first published record was by Sykes (1977) who reported it as abundantly naturalised on the Terraces of Raoul Island. Through active management it was almost eradicated from Raoul



Fig. 1. The Waitangi Treaty House grounds – the coastal bush strip in the mid-foreground is dominated by naturalised African olives (see Fig. 2). 29 Jan 2017.



Fig. 2. African olive is an abundant weed in the coastal bush strip along the front of the Waitangi Treaty grounds; Motuamaire visible in the distance. 29 Jan 2017.

Table 1. Differences between African olive and European olive (oleaster)
mainly based on plants at Cornwall Park (both subspecies) and Waitangi (African olive).

Character	African olive (subsp. <i>cuspidata</i>)	European olive (oleaster; subsp. <i>europaea</i>)
Juvenile form	Non-divaricating (Fig. 4)	Strongly divaricating (Fig. 5)
Adult leaves	Mostly 5-9cm × 10-16mm across	Mostly 5-10cm × 12-18mm across
Leaf (lower surface)	Green or yellowish-brown	Whitish-green
Leaf tip	Often hooked (Fig. 6)	Rarely hooked
Peak flowering time	16 Dec – 15 Jan (Fig. 7)	2 Sep – 8 Dec
Ripe fruiting time*	4 Mar – 13 Oct (-Jan) (Figs. 8-10)	15 Jan – 15 Jun
Fruit shape	spherical (Fig. 11, upper row)	ovoid (Fig. 11, lower row)
Fruit size	Thinly fleshy, 7-10mm long	Fleshy, 12-14mm long

* = often difficult to judge because birds remove the fruit as it ripens

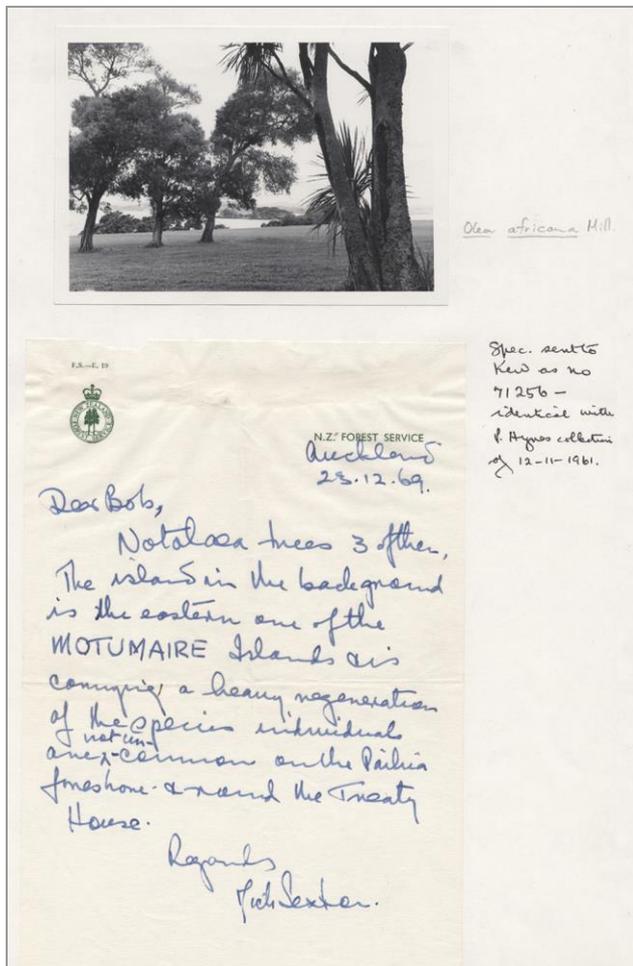


Fig. 3. The letter to Bob (Robert) Cooper, Auckland Museum, 23 Dec 1969, with this image reads: "Notelaea [*Olea europaea* subsp. *cuspidata*] trees 3 of them. The island in the background is the eastern one of the Motumaire Islands and is carrying a heavy regeneration of the species individuals are not uncommon on the Paihia foreshore and round the Treaty House. Regards, Mick [AN] Sexton, NZ Forest Service." [Filed with AK 71256].

Island by the 1990s, although young plants were still being found (Sykes & West 1996). The last African olive detected (an adolescent) on Raoul was in 2011 (the last seedling was in 2003, the last adult was in 2008) (Carol West, pers. comm., Feb 2017).

Northland

It was recorded as occasional in N. Auckland (Sykes 1988) based on the records from the Waitangi area and Paihia in the Bay of Islands. It has also been recorded and collected nearby on Motumaire Island – see Appendix and Fig. 3. The first mainland collection was by Phyllis Hynes at Waitangi on 12 Nov 1961 (AK 71256) and there was a cultivated collection made one day later at the same locality by Ronald Melville and Lucy Moore (CHR 130696).

Because there was no account of the extent of the Bay of Islands population, I visited the Waitangi Treaty House grounds and adjacent areas in July 2007 and January 2017 to see how abundant and widespread the African olive was in the area. To my surprise it was the most abundant woody weed along the coastal bush slope in front (eastern margin) of the Treaty House grounds (Fig. 1), as seedlings (Fig. 4), shrubs and small trees. In places on this coastal slope the African olive is the main vegetation 2-3(-7) m tall (Fig. 2), with occasional *Pittosporum crassifolium*, *Myrsine australis*, *Coprosma macrocarpa* and scattered emergent pohutukawa (*Metrosideros excelsa*) 8-10(-18) m tall. The land is Crown land administered by the Waitangi National Trust.

In 1969 at least three planted adult African olive trees existed near the Treaty House (Fig. 3). They are possibly part of the source of the large naturalised population in the Waitangi-Paihia coastal

Figs. 4–10: **4.** African olive seedlings, abundant in the coastal forested strip, Waitangi Treaty House grounds, 9 Jul 2007. Herbarium sheet AK 299909. **5.** Wild European olive seedling with strong divaricating form, 60 cm tall, from Motutapu Island south of Station Bay, Mar 2017. AK 364663. Scale = 5 cm. **6.** African olive with flower buds – note the hooked leaf tip visible on several of the leaves, Cornwall Park, 11 Nov 2007. All field images by author. **7.** African olive: flowers in axillary panicles, hermaphrodite, petals cream 4-lobed, and stamens 2; in full flower at Cornwall Park, 24 Dec 2007. **8.** African olive with flower buds, and green and ripe fruit at Cornwall Park, 11 Nov 2007. **9.** Wild African olives 2-3 m tall, with abundant fruit, 7.0-9.5 mm across, on the bushy headland at Paihia, c.100 m SE of wharf. 8 Jul 2007. **Fig. 10.** African olives produce abundant crops of fruit, which is eaten and dispersed by frugivorous bird species. Waitangi foreshore, 8 Jul 2007.



AK 299909 AUCKLAND MUSEUM HERBARIUM
AUCKLAND, NEW ZEALAND 06.01

OLEACEAE
Olea europaea subsp. *cuspidata* (Wall ex G.Don) Cif.

Loc: New Zealand, North Island, Eastern Northland & Islands Ecological Region and District, Waitangi, Treaty Grounds, coastal cliffs
Map: P05 094588 Alt: c.15m
Lat: 35° 16' 3" South Long: 174° 5' 2" East
Coll: E. K. Cameron Date: 09 Jul 2007
Det: E. K. Cameron Date: 09 Jul 2007

Notes: Abundant weed in coastal bush on steep slope. As seedlings (AK299909) and as shrubs & trees, 1-3 (-7m) tall (1m fruiting bush, AK299911). Seedlings have no divaricating phase. Leaves pale yellowish-green underneath. In places on this coastal slope the African olive is the main vegetation 2-3(-7)m tall, with occasional karo, *Myrsine australis* & *Carpinus macrocarpa*, scattered emergent pohutukawa & 10r. 18m are the tallest trees present





Fig. 11. Fruit of African olives (top row) and European olives (lower row) from several trees at Cornwall Park, 1 Jun 2008. The two largest fruit would be from grafted stock. Scale = 1 cm.

areas. The famous Nias Track from Ngāpuhi's ceremonial war canoe up to the Treaty grounds is, in places, overhung by African olive trees. The olives appeared to have spread northwards from the Waitangi coast at least as far as mid Wairoa Bay (1.5 km north of the Waitangi flagstaff). I'm unsure how much further they may go, but they are absent 4.7 km to the north on Moturoa Island (Enid Asquith pers. comm.; pers. obs.) and none were seen on the margins of the Kerikeri Inlet (pers. obs., Jul 2008). Occasional saplings and frequent seedlings of wild young plants however, extend westwards from the Treaty grounds for at least 0.7 km along the side of the estuary by the golf course and the Haruru Walkway. To the south of Waitangi, African olives are present both sides of the road at the SE end of Te Ti Bay, further along on the Paihia waterfront on a small bush-covered headland (Fig. 9), and in 1989 a single plant was seen by the Paihia to Opua coastal walkway east of Te Haumi. It is also apparently abundant on at least one of the adjacent islands, Motumaire Island (Figs. 2, 3), 400 m off the Waitangi-Paihia coast.

Auckland

From a specimen sent in by Howell Davies (AK 297464) in Sept 2006 and information from Simon Cook (pers. comm.) I became aware of about 30 African olives growing as street trees in Hobson Drive (Fig. 12), Panmure, possibly planted in the early 1950s. I checked them out and found that there were also a few European olive trees amongst 6-8 m tall African olive street trees. There were also occasional wild seedlings of African olives in association with these plantings, some of these self-established trees in the adjacent gardens and being maintained as ornamentals or as part of a hedge. These appear to be the first wild collections for the Auckland region – see Appendix. A year later during a BioBlitz at Smiths Bush, Northcote, we found a single African olive seedling on the NW margin of this forest reserve, some 350 m away from two planted fruiting African olive adults by the Netball Complex. A single wild sapling was found on

Pakatoa Island in 2009, about 100 m distant from a cultivated fruiting adult African olive. A fourth Auckland locality was a single woody, apparently wild, 2 m tall plant on a lava flow adjacent to mangroves SW of Hamlin Hill in 2016.

Based on the herbarium specimens (collection year in brackets), African olives have also been cultivated in Auckland at: Two House Bay, Kawau Island (1961) supposedly planted by George Grey c.1840; Campbell Park (1963); Waiuku Forestry nursery (1969); Parnell Rose Gardens (1969, 1970, 1981); Petitt's Nursery at Mangere (1975); Auckland Botanic Gardens (1996); Winifred Huggins Woodland (2007) (also mentioned by Wilcox 2012); seven trees in Cornwall Park (2007) planted c. 2001-02 (Shaun Trevan pers. comm.); and the Auckland Domain (2010). Wilcox and Warden (2017) listed it as present at Belfast Reserve in Hillsborough.

Whanganui

In 2015 Colin Ogle and Clive Higgie collected a wild seedling in a dry shade house at Paloma Gardens, Whanganui. Their notes mention other seedlings seen there, mostly inside drums around planted trees in paddocks.

Dispersal

The fruit is a thinly fleshy drupe, almost spherical 7.0-9.5 mm across, and ripening to red and finally black (Fig. 11). The woody seed is 3-5 mm across (Cuneo et al. 2006). I have seen the fruit being eaten by frugivorous birds, both native and exotic: tui, blackbird and starling; Richard Pierce records the fruit being eaten by kereru at Waitangi (see Appendix under AK 233993); and I've seen a flock of eastern rosella eating/destroying the green fruit at Cornwall Park. At Mt Annan in NSW silvereyes have been recorded voiding up to 16 African olive seeds (Cuneo & Leishman 2006). Shelley Heiss-Dunlop (pers. comm.) in 2003 recorded (in order of abundance): starling, thrush, blackbird, tui and myna feeding on European olives at Cornwall Park, Mt St John and the Auckland Domain. Presumably these

additional bird species would also feed on the smaller African olive fruit.

Naturalised African olives outside of New Zealand

In Norfolk Island, African olive is considered a noxious weed and is invasive there in the National Park (Green 1994). In Australia most of the wild records are from eastern NSW. However, there are also a few records from SE South Australia and Australian Capital Territories (AVH, Feb 2017). For New South Wales, Harden (1992: 472) records it as "Planted as an ornamental or for hedges; naturalised and often an invasive weed, chiefly in coastal districts from near Lismore to Milton" (Fig. 13). Cuneo and Leishman (2006) review the status of African olive in eastern Australia and conclude that there is a strong case for it to be declared a noxious weed throughout western Sydney and Hunter valley regions. In their genetic study Besnard et al. (2014) found strong evidence for the serial introduction of African olive from South Africa to NSW and then from NSW to Hawai'i where it has become a serious pest on three of the Hawaiian islands (Wagner et al. 1990, Starr et al. 2003, Besnard et al. 2014). In the Hawai'i Volcanoes National Park it is found in over 6,000 ha, between 500-1,000 m asl and is expanding with the removal of cattle. It is believed that it will shade out native species (Santos et al. 1992, Starr et al. 2003). Encouragingly, treatment with herbicide was found to be highly effective in controlling African olive in Hawai'i (Santos et al. 1992). More recently it has also been recorded as naturalised on St Helena Island in the South Atlantic Ocean (Besnard et al. 2014).

Conclusions

African olive is a known aggressive woody weed overseas in areas mainly a little warmer than most of New Zealand. However, global warming will increase its threat to New Zealand. It has already locally naturalised in parts of northern New Zealand for many decades. Through good management, African olive is on the verge of being pronounced extinct on Raoul Island. It is now time to attack the remaining New Zealand populations (both naturalised and cultivated), especially in the warmer areas where it is already shown to be invasive, for example at the nationally important Waitangi Treaty grounds and adjacent areas, including Paihia foreshore and Motumaire Island (the adjacent Motuarahi should also be searched). In Auckland where it is currently only sparingly naturalised it would be precautionary for Auckland Council to plan to replace the Panmure street trees (the European olives could stay), and other park managers should remove African olive trees in their care. The field evidence from Australia is that it is particularly weedy in coastal districts (Cuneo & Leishman 2006: table 1), and its New



Fig. 12. African olives as the main street trees, Hobson Drive (N side), Panmure. Totalling c.30 trees, they are the largest population known in the Auckland region. 11 Mar 2017.

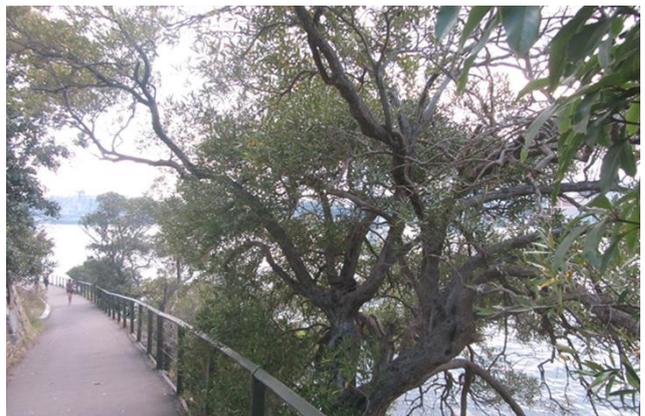


Fig. 13. African olive has naturalised along part of the coastal walkway on the sandstone cliffs near Mrs Macquaries Point, by the Sydney Botanical Gardens. Young wild plants are common, but perhaps this large one (c.4 m tall × 9 m across) was planted? 3 Nov 2013.

Zealand stronghold in the Bay of Islands supports this fact. In the warmer parts of New Zealand it should be added to the Regional Pest Management Strategies/Plans. Currently Auckland Council has it included under 'Feral olives (*Olea europaea*)' – 'Plant species to be Researched' (Auckland Council 2017), but the two subspecies have different weed ecologies (Cuneo & Leishman 2006) and need to be treated separately.

Acknowledgements

Many thanks to Simon Cook, Auckland Council, for information about the street plantings of African olive in Panmure; Carol West, Department of Conservation, for the current status of African olive on Raoul Island; Shelley Heiss-Dunlop for collecting wild European olives on Motutapu so their identification could be confirmed, and for her bird observations; Enid Asquith for the status of olives on Moturoa Island; Shaun Trevan for the approximate planting date of the Cornwall Park African olives; the herbarium staff for their specimen records: Ines Schönberger (CHR), Leon Perrie (WELT), and Matt Buys (NZFRI); Dhahara Ranatunga for assistance with Fig. 3; and Joshua Salter for improving Fig. 11.

References

- Auckland Council: <http://www.aucklandcouncil.govt.nz/EN/environmentwaste/pestsdiseases/Documents/rpms20072012.pdf> (accessed 24 Feb 2017)
- AVH (Australian Virtual Herbarium): http://avh.ala.org.au/#tab_simpleSearch (accessed 24 Feb 2017).
- Besnard, G.; Dupuy, J.; Larter, M.; Cuneo, P.; Chikhi, L. 2014: History of invasive African olive tree in Australia and Hawaii: evidence for sequential bottlenecks and hybridization with the Mediterranean olive. *Evolutionary Applications* 7: 195–211.
- Cuneo, P.; Leishman, M.R. 2006: African olive (*Olea europaea* subsp. *cuspidata*) as an environmental weed in eastern Australia: a review. *Cunninghamia* 9: 545–557.
- Green, P.S. 1994: Oleaceae, *Flora of Australia* 49: 327–334. Australian Government Publishing Service, Canberra.
- Harden G.J. 1992: *Flora of New South Wales*. Vol 3. NSW University Press, Kensington, Australia.
- Heenan, P.B.; de Lange, P.J.; Glenny, D.S.; Breitwieser, I.; Brownsey, P.J.; Ogle C.C. 1999: Checklist of dicotyledons, gymnosperms, and pteridophytes naturalised or casual in New Zealand, additional records, 1997–1998. *New Zealand Journal of Botany* 37: 629–642.
- Mei-chen, C.; Lian-qing, Q.; Green, P.S. 1996: Oleaceae, 272–319p. *In*: Zheng-yi, W.; Raven, P.H. *Flora of China*. Vol. 15. Missouri Botanical Garden, St Louis.
- Santos, G.L.; Kageler, D.; Gardner, D.E., Cuddihy, L.W.; Stone, C.P. 1992: Herbicidal control of selected alien plant species in Hawai'i Volcanoes National Park, 341–375p. *In*: Stone, C.P.; Smith, C.W.; Tunison, J.T., eds. *Alien Plant Invasions in Native Ecosystems of Hawai'i: Management and Research*. University of Hawai'i Press, Honolulu.
- Starr, F.; Starr, K.; Loope, L. 2003: *Olea europaea* subsp. *cuspidata*, African olive, Oleaceae: http://www.starrenvironmental.com/publications/species_reports/pdf/olea_europaea_subsp_cuspidatc.pdf (accessed 14 Feb 2017).
- Sykes, W.R. 1977: *Kermadec Islands Flora: an annotated check list*. DSIR Bulletin 219. Wellington, Government Printer.
- Sykes, W.R.; West, C.J. 1996: New records and other information on the vascular flora of the Kermadec Islands. *New Zealand Journal of Botany* 34: 447–462.
- Sykes, W.R. 1988: Oleaceae, 873–882p. *In*: Webb, C.J.; Sykes, W.R.; Garnock-Jones, P.J. *Flora of New Zealand*. Vol. IV. Botany Division DSIR, Christchurch.
- Thiers, B. [continuously updated]. Index Herbariorum: A global directory of public herbaria and associated staff. New York Botanical Garden's Virtual Herbarium. <http://sweetgum.nybg.org/ih/> (accessed 26 Feb 2017).
- Wagner, W.L.; Herbst, D.R.; Sohmer, S.H. 1990: *Manual of the flowering plants of Hawai'i*. Vol. 2. Bishop Museum Special Publication 83, University of Hawaii and Bishop Museum Press, Honolulu.
- Wilcox, M.D. 2007: The olives of Mt Richmond, Otahuhu. *Auckland Botanical Society* 62: 96–97.
- Wilcox, M.D. [2012]: Auckland's remarkable urban forest. *Auckland Botanical Society Bulletin* 29. 348p.
- Wilcox, M.; Warden, J. 2017: Botany of the Hillsborough coast bush reserves Manukau Harbour, Auckland. *Auckland Botanical Society* 72: 32–46.

Appendix. The main naturalised New Zealand African olive herbarium specimens arranged chronologically by regions. Herbarium acronyms follow Thiers (2017).

Kermadec Islands

- | | |
|-------------|---|
| 13 Jun 1956 | Raoul I., <i>Cooper RC</i> , AK 44338; in overgrown orchard behind workshop [presumed wild] |
| 18 Nov 1966 | Raoul I., <i>Sykes WR 21/K</i> , CHR 175854; near orchard, seedlings |
| 4 Dec 1966 | Raoul I., <i>Sykes WR 320/K</i> , CHR 175853; large spreading thicket |

Northland

- | | |
|-------------|---|
| 12 Nov 1961 | Waitangi House grounds, <i>Hynes P</i> , AK 71256; a belt of trees on foreshore |
| 29 Sep 1967 | Waitangi House [grounds], <i>Sykes WR 42/67</i> , CHR 176323; large shrub |
| 23 Dec 1969 | Motumaire I., <i>Sexton AN</i> , K [not located at K]; heavy regeneration of the species [original letter held with AK 71256, see Fig. 3] |
| Jul 1977 | islet off Waitangi [Motumaire], <i>Hay C</i> , WELT SP085910; naturalised |
| 24 May 1983 | Paihia, <i>Esler AE & Clunie NM</i> , AK 170725; naturalised in wasteland |
| 14 Feb 1988 | Paihia, <i>Cameron EK 4776</i> , AK 277072 (ex AKU 20854); wild plants frequent to 5 m tall, under large pohutukawa |
| 4 Dec 1989 | Paihia to Opua coastal walkway. <i>Cameron EK 5914</i> , AK 215238; single plant, adjacent to mangroves – garden remnant? |
| 9 Aug 1997 | Waitangi [W of Treaty grounds], <i>Pierce RJ</i> , AK 233993; between mangroves and road; kukupa feeding on ripe berries |
| 9 Jul 2007 | Waitangi Treaty grounds; <i>Cameron EK 14526</i> ; AK 299909; abundant weed in coastal bush, as seedlings, shrubs and trees 1–3–(7) m |
| 18 Jul 2008 | Waitangi, Haruru Walkway; <i>Cameron EK 15058</i> ; AK 303170; occasional saplings to 2 m tall, weedy bush slope |
| 29 Jan 2017 | Waitangi Treaty grounds; <i>Cameron EK 14526</i> ; AK 363557; abundant weed in bush and on edge of coastal bush slope |

Auckland region

- | | |
|-------------|---|
| 28 Jul 2007 | Panmure, Hobson Dr., <i>Cameron EK 14539</i> ; AK 300289; wild saplings 1–2 m tall in tecoma hedge |
| 4 Apr 2008 | Northcote, Smiths Bush, <i>Cameron EK 15026b</i> ; AK 302122; wild seedling, bush edge, 350 m distant from two cultivated trees |
| 17 Oct 2009 | Pakatoa Island; <i>Cameron EK 15258</i> ; AK 306375; single wild sapling, cultivated plant c.100 m away |
| 23 May 2016 | near Hamlin Hill, Ann's Creek; <i>Myers SC</i> ; AK 360900; single wildling c.2 m tall [no adults seen] |

Whanganui

- | | |
|------------|--|
| 2 Feb 2015 | Whanganui, Paloma Gardens; <i>Ogle CC & Higgie CN</i> ; AK 358224; wild seedling in shadehouse, enclosed but open to birds; other seedlings seen outside, inside drums around young plants |
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