

Vascular plant epiphytes on the trunks of Canary Island palms (*Phoenix canariensis*) in New Zealand

Ewen K. Cameron

The host plant: Canary Island palm (*Phoenix canariensis*), referred to as 'phoenix palm' or just 'palm' for this article

Phoenix palms are some of the largest and most common palms in New Zealand. They have been for sale here for over 120 years (Hay & Son catalogue 1899-1900). The tall ones by the Winter Garden complex, in the Auckland Domain, were planted in the mid/late 1920s, making them over 90 years old (John Adam pers. comm.). Phoenix palms are common throughout the North Island and are also frequent further south, to at least Christchurch and Hokitika in the South Island. Wilcox (2012: 81) ranked phoenix as the fifth most abundant 'tree' in Auckland's home gardens. They are hardy and thrive on many soil types under varying climatic conditions as long as temperatures do not fall below -10°C (Spennemann 2018). They are frequently planted in groups, often in lines. They are endemic to the Canary Islands (Fig. 1) where they can live for 200–300 years (Beech 2017), grow to c.18–20 m high, with a crown diameter of 10–12 m, made up of over 200 arching, pinnate fronds, and mature palms can weigh up to 10 tons (Spennemann 2018).

They are dioecious – the flowering/fruitlet females can be identified from some distance by their orange-coloured inflorescences amongst the large fronds. When there is an adjacent male plant to pollinate, copious seed is set and naturalised seedlings can be common. The cylindrical fleshy, yellow-orange ripening to tan brown fruit, the author measured were 18–25 mm long × 11–14 mm across, each containing a single date-like seed that is dispersed by frugivorous birds (but note – Healy & Edgar (1980) record the fruit as 25–50 mm long).

Because of their long stiff spines near the bases of the pinnately compound fronds, coupled with their ease to naturalise, they are ranked as a 'Sustained Control pest plant' in the Auckland and Northland Regional Pest Management Plans (Anon. 2017, 2020) which means that they cannot be propagated, distributed, sold or planted in these regions (other Councils possibly also ban them – not researched). Over three years, 2014–2016, there have been 2,097 Accident Compensation Claims for injuries caused by phoenix frond spines (Hutt 2020). Note – the phoenix spines are often referred to as 'poisonous' but it appears more likely that it is a contamination on the spine that causes the infection rather than the spines themselves. Phoenix spines are not mentioned in New Zealand poisonous plant books, e.g., Connor (1977) or Craw (1995). The dangerous spines



Fig. 1. Tall phoenix palms seen by the author in their native country, had slightly narrower trunks (unmeasured) than those present in New Zealand. Photo: Plaza Patricio García, Orotava, Tenerife, Canary Islands, 4 May 2011. All photos taken by the author unless otherwise stated.

are modified basal leaflets. They are illustrated by Esler (2004: 199) who reports that hospital statistics rate them as one of the main causes of injury to children (Esler 2004: 159).

Introduction and Methods

Little appears to have been published on epiphytes on phoenix palms before, apart from Wilcox (2012: 288) who mentions two common ones, *Coprosma repens* and *Nephrolepis cordifoli* in urban Auckland. After observing and collecting a large epiphytic *Ficus rubiginosa* (AK273382) hanging down below the head of a tall phoenix palm in Wynyard Street on the University of Auckland campus in 1984, the author became interested in the large epiphytes in Auckland's copious phoenix palms. This interest expanded into attempting to collect/record all the different vascular epiphyte species (incl. infraspecific ranks) growing on phoenix palms.

Field work was mainly carried out in the Auckland region, but non-Auckland observations, usually opportunistic moments often during a family holiday, are also recorded. Several people, knowing of my interest, sent in specimens or occasionally photographs of what they thought might be an addition to the expanding list – see the Acknowledgements. There was no systematic survey of the phoenix palms; it was more the recording of interesting epiphytes when the author saw them. Occasionally where there was a group of palms together with many epiphytes present there was an attempt to record all the epiphytes on all the palms present (see Results). Epiphytes in tall palms were

Table 1. Four different phoenix palm substrates recognised for where the epiphytes attach to the phoenix palm (see Figs. 2, 3).

H	The leafy Head – as the palm grows the lower fronds drop off (or are pruned off) leaving a short frond base attached to the trunk. The larger woody epiphytes that attached in the head, once they are under the head (lower fronds gone), they are no longer being supported by the fronds; they usually hang down at this stage (Fig. 4). This zone will be under-recorded because of difficulty reaching the taller palm heads.
FB	Frond Bases – the place between the leafy head and the clean trunk with no frond bases. This zone often extends for several meters below the leafy head and is created by either pruning of the fronds where some of the base is retained (Figs. 5, 6), or natural frond fall where they appear to break off leaving a short frond base (Fig. 3), that over many years rots to leave a clean trunk of frond scars (Fig. 2). Epiphytes frequently establish in this frond base zone because it is shaded, more moist than lower down the phoenix trunk and the gaps between the bases and ‘shelves’ are good places for epiphytes to establish (Fig. 7). Larger woody epiphytes which established in the head can survive many years if well-rooted into the frond bases (Figs. 3, 4). Once the frond bases around the epiphyte’s roots rot off, they will die unless some roots can reach the ground. Juvenile phoenix palms retain their fronds for many years and the trunk is usually over c.3–4 m tall before the fronds naturally drop off. Pruned young palm trunks are good for epiphytes (Fig. 8). Note – arborists pruning off the lower palm fronds, so that they do not fall on the public, usually remove most of the woody epiphytes at the same time.
T	Clean Trunk of packed frond scars – the frond bases have now rotted away, leaving just the frond scars. If out in the open, few higher plants establish in this zone, apart from several fern species (Fig. 9). The woody species that established in the head cannot access as many nutrients in this zone, and unless their roots reach the ground (Figs. 10, 11) they usually die. Vines and ferns with rhizomes have the ability to spread down from above (vines climbing up from the ground are excluded from this survey), especially when shady (Fig. 12). However, some species of lichens can do well in this zone when exposed to the elements (Fig. 13).
B	Palm Base, the frond scar layer is pushed off by the expanding rootlet base; it can be to 0.5(–2) m tall and develops as the palm ages (Fig. 2), although not all palms have pronounced bases. The author suspects that in good soils most of the rootlet development occurs under the ground, but in shallow soils it takes place more prominently above the ground (Fig. 14). Some epiphytes only establish on the palm bases. Since many of these species are growing adjacent to the palm base, little dispersal of seeds is required. Woody epiphytes attaching to the base have the best chance to survive because of the short distance to the ground (Fig. 15).

often difficult to identify from the ground; however, binoculars were commonly used and, more recently, a digital camera with a good zoom proved useful. Obtaining a specimen from the taller palms was also difficult; a ladder was used on one occasion (*Ficus macrophylla* s.s. in Myers Park, Auckland) and a fishing line on another (*Fatsia japonica* in Owens Road, Epsom) – on both these occasions the author was assisted by Doug Rogan. The aim was to record, and where possible, collect a good herbarium voucher of each different species observed. Because of their smaller size, the herbaceous species on the shorter palms will be better recorded than those present on the taller, out-of-reach palms. Four different phoenix palm substrates are recognised for where the epiphytes established (see Table 1 and Figs. 2, 3). Depending on the type of fruit/seed the epiphyte possessed, an attempt was made to suggest how they were possibly dispersed to the phoenix palms (see Appendix).

Results

Most of the observations are from the Auckland region. However, they do extend from Waitiki Landing in the Far North, south to Hokitika on the west coast and New Brighton in Christchurch. The observations were made from 1984 to 2022. The total number of vascular epiphytes recorded is 152

taxa, 39% indigenous, based on 345 observations, and 70 taxa are vouchered over 81 herbarium sheets placed in the Auckland Museum herbarium (AK) (see Table 2 and Appendix). Only one of the indigenous species is a threatened species (*Picris burbidgeae*), and over 20 of the exotic species are invasive weeds.

The ten most abundant species occur at 8–13 sites each, and they are represented by: five ferns, three woody dicots, a seedling woody monocot and a herb (Table 3). Ferns top the list (Table 4) because they have a good means of dispersal, most occurring naturally as epiphytes in the native forest (pre-adapted), and the heads of the palms must hold enough moisture for the fern sporophytes to establish. The woody monocot (*Cordyline australis*) and the herb (*Sonchus oleraceus*) are not recorded for the actual palm head, but just underneath it. *Cordyline australis* has been seen only as a juvenile epiphyte. One of the woody dicots, *Ficus macrophylla* s.s., is an eastern Australian specialised strangler fig and the other two (*Coprosma repens* and *Metrosideros excelsa*) are natives that are usually terrestrial species, but commonly occur on coastal cliffs rooting in the cracks in the rocks – another pre-adaptation for an epiphytic lifestyle? Our two best-known native epiphytes, *Griselinia lucida* and



Figs. 2 & 3: **2.** The four attachment surfaces of the phoenix palms recognised for this article (as labelled – see Table 1). By the Devonport library, Auckland. Photo: April 2022. Note – the same palm is shown in Fig. 17 (upper part only). **3.** An unpruned phoenix palm showing 2 m of leaf bases under the crown of fronds and the clean trunk below. Note also the two epiphytic shrubs of *Toxicodendron succedaneum* with bright green pinnate leaves, and the orange inflorescence indicating a female palm. 65 Milton Rd, Mt Eden, Auckland. Photo: May 2022.

Metrosideros robusta, were virtually absent on phoenix – perhaps too far away from a seed source? The annual ivy-leaved toadflax (*Cymbalaria muralis*) (Fig. 12) has a unique way of surviving and attaching on to its substrate: it finds a crack or hole to place its own expanding seed capsules into, “in one action sowing the seeds and providing more attachment”

(Esler 2004: 108). Annuals have a different strategy from the perennials, as they only need a substrate to be suitable for growth for a few months. Of the 152 taxa recorded, some 37 were annuals. The three most successful annuals as epiphytes were sow thistle (*Sonchus oleraceus*) (11 records), ivy-leaved toadflax (7) and veldt grass (*Ehrharta erecta*) (5).

Table 2. Species totals (incl. infraspecific ranks) by plant group and by attachment point on the phoenix palm.

Plant groups	Native	Naturalised	Species totals	H*	FB*	T*	B*	Substrate totals
Ferns & Lycopods	22	1	23	12	20	3	1	36
Gymnosperms	1	-	1	-	-	-	1	1
Flowering plants - Dicotyledons	30	75	105	21	86	4	28	139
Flowering plants - Monocotyledons	6	17	23	2	20	-	6	28
Totals	59 (39%)	93 (61 %)	152	35	126	7	36	204

*= zone of attachment on the palm – see Table 1 and Fig. 2.

Table 3. Total number of epiphyte records for each taxon seen at 345 palm sites*.

For example, a single fern species (*Nephrolepis cordifolia*) was seen at 13 sites.

No. of site* records per taxon	No. of site observations per plant group						Total no. of taxa
	ferns	conifers	dicot herbs	woody dicots	monocot herbs	woody monocots	
1	9	1	44	30	17	-	101
2	4	-	7	7	2	-	20
3	2	-	3	2	1	-	8
4	-	-	3	1	1	-	5
5	-	-	-	-	1	-	1
6	1	-	1	2	-	-	4
7	2	-	1	-	-	-	3
8	1	-	-	-	-	-	1
9	2	-	-	-	-	1	3
10	-	-	-	-	-	-	-
11	-	-	1	-	-	-	1
12	1	-	-	3	-	-	4
13	1	-	-	-	-	-	1
Totals	23	1	60	45	22	1	152

* A 'site' means a single palm or a group of palms (i.e., the 336 individual palms and the nine groups listed in the Results)

Four of the epiphyte collections/observations appear to be first records for naturalised species in New Zealand: *Ficus macrophylla* f. *macrocarpa* (1996) Myers Park, Auckland, AK228402 and AK228442 (Cameron 1996); *Halleria lucida*, Auckland Domain (Cameron 1997); *Schefflera arboricola* (1998) Ellerslie Racecourse grounds, Auckland, AK237400 (although not included by Heenan et al. 2000: 161); and *Ficus macrophylla* f. *columnaris* (Figs. 16, 17) is first recorded here by Devonport library, Auckland (pers. obs., Aug 2015; Apr 2022).

Lichens can be particularly common on the trunks of taller palm specimens in the open (Fig. 13), but diversity is generally low (Marley Ford pers. comm.).

Groups of phoenix palms surveyed for epiphytes

There are many group plantings of phoenix palms in New Zealand, some are "too well managed" to support large epiphytes. The author surveyed, or partly surveyed, the nine groups of palms listed below. Others that the author is aware of but has not surveyed include: 22 tall palms in Auckland Domain

Table 4. Numbers of epiphytes* in various plant groups, arranged according to their possible dispersal mechanisms for reaching phoenix palms.

Possible means of dispersal	Ferns & Lycopods	Dicots	Monocots	Totals
Wind	22	24	4	50
Bird/possum	-	32	5	37
Bird/gravity	-	2	1	3
Bird nest material	-	3	10	13
Explosive release	-	4	-	4
Attached to an animal	-	1	-	1
Unknown	-	23	1	24
Totals	22	89	21	132

*= the epiphytes present only on the root base have been excluded, because they are frequently growing next to the palm base and therefore hardly dispersed at all.



Figs. 4–12: **4.** Pōhutukawa shrub that established in the leafy head; as the palm grew, it has ended up hanging below the head, its large root above still able to extract moisture and nutrients. Waiwera. Photo: 30 Mar 2022. **5.** Several spider plants? (*Chlorophyton comosum*, no voucher) high up on trimmed frond bases. Also present: seedling *Toxicodendron succedaneum* and pōhutukawa, ivy-leaved toadflax, *Gamochaeta coarctata* and *Nephrolepis cordifolia*. Old Ellerslie Racecourse entrance, Auckland. Photo: Apr 2022. **6.** A 6 m-tall Moreton Bay fig (*Ficus macrophylla* s.s.), with its roots wrapped around the palm trunk. Unlike the pōhutukawa in Fig. 4, these strangling figs are more capable of sending roots to the ground (see Figs. 10, 11). Mt Roskill maunga. Photo: 20 Apr 2020. **7.** The shady area among lower fronds and frond bases colonised by ferns and several herbaceous species. *Histiopteris incisa*, *Nephrolepis cordifolia* and a grass visible. Old Ellerslie Racecourse entrance. Photo: 29 Apr 2022. **8.** *Hebe elliptica* seedlings (AK359162) amongst trimmed frond bases of a young phoenix palm. Cass Square, Hokitika. Photo: Mark Crompton, 4 Oct 2015. **9.** A patch of *Pyrrosia elaeagnifolia* – able to grow on a clean phoenix trunk in the open. Old Ellerslie Racecourse entrance. Photo: 29 Apr 2022. **10.** A 6 m-tall Morton Bay fig rooted 2 m below the head of a 16 m-tall phoenix palm. Mt Roskill maunga. Photo: 20 Apr 2020. **11.** Almost made it! The Moreton Bay fig in Fig. 10 has extended a ‘curtain’ of fine roots down the southern side of the trunk to within 3m of the ground. If it does reach the ground, it could eventually overtop and outgrow its host. Mt Roskill maunga. Photo: 20 Apr 2020. **12.** Ivy leaved toadflax spreading freely on this rather shaded short trunk. This species is a common epiphyte, usually on the upper part of phoenix trunks. Old Ellerslie Racecourse entrance, by Novotel. Photo: 22 Oct 2006.

by the Wintergardens; c.20 tall palms lining the driveway to Puketutu Island Estate, Puketutu I., Auckland; a row along the back of Buffalo Beach at Whitianga; perhaps the largest planting in New Zealand of c.100 specimens lining both sides of the main road (SH 2) for c.700 m, entering Waihi from the southwest; an avenue of palms along Palm Drive, The Victorian Esplanade, Palmerston North; and there are many others. The nine groups surveyed:

- Waitangi, in front of Copthorne Hotel, Northland: c.21 palms in a well-spaced double row in the open, along the back of the beach, mainly planted in groups of three; palm trunks 3–4(–6) m tall; surveyed 6 Feb 2020; only the three palms with the most epiphytes were recorded, the others had few or no epiphytes – 13 epiphytic species were recorded, three were collected.
- Mangawhai Heads, Northland, by entrance to the Holiday Park at the end of Mangawhai Heads Road: a line of seven palms with trunks 1.5–2.5 m tall, well-trimmed, mown lawn around them, surveyed 14 Apr 2022, 12 species were recorded, one grass specimen was collected.
- Waiwera, NE Auckland, on east side of the hot pools: several palms scattered around the boundary of a large lawn; palm trunks 0–10 m tall; the epiphytes on five of the taller specimens were recorded (Fig. 4) – ten species were recorded, none collected; surveyed 30 Mar 2022.
- Orewa, Orewa Recreation Reserve, NE Auckland, by and south of the surf club: 11 palms observed, trunks 1.5–6.5 m tall, surveyed 14 Mar 2022; rock pigeons were commonly nesting in the palm heads (Fig. 18).
- Parakai, Parakai Domain, north side of the Parakai Hot Springs, near Helensville: tall stand of phoenix, mostly lacking obvious epiphytes, however, several smaller phoenix palms (trunks 1–5 m) in a dampish hollow by a drive supported 12 epiphyte species, of which seven were collected on 13 Jun 1999.
- Mt Roskill/Puketapapa (lower NE side of the maunga), Auckland City below the road entrance: row of 16 palms, trunks (7)–10 m tall, with well-developed root bases, either side of the bike path and one just uphill of them; the vascular epiphytes were recorded on all 17 palms, totalling 14 species, and one was collected on 20 Apr 2022. A feature of these epiphytes were the many large shrubs of Moreton Bay figs (*Ficus macrocarpa* s.s.) (Figs. 6, 10, 11) and taupata (*Coprosma repens*) in, or just under, the palm heads (Fig. 19).
- The old Ellerslie Racecourse entrance off Greenlane Road, Ascot Ave, Auckland City: double row of 54

palms (Fig. 20) (including 4 adjacent specimens) between the parallel branches of Ascot Ave. The palms' trunks are of two different heights, c.6 m and at least twice that height, and they are inter-planted and well-managed (pruned fronds). There were very few shrubby epiphytes in Apr 2022; however, they all had epiphytes in and under the heads, especially fern species. The epiphytes were recorded Sep 1998, Nov 2000, Oct 2006, Apr 2022, totalling 30 spp. and nine vouchered. Because of the tall palm heights, the epiphyte flora is poorly recorded, several specimens being omitted because of the difficulty identifying them, especially the monocots (Fig. 5). It would be interesting to fully survey this group of palms; however, a very good ladder or friendly fireman would be required, or perhaps join up with the pruning gang?

- Lake Rotorua, Hannahs Bay Reserve, Rotorua: 12 palms in two rows of six (Fig. 21), with a road between them; seven females, five males; palm trunks 2–4 m tall, because of their relatively short height all epiphytes present were recorded (although the author's car, parked underneath some of the taller palms, was climbed to reach the upper palm trunk epiphytes); surveyed 8–9 Jan 2009 and 11 Mar 2015 – a total 54 species were recorded and nine were collected. These palms were particularly rich in epiphytes, both in the amount and in species diversity (Fig. 22), most likely a reflection of their previous environment rather than the current open one. Evidently the palms were transported to Hannahs Bay in 2001 from Kuirua Park in central Rotorua – where they were originally planted out at c.1 m tall in 1972 (Mark Paget, Rotorua District Council, pers. comm. to the author, Jan 2009, via Chris Ecroyd). A single palm at this locality contained 21 species and the group of 12 palms contained 54 species – both these were records for a single palm and for a group of palms the author measured. The author attributes this high diversity to two main causes: all parts of the palms could be reached, and at Kuirua Park they must have come from a crowded area with a rich diversity.
- Picton Memorial Park, Picton, in the open in a prominent position by the waterfront: at least 11 palms with trunks c.4.5 m tall, surveyed while waiting for the ferry on 30 Dec 2020. Ten species were recorded (Fig. 23), three species being the author's only record of them as epiphytes.

Fauna

Birds

The phoenix palms are utilised by birds that like to roost in crevices (Graeme Taylor pers. comm.). By far the most frequent bird species that the author has seen utilising them are rock pigeons, abundantly



Figs 13–21: **13.** Two common lichen species, *Parmotrema reticulatum* and *Flavoparmelia soredians*, locally abundant on older palm trunks, particularly on northern side. Mt Roskill. Photo: Apr 2020. **14.** A phoenix palm growing in a rocky area, the large exposed root base nearly 2 m tall, 46 Ellerton Rd, Balmoral. Photo: 3 May 2022. **15.** A large branching pōhutukawa (lower branches c.45 cm diam.) established on the base of a phoenix palm at Hall’s Beach, Northcote, Auckland – an unusual example that may outgrow its host. Photo: Joshua Salter (a selfie!), 5 May 2022. **16.** Large planted *Ficus macrophylla* f. *columnaris* (Lord Howe I. endemic). The characteristic prop roots (banyan habit) distinguish it from *F. macrophylla* s.s. By Devonport Library, Auckland. Scale: Cheryl, 1.69 m tall. Photo: Aug 2015. **17.** Wild epiphytic *Ficus macrophylla* f. *columnaris* shrubs in the head of the 16 m-tall palm shown in Fig. 2. Suspected parent tree 10 m away at left (see Fig. 16), holm oak (*Quercus ilex*) on the right. By Devonport Library, Auckland. Photo: April 2022. **18.** Rock pigeon, behind phoenix frond spines. Orewa Domain. Photo: 8 Apr 2022. **19.** A taupata shrub beginning to hang down as the palm sheds fronds. Mt Roskill. Photo: Apr 2020. **20.** Avenue of 54 phoenix palms of two ages, with heads rich in epiphytes. Photo: old Ellerslie Racecourse entrance, Auckland. Photo: Apr 2022. **21.** Avenue of 12 phoenix palms, trunks rich in epiphytes. Hannahs Bay, Lake Rotorua. Photo: 8 Jan 2009.

roosting and nesting in the palm heads (Fig. 18). The author suspects that some of the epiphytes on the phoenix palm trunks, bases and to a lesser extent in the heads, are the result of spillage from the rock pigeons' nesting material, especially the grasses. Other birds seen utilising the palm heads were:

spotted dove (EKC pers. obs.), Eastern rosellas, house sparrows roosting and likely nesting (Shelley Heiss-Dunlop pers. comm., EKC pers. obs.), favoured roost sites of Indian mynas (Graeme Taylor pers. comm.), possible nesting sites for kingfishers (EKC pers. obs., heard several calling in areas of the



Figs. 22–29: **22.** Phoenix trunk covered with epiphytes including three fern species: *Blechnum novae-zelandiae* (centre) *Asplenium polyodon* (upper), *Lecanopteris pustulata* (lower). Photo: Hannahs Bay, Lake Rotorua 8 Jan 2009. **23.** Epiphytes on a 4.5 m-tall palm include: *Pseudopanax arboreus* (upper left), *Lecanopteris pustulata* and *Asplenium flaccidum* (left side). Picton Domain. Photo: 29 Dec 2020. **24.** *Rumohra adiantiformis* (with pōhutukawa seedlings and a bryophyte); this fern often grows in similar positions (under the head) on tree ferns. Orewa, near the Orewa River. Photo: 7 Nov 2004. **25.** *Begonia* × *Semperflorens-Cultorum* flowering, with ivy-leaved toadflax, seedlings of pōhutukawa and fleabane (*Erigeron sumatrensis*) and bryophytes, on shaded trunk. Begonias were once cultivated in the garden around this palm. Old Ellerslie Racecourse, by Novotel. Photo: 22 Oct 2006. **26.** Two *Fatsia japonica* plants on a phoenix trunk. Other epiphytes include karo (*Pittosporum crassifolium*) seedlings (upper trunk), *Agapanthus praecox* (lower trunk), *Nephrolepis cordifolia* and garden balsam (*Impatiens walleriana*). Pakatoa I., Hauraki Gulf. Photo: 17 Oct 2009. **27.** *Griselinia lucida*, a specialised native epiphyte, but only seen on one palm close to three cultivated *G. lucida* shrubs; *Pseudopanax arboreus* seedling present (on left). Behind Edwin Fox Museum, Picton. Photo: 30 Dec 2020. **28.** Bermuda buttercup (*Oxalis pes-caprae*) and veldt grass (*Ehrharta erecta*) covering the tall root base; a population of rock pigeons nesting above. Behind Mt Eden War Memorial Hall, Balmoral, Auckland. Photo: 18 Jul 2020. **29.** China doll (*Radermachera sinica*) seedling (centre), with two ferns (*Nephrolepis cordata*, *Pteris tremula*), and *Solanum nigrum* flowering (above left). (An adult China doll nearby). St Peters School entrance, Epsom, Auckland. Photo: 5 Aug 2006.

palms, but no nesting seen), and welcome swallows frequently flying around the palms (EKC pers. obs.).

Mammals

Ship rats may live/visit the heads of the palms, an Auckland Council arborist (pers. comm.) saw rats (ship rats?) in the head of a tall phoenix at Kohimaramara, Auckland. One of the reasons that several Auckland parks have wide metal bands on the lower trunks of the palms (above the root base) is to stop rats climbing up; they gnaw on the sugary frond bases, which seems to cause the fronds to fall off at greater frequency (Simon Cook pers. comm.). The bands also stop brush-tailed possums climbing up – the main reason they were placed on the palms at Cornwall Park (Shelley Heiss-Dunlop, pers. comm.). Brush-tailed possums may live in the palm heads and they also can disperse quite large seeds, (Williams 2003). Therefore, dispersed by 'birds' in the Appendix potentially includes possums.

Discussion

Although phoenix palm is banned from sale, in at least northern New Zealand, because of its longevity, fierce spines and ease of naturalising, they are likely to continue to be a feature in the landscape for at least several centuries. Any future ornamental plantings of phoenix anywhere in New Zealand should be restricted to only male plants. Another reason to limit their occurrence is because phoenix palm heads are a habitat for nuisance fauna, i.e., rock pigeons, Indian mynas, brush-tailed possums and ship rats.

The interesting epiphytic flora is partly invisible and home to many weed species and native ferns.

Future surveys should also include the lower plant groups, the lichens, mosses and liverworts. Possibly future surveys should ignore the epiphytes on rootlet palm bases, because it is a very different habitat and often just a reflection of what is growing in an adjacent garden, with little dispersal involved. The use of drones in the future for surveying the taller palm epiphytes might be quite revealing. The species list in this article will be far from comprehensive. However, hopefully it might spark an interest in studying this epiphytic flora on these palms, mainly out-of-sight to most people. A more systematic survey, especially including the lower plants, would add immensely to the knowledge of this palm's fascinating epiphytic flora.

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Appendix. Vascular plant species growing in the heads, on the trunks, and root bases of phoenix palms (*Phoenix canariensis*) in New Zealand.

* = exotic naturalised species

** = native species outside its natural geographical range

AC = Auckland Super City, within Auckland Council boundary

abun = abundant

com = common

la = locally abundant

lc = locally common

loc = local

occ = occasional

sca = scarce

H = attached in the palm head

FB = attached on trunk with frond bases

T = attached on trunk without frond bases

B = attached on root base

All measurements are approximations.

By entering the AK number (without a gap) the full details of AK herbarium specimens cited can be seen at: <https://www.Aucklandmuseum.com/discover/collections>

	SPECIES (incl. infraspecific ranks) by plant groups	LOCATION (multiple records arranged north to south) (abundance / location / date /reference/ notes). Total number of site records for each species is in square brackets at the end [x]	Attachment point on phoenix palm	Possible agent of dispersal to phoenix palm
	FERNS & LYCOPHTES			
	<i>Asplenium flaccidum</i>	lc, Waitangi, front of Copthorne Hotel (2020) see AK379557, on 1 of 3 palms recorded; x1, Waiwera, AC (pers. obs., Mar 2022) on 1 of 5 palms recorded; x1, Orewa, AC (pers. obs., Mar 2022) on 1 of 11 palms observed; occ, Ellerslie Racecourse grounds, AC (pers. obs., Sep 1998) on several palms present; Clarks Beach, AC (2017) see AK368936; occ, Hannahs Bay, Rotorua (pers. obs., Jan 2009) on 9 of 12 palms present; occ, Picton (2020) see AK381682 (Fig. 23); loc, Cass Square, Hokitika township (2015) with <i>Hebe elliptica</i> see AK359162; [8]	H, FB, T	wind
70	<i>Asplenium oblongifolium</i>	lc, Waitangi, front of Copthorne Hotel (2020) see AK379557, on 1 of 3 palms recorded; loc, Orewa, AC (pers. obs., 14 Mar 2022) on 1 of 11 palms observed; x2, Parakai, AC (pers. obs., Jun 1999); x1, Pakatoa I., Hauraki Gulf, AC (2009) on same palm as AK306378; x1, Ellerslie Racecourse grounds, AC (pers. obs., Sep 1998); Clarks Beach, AC (2017) see AK368936; loc, Hannahs Bay, Rotorua (pers. obs., Jan 2009) on 3 of 12 palms present; [7]	H, FB	wind
	<i>Asplenium polyodon</i>	x1, Parakai, AC (pers. obs., Jun 2000); x1, Pakatoa I., Hauraki Gulf, AC (2009) on same palm as AK306378; occ, Ellerslie Racecourse grounds, AC (pers. obs., Sep 1998) on several palms present; loc, Mt Roskill, AC, (pers. obs., Apr 2022) on 1 of 17 palms present, in the head with other ferns; Clarks Beach, AC (2017) see AK368936; lc, Hannahs Bay, Rotorua (pers. obs., Jan 2009) on 11 of 12 palms; [6]	H, FB	wind
	<i>Blechnum novae-zelandiae</i>	x2, Hannahs Bay, Rotorua (pers. obs., Jan 2009) on 1 of 12 palms present (Fig. 22); [1]	FB	wind
	<i>Cyathea dealbata</i>	x1 (no trunk), Warkworth, AC (1998) in the adjacent palm to AK235021; [1]	FB	wind
	<i>Cyathea medullaris</i>	x1 (no trunk), Ellerslie Racecourse grounds, AC (pers. obs., Sep 1998); [2]	FB	wind
	<i>Dicksonia fibrosa</i>	x1 (no trunk), Hannahs Bay, Rotorua (2009) AK304108, on 1 of 12 palms present; [2]	FB	wind
	<i>Dicksonia squarrosa</i>	x1 (no trunk), Warkworth, AC (1998) see AK235021; near Clarks Beach, AC (2019) see AK377919; x1, Hannahs Bay, Rotorua (pers. obs., Jan 2009) on 1 of 12 palms present; [3]	FB	wind
	<i>Doodia australis</i>	x2, Albert Park, AC (2002) AK256815; [1]	H	wind
	<i>Histiopteris incisa</i>	lc, Waitangi, front of Copthorne Hotel (2020) see AK379557, on 1 of 3 palms recorded; x1, Waiwera, AC (pers. obs., Mar 2022) on 1 of 5 palms recorded; lc, by Devonport library, AC (pers. obs., Aug 2005) in the head; Greenlane, ex Ellerslie Racecourse grounds, AC (2000) AK252755; a patch, Van Damme's Lagoon, Mt Wellington, AC (pers. obs., May 1997) trunk c.16m tall; loc, Mt Roskill, AC (pers. obs., Apr 2022) on 1 of 17 palms present, in the head; x2, Hannahs Bay, Rotorua (2015) AK357394, on 2 of 12 palms present; [7]	H, FB	wind
	<i>Hypolepis ambigua</i>	loc, Hannahs Bay, Rotorua (pers. obs., Jan 2009), on 2 of 12 palms; [1]	FB	wind

<i>Hypolepis dicksonioides</i>	Vigorous epiphytes, St Heliers, AC (2019) AK379335; [1]	FB	wind
<i>Hiya distans</i>	near Clarks Beach, AC (2019) see AK377919; [1]	FB	wind
<i>Lecanopteris pustulata</i>	Waitangi, front of Copthorne Hotel (2020) see AK379557, on 1 of 3 palms measured; x1 patch, Mangawhai Heads (pers. obs, Apr 2022) on 1 of 7 palms observed; loc, Waiwera, AC (pers. obs., Mar 2022) on 1 of 5 palms recorded; loc, Orewa (pers. obs., Mar 2022) on 1 of 11 palms observed; la, Parakai, AC (1999) AK283196; x2 main road Albany Village, AC (1996) see AK227409; Ponsonby, AC (2003) see AK280179; loc, Mt Roskill, AC (pers. obs., Apr 2022) on 1 of 17 palms present, in the head; Clarks Beach, AC (2017) see AK368936; near Clarks Beach, AC, (2019) see AK377919; la, Hannahs Bay, Rotorua (pers. obs., Jan 2009), on 11 of 12 palms (Fig. 22); a large patch, Picton (2020) see AK381682 (Fig. 23); Picton (2020) see AK381686; [12]	H, FB	wind
<i>Lecanopteris scandens</i>	near Clarks Beach, AC, (2019) see AK377919; [1]	FB	wind
<i>Nephrolepis cordifolia</i> *	loc, Waitangi, front of Copthorne Hotel (2020) see AK379557, on 2 of 3 palms measured; lc, Mangawhai Heads (pers. obs, Apr 2022) on 3 of 7 palms observed; abun, Warkworth, AC (1998) with AK235021; lc, Waiwera, AC (pers. obs., Mar 2022) on 2 of 5 palms recorded; Pakatoa I., Hauraki Gulf, AC (2009) on same palm as AK306378; loc, Paritai Dr, Orakei, AC (2002) see AK256409; com, St Peters School, AK (2006) see AK297336 (Fig. 29); Mt Eden, AC (1994) see AK218625-26; com, Greenlane, ex Ellerslie Racecourse grounds, AC (pers. obs., 1998), and AK252754 (2000); loc, Puriri Dr, Cornwall Park, AC (photo SHD, 2022); la, Mt Roskill, AC (pers. obs., Apr 2022) on 1 of 17 palms present, around the base of the head; Clarks Beach, AC (2017) see AK368936 (2000); near Clarks Beach, AC, (2019) see AK377919; [13]	H, FB, T, B	wind
<i>Paesia scaberula</i>	x1 small plant, Parakai, AC (pers. obs., Jun 2000); [1]	FB	wind
<i>Phlegmariurus ?varius</i>	Mt Albert, AC (2007), AK299143, juv. plant; lc, Waikumete Cemetery, AC (1999) AK241503; [2]	H	wind
<i>Psilotum nudum</i>	x3 colonies, Cornwall Park, AC (2019) AK378156; [1]	B	wind
<i>Pteridium esculentum</i>	com, Greenlane, ex Ellerslie Racecourse grounds, AC (pers. obs., Sep 1998) and (2000) AK252754; loc, Hannahs Bay, Rotorua (pers. obs., Jan 2009) on 1 of 12 palms; [2]	FB	wind
<i>Pteris tremula</i>	Waitiki Landing, Northland (2009), see 306871; abun, Warkworth (1998) see AK235021; loc, Waiwera, AC (pers. obs., Mar 2022) on 1 of 5 palms recorded; lc, in head, Parakai, AC (1999) AK283202; x2, Albert Park, AC (2002) see AK256814; x2, St Peters School, AC (2006) see AK297336 (Fig. 29); lc, Ellerslie Racecourse grounds, AC (pers. obs., Sep 1998) on several palms present; loc, Puriri Dr, Cornwall Park, AC (photo SHD, 2022); loc, Hannahs Bay, Rotorua (pers. obs., Jan 2009), on 2 of 12 palms present; [9]	H, FB	wind
<i>Pyrrosia elaeagnifolia</i>	Waitangi, front of Copthorne Hotel (2020) see AK379557, on 1 of 3 palms recorded; loc patches, Mangawhai Heads (pers. obs, Apr 2022) on 2 of 7 palms observed; x1, Warkworth, AC (1998) see AK235021; single patch, Ponsonby, AC (2003) AK280179; old Ellerslie Racecourse entrance (Apr 2022) (Fig. 9); Clarks Beach, AC (2017) see AK368936; near Clarks Beach, (2019) see AK377919; loc, Hannahs Bay, Rotorua (pers. obs., Jan 2009), on 2 of 12 palms present; loc, Picton (2020) see AK381686; [9]	H, FB, T	wind
<i>Rumohra adiantiformis</i>	x2, Orewa, AC (2004) AK288646 (Fig. 24); single clump, Parakai, AC (1999) 1.5m up the trunk, AK283197; loc, Cass Square, Hokitika township (2015) with <i>Hebe elliptica</i> , see AK359162; [3]	H, FB	wind
GYMNOSPERMS			
<i>Podocarpus totara</i>	sca, Mt Roskill, AC (pers. obs., Apr 2022) x2 seedlings on separate palm root bases; [1]	B	bird
DICOTYLEDONS			
<i>Aeonium haworthii</i> *	x1 patch, Ellerslie Racecourse grounds, AC (pers. obs., Sep 1998); [1]	FB	?
<i>Agonis flexuosa</i> *	x1 sapling, Waitiki Landing, Northland (2009) AK322620; [1]	FB	wind
<i>Aphanes inexpectata</i> *	x2, Orewa, AC (2004) AK288645; [1]	FB	?

<i>Begonia</i> × <i>Semperflorens</i> - <i>Cultorum</i> hybrids *	lc, AC by Novotel Ellerslie (2006) AK297661 (Fig. 25), on several trunks; [1]	FB, T	?
<i>Betula pendula</i> *	x1 seedling, Hannahs Bay, Rotorua (2009) AK304110, only on 1 of 12 palms present; [1]	FB	wind
<i>Cardamine hirsuta</i> *	loc, Parakai, AC (2000) on root base, AK248206; [1]	B	adjacent
<i>Centella uniflora</i>	Large patch, Warkworth, AC (1998) see AK235021; [1]	FB	?
<i>Cerastium glomeratum</i> *	loc, Hannahs Bay, Rotorua (pers. obs., Jan 2009) on 1 of 12 palms present; [1]	FB	?
<i>Chenopodium album</i> *	loc, Hannahs Bay, Rotorua (pers. obs., Jan 2009) on 1 of 12 palms present; [1]	FB	?
<i>Cirsium vulgare</i> *	x1, Parakai, AC (pers. obs., Jun 1999) [1]	FB	wind
<i>Coprosma macrocarpa</i>	x1, Ellerslie Racecourse grounds, AC (pers. obs., Sep 1998); [1]	FB	bird
<i>Coprosma macrocarpa</i> × <i>C. robusta</i>	x1, Paritai Dr, Orakei, AC (2002) AK256420; x1 shrub, Auckland Domain, AC (2005) AK289525; [2]	H, FB	bird
<i>Coprosma repens</i>	x1 shrub, Waiwera, AC (pers. obs., Mar 2022) on 2 of 5 palms recorded; lc seedlings, Orewa, AC (pers. obs., 14 Mar 2022) on 3 of 11 palms observed; x1 shrub, Parakai, AC (pers. obs., Jun 1999); by Devonport library, AC (pers. obs., Aug 2015) shrubs in heads of several tall palms and one on a palm base; x1, Myers Park, AC (2002) AK256397; x1, Kohimaramara, AC (2002) see AK256695, and x1 in adjacent palm; occ, Balmoral, AC (2020) on root base, see AK379945; occ, Ellerslie Racecourse grounds, AC (pers. obs., Apr 2022) in the head; x1 shrub, Lambeth Rd, Sandringham, AC (pers. obs., 2002); occ, Mt Roskill, AC (pers. obs., Apr 2022) on 12 of 17 palms present, mainly in or just under the heads, shrubs with 4m branches (Fig. 19); Clarks Beach, AC (2017) see AK368936; New Brighton main street, Christchurch (2020) see AK381676; [12]	H, FB, B	bird
<i>Coprosma robusta</i>	sca, seedlings, Mangawhai Heads (pers. obs, Apr 2022) on 2 of 7 palms observed; x1, Warkworth, AC (1998) on adjacent palm to AK235021; x1, Paritai Dr, Orakei, AC (pers. obs., Apr 2002) on root base; x2, Cornwall Park, AC (1997) on same palm as AK233158; occ, Hannahs Bay, Rotorua (pers. obs., Jan 2009) on 4 of 12 palms present; loc, Cass Square, Hokitika township (2015) with <i>Hebe elliptica</i> , see AK359162; [6]	FB, B	bird
<i>Cotula australis</i>	x3, Parakai, AC (pers. obs., Jun 2000) on root base; loc, Hannahs Bay, Rotorua (pers. obs., Jan 2009) on 1 of 12 palms present; [2]	FB, B	?
<i>Cymbalaria muralis</i> *	lc, Rakino I., Hauraki Gulf, AC (pers. obs., Aug 2021); Ponsonby, AC (2003) see AK280179; Titoki St, by Auckland Domain, AC (2000) see AK245690; la, Greenlane by Novotel, Ellerslie, AC (pers. obs., Sep 1998) and see AK297660 (2006), on several trunks (Figs. 12, 25); loc, Puriri Dr, Cornwall Park, AC (photo SHD, 2022); loc, Mt Roskill, AC (pers. obs., Apr 2022) on 1 of 17 palms present, just under the head; lc, Picton (2020) see AK381682; [7]	H, FB, T	?
<i>Dichondra repens</i>	loc, Parakai, AC (pers. obs., Jun 2000) on root base; [1]	B	?
<i>Entelea arborescens</i>	x1 shrub, St Heliers, AC (2012) AK333349; [1]	H	?
<i>Epilobium ciliatum</i> *	occ, Hannahs Bay, Rotorua (pers. obs., Jan 2009) on 2 of 12 palms present; [1]	FB	wind
<i>Erigeron sumatrensis</i> *	x1, Mangawhai Heads (pers. obs, Apr 2022) on 1 of 7 palms observed; x1, (1998) see AK235021; occ, Ellerslie Racecourse grounds, AC (pers. obs., Sep 1998) on several palms present (Fig. 25); loc, Hannahs Bay, Rotorua (pers. obs., Jan 2009) on 7 of 12 palms present; lc, Wairoa township by river (2007) AK298958, on root base; [4]	FB, T, B	wind
<i>Euchiton sphaericus</i>	x1, Waitangi, front of Copthorne Hotel (2020) AK379558, on 2/3 palms recorded; x1, Hannahs Bay, Rotorua (pers. obs., Jan 2009) on 1 of 12 palms present; [2]	FB	wind
<i>Euonymus japonicus</i> *	x1, Paritai Dr, Orakei, AC (pers. obs., Apr 2002) on root base; [1]	B	bird
<i>Euphorbia pepplus</i> *	x1, Paritai Dr, Orakei, AC (pers. obs., Apr 2002) on root base; [1]	B	?
<i>Fatsia japonica</i> *	x2, Pakatoa I., Hauraki Gulf, AC (2009) AK306378 (Fig. 26); x1 shrub, Epsom, AC (1997) 8m up trunk, AK232183; x1 Clarks Beach, AC (2017) AK368938; [3]	H, FB	bird

<i>Ficus carica</i> *	x1 shrub, main road, Albany Village, AC (1996) AK227409; [1]	FB	bird
<i>Ficus macrophylla</i> f. <i>columnaris</i> *	Shrubs (Fig. 17), by Devonport library, AC (pers. obs., Aug 2015 & Apr 2022) in the heads of 7 of 13 tall palms close to a large cultivated adult (Fig. 16), see AK358321 – a new unvouchered wild record for New Zealand [1]	H	bird
<i>Ficus macrophylla</i> f. <i>macrophylla</i> *	x1 seedling, Kawau I., Hauraki Gulf, AC (1992) AK207068; x1 seedling, Mission Bay, AC (2002) AK256714; x2, Kohimaramara, AC (2002) AK256695; x2 saplings, Myers Park, AC (1996) AK228402 & AK228442 – first wildling collected in New Zealand (Cameron 1996; frequent seedlings and saplings Myers Park, AC (2002) see AK256397; x1 shrub, Auckland Domain, AC (2005) see AK289525; x1 seedling, St Peters School, AC (2006) AK297337; x1, Balmoral, AC (2020) on root base, see AK379945; x3 seedlings, Cornwall Park, AC (1997) AK233158; occ, Mt Roskill, AC (pers. obs., Apr 2022) on 7 of 17 palms present, all in or just under the heads, shrubs to 6m tall (Figs. 6, 10, 11); x3 seedlings, Whanganui (2007) AK299744; x1 seedling, Whanganui (2007), AK299766; c.20 seedlings, Whanganui (2011), AK356255; [12]	H, FB, B	bird
<i>Ficus rubiginosa</i> *	x1 tree, Wynyard St, University of Auckland, AC (1984) AK273382; x1 seedling, Cornwall Park, AC (1997) see AK233158; x1, Ellerslie Racecourse grounds, AC (pers. obs., Sep 1998) in head of palm; [3]	H, FB	bird
<i>Fuchsia boliviana</i> *	occ, driveway to Puketutu Island Estate, Puketutu I., Manukau Harbour, AC (pers. obs., Dec 2017) several flowering shrubs in the heads of tall palms lining the driveway (well-out of reach); [1]	H	bird
<i>Galium aparine</i> *	loc, Hannahs Bay, Rotorua (pers. obs., Jan 2009) on 3 of 12 palms present; [1]	FB	attached to an animal?
<i>Gamochaeta coarctata</i> *	sca, Mangawhai Heads (pers. obs, Apr 2022) on 1 of 7 palms observed; lc, Ellerslie Racecourse grounds, AC (pers. obs., Apr 2022) in head of palm; [2]	FB	wind
<i>Gamochaeta simplicicaulis</i> *	la, Waitangi, front of Copthorne Hotel (2020) AK379559, on 1 of 3 palms recorded; [1]	FB	wind
<i>Geranium purpureum</i> *	occ, Ellerslie Racecourse grounds, AC (pers. obs., Sep 1998); [1]	FB	
<i>Griselinia lucida</i>	x1 shrub, Picton (2020) AK381686 (Fig. 27); [1]	H	bird
<i>Halleria lucida</i> *	x1 shrub, Auckland Domain, AC (1997) c.11m up trunk, branches at least 4m long, shared first wild record for New Zealand (see Cameron 1997); [1]	H	bird
<i>Hebe elliptica</i>	abun. seedlings, Cass Square, Hokitika township (2015) AK359162 (Fig. 8) (also see <i>iNaturalist</i>); [1]	FB	wind
<i>Hedera helix</i> *	occ, Ellerslie Racecourse grounds, AC (pers. obs., Sep 1998) on several of the taller palms present; x1, Hannahs Bay, Rotorua (pers. obs., Jan 2009) seedling, on 1 of 12 palms present; [2]	FB	bird
<i>Helminthotheca echioides</i> *	x1, Paritai Dr, Orakei, AC (pers. obs., Apr 2002) on root base; [1]	B	wind
<i>Hydrangea macrophylla</i> *	x1, near Clarks Beach, AC (2019) AK377919 – cultivated adult within 1m; [1]	FB	wind
<i>Hydrocotyle moschata</i>	Single large patch, Warkworth, AC (1998) trunk 3m tall, AK235021; [1]	FB	?
<i>Ilex aquifolium</i> *	x2, Mt Albert, AC (2007) AK299142; [1]	FB	bird
<i>Impatiens walleriana</i> *	occ, Pakatoa I., Hauraki Gulf, AC (2009) AK306379; lc on several palms, Ellerslie Racecourse grounds, AC (1996) AK297663 and (1998) to 2.5m up trunk, AK237854, once cult. in garden at base of palm? [2]	FB, B	explosive release
<i>Kunzea robusta</i>	x1, Hannahs Bay, Rotorua (pers. obs., Jan 2009) on 1 of 12 palms present; [1]	FB	wind
<i>Lactuca</i> ? <i>serriola</i> *	x1, Onehunga, AC (2002) AK257611, sterile, 1.5m above the ground; [1]	FB	wind
<i>Lavandula dentata</i> *	x1, Titoki St, by Auckland Domain, AC (2000) AK245690; [1]	B	?
<i>Lepidium didymum</i> *	loc, Parakai, AC (2000) on root base, AK248204; loc, Hannahs Bay, Rotorua (pers. obs., Jan 2009) on 2 of 12 palms present; [2]	FB, B	?
<i>Leptospermum scoparium</i> var. <i>incanum</i>	Seedlings, Waitiki Landing, Northland (2009) see AK306871; [1]	FB	wind

<i>Ligustrum lucidum</i> *	x1 shrub, Parakai, AC (pers. obs., Jun 1999); [1]	FB	bird
<i>Ligustrum sinense</i> *	x1, Warkworth, AC (1998) adjacent palm to AK235021; [1]	FB	bird
<i>Linaria purpurea</i> *	x1, Paritai Dr, Orakei, AC (pers. obs., Apr 2002) on root base; Ponsonby, AC (2003) see AK280179; occ, Picton (2020) see AK381686; [3]	FB, B	?
<i>Lobularia maritima</i> *	loc, Paritai Dr, Orakei, AC (pers. obs., Apr 2002) on root base; [1]	B	wind
<i>Lotus pedunculatus</i> *	x1, Hannahs Bay, Rotorua (2009) AK304371, hanging down from palm head; [1]	H	bird nesting material?
<i>Lysimachia arvensis</i> *	loc, Parakai, AC (pers. obs., Jun 2000) on root base; [1]	B	?
<i>Medicago polymorpha</i> *	occ, Balmoral, AC (2020) see AK379945, rock pigeons nesting above; [1]	B	bird nesting material?
<i>Melilotus indicus</i> *	Waitangi, front of Copthorne Hotel (2020) see AK379557, on 1 of 3 palms recorded; [1]	FB	?
<i>Metrosideros excelsa</i>	lc seedlings, Waitangi, front of Copthorne Hotel (2020) see AK379557, on 2 of 3 palms recorded; lc seedlings, Mangawhai Heads (pers. obs, Apr 2022) on 7 of 7 palms observed; x2, Warkworth, AC (1998) see AK235021; com, Waiwera, AC (pers. obs., Mar 2022) on 3 of 5 palms recorded (Fig. 4); com seedlings, Orewa, AC (pers obs., Mar 2022) on 10 of 11 palms observed; x1 large tree, Halls Beach, Northcote, AC (pers. obs., Nov 2021) (Fig. 15); loc, by Devonport library, AC (pers. obs., Aug 2015) small shrubs in several of the tall palms; several shrubs, Albert Park, AC (2002) AK256814; x3, Paritai Dr, Orakei, AC (2002) on same palm as AK256409 and also on two other adjacent palms; a few seedlings, Titoki St, by Auckland Domain, AC (2000) see AK245690; x1, Ellerslie Racecourse grounds, AC (pers. obs., Sep 1998); com, Mt Roskill, AC (pers. obs., Apr 2022) on 11 of 17 palms present, in the heads and root bases, shrubs to 3m tall, but mostly <1m; [12]	H, FB, T, B	wind
<i>Metrosideros kermadecensis</i> **	x1 shrub, St Heliers, AC (2012) AK333347; [1]	H	wind
<i>Montia procumbens</i> *	x1, Warkworth, AC (1998) see AK235021; [1]	FB	?
<i>Muehlenbeckia complexa</i>	x1 tangle, Orewa, AC (pers obs., Mar 2022) on 1 of 11 palms observed; loc, Hannahs Bay, Rotorua (pers. obs., Jan 2009) on 6 of 12 palms present; [2]	FB	bird
<i>Myoporum laetum</i>	x1 shrub, Parakai, AC (1999) AK283199; [1]	FB	bird
<i>Oxalis chnoodes</i> *	x1, Waitiki Landing, Northland (2009) AK306871; [1]	FB	explosive release
<i>Oxalis corniculata</i> *	lc, Te Atatu North, AC (1996) AK230352; lc, Ellerslie Racecourse grounds, AC (pers. obs., Sep 1998); loc, Hannahs Bay, Rotorua (pers. obs., Jan 2009) on 2 of 12 palms present; [3]	FB	explosive release
<i>Oxalis exilis</i>	lc, Hannahs Bay, Rotorua (pers. obs., Jan 2009) on 3 of 12 palms present; [1]	FB	explosive release
<i>Oxalis pes-caprae</i> *	lc, Balmoral, AC (2020) AK379945 (Fig. 28), has root bulbs and bulbils, but no seed set in NZ; rock pigeons nesting above; [1]	B	bird nesting material?
<i>Paraserianthes lophantha</i> *	x1 shrub, Esplanade Rd, Mt Eden, AC (pers. obs., c.1988) in head of tall palm; [1]	H	bird nesting material?
<i>Paulownia tomentosa</i> *	x1, Tuakau, AC (2011) AK327572; [1]	FB	wind
<i>Persicaria capitata</i> *	x2, Warkworth, AC (1998) see AK235021; com, Ellerslie Racecourse grounds, AC (pers. obs., Sep 1998) on several palms present; [2]	FB	?
<i>Persicaria</i> sp. *	loc, Hannahs Bay, Rotorua (pers. obs., Jan 2009) sterile, on 2 of 12 palms present; [1]	FB	?
<i>Phytolacca octandra</i> *	x1, Warkworth, AC (1998) on adjacent palm to AK235021; com, Ellerslie Racecourse grounds, AC (pers. obs., Apr 2022) in heads of many of the palms; near Clarks Beach, AC (2019) see AK377919; [3]	H, FB	bird

<i>Picris burbridgeae</i>	x1, Waitiki Landing, Northland (2009) AK322619, a threatened species – Nationally Vulnerable (de Lange et al. 2018); [1]	FB	wind
<i>Piper excelsum</i>	x1, Paritai Dr, Orakei, AC (pers. obs., Apr 2002) 1.3m up, on root base; [1]	B	bird
<i>Pittosporum crassifolium</i>	occ, Mangawhai Heads (pers. obs, Apr 2022) on 3 of 7 palms observed; occ, Orewa, AC (1996) AK226646 and com seedlings (pers obs., Mar 2022) on 9 of 11 palms observed; lc seedlings, Pakatoa I., Hauraki Gulf, AC (2009) see AK306378; occ, Balmoral, AC (2020) on root base, see AK379945; occ shrubs, Mt Roskill, AC (pers. obs., Apr 2022) on 4 of 17 palms present, both in the heads; Clarks Beach, AC (2017) see AK368936; [6]	H, FB, B	bird
<i>Pittosporum tenuifolium</i>	occ, Hannahs Bay, Rotorua (pers. obs., Jan 2009) on 2 of 12 palms present; [1]	FB	bird
<i>Plantago lanceolata</i> *	Waitangi, front of Copthorne Hotel (2020) see AK379557, on 1 of 3 palms recorded; lc, Parakai, AC (2000) on root base, AK248205; x1, Mt Roskill, AC (pers. obs., Apr 2022) on root base of 1 of 17 palms observed; Hannahs Bay, Rotorua (pers. obs., Jan 2009) on 1 of 12 palms present; [4]	FB, B	?
<i>Polycarpon tetraphyllum</i> *	Waitangi, front of Copthorne Hotel (2020) AK379557, on 1 of 3 palms recorded; loc, Orewa, AC (pers obs., Mar 2022) on 1 of 11 palms observed; x2, Mt Roskill, AC (pers. obs., Apr 2022) on 1 of 17 palms present, both on root bases; loc, Hannahs Bay, Rotorua (pers. obs., Jan 2009) on 2 of 12 palms present; [4]	FB, B	?
<i>Polygonum aviculare</i> *	x2, Hannahs Bay, Rotorua (2009) AK304172, on 1 of 12 palms present, 40cm up from ground; [1]	FB	?
<i>Primula malacoides</i> *	x1, Ellerslie Racecourse grounds, AC (1998) AK237822, 1m up trunk - once cult. in garden at base of palm? [1]	B	adjacent
<i>Prunus campanulata</i> *	loc, Hannahs Bay, Rotorua (pers. obs., Mar 2015) on 7 of 12 palms present; [1]	FB	bird
<i>Pseudognaphalium luteoalbum</i>	x1, Ponsonby, AC (2003) AK280183; loc, Hannahs Bay, Rotorua (pers. obs., Jan 2009) on 1 of 12 palms present; [2]	FB	wind
<i>Pseudopanax arboreus</i>	Several seedlings, Picton (2020) AK381682 (Fig. 23), also see AK381686 (Fig. 27); [1]	FB	bird
<i>Pseudopanax crassifolius</i> x <i>P. lessonii</i>	Many seedlings, Whanganui (2007) see AK299766; [1]	FB	bird
<i>Radermachera sinica</i> *	x1 seedling, St Peters School, AC (2006) AK297336 (Fig. 29) – 2m from an adult; [1]	FB	wind
<i>Rubus fruticosus</i> agg. *	loc, Hannahs Bay, Rotorua (pers. obs., 9 Jan 2009) on 3 of 12 palms present; through the head and down to ground, Rotorua Government Gardens (1998) AK235539, x2 palms like this; [2]	H, FB	bird
<i>Rumex acetosella</i> *	la, Hannahs Bay, Rotorua (2009) AK304107, on 4 of 12 palms present; [1]	FB	?
<i>Sagina apetala</i> *	lc, Hannahs Bay, Rotorua (pers. obs., 9 Jan 2009) on 1 of 12 palms present; [1]	FB	?
<i>Sagina procumbens</i> *	loc, Parakai, AC (pers. obs., Jun 2000) on root base; [1]	B	?
<i>Schefflera arboricola</i> *	x1 seedling, Ellerslie Racecourse grounds, AC (1998) AK237400, 2m up trunk – first wild record for New Zealand? [1]	FB	bird
<i>Schinus terebinthifolius</i> *	x1 shrub, Clarks Beach, AC (2017) AK368936; [1]	H	bird
<i>Senecio bipinnatisectus</i>	x1, Hannahs Bay, Rotorua (pers. obs., Jan 2009) on 1 of 12 palms present; [1]	FB	wind
<i>Senecio glomeratus</i>	x1, New Brighton main street, Christchurch (2020) AK381676; [1]	FB	wind
<i>Senecio skirrhodon</i> *	Ponsonby, AC (2003) see AK280179; [1]	FB	wind
<i>Senecio sylvaticus</i> *	loc, Hannahs Bay, Rotorua (2009) AK304173, 4 plants on 3 of 12 palms present; [1]	FB	wind
<i>Silene coronaria</i> *	loc, Ellerslie Racecourse grounds, AC (1998) 1m up trunk, AK237401, cultivated by palm base; [1]	B	?
<i>Silene gallica</i> *	x2, Orewa, AC (2022) AK384013, 0.5m from ground; [1]	FB	adjacent
<i>Solanum americanum</i>	lc, Waitangi, front of Copthorne Hotel (2020) AK379557, on several palms; loc, Hannahs Bay, Rotorua (pers. obs., Jan 2009) on 2 of 12 palms present; [2]	FB	bird

<i>Solanum chenopodioides</i> *	loc, Hannahs Bay, Rotorua (2009) AK304109, on 3 of 12 palms present; New Brighton main street, Christchurch (2020) see AK381676; [2]	H, FB	bird
<i>Solanum mauritianum</i> *	x2, Cornwall Park, AC (1997) on same palm as AK233158; x1, shrub, Van Damme's Lagoon, Mt Wellington, AC (pers. obs., May 1997) trunk 16m tall; [2]	FB	bird
<i>Solanum nigrum</i> *	loc, Waiwera, AC (pers. obs., Mar 2022) on 1 of 5 palms recorded; loc, Paritai Dr, Orakei, AC (pers. obs., Apr 2002) on root base; x1, St Peters School, AC (2006) see AK297336 (Fig. 29); x1, Cornwall Park, AC (1997) on same palm as AK233158; occ, Mt Roskill, AC (2022) AK384172, on 5 of 17 palms present, all on the root bases; occ, Van Damme's Lagoon, Mt Wellington, AC (pers. obs., May 1997) trunk 16m tall; [6]	FB, B	bird
<i>Sonchus oleraceus</i> *	loc, Mangawhai Heads (pers. obs, Apr 2022) on 4 of 7 palms observed; x2, Warkworth, AC (1998) see AK235021; occ, Orewa, AC (1996) see AK226646; occ, Parakai, AC (pers. obs., Jun 1999); occ, Paritai Dr, Orakei, AC (pers. obs., Apr 2002) on root base of two palms; x1, St Peters School, AC (2006) see AK297336; occ, Balmoral, AC (2020) see AK379945; x1, Ellerslie Racecourse grounds, AC (pers. obs., Sep 1998); occ, Mt Roskill, AC (pers. obs., Apr 2022) on 6 of 17 palms present, all on root bases; occ, Hannahs Bay, Rotorua (pers. obs., Jan 2009) on 4 of 12 palms present; occ, Picton (2020) on same palm as AK381682; [11]	FB, B	wind
<i>Stellaria media</i> *	lc, Hannahs Bay, Rotorua (pers. obs., Jan 2009) on 3 of 12 palms present; [1]	FB	?
<i>Syzygium smithii</i> *	x1, Cornwall Park, AC (1997) on same palm as AK233158, under a tall <i>S. smithii</i> ; [1]	FB	bird/gravity
<i>Taraxacum officinale</i> *	x1, Parakai, AC (pers. obs., Jun 2000) on root base; [1]	B	wind
<i>Toxicodendron succedaneum</i> *	x2, 65 Milton Rd, Mt Eden, Auckland (pers. obs., May 2022, Fig. 3) shrubs in and below the palm head; occ, Ellerslie Racecourse grounds, AC (pers. obs., Apr 2022, Fig. 5) just below head on several tall palms, also several wild shrubs by base of two different phoenix palms nearby (see AK384232); [2]	H, FB	bird
<i>Trifolium repens</i> *	la, Ohawini Bay, Whangaruru Harbour, Northland (2004) AK288318, clothing upper 2/3 of Phoenix trunk (2.5m tall); [1]	FB	?
<i>Vitex lucens</i>	x1, Cornwall Park, AC (1997) on same palm as AK233158, under a tall <i>V. lucens</i> ; [1]	FB	bird/gravity
MONOCOTYLEDONS			
<i>Agapanthus praecox</i> *	loc, Waiwera, AC (pers. obs. Mar 2022) on 1 of 5 palms recorded; Pakatoa I., Hauraki Gulf, AC (2009) see AK306378 (Fig. 26); loc, Parakai, AC (pers. obs., Jun 2000) on 3 palm bases; x4, Paritai Dr, Orakei, AC (2002) 80cm up AK256409; St Peters School, AC (2006) see AK297336; [4]	FB, B	wind
<i>Agrostis capillaris</i> *	lc, Hannahs Bay, Rotorua (pers. obs., Jan 2009) on 2 of 12 palms present; [1]	FB	bird nesting material?
<i>Aira caryophyllea</i> *	loc, Mangawhai Heads (2022) AK384188, on 2 of 7 palms observed, <1m up the trunk; [1]	FB	wind
<i>Allium triquetrum</i> *	Small clump, Parakai, AC (1999) AK283201, 1 m up from ground; [1]	FB	?
<i>Anthoxanthum odoratum</i> *	loc, Hannahs Bay, Rotorua (pers. obs., Jan 2009) on 1 of 12 palms present; [1]	FB	bird nesting material?
<i>Asparagus aethiopicus</i> cv. Sprengeri *	x1 Parakai, AC (1999) AK283203; [1]	FB	bird
<i>Asparagus asparagoides</i> *	Whanganui (2007) see AK299766; [1]	FB	bird
<i>Bromus catharticus</i> *	x1, Hannahs Bay, Rotorua (pers. obs., Jan 2009) on 2 of 12 palms present; [1]	FB	bird nesting material?
<i>Bromus lithobius</i> *	x1, Hannahs Bay, Rotorua (2009) AK304106, on 1 of 12 palms present; [1]	FB	bird nesting material?
<i>Chlorophytum comosum</i> *	lc, Ellerslie Racecourse grounds, AC (pers. obs., Apr 2022) probable identification, no voucher, just below head on tall palm (Fig. 5); [1]	FB	bird nesting material?

<i>Cordyline australis</i>	sca, Mangawhai Heads (pers. obs, Apr 2022) on 3 of 7 palms observed; x1, Parakai, AC (pers. obs., Jun 2000); x2, Pakatoa I., Hauraki Gulf, AC (2009) on same palm as AK306378; x2 seedlings, Paritai Dr, Orakei, AC (pers. obs., Apr 2002) on root base; x1, Cornwall Park, AC (1997) on same palm as AK233158; occ seedlings, Ellerslie Racecourse grounds, AC (pers. obs., Sep 1998 and Apr 2022); near Clarks Beach, AC (2019) see AK377919; loc, Hannahs Bay, Rotorua (pers. obs., Jan 2009) on 5 of 12 palms present; x1 seedling, Picton (2020) see AK381682; [9]	FB, B	bird
<i>Dianella nigra</i>	x4, Paritai Dr, Orakei, AC (2002) 50cm up, on same palm as AK256409; occ, Ellerslie Racecourse grounds, AC (pers. obs., Apr 2022) in the heads - identification needs confirming; x1, Hannahs Bay, Rotorua (pers. obs., Jan 2009) on 1 of 12 palms present; [3]	H, FB	bird
<i>Digitaria sanguinalis</i> *	loc, Paritai Dr, Orakei, AC (pers. obs., Apr 2002) on root base; [1]	B	bird nesting material?
<i>Earina mucronate</i>	x1, Hannahs Bay, Rotorua (pers. obs., Jan 2009) on 1 of 12 palms present; [1]	FB	wind
<i>Ehrharta erecta</i> *	lc, north of nursery, Motutapu I., Hauraki Gulf, AC, (Shelley Heiss-Dunlop, pers. comm. 2016) over the root base, sparrows in head of palm above; la, Balmoral, AC (2020) AK379946, on root base (Fig. 28), rock pigeons nesting above; occ, Cornwall Park, AC City (1997) on same palm as AK233158; x2, Ellerslie Racecourse grounds, AC (pers. obs., Apr 2022) in the head; Clarks Beach, AC (2017) see AK368936; [5]	H, FB, B	bird nesting material?
<i>Hedychium gardnerianum</i> *	x1 large clump, Mt Eden (1994) AK218625-26, stems 1.6m long; [1]	FB	bird
<i>Holcus lanatus</i> *	loc, Hannahs Bay, Rotorua (pers. obs., Jan 2009) on 8 of 12 palms present; [1]	FB	bird nesting material?
<i>Juncus edgariae</i>	x1, Paritai Dr, Orakei, AC, on root base (pers. obs., Apr 2002); [1]	B	?
<i>Lolium perenne</i> *	x1, Mt Roskill, AC, (pers. obs., Apr 2022) on 1 of 17 palms present, on top of root base; [1]	B	bird nesting material?
<i>Microlaena stipoides</i>	lc, Waiwera (pers. obs., Mar 2022) on 1 of 5 palms recorded; loc, Hannahs Bay, Rotorua (pers. obs., 9 Jan 2009) on 1 of 12 palms present; [2]	FB	bird nesting material?
<i>Phoenix canariensis</i> *	x1-lc, Mangawhai Heads (pers. obs., Apr 2022) on 3 of 7 palms observed; x1, Parakai, AC (1999) AK283198; x1, Orewa, AC (2022) AK384012; Clarks Beach, AC (2017) see AK368936; [4]	FB	bird/gravity?
<i>Phormium</i> sp.	loc, Picton (2020) on same palm as <i>Griselinia lucida</i> (AK381686); [1]	FB	wind
<i>Poa annua</i> *	Single clump, Parakai, AC (1999) AK283200; occ, Hannahs Bay, Rotorua (pers. obs., Jan 2009) on 9 of 12 palms present; [2]	FB	bird nesting material?
<i>Vulpia bromoides</i> *	loc, Hannahs Bay, Rotorua (pers. obs., Jan 2009) on 1 of 12 palms present; [1]	FB	bird nesting material?

Postscript

During a recent holiday in New South Wales, Australia, 25 May – 11 Jun 2022, the author observed six epiphytes and a bird (nesting?) on planted suburban *Phoenix canariensis* palms, all unvouchered, and all in the FB (frond base) region on the palms:

- Sydney, entrance to South Head Cemetery, 3 phoenix palms c.6 m trunks (1 dead-standing), ladder fern (*Nephrolepis cordifolia*) under the heads of the two living palms, and a rainbow lorikeet nesting (?) in the dead-standing trunk between the leaf bases (Fig. 30);
- Sydney, Diamond Bay, 38-40 Diamond Bay Road, single palm with c.7 m trunk, *Schefflera actinophylla* (2 m shrub on the trunk);
- Central Coast, North Entrance, single palm, 2.5 m trunk, patch of ladder fern on trunk;
- Port Stephens, entrance to Ingenia Holiday One Mile Beach, 8 palms in a row, trunks c.4 m, ladder fern (on several), *Ficus macrophylla* s.s. (on several), *Schefflera arboricola* (on 2 trunks, cultivated nearby), *Histiopteris incisa* (1 patch), *Davallia solida* (1 patch).

Comment – four of these six NSW epiphytes were also recorded for New Zealand; *Schefflera arboricola* appears to be an uncommon naturalisation for Australia; and ferns dominate this small sample as they do in New Zealand.



Fig. 30. Rainbow lorikeet nesting (?) in a recently dead standing *Phoenix canariensis* trunk, c.6 m-tall, at entrance to South Head Cemetery, Sydney, NSW Australia. Photo: 25 May 2022.

Corrigendum

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Page 67: In third paragraph, '*Lamium bienne*' should be '*Linum bienne*'.

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