



FLORA OF NEW ZEALAND
FERNS AND LYCOPHYTES

POLYPODIACEAE
(excluding *Notogrammitis*)



P.J. BROWNSEY & L.R. PERRIE

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Cover image: *Microsorium novae-zealandiae*, deeply 1-pinnatifid lamina with soral bulges and wavy margins on the lobes.

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Introduction

The family Polypodiaceae (excluding the grammitid ferns) is represented in New Zealand by three indigenous genera (*Loxogramme*, *Microsorium* and *Pyrrosia*) and five species, one naturalised genus (*Polypodium*) with a single species, and two casual genera (*Niphidium* and *Platycterium*) with one species each. *Pyrrosia eleagnifolia* and two species of *Microsorium* are widespread, but *M. novae-zealandiae* is confined to the North Island. *Loxogramme dictyopteris* occurs throughout the North Island and northern half of the South Island. *Polypodium vulgare* was first observed on the Port Hills, Christchurch, but has now spread aggressively north to Wellington. *Platycterium bifurcatum* and *Niphidium crassifolium* are known only from a few localities in northern New Zealand. Species of Polypodiaceae in New Zealand usually have long-creeping rhizomes, undivided to once-divided fronds, reticulate venation, and sporangia that are either arranged in round to ovate, bulging sori, or scattered over much of the lamina surface.

Polypodiaceae J.Presl & C.Presl, *Delic. Prag.*, 159 (1822)

Type taxon: *Polypodium* L.

Epiphytic, rupestral or terrestrial ferns. Rhizomes usually short- to long-creeping or rarely erect, scaly. Fronds monomorphic or dimorphic, usually articulated to rhizome. Laminae undivided, lobed or pinnate. Veins reticulate; areoles usually with free included veinlets, rarely without. Sori round or slightly elongate, on abaxial lamina surfaces, superficial or impressed into the lamina and bulging on upper surface, arranged in one or more rows either side of the costa or sporangia scattered over the lamina surface; paraphyses often present; exindusiate. Sporangia with vertical annulus, usually 64 spores per sporangium. Homosporous; spores monolete or rarely trilete, almost smooth to tuberculate, lacking chlorophyll.

Taxonomy: A family of about 35–40 genera, and 600 species (Smith et al. 2006, not including grammitid ferns).

The family Polypodiaceae is interpreted here according to Smith et al. (2006), although the grammitid ferns will be treated at a later date. Ranker et al. (2004) and Schneider et al. (2004) have shown that the grammitid ferns are nested within Polypodiaceae, even though they have a large number of morphological apomorphies.

The family (excluding grammitid ferns) is represented in New Zealand by three indigenous genera (*Loxogramme*, *Microsorium* and *Pyrrhosia*), one naturalised (*Polypodium*) and two casual (*Niphidium* and *Platyserium*).

The family name Polypodiaceae was attributed to Berchtold & Presl (1820) by Pichi Sermolli (1970). Berchtold & Presl treated Polypodiaceae at the rank of “řad” (order), but Pichi Sermolli argued that this should be regarded as equivalent to the modern family. However a change to the rules of botanical nomenclature at Vienna (Art. 18.2, Note 1, Ex. 4) specifically states that “names published at the rank of order (“řad”) by Berchtold & Presl (1820) are not to be treated as having been published at the rank of family, since the term family (“čeled”) was sometimes used to denote a rank below the rank of order”. The name Polypodiaceae was attributed to Presl & Presl by Smith et al. (2006).

1	Fertile laminae undivided	2
	Fertile laminae lobed, pinnatifid, pinnate or bifurcating	5
2	Sori usually in 2 to many rows either side of costa	3
	Sori in 1 row either side of costa	4
3	Lower surface of laminae densely covered in stellate hairs; veins obscure	<i>Pyrrhosia</i>
	Lower surface of laminae almost glabrous, lacking stellate hairs; veins prominent	<i>Niphidium</i>
4	Rhizomes erect, with proliferous roots; areoles of reticulate veins lacking free included veinlets; hydathodes absent	<i>Loxogramme</i>
	Rhizomes long-creeping, lacking proliferous roots; areoles of reticulate veins with free included veinlets; hydathodes visible on upper lamina surface	<i>Microsorium</i>
5	Fronds strongly dimorphic with specialised sterile basal (‘nest’) fronds and fertile foliage fronds; lamina dichotomously branched; sporangia scattered over apices of lamina segments	<i>Platyserium</i>
	Fronds sometimes dimorphic but specialised sterile basal (‘nest’) fronds absent; lamina pinnately branched or lobed; sporangia in discrete sori	6
6	Laminae deeply pinnatifid but not divided completely to rachis; lamina lobes entire or wavy but not toothed	<i>Microsorium</i>
	Laminae pinnate, divided completely to rachis at least in the basal third; pinna margins minutely serrate	<i>Polypodium</i>

Distribution: Mostly tropical but a few genera and species extending into temperate regions. Eight genera with nineteen species in New Zealand; four endemic.

Biostatus: Indigenous (Non-endemic).

Table 1: Number of species in New Zealand within *Polypodiaceae* J.Presl & C.Presl

Category	Number
Indigenous (Endemic)	3
Indigenous (Non-endemic)	2
Exotic: Fully Naturalised	1
Exotic: Casual	2
Total	8

***Loxogramme* (Blume) C.Presl, Tent. Pterid., 214 (1836)**

= *Anarthropteris* Copel., *Gen. Fil.*, 217 (1947)

Type taxon: *Loxogramme lanceolata* (Sw.) C.Presl

Etymology: From the Greek *loxos* (oblique), and *gramme* (a line), a reference to the sori which are mostly elongate and oblique to the costa.

Epiphytic or rupestral ferns. Rhizomes erect (NZ) to long-creeping (not NZ), scaly. Rhizome scales clathrate, squarrose. Fronds monomorphic (NZ) to dimorphic (not NZ), articulation evident or not, undivided, herbaceous to coriaceous, virtually glabrous. Veins reticulate; areoles with (not NZ) or without free included veinlets (NZ); hydathodes absent. Sori mostly elongate, or rarely round, sometimes partly impressed into the lamina and bulging on upper surface, arranged in one row either side of midrib (NZ) or often confluent with age (not NZ), often confined to upper part of frond; paraphyses present as narrow scales (NZ) or absent (not NZ); exindusiate. Spores monoletate, bilaterally symmetrical, granulate.

Taxonomy: A genus of about 34 species (Hennipman et al. 1990).

The monotypic genus *Anarthropteris* was created by Copeland (1947) with the New Zealand species, *A. lanceolata*, as the sole representative. Thus construed, *Anarthropteris* was one of only three fern genera (all monotypic) endemic to New Zealand (Brownsey et al. 1985; Brownsey & Smith-Dodsworth 2000). Copeland considered it closely related to *Loxogramme*, but distinguished by its more or less round sori, distinctive receptacular scales, and spore morphology. However, all these characters are highly variable within *Loxogramme*. Recently, Kreier & Schneider (2006) have shown, based on DNA sequences from four chloroplast genome regions, that *Anarthropteris* is nested within *Loxogramme*, and is better treated in the latter genus. When treated in *Loxogramme*, the correct name for the New Zealand species is *L. dictyopteris* (Mett.) Copel. (Kreier & Schneider 2006), which is adopted here.

Loxogramme scolopendrioides (Gaud.) C.V.Morton was erroneously recorded for New Zealand by earlier authors but is now excluded (Morton 1973).

Distribution: Mostly tropical but a few species extending into south temperate regions; one in Central America, four in Africa, two in the Pacific, and the majority in Malesia. One species endemic to New Zealand.

Biostatus: Indigenous (Non-endemic).

Table 2: Number of species in New Zealand within *Loxogramme* (Blume) C.Presl

Category	Number
Indigenous (Endemic)	1
Total	1

Cytology: n = 35, 36, 37 (Hennipman et al. 1990).

***Loxogramme dictyopteris* (Mett.) Copel., Univ. Calif. Publ. Bot. 14: 369 (1929)**

≡ *Polypodium dictyopteris* Mett., *Ann. Sci. Nat. Bot. sér. 4* 15: 77 (1861)

≡ *Anarthropteris dictyopteris* (Mett.) Copel., *Gen. Fil.*, 218 (1947)

Lectotype (selected by Brownsey & Perrie 2012): Plate 409 in *Icones Plantarum* (Hooker 1842).

= *Dictyopteris lanceolata* J.Sm., *J. Bot. (Hooker)* 4: 64 (1841) nom. nud.

≡ *Anarthropteris lanceolata* (J.Sm.) L.B.Moore in Allan, *Fl. New Zealand* 1, 1010 (1961) nom. illeg.

= *Dictymia lanceolata* Hook.f., *Bot. Antarct. Voy. II (Fl. Nov.-Zel.) Part II*, 43 (1854)
≡ *Polypodium cunninghamii* Hook., *Gard. Ferns*, t. 30 (1862) nom. nov. pro *Dictymia lanceolata* Hook.f. 1854
≡ *Anarthropteris lanceolata* (Hook.f.) Pic.Serm., *Webbia* 29: 13 (1975)
Lectotype (selected by Brownsey & Perrie 2012): New Zealand, J.D. Hooker, K 000501466!

Etymology: From the Greek *dictyon* (a net), and *pteris* (a fern), in reference to the venation.

Vernacular name: lance fern

Low epiphytic or rupestral fern; tufted. Rhizomes erect, scaly, bearing proliferous roots. Rhizome scales clathrate, narrowly ovate, 2–7 mm long, 0.5–1 mm wide, squarrose, brown, entire. Stipes indistinct from lamina, not obviously articulated to rhizome. Fronds undivided, narrowly elliptic to narrowly obovate, 40–360 mm long, 4–35 mm wide; apex acuminate or sometimes acute; margins entire or rarely slightly toothed; base attenuate to an indistinct winged stipe; adaxial surface dark green; abaxial surface slightly paler; herbaceous to coriaceous; glabrous except for widely scattered scales at the base. Costa prominent on upper surface; veins reticulate; areoles without free included veinlets; hydathodes absent. Sori round or slightly elongate, 3–7 mm long, partly impressed into lamina forming low bulges on adaxial surface, in 1 row either side of the costa, closer to costa than margin, usually confined to distal half of frond; paraphyses present as very narrow clathrate scales ca. 3 cells wide; exindusiate.

Distribution: North Island: Northland, Auckland, Volcanic Plateau, Gisborne, Taranaki, Southern North Island.

South Island: Western Nelson, Sounds-Nelson, Westland, Canterbury.

Chatham Islands.

Altitudinal range: 0–600 m.

Common throughout coastal and lowland regions, extending locally into montane areas of the North Island, from near sea level to c. 600 m, but largely absent from high country areas in Taranaki, Volcanic Plateau and Gisborne. In the South Island, it is mostly confined to coastal areas of the Marlborough Sounds and Nelson, up to c. 250 m, extending as far south as Lake Kaniere on the west coast, and Banks Peninsula on the east coast.

Biostatus: Indigenous (Endemic).

Habitat: A low epiphyte on trunks and fallen logs, or on acidic and calcareous rocks and banks, in damp shaded parts of coastal and lowland broadleaved forest; sometimes in shaded hollows of open scoria. It covers large areas on trunks or rocks owing to its proliferous roots, but rarely occurs far above ground level. It often wilts conspicuously in dry weather.

Recognition: This species is easily recognised by its undivided fronds, and large, exindusiate, round or slightly elongate sori. The proliferous roots, giving rise to new plants at intervals, can be confused for a creeping rhizome, but the species has an erect rhizome which distinguishes it from *Pyrrosia eleagnifolia* and juvenile plants of *Microsorium* species. It can be further distinguished from *Pyrrosia* by its glabrous lamina, and from *Microsorium* species by its lack of free, included veinlets in the areoles.

Occasional aberrant fronds are found, either crested at the apices or with the lamina divided into short, lateral segments.

Cytology: n = 37 (Brownlie 1958, as *Anarthropteris dictyopteris*).

Notes: This species has a complex taxonomic history, documented by Pichi Sermolli (1975). The earliest name, *Polypodium attenuatum* R.Br., used by Richard (1832), was a misidentification for what is now known as *Dictymia brownii* (Wikstr.) Copel., but was in any case illegitimate because of a previously published homonym. The species was first validly described as *Dictymia lanceolata* by Hooker (1855) but when transferred to *Loxogramme*, Copeland (1929a) had to base his new combination on a later name, *Polypodium dictyopteris* Mettenius (1861), because the combination based on *D. lanceolata* was pre-occupied in *Loxogramme*. However, when he transferred it again to his new genus *Anarthropteris*, Copeland (1947) incorrectly used the combination *Anarthropteris dictyopteris*, overlooking the earlier binomial, *Dictymia lanceolata*. Moore (in Allan 1961) established

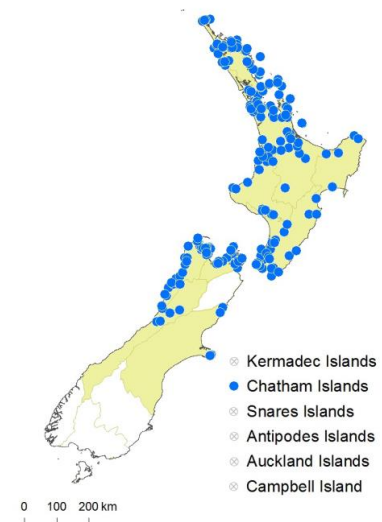


Fig. 1: *Loxogramme dictyopteris* distribution map based on databased records at AK, CHR and WELT.

the correct combination, *Anarthropteris lanceolata*, but attributed the species name incorrectly to J. Smith, rather than J.D. Hooker. This error was corrected by Pichi Sermolli (1975) who established the correct name, *Anarthropteris lanceolata* (J.Sm. ex Hook.f.) Pic.Serm. However, when treated in *Loxogramme*, the correct name is *L. dictyopteris* (Mett.) Copel. (Kreier & Schneider 2006).



Fig. 2: *Loxogramme dictyopteris*: juvenile and mature plants growing on rock.



Fig. 3: *Loxogramme dictyopteris*: plants colonising a rock outcrop.



Fig. 4: *Loxogramme dictyopteris*: soral bulges on upper side of undivided lamina.



Fig. 5: *Loxogramme dictyopteris*: underside of lamina with large, ovate, exindusiate sori.

***Microsorium* Link, Hort. Reg. Bot. Berol. 2, 110 (1833)**

= *Phymatosorus* Pic.Serm., *Webbia* 28: 457 (1973)

Type taxon: *Microsorium punctatum* (L.) Copel.

Etymology: From the Greek *mikros* (small), and *soros*, indicating the small sori of some species, notably the type.

Epiphytic, rupestral or terrestrial ferns. Rhizomes long-creeping (NZ) or short-creeping (not NZ), scaly. Rhizome scales clathrate, squarrose or appressed. Fronds monomorphic or dimorphic, articulated to short stalks (phyllodia) at intervals along the rhizome. Laminae undivided, variously lobed or deeply 1-pinnatifid, herbaceous to coriaceous, virtually glabrous. Veins reticulate, usually forming 1–3 series of areoles between costa and lobe margin; areoles with free included veinlets, ending in hydathodes. Sori round or slightly elongate, superficial or impressed into the lamina and bulging on upper surface, arranged in one row either side of costa (NZ) or in more than one row or scattered over the lamina surface (not NZ), not confluent with age, occurring throughout the lamina; paraphyses absent (NZ) or sometimes present as simple uniseriate hairs (not NZ); exindusiate. Spores monolete, bilaterally symmetrical, granulate to tuberculate.

Taxonomy: A genus of about 50 species when interpreted broadly (Nootboom 1997).

Generic boundaries in this group of ferns remain unclear, and the taxonomy has been complicated by nomenclatural errors. Two principal generic names have been applied to the group – *Microsorium* Link and *Phymatosorus* Pic.Serm. The former is often incorrectly spelled *Microsorium* but that is an orthographic variant of the original name and should not be used (Bosman 1986). The latter is a replacement name for the earlier *Phymatodes* C.Presl which is illegitimate (Pichi Sermolli 1973).

Copeland (1947) reluctantly included both groups within *Microsorium* even though he felt the types of these genera were “too unlike to be included in any natural genus”. Nevertheless he was unable to find any way to satisfactorily separate them. Bosman (1991) proposed a more restricted circumscription of *Microsorium*, distinguishing it from the other microsoroid genera, *Colysis*, *Leptochilus*, *Neocheiropteris* and *Phymatosorus*. In particular, *Phymatosorus* was distinguished from *Microsorium* by having more than five pairs of lamina lobes, anadromous rather than catadromous tertiary veins, a different arrangement of the sori on the veins, and sori sometimes sunk in the lamina. Following Bosman’s revision, the name *Phymatosorus* was quite widely adopted for the three species present in New Zealand. However, some of the diagnostic characters of *Phymatosorus* have been questioned in a later treatment of the microsoroid ferns by Nootboom (1997) who reverted to a broader interpretation of *Microsorium*.

Molecular evidence suggests that *Microsorium* is polyphyletic (Schneider et al. 2004). Moreover, *M. punctatum* and *M. scolopendria*, the types of *Microsorium* and *Phymatosorus* respectively, occur in the same core microsoroid clade, whereas the three New Zealand taxa belong in a separate clade, along with species of *Lecanopteris*. Whilst the former group might be treated as *Microsorium sens. str.*, the latter group has no satisfactory name available at present (Schneider et al. 2006). Hence, a broad interpretation of *Microsorium* is adopted here until such time as a clearer phylogeny of the group can be determined, and robust generic boundaries identified. This is consistent with the approach taken in Australia where two of the New Zealand species also occur (Bostock & Spokes 1998).

- 1 Rhizomes usually < 4 mm diameter; laminae dull green, herbaceous, exuding musky aroma when fresh, extending 10–150 mm below lowest pinna lobe *scandens*
Rhizomes usually > 4 mm diameter; laminae bright green, coriaceous, lacking musky aroma when fresh, extending 5–40 mm below lowest pinna lobe 2
- 2 Rhizome scales appressed, blackish-brown; laminae highly dimorphic, from undivided to deeply 1-pinnatifid; hydathodes prominent on upper surface *pustulatum*
Rhizome scales squarrose, orange-brown; laminae usually monomorphic, deeply 1-pinnatifid; hydathodes inconspicuous on upper surface
..... *novae-zealandiae*

Distribution: Mostly tropical but a few species extending into south temperate regions; six in Africa, eight in Australia, ca. 20 in the Pacific, and the majority in Asia from India and China to Malesia. One species endemic and two indigenous in New Zealand.

Biostatus: Indigenous; wild.

Table 3: Number of species in New Zealand within *Microsorium* Link

Category	Number
Indigenous (Endemic)	1
Indigenous (Non-endemic)	2
Total	3

Cytology: n = 36, 37 (Hennipman et al. 1990).

Microsorium novae-zealandiae (Baker) Copel., *Gen. Fil.*, 196 (1947)

as "*Microsorium novae-zealandiae*"

≡ *Polypodium novae-zealandiae* Baker in Hooker, *Hooker's Icon. Pl.* 17, t: 1674 (1886)

≡ *Phymatodes novae-zealandiae* (Baker) Pic.Serm., *Webbia* 8: 222 (1951)

≡ *Phymatosorus novae-zealandiae* (Baker) Pic.Serm., *Webbia* 28: 459 (1973)

Lectotype (selected by Brownsey & Perrie 2012): Pirongia Mt, Upper Waikato district, N[ew] Zealand, T.F. Cheeseman, 'rec'd 5/77', K! (photo WELT E470/20).

Etymology: *novae-zealandiae* (Latin) – from New Zealand.

Epiphytic or occasionally terrestrial; creeping or climbing ferns. Rhizomes long-creeping, 4–10 mm diameter, scaly. Rhizome scales clathrate, ovate, 5–15 mm long, 1.5–2.5 mm wide, squarrose, orange-brown, virtually entire. Fronds 150–900 mm long. Stipes 40–330 mm long, pale brown, glabrous except for very scattered scales at base. Laminae deeply 1-pinnatifid to almost pinnate at base, ovate to elliptic, 100–470 mm long, 60–270 mm wide, extending 5–20 mm below the lowest lobe, bright green, coriaceous, glabrous. Lamina lobes in 1–25 pairs, 45–180 mm long, 5–15 mm wide, straight or slightly falcate, acuminate, margins entire or wavy, widest at base or at middle. Veins reticulate, forming 1–2 series of areoles between costa and lobe margin; hydathodes usually inconspicuous on adaxial surface of lamina. Sori round or slightly elongate, 2–4 mm long, superficial or impressed into lamina forming low bulges on adaxial surface, in 1 row on either side of the costa, closer to the lobe margin; paraphyses absent; exindusiate.

Distribution: North Island: Auckland, Volcanic Plateau, Gisborne, Taranaki, Southern North Island.

Altitudinal range: 350–1300 m.

Confined to montane forests of the North Island from Coromandel to the southern Tararua range, generally from 350–1300 m. South of Mt Taranaki and the Volcanic Plateau, the species occurs only as disjunct populations in the southern Tararua range, and is known from just one collection in the Ruahine range (WELT P022827).

Biostatus: Indigenous (Endemic).

Habitat: Usually epiphytic, occasionally on fallen logs, in damp montane forests of the North Island. It is found in a range of podocarp, beech and broadleaved forest.

Recognition: This species can be confused with *M. pustulatum*, especially when young. However, it is generally a larger plant, rarely if ever produces undivided fronds, and has very distinctive, spreading, orange-brown rhizome scales. Hydathodes on the upper lamina surface are present but inconspicuous. The thicker rhizomes (> 4 mm diameter), distinctive rhizome scales, coriaceous lamina and bright green colour distinguish it from *M. scandens*.

Cytology: n = 37 (de Lange et al. 2004).

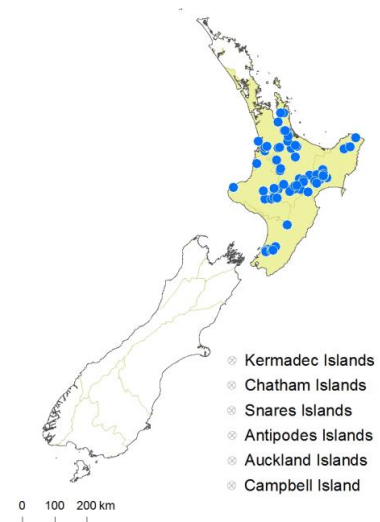


Fig. 6: *Microsorium novae-zealandiae* distribution map based on databased records at AK, CHR and WELT.



Fig. 7: *Microsorium novae-zealandiae*: plant growing epiphytically at the base of a tree trunk.



Fig. 8: *Microsorium novae-zealandiae*: deeply 1-pinnatifid lamina with soral bulges and wavy margins on the lobes.



Fig. 9: *Microsorium novae-zealandiae*: creeping rhizome with crowded, squarrose, orange-brown scales.



Fig. 10: *Microsorium novae-zealandiae*: with squarrose, orange-brown rhizome scales.

***Microsorium pustulatum* (G.Forst.) Copel., *Gen. Fil.*, 196 (1947)**

as "*Microsorium pustulatum*"

≡ *Polypodium pustulatum* G.Forst., *Fl. Ins. Austr.*, 81 (1786)

≡ *Phymatosorus pustulatus* (G.Forst.) Large, Braggins & P.S.Green, *New Zealand J. Bot.* 30: 207 (1992) — as *Phymatosorus pustulatum*

Lectotype selected by Pichi Sermolli 1951: New Zealand, *G. Forster*, BM 000066256!

= *Polypodium scandens* Labill., *Nov. Holl. Pl.* 2, 91, t.240 (1807) nom. illeg.

≡ *Polypodium diversifolium* Willd., *Sp. Pl.* 5 (1), 166 (1810) nom. nov. pro *Polypodium scandens* Labill. 1807 (non *Polypodium scandens* G.Forst. 1786)

≡ *Microsorium diversifolium* (Willd.) Copel., *Univ. Calif. Publ. Bot.* 16: 114 (1929) — as *Microsorium diversifolium*

≡ *Pleopeltis diversifolia* (Willd.) Melvaine, *Proc. Linn. Soc. New South Wales* 61: 120 (1936)

≡ *Phymatodes diversifolium* (Willd.) Pic.Serm., *Webbia* 8: 222 (1951)

≡ *Phymatosorus diversifolius* (Willd.) Pic.Serm., *Webbia* 28: 459 (1973)

Lectotype (selected by Brownsey & Perrie 2012): Nova Hollandia, [Tasmania], J.J.H.de Labillardière, FI 004209 (image!)

= *Polypodium billardierei* R.Br., *Prodr. Fl. Nov. Holland.*, 147 (1810)
 ≡ *Phymatodes billardierei* (R.Br.) C.Presl, *Tent. Pterid.*, 196 (1836)
 ≡ *Chrysopteris billardierei* (R.Br.) Link, *Fil. Spec.*, 123 (1841)
 ≡ *Drynaria billardierei* (R.Br.) J.Sm., *Companion Bot. Mag. New Ser.* 2: 14 (1846)
 ≡ *Pleopeltis billardierei* (R.Br.) T.Moore, *Index Fil.*, lxxviii (1857)
 ≡ *Polypodium scandens* var. *billardierei* (R.Br.) F.Muell., *Veg. Chatham Isl.*, 69 (1864)
 Lectotype (selected by Tindale 1961): Port Dalrymple, [Tasmania], *R. Brown Iter Austral.* 11, Jan. 1804, BM 001038373!

Etymology: From the Latin *pustulatus* (having pustules), a reference to the impressed sori forming bulges on the upper lamina surface.

Vernacular names: hound's tongue; kōwaowao; pāraharaha

Biostatus: Indigenous (Non-endemic).

Microsorium pustulatum* (G.Forst.) Copel., *Gen. Fil.*, 196 (1947) subsp. *pustulatum

Vernacular names: hound's tongue; kōwaowao; pāraharaha

Epiphytic and terrestrial; creeping or climbing fern. Rhizomes long-creeping, 3–11 mm diameter, scaly. Rhizome scales clathrate, ovate, 3–7 mm long, 1–2 mm wide, mostly appressed but with the tips sometimes squarrose, blackish-brown, entire. Fronds 45–750 mm long. Stipes 10–350 mm long, pale to chocolate brown, glabrous or with very scattered scales. Laminae very varied, from undivided or variously lobed to deeply 1-pinnatifid; undivided laminae (fertile) narrowly elliptic, 35–220 mm long, 6–30 mm wide, or (sterile) longer and broader, up to 260 mm long and 70 mm wide; lobed or pinnatifid laminae (fertile) ovate to elliptic or broadly ovate to broadly elliptic, 50–425 mm long, 35–350 mm wide, or (sterile) up to 420 mm long and 300 mm wide; lamina extending 5–40 mm below the lowest lobe, bright glossy green, coriaceous, glabrous or with scattered scales on the costae. Lamina lobes (fertile) in 1–15 pairs, 25–185 mm long, 4–30 mm wide, or (sterile) less numerous and wider, in up to 10 pairs and up to 60 mm wide; straight, acute to acuminate, margins entire or wavy, widest about the middle. Veins reticulate, forming 2–3 series of areoles between costa and lobe margin; hydathodes conspicuous on adaxial surface of lamina. Sori round or rarely elliptic, 2.5–5 mm wide, impressed into lamina forming low bulges on adaxial surface, in 1 row either side of costa, medial or closer to the lobe margin; paraphyses absent; exindusiate.

Distribution: North Island: Northland, Auckland, Volcanic Plateau, Gisborne, Taranaki, Southern North Island.

South Island: Western Nelson, Sounds-Nelson, Marlborough, Westland, Canterbury, Otago, Southland, Fiordland.

Kermadec Islands, Three Kings Islands, Chatham Islands, Solander Island, Stewart Island, Antipodes Islands, Auckland Islands.

Altitudinal range: 0–900 m.

Abundant throughout the North Island from near sea-level to c. 700 m; more common in coastal and lowland regions of the South Island, extending locally to c. 900 m but largely absent from inland high country regions and much of Otago.

Also Australia (Queensland, NSW, ACT, Victoria, Tasmania), Norfolk Island.

Biostatus: Indigenous (Non-endemic).

Habitat: Creeping and often covering extensive areas on the ground, growing over rocks or fallen logs, on cliffs and banks, or epiphytic on native and naturalised trees. Occurs in coastal to montane forest, pine forest, scrub, scoria and open areas, usually in slightly drier habitats, extending into subalpine scrub in the southern South Island.

Recognition: This is the commonest and most variable of the three species of *Microsorium* in New Zealand. It can be distinguished by its thick rhizomes (> 4 mm diameter) with appressed blackish-brown scales, its very variable fronds

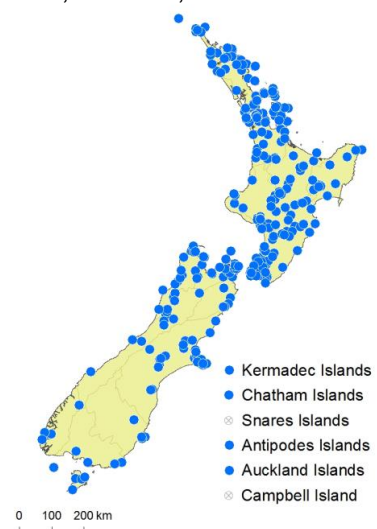


Fig. 11: *Microsorium pustulatum* subsp. *pustulatum* distribution map based on databased records at the Allan Herbarium, Auckland War Memorial Museum and Te Papa Tongarewa.

(Brownsey & Smith-Dodsworth 2000), coriaceous and bright glossy green laminae, conspicuous veins and hydathodes on the upper lamina surface, and broad lamina lobes.

Occasional aberrant forms are found – either crested at the apices or with 2-pinnatifid laminae.

Only one subspecies is present in New Zealand. *Microsorium pustulatum* subsp. *howense* (Tindale et P.S.Green) Bostock is recognised as endemic to Lord Howe Island (Green 1994). It is distinguished by having rhizome scales which are abruptly acuminate and 1.5–3.3 mm wide, laminae which are usually divided to the rachis into adnate pinnae, and sori which are deeply sunken into the lamina and usually either submarginal or about one third of the way to the costa.

Cytology: $n = 37$ (Brownlie 1954, as *Microsorium diversifolium*).

Notes: This species has been widely known as *Phymatosorus diversifolius* (e.g. Brownsey & Smith-Dodsworth 2000), *Microsorium diversifolium* (e.g. Crookes 1963) or *Phymatodes diversifolium* (e.g. Allan 1961), combinations based on *Polypodium diversifolium* Willd. collected in Tasmania by Labillardière. An earlier basionym, *Polypodium pustulatum* G.Forst., was for many years considered a “*species dubia*” because of the inadequate type specimen lacking a rhizome, which could not be distinguished as either *diversifolium* or *novae-zealandiae* (Pichi Sermolli 1951). However, on the basis of spore morphology Large et al. (1992a) showed conclusively that the specimen is the same as the former, and that the name *P. pustulatum* should take priority. Hence the species is now recognised as *Microsorium pustulatum* (Large et al. 1992a, 1992b).

Robert Brown’s *Polypodium billardieri*, and names based on his type from Port Dalrymple, are later synonyms. The name *Polypodium phymatodes* L. used by Richard (1832) is a misidentification.



Fig. 12: *Microsorium pustulatum*: mature plant growing terrestrially showing diversity of lamina shape.



Fig. 13: *Microsorium pustulatum*: prominent reticulate veins, white hydathodes and soral bulges on upper side of lamina.



Fig. 14: *Microsorium pustulatum*: underside of lamina with large, round or ovate, exindusiate sori and prominent reticulate veins.



Fig. 15: *Microsorium pustulatum*: thick, creeping rhizome with widely spaced, blackish-brown, appressed rhizome scales.



Fig. 16: *Microsorium pustulatum*: juvenile frond with reticulate venation and free included veinlets ending in hydathodes.

***Microsorium scandens* (G.Forst.) Tindale, *Amer. Fern J.* 50: 241 (1960)**

as "*Microsorium scandens*"

≡ *Polypodium scandens* G.Forst., *Fl. Ins. Austr.*, 81 (1786)

≡ *Phymatodes scandens* (G.Forst.) C.Presl, *Tent. Pterid.*, 196 (1836)

≡ *Drynaria scandens* (G.Forst.) Fée, *Mém. Foug.*, 5. *Gen. Filic.*, 271 (1852)

≡ *Phymatosorus scandens* (G.Forst.) Pic.Serm., *Webbia* 28: 459 (1973)

Lectotype (selected by Tindale 1961): *G. Forster*, BM 000066255!, labelled Society Islands but probably from New Zealand.

Etymology: From the Latin *scandens* (climbing), referring to the habit.

Vernacular names: fragrant fern; mokimoki

Epiphytic and terrestrial; creeping or climbing fern. Rhizomes long-creeping, 2–4 mm diameter, wiry, scaly. Rhizome scales clathrate, narrowly triangular in the upper part but abruptly widened to a broadly ovate base, 3–6 mm long, 0.5–2 mm wide (at base), squarrose, blackish-brown, entire. Fronds 45–620 mm long. Stipes 5–120 mm long, pale brown, glabrous or with scattered scales. Laminae very varied, from undivided or variously lobed to deeply 1-pinnatifid; undivided laminae narrowly ovate to narrowly elliptic or linear, 40–430 mm long, 3–25 mm wide; lobed or pinnatifid laminae narrowly ovate to narrowly elliptic or occasionally ovate to elliptic, 110–540 mm long, 25–190 mm wide; lamina extending 10–160 mm below the lowest lobe, dull dark green, herbaceous, glabrous or with scattered scales along the costae. Lamina lobes in 1–20 pairs, 15–105 mm long, 3–11 mm wide, straight or slightly falcate, acuminate, margins entire or wavy, widest at base. Veins reticulate, forming 1–2 series of areoles between costa and lobe margin; hydathodes usually inconspicuous on adaxial surface of lamina. Sori round or slightly elongate, 1–3 mm long, superficial or impressed into lamina forming low bulges on adaxial surface, in 1 row close to lobe margin on either side of the costa; paraphyses absent; exindusiate.

Distribution: North Island: Northland, Auckland, Volcanic Plateau, Gisborne, Taranaki, Southern North Island.

South Island: Western Nelson, Sounds-Nelson, Westland, Canterbury.

Chatham Islands.

Altitudinal range: 0–800 m.

Common from near sea level in coastal and lowland areas of the North Island, extending locally to 800 m in montane forest, but absent from high country areas in Taranaki, Volcanic Plateau and Gisborne. In the South Island, largely confined to coastal areas of the Marlborough Sounds, Nelson and Westland, extending locally to 500 m and as far south as Haast. Absent from most of the east coast except for an outlying population on Banks Peninsula.

Also Australia (Queensland, NSW, Victoria), Lord Howe Island.

Biostatus: Indigenous (Non-endemic).

Habitat: Creeping on the ground, over rocks or on banks, climbing trees, or epiphytic. Common in a wide range of coastal and lowland scrub and forest, usually in damper habitats.

Recognition: This species can be distinguished from the other species of *Microsorium* in New Zealand by its thin (<4 mm diameter) wiry rhizome with small squarrose blackish-brown scales, thinner dull green laminae, occasional scales along the rachis and costae, and generally smaller sori. It also has a musky scent when fresh, as reflected in its common name.

Occasional aberrant forms are found – either crested at the apices or with bifid laminae.

Cytology: n = 37 (Brownlie 1958, as *Microsorium pustulatum*).

Notes: This fern has been widely misidentified by earlier New Zealand authors as *Polypodium pustulatum*, *Phymatodes pustulata* or *Microsorium pustulatum* (see Brownsey et al. 1985).

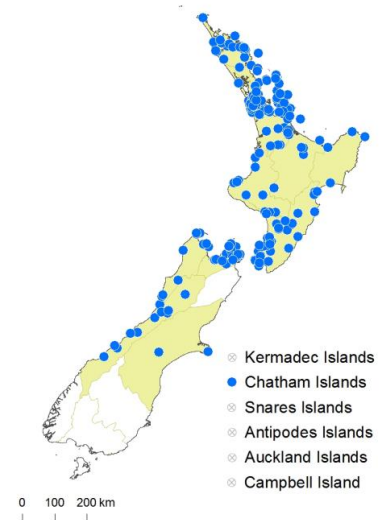


Fig. 17: *Microsorium scandens* distribution map based on databased records at AK, CHR and WELT.



Fig. 18: *Microsorium scandens*: mature plant growing epiphytically on tree fern trunk.



Fig. 19: *Microsorium scandens*: thin, creeping rhizome with crowded, squarrose, blackish-brown, rhizome scales.



Fig. 20: *Microsorium scandens*: underside of lamina with small, round or ovate, exindusiate sori and obscure veins.

***Niphidium* J.Sm., *Hist. Fil.*, 99 (1875)**

Type taxon: *Niphidium americanum* (Hook.) J.Sm.

Epiphytic or terrestrial ferns. Rhizomes short to long-creeping, scaly. Rhizome scales clathrate, squarrose. Fronds monomorphic, articulated to rhizome, undivided, coriaceous, virtually glabrous. Veins reticulate; areoles with free included veinlets; hydathodes often present. Sori round or slightly elongate, superficial, arranged in single rows of 5–12 between the main lateral veins, not confluent with age; paraphyses present as abortive sporangia; exindusiate. Spores monoete, bilaterally symmetrical, smooth to slightly papillate.

Taxonomy: A genus of 10 species (Lellinger 1972).

Distribution: A neotropical genus occurring from Cuba and Mexico to Argentina and Uruguay. One species casual in New Zealand.

Biostatus: Exotic; casual.

Table 5: Number of species in New Zealand within *Niphidium* J.Sm.

Category	Number
Exotic: Casual	1
Total	1

***Niphidium crassifolium* (L.) Lellinger, *Amer. Fern J.* 62: 106 (1972)**

≡ *Polypodium crassifolium* L., *Sp. Pl.*, 1083 (1753)

Lectotype (selected by Lellinger 1972): Petiver, *Pterigraphia Americana* t. 6, f. 1 (1712).

Etymology: From the Latin *crassus* (thick, fleshy), and *-folium* (leaved), a reference to the coriaceous lamina.

Distribution: North Island: Auckland.

Known only from one locality in Auckland.

Occurs naturally in tropical America from Cuba to Brazil and Guyana (Lellinger 1972).

Biostatus: Exotic; casual.

Habitat: Recorded as a cultivation escape on scoria boulders near a cultivated parent plant.

First record: Heenan et al. (2008, p. 263). Voucher: AK 289667, 2004.

Recognition: This species can be recognised by its short creeping rhizome, entire, glabrous and coriaceous fronds, narrowly elliptic to narrowly obovate laminae, prominent veins, round sori arranged in single rows of 6–10 between the main lateral veins, presence of paraphyses in the sori, and short hairs on the sporangia.

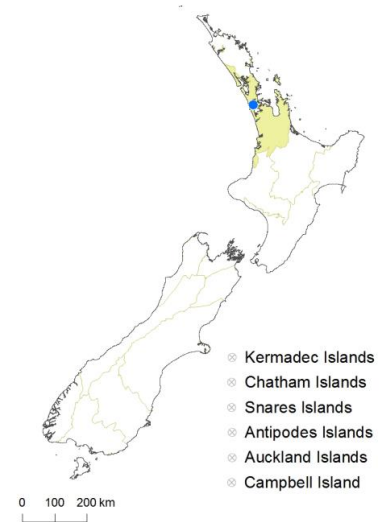


Fig. 21: *Niphidium crassifolium* distribution map based on databased records at AK, CHR and WELT.

***Platycterium* Desv., Mém. Soc. Linn. Paris 6: 213 (1827)**

Type taxon: *Platycterium alicorne* Desv.

Etymology: From the Greek *platys* (flat or broad), and *keras* (a horn), a reference to the fertile fronds resembling the horns of a stag.

Epiphytic ferns. Rhizomes short-creeping, scaly. Rhizome scales non-clathrate, chaffy. Fronds dimorphic; basal fronds sterile, cordate, overlapping, appressed, entire or variously lobed, becoming brown with age, forming a 'nest' or 'basket'; upper foliage fronds sterile or fertile, articulated to rhizome, dichotomously branched, strap-like, coriaceous, covered with stellate hairs. Major veins dichotomously branched; minor veins reticulate; areoles with or without free included veinlets; hydathodes absent. Sporangia in dense patches on various parts of the abaxial lamina surface; paraphyses present as stellate hairs; exindusiate. Spores monoletate, bilaterally symmetrical, plain to tuberculate.

Taxonomy: A genus of about 18 species (Hennipman & Roos 1982, Bostock & Spokes 1998).

Distribution: Pantropical with one species in South America, six in Africa and Madagascar, eight in south east Asia, and four in Australia. One species casual in New Zealand.

Biostatus: Exotic; casual.

Table 6: Number of species in New Zealand within *Platycterium* Desv.

Category	Number
Exotic: Casual	1
Total	1

***Platycterium bifurcatum* (Cav.) C.Chr., Index Filic., 496 (1906)**

≡ *Acrostichum bifurcatum* Cav., *Anales Hist. Nat.* 1: 105 (1799)

Holotype: Port Jackson [Sydney, New South Wales], L. Née, MA 475361-1,2,3 (images!)

Etymology: From the Latin *bifurcatus* (divided into equal limbs), a reference to the dichotomously branching lamina.

Vernacular names: elk's-horn fern; staghorn fern

Distribution: North Island: Northland, Auckland, Volcanic Plateau.

Known from Russell, Mt Maunganui and a few collections around Auckland.

Occurs naturally in Australia (Queensland, New South Wales) and Lord Howe Island (Bostock & Spokes 1998).

Biostatus: Exotic; casual.

Habitat: Recorded as a perching epiphyte on branches of *Cordyline australis* (cabbage tree), *Metrosideros excelsa* (pōhutukawa), *Ficus macrophylla* (Moreton Bay fig) and *Eriobotrya japonica* (loquat) in urban areas where it is likely to have spread from nearby cultivated plants.

First record: Heenan et al. (2004, p. 803). Voucher: CHR 247069, 1971.

Recognition: This species is easily recognised by its perching, epiphytic habit and strongly dimorphic fronds, with sterile, appressed, orbicular to reniform, basal 'nest' fronds, and fertile, pendulous, dichotomously dividing, aerial fronds. The lamina segments are strap-shaped and densely covered in stellate hairs. The major veins divide dichotomously, but the minor veins are reticulate; the areoles lack free included veinlets, and hydathodes are absent. Sporangia form dense patches on the lamina between the apex and the first fork, paraphyses are present as stellate hairs, and indusia are lacking.

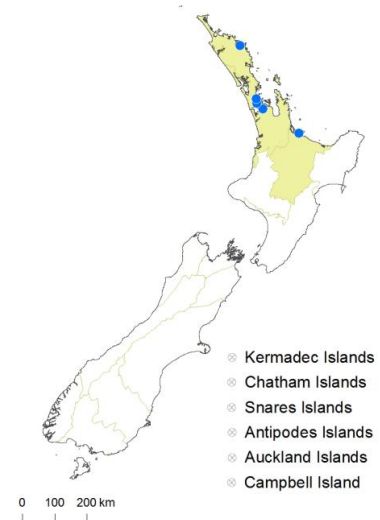


Fig. 22: *Platycerium bifurcatum* distribution map based on databased records at AK, CHR and WELT.



Fig. 23: *Platycerium bifurcatum*: cultivated plant showing strongly dimorphic leaves, with sterile reniform appressed "nest" leaves and pendulous dichotomously dividing fertile fronds.



Fig. 24: *Platycerium bifurcatum*: fertile cultivated plant growing on an exotic tree in an urban area.



Fig. 25: *Platycerium bifurcatum*: strap-shaped fertile fronds on a cultivated plant showing dichotomously dividing veins and dense patches of sporangia between the apex and the first fork.



Fig. 26: *Platycerium bifurcatum*: cultivated plant growing on an exotic oak tree in an urban area.

***Polypodium* L., Sp. Pl., 1082 (1753)**

Type taxon: *Polypodium vulgare* L.

Etymology: From the Greek *polys* (many), and *podion* (foot), a reference to the scars left when fronds fall off the rhizome, suggesting a centipede with many feet.

Vernacular name: polypody

Epiphytic, rupestral or terrestrial ferns. Rhizomes short (not NZ) to long-creeping (NZ), scaly. Rhizome scales non-clathrate, squarrose. Fronds monomorphic to dimorphic, articulated to rhizome. Laminae undivided (not NZ) to 1-pinnatisect (NZ), herbaceous to coriaceous, usually glabrous. Veins reticulate (NZ) or free (not NZ); areoles with free included veinlets; hydathodes absent. Sori round or slightly elongate, superficial, arranged in 1 (NZ) or 2 rows (not NZ) either side of midrib, not confluent with age, occurring throughout the lamina; paraphyses present (not NZ) or absent (NZ); exindusiate. Spores monolete, bilaterally symmetrical, verrucate to tuberculate and sometimes papillate.

Taxonomy: A poorly defined genus of about 200 species (Hennipman et al. 1990).

The treatment of *Polypodium* follows Brownsey in Webb et al. (1988) and Brownsey & Smith-Dodsworth (2000) in recognising a single naturalised species in New Zealand. However, Gilbert (1899) described one new species, *Polypodium viride*, and one new variety, *Polypodium vulgare* var. *auritum*, from New Zealand. These taxa were based on specimens collected by Dr C.H.F. Peters, astronomer-in-chief on the Transit of Venus expedition to New Zealand in 1874. Peters was based in Queenstown and whilst waiting for an observatory to be built he collected ferns for Benjamin Gilbert back in America. Some 25 years later, Gilbert described a new species and variety based on these collections, but they have been largely ignored ever since.

Morton (1958) wrote a short paper on the two names, having succeeded in locating the Gilbert herbarium, previously thought to have been lost. He illustrated the holotype of *P. viride* and suggested that it was the common polypody of the eastern USA – *Polypodium vulgare* var. *virginianum* (now treated as a distinct tetraploid species, *P. virginianum* L.). Since no other species of *Polypodium* were then known from New Zealand, Morton concluded that Gilbert had described the species from American material inadvertently mixed up with Peters' New Zealand collections. He made no comment about the identity of the other taxon, *P. vulgare* var. *auritum*.

The fact that *Polypodium* is now known to be naturalised in New Zealand, albeit a long way from Queenstown, suggests the possibility that Peters's collection may be the first known record. It also raises the question of whether the Canterbury and Wellington populations are correctly as identified as *P. vulgare* rather than the closely related *P. virginianum*. However, the latter species can be identified by its very distinctive paraphyses which are almost as large as the sporangia and characteristically gland-tipped (see Shivas 1961). Morton (1958) noted that these paraphyses were present in the type specimen of *P. viride*, confirming the identity of that plant as *P. virginianum*. However, plants from

Canterbury and Wellington lack these paraphyses and are a different species. It is very likely, therefore, that Morton was correct, and that *P. viride* is actually an American specimen of *P. virginianum* which became mixed up with Gilbert's New Zealand specimens.

Both of Gilbert's names were excluded from the New Zealand flora by Brownsey & Perrie (2012).

Distribution: Widely distributed in the Americas, and across Eurasia extending south to the Himalayas, Taiwan and southern Africa. The majority of species occur in the American tropics. One species naturalised in New Zealand.

Biostatus: Exotic; fully naturalised.

Table 7: Number of species in New Zealand within *Polypodium* L.

Category	Number
Exotic: Fully Naturalised	1
Total	1

Cytology: n = 37, 74; 2n = 74, 111, 148 (Hennipman et al. 1990).

Polypodium vulgare L., Sp. Pl., 1085 (1753)

Lectotype (selected by Jonsell & Jarvis 1993): Herb. Burser XX: 44, UPS (*n.v.*).

Etymology: From the Latin *vulgare* (common), a reference to the plant in its native range.

Vernacular name: common polypody

Rupestrial or terrestrial; creeping fern. Rhizomes long-creeping, 4–7 mm diameter, scaly. Rhizome scales non-clathrate, ovate, 2–6 mm long, 0.5–2 mm wide, squarrose, orange-brown, entire or toothed towards the apex. Fronds 100–550 mm long. Stipes 20–250 mm long, not winged except near base of lamina, yellow-brown, glabrous. Laminae 1-pinnatisect, ovate to narrowly elliptic, 100–300 mm long, 50–120 mm wide, mid-green turning yellow-green with age, herbaceous to coriaceous, glabrous except for widely scattered scales at base. Pinnae in 9–25 pairs, 30–70 mm long, 6–11 mm wide, oblong, apices obtuse, margins minutely serrate, decurrent at base, adnate to rachis. Veins reticulate, usually forming 1 series of areoles between costa and lobe margin; hydathodes absent. Sori round or slightly elongate, 1–3.5 mm long, superficial and not or only slightly bulging on adaxial surface, in 1 row on either side of the costa, medial or closer to the costa; paraphyses absent; exindusiate.

Distribution: North Island: Southern North Island.

South Island: Canterbury.

Altitudinal range: 0–700 m.

A European and Asian species first recorded from the Port Hills of Christchurch (Lovis 1980). It was first observed in the 1960s and is now spreading aggressively in that area, being widespread from Godley Head to Gebbies Pass, on Quail Island, and on parts of Banks Peninsula. More recently it has also been collected from several sites in Canterbury between Christchurch and Kaikoura, as far inland as the Amuri Range, and from Hongoeka Bay north of Porirua (Shepherd & Perrie 2006). It occurs from near sea level around Wellington, to over 700 m in the North Canterbury hills.

Biostatus: Exotic; fully naturalised.

Habitat: On coastal cliffs, road banks, volcanic rock bluffs, and on greywacke rock under dry scrub or shrub or forest vegetation.

First record: Lovis (1980, p. 56). Voucher: CHR 323300, 1976.

Recognition: This species is superficially similar to species of *Microsorium*. It can be distinguished by the lamina, at least in its lower third, being divided right to the rachis to form distinct pinnae, whereas in *Microsorium* the lamina is only ever pinnatifid. Also, the pinna margins are minutely serrate, in contrast to the entire margins in *Microsorium*.

Cytology: Lovis (1980) determined that plants from the Port Hills were "tetraploid" (i.e. n = 74), but no explicit count was given.

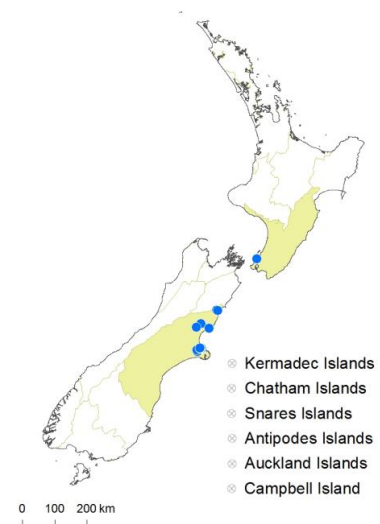


Fig. 27: *Polypodium vulgare* distribution map based on databased records at AK, CHR and WELT.

Notes: In Europe the *Polypodium vulgare* aggregate consists of three cytologically and morphologically distinct species. Lovis (1980) concluded that the New Zealand plants were not entirely consistent with any of these three taxa, but that their tetraploid nature and micro-morphological characters suggested they were referable to *P. vulgare sens. str.* They also lack the distinctive gland-tipped paraphyses of the tetraploid American species, *P. virginianum*.

Polypodium vulgare is a major component of Horny Goat Weed, a Chinese medicine which claims a variety of aphrodisiacal and medical benefits. There is at least one report of deliberate transfer of this species from Christchurch to the Hawke's Bay region to grow for medicinal purposes.

Active control of this aggressive weed is being attempted in the Christchurch area, and dispersal to other parts of the country is strongly discouraged.



Fig. 28: *Polypodium vulgare*: pinnatisect lamina of mature plant showing soral bulges on upper surface.



Fig. 29: *Polypodium vulgare*: underside of pinnatisect lamina with round, exindusiate sori.

***Pyrrhosia* Mirb., *Hist. Nat. Pl.* 4, 70 (1803)**

= *Cyclophorus* Desv., *Mag. Neuesten Entdeck. Gesammten Naturk. Ges. Naturf. Freunde Berlin* 5: 300, t. 7, fig. 4 (1811)

= *Niphobolus* Kaulf., *Enum. Filic.*, 124 (1824) nom. illeg.

Type taxon: *Pyrrhosia chinensis* Mirb. = *Pyrrhosia stigmosa* (Sw.) Ching

Etymology: From the Greek *pyrrhos* (tawny), a reference to the colour of the hairs on the frond.

Epiphytic or rupestral ferns. Rhizomes long-creeping (NZ) or short-creeping (not NZ), densely scaly. Rhizome scales non-clathrate, squarrose (NZ) or appressed (not NZ). Fronds monomorphic or dimorphic, articulated to short stalks (phyllopodia) at intervals along the rhizome. Laminae undivided, thick, coriaceous to succulent, covered with stellate hairs. Veins obscure; hydathodes absent. Sori round or slightly elongate, superficial or partly impressed into the lamina, arranged in one to many rows either side of midrib, sometimes confluent with age, often confined to distal part of lamina; paraphyses present as stellate hairs; exindusiate. Spores monolete, bilaterally symmetrical, verrucate to tuberculate.

Taxonomy: A genus of about 50 species.

Pyrrhosia was revised by Hovenkamp (1986) and his treatment is followed here.

Distribution: Three species in Africa, four in Australia, six in the Pacific, and the majority in Asia from India and China to Malesia and New Guinea. One species indigenous to New Zealand.

Biostatus: Indigenous; wild.

Table 8: Number of species in New Zealand within *Pyrrhosia* Mirb.

Category	Number
Indigenous (Endemic)	1
Total	1

Cytology: n = 36, 37, 74, 108–111 (Hovenkamp 1986).

***Pyrrrosia eleagnifolia* (Bory) Hovenkamp, *Blumea* 30: 208 (1984)**

≡ *Polypodium eleagnifolium* Bory in Duperrey, *Voy. Monde, Crypt.*, 259, t. 31, f. 1 (1829)

Holotype: Baie des Isles [Bay of Islands], New Zealand, Lesson, L (Hovenkamp 1986)

= *Polypodium rupestre* var. *sinuatum* Colenso, *Trans. & Proc. New Zealand Inst.* 17: 257 (1885)

Lectotype (selected by Brownsey & Perrie 2012): Dannevirke, W. Colenso, AK 850!

Etymology: From *elaegnus* (olive), and *folium* (leaf), a reference to the nature of the frond.

Vernacular names: leather-leaf fern; ota

Epiphytic and terrestrial; creeping and climbing ferns. Rhizomes long-creeping, 0.75–2 mm diameter, scaly. Rhizome scales non-clathrate, narrowly ovate, 2–7 mm long, 0.5–1 mm wide, squarrose, orange-brown when young, entire or sometimes denticulate. Stipes winged for most of their length and indistinct from the attenuate lamina base. Fronds undivided, very varied in shape; the sterile almost orbicular to elliptic, obovate or spatulate, 20–180 mm long (including stipe), 11–31 mm wide; the fertile narrowly obovate to spatulate or sometimes narrowly elliptic to linear, 30–260 mm long (including stipe), 4–20 mm wide; apex obtuse to rounded; margins entire; base attenuate to an indistinct stipe; dark green; coriaceous to succulent; scattered stellate hairs on adaxial surface, densely covered in fawn or rarely silver coloured stellate hairs on abaxial surface. Veins obscure; hydathodes absent. Sori round or slightly elongate, 2–4 mm long, superficial or partly impressed into the lamina but not or rarely bulging on adaxial surface, irregularly arranged in 2–5 rows (rarely 1) either side of midrib, rarely almost confluent with age, occasionally confined to distal part of lamina; paraphyses present as stellate hairs; exindusiate.

Distribution: North Island: Northland, Auckland, Volcanic Plateau, Gisborne, Taranaki, Southern North Island.

South Island: Western Nelson, Sounds-Nelson, Marlborough, Westland, Canterbury, Otago, Southland, Fiordland.

Kermadec Islands, Three Kings Islands, Chatham Islands, Stewart Island.

Hovenkamp (1986) cites one specimen from Norfolk Island (*A. Cunningham* 33, U), but Green (1994) asserts that only one species, *P. confluens*, is present on the island.

Altitudinal range: 0–900 m.

Common in lowland to montane areas throughout, from sea level to about 900 m. Uncommon in inland parts of the South Island, especially Otago.

Biostatus: Indigenous (Endemic).

Habitat: This is a very tough and adaptable fern which can survive dry conditions due to its fleshy frond, dense covering of hairs and reduced lamina area. It occurs on rocks, logs, scoria and banks, and as an epiphyte on branches and trunks of native, naturalised and cultivated trees. It is found from exposed coastal situations to sheltered forest, in a wide range of scrub, beech, podocarp and broadleaved forest types.

Recognition: This species is easily recognised by its thick, fleshy, undivided fronds, dense covering of usually fawn-coloured stellate hairs, and exindusiate sori normally arranged in several rows either side of the midrib.

Very occasional aberrant fronds are found with lobed or bifid fronds, and sometimes the rhizome apices are fastigiately divided into multiple growing tips. The latter has been attributed to a gall-forming mite, *Aceria* sp. (Hovenkamp 1986, p. 178).

Cytology: n = 37 (Brownlie 1961, as *Pyrrrosia serpens*).

Notes: New Zealand plants were previously referred to *P. serpens* (G.Forst.) Ching, but that species has larger sori in just 1–2 rows either side of the costa. The confusion arose because Forster identified New Zealand as the type locality for *P. serpens*, but his specimen is not conspecific with the local

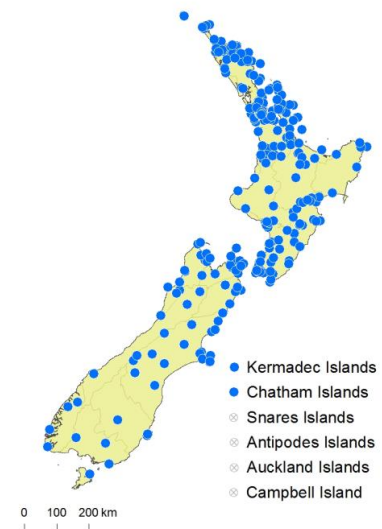


Fig. 30: *Pyrrrosia eleagnifolia* distribution map based on databased records at AK, CHR and WELT.

species. It was probably collected on one of the Pacific islands, and the specimen mis-labelled (Hovenkamp 1986). *P. serpens* occurs across the Pacific from New Caledonia to Pitcairn Island.

Pyrrrosia eleagnifolia has been widely misidentified in earlier New Zealand literature under the names *Polypodium stellatum* Vahl, *Polypodium serpens* G.Forst., *Niphobolus bicolor* Kaulf., and *Polypodium rupestre* R.Br. (and combinations based on them).

Hovenkamp (1986) noted that specimens from the Kermadec Islands have rhizome scales that are more strongly dentate than those from elsewhere. Sometimes, they also have larger sterile fronds with silver coloured hairs (e.g. AK 234205). Whether these differences warrant taxonomic recognition needs further investigation.



Fig. 31: *Pyrrrosia eleagnifolia*: mature plants growing epiphytically on fallen tree fern trunk.



Fig. 32: *Pyrrrosia eleagnifolia*: rounded sterile and elongate fertile fronds borne on long creeping rhizomes.



Fig. 33: *Pyrrrosia eleagnifolia*: underside of lamina with ovate, exindusiate sori and a dense covering of stellate hairs.

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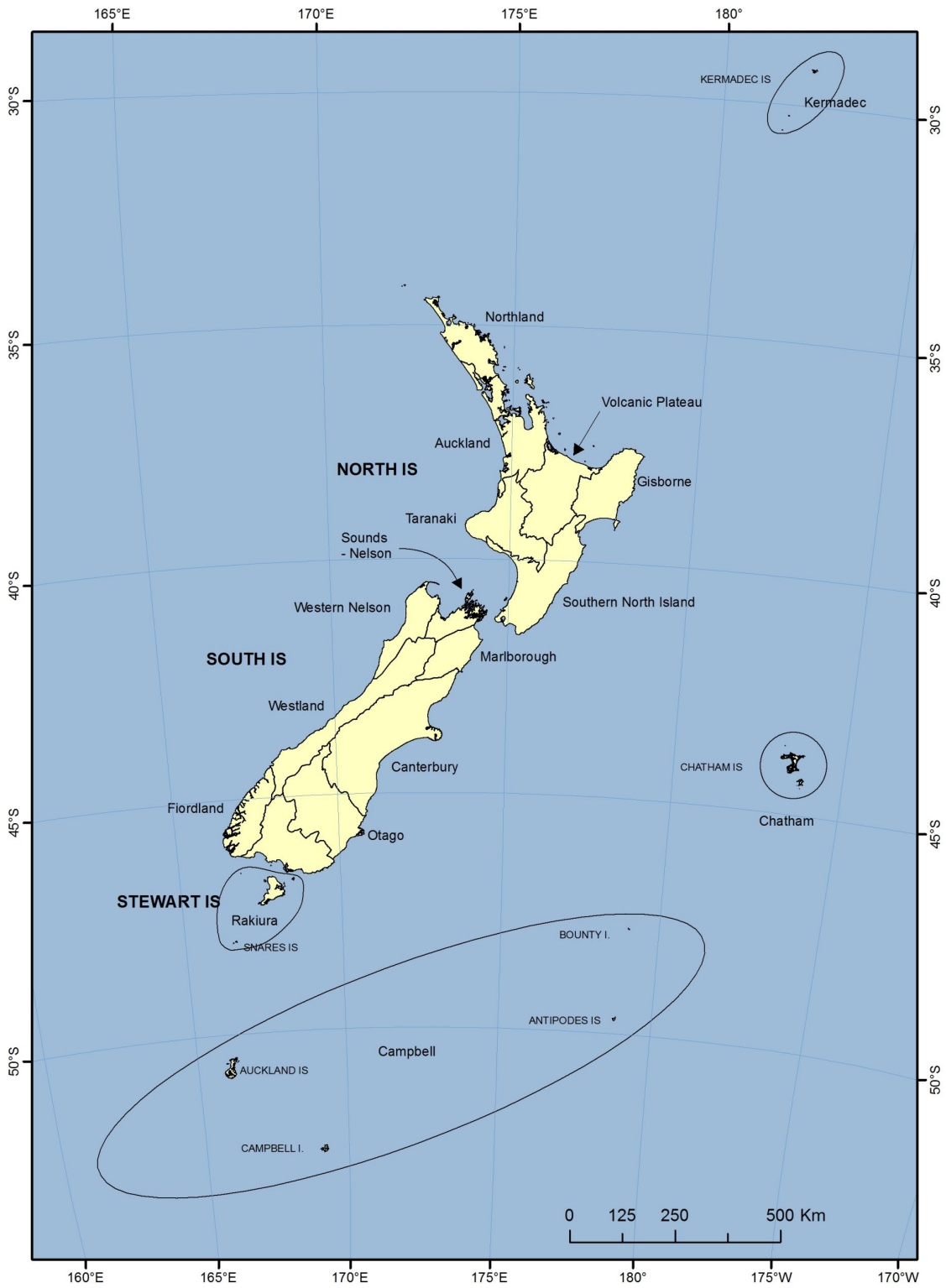
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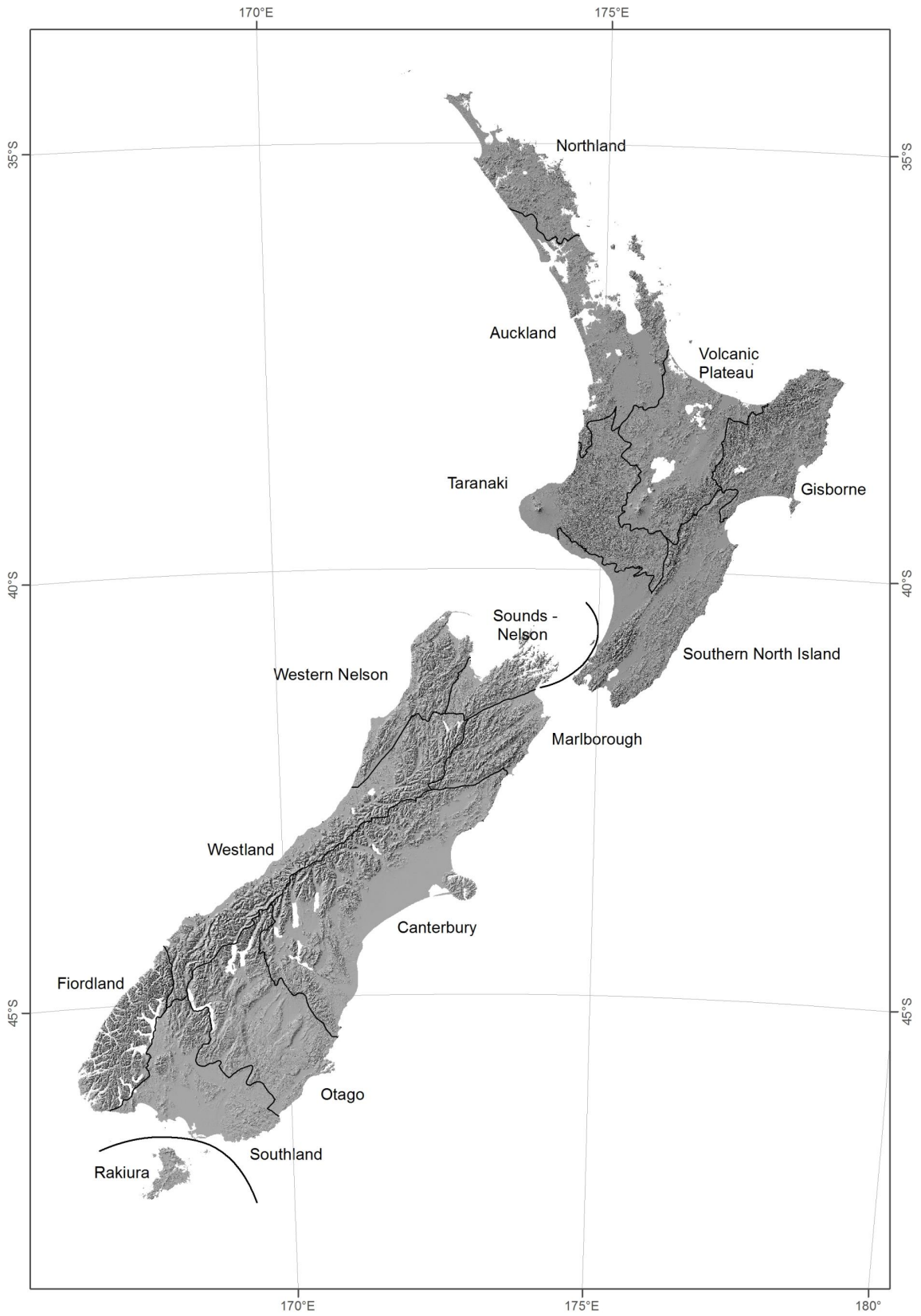
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Map 1: Map of New Zealand and offshore islands showing Ecological Provinces



Map 2: Map of New Zealand showing Ecological Provinces

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