

# FLORA OF NEW ZEALAND

## FERNS AND LYCOPHYTES

### DENNSTAEDTIACEAE



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**P.J. BROWNSEY & L.R. PERRIE**

Fascicle 19 – JUNE 2018

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Cover image: *Hypolepis millefolium*. Mature 3-pinnate-pinnatifid frond.

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## Introduction

Dennstaedtiaceae is a medium-sized family widespread in tropical and temperate regions. It is represented in New Zealand by five indigenous genera (*Histiopteris*, *Hypolepis*, *Leptolepia*, *Paesia* and *Pteridium*) and two that are naturalised (*Dennstaedtia* and *Microlepia*). Most of the species are opportunist plants of open, disturbed areas. *Histiopteris*, *Paesia* and *Pteridium* are each represented by a single widespread non-endemic species, whilst *Dennstaedtia* and *Microlepia* are each known from one casual species. *Leptolepia* is currently regarded as a monotypic genus endemic to New Zealand, but it nests in one of the clades of the polyphyletic *Dennstaedtia*, which requires further investigation; the sole species is distinctive in being confined to shaded forest habitats. Only *Hypolepis* with seven species, four of them endemic, shows significant diversity, varying both morphologically and cytologically. *Hypolepis ambigua* and *H. rufobarbata* are both widespread species whilst *H. distans* is widespread in the North Island but largely confined to the west coast of the South Island. *Hypolepis dicksonioides* and *H. lactea* are both more common in the northern half of the country, whereas *H. millefolium* is a montane to subalpine species more widespread in the south. *Hypolepis amaurorhachis* is a rare species confined to the far south of the South Island and subantarctic islands.

All members of the family in New Zealand are terrestrial ferns with long-creeping rhizomes. They generally have highly divided laminae and are characterised by bearing multicellular, glandular and non-glandular hairs. *Histiopteris* is exceptional in being glabrous except for a few scales on the rhizomes and stipes. All species have marginal or submarginal sori that are either more or less round, or elongated along the lamina margins, and indusia that are either attached at the base opening towards the margin, more or less cup-shaped, or are formed from the inrolled lamina margin.

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## **Dennstaedtiaceae** Lotsy, *Vortr. Bot. Stammesgesch.* 2, 655 (1909)

= *Hypolepidaceae* Pic.Serm., *Webbia* 24: 705 (1970)

**Type taxon:** *Dennstaedtia* Bernh.

Terrestrial or rupestral ferns. Rhizomes often long-creeping or occasionally short-creeping, usually bearing multicellular hairs, or rarely scales and unicellular hairs (in *Histiopteris*). Fronds monomorphic, not articulated to rhizome. Laminae usually 2–5-pinnate, rarely 1-pinnate (not NZ), anadromous, herbaceous or coriaceous, usually hairy or rarely glabrous, lacking scales. Veins usually free or rarely anastomosing without free included veinlets. Sori round, or extending laterally, or almost continuous around the lamina margin, superficial or on a slightly raised receptacle, borne on abaxial surface, marginal or submarginal; paraphyses present or absent; indusia ovate and attached at base, or half-cup- or cup-shaped and attached at base and sides, or with a pseudoindusium (formed from the modified recurved lamina margin) sometimes also with an inner indusium, or indusia absent; sporangial maturation mixed. Sporangia with vertical or slightly oblique annulus, usually 64 spores per sporangium. Homosporous; spores monolete or trilete, lacking chlorophyll; perispores variably sculptured.

**Taxonomy:** A family of 10 genera and about 265 species (PPG 1 2016). Kramer (1990) included the Lindsaeoid ferns within the Dennstaedtiaceae, recognising a broad family of about 16 genera. However, molecular analyses (Wolf et al. 1994; Wolf 1995; Der et al. 2009; Lehtonen et al. 2010) showed that the two groups belonged to different clades and should be recognised as the separate families Dennstaedtiaceae and Lindsaeaceae. Smith et al. (2006) listed the genera *Blotiella*, *Coptodipteris*, *Dennstaedtia*, *Histiopteris*, *Hypolepis*, *Leptolepia*, *Microlepia*, *Monachosorum*, *Oenotrichia*, *Paesia*, and *Pteridium* within Dennstaedtiaceae, but Yuehong et al. (2013) reduced the monotypic *Coptodipteris* to synonymy in *Dennstaedtia*. Perrie et al. (2015) confirmed that *Oenotrichia* belongs in the Dennstaedtiaceae, but also showed that *Dennstaedtia* and *Saccoloma* are both not monophyletic. *Dennstaedtia* forms two distinct clades within Dennstaedtiaceae, while *Saccoloma* forms one clade within Dennstaedtiaceae and one outside. Further work is needed to delimit the genera within the family.

- |   |   |                     |
|---|---|---------------------|
| 1 | Sori discrete, ± round, near lamina margins.....  | 2                   |
|   | Sori ± continuous around lamina margins.....  | 5                   |
| 2 | Sori unprotected, or protected only by inrolled lamina flaps opening away from margin; inner indusia absent; spores monolete.....   | <i>Hypolepis</i>    |
|   | Sori protected by membranous indusia opening towards margin, or by cup-shaped or bivalvate indusia formed from a true inner indusium and modified marginal lamina flap; spores trilete..... | 3                   |
| 3 | Sori submarginal; indusia ovate, attached to lamina at base with two free lateral margins.....  | <i>Leptolepia</i>   |
|   | Sori marginal or submarginal; indusia cup-shaped, or half cup-shaped and attached to lamina by base and sides.....  | 4                   |
| 4 | Sori marginal; indusia cup-shaped; spores coarsely ridged or reticulate.....  | <i>Dennstaedtia</i> |
|   | Sori submarginal; indusia half cup-shaped, attached by base and sides to lamina; spores smooth or echinate.....   | <i>Microlepia</i>   |
| 5 | Laminae glabrous, usually glaucous; pinnae sessile; veins anastomosing; scales present on rhizome and base of stipe.....  | <i>Histiopteris</i> |
|   | Laminae hairy, never glaucous; pinnae stalked; veins free; scales absent from rhizome and base of stipe.....  | 6                   |
| 6 | Glandular hairs present on stipes and laminae.....  | <i>Paesia</i>       |
|   | Glandular hairs absent on stipes and laminae.....   | <i>Pteridium</i>    |

**Distribution:** A worldwide family, mostly tropical but with several species in southern temperate regions and some in the northern temperate zone (Kramer 1990). The greatest diversity is found in the Old World tropics; 29 species in Africa (Roux 2009), 52 in China (Yuehong et al. 2013), 14 in Australia (Brownsey 1998), and about 25 in the Pacific. One endemic and six non-endemic genera with 13 species in New Zealand; six endemic, five non-endemic, and two casual species.

**Biostatus:** Indigenous (Non-endemic).

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**Table 1:** Number of species in New Zealand within *Dennstaedtiaceae* Lotsy

Category	Number
Indigenous (Endemic)	6
Indigenous (Non-endemic)	5
Exotic: Casual	2
<b>Total</b>	<b>13</b>

**Recognition:** The Dennstaedtiaceae comprises predominantly terrestrial or scandent ferns with long-creeping rhizomes, mostly 2–5-pinnate laminae bearing multicellular hairs, marginal or submarginal sori that are either discrete or elongated around the lamina edge, and indusia that are either attached at the base and open towards the margin or are formed from the inrolled lamina margin. The sporangia have a vertical annulus. Many of the New Zealand species are opportunist species of disturbed areas.

## ***Dennstaedtia* Bernh., *J. Bot. (Schrader)*, 1800(2): 124, t. 1(3) (1801)**

**Type taxon:** *Dennstaedtia flaccida* (G.Forst.) Bernh.

**Etymology:** Named in honour of the German physician and botanist August Wilhelm Dennstedt (1776–1826), surname sometimes spelled Dennstaedt, director of the Belvedere garden near Weimar.

Terrestrial ferns. Rhizomes short- (not NZ) to long-creeping (NZ), bearing yellow to red multicellular hairs. Fronds monomorphic. Stipes hairy or occasionally spiny (not NZ). Laminae 3–4-pinnate (NZ) or rarely 1–2-pinnate (not NZ), herbaceous (NZ) or coriaceous (not NZ), bearing non-glandular hairs; primary pinnae stalked, lacking basal pinnule-like stipules. Veins free. Sori round (NZ) or broader than long (not NZ), on a slightly raised receptacle, marginal; paraphyses present or absent. Indusia cup-shaped or slightly bivalvate, formed from a true inner indusium and outer modified inrolled lamina flap, attached at base. Spores trilete, tuberculate to verrucate or coarsely ridged or reticulate.

**Taxonomy:** The taxonomy of *Dennstaedtia* has been revised in America (Tryon 1960; Tryon & Tryon 1982) but is inadequately studied in the Old World. The genus is closely related to, and often difficult to distinguish from, *Microlepia*. It is also not monophyletic, with two distinct clades identified (Schuettpeitz & Pryer 2007; Perrie et al. 2015), one of them closely related to *Microlepia*. Perrie et al. (2015) also noted that one clade had chromosome numbers based on  $x = 46$  or  $47$ , while the other had counts based on  $x = 30, 31, 32, 33$ , or  $34$ .

**Distribution:** A genus of about 70 species (PPG 1 2016) in tropical and temperate regions of the Americas, Asia, Australia, and the Pacific (Brownsey 1998); 12 species in the Americas (Tryon 1960; Tryon & Tryon 1982), one in Africa (Roux 2009), eight in China (Yuehong et al. 2013), 15 in the Philippines (Copeland 1958), 12 in New Guinea (Copeland 1950), one in Australia (Brownsey 1998), and about eight in the Pacific. The Australian species occurs as a casual in New Zealand.

**Biostatus:** Exotic; casual.

**Table 2:** Number of species in New Zealand within *Dennstaedtia* Bernh.

Category	Number
Exotic: Casual	1
<b>Total</b>	<b>1</b>

**Recognition:** In New Zealand, *Dennstaedtia* can be recognised by its creeping rhizomes, highly divided laminae bearing non-glandular hairs, more or less round marginal sori, and cup-shaped or bivalvate indusia.

## ***Dennstaedtia davallioides* (R.Br.) T.Moore, *Index Fil.* 305 (1861)**

≡ *Dicksonia davallioides* R.Br., *Prodr. Fl. Nov. Holland.* 158 (1810)

≡ *Sitobolium davallioides* (R.Br.) J.Sm., *London J. Bot.* 1: 434 (1842)

Lectotype (selected by Brownsey & Perrie 2016): Patersons River, [New South Wales], *R. Brown Iter Austral.* 93, Oct. 1804, BM 001048114!

**Etymology:** From *Davallia* (a genus of ferns), and Greek *-oides* (like), a reference to the similarity of this fern to *Davallia*.

**Distribution:** North Island: Auckland.

Altitudinal range: 40 m.

Known from the University of Auckland campus and from Whenuapai in Auckland, and from the Arapuni Gorge near Te Awamutu, as an escape from cultivation.

Occurs naturally in Australia (Queensland, New South Wales, Victoria); naturalised in South Australia (Brownsey 1998), and has the potential to spread aggressively by spores and its creeping rhizomes (Heenan et al. 1998).

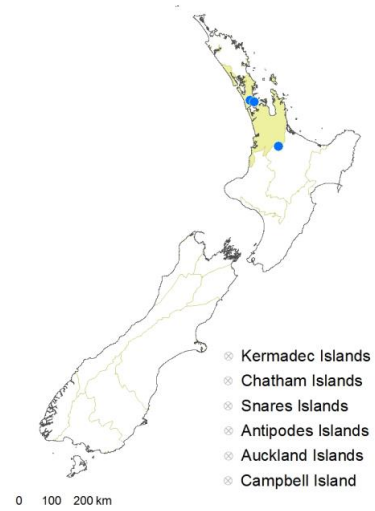
**Biostatus:** Exotic; casual.

**Habitat:** Recorded as widely scattered in an overgrown garden and spreading through a fence into the adjacent property at Whenuapai, and amongst *Clivia* plantings at the University of Auckland campus. Its habitat in the Arapuni Gorge is unknown.

**First record:** Heenan et al. (1998, p. 158). Voucher AK 231458, 231698, 1997.

**Recognition:** *Dennstaedtia davallioides* has long-creeping rhizomes; fronds 800–2000 mm long; stipes black-brown proximally, chestnut-brown to yellow-brown distally, 340–650 mm long; laminae deeply 3-pinnate-pinnatifid or 4-pinnate, broadly ovate or broadly elliptic, 400–1350 mm long; the longest primary pinnae 400–600 mm long and 200–300 mm wide. The abaxial surfaces of the rachis and costae bear sparse, colourless or pale brown, multicellular, non-glandular hairs up to 0.5 mm long. The indusia are slightly bivalvate, formed from a true inner lobed indusium and outer modified inrolled lamina flap, attached at the base, lacking hairs.

**Cytology:** A diploid chromosome count of  $n = c. 29$  was reported for this species from Australia (Tindale & Roy 2002).



**Fig. 1:** *Dennstaedtia davallioides* distribution map based on databased records at AK, CHR & WELT.



**Fig. 2:** *Dennstaedtia davallioides*. Sterile frond growing in cultivation.



**Fig. 3:** *Dennstaedtia davallioides*. Sterile 3-pinnate-pinnatifid lamina.





**Fig. 4:** *Dennstaedtia davallioides*. Adaxial surface of rachis and primary pinnae.



**Fig. 5:** *Dennstaedtia davallioides*. Stipes arising from underground creeping rhizomes.

### ***Histiopteris* (J.Agardh) J.Sm., *Hist. Fil.* 294 (1875)**

≡ *Pteris* sect. *Histiopteris* J.Agardh, *Recens. Spec. Pter.* 76 (1839)

**Type taxon:** *Histiopteris vespertilionis* (Labill.) J.Sm. = *Histiopteris incisa* (Thunb.) J.Sm.

**Etymology:** From the Greek *histion* (a web) and *pterus* (a fern), a reference to the anastomosing vein pattern.

Terrestrial ferns. Rhizomes long-creeping, bearing hairs and clathrate scales. Fronds monomorphic. Stipes glabrous. Laminae 2–3-pinnate, herbaceous, glabrous and usually glaucous when young; primary pinnae sessile, sometimes with reduced stipule-like basal pinnules (not NZ). Veins reticulate, areoles without included veinlets; a marginal connecting vein also present. Sori more or less continuous around the lamina margin, borne on the connecting vein, superficial; paraphyses present. Pseudoindusium (formed from the reflexed membranous lamina margin) opening inwards; true inner indusium absent. Spores monoletate, coarsely tuberculate.

**Taxonomy:** On morphological grounds, *Histiopteris* appears anomalous within Dennstaedtiaceae, lacking the hairs typical of the family, and having scales on the rhizome, although Kramer (1990) referred to these as pluriseriate bristles rather than true scales. The reported chromosome numbers of  $n = 48$  and  $96$  do not relate easily to other members of the family. However, molecular evidence indicates that *Histiopteris* is clearly embedded within Dennstaedtiaceae (Perrie et al. 2015). Holttum (1967) showed that *Lepidocaulon* is congeneric with *Histiopteris* and listed about six species in his expanded genus.

**Distribution:** A genus of one pantropical species that extends into temperate areas of southern Chile, South Africa, Australia, New Zealand and the subantarctic islands (Brownsey 1998), and five or six other species in Malesia, Fiji, Vanuatu and the Solomon Islands (Holttum 1967). One non-endemic species in New Zealand.

**Biostatus:** Indigenous (Non-endemic).

**Table 3:** Number of species in New Zealand within *Histiopteris* (J.Agardh) J.Sm.

Category	Number
Indigenous (Non-endemic)	1
<b>Total</b>	<b>1</b>

**Recognition:** *Histiopteris* can be recognised by its long-creeping rhizomes, glabrous fronds, presence of scales on the rhizome and stipe bases, sessile primary pinnae, reticulate venation, and sori more or less continuous around the ultimate lamina segments and protected by the inrolled lamina margins.

**Cytology:** Chromosome counts of  $n = 48$  and  $n = 96$  have been reported in *Histiopteris* (Löve et al. 1977), but the base number is not known with certainty.

## *Histiopteris incisa* (Thunb.) J.Sm., *Hist. Fil.* 294 (1875)

≡ *Pteris incisa* Thunb., *Prodr. Pl. Cap.* 171 (1800)

≡ *Litobrochia incisa* (Thunb.) C.Presl, *Tent. Pterid.* 149 (1836)

≡ *Phegopteris incisa* (Thunb.) Keyserl., *Polyp. Herb. Bunge.* 51 (1873)

Holotype: Cap. b. Spei [Cape of Good Hope], Grootvadersbosch, *C.P. Thunberg s.n.*, UPS-T 24932 (*n.v.*, see Roux 2009); isotype S P-7759 (online)

= *Pteris vespertilionis* Labill., *Nov. Holl. Pl.* 2, 96, t. 245 (1807)

≡ *Litobrochia vespertilionis* (Labill.) C.Presl, *Tent. Pterid.* 149 (1836)

≡ *Histiopteris vespertilionis* (Labill.) J.Sm., *Hist. Fil.* 295 (1875)

Lectotype (selected by Perrie & Brownsey 2016): Van Diemen [Tasmania], *Labillardière*, FI 004178 (online)

= *Pteris brunoniana* Endl., *Prodr. Fl. Norfolk.* 12 (1833)

Holotype: Norfolk Island, *F. Bauer s.n.*, W 0046251–0046252 (online)

= *Pteris montana* Colenso, *Tasmanian J. Nat. Sci.* 2: 172 (1845)

Lectotype (selected by Allan 1961): near Waikare Lake [L. Waikaremoana], *Herb. W. Colenso*, 1841, WELT P003219!

**Etymology:** From the Latin *incisus* (incised), a reference to the divided nature of the pinnae.

**Vernacular names:** mātā; mātātā; water fern

Rhizomes long-creeping, 1–7 mm diameter, with stipes arising 25–130 mm apart; bearing ovate, chestnut-brown scales, 1.5–7 mm long, 0.5–1.5 mm wide, and chestnut-brown, unicellular hairs up to 2 mm long. Fronds 170–2200 mm long. Stipes 20–730 or rarely to 900 mm long, 1.5–10 mm diameter, green when young, becoming red-brown to yellow-brown, glabrous except for basal scales. Rachises red-brown proximally, yellow-brown or yellow-green distally, glabrous. Laminae usually 2-pinnate-pinnatifid to 2-pinnate-pinnatisect, rarely 1-pinnate-pinnatisect in smallest fronds and 3-pinnate-pinnatifid in the largest, ovate or elliptic, tapering to a pinnatisect apex, 110–1480 mm long, 60–1250 mm wide, glaucous when young, becoming yellow-green with age, herbaceous, glabrous. Primary pinnae in 9–16 pairs below pinnatisect apex, overlapping, sometimes narrowly winged in less divided fronds; distal primary pinnae narrowly oblong or narrowly ovate; proximal primary pinnae ovate; the longest at or near the base, 32–760 mm long, 14–260 mm wide, apices acuminate, bases usually sessile or very short-stalked in largest fronds. Secondary pinnae decreasing markedly in length along primary pinnae to the distal end, winged distally or sometimes throughout; the longest narrowly ovate, 8–185 mm long, 3–72 mm wide, apices acuminate or acute, bases sessile or adnate; the proximal pair sometimes greatly reduced in largest fronds and borne very close to the rachis. Tertiary segments ovate or oblong, 7–36 mm long, 4–11 mm wide, apices rounded, bases adnate or rarely sessile, margins entire or slightly divided on largest fronds, rarely divided more than halfway to costae. Sori ± continuous along margins of ultimate segments except at the apices.

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

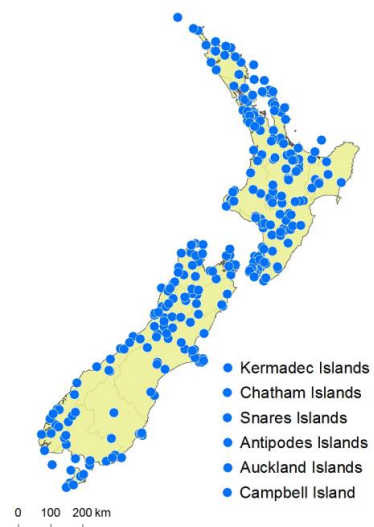
South Island: Western Nelson, Sounds-Nelson, Marlborough, Westland, Canterbury, Otago, Southland, Fiordland.

Kermadec Islands, Chatham Islands, Solander Island, Stewart Island, Snares Islands, Antipodes Island, Auckland Islands, Campbell Island.

Altitudinal range: 5–1320 m.

*Histiopteris incisa* occurs in lowland to subalpine areas throughout much of the North Island from Te Pahi southwards. It ranges from near sea level to over 1300 m in the Kaweka Ranges. In the South Island it is found in lowland and montane areas throughout, becoming uncommon only in the drier inland parts of South Canterbury, Otago and northern Southland. It extends from near sea level to 1000 m on Mt Rochfort. It also occurs on Stewart Island, the Chatham Islands and all the subantarctic islands, including the Snares Islands (Horning 1983).

Throughout the tropics and southern temperate regions including Australia (Northern Territory, South Australia, Queensland, New



**Fig. 6:** *Histiopteris incisa* distribution map based on databased records at AK, CHR & WELT.

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South Wales, Victoria, Tasmania), Lord Howe Island, Norfolk Island, and almost all the main Pacific islands.

**Biostatus:** Indigenous (Non-endemic).

**Habitat:** *Histiopteris incisa* is found in open areas, on disturbed ground and in cleared forest, in light gaps under podocarp, beech and broadleaved forest, in coastal forest and scrub, under mānuka and kānuka, in subalpine tussock and shrubland, and under introduced conifer plantations. It occurs on damp soils, dunes, and coastal cliffs, beside lakes and swamps, on roadside banks and forest margins, in ditches, on alluvial flats and river banks, on rotten logs, in wind-thrown areas, on pumice, and along thermally heated creeks and soils.

**Recognition:** In New Zealand, *Histiopteris incisa* can be recognised by its long-creeping rhizomes, glabrous and glaucous fronds (when young), presence of scales on the rhizome and stipe bases, sessile primary pinnae, reticulate venation, and sori more or less continuous around the ultimate lamina segments, protected by the inrolled lamina margins.

**Cytology:** n = c. 96 (Brownlie 1961).

**Notes:** Perrie et al. (2015) showed that whereas collections of *Histiopteris incisa* from Fiji and New Caledonia had identical rbcL sequences, samples from New Zealand were more divergent. Further investigation of this species in the Australasian/Pacific region is desirable.

*Pteris alpina* was proposed by Field (1890, p. 97) for what he thought might be a new species. He provided a description and illustration (Plate 28, fig. 2) of the plant which was “in the possession of my nephew, Mr D.H. Munro, of Christchurch who obtained it from a toll-gate keeper at the Otairi [Otira] Gorge ... who collected and pressed ferns for sale to travellers”. Field suggested that it might be an alpine form of *Histiopteris incisa* but stated that “should it prove to be new to science, I would propose to call it ‘Pteris alpina’.” It is clear from this that Field did not definitely accept the species, and was simply proposing the name in anticipation of it being accepted later. Under Art. 36.1 of the Code, the name is therefore not validly published and has no status.



**Fig. 7:** *Histiopteris incisa*. Developing frond with 3-pinnate lamina, glaucous when young.



**Fig. 8:** *Histiopteris incisa*. Base of red-brown stipe on mature frond with scattered chestnut-brown scales.





**Fig. 9:** *Histiopteris incisa*. Habit of plant in open grassy area.



**Fig. 10:** *Histiopteris incisa*. Mature frond showing red-brown to yellow-brown rachis.



**Fig. 11:** *Histiopteris incisa*. Sessile and glabrous primary pinnae attached to glaucous rachis of developing frond.



**Fig. 12:** *Histiopteris incisa*. Sessile and glabrous primary pinnae attached to red-brown rachis of mature frond.



**Fig. 13:** *Histiopteris incisa*. Young glabrous tertiary lamina segments showing adnate bases, and indusia formed from the inrolled pinna margin.



**Fig. 14:** *Histiopteris incisa*. Mature tertiary lamina segments showing adnate bases and sori arranged along the pinna margins.

## ***Hypolepis* Bernh., *Neues J. Bot.* 1(2): 34 (1805)**

**Type taxon:** *Hypolepis tenuifolia* (G.Forst.) Bernh. ex C.Presl

**Etymology:** From the Greek *hypo-* (under) and *lepis* (a scale), a reference to the protection of the sori beneath a reflexed portion of the margin.

Terrestrial ferns. Rhizomes long-creeping, bearing red-brown or pale brown multicellular hairs. Fronds monomorphic. Stipes hairy or occasionally spiny (not NZ). Laminae 2–5-pinnate, herbaceous or



coriaceous, bearing glandular and/or non-glandular hairs; primary pinnae stalked, lacking basal pinnule-like stipules. Veins free. Sori round or elliptic, superficial, submarginal; paraphyses present or absent. Indusia either absent, or formed from reflexed lamina flaps that vary from membranous and sharply reflexed to green and partially reflexed, opening inwards; inner indusium absent. Spores monolete, usually echinate and more or less reticulate, rarely almost smooth.

**Taxonomy:** Most species of *Hypolepis* form a clearly defined genus distinct from the other genera in Dennstaedtiaceae on morphological (Brownsey 1998) and molecular grounds (Schuettpeiz & Pryer 2007; Perrie et al. 2015). The genus has been revised in Australia (Brownsey & Chinnock 1984; Brownsey 1998), New Zealand (Brownsey & Chinnock 1984) and Malesia and the Pacific (Brownsey 1987), whilst the *H. rugosula* complex has been analysed worldwide by Schwartsburd & Prado (2014). The latter authors recognised 15 distinct geographic subspecies within *H. rugosula*, including the taxa that we recognise here as *H. amaurorhachis*, *H. lactea* and *H. rufobarbata*. In our opinion there is ample morphological evidence for recognising these three taxa as species in New Zealand, as well as a ploidy difference between them and *H. rugosula* in Australia.

Whether the morphological and cytological distinctiveness of *H. distans* and perhaps some other related species (Brownsey 1983) merits the recognition of a separate genus requires further investigation.

- |   |  |                      |
|---|--|----------------------|
| 1 | Veins of ultimate lamina segments ending in a small marginal sinus; basal pair of primary pinnae arising at c. 90° to rachis.....  | <i>distans</i>       |
|   | Veins of ultimate lamina segments never ending in a marginal sinus; basal pair of primary pinnae arising at 20–80° to rachis.....  | 2                    |
| 2 | Sori protected by well-developed, reflexed, partially membranous, lamina flaps; stipes 2–15 mm diameter.....   | <i>dicksonioides</i> |
|   | Sori unprotected, or protected only by slightly reflexed, green, lamina flaps; stipes 1–6 mm diameter.....   | 3                    |
| 3 | Abaxial surface of lamina and rachis bearing only non-glandular hairs.....   | 4                    |
|   | Abaxial surface of lamina and rachis bearing at least some glandular hairs as well as acicular hairs.....  | 5                    |
| 4 | Laminae up to 770 mm long and 400 mm wide; ultimate lamina segments less than 1 mm wide; paraphyses absent from sori.....  | <i>millefolium</i>   |
|   | Laminae up to 1200 mm long and 1200 mm wide; ultimate lamina segments more than 1 mm wide; paraphyses sometimes present in sori.....   | <i>ambigua</i>       |
| 5 | Lamina margins bearing abundant red-brown (or occasionally colourless) acicular hairs; stipe and rachis purple-brown.....  | <i>rufobarbata</i>   |
|   | Lamina margins bearing colourless glandular or acicular hairs; stipe and rachis pale brown, red-brown or purple-brown.....   | 6                    |
| 6 | Glandular hairs on laminae 0.1–0.3 mm long; stipe and rachis red-brown or purple-brown for at least ¾ their length; plants largely confined to North Island and northern South Island..... | <i>lactea</i>        |
|   | Glandular hairs on laminae 0.3–1.0 mm long; stipe and rachis red-brown for c. ½ their length; plants of southern South Island and subantarctic islands.....                                | <i>amaurorhachis</i> |

**Distribution:** A genus of 40–50 species in tropical and temperate regions of Central and South America, southern Africa, India, China, Japan, south-east Asia, Australasia and the Pacific (Brownsey 1998; Yuehong et al. 2013). There are about 15 species in the Americas (Tryon & Tryon 1982), but the greatest diversity is in the Old World, with three species in Africa (Roux 2009), eight in China (Yuehong et al. 2013), 14 in Malesia and the Pacific (Brownsey 1987), and seven in Australia (Brownsey & Chinnock 1987). Seven species in New Zealand; four endemic.

**Biostatus:** Indigenous (Non-endemic).

**Table 4:** Number of species in New Zealand within *Hypolepis* Bernh.

Category	Number
Indigenous (Endemic)	4
Indigenous (Non-endemic)	3
<b>Total</b>	<b>7</b>

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**Recognition:** In New Zealand, species of *Hypolepis* can be recognised by their creeping rhizomes, highly divided laminae bearing glandular or non-glandular hairs, and more or less round submarginal sori that are either unprotected, or protected by reflexed lamina flaps that open inwards.

**Cytology:** The base chromosome number in *Hypolepis* is either  $x = 26$  or  $x = 52$ . However, there are also reports of  $n = 28, 29, 39$  and  $98$ , suggesting polyphyly, or aneuploidy within the genus (Brownsey 1983).

### ***Hypolepis amaurohachis* (Kunze) Hook., Sp. Fil. 2, 62 (1852)**

≡ *Cheilanthes amaurohachis* Kunze, *Linnaea* 23: 242, 306 (1850)

Lectotype (selected by Brownsey & Chinnock 1987): Hort. Lips. ex Tasmania, G. Kunze s.n., B 20 0074521!

= *Hypolepis subantarctica* Brownsey & Chinnock, *New Zealand J. Bot.* 22: 57 (1984)

≡ *Hypolepis rugosula* subsp. *subantarctica* (Brownsey & Chinnock) Schwartsb. in Schwartsburd & Prado, *Acta Bot. Brasil.* 28: 217 (2014)

Holotype: New Zealand, Campbell Island, D.R. Given s.n., cultivated at CHR as G11407, WELT P011518!; isotypes AK 166974!, CHR 433018!

**Etymology:** From the Greek *amauro-* (dark), and *rhachis*, a reference to the dark red-brown colour of the rachis in this species.

Rhizomes long-creeping, 2–3 mm diameter, with stipes arising 20–35 mm apart; bearing multicellular, non-glandular, red-brown hairs up to 3 mm long. Fronds 240–1000 mm long. Stipes 70–450 mm long, 1–3.5 mm diameter, dark red-brown, bearing abundant colourless or pale brown glandular hairs up to 0.5 mm long and scattered red-brown non-glandular hairs up to 2 mm long. Rachises dark red-brown proximally, becoming paler and often green distally, densely covered in colourless or pale brown glandular hairs up to 1 mm long and scattered red-brown non-glandular hairs up to 2 mm long. Laminae 2-pinnate-pinnatifid to almost 3-pinnate, narrowly ovate to ovate, tapering to a pinnatifid apex, 130–550 mm long, 72–430 mm wide, dark green adaxially, lighter green abaxially, herbaceous; colourless and pale brown glandular and non-glandular hairs densely covering abaxial lamina surface and costae, 0.3–1.0 mm long on laminae, up to 1.5 mm long on costae; non-glandular hairs only on the lamina margins. Primary pinnae in 15–30 pairs below pinnatifid apex, widely spaced proximally, almost overlapping distally, the proximal pair arising at 30–70° to rachis; distal primary pinnae narrowly oblong or narrowly ovate; proximal primary pinnae narrowly ovate or ovate; the longest at or near the base, 37–240 mm long, 18–140 mm wide, apices acute or acuminate, bases short-stalked; costae winged distally. Secondary pinnae gradually decreasing in length along each primary pinna to the distal end; the longest ovate or oblong, 5–75 mm long, 4–26 mm wide, apices obtuse, bases short-stalked or sessile or adnate; costae winged throughout. Tertiary segments oblong, 3–14 mm long, 2–17 mm wide, apices obtuse, bases adnate, deeply divided on largest fronds. Veins ending in apices of ultimate segments. Sori ± round, protected by slightly reflexed green lamina flaps bearing a few short acicular hairs; paraphyses absent. Mean spore size 31–34 µm long, 20–22 µm wide; perispores pale, echinate and reticulate.

**Distribution:** South Island: Southland, Fiordland.

Chatham Islands, Antipodes Island, Auckland Islands, Campbell Island.

Altitudinal range: 0–200 m.

*Hypolepis amaurohachis* is known only from isolated collections in Fiordland and the Catlins region of the South Island, as well as from the Chatham Islands, Antipodes Island, Auckland Islands and Campbell Island. It ranges from near sea level in the South Island to 200 m on Campbell Island.

Also Australia (Victoria, Tasmania).

**Biostatus:** Indigenous (Non-endemic).

**Habitat:** Grows on open rocky slopes and terraces near the coast, in open *Dracophyllum* scrub, in *Bulbinella* herbfield, or on tracksides and riverbanks, and in light gaps under podocarp or rātā forest.

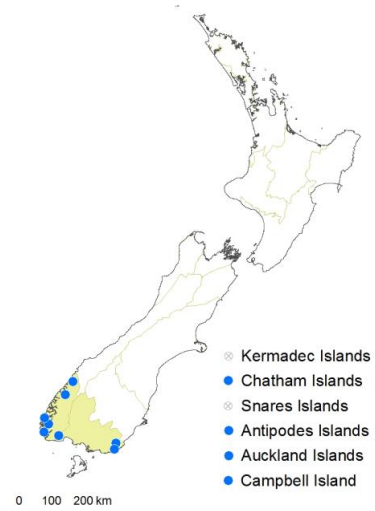
**Recognition:** *Hypolepis amaurohachis* is one of three similar species in New Zealand that have glandular hairs, red- or purple-brown stipes and rachises, and lack indusial flaps. It is distinguished from *H. rufobarbata* by the presence of colourless glandular and non-glandular hairs on the lamina margin in contrast to the abundant red-brown acicular hairs in *H. rufobarbata*. It also has colourless glandular hairs on the rachises and costae, whereas *H. rufobarbata* has red-brown glandular or acicular hairs. *Hypolepis amaurohachis* is more similar to *H. lactea* but is distinguished by its paler red-brown stipe and rachis, becoming green in the distal half of the rachis, and by its longer glandular hairs on the laminae (0.3–0.7 cf. 0.1–0.3 mm long). *Hypolepis amaurohachis* occurs only in the far south of the South Island and on the Chatham Islands and subantarctic islands, whereas *H. lactea* occurs in the North Island and South Island except for the far south. *Hypolepis amaurohachis* can also be confused with *H. ambigua*, but is usually distinguished by the presence of glandular hairs and smaller spores (31–34 × 20–22 μm cf. 36–41 × 22–28 μm).

**Cytology:** n = 52 (Brownsey & Chinnock 1984).

**Notes:** In his original description of this species in *Cheilanthes*, Kunze (1850) used the epithet “*amaurohachis*”. When Hooker (1851–1858) made the new combination in *Hypolepis* he spelled the epithet “*amaurorachis*”, incorrectly citing the spelling used by Kunze. This error was followed by Brownsey & Chinnock (1987) when reinstating the name for the Australasian species, and perpetuated by subsequent authors (e.g. Brownsey & Smith-Dodsworth 2000). The original spelling used by Kunze is not an orthographic error and must therefore be retained as *Hypolepis amaurohachis*.

In New Zealand, this species has been widely misidentified as *Polypodium viscidum* Roxb., *Polypodium rugosulum* Labill., *Polypodium punctatum* Thunb., or combinations based on them.

*Hypolepis amaurohachis* occurs in both New Zealand and Australia, and, with n = 52, is cytologically distinct from the Australian *H. rugosula*, which has n = c. 104 (Brownsey & Chinnock 1987). We therefore recognise it here as a distinct species, rather than as a subspecies of *H. rugosula* as proposed by Schwartzburd & Prado (2014).



**Fig. 15:** *Hypolepis amaurohachis* distribution map based on databased records at AK, CHR & WELT.



**Fig. 16:** *Hypolepis amaurohachis*. Herbarium specimen from Campbell Island, WELT P007786.



**Fig. 17:** *Hypolepis amaurohachis*. Herbarium specimen from Tautuku, Catlins, S.E. Otago, WELT P017678/B.



**Fig. 18:** *Hypolepis amaurohachis*. Close up of WELT P017678/B showing abaxial surface of lamina bearing long glandular and non-glandular hairs, and immature submarginal sori.



**Fig. 19:** *Hypolepis amaurohachis*. Close up of WELT P007786 showing round submarginal sori protected by slightly reflexed green lamina flaps.

## ***Hypolepis ambigua* (A.Rich.) Brownsey & Chinnock, *New Zealand J. Bot.* 22: 59 (1984)**

≡ *Cheilanthes ambigua* A.Rich., *Voy. Astrolabe, Essai*, 84 (1832)

Lectotype (selected by Brownsey & Chinnock 1984): Nlle Zelande, Baie des îles [New Zealand, Bay of Islands], *Astrolabe*, Herb. Richard, P 00607928!

= *Polypodium amplum* Colenso, *Trans. & Proc. New Zealand Inst.* 24: 396 (1892) nom. illeg., non *Polypodium amplum* Willd. 1810

Lectotype (selected by Brownsey & Chinnock 1984): no locality, *W. Colenso s.n.*, presented 1897, "described in Vol. XXIV *Trans. N.Z. Inst.*", K 000913963–000913965, on 3 sheets!

= *Hypolepis petrieana* Carse, *Trans. & Proc. New Zealand Inst.* 50: 64 (1918)

Lectotype (selected by Brownsey & Chinnock 1984): Otorohanga, Waitomo Caves, *D. Petrie s.n.*, CHR 291729!

**Etymology:** From the Latin *ambigua* (of uncertain relationship), a reference to the doubtful taxonomic placement of this species when described.

Rhizomes long-creeping, 2–4 mm diameter, with stipes arising 20–200 mm apart; bearing multicellular, non-glandular, red-brown hairs up to 3 mm long. Fronds 210–1850 mm long. Stipes 40–920 mm long,



1–6 mm diameter, red-brown or chestnut-brown proximally, usually becoming chestnut-brown or yellow-brown distally but rarely red-brown throughout, bearing abundant multicellular non-glandular red-brown hairs up to 3 mm long proximally, but sparser and paler distally. Rachises usually chestnut-brown or yellow-brown proximally, becoming yellow-green or green distally, rarely red-brown becoming chestnut-brown, sparsely covered in pale brown or red-brown hairs up to 2 mm long. Laminae deeply 2-pinnate-pinnatifid to deeply 3-pinnate-pinnatifid, narrowly ovate to broadly ovate, tapering to a pinnatifid apex, 135–1200 mm long, 90–1200 mm wide, light green on both surfaces, herbaceous or coriaceous; glistening colourless non-glandular hairs on abaxial lamina surface and costae but absent from lamina margin, 0.3–1 mm long; pale brown hairs on costae up to 2 mm long; glandular hairs rarely present on developing fronds. Primary pinnae in 17–30 pairs below pinnatifid apex, widely spaced proximally, overlapping distally, narrowly winged distally, the proximal pair arising at 20–50° to rachis; distal primary pinnae narrowly oblong or narrowly ovate; proximal primary pinnae ovate or broadly ovate; the longest at or near the base, 47–620 mm long, 30–350 mm wide, apices acute or acuminate, bases short-stalked. Secondary pinnae decreasing in length along primary pinnae to the distal end, winged throughout; the longest narrowly ovate or narrowly oblong, 17–235 mm long, 7–90 mm wide, apices acute or acuminate, bases short-stalked. Tertiary pinnae narrowly ovate or oblong, 4–62 mm long, 2–16 mm wide, apices obtuse, bases adnate, deeply divided on larger fronds into ultimate segments 2.5–9 mm long, 1.5–5 mm wide. Veins ending in apices of ultimate segments. Sori ± round, protected by slightly reflexed green lamina flaps bearing a few short hairs; paraphyses sometimes present, 0.3–0.5 mm long. Mean spore size 36–41 µm long, 22–28 µm wide; perispores pale, echinate and reticulate.

**Note:** measurements given above are from herbarium specimens. Larger fronds sometimes occur in the wild. WELT P020820 comprises parts of a frond that was said to measure 2500 mm long, with the lamina 1700 mm long and 1300 mm wide, and the largest primary pinna 900 mm long and 420 mm wide.

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

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

Three Kings Islands, Chatham Islands, Stewart Island.

Altitudinal range: 0–900 m.

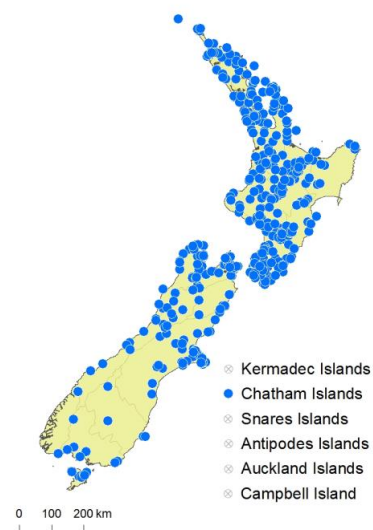
*Hypolepis ambigua* occurs in lowland and montane areas throughout the North Island from Te Pahi southwards, although apparently it is uncommon on the east coast around Gisborne. It ranges from near sea level to over 900 m in the Tongariro and Urewera National Parks. It occurs in lowland parts of much of the South Island, reaching 900 m at Jordan Stream, Marlborough, but is apparently absent from most of Fiordland. It also extends to the Chatham Islands and Stewart Island.

The species has naturalised on the island of Bute in Scotland (Hannah 2017).

**Biostatus:** Indigenous (Endemic).

**Habitat:** Grows in open forest and forest clearings, on forest margins, in scrub and open grassland, under conifer plantations and willows, on river banks and alluvial flats, on sandy soils, roadsides, tracksides, in drainage ditches, and bordering lakes, swamps, peat bogs and thermally heated streams. In forest situations it prefers disturbed soils and rotten logs, and in open areas it often grows with bracken. It can form extensive colonies spreading by means of its rapidly growing rhizomes, and may also grow as a weed in gardens.

**Recognition:** *Hypolepis ambigua* is one of three *Hypolepis* species in New Zealand that lacks glandular hairs. It is distinguished from *H. distans* by its veins, which reach the margin at an apex rather than a sinus; by its distal pinnae, which arise at an acute angle to the rachis rather than at right angles; and by its stipes, which are much thicker (1–6 cf. 0.75–1.25 mm diameter). It is similar to *H. millefolium* but can be recognised by its larger fronds (up to 1200 mm long and 1200 mm wide, cf. 770 mm long and 400 mm wide), and by the broader ultimate segments (more than 1 mm wide cf. less than 1 mm wide). The two are also often ecologically separated, *H. ambigua* being more common in lowland sites, whereas *H. millefolium* generally occurs at higher elevations. *Hypolepis ambigua* is



**Fig. 20:** *Hypolepis ambigua* distribution map based on databased records at AK, CHR & WELT.

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morphologically similar to *H. dicksonioides*, the two often growing together in thermal areas, but *H. ambigua* can be distinguished by its lack of glandular hairs, more slender stipes (1–6 cf. 2–15 mm diameter), and lack of well-developed indusia.

**Cytology:**  $n = 104$  (Brownlie 1954, 1957, as *H. tenuifolia*; Brownlie 1961, as *H. punctata*; Brownsey & Chinnock 1984).

**Hybridisation:** There is evidence for hybridisation between *H. ambigua* and *H. dicksonioides* (AK 266639, CHR 212707, WELT P011525), *H. lactea* (AK 298766–298767), *H. millefolium* (WELT P011837) and *H. rufobarbata* (AK 170251, CHR 280735, WELT P011530). Hybrids can be recognised by their aborted spores (see Brownsey & Chinnock 1984). The combination *H. ambigua* × *rufobarbata* is found commonly where the two species occur together, whilst *H. ambigua* × *dicksonioides* arises frequently in thermal areas.

**Notes:** In New Zealand this species has been widely misidentified by earlier authors as either *Hypolepis tenuifolia* (G.Forst.) Bernh. ex C.Presl or *Hypolepis punctata* (Thunb.) Mett.

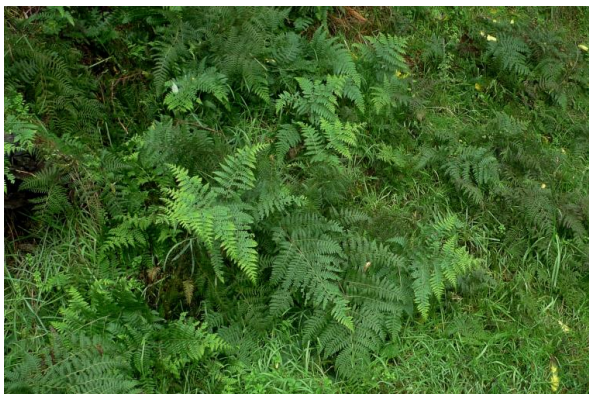
*Hypolepis ambigua* is morphologically very similar to *H. polypodioides*, a species which occurs from north-west India through southern China to the Philippines, peninsular Malaysia, Java and Flores (Brownsey 1987). Given the large distance between the distributions of the two species, it would be surprising if they were conspecific, but the possibility deserves further investigation.



**Fig. 21:** *Hypolepis ambigua*. Mature frond with yellow-brown rachis.



**Fig. 22:** *Hypolepis ambigua*. Mature frond with red-brown rachis.



**Fig. 23:** *Hypolepis ambigua*. Habit of plant, spreading by creeping rhizomes in open grassy area.



**Fig. 24:** *Hypolepis ambigua*. Abundant colourless and pale brown non-glandular hairs at junction of stipe and rachis.





**Fig. 25:** *Hypolepis ambigua*. Costae of primary and secondary pinnae bearing colourless and pale brown non-glandular hairs.



**Fig. 26:** *Hypolepis ambigua*. Costae of primary and secondary pinnae bearing red-brown non-glandular hairs.



**Fig. 27:** *Hypolepis ambigua*. Immature round sori on secondary pinnae, protected by slightly reflexed green marginal flaps, or virtually unprotected.



**Fig. 28:** *Hypolepis ambigua*. Mature sori on margins of secondary pinnae

### ***Hypolepis dicksonioides* (Endl.) Hook., Sp. Fil. 2, 61 (1852)**

≡ *Cheilanthes dicksonioides* Endl., *Prodr. Fl. Norfolk*. 15 (1833)

≡ *Hypolepis endlicheriana* C.Presl, *Tent. Pterid.* 162 (1836) nom. illeg., nom. nov. pro *Cheilanthes dicksonioides* Endl. 1833

Lectotype (selected by Brownsey & Chinnock 1984): Norfolk Island, *F. Bauer s.n.*, W 0016791!; isolectotypes W 0016788–0016790!

= *Cheilanthes pellucida* Colenso, *Tasmanian J. Nat. Sci.* 2: 173 (1845)

≡ *Hypolepis tenuifolia* var. *pellucida* (Colenso) Hook., *Sp. Fil.* 2, 60, t. 90a (1858)

Lectotype (selected by Allan 1961): dry woods, E. Coast [New Zealand], *W. Colenso s.n.*, WELT P003224!

**Etymology:** From *Dicksonia* (a tree fern), and *-oides* (like), a reference to the size and similarity of this fern to species of *Dicksonia*.

**Vernacular name:** giant hypolepis

Rhizomes long-creeping, 3–8 mm diameter, with stipes arising 35–200 mm apart, or rarely 10 mm apart when growing on pumice; bearing pale brown or chestnut-brown non-glandular hairs up to 3 mm long. Fronds 220–2450 mm long. Stipes 70–1400 mm long, 2–15 mm diameter, red-brown proximally, chestnut-brown or yellow-brown distally, with two dark vertical bands (when fresh), bearing red-brown non-glandular hairs proximally and colourless glandular and non-glandular hairs distally, up to 5 mm long. Rachises chestnut-brown or yellow-brown proximally, green distally, bearing abundant colourless glandular and non-glandular hairs up to 3 mm long. Laminae 3-pinnate to deeply 4-pinnate-pinnatifid or almost 5-pinnate, ovate or broadly ovate or broadly elliptic, tapering to a pinnatifid apex, 150–1500 mm long, 90–1100 mm wide, light green on both surfaces, herbaceous; colourless glandular and non-glandular hairs on abaxial lamina surface and costae but absent from lamina margin,

0.3–1.5 mm long. Primary pinnae in 15–30 pairs below pinnatifid apex, overlapping, narrowly winged distally, the proximal pair arising at 30–50° to rachis; distal primary pinnae ovate or narrowly ovate; proximal primary pinnae ovate; the longest at or near the base, 55–860 mm long, 27–480 mm wide, apices acute or acuminate, bases stalked. Secondary pinnae decreasing in length along primary pinnae to the distal end, winged distally, or throughout in less divided fronds; the longest ovate or narrowly ovate, 17–360 mm long, 7–170 mm wide, apices acute or acuminate, bases stalked. Tertiary pinnae winged throughout; the longest ovate or narrowly ovate, 5–90 mm long, 2–40 mm wide, apices acute or obtuse, bases short-stalked to adnate. Quaternary pinnae narrowly ovate or oblong, 7–16 mm long, 2–6 mm wide, adnate, deeply divided on larger fronds into ultimate segments up to 4 mm long and 2 mm wide. Veins ending in apices of ultimate segments. Sori ± round, protected by distinct reflexed lamina flaps (green at the base, membranous at apex); paraphyses absent. Mean spore size 38–39 µm long, 22–25 µm wide; perispores pale, echinate and reticulate.

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

South Island: Western Nelson, Sounds-Nelson.

Kermadec Islands, Chatham Islands.

Altitudinal range: 0–750 m.

*Hypolepis dicksonioides* occurs on Raoul, Macauley and South Meyer Islands in the Kermadec Islands. In the North Island it occurs mostly in coastal and lowland sites from Te Kao, Aupori Ecological District, to Auckland, and in scattered localities from the Bay of Plenty to Wellington. It occurs at higher elevations around thermal areas from Rotorua to Taupō, and reaches 750 m near Wairakei. In the South Island it occurs only in coastal areas of north-west Nelson and the Marlborough Sounds. It has also been recorded from the Chatham Islands.

Also Norfolk Island, Samoa, Cook Islands, Tahiti and Marquesas Islands (Brownsey 1987; Sykes 2016). It is naturalised in South Australia (Brownsey 1998).

**Biostatus:** Indigenous (Non-endemic).

**Habitat:** Grows in open places, on rocky coastal slopes, among boulders, at cliff bases, on pumice beds and scoria (where it is often very stunted), on thermally heated soil and along hot streams, in ditches, on roadsides, in poor pasture, on old logs, on forest margins, in open coastal forest and forest clearings, and under *Pinus* plantations. It prefers disturbed or sandy soils, and sometimes grows amongst bracken. It also appears as a weed in gardens and urban environments.

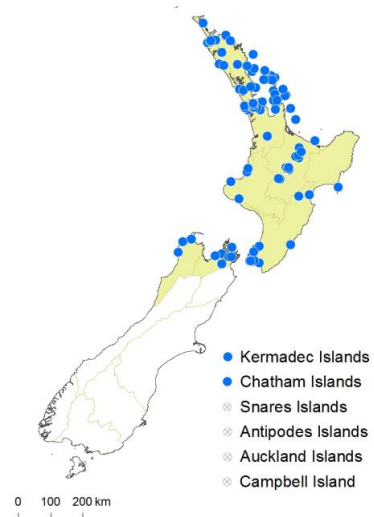
**Recognition:** *Hypolepis dicksonioides* is generally the largest of all the New Zealand species (except for stunted fronds found growing on pumice), and can be confused only with *H. ambigua*, with which it often grows in thermal sites. *Hypolepis dicksonioides* can be distinguished by its long, colourless, glandular hairs, thicker stipes (5–15 cf. 1.5–6 mm diameter), and well-developed indusial flaps.

**Cytology:** n = 104 (Brownsey & Chinnock 1984).

**Hybridisation:** There is evidence for hybridisation between *H. dicksonioides* and *H. ambigua* (AK 266639, CHR 212707, WELT P011525) and *H. lactea* (WELT P011537). Hybrids can be recognised by their aborted spores (see Brownsey & Chinnock 1984). The combination *H. ambigua* × *dicksonioides* occurs frequently in thermal areas where the two parents are found together.

**Notes:** In New Zealand this species has been widely misidentified by earlier authors as *Hypolepis tenuifolia* (G.Forst.) Bernh. ex C.Presl.

Brownsey (1987) noted that *Hypolepis dicksonioides* has a disjunct distribution, with lowland populations occurring in New Zealand (from sea level, reaching 750 m around thermal areas), the Kermadec Islands (up to 250 m) and Norfolk Island (up to 300 m), and higher-altitude populations on Samoa (1200–1700 m), Tahiti (785–1560 m) and the Marquesas Islands (1020 m). However, populations in Samoa have smaller spores (32–33 µm long, 20–21 µm wide) than those from elsewhere (38–43 µm long, 22–26 µm wide). Whether this is indicative of a difference in chromosome number, and perhaps a different taxon, requires further investigation.



**Fig. 29:** *Hypolepis dicksonioides* distribution map based on databased records at AK, CHR & WELT.





**Fig. 30:** *Hypolepis dicksonioides*. Habit of mature plant in open shrubby area.



**Fig. 31:** *Hypolepis dicksonioides*. Mature, 4-pinnate frond.



**Fig. 32:** *Hypolepis dicksonioides*. Mature, 4-pinnate frond.



**Fig. 33:** *Hypolepis dicksonioides*. Portion of developing stipe bearing long, colourless, glandular and non-glandular hairs.



**Fig. 34:** *Hypolepis dicksonioides*. Base of mature plant showing thick stipes arising from long, creeping rhizomes that are green initially, becoming red-brown with age.



**Fig. 35:** *Hypolepis dicksonioides*. Uncoiling frond covered in long, colourless, glandular and non-glandular hairs.





**Fig. 36:** *Hypolepis dicksonioides*. Abundant, colourless, glandular and non-glandular hairs on costae.



**Fig. 37:** *Hypolepis dicksonioides*. Round sori on margins of pinna segments.



**Fig. 38:** *Hypolepis dicksonioides*. Round sori on margins of ultimate pinna segments protected by reflexed green lamina flaps.



**Fig. 39:** *Hypolepis dicksonioides*. Round sori on margins of ultimate pinna segments protected by reflexed green lamina flaps.

### ***Hypolepis distans* Hook., Sp. Fil. 2, 70, t. 95c (1852)**

Lectotype (selected by Brownsey & Chinnock 1984): no locality, *W. Colenso 1782*, Herb. Hooker., K 000913967!

**Etymology:** From the Latin *distans* (widely separated), a reference to the widely spaced pinnae of this species.

Rhizomes long-creeping, 1–2.5 mm diameter, with stipes arising 5–110 mm apart; bearing red-brown or chestnut-brown hairs up to 5 mm long. Fronds 120–1700 mm long. Stipes 15–600 mm long, 0.75–1.25 mm diameter, dark red-brown, polished, bearing scattered red-brown non-glandular hairs up to 3 mm long. Rachises red-brown, becoming paler only at the distal end, bearing scattered chestnut-brown non-glandular hairs up to 1 mm long. Laminae usually deeply 2-pinnate-pinnatifid, rarely 2- or 3-pinnate, narrowly elliptic or elliptic or narrowly ovate or ovate, tapering to a very short pinnatifid apex, 105–1280 mm long, 45–390 mm wide, light green on both surfaces, coriaceous; a few scattered pale brown non-glandular hairs on abaxial lamina surface and costae but absent from lamina margin, up to 0.5 mm long. Primary pinnae in 15–40 pairs below pinnatifid apex, widely spaced, narrowly ovate, narrowly winged; the proximal pair arising at c. 90° to rachis; the longest at or below the middle, 25–210 mm long, 8–75 or rarely to 82 mm wide, apices acuminate, bases short-stalked or sessile. Secondary pinnae decreasing very gradually in length along primary pinnae to the distal end, winged throughout; the longest ovate to narrowly ovate, 4–50 mm long, 2–12 mm wide, apices acute or obtuse, bases sessile or shortly stalked, deeply divided or divided to the midrib in largest fronds. Tertiary pinnae ovate, 2–7 mm long, 1–3 mm wide, apices obtuse, bases adnate, margins rarely deeply divided. Veins reaching margin at a sinus. Sori ± round, protected by reflexed toothed lamina flaps; paraphyses absent. Mean spore size 31–34 µm long, 19–21 µm wide; perispores dark brown, reticulate, lacking obvious projections.

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

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

Chatham Islands, Stewart Island.

Altitudinal range: 0–750 m.

In the North Island *Hypolepis distans* occurs in coastal and lowland sites from near Kaitiāia to Wellington, but is absent from much of the central high country and uncommon on the eastern side of the island. It reaches 750 m in the Herangi Range. In the South Island it is common only in coastal and lowland areas of the Marlborough Sounds, north-west Nelson and Westland as far south as the Haast River, with very scattered records on the east coast from Akaroa, the Catlins district and Stewart Island. It reaches 300 m in the Marlborough Sounds. It has also been recorded from the Chatham Islands.

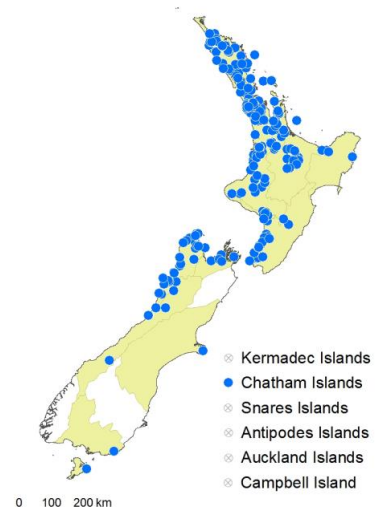
Also Australia (Tasmania and King Island). Naturalised on Norfolk Island and possibly King Island (de Lange 2000).

**Biostatus:** Indigenous (Non-endemic).

**Habitat:** Grows in swampy areas, bordering wetlands, on the bases of *Carex secta* in bogs, on peat or soils with a deep humus layer, in drainage ditches, on river terraces, on disturbed soils, on decomposing logs and humus mounds, in clearings, on road banks and forest margins. The weak stipes of *H. distans* are unable to support the laminae, and plants often scramble over the substrate forming a mound of rhizome and fronds, or less commonly climb up through other vegetation. In northern New Zealand it is found in kauri forest or mānuka, but further south it grows under podocarp or broadleaved forest, or under mānuka and kānuka. It is also found under pines.

**Recognition:** *Hypolepis distans* is a very distinct species recognised by its polished red-brown stipes, relatively narrow laminae, coriaceous texture, pinnae that arise at c. 90° to the rachis, veins that reach the margin at a sinus, well-developed indusia and dark brown spores that lack obvious projections.

**Cytology:** n = 28 (Brownsey 1983; Brownsey & Chinnock 1984). This number is unique in the genus, and its significance has been discussed by Brownsey (1983).



**Fig. 40:** *Hypolepis distans* distribution map based on databased records at AK, CHR & WELT.



**Fig. 41:** *Hypolepis distans*. Mature 2-pinnate-pinnatifid frond with primary pinnae arising at right angles from rachis.



**Fig. 42:** *Hypolepis distans*. Mature frond showing red-brown rachis.





**Fig. 43:** *Hypolepis distans*. Base of mature red-brown stipe bearing chestnut-brown non-glandular hairs.



**Fig. 44:** *Hypolepis distans*. Adaxial surface of rachis and primary pinnae bearing scattered, pale brown non-glandular hairs.



**Fig. 45:** *Hypolepis distans*. Secondary pinnae with marginal sori protected by inrolled green lamina flaps.



**Fig. 46:** *Hypolepis distans*. Mature sori on secondary pinnae.



**Fig. 47:** *Hypolepis distans*. Secondary pinnae showing veins reaching the margin at a sinus.



**Fig. 48:** *Hypolepis distans*. Scrambling habit of mature plants on forest floor.

***Hypolepis lactea* Brownsey & Chinnock, *New Zealand J. Bot.* 22: 55 (1984)**

≡ *Hypolepis rugosula* subsp. *lactea* (Brownsey & Chinnock) Schwartzb. in Schwartzburd & Prado, *Acta Bot. Brasil.* 28: 216 (2014)  
 Holotype: Butterfly Creek, Eastbourne, Wellington, *P.J. Brownsey* NZ1356, 21 Feb. 1979, WELT P011516!

**Etymology:** From the Latin *lacteus* (milky white), a reference to the milky white exudate often seen on the adaxial surface of mature fronds.

Rhizomes long-creeping, 1–2 mm diameter, with stipes arising 15–90 mm apart; bearing red-brown non-glandular hairs up to 3.5 mm long. Fronds 240–1100 mm or rarely to 1900 mm long. Stipes 85–700 or rarely to 900 mm long, 1.5–5 mm diameter, dark purple-brown to red-brown, bearing abundant red-brown non-glandular hairs up to 3 mm long proximally, becoming scattered distally and replaced by abundant colourless glandular hairs, which are variable in length but shorter than the brown hairs. Rachises red-brown proximally, becoming yellow-brown distally, densely covered in short colourless glandular hairs 0.1–0.8 mm long interspersed with scattered red-brown non-glandular hairs to 2 mm long. Laminae 2-pinnate-pinnatifid to 3-pinnate-pinnatifid, ovate, tapering to a long pinnatifid apex, 145–1000 mm long, 115–600 mm wide, light green on both surfaces, herbaceous, exuding white milky substance from adaxial surface with age; lamina margins and abaxial lamina surfaces and costae densely covered in colourless glandular hairs, 0.1–0.3 mm long on laminae, up to 0.4 mm long on costae, interspersed with a few colourless non-glandular hairs of similar length; occasional red-brown non-glandular hairs up to 1 mm long on costae. Primary pinnae in 20–35 pairs below long-tapering pinnatifid apex, widely spaced or slightly overlapping, the proximal pair arising at 35–80° to rachis, winged distally; distal primary pinnae narrowly ovate to narrowly oblong; proximal primary pinnae ovate to triangular; the longest at or near the base, 65–385 mm long, 32–155 mm wide, apices long-acuminate, bases short-stalked. Secondary pinnae gradually decreasing in length along each primary pinna to the distal end, winged throughout; the longest narrowly ovate or narrowly oblong, 17–90 mm long, 8–30 mm wide, apices acute or obtuse, bases short-stalked. Tertiary pinnae winged throughout; the longest oblong, 4–16 mm long, 2–7 mm wide, apices obtuse, bases adnate; margins deeply divided on larger fronds into ultimate segments up to 4 mm long and 2.5 mm wide. Veins ending in apices of ultimate segments, sometimes slightly excurrent. Sori ± round, virtually unprotected; paraphyses absent. Mean spore size 28–35 µm long, 18–21 µm wide; perispores pale, echinate and reticulate.

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

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

Chatham Islands.

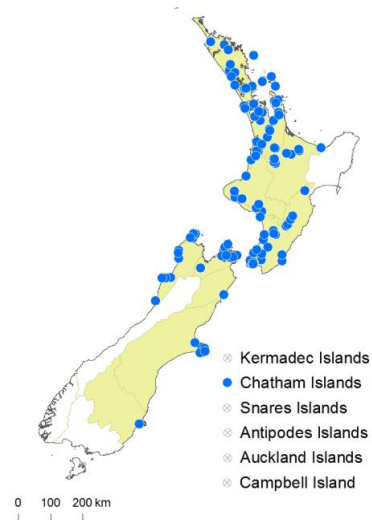
Altitudinal range: 0–800 m.

In the North Island *Hypolepis lactea* occurs from near Kaitiāia to Wellington but is found most frequently in coastal and lowland sites from Kaipara Harbour southwards, extending locally into montane areas and reaching 800 m near Rotorua. It is absent from the central high country, Gisborne Ecological Province and much of the east coast. In the South Island it occurs in coastal and lowland areas of the Marlborough Sounds and north-west Nelson as far south as Greymouth, reaching 600 m near Denniston. On the east coast there are isolated populations near Kaikōura, on Banks Peninsula and around Dunedin. It is common on the Chatham Islands.

**Biostatus:** Indigenous (Endemic).

**Habitat:** Grows on swampy and peaty soils, on the bases of *Carex secta* in bogs, on disturbed or stony ground in forest and scrub, in clearings, on bush margins, clay banks, stream banks, drainage ditches, and roadsides, at the base of uprooted trees, and on rotting logs. It occurs in kauri, podocarp, broadleaved and beech forest, and under mānuka. It is similar in its ecological tolerances to *H. rufobarbata*, but occurs generally at lower altitudes.

**Recognition:** *Hypolepis lactea* is one of three similar species in New Zealand that have glandular hairs, red- or purple-brown stipes and rachises, and lack indusial flaps. It is distinguished from *H. rufobarbata* by the presence of colourless glandular and non-glandular hairs on the lamina margin in contrast to the abundant red-brown acicular hairs in *H. rufobarbata*. *Hypolepis lactea* is further distinguished by its milky exudate on the adaxial lamina surface at maturity, and by its veins, which are sometimes slightly excurrent. It also has abundant short, colourless glandular hairs on the rachises and costae, in contrast to *H. rufobarbata*, which has red-brown glandular or acicular hairs. *Hypolepis lactea* is more similar to *H. amaurorhachis* but is distinguished by its darker purple-brown stipe and



**Fig. 49:** *Hypolepis lactea* distribution map based on databased records at AK, CHR & WELT.



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rachis, which become green only at the far distal end, and by its shorter glandular hairs on the laminae (0.1–0.3 cf. 0.3–0.7 mm long). The distributions of the two species do not overlap, *H. lactea* being a plant of the North Island and South Island except for the far south, whereas *H. amaurorhachis* occurs only in the far south of the South Island and on the subantarctic islands.

**Cytology:** n = 52 (Brownsey & Chinnock 1984).

**Hybridisation:** There is evidence for hybridisation between *H. lactea* and *H. ambigua* (AK 298766–298767) and *H. dicksonioides* (WELT P011537). Hybrids can be recognised by their aborted spores (see Brownsey & Chinnock 1984). There is also some morphological evidence that *H. lactea* and *H. rufobarbata* hybridise when they occur together (AK 270457–60, CHR 323893, WELT P011467), but no aborted spores have been found and further work is needed to determine whether such hybrids exist and whether they retain some degree of fertility (Brownsey & Chinnock 1984).

**Notes:** In New Zealand this species has been widely misidentified by earlier authors as *Polypodium rugosulum* Labill., *P. punctatum* Thunb., or combinations based on them.

*Hypolepis lactea* is morphologically and cytologically distinct from the Australian *H. rugosula*, which has n = c. 104 (Brownsey & Chinnock 1987). We therefore recognise it here as a distinct species, rather than as a subspecies of *H. rugosula* as proposed by Schwartzburd & Prado (2014).



**Fig. 50:** *Hypolepis lactea*. Mature, ovate, 3-pinnate frond.



**Fig. 51:** *Hypolepis lactea*. Habit of plant.



**Fig. 52:** *Hypolepis lactea*. Mature lamina showing red-brown rachis, becoming yellow-brown only at the distal end.



**Fig. 53:** *Hypolepis lactea*. Secondary pinnae bearing mature marginal round sori unprotected by any inrolled lamina flaps.



**Fig. 54:** *Hypolepis lactea*. Abundant short, colourless glandular hairs and occasional long red-brown non-glandular hairs on costae, and short, colourless glandular hairs on lamina surfaces and margins.

### ***Hypolepis millefolium* Hook., Sp. Fil. 2, 68, t. 95b (1852)**

Lectotype (selected by Allan 1961): no locality, *W. Colenso* 921, Herb. Hooker., K 000913958!

**Etymology:** From the Latin *mille-* (thousand), and *-folius* (leaved), a reference to the highly divided lamina of this species.

**Vernacular name:** thousand-leaved fern

Rhizomes long-creeping, 1.5–4 mm diameter, with stipes arising 10–130 mm apart; glabrous or bearing scattered pale brown hairs up to 2 mm long. Fronds 120–1000 mm long. Stipes 25–400 mm long, 1–3 mm diameter, red-brown proximally, chestnut-brown or yellow-brown distally, almost glabrous or bearing a few pale brown non-glandular hairs up to 2 mm long. Rachises pale brown proximally, becoming yellow-green distally, bearing pale brown or colourless non-glandular hairs up to 1 mm long. Laminae 3-pinnate to 4-pinnate-pinnatifid, ovate to broadly ovate or elliptic, tapering to a pinnatifid apex, 85–770 mm long, 35–400 mm wide, light green on both surfaces, herbaceous; glistening, colourless or rarely pale brown non-glandular hairs on costae but absent from abaxial lamina surfaces and margins, up to 1 mm long. Primary pinnae in 15–25 pairs below a short pinnatifid apex, widely spaced proximally, overlapping distally, narrowly winged distally, the proximal pair arising at 30–50° to rachis; distal primary pinnae narrowly ovate; proximal primary pinnae ovate; the longest below the middle, 25–280 mm long, 15–140 mm wide, apices acute or acuminate, bases short-stalked; one or more pairs of proximal pinnae sometimes greatly reduced. Secondary pinnae decreasing gradually in length along primary pinnae to the distal end, or one or more proximal pairs slightly shorter than the next, broadly winged; the longest ovate or narrowly ovate, 7–80 mm long, 5–35 mm wide, apices acute, bases short-stalked. Tertiary pinnae winged; the longest narrowly ovate or oblong, 2–20 mm long, 1–9 mm wide, apices obtuse, bases adnate, margins deeply divided or divided into quaternary segments. Quaternary pinnae 1–5 mm long, 1–4 mm wide, sometimes deeply divided on large fronds. Veins ending at apices of ultimate segments. Sori ± round, unprotected or protected by slightly reflexed green lamina flaps; paraphyses absent. Mean spore size 31–34 µm long, 20–22 µm wide; perispores pale, echinate and reticulate.



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

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

Chatham Islands, Stewart Island, Antipodes Island, Auckland Islands, Campbell Island.

Altitudinal range: 30–1500 m.

In the North Island *Hypolepis millefolium* occurs in montane and subalpine sites from Mt Pirongia and the Raukūmara Ranges southwards, occupying a zone from 500 m to 1375 m in all the high country areas. In the South Island it is widespread in montane and subalpine areas from 250 m to over 1500 m, but in the far south it descends almost to sea level. It is present on the Chatham Islands, Stewart Island and all the subantarctic islands except the Snares.

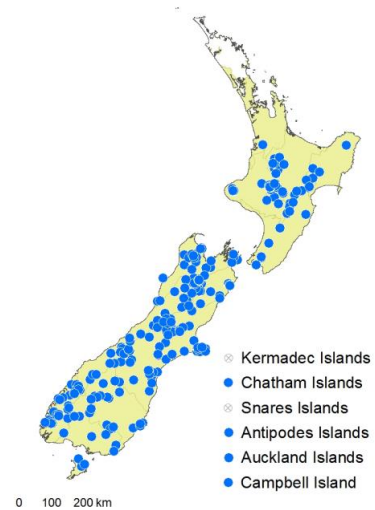
**Biostatus:** Indigenous (Endemic).

**Habitat:** Grows in open rocky places, on shingle slides, in tussock grassland and shrubland, on open hillsides and pasture, in subalpine scrub and herbfield, on forest margins, in forest clearings, along tracksides and streambanks, in forest, on swamp margins and on road banks. It occurs in podocarp, broadleaved and beech forest and under mānuka and plantations of conifers. It often forms extensive colonies by means of its underground rhizomes, and is deciduous in winter.

**Recognition:** *Hypolepis millefolium* is one of three *Hypolepis* species in New Zealand that lack glandular hairs. It is distinguished from *H. distans* by its veins, which reach the margin at an apex rather than a sinus; by its distal pinnae, which arise at an acute angle to the rachis rather than at right angles; and by its thicker stipes (1–3 cf. 0.75–1.25 mm diameter). It is similar to *H. ambigua* but can be recognised by its smaller fronds (up to 770 mm long and 400 mm wide, cf. 1200 mm long and 1200 mm wide), and narrower ultimate segments (less than 1 mm wide cf. more than 1 mm wide). The two are also often ecologically separated, *H. millefolium* generally occurring at higher elevations whereas *H. ambigua* is more common in lowland sites.

**Cytology:** n = 52 (Brownlie 1958; Brownsey & Chinnock 1984).

**Hybridisation:** There is evidence for hybridisation between *H. millefolium* and *H. ambigua* (WELT P011837) and *H. rufobarbata* (CHR 221720). Hybrids can be recognised by their aborted spores (see Brownsey & Chinnock 1984).



**Fig. 55:** *Hypolepis millefolium* distribution map based on databased records at AK, CHR & WELT.



**Fig. 56:** *Hypolepis millefolium*. Mature 3-pinnate-pinnatifid frond.



**Fig. 57:** *Hypolepis millefolium*. Habit of plants growing in open area.





**Fig. 58:** *Hypolepis millefolium*. Habit of plants growing in alpine boulder field.



**Fig. 59:** *Hypolepis millefolium*. Glistening, colourless non-glandular hairs on adaxial surface of rachis and primary costae.



**Fig. 60:** *Hypolepis millefolium*. Abaxial surface of primary pinna showing colourless non-glandular hairs, and round marginal sori protected by slightly reflexed green lamina flaps.



**Fig. 61:** *Hypolepis millefolium*. Abaxial surface of secondary pinna showing colourless non-glandular hairs, and round marginal sori protected by slightly reflexed green lamina flaps.



**Fig. 62:** *Hypolepis millefolium*. Mature sori protected by reflexed green lamina flaps.

***Hypolepis rufobarbata* (Colenso) N.A.Wakef., *Vict. Naturalist* 72: 159 (1956)**

≡ *Polypodium rufobarbatum* Colenso, *Trans. & Proc. New Zealand Inst.* 16: 347 (1884)

≡ *Polypodium rugosulum* subsp. *rufobarbata* (Colenso) Schwartsb. in Schwartsburd & Prado, *Acta Bot. Brasil.* 28: 217 (2014)

Lectotype (selected by Brownsey & Chinnock 1984): Norsewood, H[awkes] B[ay], Herb. W. Colenso, WELT P003346!

= *Polypodium viscidum* Colenso, *Tasmanian J. Nat. Sci.* 2: 164 (1845) nom. illeg., non *Polypodium viscidum* Roxb. 1816

Lectotype (selected by Allan 1961): open spots, mountains, near Waikare Lake [L. Waikaremoana], Dec. 1841, Herb. W. Colenso, WELT P003189!

**Etymology:** From the Latin *rufo-* (reddish-), and *barbatus* (tufts of hairs), a reference to the abundant red-brown hairs of this species.

**Vernacular name:** sticky pig fern

Rhizomes long-creeping, 1–2 mm diameter, with stipes arising 10–110 mm apart; bearing red-brown hairs up to 4 mm long. Fronds 125–1180 mm long. Stipes 30–500 mm long, 0.7–3 mm diameter, dark purple-brown to red-brown, bearing a few scattered red-brown non-glandular hairs up to 3 mm long and abundant shorter red-brown glandular hairs up to c. 0.7 mm long. Rachises red-brown proximally, becoming yellow-brown distally, densely covered in red-brown hairs with a few widely spaced non-glandular hairs up to 3 mm long, and many glandular and non-glandular hairs <1 mm long. Laminae 2-pinnate-pinnatifid to 3-pinnate-pinnatifid, narrowly ovate to ovate, tapering to a short pinnatifid apex, 90–830 mm long, 30–340 mm wide, light green on both surfaces, herbaceous; lamina margins and abaxial lamina surfaces bearing red-brown acicular hairs (sometimes pale in juvenile fronds) 0.25–0.5 mm long, interspersed on lamina surfaces with pale glandular and non-glandular hairs; costae bearing some red-brown non-glandular hairs to 1 mm long and many shorter red-brown glandular and non-glandular hairs. Primary pinnae in 12–30 pairs below pinnatifid apex, widely spaced, the proximal pair arising at 30–90° to rachis, winged distally; distal primary pinnae narrowly oblong or narrowly ovate; proximal primary pinnae ovate to narrowly ovate; the longest below the middle, 18–270 mm long, 10–100 mm wide, apices acuminate, bases short-stalked. Secondary pinnae gradually decreasing in length along each primary pinna to the distal end, winged throughout; the longest ovate or narrowly ovate, 6–52 mm long, 3–27 mm wide, apices acute or rarely acuminate in the longest pinnae and obtuse in the shortest, bases short-stalked to sessile or adnate in the smallest fronds. Tertiary pinnae oblong, 1–16 mm long, 1–7 mm wide, apices obtuse, bases adnate, partially divided on larger fronds. Veins ending in apices of ultimate segments. Sori ± round, virtually unprotected; paraphyses absent. Mean spore size 28–32 µm long, 18–21 µm wide; perispores pale, echinate, and reticulate.

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

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

Chatham Islands, Stewart Island.

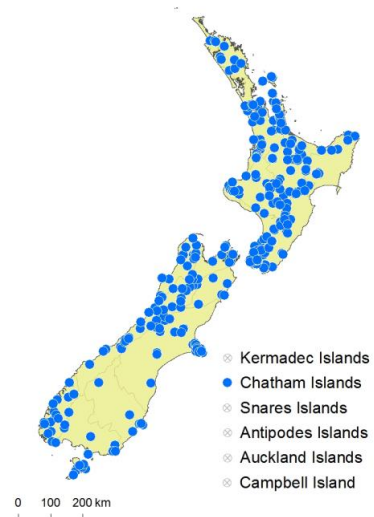
Altitudinal range: 10–1100 m.

*Hypolepis rufobarbata* is widespread in montane areas of the North Island from near Kaitiāia to Wellington, but is scarce on the east coast. It is occasionally found in lowland sites from 50 to 300 m, but occurs most frequently above 300 m, reaching 1100 m in the southern Ruahine Range. In the South Island it is widespread in lowland and montane areas, but is scarce in central Otago and South Canterbury. It mostly occupies a zone from 300 m up to 1000 m but occasionally descends to near sea level in the southern half of the island. It is rare on the Chatham Islands.

**Biostatus:** Indigenous (Endemic).

**Habitat:** Grows on disturbed or boggy soils, swamp margins, rocky ground, clay banks, stream banks, tracksides, and road banks, at the base of uprooted trees, on rotting logs, in humus, on bush margins, in clearings, under scrub, and in forest. It does not tolerate competition from other species and is a coloniser of open ground in damp forested or shaded areas. It grows in podocarp, broadleaved, beech and pine forest, and under mānuka and kānuka.

**Recognition:** *Hypolepis rufobarbata* is one of three similar species in New Zealand that have glandular hairs, red- or purple-brown stipes and rachises, and lack indusial flaps. *Hypolepis rufobarbata* is distinguished from *H. lactea* and *H. amaurorhachis* by the presence of abundant red-brown acicular hairs on the lamina margin, in contrast to the other two species, which have only



**Fig. 63:** *Hypolepis rufobarbata* distribution map based on databased records at AK, CHR & WELT.



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colourless glandular or acicular hairs on the margins. *Hypolepis lactea* is further distinguished by its milky exudate on the adaxial lamina surface at maturity, and by its veins, which are sometimes slightly excurrent. It also has abundant short, colourless, glandular hairs on the rachises and costae, in contrast to *H. rufobarbata*, which has red-brown glandular or acicular hairs. *Hypolepis amaurorhachis* is further distinguished by its paler red-brown stipe and rachis becoming green in the distal half.

**Cytology:** n = 52 (Brownlie 1954, 1957, as *H. rugosula*; Brownsey & Chinnock 1984).

**Hybridisation:** There is evidence for hybridisation between *H. rufobarbata* and *H. ambigua* (AK 170251, CHR 280735, WELT P007817) and *H. millefolium* (CHR 221720). Hybrids can be recognised by their aborted spores (see Brownsey & Chinnock 1984). The combination *H. ambigua* × *rufobarbata* is found commonly where the two species occur together. There is also some morphological evidence that *H. rufobarbata* and *H. lactea* hybridise when they occur together (CHR 323893, WELT P011467), but no aborted spores have been found and further work is needed to determine whether such hybrids exist and whether they retain some degree of fertility (Brownsey & Chinnock 1984).

**Notes:** In New Zealand this species has been widely misidentified by earlier authors as *Polypodium rugosulum* Labill., *P. punctatum* Thunb., or combinations based on them.

*Hypolepis rufobarbata* is morphologically and cytologically distinct from the Australian *H. rugosula*, which has n = c. 104 (Wakefield 1956; Brownsey & Chinnock 1987). We therefore recognise it here as a distinct species, rather than as a subspecies of *H. rugosula* as proposed by Schwartsburd & Prado (2014).



**Fig. 64:** *Hypolepis rufobarbata*. Mature fronds showing red-brown rachises.



**Fig. 65:** *Hypolepis rufobarbata*. Narrowly ovate mature frond.



**Fig. 66:** *Hypolepis rufobarbata*. Red-brown stipes and rachises bearing glandular hairs.



**Fig. 67:** *Hypolepis rufobarbata*. Abundant red-brown glandular hairs and longer red-brown non-glandular hairs on stipe, rachis and primary costae.



**Fig. 68:** *Hypolepis rufobarbata*. Primary costae showing shorter red-brown glandular hairs with longer, dark red-brown non-glandular hairs.



**Fig. 69:** *Hypolepis rufobarbata*. Ultimate lamina segments with round, unprotected submarginal sori, and red-brown non-glandular hairs on the margins.

## ***Leptolepia* Mett. ex Prantl, *Arbeiten Königl. Bot. Gart. Breslau* 1: 23 (1892)**

**Type taxon:** *Leptolepia novae-zelandiae* (Colenso) Mett. ex Diels

**Etymology:** From the Greek *lepto-* (slender, small) and *lepis* (a scale), a reference to the nature of the indusia.

Terrestrial ferns. Rhizomes long-creeping, bearing chestnut-brown multicellular hairs. Fronds monomorphic. Stipes hairy. Laminae 3–4-pinnate-pinnatifid, herbaceous, bearing non-glandular hairs; primary pinnae stalked, lacking basal pinnule-like stipules. Veins free. Sori round or oblong, superficial, submarginal; paraphyses absent. Indusia ovate or triangular, attached at base but not the sides, opening towards the margin. Spores trilete, coarsely verrucate.

**Taxonomy:** *Leptolepia* is a monotypic genus endemic to New Zealand, distinguished by its ovate or triangular, toothed indusium attached only at the base and opening towards the margin. *Leptolepia novae-zelandiae* nests with *Oenotrichia maxima* in one of the clades of *Dennstaedtia* (Perrie et al. 2015). However, it is currently far from clear what the generic limits should be in this part of the Dennstaedtiaceae, and *Leptolepia* is retained here as a monotypic genus until the group is investigated further.

**Distribution:** A monotypic genus endemic to New Zealand.

**Biostatus:** Indigenous (Endemic).

**Table 5:** Number of species in New Zealand within *Leptolepia* Mett. ex Prantl

Category	Number
Indigenous (Endemic)	1
<b>Total</b>	<b>1</b>

**Cytology:** The base chromosome number in *Leptolepia* is  $x = 47$  (Kramer 1990).

**Notes:** Authorship of the name *Leptolepia* was previously attributed to Mett. ex Kuhn (e.g. Allan 1961), but Pichi Sermolli (1978) noted that that name was a *nomen nudum* not validly published by Kuhn (1882).

## ***Leptolepia novae-zelandiae* (Colenso) Mett. ex Diels in Engler & Prantl, *Nat. Pflanzenfam.* 1(4), 212, f. 11a, b (1899)**

≡ *Davallia novae-zelandiae* Colenso, *Tasmanian J. Nat. Sci.* 2: 182 (1845)

≡ *Acrophorus hispidus* T.Moore, *Proc. Linn. Soc. London* 2: 286 (1854) nom. illeg., nom. nov. pro *Davallia novae-zelandiae* Colenso 1845

≡ *Microlepia novae-zelandiae* (Colenso) J.Sm., *Cult. Ferns* 67 (1856)

≡ *Dennstaedtia novae-zelandiae* (Colenso) Keyserl., *Polyp. Herb. Bunge.* 22 (1873)

Lectotype (selected by Allan 1961): damp woods, Te Waiiti district, Jan. 1842, Herb. W. Colenso, WELT P003253! (two fronds labelled "α")

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

**Vernacular name:** lace fern

Rhizomes long-creeping, 1–3 mm diameter, with stipes arising 20–175 mm apart; bearing chestnut-brown multicellular hairs up to 2 mm long. Fronds 135–1150 mm long. Stipes 40–675 mm long, 0.5–4 mm diameter, red-brown or becoming chestnut-brown distally, bearing chestnut-brown multicellular non-glandular hairs up to 3 mm long proximally. Rachises chestnut-brown or becoming yellow-brown distally, smooth and polished, bearing hairs at pinna junctions on adaxial surface up to 2 mm long, scattered hairs elsewhere, or rarely abundantly hairy in developing fronds. Laminae 3-pinnate-pinnatifid to 4-pinnate-pinnatifid, ovate or elliptic or broadly ovate, tapering to a pinnatisect apex, 65–530 mm long, 40–500 mm wide, dark green to yellow-green on both surfaces, coriaceous, glabrous or with very scattered colourless or pale brown multicellular non-glandular hairs. Primary pinnae in 15–27 pairs below pinnatisect apex, overlapping or sometimes the proximal ones not overlapping, narrowly winged distally; distal primary pinnae narrowly ovate; proximal primary pinnae ovate; the longest at or near the base, 22–260 mm long, 11–125 mm wide, apices acute or acuminate, bases short-stalked. Secondary pinnae narrowly winged, decreasing gradually in length along acroscopic side of primary pinnae to the distal end; the basal basispic secondary pinna inserted at a more acute angle than the basal acroscopic one and sometimes shorter; the longest secondary pinnae narrowly ovate, 8–80 mm long, 4–32 mm wide, apices acute or acuminate, bases stalked. Tertiary pinnae narrowly ovate, 3–23 mm long, 1–8 mm wide, apices acute, bases stalked, usually deeply divided more than halfway to the midrib into ultimate segments, or rarely undivided in the smallest specimens and completely divided into quaternary pinnae in the largest. Sori round or oblong. Indusia ovate or broadly ovate or triangular, margins toothed.

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

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

Chatham Islands, Stewart Island.

Altitudinal range: 30–900 m.

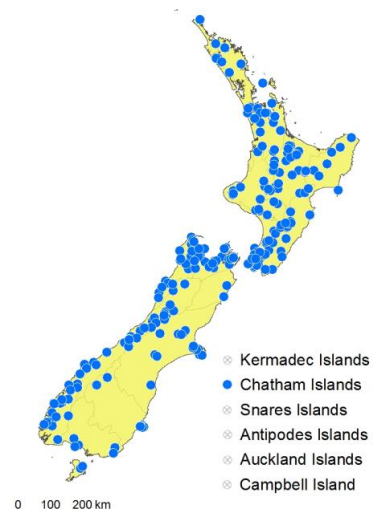
*Leptolepia novae-zelandiae* is widely distributed in lowland and montane areas of the North Island from Te Pahi to Wellington, mostly above 100 m and reaching over 900 m on Mt Hauhungatahi and Mt Taranaki. In the South Island it occurs in lowland and montane areas throughout, although it is scarcer on the east coast and largely absent from the drier parts of Marlborough, South Canterbury, Otago and northern Southland. It ranges from c. 30 m up to 750 m in Blue Duck Reserve, near Kaikōura. It also extends to Stewart Island and the Chatham Islands.

**Biostatus:** Indigenous (Endemic).

**Habitat:** *Leptolepia novae-zelandiae* grows in shaded podocarp, broadleaved and beech forest. It favours damp soils in gullies and on stream banks, river terraces, banks, and tracksides, and occasionally on rotting logs.

**Recognition:** *Leptolepia novae-zelandiae* can be recognised by its creeping rhizomes, red-brown or chestnut-brown stipes and rachises, highly divided laminae bearing non-glandular multicellular hairs, and round submarginal sori that are protected by ovate or triangular indusia opening towards the lamina margin. The basal basispic secondary pinnae on each primary pinna are often greatly reduced.

**Cytology:** n = c. 47 (Brownlie 1961).



**Fig. 70:** *Leptolepia novae-zelandiae* distribution map based on databased records at AK, CHR & WELT.





**Fig. 71:** *Leptolepia novae-zelandiae*. Mature 3-pinnate-pinnatifid frond.



**Fig. 72:** *Leptolepia novae-zelandiae*. Mature 3-pinnate-pinnatifid frond.



**Fig. 73:** *Leptolepia novae-zelandiae*. Mature frond showing chestnut-brown rachis becoming yellow-brown distally, and reduced basal basiscopic secondary pinnae inserted at an acute angle.



**Fig. 74:** *Leptolepia novae-zelandiae*. Long-creeping rhizome and base of stipe bearing chestnut-brown non-glandular hairs.



**Fig. 75:** *Leptolepia novae-zelandiae*. Adaxial surface of rachis and primary pinnae.



**Fig. 76:** *Leptolepia novae-zelandiae*. Abaxial surface of rachis and primary pinna showing narrowly winged costae.





**Fig. 77:** *Leptolepia novae-zelandiae*. Abaxial surface of secondary pinnae showing submarginal sori.



**Fig. 78:** *Leptolepia novae-zelandiae*. Abaxial surface of lamina showing submarginal sori protected by ovate indusia attached basally and opening towards the margin.

## ***Microlepia* C.Presl, *Tent. Pterid.* 124, t. 4 (1836)**

**Type taxon:** *Microlepia polypodioides* (Sw.) C.Presl

**Etymology:** From the Greek *mikros* (small) and *lepis* (a scale), a reference to the nature of the indusia.

Terrestrial ferns. Rhizomes short- to long-creeping, bearing multicellular hairs. Fronds monomorphic. Stipes hairy. Laminae 2–3-pinnate (NZ) or 1-pinnate or 4-pinnate (not NZ), herbaceous (NZ) or coriaceous (not NZ), bearing non-glandular hairs; primary pinnae stalked, lacking basal pinnule-like stipules. Veins free. Sori round (NZ) or broader than long (not NZ), on a slightly raised receptacle, submarginal; paraphyses present (NZ) or absent (not NZ). Indusia half-cup-shaped, attached at base and sides (NZ), or rarely cup-shaped (not NZ). Spores trilete, finely echinate or almost smooth.

**Taxonomy:** *Microlepia* is closely related to, and often difficult to distinguish from, *Dennstaedtia*. Molecular evidence (Schuettepelz & Pryer 2007; Perrie et al. 2015) suggests that it is monophyletic and sister to one clade of *Dennstaedtia*. It is slightly more homogeneous cytologically than *Dennstaedtia*, with base chromosome numbers of  $x = 40, 42, 43$  and c. 44 reported (Brownsey 1998). The genus is in need of revision.

**Distribution:** A genus of one pantropical species and about 60 species in the Asia–Pacific region (PPG 1 2016), with 25 species in China (Yuehong et al. 2013), six in Malaya (Holtum 1968), seven in the Philippines (Copeland 1958), five in New Guinea (Copeland 1950), one in Australia (Brownsey 1998), and about five in the Pacific. One species occurs as a casual in New Zealand.

**Biostatus:** Exotic; casual.

**Table 6:** Number of species in New Zealand within *Microlepia* C.Presl

Category	Number
Exotic: Casual	1
<b>Total</b>	<b>1</b>

**Recognition:** In New Zealand, *Microlepia* can be recognised by its creeping rhizomes, highly divided laminae bearing non-glandular hairs, more or less round submarginal sori, and half-cup-shaped indusia attached at the base and sides.

**Notes:** *Microlepia* was described by Presl (1836) but is pre-dated by *Scyphofilix*, published 30 years earlier by Thouars (1806). They were both lectotypified with the same type by Farwell (1931), who argued that *Scyphofilix* had priority over *Microlepia*. Nevertheless, Farwell's work has been ignored and *Microlepia* almost universally adopted as the name for this genus. Schwartzburd (2017) proposed that *Microlepia* should be conserved against *Scyphofilix*.

## ***Microlepia strigosa* (Thunb.) C.Presl, *Epimel. Bot.* 95 (1851)**

≡ *Trichomanes strigosum* Thunb. in Murray, *Syst. Veg.*, ed. 14, 941 (1784)

Holotype?: Japan, *C.P. Thunberg*, UPS 25129 (online) – annotated “lectotype, T. Nakaike, 24 Oct. 1978” (see Roux 2009)

= *Davallia pinkneyi* Colenso, *Trans. & Proc. New Zealand Inst.* 29: 415 (1897)  
≡ *Microlepidia pinkneyi* (Colenso) C. Chr., *Index Filic.* 427 (1906)  
Holotype: New Zealand, *W. Colenso*, pres. 1897, K 000913939 (online)

**Etymology:** From the Latin *strigosus* (bearing short, straight, appressed, sharp-pointed hairs), a reference to the indumentum on the laminae.

**Distribution:** North Island: Auckland

Altitudinal range: 40 m.

Known only from one locality in Mt Wellington, Auckland, where it established spontaneously in a garden.

Occurs naturally in India, Sri Lanka, China, south-east Asia, New Caledonia, Vanuatu, Fiji and Hawai'i.

**Biostatus:** Exotic; casual.

**Habitat:** Recorded as naturalised in a garden and established in the lawn, along a fence-line and under a slat terrace (Heenan et al. 2004).

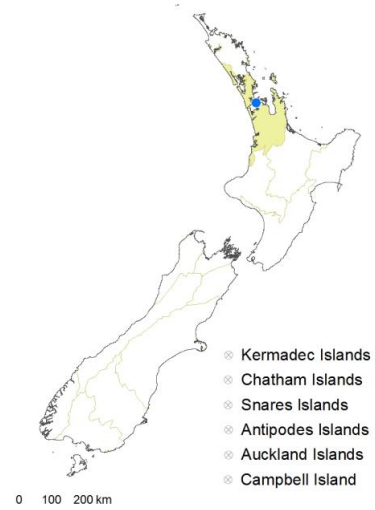
**First record:** Heenan et al. (2004). Voucher AK 281050, 2003.

**Recognition:** *Microlepidia strigosa* has long-creeping rhizomes; fronds 470–950 mm long; stipes yellow-brown to red-brown, 180–350 mm long; laminae 2–3-pinnate-pinnatifid, ovate, 210–510 mm long; the longest primary pinnae 70–200 mm long and 45–70 mm wide. The abaxial surfaces of the rachis, costae and veins bear abundant, colourless or pale brown, multicellular, non-glandular hairs up to 1.2 mm long. The sori are submarginal, and the indusia are half-cup-shaped, attached on three sides, bearing hairs at the base and on the abaxial surface.

**Notes:** Bartholomew et al. (1997) pointed out that Carl Thunberg's names in Johan Murray's *Systema vegetabilium* of 1784 should be attributed to Thunberg. The correct author citation for *Trichomanes strigosum* is therefore "Thunb." and not "Thunb. ex Murray".

*Davallia pinkneyi* was described by Colenso (1897) from a frond collected by Mr Pinkney "in a dry wood near margin of Mangatera Stream, south of Dannevirke; 1895" and grown in his private fernery. The original location was subsequently felled and burnt. Colenso stated that he sent half a fertile frond and two sterile ones to K, and these specimens constitute the holotype (K 000913939). They are annotated in Colenso's writing "Fern exhibited at meeting, and description drawn up, paper rec'd – for publication next vol.". There are two more sheets in the Cheeseman herbarium (AK 114359–114360), both labelled "*Davallia (Microlepidia) pinkneyi*" in Colenso's hand-writing and "lower specimen bearing fruit" on AK 114359. There are four sterile fronds and most of a fertile frond, but no indication of locality except for a more recent annotation "Hawkes Bay (probably)". These sheets do not match Colenso's description of the type and were probably acquired by him later.

Brownlie (1959) examined the specimens at K and identified them as belonging to *Microlepidia strigosa*, which, he said, had been grown in ferneries for at least a century. He suggested that Pinkney may have had exotic as well as native ferns growing in his fernery, and that the origin of the material he gave to Colenso may have been confused. He suggested deleting *M. strigosa* from the list of indigenous New Zealand ferns. However, if it could be shown that Colenso's specimen was genuinely naturalised, it would constitute the first record for this species in New Zealand, preceding the current record by over 100 years.



**Fig. 79:** *Microlepidia strigosa* distribution map based on databased records at AK, CHR & WELT.





**Fig. 80:** *Microlepia strigosa*. Herbarium specimen of a fertile frond from Mt Wellington, Auckland, WELT P026697.



**Fig. 81:** *Microlepia strigosa*. Close up from WELT P026697, showing abundant, multicellular, non-glandular hairs on the abaxial lamina surface, and submarginal indusia with hairs at their bases.

## ***Paesia* A.St.-Hil., Voy. Distr. Diam. 1, 381 (1833)**

**Type taxon:** *Paesia viscosa* J.St.-Hil.

**Etymology:** Named in honour of Fernando Dias Paes Leme (1608–1681), Portuguese administrator of Minas Gerais, Brazil.

Terrestrial or rupestral ferns. Rhizomes long-creeping, bearing red-brown multicellular hairs. Fronds monomorphic or slightly dimorphic. Stipes hairy. Laminae 3–4-pinnate-pinnatifid, herbaceous or coriaceous, bearing glandular and/or non-glandular hairs; primary pinnae stalked, lacking basal pinnule-like stipules. Veins free except for a marginal connecting vein. Sori more or less continuous around the lamina margin, borne on the connecting vein, superficial; paraphyses absent. Outer indusium formed from the reflexed membranous lamina margin, opening inwards; inner indusium also present, margin irregularly toothed. Spores monolete, coarsely rugose.

**Taxonomy:** *Paesia* is a clearly defined genus within Dennstaedtiaceae.

**Distribution:** A genus of about 12 species with two species in tropical America, and the others in eastern Asia and the Pacific (Kramer 1990). Absent from Australia. One endemic species in New Zealand.

**Biostatus:** Indigenous (Non-endemic).

**Table 7:** Number of species in New Zealand within *Paesia* A.St.-Hil.

Category	Number
Indigenous (Endemic)	1
<b>Total</b>	<b>1</b>

**Recognition:** *Paesia* can be recognised by its long-creeping rhizomes, highly divided laminae sometimes bearing glandular hairs, and sori that are more or less continuous around the lamina margins protected by the inrolled lamina margin and a true inner indusium.

**Cytology:** The base chromosome number in *Paesia* is  $x = 26$  (Brownsey 1983; Kramer 1990).

## *Paesia scaberula* (A.Rich.) Kuhn, *Chaetopt.*, 27 (1882)

≡ *Pteris scaberula* A.Rich., *Voy. Astrolabe, Essai*, 82, t. 11 (1832)

≡ *Allosorus scaberulus* (A.Rich.) C.Presl, *Tent. Pterid.* 154 (1836)

≡ *Ornithopteris scaberula* (A.Rich.) J.Sm., *Hist. Fil.* 299 (1875)

Holotype: Nille Zelande [New Zealand], *Astrolabe*, P 00633367!

= *Pteris microphylla* A.Cunn., *Companion Bot. Mag.* 2: 366 (1837)

Holotype: Wangaroa, New Zealand, A. *Cunningham*, Nov. 1826, K 000913945!

**Etymology:** From the Latin *scaberulus* (roughish), a reference to the slightly scabrid stipe and rachis.

**Vernacular names:** hard fern; lace fern; mātā; mātātā; pig fern; ring fern; scented fern; sticky pig fern

Rhizomes long-creeping, 1–4 mm diameter, with stipes arising 10–165 mm apart; bearing chestnut-brown, multicellular, non-glandular hairs up to 4 mm long. Fronds 150–1175 mm long. Stipes 25–560 mm long, 1–2.5 mm diameter, red-brown or chestnut-brown, bearing red-brown, multicellular, non-glandular hairs up to 5 mm long. Rachises chestnut-brown, becoming yellow-brown distally, zigzag, bearing red-brown, multicellular, non-glandular hairs up to 2 mm long, and very short yellowish glandular hairs up to 0.1 mm long (becoming white with age). Laminae 3–4-pinnate, ovate or elliptic, tapering to a short pinnatisect apex, 100–780 mm long, 45–430 mm wide, yellow-green on both surfaces, coriaceous; abaxial surface of costae bearing red-brown, multicellular, non-glandular hairs up to 1 mm long; costae and both lamina surfaces bearing very short, yellowish, glandular hairs. Primary pinnae in 15–30 pairs below pinnatisect apex, widely spaced proximally, overlapping distally, narrowly winged distally except in the most divided fronds; distal primary pinnae narrowly ovate; proximal primary pinnae ovate; the longest at or below the middle, 25–265 mm long, 11–90 mm wide, apices acute or acuminate, bases stalked. Secondary pinnae decreasing gradually in length along primary pinnae to the distal end, narrowly winged throughout; the longest narrowly ovate or ovate, 9–60 mm long, 4–23 mm wide, apices acute or acuminate, bases short-stalked; fertile secondary pinnae often with a long undivided terminal segment. Tertiary pinnae narrowly ovate or narrowly oblong, 3–13 mm long, 1–4 mm wide, apices acute or obtuse, bases short-stalked, margins entire on fertile pinnae, deeply divided on sterile pinnae, sometimes into quaternary pinnae. Sori and indusia almost continuous along margins of ultimate segments.

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

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

Three Kings Islands, Chatham Islands, Stewart Island.

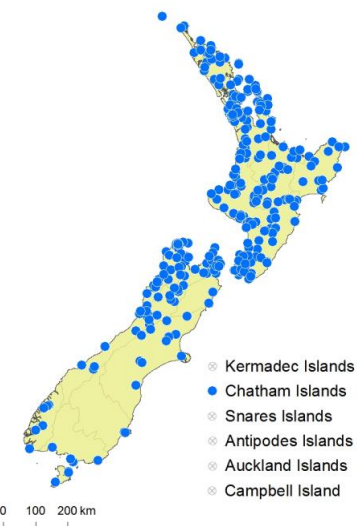
Altitudinal range: 0–1200 m.

*Paesia scaberula* is widespread in coastal, lowland and montane areas of the North Island from Te Pahi south, reaching over 1200 m on Mt Honokawa in the Raukūmara Range. In the South Island it occurs commonly in coastal and lowland areas of the northern half of the island, but elsewhere it is largely confined to coastal districts and is absent from drier inland regions. It reaches 1200 m near Hokitika. It also occurs on the Chatham Islands.

**Biostatus:** Indigenous (Endemic).

**Habitat:** *Paesia scaberula* often forms extensive populations in reverting pasture, grassy clearings, and on stabilised dunes and waste ground. It also grows in roadside ditches and banks, along tracksides, in light gaps in forest, on rotten wood, on swamp and forest margins, in pākihi, along stream beds and hot streams, in modified tussock, and on scree. It mostly grows in the open, but also occurs under podocarp, broadleaved and beech forest, under mānuka and kānuka, in coastal scrub, under pine plantations and with bracken.

**Recognition:** *Paesia scaberula* can be recognised by its long-creeping rhizomes, highly divided and slightly dimorphic laminae bearing glandular hairs, zigzag rachises, and sori that are more or less continuous around the lamina margins, protected by the inrolled lamina margin and a true inner indusium. The sterile pinnae are more divided than the fertile pinnae.



**Fig. 82:** *Paesia scaberula* distribution map based on databased records at AK, CHR & WELT.



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Very occasional crested forms are found with the apices of the pinnae divided multiple times.

**Cytology:** n = 26 (Brownlie 1954, 1957).



**Fig. 83:** *Paesia scaberula*. Mature 3-pinnate frond.



**Fig. 84:** *Paesia scaberula*. Yellow-brown zig-zag rachis.



**Fig. 85:** *Paesia scaberula*. Abaxial surface of rachis showing multicellular, red-brown, non-glandular hairs and tiny, yellowish, glandular hairs.



**Fig. 86:** *Paesia scaberula*. Adaxial surface of mature fertile frond.



**Fig. 87:** *Paesia scaberula*. Abaxial surface of primary pinna showing elongated marginal sori protected by reflexed membranous lamina margin.



**Fig. 88:** *Paesia scaberula*. Mature marginal sori protected by reflexed membranous lamina margins.





**Fig. 89:** *Paesia scaberula*. Over-mature sori almost continuous around the lamina margins.



**Fig. 90:** *Paesia scaberula*. Plants covering reverting hillside pasture.

***Pteridium* Gled. ex Scop., *Fl. Carniol.* 169 (1760), nom. cons.**

= *Cincinalis* Gled., *Syst. Pl. [Gleditsch]* 290 (1764)

= *Pteris* sect. *Ornithopteris* J.Agardh, *Recens. Spec. Pter.* 45 (1839)

≡ *Ornithopteris* (J.Agardh) J.Sm., *Hist. Fil.* 297 (1875) nom. illeg., non *Ornithopteris* Bernh. 1805

**Type taxon:** *Pteridium aquilinum* (L.) Kuhn

**Etymology:** Diminutive of the Greek *ptēris* (a fern).

Terrestrial ferns. Rhizomes long-creeping, bearing multicellular hairs. Fronds monomorphic. Stipes hairy. Laminae 2–5-pinnate, coriaceous, bearing non-glandular hairs; primary pinnae stalked, sometimes with reduced stipule-like basal pinnules. Veins free except for a marginal connecting vein. Sori more or less continuous around the lamina margin borne on the connecting vein, superficial; paraphyses absent. Outer indusium formed from the reflexed membranous lamina margin, opening inwards; inner indusium poorly developed or absent. Spores trilete, irregularly granulate.

**Taxonomy:** *Pteridium* is clearly defined and forms a clade along with *Paesia*, *Saccoloma*, *Histiopteris* and *Blotiella* within Dennstaedtiaceae (Perrie et al. 2015). It is a worldwide genus variously interpreted as having a single species with two subspecies and a number of varieties (Tryon 1941; Page 1976; Tryon & Tryon 1982; Kramer 1990), or perhaps four closely related species and several subspecies (Brownsey 1989, 1998; Der et al. 2009; Thomson 2012; Zhou et al. 2014). Recent analyses of sequence data suggest that there are two major diploid clades corresponding to *P. aquilinum* in the Northern Hemisphere and Africa, and *P. esculentum* in South America, Australia, New Zealand and south-east Asia. There is also evidence for two allotetraploid species – *P. semihastatum* in northern Australia and south-east Asia, and *P. caudatum* in Central and South America (Thomson & Alonso-Amelot 2002; Der et al. 2009; Zhou et al. 2014). However, some authors have continued to recognise additional species in South America (Schwartzburd et al. 2014) and China (Wenbo et al. 2013).

**Distribution:** A subcosmopolitan genus interpreted here as having four closely related species and several subspecies. There are two species in Australia (Brownsey 1989, 1998) and one in the Pacific. One non-endemic species in New Zealand.

**Biostatus:** Indigenous (Non-endemic).

**Table 8:** Number of species in New Zealand within *Pteridium* Gled. ex Scop.

Category	Number
Indigenous (Non-endemic)	1
<b>Total</b>	<b>1</b>

**Recognition:** *Pteridium* can be recognised by its long-creeping rhizomes, highly divided laminae bearing non-glandular hairs, and sori that are more or less continuous around the lamina margins protected by the inrolled lamina margin and a poorly developed inner indusium.

**Cytology:** The base chromosome number in *Pteridium* is  $x = 26$  (Brownsey 1983; Kramer 1990).

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***Pteridium esculentum* (G.Forst.) Cockayne, *Rep. Bot. Survey  
Tongariro Natl. Park 34* (1908)**

≡ *Pteris esculenta* G.Forst., *Pl. Esc.* 74 (1786)

≡ *Allosorus esculentus* (G.Forst.) C.Presl, *Tent. Pterid.* 154 (1836)

≡ *Pteris aquilina* var. *esculenta* (G.Forst.) Hook.f., *Bot. Antarct. Voy. II (Fl. Nov.-Zel.) Part II*, 25 (1854)

≡ *Cincinalis esculenta* (G.Forst.) Trevis., *Atti Soc. Ital. Sci. Nat.* 17: 239 (1874)

≡ *Ornithopteris esculenta* (G.Forst.) J.Sm., *Hist. Fil.* 298 (1875)

≡ *Pteridium aquilinum* var. *esculentum* (G.Forst.) Kuhn, *Chaetopt.*, 27 (1882)

≡ *Pteridium aquilinum* subsp. *esculentum* (G.Forst.) C.Chr., *Index Filic.* 591, 597 (1906)

Lectotype (selected by Brownsey 1989): Nov. Zealand [New Zealand], Herb. G. Forster 258, BM 001048405!

**Etymology:** From the Latin *esculentus* (edible), a reference to the use of bracken rhizomes as a food source, especially by Māori.

**Vernacular names:** austral bracken; bracken

Terrestrial ferns. Rhizomes long-creeping, bearing multicellular hairs. Fronds 250–2000 mm long or more. Stipes 1–10 mm diameter, bearing petiolar roots distally above the junction with the rhizome. Rachises with swollen nectaries at the base of the primary pinnae. Laminae 2-pinnate-pinnatifid to 5-pinnate, broadly ovate or broadly elliptic, bearing hairs, lacking scales. Some lamina segments adnate at base with long-decurrent bases either extending along the axes, or often becoming separated as free lobes forming narrow wings. Ultimate lamina segments linear and entire; adaxial surface dark green and glossy; abaxial surface paler green, bearing white hairs and minute gnarled trichomes that create a farinaceous or mealy appearance. When fertile, sori almost continuous along margins of ultimate segments, protected by the inrolled lamina margin.

**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, Antipodes Island.

Altitudinal range: 0–1000 m.

*Pteridium esculentum* occurs on Raoul Island (Sykes & West 1996), the Three Kings Islands, and in coastal, lowland, and montane sites throughout the North Island and much of the South Island. It has been little documented from the driest parts of south Canterbury and Otago. In the North Island it grows from near sea level to over 1000 m in the northern Ruahine Ranges, and in the South Island up to 1000 m on Mt Benmore, Marlborough. It also occurs on Stewart Island, the Chatham Islands, and Antipodes Island.

Also Australia (Western Australia, South Australia, Queensland, New South Wales, Victoria, Tasmania), Lord Howe Island, Norfolk Island, Solomon Islands, New Caledonia, Vanuatu, Fiji, Tonga, Central America from Mexico south, Caribbean islands, South America except Chile (see Brownsey 1989; Thomson 2012).

**Biostatus:** Indigenous (Non-endemic).

**Habitat:** *Pteridium esculentum* is a serious weed of pasture, aggressively invading cleared or burnt land and forming extensive populations by means of its underground rhizomes. It eventually disappears under regenerating scrub and forest. It is found in rough and reverting pasture, on road cuttings and banks, in ditches, on lake and forest margins, in peat bogs, on old sand dunes, on cliff faces, in forest clearings and disturbed ground, along river beds and terraces, in tussock land, and on heated ground. Although mostly found in the open, it also occurs under podocarp, broadleaved and beech forest, under mānuka and kānuka, in coastal and other scrub, and under pine plantations.

**Recognition:** *Pteridium esculentum* is distinguished from the northern hemisphere diploid species, *P. aquilinum*, by the presence of petiolar roots at the base of the stipe above the junction with the rhizome, winged axes that appear as free lobes or as long-decurrent bases to the lamina segments (Thomson 2016), and gnarled trichomes on the abaxial lamina surface that cause a farinaceous or mealy appearance (Thomson 2012). These features are all absent in *P. aquilinum*.

**Cytology:** n = 52 (Brownlie 1954, 1957).

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**Notes:** Thomson (2012) recognised two species of diploid bracken: the predominantly northern hemisphere *Pteridium aquilinum* (L.) Kuhn and the mainly southern hemisphere *Pteridium esculentum*. He further recognised 11 subspecies within *P. aquilinum* and two subspecies within *P. esculentum* – subsp. *esculentum* confined to Australia, New Zealand, New Caledonia, Solomon Islands, New Guinea, Vanuatu, Fiji and Tonga, and subsp. *arachnoideum* (Kaulf.) J.A.Thomson confined to Central and South America. However, Schwartsburd et al. (2014) continued to treat the South American plants as a distinct species, *P. arachnoideum* (Kaulf.) Maxon.

***Pteridium esculentum* (G.Forst.) Cockayne, Rep. Bot. Survey  
Tongariro Natl. Park 34 (1908) subsp. *esculentum***

**Vernacular names:** austral bracken; bracken; rahurahu; rarauhe; rārahu

Rhizomes long-creeping, 3–12 mm diameter, with stipes arising 10–100 mm apart; bearing red-brown, multicellular hairs up to 3 mm long. Fronds 250–2200 mm long. Stipes 85–1360 mm long, 1–10 mm diameter, becoming woody, grey-brown or pale chestnut-brown, glabrous or bearing scattered dark brown, multicellular, non-glandular hairs. Rachises pale chestnut-brown or yellow-brown, bearing similar hairs to the stipe up to 1 mm long. Laminae 2-pinnate-pinnatifid to 5-pinnate, broadly ovate or broadly elliptic, tapering to an undivided terminal segment, 100–1350 mm, 165–900 mm wide, adaxial surface dark green, abaxial surface paler green, coriaceous; abaxial lamina surface bearing abundant straight, white, appressed acicular hairs along the veins of ultimate segments; costae bearing curly brown, multicellular, non-glandular hairs up to 1 mm long, abundantly so in uncoiling fronds; adaxial surface of juvenile fronds bearing white, multicellular, non-glandular hairs, becoming glabrous in mature fronds. Primary pinnae in 7–20 pairs below undivided terminal segment, widely spaced proximally, overlapping distally, curled downwards, not winged, arising at 90° to rachis; distal primary pinnae ovate or narrowly ovate; proximal primary pinnae ovate or broadly ovate; the longest at or near the base, 70–820 mm long, 40–520 mm wide, apices acute, bases short- or long-stalked. Secondary pinnae decreasing gradually in length along primary pinnae to the distal end, except the basal basiscopic one usually greatly reduced to a stipule-like pinnule near junction with rachis, arising at 90° to costae; the longest narrowly to broadly ovate, 23–490 mm long, 5–200 mm wide, apices drawn out into an undivided terminal segment, bases short-stalked or sessile. Tertiary pinnae narrowly ovate, the basal basiscopic one sometimes reduced in highly divided fronds, arising at 90° to costae; the longest 3–115 mm long, 1–50 mm wide, apices drawn out into a long undivided terminal segment, bases short-stalked or sessile or decurrent in less divided fronds; decurrent segments sometimes becoming separated as free lobes. Quaternary pinnae narrowly oblong or linear, the longest 4–25 mm long, 1–10 mm wide, apices obtuse or rounded, margins entire, bases adnate or decurrent, divided again in largest fronds into ultimate segments up to 5 mm long and 1 mm wide. Ultimate segments up to 5 mm long and 1 mm wide. Sori almost continuous along margins of ultimate segments.

**Note:** measurements given above are from herbarium specimens. Much larger fronds are known to occur in the wild. CHR 223011 comprises parts of a frond that was said to measure 4700 mm long, with the stipe 2600 mm long, the lamina 2080 mm long, the largest primary pinna 1450 mm long, and the largest secondary pinna 560 mm long.



**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, Antipodes Island.

Altitudinal range: 0–1000 m.

*Pteridium esculentum* subsp. *esculentum* occurs on Raoul Island (Sykes & West 1996), the Three Kings Islands, and in coastal, lowland, and montane sites throughout the North Island and much of the South Island. It has been under-collected from the driest parts of south Canterbury and Otago, where it is known to occur (John Steel, pers. comm.). In the North Island it grows from near sea level to over 1000 m in the northern Ruahine Ranges, and in the South Island up to 1000 m on Mt Benmore, Marlborough. It also occurs on Stewart Island, the Chatham Islands, and Antipodes Island.

Also Australia (Western Australia, South Australia, Queensland, New South Wales, Victoria, Tasmania), Lord Howe Island, Norfolk Island, Solomon Islands, New Caledonia, Vanuatu, Fiji, Tonga (see Brownsey 1989; Thomson 2012).

It has been reported from Mt Kinabalu (Parris et al. 1992; Beaman & Edwards 2007), and may extend to New Guinea, Indonesia, and Malaysia, but records are not clearly distinguished from *P. semihastatum* (Brownsey 1989). It has also been recorded for China, with a distribution extending to Cambodia, India, Indonesia, Malaysia, Philippines, Thailand, and Vietnam (Wenbo et al. 2013). In contrast, based on molecular evidence from three chloroplast DNA regions, Zhou et al. (2014) recognised only two subspecies of *P. aquilinum* in China. The exact distribution of *P. esculentum* subsp. *esculentum* outside Australia and the Pacific, especially in the Malesian region, therefore requires further investigation.

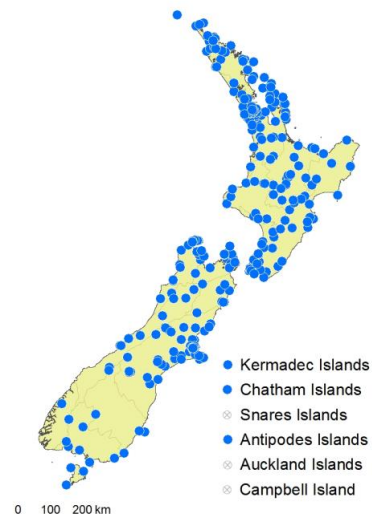
**Biostatus:** Indigenous (Non-endemic).

**Habitat:** *Pteridium esculentum* subsp. *esculentum* is a serious weed of pasture, aggressively invading cleared or burnt land and forming extensive populations by means of its underground rhizomes (McGlone et al. 2005). It eventually disappears under regenerating scrub and forest. It is found in rough and reverting pasture, on road cuttings and banks, in ditches, on lake and forest margins, in peat bog, on old sand dunes, on cliff faces, in forest clearings and disturbed ground, along river beds and terraces, in tussock land, and on heated ground. Although mostly found in the open, it also occurs under podocarp, broadleaved and beech forest, under mānuka and kānuka, in coastal and other scrub and under pine plantations.

**Recognition:** *Pteridium esculentum* subsp. *esculentum* can be recognised by its long-creeping rhizomes, highly divided laminae, with the pinnae and pinna segments arising at 90° to their axes, abaxial lamina surfaces bearing straight, white, appressed, acicular hairs along the veins of the ultimate segments and curly brown, non-glandular hairs on the costae, and sori that are more or less continuous around the lamina margins protected by the inrolled lamina margin and a poorly developed inner indusium. Fronds vary immensely in size from dwarf forms only about 200 mm long up to fronds 3–4 m in length, much longer than the dimensions given in the description above, which are based solely on herbarium specimens.

**Cytology:** n = 52 (Brownlie 1954, 1957).

**Notes:** Bracken root was a staple plant food source for early Māori, second only in importance to the kūmara (Colenso 1881; Best 1942; Roskrige 2014), but was also valued for its medicinal properties (Riley 1994). The Ngā Tipu Whakaoranga database, <http://maoriplantuse.landcareresearch.co.nz>, provides a comprehensive list of Māori names for the bracken fern and its various parts, and an extensive bibliography detailing its traditional use.



**Fig. 91:** *Pteridium esculentum* subsp. *esculentum* distribution map based on databased records at AK, CHR & WELT.



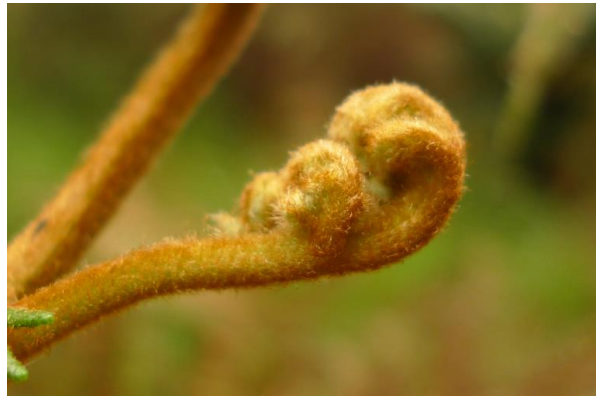
**Fig. 92:** *Pteridium esculentum*. Mature fronds.



**Fig. 93:** *Pteridium esculentum*. Mature fronds growing on scrub margin.



**Fig. 94:** *Pteridium esculentum*. Swollen nectary on rachis at base of primary pinna.



**Fig. 95:** *Pteridium esculentum*. Uncoiling primary pinna abundantly covered in curly brown, non-glandular multicellular hairs.



**Fig. 96:** *Pteridium esculentum*. Primary pinnae with reduced stipule-like basal basiscopic secondary pinnae.



**Fig. 97:** *Pteridium esculentum*. Secondary pinnae at base of primary pinna bearing decurrent tertiary pinnae.





**Fig. 98:** *Pteridium esculentum*. Secondary pinnae with decurrent tertiary pinnae distally, the decurrent segments becoming separated as free lobes proximally.



**Fig. 99:** *Pteridium esculentum*. Free lobes on costae of secondary pinnae.



**Fig. 100:** *Pteridium esculentum*. Curly brown hairs on abaxial surfaces of costae, and reflexed membranous lamina margin protecting the maturing sori.



**Fig. 101:** *Pteridium esculentum*. Mature sori protected by reflexed membranous lamina margin.



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## References

- Agardh, J.G. 1839: *Recensio specierum generis Pteridis*. Berling, Lund.
- Allan, H.H. 1961: *Flora of New Zealand. Vol. I. Indigenous Tracheophyta: Psilopsida, Lycopsidea, Filicopsida, Gymnospermae, Dicotyledones*. Government Printer, Wellington.
- Bartholomew, B.; Nicolson, D.H.; Nordenstam, B. 1997: Author citation of Thunberg's new species in Murray's *Systema vegetabilium*, ed. 14. *Taxon* 46: 311–314.
- Beaman, J.H.; Edwards, P.J. 2007: *Ferns of Kinabalu*. Natural History Publications (Borneo), Kota Kinabalu.
- Bernhardi, J.J. 1801: Tentamen alterum filices in genera redigenda. *Journal für die Botanik (Schrader)*, 1800(2): 121–136.
- Bernhardi, J.J. 1805: Dritter Versuch einer Anordnung der Farrnkräuter. *Neues Journal für die Botanik* 1(2): 1–50.
- Best, E. 1942: Forest lore of the Māori. *Dominion Museum Bulletin* 14: 1–503.
- Brown, R. 1810: *Prodromus Florae Novae Hollandiae et Insulae Van-Diemen*. Johnson, London.
- Brownlie, G. 1954: Introductory note to cyto-taxonomic studies of New Zealand ferns. *Transactions of the Royal Society of New Zealand* 82: 665–666.
- Brownlie, G. 1957: Cyto-taxonomic studies on New Zealand Pteridaceae. *New Phytologist* 56: 207–209.
- Brownlie, G. 1958: Chromosome numbers in New Zealand ferns. *Transactions of the Royal Society of New Zealand* 85: 213–216.
- Brownlie, G. 1959: Some problems in New Zealand fern nomenclature. *Transactions of the Royal Society of New Zealand* 87: 195–198.
- Brownlie, G. 1961: Additional chromosome numbers – New Zealand ferns. *Transactions of the Royal Society of New Zealand. Botany* 1: 1–4.
- Brownsey, P.J. 1983: Polyploidy and aneuploidy in *Hypolepis*, and the evolution of the Dennstaedtiales. *American Fern Journal* 73: 97–108.
- Brownsey, P.J. 1987: A review of the fern genus *Hypolepis* (Dennstaedtiaceae) in the Malesian and Pacific regions. *Blumea* 32: 227–276.
- Brownsey, P.J. 1989: The taxonomy of bracken (*Pteridium*: Dennstaedtiaceae) in Australia. *Australian Systematic Botany* 2: 113–128.
- Brownsey, P.J. 1998: Dennstaedtiaceae. In: *Flora of Australia*. Vol. 48. 214–228.
- Brownsey, P.J.; Chinnock, R.J. 1984: A taxonomic revision of the New Zealand species of *Hypolepis*. *New Zealand Journal of Botany* 22(1): 43–80.
- Brownsey, P.J.; Chinnock, R.J. 1987: A taxonomic revision of the Australian species of *Hypolepis*. *Journal of the Adelaide Botanic Gardens* 10: 1–30.
- Brownsey, P.J.; Perrie, L.R. 2016: Taxonomic notes on the New Zealand flora: lectotypes in the fern families Dennstaedtiaceae and Lindsaeaceae. *New Zealand Journal of Botany* 54: 511–514.
- Brownsey, P.J.; Smith-Dodsworth, J.C. 2000: *New Zealand ferns and allied plants*. Edition 2. David Bateman, Auckland.
- Carse, H. 1918: A new species of *Hypolepis*. *Transactions and Proceedings of the New Zealand Institute* 50: 64.
- Christensen, C. 1905–1906: *Index Filicum*. Hagerup, Copenhagen.
- Cockayne, L. 1908: *Report on a Botanical Survey of the Tongariro National Park*. Government Printer, Wellington.
- Colenso, W. 1845: A classification and description of some newly discovered ferns, collected in the Northern Island of New Zealand, in the summer of 1841–2. *Tasmanian Journal of Natural Science* 2: 161–189.
- Colenso, W. 1881: On the vegetable food of the ancient New Zealanders before Cook's visit. *Transactions and Proceedings of the New Zealand Institute* 13: 3–38.
- Colenso, W. 1884: A further contribution towards making known the botany of New Zealand. *Transactions and Proceedings of the New Zealand Institute* 16: 325–363.
- Colenso, W. 1892: Description of three species of newly discovered New Zealand ferns. *Transactions and Proceedings of the New Zealand Institute* 24: 394–398.

- 
- Colenso, W. 1897: A description of some new indigenous New Zealand forest ferns. *Transactions and Proceedings of the New Zealand Institute* 29: 414–421.
- Copeland, E.B. 1950: Pteridaceae of New Guinea. *Philippine Journal of Science* 78: 5–41.
- Copeland, E.B. 1958: *Fern flora of the Philippines*. Vol. 1. Bureau of Printing, Manila.
- Cunningham, A. 1837: Florae insularum Novae Zelandiae precursor; or a specimen of the botany of the islands of New Zealand. *Companion to the Botanical Magazine* 2: 222–233, 327–336, 358–378.
- de Lange, P.J. 2000: *Hypolepis distans* (Dennstaedtiaceae), a casual introduction to Norfolk Island. *New Zealand Botanical Society Newsletter* 61: 17–18.
- Der, J.P.; Thomson, J.A.; Stratford, J.K.; Wolf P.G. 2009: Global chloroplast phylogeny and biogeography of bracken (*Pteridium*; Dennstaedtiaceae). *American Journal of Botany* 96: 1041–1049.
- Endlicher, S.F.L. 1833: *Prodromus Florae Norfolkicae*. Beck, Wien.
- Engler, H.G.A; Prantl, K.A.E. (ed.) 1898–1902: *Die natürlichen Pflanzenfamilien*. Teil 1. Abt. 4. Engelmann, Leipzig.
- Farwell, O.A. 1931: Fern notes II. Ferns in the herbarium of Parke, Davis & Company. *American Midland Naturalist* 12: 233–311.
- Field, H.C. 1890: *The ferns of New Zealand*. A.D. Willis, Wanganui.
- Forster, J.G.A. 1786: *De Plantis Esculentis Insularum Oceani Australis commentatio botanica*. Haude & Spener, Berlin.
- Gleditsch, J.G. 1764: *Systema Plantarum a staminum situ*. Haude & Spener, Berlin.
- Hannah, A. 2017: Discovery of the New Zealand endemic fern *Hypolepis ambigua* (Pig fern) growing wild in Scotland. *New Zealand Botanical Society Newsletter* 127: 12–14.
- Heenan, P.B.; Breitwieser, I.; Glenny, D.S.; de Lange, P.J.; Brownsey, P.J. 1998: Checklist of dicotyledons and pteridophytes naturalised or casual in New Zealand: additional records 1994–1996. *New Zealand Journal of Botany* 36(2): 155–162.
- Heenan, P.B.; de Lange, P.J.; Cameron, E.K.; Ogle, C.C.; Champion, P.D. 2004: Checklist of dicotyledons, gymnosperms, and pteridophytes naturalised or casual in New Zealand: additional records 2001–2003. *New Zealand Journal of Botany* 42: 797–814.
- Holttum, R.E. 1967 ("1966"): New ferns from Malesia. *Kew Bulletin* 20: 455–460.
- Holttum, R.E. 1968 ("1966"): *A revised Flora of Malaya. Vol. II. Ferns of Malaya*. Government Printing Office, Singapore.
- Hooker, J.D. 1854–1855: *The Botany of the Antarctic Voyage of H.M. Discovery Ships Erebus and Terror, in the years 1839–1843, under the command of Captain Sir James Clark Ross*. II. Flora Novae-Zelandiae. Part II. Flowerless plants. Lovell Reeve, London.
- Hooker, W.J. 1851–1858: *Species Filicum*. Vol. 2. Pamplin, London.
- Horning, D.S. 1983: A new fern record from The Snares, southern New Zealand. *New Zealand Journal of Botany* 21: 205–208.
- Keyserling, A.F.M.L.A von 1873: *Polypodiacea et Cyatheacea herbaria bungeani*. Engelmann, Leipzig.
- Kramer, K.U. 1990: Dennstaedtiaceae. In: Kramer, K.U.; Green, P.S. *Pteridophytes and gymnosperms*. Vol. 1. In: Kubitzki, K. (ed.) *The Families and Genera of Vascular Plants*. Springer-Verlag, Berlin.
- Kuhn, F.A.M. 1882: Die Gruppe der Chaetopterides unter den Polypodiaceen. In: *Festschrift zu dem Fünfzigjährigen Jubiläum der Königstädtischen Realschule zu Berlin*. Winkelmann, Berlin. 322–348.
- Kunze, G. 1850: Index filicum (sensu latissimo) adhuc, quantum innotuit, in hortis Europaeis cultarum. *Linnaea* 23: 209–323.
- Labillardière, J.J.H. de 1806–1807: *Novae Hollandiae Plantarum Specimen*. Vol. 2. Huzard, Paris.
- Lehtonen, S.; Tuomisto, H.; Rouhan, G.; Christenhusz, M.J.M 2010: Phylogenetics and classification of the pantropical fern family Lindsaeaceae. *Botanical Journal of the Linnean Society* 163: 305–359.
- Lotsy, J.P. 1909: *Vorträge über botanische Stammesgeschichte*. Vol. 2. Gustav Fischer, Jena.
- Löve, Á.; Löve, D.; Pichi Sermolli, R.E.G. 1977: *Cytotaxonomical atlas of the Pteridophyta*. Cramer, Vaduz.
-

- 
- McGlone, M.S.; Wilmshurst, J.M.; Leach, H.M. 2005: An ecological and historical review of bracken (*Pteridium esculentum*) in New Zealand, and its cultural significance. *New Zealand Journal of Ecology* 29: 165–184.
- Moore, T. 1854: Notes on some ferns in the Wallichian Herbarium. *Proceedings of the Linnean Society of London* 2: 285–286.
- Moore, T. 1857–1862: *Index Filicum*. Pamplin, London.
- Murray, J.A. 1784: *Systema Vegetabilium: secundum classes ordines genera species cum characteribus et differentiis*. Edition 14. Joannis Christiani Dieterich, Göttingen.
- Page, C.N. 1976: The taxonomy and phytogeography of bracken – a review. *Botanical Journal of the Linnean Society* 73: 1–34.
- Parris, B.S.; Beaman, R.S.; Beaman, J.H. 1992: *The plants of Mount Kinabalu. I. Ferns and fern allies*. Royal Botanic Gardens, Kew.
- Perrie, L.R.; Shepherd, L.D.; Brownsey, P.J. 2015: An expanded phylogeny of the Dennstaedtiaceae ferns: *Oenotrichia* falls within a non-monophyletic *Dennstaedtia*, and *Saccoloma* is polyphyletic. *Australian Systematic Botany* 28: 256–264.
- Pichi Sermolli, R.E.G. 1970: Fragmenta Pteridologiae II. *Webbia* 24: 699–722.
- Pichi Sermolli, R.E.G. 1978: Pteridophytorum nomina generica invalida. *Webbia* 32: 341–353.
- PPG 1 2016: A community-derived classification for extant lycophytes. *Journal of Systematics and Evolution* 54(6): 563–603.
- Prantl, K.A.E. 1892: Das System der Farne. *Arbeiten aus dem Königl. Botanischen Garten zu Breslau* 1: 1–38.
- Presl, C.B. 1836: *Tentamen Pteridographiae*. Haase, Prague.
- Presl, C.B. 1851: *Epimeliae botanicae*. Haase, Prague.
- Richard, A. 1832: Essai d'une Flore de la Nouvelle Zélande. In: Lesson, A.; Richard, A. *Botanique*. In: Dumont d'Urville, J. *Voyage de Découvertes de l'Astrolabe*. Tastu, Paris. [1]–376.
- Riley, M. 1994: *Māori healing and herbal*. Viking Sevenses N.Z. Ltd, Paraparaumu.
- Roskrige, N.R. 2014: *Rauwaru, the proverbial garden: ngā-weri, Māori root vegetables, their history and tips on their use*. Institute of Agriculture and Environment, Massey University, Palmerston North.
- Roux, J.P. 2009: Synopsis of the Lycopodiophyta and Pteridophyta of Africa, Madagascar and neighbouring islands. *Strelitzia* 23: 1–296.
- Saint-Hilaire, A.F.C.P de 1833: *Voyage dans le District des Diamans*. Vol. 1. Librairie-Gide, Paris.
- Schuettpelz, E.; Pryer, K.M. 2007: Fern phylogeny inferred from 400 leptosporangiate species and three plastid genes. *Taxon* 56: 1037–1050.
- Schwartsburd, P.B. 2017: (2508) Proposal to conserve the name *Microlepia* against *Scyphofilix* (Dennstaedtiaceae). *Taxon* 66: 516.
- Schwartsburd, P.B.; Prado, J. 2014: Subspecies of *Hypolepis rugosula* (Dennstaedtiaceae; Pteridophyta) around the world: morphological and biogeographic perspectives. *Acta Botanica Brasiliica* 28: 206–226.
- Schwartsburd, P.B.; de Moraes, P.L.R.; Lopes-Mattos, K.L.B. 2014: Recognition of two morpho-types in eastern South American brackens (*Pteridium* – Dennstaedtiaceae – Polypodiopsida). *Phytotaxa* 170: 103–117.
- Scopoli, J.A. 1760: *Flora Carniolica Exhibens Plantas Carniolae Indigenas et Distributas in Classes Naturales cum Differentiis Specificis, Synonymis Recentiorum, Locis Natalibus, Nominibus Incolarum, Observationibus Selectis, Viribus Medicis*. Joannis Thomae Trattner, Vienna.
- Smith, A.R.; Pryer, K.M.; Schuettpelz, E.; Korall, P.; Schneider, H.; Wolf, P.G. 2006: A classification for extant ferns. *Taxon* 55(3): 705–731.
- Smith, J. 1842: An arrangement and definition of the genera of ferns, with observations on the affinities of each genus. *London Journal of Botany* 1: 419–438.
- Smith, J. 1856: *Cultivated ferns*. Pamplin, London.
- Smith, J. 1875: *Historia Filicum; an exposition of the nature, number, and organography of ferns*. Macmillan, London.
- Sykes, W.R. 2016: *Flora of the Cook Islands*. National Tropical Botanical Garden, Kalaheo, Kauaʻi, Hawaiʻi.
-



- 
- Sykes, W.R.; West, C.J. 1996: New records and other information on the vascular flora of the Kermadec Islands. *New Zealand Journal of Botany* 34(4): 447–462.
- Thomson, J.A. 2012: Taxonomic status of diploid Southern hemisphere brackens (*Pteridium*: Dennstaedtiaceae). *Telopea* 14: 43–48.
- Thomson, J.A. 2016: Free axial lobes: an important diagnostic character in *Pteridium* (Dennstaedtiaceae). *Telopea* 19: 193–200.
- Thomson, J.A.; Alonso-Amelot, M.E. 2002: Clarification of the taxonomic status and relationships of *Pteridium caudatum* (Dennstaedtiaceae) in Central and South America. *Botanical Journal of the Linnean Society* 140: 237–248.
- Thouars, L.M.A. 1806: *Genera nova Madagascariensia*. Paris.
- Thunberg, C.P. 1800: *Prodromus Plantarum Capensium*. Edman, Uppsala.
- Tindale, M.D.; Roy, S.K. 2002: A cytotaxonomic survey of the Pteridophyta of Australia. *Australian Systematic Botany* 15: 839–937.
- Trevisan, V. 1874: Sylloge sporophytarum Italiae. I. Prothallogammae. *Atti della Società Italiana di Scienze Naturali* 17: 213–258.
- Tryon, R.M. 1941: A revision of the genus *Pteridium*. *Rhodora* 43: 1–31, 37–67.
- Tryon, R.M. 1960: A review of the genus *Dennstaedtia* in America. *Contributions from the Gray Herbarium of Harvard University* 187: 23–52.
- Tryon, R.M.; Tryon, A.F. 1982: *Ferns and allied plants*. Springer-Verlag, New York.
- Wakefield, N.A. 1956: New combinations in some Australasian ferns. 2. *Victorian Naturalist* 72: 159–160.
- Wenbo, L.; Mingyan, D.; Faguo, W.; Zhaohong, W.; Prado, J. 2013: *Pteridium*. In: Zhengui, W.; Raven, P.H.; Deyuan, H. (ed.) *Flora of China. Lycopodiaceae through Polypodiaceae*. Vol. 2–3. Science Press, Beijing.
- Wolf, P.G. 1995: Phylogenetic analyses of *rbcL* and nuclear ribosomal RNA gene sequences in Dennstaedtiaceae. *American Fern Journal* 85: 306–327.
- Wolf, P.G.; Soltis, P.S.; Soltis, D.E. 1994: Phylogenetic relationships of dennstaedtioid ferns; evidence from *rbcL* sequences. *Molecular Phylogenetics and Evolution* 3: 383–392.
- Yuehong, Y.; Xinping, Q.; Wenbo, L.; Fuwu, X.; Mingyan, D.; Faguo, W.; Xianchun, Z.; Zhaohong, W.; Shiew-hung, W.; Serizawa, S.; Prado, J.; Funston, A.M.; Gilbert, M.G.; Nootboom, H.P. 2013: Dennstaedtiaceae. In: Zhengui, W.; Raven, P.H.; Deyuan, H. (ed.) *Flora of China. Lycopodiaceae through Polypodiaceae*. Vol. 2–3. Science Press, Beijing.
- Zhou, S.; Dong, W.; Chen, X.; Zhang, X.; Wen, J.; Schneider, H. 2014: How many species of bracken (*Pteridium*) are there? Assessing the Chinese brackens using molecular evidence. *Taxon* 63: 509–521.

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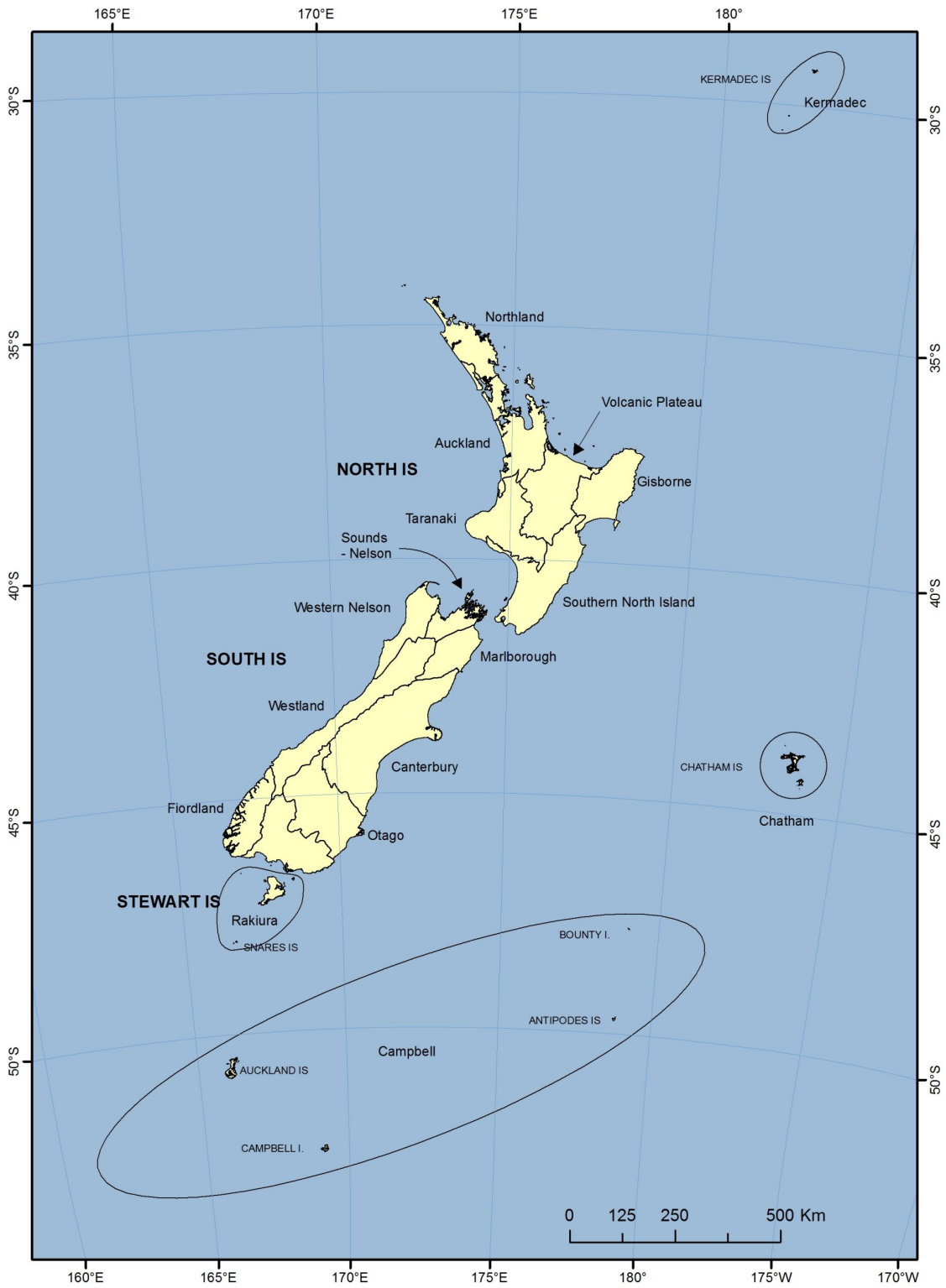
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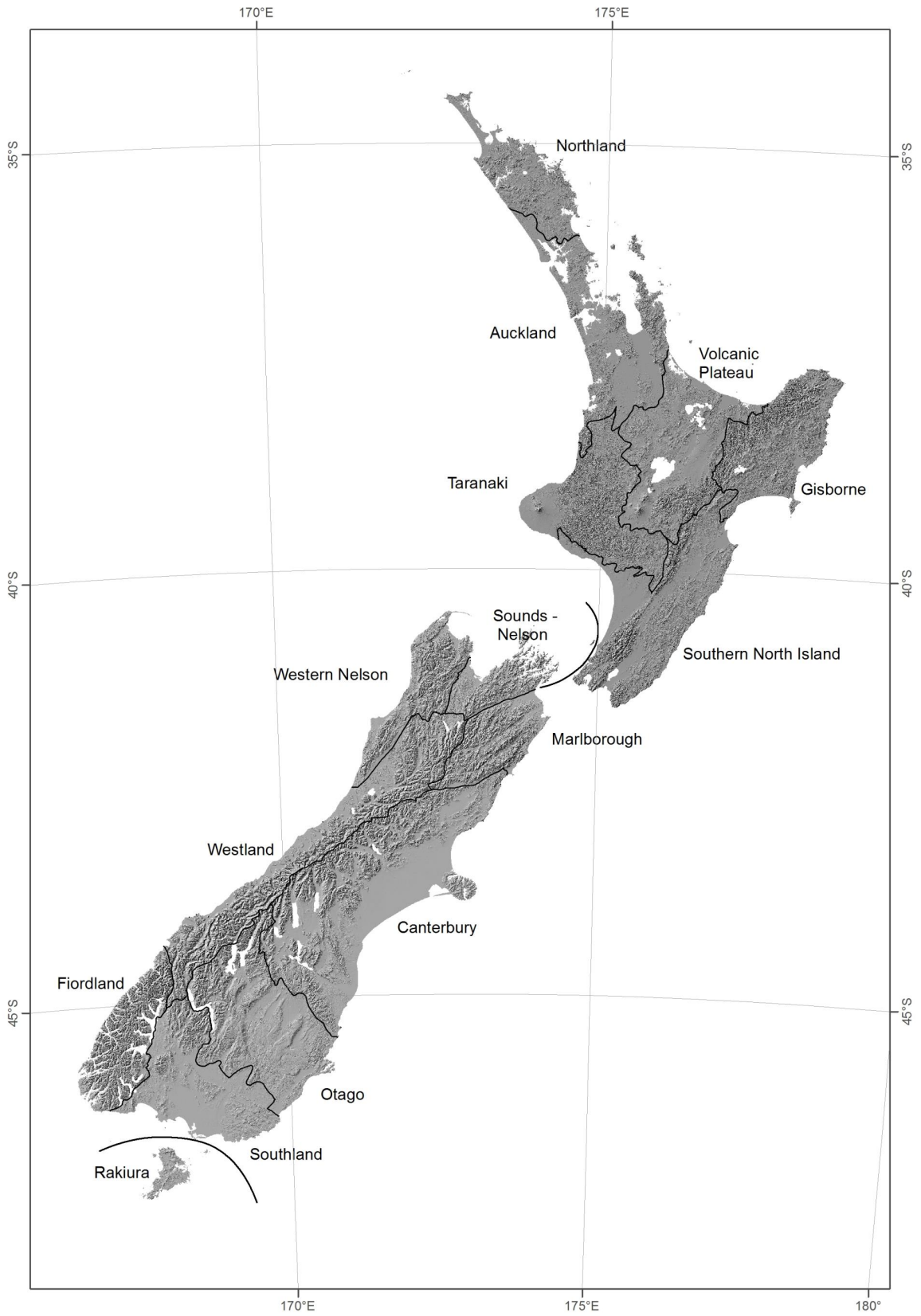
PatB@tepapa.govt.nz

LeonP@tepapa.govt.nz



**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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