

FLORA OF NEW ZEALAND

FERNS AND LYCOPHYTES

DRYOPTERIDACEAE



P.J. BROWNSEY & L.R. PERRIE

Fascicle 31 – AUGUST 2021

© Landcare Research New Zealand Limited 2021.

Unless indicated otherwise for specific items, this copyright work is licensed under the Creative Commons Attribution 4.0 International licence



Attribution if redistributing to the public without adaptation: "Source: Manaaki Whenua – Landcare Research"

Attribution if making an adaptation or derivative work: "Sourced from Manaaki Whenua – Landcare Research"

See Image Information for copyright and licence details for images.

CATALOGUING IN PUBLICATION

Brownsey, P. J. (Patrick John), 1948–

Flora of New Zealand : ferns and lycophytes. Fascicle 31, Dryopteridaceae / P.J. Brownsey and L.R. Perrie. -- Lincoln, N.Z.: Manaaki Whenua Press, 2021.

1 online resource

ISBN 978-0-947525-76-7 (pdf)

ISBN 978-0-478-34761-6 (set)

1.Ferns -- New Zealand -- Identification. I. Perrie, L. R. (Leon Richard). II. Title. III. Manaaki Whenua-Landcare Research New Zealand Ltd.

UDC 582.394.742(931)

DC 587.30993

DOI: 10.7931/5snh-wv42

This work should be cited as:

Brownsey, P.J. & Perrie, L.R. 2021: Dryopteridaceae. *In*: Breitwieser, I. (ed.) *Flora of New Zealand — Ferns and Lycophytes*. Fascicle 31. Manaaki Whenua Press, Lincoln.
<http://dx.doi.org/10.7931/5snh-wv42>

Date submitted: 3 Dec 2020; Date accepted: 8 Mar 2021; Date published: 9 August 2021

Cover image: *Polystichum wawranum*. Adaxial surface of mature 2-pinnate frond.



**Manaaki
Whenua
PRESS**

Contents

Introduction.....	1
Taxa	
<i>Dryopteridaceae</i> Herter	2
<i>Arachniodes</i> Blume	3
<i>Arachniodes aristata</i> (G.Forst.) Tindale	4
<i>Cyrtomium</i> C.Presl	6
<i>Cyrtomium falcatum</i> (L.f.) C.Presl	7
<i>Dryopteris</i> Adans.	9
<i>Dryopteris affinis</i> (Lowe) Fraser-Jenk.	10
<i>Dryopteris carthusiana</i> (Vill.) H.P.Fuchs	12
<i>Dryopteris cycadina</i> (Franch. & Sav.) C.Chr.	13
<i>Dryopteris dilatata</i> (Hoffm.) A.Gray	15
<i>Dryopteris erythrosora</i> (D.C.Eaton) Kuntze	18
<i>Dryopteris filix-mas</i> (L.) Schott	19
<i>Dryopteris formosana</i> (Christ) C.Chr.	22
<i>Dryopteris inaequalis</i> (Schltdl.) Kuntze	23
<i>Dryopteris kinkiensis</i> Koidz. ex Tagawa	24
<i>Dryopteris sieboldii</i> (van Houtte ex Mett.) Kuntze	25
<i>Dryopteris stewartii</i> Fraser-Jenk.	26
<i>Dryopteris wallichiana</i> (Spreng.) Hyl.	27
<i>Lastreopsis</i> Ching	28
<i>Lastreopsis hispida</i> (Sw.) Tindale	29
<i>Lastreopsis velutina</i> (A.Rich.) Tindale	32
<i>Parapolystichum</i> (Keyserl.) Ching	34
<i>Parapolystichum glabellum</i> (A.Cunn.) Labiak, Sundue & R.C.Moran	36
<i>Parapolystichum kermadecense</i> (Perrie & Brownsey) Perrie & L.D.Sheph.	38
<i>Parapolystichum microsorum</i> (Endl.) Labiak, Sundue & R.C.Moran	41
<i>Polystichum</i> Roth	44
<i>Polystichum cystostegia</i> (Hook.) J.B.Armstr.	45
<i>Polystichum lentum</i> (D.Don) T.Moore	48
<i>Polystichum neozelandicum</i> Fée	49
<i>Polystichum oculatum</i> (Hook.) J.B.Armstr.	51
<i>Polystichum polyblepharum</i> (Roem. ex Kunze) C.Presl	54
<i>Polystichum proliferum</i> (R.Br.) C.Presl	55
<i>Polystichum setiferum</i> (Forssk.) T.Moore ex Woyn.	57
<i>Polystichum sylvaticum</i> Diels	59
<i>Polystichum vestitum</i> (G.Forst.) C.Presl	62
<i>Polystichum wawranum</i> (Szyszyl.) Perrie	65
<i>Rumohra</i> Raddi	67
<i>Rumohra adiantiformis</i> (G.Forst.) Ching	68
References	72
Acknowledgements	78
Maps	79
Index	81
Image Information	83

Introduction

Dryopteridaceae is a very large and diverse family. It is cosmopolitan in distribution, with the greatest diversity in north temperate regions, and in montane areas of central, eastern and southern Asia. It is represented in New Zealand by five indigenous genera (*Arachniodes*, *Lastreopsis*, *Parapolystichum*, *Polystichum*, *Rumohra*) and 13 indigenous species, eight of which are endemic, and another four that are fully naturalised or casual. In addition there are two wholly naturalised genera (*Cyrtomium* and *Dryopteris*) with 13 species, more than in any other New Zealand fern family.

Members of *Dryopteridaceae* in New Zealand are mainly terrestrial species with erect rhizomes, although a few have long creeping-rhizomes. The fronds are 1–5-pinnate, abundantly scaly, sometimes also hairy, and usually with free veins. The sori are round, and protected by round or reniform, peltate indusia, or occasionally exindusiate.

Of the indigenous genera, *Arachniodes* includes a single species, *A. aristata*, which has long-creeping rhizomes, reniform indusia, and lacks hairs. *Lastreopsis* and *Parapolystichum* include five indigenous species, which have reniform indusia, and abundant hairs as well as scales. *Polystichum* includes six indigenous and four naturalised species characterised by erect rhizomes, absence of hairs, and round or absent indusia. *Rumohra* has a single species, *R. adiantiformis*, which is widespread in New Zealand and recognised by its long-creeping rhizome, round indusia and absence of hairs.

Parapolystichum glabellum and *Polystichum vestitum* are widespread species. *Lastreopsis hispida* and *Rumohra adiantiformis* are widespread in the North Island but largely confined to wetter, western parts of the South Island, whereas *Lastreopsis velutina*, *Polystichum neozelandicum* and *P. oculatum* are more common in drier, eastern areas. Two species, *Parapolystichum microsorum* and *Polystichum sylvaticum*, have a mainly northern distribution, extending only to the northern South Island, and *Polystichum wawranum* is confined to the North Island. The remaining species have restricted distributions – *Polystichum cystostegia* is an alpine species largely confined to the South Island, and *Arachniodes aristata* and *Parapolystichum kermadecense* occur only on the Kermadec Islands.

Of the naturalised genera *Cyrtomium* is represented by a single species, *C. falcatum*, which is distinguished by its pinnate fronds, reticulate venation, and sori arranged in several rows either side of the costa. *Dryopteris* includes four fully naturalised and eight casual species, of which *D. filix-mas* is easily the most widespread, becoming a serious weed in the South Island. They have erect or short-creeping rhizomes, free veins, reniform indusia, and lack hairs.

***Dryopteridaceae* Herter, *Revista Sudamer. Bot.* 9: 15 (1949), nom. cons.**

Type taxon: *Dryopteris* Adans.

Terrestrial or climbing (NZ) or epiphytic (not NZ) ferns. Evergreen or deciduous. Rhizomes erect or long-creeping, bearing non-clathrate scales. Fronds monomorphic (NZ) or dimorphic (not NZ), not articulated to rhizome. Laminae 1–5-pinnate, anadromous or catadromous, herbaceous or coriaceous, scaly and/or hairy. Veins free or rarely reticulate. Sori round, superficial, borne on abaxial surface, usually away from the margins (NZ), or acrostichoid (not NZ); paraphyses absent; indusia round or reniform, peltate, or rarely absent; sporangial maturation mixed. Sporangia with vertical annulus, 16–64 spores per sporangium. Homosporous; spores monolete, lacking chlorophyll; perispores rugose, tuberculate or cristate, sometimes fenestrate, reticulate or echinate.

Taxonomy: A family of three subfamilies, 26 genera and c. 2115 species (PPG 1 2016).

The family Dryopteridaceae, or sometimes Aspidiaceae (e.g. Pichi Sermolli 1977), has been variously circumscribed. Kramer (1990) included Woodsiaceae (including Athyriaceae), Tectariaceae and Onocleaceae within a much broader Dryopteridaceae, but these are now all recognised as separate families (PPG 1 2016). Smith et al. (2006) retained Hypodematiaceae within their more narrowly circumscribed Dryopteridaceae, but this is now also treated as a separate family by PPG 1 (2016).

Three subfamilies were recognised within Dryopteridaceae (PPG 1 2016): Polybotryoideae, Elaphoglossoideae and Dryopteridoideae. All are monophyletic (Liu et al. 2016), but only the latter two occur in New Zealand, with *Lastreopsis*, *Parapolystichum* and *Rumohra* in Elaphoglossoideae, and *Arachniodes*, *Cyrtomium*, *Dryopteris* and *Polystichum* in Dryopteridoideae.

Within Elaphoglossoideae, the lastreopsid ferns form a well-supported clade comprising *Rumohra*, *Megalastrum*, *Lastreopsis sens. str.* and *Parapolystichum* (Labiak et al. 2014; Gardner et al. 2017). However, although the monophyly of the lastreopsid ferns is strongly supported by molecular data, Labiak et al. (2014, 2015a) found no morphological synapomorphies that distinguish these ferns from other clades within the Dryopteridaceae. Nevertheless, they noted that the lastreopsids, apart from *Megalastrum*, can usually be diagnosed by their distinctive rachis-costa architecture, in which the marginal ridge of the lamina is confluent with the walls of the rachis. Other characters, such as the deltoid and highly dissected laminae, creeping rhizomes, round sori, and presence of yellow or orange glands, occur in most, but not all, representatives of the group.

The individual clades comprising *Rumohra*, *Megalastrum*, *Lastreopsis sens. str.* and *Parapolystichum* are also monophyletic, although the *Lastreopsis* clade is only weakly supported by molecular data. As with the larger lastreopsid clade, there are no clear morphological synapomorphies that define either *Lastreopsis sens. str.* or *Parapolystichum*. On the other hand, the genus *Lastreopsis sens. lat.*, as defined by Tindale (1965) to encompass most of the species currently assigned to *Lastreopsis sens. str.* and *Parapolystichum*, is paraphyletic according to the analyses of Labiak et al. (2014) and Gardner et al. (2017). This leaves an uncomfortable choice between adopting a single monophyletic but morphologically unrecognisable genus for all lastreopsid ferns, a set of four monophyletic genera of which *Lastreopsis sens. str.* and *Parapolystichum* are not always morphologically recognisable, or retaining *Lastreopsis sens. lat.*, which is paraphyletic. In our opinion, the least unsatisfactory of these options is to accept the four genera, *Rumohra*, *Megalastrum*, *Lastreopsis sens. str.* and *Parapolystichum*, as proposed by Labiak et al. (2014, 2015a) and Gardner et al. (2017), albeit noting that the latter two cannot always be recognised in the field.

1	Fertile laminae 1-pinnate; primary pinnae toothed but not divided more than ½ way to midrib	2
	Fertile laminae 1-pinnate-pinnatisect to 4-pinnate; if 1-pinnate, primary pinnae divided more than ½ way to midrib.....	3
2	Veins reticulate; indusia round.....	<i>Cyrtomium</i>
	Veins free; indusia reniform.....	<i>Dryopteris</i>
3	Indusia round or absent.....	4
	Indusia reniform.....	5
4	Rhizomes erect; ultimate lamina segments usually acute, acuminate or mucronate; laminae sometimes bulbiferous.....	<i>Polystichum</i>
	Rhizomes long-creeping; ultimate lamina segments obtuse or round-ended; laminae never bulbiferous.....	<i>Rumohra</i>

5	Laminae bearing hairs and scales.....	6
	Laminae bearing scales, but lacking hairs.....	8
6	Stipes and rachises bearing bristle-like scales with bulbous bases.....	<i>Lastreopsis</i>
	Stipes and rachises bearing non-bristle-like scales without bulbous bases.....	7
7	Stipes, rachises and laminae densely covered in soft brown hairs on both surfaces; laminae with a velvety feel.....	<i>Lastreopsis</i>
	Stipes, rachises and laminae bearing red or whitish hairs, often sparse on abaxial surfaces; laminae soft but not velvety.....	<i>Parapolystichum</i>
8	Rhizomes long-creeping; plants confined to the Kermadec Islands.....	<i>Arachniodes</i>
	Rhizomes erect or short-creeping; plants of the main islands of New Zealand.....	<i>Dryopteris</i>

Distribution: Dryopteridaceae is a large family, cosmopolitan in distribution, with its greatest diversity in north temperate regions, and in montane regions of central, eastern and southern Asia (Kramer 1990). Five non-endemic and two naturalised genera, with 30 species in New Zealand: nine endemic, four non-endemic, and 17 naturalised or casual species.

Biostatus: Indigenous (Non-endemic).

Table 1: Number of species in New Zealand within *Dryopteridaceae* Herter

Category	Number
Indigenous (Endemic)	8
Indigenous (Non-endemic)	5
Exotic: Fully Naturalised	7
Exotic: Casual	10
Total	30

Recognition: Dryopteridaceae is a large and diverse family comprising mainly terrestrial species with erect rhizomes, although a few species have long-creeping rhizomes. The fronds are monomorphic, usually 2–5-pinnate (but rarely only 1-pinnate), abundantly scaly and sometimes also hairy. Some species are bulbiferous, and the naturalised species are often deciduous. The veins are usually free, except in *Cyrtomium*. The sori are round, protected by round or reniform, peltate indusia, or occasionally exindusiate. The spores are monolete with prominent perispores (Large & Braggins 1991), and the base chromosome number is $x = 41$.

Notes: Incertae sedis

The type for the following name has not been located and its identity is uncertain:

Aspidium coriaceum var. *acutidentatum* A.Rich., *Voy. Astrolabe, Essai*, 71 (1832)

***Arachniodes* Blume, Enum. Pl. Javae 2, 241 (1828)**

= *Polystichopsis* (J.Sm.) Holttum, *J. Linn. Soc., Bot.* 53: 149 (1947)

= *Byrsopteris* C.V.Morton, *Amer. Fern J.* 50: 149 (1960)

Type taxon: *Arachniodes aspidioides* Blume

Etymology: From the Greek *arachniodes* (like a spider's web), a reference to the indumentum of one species.

Terrestrial ferns, evergreen. Rhizomes long-creeping, scaly. Rhizome scales non-clathrate, narrowly ovate to narrowly triangular, margins entire or toothed, attached at base, concolorous, pale brown or red-brown. Fronds monomorphic, not bulbiferous. Stipes and rachises scaly, adaxially sulcate. Laminae 3–4-pinnate (NZ), rarely 1–2- or 5-pinnate (not NZ), coriaceous (NZ) or herbaceous (not NZ), scaly. Veins free. Sori round, borne on abaxial surface, away from the margin, in 1 row either side of midrib; indusia reniform, peltate. Spores monolete; perispores rugose or tuberculate, often minutely echinate on the surface.

Taxonomy: A genus of over 80 species, included in the subfamily Dryopteridoideae (Lu et al. 2019).

Arachniodes is sister to *Dryopteris*, with these two genera in turn sister to the polystichoid ferns (Liu et al. 2016; Lu et al. 2019).

Only one species, *Arachniodes aristata*, occurs in New Zealand, where it is confined to the Kermadec Islands. It was treated as *Rumohra aristata* by Allan (1961).

Distribution: *Arachniodes* is a genus of tropical and temperate regions. The greatest diversity is in China and the Himalayas, with a few species extending to Africa, tropical America, Australia and the Pacific (Tindale 1961a); 40 species in China (He et al. 2013), two in Africa and Madagascar (Roux 2009), and one widespread species in Australia and the Pacific (Jones 1998; Nakamura 2008). One non-endemic species in New Zealand.

Biostatus: Indigenous (Non-endemic).

Table 2: Number of species in New Zealand within *Arachniodes* Blume

Category	Number
Indigenous (Non-endemic)	1
Total	1

Recognition: In New Zealand the sole species of *Arachniodes* is confined to the Kermadec Islands. It is recognised by its terrestrial habit, long-creeping rhizomes, 3–4-pinnate laminae, scaly fronds, and round sori protected by reniform indusia. The spores are rugose with minute papillae on the surface (Large & Braggins 1991).

Cytology: The base chromosome number in *Arachniodes* is $x = 41$ (Kramer 1990).

***Arachniodes aristata* (G.Forst.) Tindale, *Contr. New South Wales Natl. Herb.* 3: 89 (1961)**

- ≡ *Polypodium aristatum* G.Forst., *Fl. Ins. Austr.* 82 (1786)
 - ≡ *Aspidium aristatum* (G.Forst.) Sw., *J. Bot. (Schrader)* 1800(2): 37 (1801)
 - ≡ *Nephrodium aristatum* (G.Forst.) C.Presl, *Reliq. Haenk.* 1, 37 (1825)
 - ≡ *Polystichum aristatum* (G.Forst.) C.Presl, *Tent. Pterid.* 83 (1836)
 - ≡ *Lastrea aristata* (G.Forst.) T.Moore, *Index Fil.* 86 (1858)
 - ≡ *Dryopteris aristata* (G.Forst.) Kuntze, *Revis. Gen. Pl.* 2, 813 (1891)
 - ≡ *Rumohra aristata* (G.Forst.) Ching, *Sinensia* 5: 50 (1934)
 - ≡ *Polystichopsis aristata* (G.Forst.) Holttum, *Rev. Fl. Malaya* 2, 486 (1955)
 - ≡ *Byrsopteris aristata* (G.Forst.) C.V.Morton, *Amer. Fern J.* 50: 152, t. 14 (1960)
- Lectotype (selected by Morton 1960): Otahiete [Tahiti], Herb. G. Forster 294, BM 0001048414!

Etymology: From the Latin *aristatus* (awned, aristate), a reference to the aristate pinnules in this species.

Rhizomes long-creeping, up to 70 mm long (in herbarium material), 5–10 mm diameter, densely scaly. Rhizome scales narrowly ovate, 3–9 mm long, 0.4–0.8 mm wide, red-brown, concolorous, margins entire. Fronds 680–1050 mm long. Stipes 320–650 mm long, pale or chestnut-brown, scaly, especially near junction with rhizome; scales linear, pale brown, up to 15 mm long, 1 mm wide. Rachises pale brown, sulcate, narrowly winged distally, scaly; scales scattered throughout, linear, pale brown, up to 4 mm long and 0.2 mm wide. Laminae 3–4-pinnate at base, ovate or broadly ovate or 5-angled, 240–430 mm long, 190–460 mm wide, dark shining green adaxially, paler green abaxially, coriaceous, bearing linear scales on abaxial costae, almost glabrous adaxially. Primary pinnae in 16–24 pairs below pinnatifid apex, widely spaced especially proximally, narrowly ovate distally, ovate or broadly ovate proximally; the longest at the base, 145–320 mm long, 68–225 mm wide, apices acuminate, bases stalked, costae narrowly winged for most of their length. Acroscopic secondary pinnae decreasing evenly in length along the primary pinna to the distal end; the basal basispic secondary pinna the longest, ovate, 43–195 mm long, 18–48 mm wide, apices acute, bases stalked, costae winged throughout. Tertiary pinnae ovate or oblong, 12–40 mm long, 6–15 mm wide, apices acute, bases stalked, costae winged throughout. Ultimate lamina segments up to 12 mm long and 5 mm wide, apices acute, margins sharply toothed, bases stalked. Sori round, nearer costa than margin; indusia reniform, 0.8–1.5 mm diameter, with dark centres, glabrous.

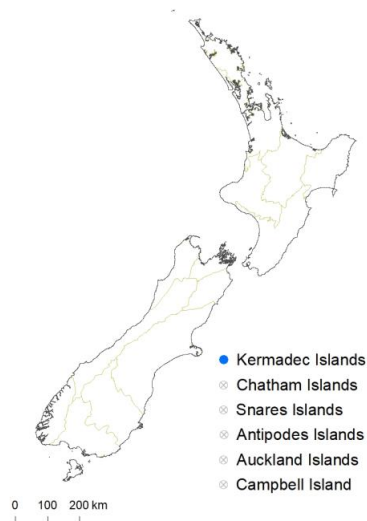


Fig. 1: *Arachniodes aristata* distribution map based on databased records at AK, CHR & WELT.

Habitat: *Arachniodes aristata* was reported to be the commonest terrestrial fern of dry forest areas on Raoul Island, but absent from wet forest and swamp (Sykes 1977). It has been collected from roadsides and damp banks.

Recognition: *Arachniodes aristata* is recognised by its terrestrial habit, long-creeping rhizomes, 3–4-pinnate laminae with sharply toothed margins, scaly fronds, and round sori protected by reniform indusia.

Cytology: $2n = 164$ (de Lange et al. 2004). This is the same tetraploid number as that reported by Brownlie (in Fabbri 1963) for the species in New Caledonia, but different to the diploid count of $n = 41$ reported in Australia (Tindale & Roy 2002).

Notes: Fraser-Jenkins et al. (2018) noted that “Although the name has long been applied to various Indian and Asian species ... the true *A. aristata* from Tahiti etc. is a different species with smaller, stiffer segments and a less markedly longer lowest basicopic pinnule of the lowest pinna. The reports from India, Bhutan and mainland Asia, and also from South Africa, refer to other species ...”. This observation has been confirmed by Lu et al. (2019), who found the two groups to be resolved in different clades.



Fig. 2: *Arachniodes aristata*. Mature plants with 3-pinnate fronds growing in forest.

Distribution: Kermadec Islands

Altitudinal range: 60–440 m.

In New Zealand *Arachniodes aristata* is known only from Raoul Island, where it is common in dry forest areas under *Rhopalostylis baueri* and *Metrosideros kermadecensis*.

Three sheets of material, said to be from the Chatham Islands, are held at WELT. Two were collected by Travers (WELT P003394, P003683), and the other is from the Kirk Herbarium. The species was not listed by Mueller (1864) from the specimens collected by Travers in 1863, nor by Cheeseman (1906, 1925), Allan (1961), or de Lange et al. (2011). The species is not known on the Chatham Islands today, and the status of the three collections in WELT is unclear.

Also Australia (Queensland, New South Wales), Lord Howe Island, Norfolk Island, and most South Pacific islands from Solomon Islands to Pitcairn Island.

Biostatus: Indigenous (Non-endemic).

Arachniodes aristata was given a conservation status of Naturally Uncommon by de Lange et al. (2018).



Fig. 3: *Arachniodes aristata*. Herbarium specimen from Raoul Island, WELT P008007/B, showing abaxial surface of fertile frond with extended basal basicopic secondary pinnae.



Fig. 4: *Arachniodes aristata*. Close up of WELT P008007/B showing sharply toothed ultimate segments, and sori protected by reniform indusia with dark centres.

***Cyrtomium* C.Presl, Tent. Pterid. 86 (1836)**

Type taxon: *Cyrtomium falcatum* (L.f.) C.Presl

Etymology: From the Greek *cyrtos* (arched), a reference to the arched nature of the fronds.

Terrestrial ferns, evergreen. Rhizomes erect, scaly. Rhizome scales non-clathrate, ovate or broadly ovate, margins entire or toothed, attached at base, concolorous or bicolorous, pale brown to blackish-brown. Fronds monomorphic, not bulbiferous. Stipes and rachises scaly, adaxially sulcate. Laminae 1-pinnate, coriaceous, scaly. Veins reticulate with free included veinlets. Sori round, borne on abaxial surface, away from the margins, in 1 to several rows either side of midrib; indusia round, peltate. Spores monoletate; perispores tuberculate or reticulate, smooth on the surface.

Taxonomy: A genus of 35 species included in subfamily Dryopteridoideae (PPG 1 2016).

Cyrtomium is assumed to be monophyletic and sister to *Polystichum*. The polystichoid ferns are sister to the dryopteroid ferns, comprising *Arachniodes* and *Dryopteris* (Liu et al. 2016).

Only one naturalised species, *Cyrtomium falcatum*, occurs in New Zealand, first recorded by Brownsey (1981).

Distribution: *Cyrtomium* is a genus of warm temperate regions in the Old World. The greatest diversity is in south-west China, with a few species extending to southern Africa, southern India, and Japan; 31 species in China (Zhang & Barrington 2013a), one native species in Africa and Madagascar (Roux 2009), and one native species in Hawai'i (Palmer 2003); one widespread naturalised species in North America, Europe, southern Africa, Reunion, Hawai'i, Australia and New Zealand.

Biostatus: Exotic; fully naturalised.

Table 3: Number of species in New Zealand within *Cyrtomium* C.Presl

Category	Number
Exotic: Fully Naturalised	1
Total	1

Recognition: In New Zealand the sole species of *Cyrtomium* can be recognised by its terrestrial habit, erect rhizome, 1-pinnate scaly frond, reticulate venation, and sori protected by round indusia that are arranged in several rows either side of the midrib. The spores are tuberculate to reticulate with a smooth surface (Large & Braggins 1991).

Cytology: The base chromosome number in *Cyrtomium* is $x = 41$ (Löve et al. 1977).

***Cyrtomium falcatum* (L.f.) C.Presl, Tent. Pterid. 86, t. 2, f. 26 (1836)**

≡ *Polypodium falcatum* L.f., *Suppl. Pl.* 446 (1782)

≡ *Aspidium falcatum* (L.f.) Sw., *J. Bot. (Schrader)* 1800(2): 31 (1801)

≡ *Dryopteris falcata* (L.f.) Kuntze, *Revis. Gen. Pl.* 2, 812 (1891)

≡ *Polystichum falcatum* (L.f.) Diels in Engler & Prantl, *Nat. Pflanzenfam.* 1(4), 194 (1899)

≡ *Phanerophlebia falcata* (L.f.) Copel., *Gen. Fil.* 111 (1947)

Holotype: Japan, *C.P. Thunberg s.n.*, UPS (*n.v.*; see Roux 2009)

Etymology: From the Latin *falcatus* (sickle-shaped), a reference to the falcate-shaped pinnae in this species.

Vernacular name: holly fern

Rhizomes erect, densely scaly. Rhizome scales ovate, 5–8 mm long, 0.8–1.4 mm wide, pale brown or chestnut-brown, concolorous or darker towards the centre, margins irregularly toothed, apices acuminate. Fronds 200–1100 mm long. Stipes 70–450 mm long, pale or chestnut-brown, densely scaly, especially proximally; scales elliptic, chestnut-brown, up to 20 mm long and 6 mm wide, irregularly toothed or fimbriate on margins, acuminate. Rachises pale brown, sulcate, scaly; scales abundant throughout, with a mixture of narrowly ovate to hair-like, pale brown scales. Laminae 1-pinnate, narrowly ovate or narrowly elliptic, 120–770 mm long, 70–250 mm wide, glossy dark green adaxially, paler green abaxially, coriaceous, bearing hair-like scales on abaxial costae and laminae, almost glabrous adaxially. Primary pinnae in 5–17 pairs below terminal pinna, widely spaced especially proximally, ovate distally, ovate or oblong proximally, falcate; the longest at or below the middle, 50–145 mm long, 20–50 mm wide, apices acuminate, bases stalked, lobed acroscopically, margins irregularly toothed. Veins reticulate. Sori round, in several rows either side of costa; indusia round, 0.9–1.3 mm diameter, with dark centres, glabrous.

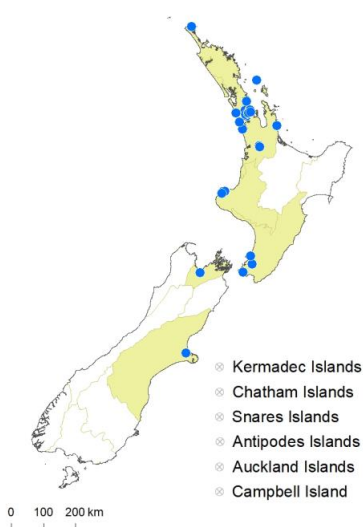


Fig. 5: *Cyrtomium falcatum* distribution map based on databased records at AK, CHR & WELT.

Distribution: North Island: Northland, Auckland, Taranaki, Southern North Island.

South Island: Sounds-Nelson, Canterbury.

Altitudinal range: 0–60 m.

Cyrtomium falcatum is naturalised in the North Island at Spirits Bay, on islands in the Hauraki Gulf, and around Auckland, Coromandel Peninsula, Hamilton, New Plymouth, Waikanae and Wellington. It has also been recorded growing in the South Island in Nelson and as a weed in a glasshouse at Governors Bay, Port Hills.

Occurs naturally in China, Japan and south-east Asia (Zhang & Barrington 2013a), but is introduced in Europe (Tutin et al. 1964; Page 1982), North America (Smith 1993), Hawai'i (Palmer 2003), Reunion, southern Africa (Roux 2009), and Australia (Jones 1998).

Biostatus: Exotic; fully naturalised.

Habitat: *Cyrtomium falcatum* occurs in lowland habitats, often near the sea, growing on cliffs, clay banks, rocky ground, sandy slopes, stream banks, in open grassland, among *Phormium*, and under scrub, pōhutukawa and willows. It also occurs in urban environments, growing on retaining walls, mortar, and among builder's rubble.

First record: Brownsey (1981). Voucher CHR 83376, 1952.

Recognition: *Cyrtomium falcatum* can be recognised by its terrestrial habit, erect rhizome, 1-pinnate scaly frond, irregularly toothed and falcate pinnae, reticulate venation, and sori protected by round indusia that are arranged in several rows either side of the midrib.

Cytology: No chromosome count has been reported for New Zealand plants, but sexually reproducing diploid and tetraploid cytotypes, and an apomictic triploid, are known in Asia (Zhang & Barrington 2013a).



Fig. 6: *Cyrtomium falcatum*. Mature plants with 1-pinnate fronds.



Fig. 7: *Cyrtomium falcatum*. Adaxial surface of fertile frond showing ovate pinnae with irregularly toothed margins and short basal acroscopic lobes.



Fig. 8: *Cyrtomium falcatum*. Mature plant.



Fig. 9: *Cyrtomium falcatum*. Large ovate scales with darker brown centres on rhizome and stipe bases.



Fig. 10: *Cyrtomium falcatum*. Abaxial surface of fertile pinnae showing round sori protected by round, peltate indusia with darker centres.



Fig. 11: *Cyrtomium falcatum*. Abaxial surface of fertile pinnae showing reticulate venation with free included veinlets, and round indusia with dark centres.

***Dryopteris* Adans., Fam. Pl. 2, 20 (1763), nom. cons.**

Type taxon: *Dryopteris filix-mas* (L.) Schott

Etymology: From the Greek *drys* (an oak) and *ptēris* (a fern); oak-fern, Dioscorides' name for this group of plants.

Terrestrial ferns, evergreen or marcescent. Rhizomes erect or short-creeping (NZ) or rarely long-creeping (not NZ), scaly. Rhizome scales non-clathrate, ovate to narrowly ovate, margins entire, attached at base, concolorous, light brown to red-brown. Fronds monomorphic, not bulbiferous. Stipes and rachises scaly, adaxially sulcate. Laminae 1-pinnate to 3-pinnate-pinnatifid (NZ), or 4-pinnate (not NZ), herbaceous, scaly. Veins free. Sori round, borne on abaxial surface, away from the margin, in 1 row either side of midrib; indusia reniform, peltate. Spores monolete; perispores rugose, tuberculate or cristate, sometimes minutely echinate on the surface.

Taxonomy: A genus of c. 400 species, included in subfamily Dryopteridoideae (PPG 1 2016).

Dryopteris is considered to be monophyletic and sister to *Arachniodes*, and these two genera are in turn sister to the polystichoid ferns (Liu et al. 2016). Four subgenera with a total of 17 sections were recognised by Fraser-Jenkins (1986).

In NZ the genus is represented only by naturalised or casual species; none are indigenous. Three naturalised species, *Dryopteris affinis*, *D. dilatata* and *D. filix-mas*, were recorded by Brownsey (1981). Two casual species, *D. cycadina* and *D. inaequalis*, were reported by Heenan et al. (2004), another five, *D. carthusiana*, *D. erythrosora*, *D. kinkiensis*, *D. sieboldii* and *D. stewartii*, by Heenan et al. (2008), and two, *D. formosana* and *D. wallichiana*, by Ogle et al. (2021). *D. cycadina* is now regarded as fully naturalised.

1	Laminae 1-pinnate.....	2
	Laminae 1-pinnate-pinnatifid or more divided.....	3
2	Primary pinnae in 1–4 pairs; pinna margins entire or minutely serrate; sori in 3–4 irregular rows either side of costa.....	<i>sieboldii</i>
	Primary pinnae in 17–20 pairs; pinna margins deeply toothed; sori in 1–2 rows either side of costa.....	<i>cycadina</i>
3	Laminae 2-pinnate-pinnatifid or more divided.....	4
	Laminae 1-pinnate-pinnatifid to 2-pinnate.....	7
4	Laminae 3-pinnate to 3-pinnate pinnatifid, ovate to pentagonal.....	5
	Laminae 2-pinnate-pinnatifid to 3-pinnate, elliptic to ovate.....	6
5	Basal basiscopic secondary pinna on the basal primary pinnae much longer than the acroscopic; scales on abaxial costae weakly inflated.....	<i>formosana</i>
	Basal basiscopic secondary pinna on the basal primary pinnae only a little longer than the acroscopic; scales on abaxial costae minute and flat.....	<i>inaequalis</i>
6	Rhizomes prostrate; rhizome scales pale brown, lacking a dark central area; fronds erect; laminae often parallel-sided in proximal half.....	<i>carthusiana</i>
	Rhizomes erect; rhizome scales dark brown, often with a darker central area; fronds arching; laminae ovate.....	<i>dilatata</i>
7	Fronds red-tinged when young; indusia with red centres.....	<i>erythrosora</i>
	Fronds not red-tinged; indusia lacking red centres.....	8
8	Secondary segments on lowermost primary pinnae stalked or sessile.....	9
	Secondary segments on lowermost primary pinnae adnate to costae.....	10
9	Scales on abaxial costae flat.....	<i>stewartii</i>
	Scales on abaxial costae inflated at their bases.....	<i>kinkiensis</i>
10	Stipe scales linear with long hair-points.....	<i>wallichiana</i>
	Stipe scales ovate or narrowly ovate with short apices.....	11

- 11 Rhizome and stipe scales golden brown; abaxial costae darkened at junction with rachis when fresh; secondary pinnae truncate; indusia inrolled when young..... *affinis*
- Rhizome and stipe scales pale brown; abaxial costae not darkened at junction with rachis when fresh; secondary pinnae rounded or obtuse; indusia flat when young..... *filix-mas*

Distribution: *Dryopteris* is primarily a genus of the northern temperate regions of Europe and North America, extending to warm temperate parts of central and eastern Asia, montane and southern Africa, Australia and the Pacific. It also occurs in tropical montane regions of Africa and south-east Asia, as well as in the Neotropics. The centre of diversity is in south-west China and the eastern Himalaya (Fraser-Jenkins 1986; Kramer 1990); 167 species in China (Wu et al. 2013); 38 species in Africa and Madagascar (Roux 2009), three in Australia (Field 2020), perhaps 12 in the south Pacific, and 10 in Hawai'i (Palmer 2003); four naturalised and eight casual species in New Zealand; none indigenous.

Biostatus: Exotic; fully naturalised.

Table 4: Number of species in New Zealand within *Dryopteris* Adans.

Category	Number
Exotic: Fully Naturalised	4
Exotic: Casual	8
Total	12

Recognition: In New Zealand all species of *Dryopteris* are naturalised and have fronds that are sometimes marcescent rather than evergreen. They are recognised by their terrestrial habit, erect or short-creeping rhizomes, 1-pinnate to 3-pinnate-pinnatifid, scaly fronds, and round sori protected by reniform indusia. The spores are rugose, sometimes with minute papillae on the surface (Large & Braggins 1991).

Cytology: The base chromosome number in *Dryopteris* is $x = 41$ (Kramer 1990). There is a polyploid series including diploid, triploid and tetraploid species, several of which are known to be apomictic (Lovis 1977).

***Dryopteris affinis* (Lowe) Fraser-Jenk., *Fern Gaz.* 12: 56 (1979)**

≡ *Nephrodium affine* Lowe, *Trans. Cambridge Philos. Soc.* 6: 525 (1838)

Lectotype (selected by Fraser-Jenkins 1980): Madeira, Ribeiro Frio, by the Levada to the right, R.T. Lowe s.n., 1 Nov. 1828, K 000351173 (online)

Etymology: From the Latin *affinis* (related to, similar to), a reference to the similarity of this species to *Dryopteris filix-mas*.

Vernacular names: golden male fern; golden shield fern; golden-scaled male fern

Rhizomes erect, densely scaly. Rhizome scales ovate, 12–15 mm long, 2–5 mm wide, golden brown, concolorous, margins entire. Fronds 550–1290 mm long. Stipes 110–450 mm long, pale brown, densely scaly throughout; scales ovate or narrowly ovate, golden brown, up to 18 mm long and 4 mm wide. Rachises pale brown, sulcate, narrowly winged distally, scaly; scales abundant throughout, narrowly ovate, golden brown, up to 10 mm long and 1.5 mm wide. Laminae 2-pinnate at base, elliptic or narrowly elliptic, 410–910 mm long, 140–270 mm wide, mid- to yellow-green on both surfaces, herbaceous, bearing flat scales on both costa surfaces and the abaxial lamina surface. Primary pinnae in 27–46 pairs below pinnatifid apex, widely spaced throughout, narrowly ovate or narrowly triangular; the longest at or near the middle, 75–150 mm long, 18–30 mm wide, apices acuminate, bases stalked; costae narrowly winged throughout; dark patches at costa/rachis junction when fresh. Secondary pinnae decreasing very gradually in length along the primary pinna to the distal end; the longest secondary pinnae oblong, 9–18 mm long, 3–7 mm wide, apices rounded or truncate, margins entire or toothed near apices, bases adnate. Sori on distal primary pinnae only, round, in 1 row either side of costa, nearer costa than margin; indusia reniform, rolled under sori when young, 0.8–1.2 mm diameter, concolorous, glabrous.

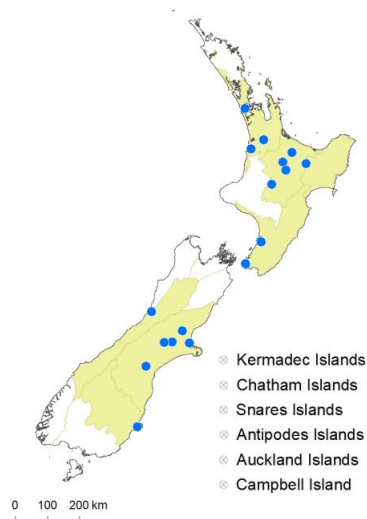


Fig. 12: *Dryopteris affinis* distribution map based on databased records at AK, CHR & WELT.

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

South Island: Canterbury, Westland, Otago.

Altitudinal range: 0–650 m.

Dryopteris affinis occurs in scattered lowland and montane localities from Auckland to Dunedin. It ranges from near sea level, up to 650 m near Lake Rotoaira in the central North Island.

Occurs naturally in Europe, Asia and North Africa (Tutin et al. 1964; Roux 2009).

Biostatus: Exotic; fully naturalised.

Habitat: *Dryopteris affinis* grows under mānuka and kānuka scrub, beech forest, and introduced willows, pine and Douglas fir plantations, often on road banks, river terraces, in damp valleys, or at the base of clay banks. It also occurs as a spontaneous garden weed.

First record: Lovis (1980). Voucher WELT P023121, 1963.

Recognition: *Dryopteris affinis* is recognised by its erect rhizomes, golden brown scales, densely scaly stipes and rachises, 2-pinnate laminae, secondary pinnae of uniform size, basal basiscopic secondary pinnae on the lowermost pair of primary pinnae not extended, and sori confined to the distal half of the lamina. It is very similar to *D. filix-mas* but differs in that the stipe is more abundantly covered in scales that are golden brown rather than pale brown, and in having more widely spaced and slightly narrower primary pinnae (18–25 mm wide, cf. 17–38 mm wide), more widely spaced secondary pinnae with truncate rather than rounded apices, and indusia that are inrolled when young rather than flat. In living plants there are dark patches abaxially at the costa/rachis junctions.

Cultivars with crested pinna apices occur occasionally in the wild (e.g. CHR 461167, Coalgate, Canterbury) and are referable to 'Cristata', sometimes known as 'Cristata the King' (Hoshizaki & Moran 2001).

Cytology: No chromosome count has been reported for New Zealand plants. In Europe, diploid and triploid apomictics are known (Fraser-Jenkins 1980a).

Hybridisation: *Dryopteris ×tavelii* Rothm., the hybrid between *D. affinis* and *D. filix-mas*, has been recorded from the Rakaia Gorge, Canterbury (WELT P023374–023378) and from Dunedin (WELT P011737–011738).

Notes: The names *Dryopteris borrieri* Newman and *D. pseudomas* (Wollaston) Holub & Pouzar have previously been used on New Zealand herbarium specimens for this taxonomically and nomenclaturally difficult complex (Fraser-Jenkins 1980a).



Fig. 13: *Dryopteris affinis*. Mature plant with 2-pinnate fronds.



Fig. 14: *Dryopteris affinis*. Mature plant growing from an erect rhizome.



Fig. 15: *Dryopteris affinis*. Adaxial surface of sterile 2-pinnate frond showing truncate apices on secondary pinnae.



Fig. 16: *Dryopteris affinis*. Large, golden brown scales on rhizome and stipe bases.



Fig. 17: *Dryopteris affinis*. Abaxial surface of fertile pinnae showing dark patches at costa/rachis junctions, and round sori protected by reniform, peltate, concolorous indusia, rolled under the sori when young.



Fig. 18: *Dryopteris affinis*. Abaxial surface of fertile pinnae showing over-mature sori and indusia.

***Dryopteris carthusiana* (Vill.) H.P.Fuchs, *Bull. Soc. Bot. France* 105: 339 (1959)**

≡ *Polypodium carthusiana* Vill., *Hist. Pl. Dauphiné* 1, 292 (1786)

Neotype (designated by Fraser-Jenkins 1980): France, Isère, 1.5 km above Chateau d'Entremont on route to Mt Bovinant, Grande Chartreuse, N.E. of Grenoble, C.R. Fraser-Jenkins 7335, 1 July 1978, BM 001066001 (!online)

Etymology: From the Latin *carthusianus*, relating to the Grande Chartreuse Monastery, Chartreuse, France, near where the species was first collected.

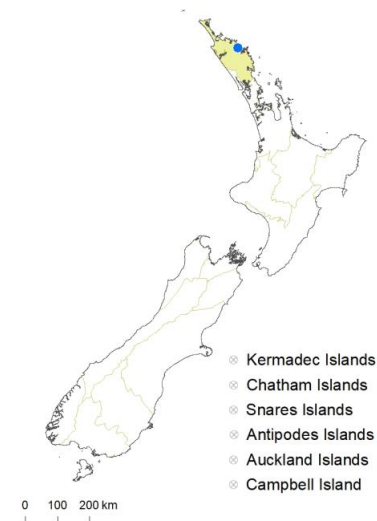


Fig. 19: *Dryopteris carthusiana* distribution map based on databased records at AK, CHR & WELT.

lamina. The lamina is flat rather than having slightly down-turned margins (Page 1982; Hoshizaki & Moran 2001).

Cytology: No chromosome count has been reported for New Zealand plants. In Europe the plant is known to be an allotetraploid sexual species derived from *D. intermedia* and an unknown diploid species (Fraser-Jenkins 1980b).



Fig. 20: *Dryopteris carthusiana*. Herbarium specimen of self-sown plant from Kerikeri, AK 296560, showing a 3-pinnate frond.



Fig. 21: *Dryopteris carthusiana*. Herbarium specimen of a fertile frond from a plant cultivated in Auckland, AK 266554.

***Dryopteris cycadina* (Franch. & Sav.) C.Chr., *Index Filic.* 260 (1905)**

≡ *Aspidium cycadinum* Franch. & Sav., *Enum. Pl. Jap.* 2, 236 (1879)

Holotype: Japan, P 00630679 (!online)

Etymology: From the Latin *cycadinus* (like a small cycad), a reference to the growth form of this species.

Rhizomes erect, densely scaly. Rhizome scales ovate to narrowly ovate, 12–17 mm long, 1.5–4 mm wide, blackish-brown, concolorous, margins ciliate. Fronds 340–800 mm long. Stipes 130–250 mm long, pale brown, abundantly scaly especially near junction with the rhizome; scales narrowly ovate, blackish-brown, ciliate, up to 15 mm long and 1.2 mm wide. Rachises pale or yellow-brown, sulcate, not winged, scaly; scales scattered throughout but more abundant at pinna junctions, linear, blackish-

brown, up to 6 mm long and 0.4 mm wide. Laminae 1-pinnate at base, elliptic, 180–580 mm long, 80–200 mm wide, mid-green on both surfaces, herbaceous, bearing flat scales on abaxial costae, $\pm$ glabrous on adaxial surface. Primary pinnae in 17–30 pairs below pinnatifid terminal segment, slightly overlapping, narrowly ovate or narrowly elliptic; the longest at or near the middle, 44–115 mm long, 14–17 mm wide, apices acute or acuminate, margins deeply serrate, bases sessile or short-stalked; not dark at junctions with rachis when fresh. Sori present on all pinnae, round, in 1–2 rows either side of costa, nearer costa than margin; indusia reniform, flat when young, 0.4–0.6 mm diameter, concolorous, glabrous.

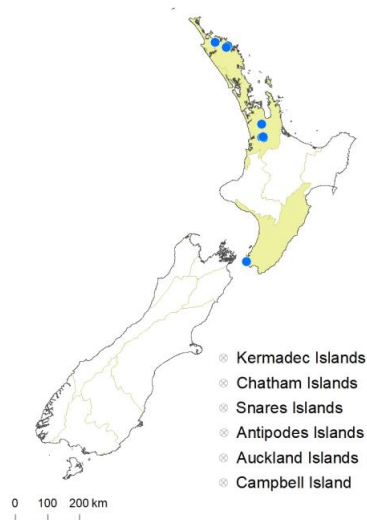


Fig. 22: *Dryopteris cycadina* distribution map based on databased records at AK, CHR & WELT.

Distribution: North Island: Northland, Auckland, Southern North Island.

Altitudinal range: 10–80 m.

Collected in Kerikeri and Wellington from plants occurring spontaneously in gardens, and from naturalised plants around Hamilton and the Waikato River.

Occurs naturally in China, Japan and Taiwan (Wu et al. 2013).

Biostatus: Exotic; fully naturalised.

Habitat: Recorded growing under forest and scrub on river banks, beside a waterfall, and on a lake shore, as well as in urban habitats.

First record: Heenan et al. (2004). Voucher AK 283998, 2003.

Recognition: *Dryopteris cycadina* is recognised by its erect rhizome with narrowly ovate, blackish-brown, ciliate scales, 1-pinnate laminae with deeply serrate pinnae, and sori in 1–2 rows either side of the costa.



Fig. 23: *Dryopteris cycadina*. Mature 1-pinnate frond.



Fig. 24: *Dryopteris cycadina*. Adaxial surface of mature frond showing deeply serrate primary pinnae.



Fig. 25: *Dryopteris cycadina*. Abaxial surface of fertile frond showing narrow, blackish-brown scales, and sori in one or two rows either side of costae.



Fig. 26: *Dryopteris cycadina*. Abaxial surface of fertile frond showing deeply serrate pinnae, and sori in one or two rows either side of costae.



Fig. 27: *Dryopteris cycadina*. Herbarium specimen from Wellington, WELT P028750/A, showing abaxial surface of fertile frond, with narrow, blackish-brown scales on stipe and rachis.



Fig. 28: *Dryopteris cycadina*. Close up of WELT P028750/A showing abaxial surface of fertile pinnae with narrow, blackish-brown scales, and sori in two rows either side of costae.

***Dryopteris dilatata* (Hoffm.) A.Gray, *Manual* 631 (1848)**

≡ *Polypodium dilatatum* Hoffm., *Deutschl. Fl.* 2, 7 (1796)

Lectotype (selected by Fraser-Jenkins 1980): original material apparently destroyed in MW during the Napoleonic wars, but typified by Hoffman's reference to the illustration of O. Müller, *Fl. Fridrichsd.*, t. 2, fig. 4 (1767).

Etymology: From the Latin *dilatatus* (expanded), a reference to the enlarged basal basiscopic secondary pinnae on the lowermost primary pinnae in this species.

Rhizomes erect, densely scaly. Rhizome scales narrowly ovate, 6–12 mm long, 1.5–3 mm wide, dark brown, concolorous or slightly darker centrally, margins entire. Fronds 330–960 mm long. Stipes 150–420 mm long, dark brown proximally, pale brown distally, scaly especially near junction with rhizome; scales ovate or narrowly ovate, dark brown, sometimes with paler margins, often becoming orange-brown distally, up to 20 mm long and 5 mm wide. Rachises pale or yellow-brown, sulcate, narrowly winged distally, scaly; scales scattered throughout, ovate to narrowly ovate, orange-brown or sometimes dark brown, up to 6 mm long and 1.5 mm wide. Laminae 3-pinnate at base, elliptic or

ovate, 180–570 mm long, 100–300 mm wide, mid-green on both surfaces, herbaceous, bearing flat scales on abaxial costae, but very scattered adaxially. Primary pinnae in 15–21 pairs below pinnatifid apex, widely spaced especially proximally, narrowly ovate distally, ovate proximally; the longest from middle to base, 60–180 mm long, 30–115 mm wide, apices acute or acuminate, bases stalked; costae narrowly winged for most of their length, not dark at junctions with rachis when fresh. Acroscopic secondary pinnae decreasing gradually in length along the primary pinna to the distal end; the basal basiscopic secondary pinna the longest, narrowly ovate, 19–85 mm long, 10–50 mm wide, apices acute, bases stalked, costae winged throughout. Tertiary pinnae ovate or oblong, 6–32 mm long, 3–20 mm wide, apices obtuse, margins deeply divided into finely pointed ultimate segments, bases adnate, costae winged throughout. Sori present on all pinnae, round, in 1 row either side of costa, nearer costa than margin; indusia reniform, flat when young, 0.5–0.8 mm diameter, concolorous, glabrous.

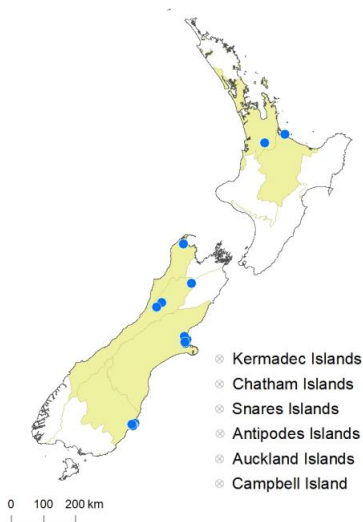


Fig. 29: *Dryopteris dilatata* distribution map based on databased records at AK, CHR & WELT.

Distribution: North Island: Auckland, Volcanic Plateau.

South Island: Western Nelson, Canterbury, Westland, Otago.

Altitudinal range: 0–400 m (up to 1550 m).

Naturalised in a few lowland areas around Hamilton and Mt Maunganui in the North Island, and North Westland, Christchurch and Dunedin in the South Island. It mostly occurs below 400 m, but has also been collected from 1550 m at Rainbow Skifield near St Arnaud, where it was presumably introduced by skifield operations.

Occurs naturally in Europe and Asia (Tutin et al. 1964).

Biostatus: Exotic; fully naturalised.

Habitat: *Dryopteris dilatata* occurs in lowland habitats on pākihi soils, along tracksides and roadsides, on rotten logs, in podocarp forest, under mānuka and introduced willows and pines, and in urban environments. Also recorded from an alpine area near Rainbow Skifield.

First record: Healy (1958). Voucher CHR 53490, CHR 71628, 1950.

Recognition: *Dryopteris dilatata* is recognised by its erect rhizome with dark brown scales, scaly stipes, 3-pinnate laminae, extended basal basiscopic secondary pinnae on the lowermost pair of primary pinnae, and sori present throughout the lamina (Page 1982; Brownsey & Smith-Dodsworth 2000; Hoshizaki & Moran 2001).

Cytology: No chromosome count has been reported for New Zealand plants. In Europe the plant is known to be an allotetraploid sexual species derived from *D. azorica* and *D. expansa* (Fraser-Jenkins 1980b).



Fig. 30: *Dryopteris dilatata*. Mature plant with sterile 3-pinnate frond.



Fig. 31: *Dryopteris dilatata*. Abundant, ovate scales with darker centres on stipe bases.



Fig. 32: *Dryopteris dilatata*. Mature plant growing from an erect rhizome.



Fig. 33: *Dryopteris dilatata*. Adaxial surface at the apex of a fertile frond.



Fig. 34: *Dryopteris dilatata*. Abaxial surface of fertile frond showing concolorous, reniform indusia.



Fig. 35: *Dryopteris dilatata*. Abaxial surface of fertile frond showing concolorous, reniform indusia.

***Dryopteris erythrosora* (D.C.Eaton) Kuntze, *Revis. Gen. Pl.* 2, 812 (1891)**

≡ *Aspidium erythrosorum* D.C.Eaton in Perry, *Narr. Exped. China Japan* 2, 330 (1856)

Holotype: Simoda, Japan, C. Wright, 1853–1856, US 0135342 (online)

Etymology: From the Latin *erythrosorus* (with red sori), a reference to the colour of the sori in this species.

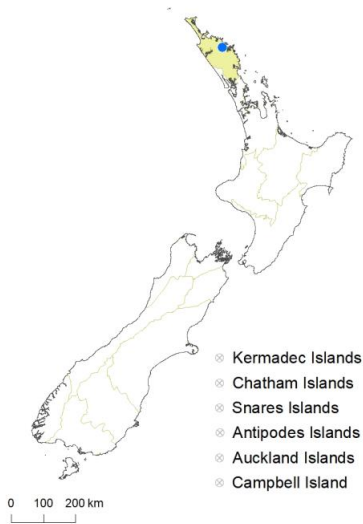


Fig. 36: *Dryopteris erythrosora* distribution map based on databased records at AK, CHR & WELT.

Distribution: North Island: Northland.

Altitudinal range: c. 80 m.

Collected as an escape from cultivation in Kerikeri.

Occurs naturally in China, Korea and Japan (Wu et al. 2013).

Biostatus: Exotic; casual.

Habitat: Recorded as self-sown near to a cultivated parent plant.

First record: Heenan et al. (2008). Voucher AK 288162, 2004.

Recognition: *Dryopteris erythrosora* has an erect to short-creeping rhizome, 2-pinnate ovate laminae, and narrowly ovate blackish-brown scales on the stipe. Young fronds are often red-tinged. The scales on the costae are inflated, with long, attenuate apices. The sori are arranged in one row either side of the costae, and the reniform indusia characteristically have red centres (Hoshizaki & Moran 2001).



Fig. 37: *Dryopteris erythrosora*. Adaxial surface of fertile 2-pinnate frond, red-tinged on the margins.



Fig. 38: *Dryopteris erythrosora*. Adaxial surface of primary pinnae showing red-tinged margins.



Fig. 39: *Dryopteris erythrosora*. Abaxial surface of primary pinna showing indusia with red centres.



Fig. 40: *Dryopteris erythrosora*. Abaxial surface of secondary pinnae showing tiny, inflated scales on the costa, and indusia with red centres.

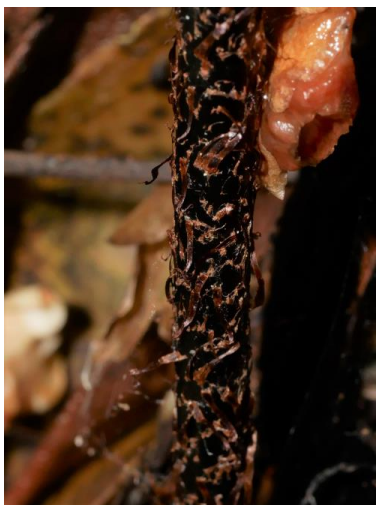


Fig. 41: *Dryopteris erythrosora*. Dark brown, narrowly ovate scales on the stipe.



Fig. 42: *Dryopteris erythrosora*. Herbarium specimen of cultivated plant from Manurewa, AK 228913, showing 2-pinnate frond with sori arranged in one row either side of costae.

***Dryopteris filix-mas* (L.) Schott, *Gen. Fil.* t. 9 (1834)**

≡ *Polypodium filix-mas* L., *Sp. Pl.* 1090 (1753)

Lectotype (selected by Jonsell & Jarvis 1994): Herb. Clifford 475, *Polypodium* 10, BM 000647599 (online)

Etymology: From the Latin *filix* (fern) and *mas* (male), the male fern.

Vernacular name: male fern

Rhizomes erect, densely scaly. Rhizome scales ovate, 7–25 mm long, 2–5 mm wide, pale brown, concolorous, margins entire. Fronds 240–1190 mm long. Stipes 40–420 mm long, pale brown, densely scaly, especially near the junction with the rhizome; scales ovate, pale brown, up to 30 mm long and 7 mm wide. Rachises pale or yellow-brown, sulcate, narrowly winged distally, scaly; scales scattered throughout, ovate, pale brown, up to 4 mm long and 1 mm wide. Laminae 2-pinnate at base, elliptic or narrowly elliptic, 200–880 mm long, 95–340 mm wide, mid-green on both surfaces, herbaceous, bearing scales on both costa surfaces and the abaxial lamina surface. Primary pinnae in 17–38 pairs below pinnatifid apex, widely spaced especially proximally, narrowly ovate or narrowly triangular or narrowly elliptic; the longest at or near the middle, 50–180 mm long, 13–38 mm wide, apices acute or acuminate, bases stalked; costae narrowly winged throughout, not dark at junctions with rachis when fresh. Secondary pinnae decreasing gradually in length along the primary pinna to the distal end, or sometimes longest at mid-pinna; the longest secondary pinnae oblong, 7–23 mm long, 3–7 mm wide,

apices obtuse or rounded, margins toothed especially at the apices, bases adnate. Sori on distal primary pinnae only, round, in 1 row either side of costa, nearer costa than margin; indusia reniform, flat when young, 0.8–1.2 mm diameter, concolorous, glabrous.

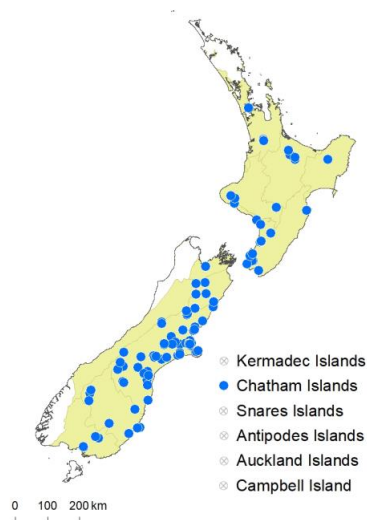


Fig. 43: *Dryopteris filix-mas* distribution map based on databased records at AK, CHR & WELT.

It favours tracksides, roadside verges, banks, river terraces, gullies, drains, boulder fields, rotten logs, and dune hollows. It also grows in urban environments on brick or block walls, on concrete, along fence lines, and on waste ground.

First record: Healy (1958). Voucher CHR 71623, 1951.

Recognition: *Dryopteris filix-mas* is recognised by its erect rhizomes with pale brown scales, abundantly scaly stipes and rachises, 2-pinnate laminae, secondary pinnae of uniform size, basal basiscopic secondary pinnae on the lowermost pair of primary pinnae not extended, and sori confined to the distal half of the lamina. It is very similar to *D. affinis* but differs in that the stipe is less abundantly covered in pale brown rather than golden brown scales, and in having slightly overlapping and wider primary pinnae (17–38 mm wide, cf. 18–25 mm wide), more crowded secondary pinnae with obtuse or rounded rather than truncate apices, and indusia that are flat when young rather than inrolled. In living plants the costae of the primary pinnae are not darkened at the junctions with the rachis.

Cultivars with crested pinna apices are known to occur occasionally in the wild. Most of these are referable to 'Cristata' (e.g. CHR 065932, Motu Bush, Gisborne; AK 225551, Rakaia Gorge) but a few with very narrow pinnae (e.g. AK 284228, CHR 526478, Riccarton, Christchurch) are 'Linearis Polydactyla' (Hoshizaki & Moran 2001).

Cytology: No chromosome count has been reported for New Zealand plants. In Europe the plant is known to be an allotetraploid sexual species derived from *D. caucasica* and *D. oreades* (Page 1982).

Hybridisation: *Dryopteris ×tavelii* Rothm., the hybrid between *D. affinis* and *D. filix-mas*, has been recorded from the Rakaia Gorge, Canterbury (WELT P023374–023378; CHR 616781) and from Dunedin (WELT P011737–011738).

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

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

Chatham Islands.

Altitudinal range: 0–1580 m.

Dryopteris filix-mas is widely distributed in the North Island from Auckland to Wellington, and in the South Island from Nelson to Foveaux Strait. It is particularly well established and spreading east of the main divide in Marlborough, Canterbury and Otago. In the North Island it ranges from near sea level, up to 900 m near Dawson Falls, Mt Taranaki. In the South Island it reaches 1580 m in the Two Thumbs Range, Canterbury. It also occurs on the Chatham Islands.

Occurs naturally in North America, Europe, Asia and North Africa (Tutin et al. 1964; Smith 1993; Roux 2009).

Biostatus: Exotic; fully naturalised.

Habitat: *Dryopteris filix-mas* grows under kānuka, broadleaved forest, scrub, introduced *Acer*, *Larix*, *Picea*, *Pinus*, *Pseudotsuga* and *Salix* species, and in open grassland.



Fig. 44: *Dryopteris filix-mas*. Adaxial surface of mature 2-pinnate frond.



Fig. 45: *Dryopteris filix-mas*. Narrowly ovate, pale brown scales on the rachis.



Fig. 46: *Dryopteris filix-mas*. Mature plant growing from an erect rhizome.



Fig. 47: *Dryopteris filix-mas*. Abundant, pale brown, ovate scales on the rhizome and stipe bases.



Fig. 48: *Dryopteris filix-mas*. Abaxial surface of fertile frond showing concolorous, reniform indusia, not curled under the sori when young.



Fig. 49: *Dryopteris filix-mas*. Abaxial surface of fertile frond showing over-mature, concolorous, reniform indusia.



Fig. 50: *Dryopteris filix-mas* 'Cristata'. Mature plant with crested pinna apices.



Fig. 51: *Dryopteris filix-mas* 'Cristata'. Abaxial surface of fertile frond showing crested pinna apices.

***Dryopteris formosana* (Christ) C.Chr., *Index Filic.* 266 (1905)**

≡ *Aspidium formosanum* Christ, *Bull. Herb. Boissier sér. 2*, 4: 615 (1904)

Holotype: Hakuto, Taiwan, *U. Faurie* 687, 4 May 1903, P 00630715 (lonline)

Etymology: *formosanus* (Latin) – from *Formosa* (Taiwan)

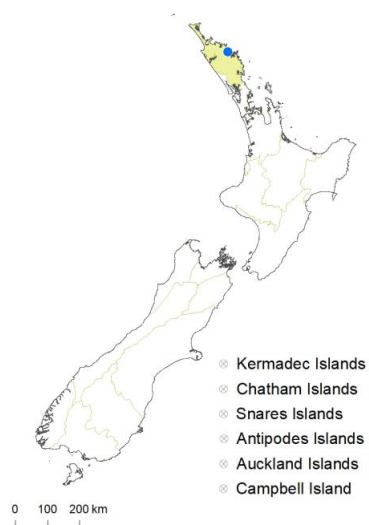


Fig. 52: *Dryopteris formosana* distribution map based on databased records at AK, CHR & WELT.

Distribution: North Island: Northland.

Altitudinal range: c. 15 m.

Collected as a self-sown plant in cultivation in Kerikeri.

Occurs naturally in China, Korea, Japan, Taiwan and Philippines.

Biostatus: Exotic; casual.

Habitat: Recorded as self-sown c. 5 m away from a cultivated plant.

First record: Ogle et al. (2021). Voucher AK 374687, 2018.

Recognition: *Dryopteris formosana* has an erect rhizome, dark brown to almost black scales on the stipe and rachis, laminae that are pentagonal and 3-pinnate to 3-pinnate-pinnatifid, 1–2 basiscopic secondary pinnae on the basal primary pinnae that are longer than the corresponding acroscopic secondary pinnae, aristate teeth on the ultimate lamina segments, light brown weakly inflated scales on the abaxial costa surfaces, and reniform indusia (Hoshizaki & Moran 2001).



Fig. 53: *Dryopteris formosana*. Herbarium specimen of a self-sown plant from Kerikeri, AK 374687/B, showing the distal portion of a 3-pinnate-pinnatifid frond.



Fig. 54: *Dryopteris formosana*. Herbarium specimen of a fertile frond showing elongated basal basispic secondary pinnae on the basal primary pinnae, AK 374687/A.

***Dryopteris inaequalis* (Schltdl.) Kuntze, *Revis. Gen. Pl.* 2, 813 (1891)**

≡ *Aspidium inaequale* Schltdl., *Adumbr. Fil.* 23, t. 12 (1825)

Lectotype (selected by Pichi Sermolli 1984): in Promontorio Bonae Spei [Cape of Good Hope], J.L.L. Mund & L. Maire, B 20 0044699 (image!)

Etymology: From the Latin *inaequalis* (unequal-sided), a reference to the slightly enlarged basal basispic secondary pinnae in this species.

Distribution: North Island: Northland.

Altitudinal range: c. 10 m.

Collected once as a spontaneous occurrence in a garden in Kerikeri.

Occurs naturally in southern Africa (Roux 2009).

Biostatus: Exotic; casual.

Habitat: Recorded as self-sown near cultivated parent plants.

First record: Heenan et al. (2004). Voucher AK 284000, 2003.

Recognition: *Dryopteris inaequalis* has a short-creeping rhizome and 2-pinnate-pinnatifid to 3-pinnate, ovate laminae. The basal basispic secondary pinnae are slightly enlarged. The lamina surfaces are glabrous, but there are minute scales along the costae. The sori are arranged in one row either side of the costae, and the indusia are reniform and either glabrous or with glands on the margins or surfaces (Crouch et al. 2011).

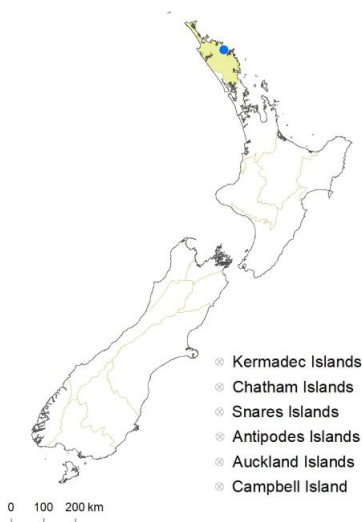


Fig. 55: *Dryopteris inaequalis* distribution map based on databased records at AK, CHR & WELT.



Fig. 56: *Dryopteris inaequalis*. Herbarium specimen of self-sown plant from Kerikeri, AK 28400, showing 3-pinnate frond with enlarged basal basispic secondary pinnae, and sori arranged in one row either side of costae.

***Dryopteris kinkiensis* Koidz. ex Tagawa, *Acta Phytotax. Geobot.* 2: 200 (1933)**

Type: not located

Etymology: *kinkiensis*, from Kinki, a region in southern Honshu, Japan, where the species was first found.

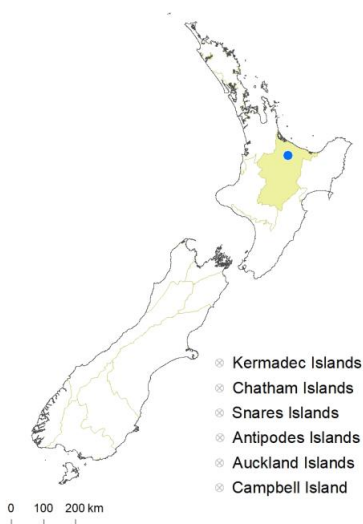


Fig. 57: *Dryopteris kinkiensis* distribution map based on databased records at AK, CHR & WELT. al. 2013).

Distribution: North Island: Volcanic Plateau.

Altitudinal range: c. 250 m.

Collected once from near Rotorua.

Occurs naturally in China and Japan (Wu et al. 2013).

Biostatus: Exotic; casual.

Habitat: Recorded as growing amongst *Dryopteris affinis* on sodden ground under *Salix cinerea* in a frequently flooded willow carr on the shore of Lake Rotorua.

First record: Heenan et al. (2008). Voucher AK 301011, 2006.

Recognition: *Dryopteris kinkiensis* has an erect rhizome and 2-pinnate, ovate laminae, which are glabrous adaxially and scaly abaxially. The scales on the stipe are ovate, toothed and dark brown, and those on the abaxial costae inflated at their bases. The secondary pinnae are $\pm$ uniform in size for about half their length and then decrease to the apices, deeply toothed on the margins, and the basal basispic pinnae are not enlarged. The sori are arranged in one row either side of the costae, protected by reniform indusia (Zhang 2012; Wu et al. 2013).



Fig. 58: *Dryopteris kinkiensis*. Herbarium specimen of a plant from Rotorua, AK 301011, showing 2-pinnate frond, lacking enlarged basal basiscopic secondary pinnae.

***Dryopteris sieboldii* (van Houtte ex Mett.) Kuntze, *Revis. Gen. Pl.* 2, 813 (1891)**

≡ *Aspidium sieboldii* van Houtte ex Mett., *Fil. Hort. Bot. Lips.* 87, t. 20, f. 1-4 (1856)

Type: Japan, Siebold (not located).

Etymology: Named in honour of Philipp Franz von Siebold (1796–1866), a German physician and botanist who lived, worked and collected in Japan from 1823 to 1830.

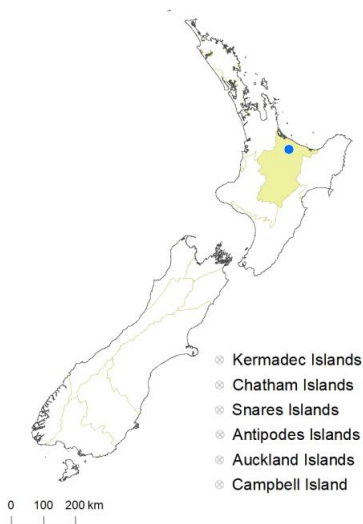


Fig. 59: *Dryopteris sieboldii* distribution map based on databased records at AK, CHR & WELT.

Distribution: North Island: Volcanic Plateau.

Altitudinal range: c. 300 m.

Collected once as a spontaneous occurrence in a garden near Rotorua.

Occurs naturally in China and Japan (Wu et al. 2013).

Biostatus: Exotic; casual.

Habitat: Recorded as self-sown on a crib wall near to cultivated parent plants.

First record: Heenan et al. (2008). Voucher AK 299456, 2006.

Recognition: *Dryopteris sieboldii* is a very distinct species with an erect rhizome and 1-pinnate, broadly oblong or broadly ovate, coriaceous laminae. There are up to four pairs of stalked, narrowly elliptic, entire pinnae tapering to acuminate apices, and a similar terminal pinna. The laminae are glabrous adaxially, with a few scattered scales abaxially. The sori are arranged in 3–4 irregular rows either side of the costae (Hoshizaki & Moran 2001; Zhang 2012; Wu et al. 2013).



Fig. 60: *Dryopteris sieboldii*. Herbarium specimen of self-sown plant from Rotorua, AK 299456, showing sterile, broadly ovate, 1-pinnate frond with three pairs of pinnae.



Fig. 61: *Dryopteris sieboldii*. Herbarium specimen of self-sown plant from Rotorua, AK 300493, showing fertile frond with sori arranged in irregular rows either side of costae.

***Dryopteris stewartii* Fraser-Jenk., *Kalikasan* 7: 272 (1979)**

Holotype: Pakistan, Hazara, Abbottabad District, 0.5 km N. of Changla Gali, Murree to Abbottabad, C.R. Fraser-Jenkins 6295, 25 July 1977, BM (*n.v.*; see Fraser-Jenkins et al. 2018)

Etymology: Named in honour of Dr Ralph Randles Stewart (1890–1993), an American-born botanist who taught and studied plants in Pakistan for over 50 years. He is considered the father of systematic botany in Pakistan, and had a specialist interest in ferns.

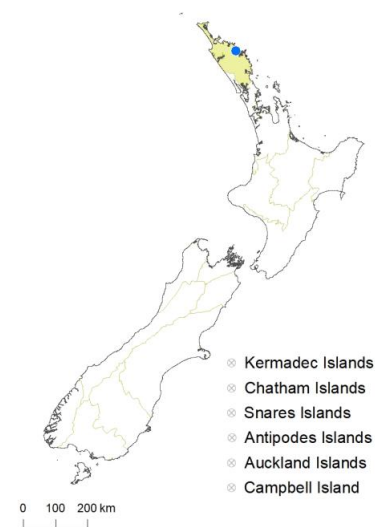


Fig. 62: *Dryopteris stewartii* distribution map based on databased records at AK, CHR & WELT.

Distribution: North Island: Northland.

Altitudinal range: c. 10 m.

Collected once as a garden escape in Kerikeri.

Occurs naturally in Afghanistan, Nepal, Pakistan and India (Fraser-Jenkins et al. 2018).

Biostatus: Exotic; casual.

Habitat: Recorded as self-sown in the nest leaves of *×Aglaonaria robertsii* near cultivated parent plant.

First record: Heenan et al. (2008). Voucher AK 299450, 2006.

Recognition: *Dryopteris stewartii* has an erect rhizome and 2-pinnate, ovate laminae, which are yellow-green in colour. The stipe scales are narrowly ovate and dark brown. The laminae are $\pm$ glabrous adaxially, with very scattered tiny flat scales abaxially. The secondary pinnae are adnate or sessile on the primary pinna costae, and deeply toothed on their margins. They decrease in size to the primary pinna apices. The sori are arranged in one row either side of the costae, protected by reniform indusia (Hoshizaki & Moran 2001).



Fig. 63: *Dryopteris stewartii*. Herbarium specimen showing the frond apex of a self-sown plant from Kerikeri, AK 300393.



Fig. 64: *Dryopteris stewartii*. Herbarium specimen showing the frond base of a self-sown plant from Kerikeri, AK 299450.

***Dryopteris wallichiana* (Spreng.) Hyl., Bot. Not. 1953(3): 352 (1953)**

≡ *Aspidium wallichianum* Spreng., Syst. Veg., ed. 16, 4, 104 (1827)

Lectotype (selected by Fraser-Jenkins in Fraser-Jenkins et al. 2018): Nepal, Kathmandu District, summit of Sheopure Mt., BM (*n.v.*)

Etymology: Named in honour of Nathaniel Wallich (1786–1854), a Danish surgeon and botanist who worked in India for the Danish and, later, British East India Companies.

Distribution: North Island: Northland.

Altitudinal range: c. 15 m.

Collected as a self-sown plant from cultivation in Kerikeri.

Occurs naturally in North, Central and South America, southern Africa, from India to Japan, south-east Asia, and Hawai'i (Fraser-Jenkins et al. 2018).

Biostatus: Exotic; casual.

Habitat: Recorded as self-sown up to 25 m from a cultivated plant.

First record: Ogle et al. (2021). Voucher AK 374688, 2017.

Recognition: *Dryopteris wallichiana* has a stout, erect rhizome, bearing fronds 1000 mm or more in length. The stipe is densely covered in red-brown, linear and hair-pointed scales, which become darker brown on the rachis. The laminae are narrowly elliptic, and deeply 1-pinnate-pinnatifid to 2-pinnate. The pinnae are sessile, longest near the middle of the laminae, with the basal pair much shorter and sometimes deflexed. There are flat scales on the abaxial costae, the secondary segments are truncate or obtuse and adnate to the costae, and the indusia reniform (see Hoshizaki & Moran 2001).

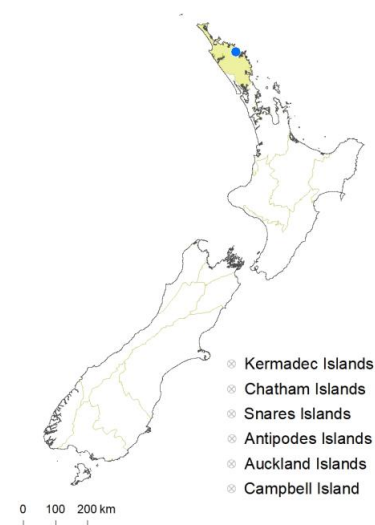


Fig. 65: *Dryopteris wallichiana* distribution map based on databased records at AK, CHR & WELT.



Fig. 66: *Dryopteris wallichiana*. Herbarium specimen of a self-sown plant from Kerikeri, AK 374688/A, showing the apex of a deeply 1-pinnate-pinnatifid frond.



Fig. 67: *Dryopteris wallichiana*. Herbarium specimen of a fertile frond showing truncate secondary segments, and dense red-brown scales on the stipe, AK 375688/B.

***Lastreopsis* Ching, *Bull. Fan Mem. Inst. Biol.* 8: 157 (1938)**

Type taxon: *Lastreopsis recedens* (J.Sm. ex T.Moore) Ching

Etymology: From the genus *Lastrea*, and the Greek *-opsis* (looking like), a reference to the similarity between the two genera.

Terrestrial (NZ) or rarely epiphytic ferns (not NZ). Rhizomes short- to long-creeping or rarely erect, scaly. Rhizome scales non-clathrate, linear to narrowly ovate, margins entire or toothed (NZ) or rarely spiny (not NZ), attached at base, concolorous, pale brown to almost black. Fronds monomorphic, not bulbiferous. Stipes and rachises scaly, often hairy, adaxially sulcate, not bulbiferous. Hairs usually long, predominantly acicular or clavate. Laminae 3–5-pinnate (NZ), or sometimes 1–2-pinnate (not NZ), catadromous or anadromous, herbaceous, scaly, hairy (NZ) or rarely glabrous (not NZ), usually with unicellular glands. Veins free (NZ) or rarely anastomosing (not NZ). Sori round, borne on abaxial surface, away from the margin (NZ) or rarely submarginal (not NZ), in 1 row either side of midrib; indusia reniform, peltate (NZ), or rarely absent (not NZ). Spores monoletate; perispores rugose, tuberculate or echinate, sometimes minutely echinate on the surface.

Taxonomy: A genus of c. 18 species (Gardner et al. 2017), included in the subfamily *Elaphoglossoideae* (PPG 1 2016).

Lastreopsis was revised by Tindale (1965). She recognised a total of 33 species, of which 17 occurred in Australia alone (Green 1994; Jones 1998). However, the genus has since been identified as paraphyletic, and subsequently split into two, with 18 species retained in a monophyletic *Lastreopsis sens. str.*, 31 recognised in *Parapolystichum*, and four still *incertae sedis* (Labiak et al. 2014, 2015a; Gardner et al. 2017). *Lastreopsis*, as circumscribed by Labiak et al. (2014, 2015a), includes the Australian species previously recognised in *Coveniella* and *Oenotrichia* (Jones 1998; Brownsey 1998). However, Labiak et al. (2014, 2015a) were unable to find any morphological characters to distinguish *Lastreopsis* from *Parapolystichum*.

Even in its more restricted sense, *Lastreopsis* remains heterogeneous. A group of four species, including *L. amplissima* (C.Presl) Tindale, *L. davalliodies* (Brack.) Tindale, *L. hispida*, and *L. killipii* (C.Ch. & Maxon) Tindale has been segregated into subg. *Rhopalotricha* (Labiak et al. 2015b). This subgenus is supported by molecular data and distinguished by clavate and glandular hairs on the adaxial surface of the rachis and costae, denticulate rhizome scales, and finely echinate surfaces on the perispores. Another small clade was recognised by Gardner et al. (2017) that included *L. vieillardii* (Mett.) Tindale and another taxon from New Caledonia, now described as *L. abscondita* Perrie & Amice (Perrie et al. 2021). These two taxa are distinguished from the others by their molecular data and by almost hairless adaxial lamina surfaces. The inter-relationships among these subgroups require further investigation. Even when subgenus *Rhopalotricha* and *L. vieillardii* and *L. abscondita* are put to one side, although the remaining *Lastreopsis* species are a more homogeneous group,

there is still no morphological synapomorphy to distinguish them from *Parapolystichum*. *Lastreopsis* is treated here in the broader sense of Labiak et al. (2014).

The two species of *Lastreopsis* present in New Zealand, *L. hispida* and *L. velutina*, are atypical of the group as a whole. Even within subg. *Rhopalotricha*, *L. hispida* is unusual in having bulbous-based, bristle-like scales on the stipes and rachises that are not seen in any other species. Similarly, *L. velutina* is distinctive within subg. *Lastreopsis* in having an erect rather than creeping rhizome, and abundant acicular rather than catenate hairs on all lamina surfaces.

Allan (1961) initially treated *Lastreopsis hispida* in *Rumohra*, and *L. velutina* in *Ctenitis* but, following Tindale (1957), he accepted both in *Lastreopsis* (Allan 1961, Supplementary Notes).

- 1 Stipes and rachises bearing long, black, bristle-like scales; laminae harsh; ultimate segments acute..... *hispida*
 Stipes bearing flat, brown scales only near junction with rhizome; laminae densely covered in soft, velvety, acicular hairs; ultimate segments obtuse or rounded..... *velutina*

Distribution: *Lastreopsis* extends from the Neotropics to India, Sri Lanka, south-east Asia, Australia, New Zealand and the south-west Pacific, with the centre of diversity in Australia; two species in South America, one in India and Malesia, 11 species in Australia, four in New Caledonia, and two in the Pacific. However, subg. *Lastreopsis* is absent from the Neotropics (Tindale 1965; Labiak et al. 2014, 2015a; Gardner et al. 2017). Two species in New Zealand; one endemic.

Biostatus: Indigenous (Non-endemic).

Table 5: Number of species in New Zealand within *Lastreopsis* Ching

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

Recognition: Currently no morphological characters are known that consistently distinguish *Lastreopsis* from *Parapolystichum*, and the two genera cannot always be recognised as such in the field. However, the two New Zealand species of *Lastreopsis* are very distinctive and are easily identified individually. *L. hispida* has bulbous-based, bristle-like scales on the stipes and rachises that are not present in any other species, and *L. velutina* has a dense covering of soft, acicular hairs on all surfaces of the laminae that gives the frond a velvety feel.

In the wider Australasian region, species of *Lastreopsis* subg. *Lastreopsis* generally have short- to long-creeping rhizomes (although not in *L. velutina*), laminae that are mostly 3–4-pinnate and catadromous in the distal half, and sori that are more frequently indusiate. Most importantly, they generally have long, acicular or clavate hairs, rather than short, catenate (ctenitoid) hairs on the lamina and rachis surfaces. By contrast, species of *Parapolystichum* have erect to long-creeping rhizomes, laminae that are 2–4-pinnate and anadromous in the distal half, and sori that may be indusiate or exindusiate. They have short, catenate (ctenitoid) hairs on the lamina and rachis surfaces, rather than long, acicular or clavate hairs.

Cytology: The base chromosome number in *Lastreopsis* is $x = 41$ (Tindale & Roy 2002).

***Lastreopsis hispida* (Sw.) Tindale, Vict. Naturalist 73: 183 (1957)**

≡ *Aspidium hispidum* Sw., J. Bot. (Schrader) 1800(2): 39 (1801)

≡ *Polystichum hispidum* (Sw.) J.Sm., J. Bot. (Hooker) 4: 195 (1841)

≡ *Lastrea hispida* (Sw.) Houlston & T.Moore, Gard. Mag. Bot. 3: 318 (1851)

≡ *Nephrodium hispidum* (Sw.) Hook., Sp. Fil. 4, 150 (1862)

≡ *Dryopteris hispida* (Sw.) Kuntze, Revis. Gen. Pl. 2, 813 (1891)

≡ *Rumohra hispida* (Sw.) Copel., Gen. Fil. 114 (1947)

Holotype: G. Forster, S P6231 (online; see Tindale 1961)

= *Polypodium setosum* G.Forst., Fl. Ins. Austr. 82 (1786) nom. illeg., non *Polypodium setosum* Thunb. 1784

≡ *Polystichum schkuhrii* C.Presl, Tent. Pterid. 84 (1836) nom. nov. pro *Polypodium setosum* G.Forst. 1786

Lectotype (selected by Brownsey et al. 2019): New Zealand, Herb. G. Forster 285, BM 001048428!

Etymology: From the Latin *hispidus* (bristly), a reference to the bristle-like scales on the stipe and rachis of this species.

Rhizomes long-creeping, up to 175 mm long (in herbarium material), 4–10 mm diameter, densely scaly. Rhizome scales $\pm$ linear, 4.5–17 mm long, 0.2–1.0 mm wide, dark red-brown, margins toothed. Fronds 265–1400 mm long. Stipes 120–870 mm long, red-brown proximally, pale brown distally, densely scaly and hairy; scales bristle-like with bulbous bases, almost black, up to 14 mm long and 0.5 mm wide, apices filiform, margins entire; hairs minute, stiff, red-brown, clavate, up to 0.1 mm long. Rachises pale brown, sulcate, narrowly winged only at distal end, abundantly covered in scales and hairs similar to but shorter than those of the stipes. Laminae 3–4-pinnate, or rarely 5-pinnate, ovate, 145–630 mm long, 80–400 mm wide, or rarely to 550 mm wide, brownish green on both surfaces, harsh, bearing abundant black bristle-like scales and shorter brown scales on both costa surfaces, $\pm$ colourless non-glandular hairs up to 0.4 mm long on the abaxial costae, and yellow club-shaped glands on both lamina surfaces but sparser adaxially. Primary pinnae in 12–21 pairs below pinnatifid apex, slightly overlapping; distal pinnae narrowly ovate, proximal pinnae ovate; the longest at or near the base, 60–295 mm long, 35–220 mm wide, apices acute or acuminate, bases stalked; costae narrowly winged for most of their length except on largest fronds. Acroscopic secondary pinnae decreasing evenly in length along the primary pinnae to the distal end; the basal basisopic secondary pinna the longest, ovate, 30–130 mm long, 10–70 mm wide, apices acute, bases stalked, costae winged throughout. Tertiary segments narrowly ovate, 9–40 mm long, 2–19 mm wide, apices acute, margins sharply and deeply serrate or divided into quaternary pinnae, bases stalked. Quaternary segments narrowly ovate, up to 13 mm long and 4 mm wide, bases adnate or stalked. Sori round, nearer margin than costa; indusia reniform, 0.6–0.8 mm diameter, with a darker central area and yellow glands on the margins and surface.

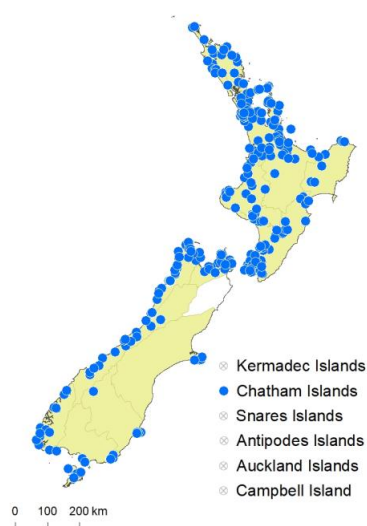


Fig. 68: *Lastreopsis hispida* distribution map based on databased records at AK, CHR & WELT.

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

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

Chatham Islands, Stewart Island.

Altitudinal range: 0–915 m.

Lastreopsis hispida occurs in lowland and montane regions throughout the North Island from Te Paki to Wellington, except for the central high country. It grows from near sea level, to over 900 m on Tutamoe in Northland. In the South Island it is largely confined to coastal and lowland areas from the Marlborough Sounds to Fiordland and Southland. On the east coast, populations are confined to Banks Peninsula, Dunedin and the Catlins district. It reaches 520 m on the Whangamoa Saddle near Nelson. It extends also to the Chatham Islands and Stewart Island.

Also Australia (New South Wales, Victoria, Tasmania).

Biostatus: Indigenous (Non-endemic).

Habitat: *Lastreopsis hispida* occurs as a terrestrial fern, or rarely a low epiphyte, in kauri, podocarp, broadleaved, beech and coastal forest, or under kānuka. It grows on hillsides, clay banks, streambanks, river terraces, tracksides, in rocky gullies, amongst boulders, on rotten logs, or on the forest floor. Occasionally it occurs on fallen logs and trees, or as a low epiphyte on *Cyathea dealbata* or *C. smithii*. It grows on greywacke and limestone substrates.

Recognition: *Lastreopsis hispida* is recognised by its long-creeping rhizomes, stipes and rachises that are densely covered in black bristle-like scales, harsh 3–5-pinnate laminae, sharply acute ultimate lamina segments, and round sori protected by reniform indusia with yellow clavate glands on the margins and surfaces.

Cytology: n = 41 (Brownlie 1958 – as *Rumohra hispida*).



Fig. 69: *Lastreopsis hispida*. Adaxial surface of mature 3-pinnate-pinnatifid frond.



Fig. 70: *Lastreopsis hispida*. Long, bristle-like scales on the red-brown stipe.



Fig. 71: *Lastreopsis hispida*. Adaxial surface of mature 3-pinnate-pinnatifid frond.



Fig. 72: *Lastreopsis hispida*. Adaxial surface of frond showing bristle-like scales on the rachis and costae.



Fig. 73: *Lastreopsis hispida*. Abaxial surface of fertile frond showing colourless non-glandular hairs and bristle-like scales on the costae, and concolorous reniform indusia.



Fig. 74: *Lastreopsis hispida*. Abaxial surface of fertile frond showing concolorous, reniform indusia.

***Lastreopsis velutina* (A.Rich.) Tindale, *Vict. Naturalist* 73: 184 (1957)**

≡ *Aspidium velutinum* A.Rich., *Essai Fl. Nouv.-Zél.*, 70 (1832)

≡ *Lastrea velutina* (A.Rich.) Brack., *U.S. Expl. Exped., Filic.* 16, 198 (1854)

≡ *Nephrodium velutinum* (A.Rich.) Hook.f., *Bot. Antarct. Voy. II (Fl. Nov.-Zél.) Part II*, 39, t. 80 (1854)

≡ *Dryopteris velutina* (A.Rich.) Kuntze, *Revis. Gen. Pl.* 2, 814 (1891)

≡ *Ctenitis velutina* (A.Rich.) Copel., *Gen. Fil.* 124 (1947)

Holotype: Nouvelle Zélande [New Zealand], *D'Urville*, Herb. Richard, P 00644796!

= *Nephrodium pentangulare* Colenso, *Tasmanian J. Nat. Sci.* 2: 169 (1845) – as *Nephrodium pentangulare*

≡ *Ctenitis pentangularis* (Colenso) Alston, *Amer. Fern J.* 45: 160 (1955)

≡ *Lastreopsis microsora* subsp. *pentangularis* (Colenso) Tindale, *Contr. New South Wales Natl. Herb.* 3: 334 (1965)

≡ *Parapolystichum microsorium* subsp. *pentangulare* (Colenso) Labiak, Sundue & R.C.Moran, *Brittonia* 67: 83 (2014)

Lectotype (selected by Brownsey et al. 2019): New Zealand, *W. Colenso*, 1837, Herb.

Hooker., K 001080644! (lower frond)

Etymology: From the Latin *velutinus* (velvety), a reference to the soft feel of the fronds of this species due to the covering of hairs.

Vernacular name: velvet fern

Rhizomes erect or rarely prostrate, densely scaly. Rhizome scales narrowly ovate to linear, 5–26 mm long, 0.4–2.5 mm wide, golden brown, margins entire. Fronds 240–960 mm long. Stipes 110–530 mm long, red-brown proximally, red- or chestnut-brown distally, densely hairy, bearing scattered scales; scales narrowly ovate, 5–20 mm long, 0.6–1.2 mm wide, pale brown, margins entire or sparsely toothed; hairs 0.2–0.5 mm long, soft, red-brown, acicular. Rachises red- or chestnut-brown, sulcate, narrowly winged only at distal end, abundantly covered in scales and hairs similar to those of the stipes. Laminae 3–4-pinnate, broadly ovate or broader than long, 135–430 mm long, 95–500 mm wide, brownish green on both surfaces, velvety, abundantly covered on all surfaces and margins in soft red-brown acicular hairs, bearing minute yellow clavate glands on both lamina surfaces but more abundant abaxially. Primary pinnae in 10–20 pairs below pinnatifid apex, slightly overlapping; distal pinnae narrowly ovate, proximal pinnae broadly ovate; the longest at or near the base, 75–275 mm long, 33–210 mm wide, apices acuminate, bases stalked; costae winged only in distal half. Acroscopic secondary pinnae decreasing evenly in length along the primary pinnae to the distal end; the basal basiscopic secondary pinna the longest, ovate or narrowly ovate, 23–150 mm long, 10–65 mm wide, apices acuminate, bases stalked, costae winged. Tertiary pinnae ovate or oblong, 6–40 mm long, 2–16 mm wide, apices acute or obtuse, bases stalked or adnate, deeply divided almost to the costa into quaternary segments in largest fronds. Quaternary segments oblong, up to 10 mm long and 6 mm wide, apices obtuse, margins serrate or deeply divided. Sori round, medial; indusia reniform, 0.4–0.6 mm diameter, with a darker central area and yellow glands on the surface and margins.

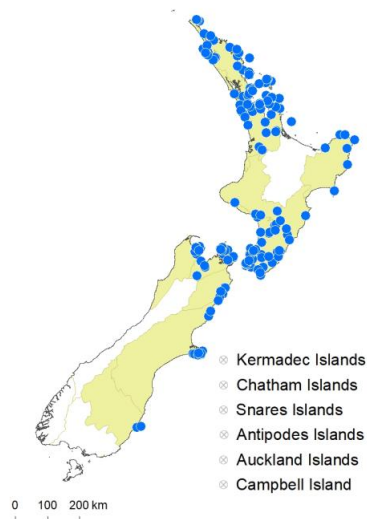


Fig. 75: *Lastreopsis velutina* distribution map based on databased records at AK, CHR & WELT.

on stream banks. It grows on greywacke, limestone and volcanic substrates.

Recognition: *Lastreopsis velutina* is recognised by its erect rhizomes, 3–4-pinnate laminae which have a distinctive velvety feel due to the dense covering of soft red-brown acicular hairs on all surfaces and margins, and small reniform indusia with yellow clavate glands on the margins and surfaces. The very broad laminae and elongated basal basispic secondary pinnae on the proximal pair of primary pinnae are also characteristic.

Cytology: n = 41 (Brownlie 1958 – as *Ctenitis velutina*).

Notes: Brownsey et al. (2019) demonstrated that Colenso's *Nephrodium pentangulare* was based on a specimen of *Lastreopsis velutina*, and it is included here under the synonymy for that species. However, *Nephrodium pentangulare* was misinterpreted by Cheeseman (1906, 1925), Allan (1961) and Tindale (1965) and included in what is now known as *Parapolystichum microsorum*. Tindale incorrectly used it as the basis for the new combination *Lastreopsis microsora* subsp. *pentangularis*, by which name it has since been known in New Zealand (e.g. Brownsey et al. 1985).



Fig. 76: *Lastreopsis velutina*. Adaxial surface of broadly ovate, 4-pinnate frond with enlarged basal basispic secondary pinnae on basal primary pinnae.



Fig. 77: *Lastreopsis velutina*. Dense red-brown hairs on rachis and costae.



Fig. 78: *Lastreopsis velutina*. Adaxial surface of mature frond showing abundant red-brown hairs.



Fig. 79: *Lastreopsis velutina*. Adaxial surface of frond showing abundant hairs on costae, lamina surfaces and margins.



Fig. 80: *Lastreopsis velutina*. Abaxial surface of fertile frond showing hairy surfaces and small sori.



Fig. 81: *Lastreopsis velutina*. Abaxial surface of fertile frond showing hairy surfaces, and small sori protected by concolorous, reniform indusia.

***Parapolystichum* (Keyserl.) Ching, *Sunyatsenia* 5: 239 (1940)**

Type taxon: *Parapolystichum effusum* (Sw.) Ching

Etymology: From the genus *Polystichum*, and the Greek *para-* (near), a reference to the similarity between the two genera.

Terrestrial (NZ) or rarely epiphytic ferns (not NZ). Rhizomes erect to long-creeping, scaly. Rhizome scales non-clathrate, linear to ovate, margins entire (NZ) or rarely toothed (not NZ), attached at base, concolorous, pale brown to almost black. Fronds monomorphic, occasionally bulbiferous (not NZ). Stipes and rachises scaly, hairy, adaxially sulcate. Laminae 3–4-pinnate (NZ), or 2– or 5-pinnate (not NZ), anadromous or catadromous, herbaceous, scaly, hairy and usually with unicellular glands. Hairs usually short and catenate. Veins free. Sori round, borne on abaxial surface, away from the margin, in 1 row either side of midrib; indusia reniform, peltate, or absent. Spores monoletate; perispores rugose, tuberculate or echinate, sometimes minutely echinate on the surface.

Taxonomy: A genus of c. 31 species (Gardner et al. 2017), included in the subfamily Elaphoglossoideae (PPG 1 2016).

Species of *Parapolystichum* were previously included in the genus *Lastreopsis*, which was revised by Tindale (1965). She recognised a total of 33 species, of which 17 occurred in Australia alone (Green 1994; Jones 1998). However, the genus has since been identified as paraphyletic, and subsequently split into two, with 18 species retained in a monophyletic *Lastreopsis*, 31 recognised in *Parapolystichum*, and four still *incertae sedis* (Labiak et al. 2014, 2015a; Gardner et al. 2017).

However, Labiak et al. (2014, 2015a) were unable to find any morphological characters to distinguish *Parapolystichum* from *Lastreopsis*.

Allan (1961) initially treated *Parapolystichum glabellum* and *P. microsorum* subsp. *pentagulare* as *Ctenitis glabella* and *C. decomposita*, but, following Tindale (1957), he accepted both in *Lastreopsis* (Allan 1961, Supplementary Notes). New combinations in *Parapolystichum* were made by Labiak et al. (2015a). Tindale (1965) noted an imperfectly known taxon from the Kermadec Islands, which was subsequently described as *Lastreopsis kermadecensis* by Perrie & Brownsey (2012), and transferred to *Parapolystichum* by Gardner et al. (2017).

- 1 Rhizomes long-creeping, with fronds arising at intervals; fronds bearing whitish catenate hairs around the stipes and rachises, and on both lamina surfaces; abaxial rachis surface densely hairy..... *microsorium*
Rhizomes erect or short-creeping, with fronds clustered at the apex; fronds bearing reddish catenate hairs, mainly along the adaxial groove of the rachis, and on the adaxial surfaces; abaxial rachis surface sparsely hairy or glabrous..... 2
- 2 Secondary pinnae narrow, 10–90 mm long, 3–35 mm wide; hairs on adaxial costae up to 0.7 mm long; plants of main islands of New Zealand..... *glabellum*
Secondary pinnae wider, 35–150 mm long, 11–45 mm wide; hairs on adaxial costae up to 0.3 mm long; plants confined to Kermadec Islands..... *kermadecense*

Distribution: *Parapolystichum* extends from the Neotropics to Africa, Madagascar, Indonesia, Papua New Guinea, Australia, New Zealand and the south Pacific, with the centre of diversity in Australia; five species in the Neotropics, six in Africa, nine in Madagascar, one in Indonesia, one in Papua New Guinea, nine in Australia, one in New Caledonia and one in the Pacific (Tindale 1965; Labiak et al. 2014, 2015a; Gardner et al. 2017). Three species in New Zealand; two endemic.

Biostatus: Indigenous (Non-endemic).

Table 6: Number of species in New Zealand within *Parapolystichum* (Keyserl.) Ching

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

Recognition: Currently no morphological characters are known that consistently distinguish *Parapolystichum* from *Lastreopsis*, and the two genera cannot always be recognised as such in the field.

In the Australasian region, species of *Parapolystichum* generally have erect to long-creeping rhizomes, laminae that are 2–4-pinnate and anadromous in the distal half, and sori that may be indusiate or exindusiate. They have short, catenate (ctenitoid) hairs on the lamina and rachis surfaces, rather than long, acicular or clavate hairs. By contrast, species of *Lastreopsis* subg. *Lastreopsis* generally have short- to long-creeping rhizomes (although not in *L. velutina*), laminae that are 3–5-pinnate and catadromous in the distal half, and sori that are more frequently indusiate. They generally have long, acicular or clavate hairs on the lamina and rachis surfaces.

Cytology: The base chromosome number in *Parapolystichum* is $x = 41$ (Labiak et al. 2014).

***Parapolystichum glabellum* (A.Cunn.) Labiak, Sundue & R.C.Moran
in Labiak et al., *Brittonia* 67: 83 (2014)**

- ≡ *Nephrodium glabellum* A.Cunn., *Companion Bot. Mag.* 2: 367 (1837)
- ≡ *Lastrea glabella* (A.Cunn.) Houlston & T.Moore, *Gard. Mag. Bot.* 3: 318 (1851)
- ≡ *Nephrodium decompositum* var. *glabellum* (A.Cunn.) Hook.f., *Bot. Antarct. Voy. II (Fl. Nov.-Zel.) Part II*, 39 (1854)
- ≡ *Aspidium glabellum* (A.Cunn.) E.J.Lowe, *Ferns Brit. Exot.* 6, 93, t. 32 (1857)
- ≡ *Dryopteris glabella* (A.Cunn.) C.Chr., *Index Filic.* 256 (1905)
- ≡ *Ctenitis glabella* (A.Cunn.) Copel., *Gen. Fil.* 124 (1947)
- ≡ *Lastreopsis glabella* (A.Cunn.) Tindale, *Vict. Naturalist* 73 (1957)
 - Lectotype (selected by Tindale 1965): Bay of Islands, New Zealand, A. Cunningham, Oct. 1826, K 001080645! Tindale noted that Allan (1961) chose this specimen as lectotype, but erroneously reported it as being in BM.
- = *Nephrodium decompositum* var. *microphyllum* Hook., *Sp. Fil.* 4, 146 (1862)
 - Holotype: Port Nicholson [Wellington], Cook's Strait, D. Lyall, July 1849, Herb. Hooker., K! (photo WELT E473/2)

Etymology: From the Latin *glabellus* (somewhat smooth), a reference to the smooth stipe in this species.

Vernacular name: smooth shield fern

Rhizomes erect, up to 60 mm long (in herbarium material), densely scaly. Rhizome scales linear to narrowly ovate, 3.5–9 mm long, 0.4–1.0 mm wide, dark brown, margins entire or fimbriate. Fronds 120–900 mm long. Stipes 60–550 mm long, red-brown proximally, pale brown or pale purple-brown distally, scaly proximally, hairy or glabrous; scales narrowly ovate, brown or dark brown, 1–4.5 mm long, 0.2–0.4 mm wide, apices acuminate, margins entire; hairs red-brown, catenate (ctenitoid), up to 0.4 mm long. Rachises pale brown or pale purple-brown, sulcate, narrowly winged only at distal end, the sulcus densely filled with reddish catenate hairs up to 0.3 mm long, with slightly longer reddish hairs up to 0.4 mm long at costa/rachis junctions. Laminae 2-pinnate-pinnatifid to 3-pinnate-pinnatifid, ovate or broadly ovate, 60–400 mm long, 40–300 mm wide, dark green on both surfaces, herbaceous, glabrous or with scattered hairs abaxially, reddish catenate hairs up to 0.7 mm long on adaxial costae, and tiny yellow or orange clavate glands on abaxial lamina surfaces. Primary pinnae in 9–20 pairs below pinnatifid apex, slightly overlapping; distal pinnae narrowly ovate, proximal pinnae ovate or broadly ovate; the longest at or near the base, 25–205 mm long, 14–140 mm wide, apices acuminate, bases stalked; costae narrowly winged for most of their length except on largest fronds. Acroscopic secondary pinnae decreasing evenly in length along the primary pinnae to the distal end; the basal basiscopic secondary pinna the longest, ovate or narrowly ovate, 10–90 mm long, 3–35 mm wide, apices acute or acuminate, bases stalked, costae winged throughout. Tertiary segments oblong, 3–22 mm long, 1–7 mm wide, apices acute or obtuse and toothed, margins serrate to deeply divided, bases adnate or stalked. Sori round, medial; indusia reniform, 0.7–1.2 mm diameter, concolorous, yellow glands present or absent on the margins and surface.

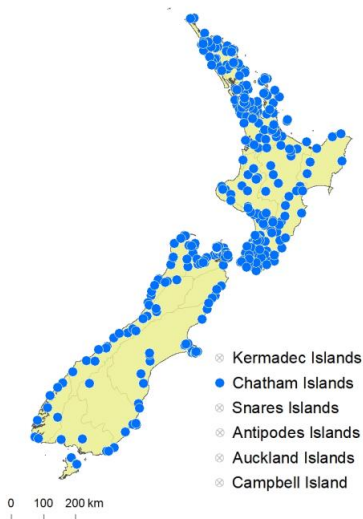


Fig. 82: *Parapolytichum glabellum* distribution map based on databased records at AK, CHR & WELT.

tracksides, bush margins, in boggy ground, and amongst rocks and boulders. It grows on greywacke, limestone and acidic volcanic substrates.

Recognition: *Parapolytichum glabellum* is characterised by its erect rhizome, 2–3-pinnate-pinnatifid laminae, reddish catenate hairs in the sulcus and on the adaxial costae, and only scattered hairs on the abaxial surface. It is distinguished from *P. microsorum* by its erect rather than creeping rhizome, and reddish hairs, which are largely confined to the adaxial surface, rather than whitish hairs, which occur on both surfaces. It is very similar to *Parapolytichum kermadecense* but generally has a more divided frond, shorter and narrower secondary pinnae (10–90 cf. 35–150 mm long, 3–35 cf. 11–45 mm wide), more abundant hairs, and more frequent and conspicuous glands.

Cytology: n = 82 (Brownlie 1958 – as *Ctenitis glabella*).

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

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

Chatham Islands, Stewart Island.

Altitudinal range: 0–760 m.

Parapolytichum glabellum occurs in lowland to montane areas throughout the North Island from Te Pahi to Wellington, ranging from near sea level, up to 730 m at Blowhard Bush in the Kāweka Range. In the South Island it occurs in coastal and lowland areas throughout, but is absent from the drier inland regions and areas above c. 400 m. It reaches 760 m at Blue Duck Reserve, Marlborough. It also extends to Stewart Island and the Chatham Islands.

Biostatus: Indigenous (Endemic).

Habitat: *Parapolytichum glabellum* occurs in wetter kauri, podocarp, broadleaved and beech forest, under mānuka and kānuka, in coastal forest, and rarely under *Pinus* and *Cupressus macrocarpa*. It is a terrestrial fern found on the forest floor, in damp gullies, on streambanks, river terraces,



Fig. 83: *Parapolytichum glabellum*. Adaxial surface of mature 3-pinnate frond.



Fig. 84: *Parapolytichum glabellum*. Adaxial surface of mature frond showing abundant red hairs on the rachis and costae.



Fig. 85: *Parapolystichum glabellum*. Mature plants growing from an erect rhizome.



Fig. 86: *Parapolystichum glabellum*. Stipes arising from an erect rhizome.



Fig. 87: *Parapolystichum glabellum*. Abaxial surface of fertile frond showing sparse hairs on the rachis and costae, and concolorous, reniform indusia.



Fig. 88: *Parapolystichum glabellum*. Abaxial surface of fertile frond showing narrow wings on the costae of the primary pinnae, and round sori.

***Parapolystichum kermadecense* (Perrie & Brownsey) Perrie & L.D.Sheph. in Gardner et al., Syst. Bot. 42: 390 (2017)**

≡ *Lastreopsis kermadecensis* Perrie & Brownsey, *New Zealand J. Bot.* 50: 33 (2012)

Holotype: Kermadec Islands, Raoul Island, A.E. Wright 12453, 24 Nov. 1994, AK 242201!

Etymology: *kermadecensis* (Latin) – from the Kermadec Islands north of New Zealand.

Rhizomes erect or prostrate, up to 140 mm long (in herbarium material), with fronds clustered at the apex, densely scaly. Rhizome scales linear to narrowly ovate, 7–8 mm long, c. 1 mm wide, brown, margins entire or ciliate. Fronds 370–910 mm long. Stipes 100–500 mm long, red-brown proximally, yellow-brown distally, scaly proximally, hairy or glabrous; scales narrowly ovate, brown or dark brown, 5–12 mm long, 0.8–2.1 mm wide, apices acuminate, margins entire or ciliate; hairs red-brown, catenate (ctenitoid), up to 0.7 mm long. Rachises yellow-brown, sulcate, narrowly winged only at distal end, the sulcus abundantly filled with reddish catenate hairs up to 0.2 mm long, with slightly longer reddish hairs up to 0.3 mm long at costa/rachis junctions. Laminae 2-pinnate-pinnatifid to 3-pinnate, ovate, 145–450 mm long, 100–330 mm wide, pale green on both surfaces, herbaceous, glabrous or with scattered hairs abaxially, reddish catenate hairs up to 0.3 mm long on adaxial costae, and tiny yellow or orange clavate glands on abaxial lamina surfaces. Primary pinnae in 8–16 pairs below pinnatifid apex, slightly overlapping; distal pinnae narrowly ovate, proximal pinnae ovate or broadly ovate; the longest at or near the base, 75–250 mm long, 50–210 mm wide, apices acuminate, bases stalked; costae narrowly winged for most of their length except on largest fronds. Acroscopic secondary pinnae decreasing evenly in length along the primary pinnae to the distal end; the basal basicopic 1–2 pairs of secondary pinnae longer than the others, narrowly ovate, 35–150 mm long,

11–45 mm wide, apices acute or acuminate, bases stalked, costae winged throughout. Tertiary segments oblong, 11–23 mm long, 2–8 mm wide, apices acute or obtuse with several teeth, margins serrate, bases adnate or stalked. Sori round, medial; indusia reniform, 0.7–1.3 mm diameter, concolorous, yellow glands present or absent on the margins and surface.

Distribution: Kermadec Islands.

Altitudinal range: 130–520 m.

Parapolystichum kermadecense is endemic to Raoul Island in the Kermadec Islands.

Biostatus: Indigenous (Endemic).

Parapolystichum kermadecense was given a conservation status of Naturally Uncommon by de Lange et al. (2018).

Habitat: *Parapolystichum kermadecense* is a terrestrial fern found in the wet forest of Raoul Island, where it occurs above c. 125 m, particularly under *Rhopalostylis baueri* and *Metrosideros kermadecensis*.

Recognition: *Parapolystichum kermadecense* is endemic to the Kermadec Islands, and the only species of *Parapolystichum* or *Lastreopsis* found there. It is distinguished by its erect to prostrate rhizome, 2-pinnate-pinnatifid to 3-pinnate laminae, reddish catenate hairs largely confined to the sulcus and adaxial costae, and only scattered hairs present on the abaxial surfaces. Within New Zealand it is most similar to *Parapolystichum glabellum*, which generally has a more divided frond, narrower secondary pinnae (10–90 cf.

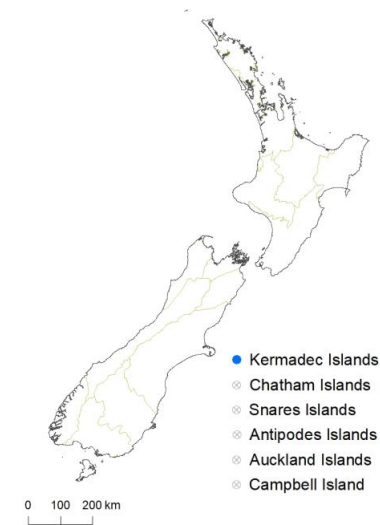


Fig. 89: *Parapolystichum kermadecense* distribution map based on databased records at AK, CHR & WELT.

35–150 mm long, 3–35 cf. 11–45 mm wide), longer and more abundant hairs, and more frequent and conspicuous glands.

Cytology: $2n = 164$ (see Perrie & Brownsey 2012 – as *Lastreopsis kermadecensis*).



Fig. 90: *Parapolystichum kermadecense*. Mature plant growing under forest.



Fig. 91: *Parapolystichum kermadecense*. Mature plant growing under forest.



Fig. 92: *Parapolystichum kermadecense*.
Abaxial surface of mature 2-pinnate-pinnatifid frond.



Fig. 93: *Parapolystichum kermadecense*. Plant
with prostrate rhizome.



Fig. 94: *Parapolystichum kermadecense*.
Herbarium specimen from Raoul Island, WELT
P025085, showing abaxial surface of 2-pinnate-
pinnatifid fertile frond.



Fig. 95: *Parapolystichum kermadecense*. Close up
of WELT P023367, showing concolorous, reniform
indusia.

***Parapolystichum microsorum* (Endl.) Labiak, Sundue & R.C.Moran in Labiak et al., *Brittonia* 67: 83 (2014)**

≡ *Nephrodium microsorum* Endl., *Prodr. Fl. Norfolk*. 9 (1833)

≡ *Lastreopsis microsora* (Endl.) Tindale, *Vict. Naturalist* 73: 181 (1957)

Lectotype (selected by Tindale 1957): Nova Hollandia [Australia], F.W. Sieber, *Syn Fil.* 101, L 908, 335.846 (n.v.). The specimen was originally cited as “isolectotype” by Tindale, but this is correctable to lectotype under Art. 9.10 (Field 2020).

= *Nephrodium decompositum* var. *pubescens* Hook.f., *Bot. Antarct. Voy. II (Fl. Nov.-Zel.) Part II*, 39 (1854)

Lectotype (selected by Brownsey et al. 2019): New Zealand, no collector, no date, Herb. Hooker., K! (photo WELT E473/1)

Etymology: From the Greek *mikros* (small), and *soros* (sorus), a reference to the small size of the sori.

Rhizomes long-creeping, up to 400 mm long (in herbarium material), 3–5 mm diameter, scaly. Rhizome scales ovate, 1.5–3 mm long, 0.5–1 mm wide, brown or dark brown, margins entire or fimbriate. Fronds 240–960 mm long. Stipes 100–560 mm long, red-brown proximally, yellow-brown distally, scaly proximally, hairy throughout; scales ovate, brown or dark brown, 3–7 mm long, 1–2 mm wide, apices acute, margins entire or fimbriate; hairs whitish, catenate (ctenitoid), up to 0.6 mm long. Rachises pale brown or yellow-brown, sulcate, narrowly winged only at distal end, the sulcus filled with whitish catenate hairs up to 0.4 mm long, with slightly longer hairs up to 0.5 mm long at costa/rachis junctions. Laminae 3–4-pinnate, ovate or broadly ovate, 120–400 mm long, 90–320 mm wide, pale green on both surfaces, herbaceous; abundant whitish catenate hairs up to 0.5 mm long on both costa surfaces and on the adaxial lamina surface, more scattered on abaxial lamina surface; tiny yellow or orange clavate glands on both lamina surfaces. Primary pinnae in 14–22 pairs below pinnatifid apex, slightly overlapping; distal pinnae narrowly ovate, proximal pinnae ovate or broadly ovate; the longest at or near the base, 55–210 mm long, 30–150 mm wide, apices acuminate, bases stalked; costae narrowly winged in distal half. Acroscopic secondary pinnae decreasing evenly in length along the primary pinnae to the distal end; the basal basiscopic secondary pinna the longest, ovate, 28–115 mm long, 9–37 mm wide, apices acute, bases stalked, costae winged throughout. Tertiary segments ovate, 6–25 mm long, 2–11 mm wide, apices acute or obtuse, margins serrate to deeply divided, bases adnate or stalked. Ultimate segments narrowly oblong, up to 8 mm long and 2 mm wide, apices obtuse and toothed, margins serrate, bases adnate or stalked. Sori round, medial; indusia reniform, 0.5–1.3 mm diameter, concolorous, minutely hairy on the margins and surface.

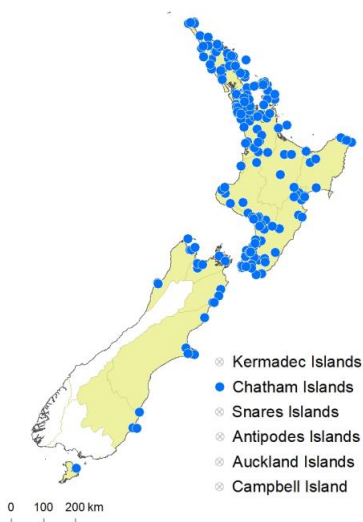


Fig. 96: *Parapolystichum microsorum* distribution map based on databased records at AK, CHR & WELT.

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

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

Chatham Islands, Stewart Island.

Altitudinal range: 0–500 m.

Parapolystichum microsorum occurs in lowland areas throughout the North Island from Te Pahi to Wellington, extending locally into montane areas but absent from most of the central high country. It ranges from near sea level, up to 500 m at Ngongotahā near Rotorua. In the South Island it is confined to coastal and lowland areas from Golden Bay to the Marlborough Sounds, with outlying populations south to Westport, Banks Peninsula, and Trotters Gorge near Moeraki. It reaches 150 m in the Kekerengu Valley, Marlborough, and extends to the Chatham Islands. There are early collections made by W.A. Scarfe from the Leith Valley, Dunedin (CHR 283522), and by Petrie from Otago Peninsula and Stewart Island (WELT P008540, P028836). The species was not recorded from Stewart Island by Wilson (1982), and its occurrence there, and in Otago, needs confirmation.

Also Australia (Queensland, New South Wales, Victoria).

Biostatus: Indigenous (Non-endemic).

Habitat: *Parapolystichum microsorum* occurs in podocarp, broadleaved and coastal forest, under kākūka, and rarely under willows. It is a terrestrial fern found on the forest floor, on streambanks, on river terraces, near waterfalls, in damp gullies, amongst rocks, on clay banks, and on tracksides. It grows on greywacke, limestone and acidic volcanic substrates.

Recognition: *Parapolystichum microsorum* is characterised by a long-creeping rhizome, 3–4-pinnate laminae, and abundant whitish catenate hairs on both lamina surfaces. It is distinguished from *P. glabellum* by its creeping rather than erect rhizome, and whitish hairs on both lamina surfaces, rather than reddish hairs, which are largely confined to the adaxial surface. The abaxial rachis surface is densely hairy, unlike those in *P. glabellum* and *P. kermadecense*, which are glabrous or only sparsely hairy.

Parapolystichum microsorum in New Zealand is very similar to the plant that occurs in Australia. However, Tindale (1965) distinguished them as separate subspecies, with subsp. *microsorum* occurring in Australia and subsp. *pentangulare* (Colenso) Tindale confined to New Zealand. Subsp. *pentangulare* was said to have smaller laminae (140–400 mm long, 90–320 mm wide) compared to subsp. *microsorum* (180–500 mm long, 120–470 mm wide), with the ultimate segments more sharply spinulose-dentate (Tindale 1965). The recognition of two subspecies was described as “somewhat borderline” by Tindale (1965), but there is a difference in chromosome number, Australian plants being diploid and New Zealand plants tetraploid. The status of the species in both countries needs further investigation.

Cytology: In New Zealand *Parapolystichum microsorum* has been reported as tetraploid with $n = 82$ (Brownlie 1961– as *Ctenitis decomposita*). In Australia it has been reported as diploid with $n = 41$ (Tindale & Roy 2002).

Notes: The name *Nephrodium decompositum* R.Br., and combinations based on it, used in earlier Flora treatments are misidentifications of *Lastreopsis decomposita* (R.Br.) Tindale, which is a diploid Australian species.

The name *Parapolystichum microsorum* subsp. *pentangulare*, and earlier combinations based on the same type, cannot be used for the New Zealand plant because Colenso’s original collection is a specimen of *Lastreopsis velutina* (Brownsey et al. 2019). Plants in Australia and New Zealand need further investigation to see if there are consistent differences between them, and whether diploid and tetraploid forms are each confined to one or other country. If New Zealand plants deserve recognition, the varietal name *Nephrodium decompositum* var. *pubescens* is available.



Fig. 97: *Parapolystichum microsorum*. Adaxial surface of mature frond.



Fig. 98: *Parapolystichum microsorum*. Adaxial surface of frond showing whitish hairs on rachis and costae.



Fig. 99: *Parapolystichum microsorum*. Adaxial surface of mature 3-pinnate-pinnatifid frond showing elongated basispic secondary pinnae on basal primary pinnae.



Fig. 100: *Parapolystichum microsorum*. Stipe and rachis abundantly covered in white hairs.



Fig. 101: *Parapolystichum microsorum*. Uncoiling young frond bearing flattened, ovate, brown scales.



Fig. 102: *Parapolystichum microsorum*. Long-creeping rhizome giving rise to stipes at intervals.



Fig. 103: *Parapolystichum microsorum*. Abaxial surface of fertile frond showing abundant white hairs on rachis and costae, and young concolorous reniform indusia.



Fig. 104: *Parapolystichum microsorum*. Abaxial surface of fertile frond showing mature, round sori, and reniform indusia.

***Polystichum* Roth, Tent. Fl. Germ. 3, 31 (1799), nom. cons.**

= *Hypopeltis* Michx., Fl. Bor.-Amer. 2, 226 (1803)

Type taxon: *Polystichum lonchitis* (L.) Roth.

Etymology: From the Greek *poly-* (many), and *stichos* (a row), alluding to the arrangement of the sori in several rows in some species.

Vernacular name: shield fern

Terrestrial ferns, evergreen or occasionally marcescent. Rhizomes erect, scaly. Rhizome scales non-clathrate, ovate or narrowly ovate, margins entire or fimbriate, attached at base, concolorous or bicolorous, pale brown to black-brown. Fronds monomorphic, sometimes bulbiferous. Stipes and rachises scaly, adaxially sulcate. Laminae 1–3-pinnate (NZ), or 4-pinnate (not NZ), herbaceous or coriaceous, scaly. Veins free. Sori round, borne on abaxial surface, away from the margin, in 1 row either side of midrib; indusia round, peltate. Spores monolete; perispores tuberculate or cristate, often reticulate or fenestrate, rarely minutely echinate on the surface.

Taxonomy: A genus of c. 500 species included in the subfamily Dryopteridoideae (PPG 1 2016).

Polystichum is considered to be monophyletic (Le Péchon et al. 2016) and sister to *Cyrtomium*. The polystichoid ferns are sister to the dryopteroid ferns, the latter comprising *Arachniodes* and *Dryopteris* (Liu et al. 2016).

Allan (1961) recognised four indigenous species in New Zealand – *P. cystostegia*, *P. richardii*, *P. sylvaticum* (as *silvaticum*) and *P. vestitum*. However, Perrie et al. (2003a) showed that plants previously referred to *P. richardii* comprised an allo-octoploid complex with two tetraploid species, *P. oculatum* and *P. wawranum*, and an octoploid species, *P. neozelandicum*.

Two naturalised species, *P. proliferum* and *P. setiferum*, and one casual species, *P. lentum*, were recorded by Brownsey (1981). A second casual species, *P. polyblepharum*, was reported by Heenan et al. (2004).

1	Fronds bearing bulbils.....	2
	Fronds lacking bulbils.....	4
2	Fronds with numerous bulbils, borne along the rachis at junctions with the primary pinnae.....	<i>setiferum</i>
	Fronds with one or a few bulbils, borne near the apex of the rachis.....	3
3	Proximal primary pinnae bearing several stalked secondary pinnae.....	<i>proliferum</i>
	Proximal primary pinnae sometimes divided to the costa, but never bearing more than one stalked secondary pinna.....	<i>lentum</i>
4	Indusia with conspicuous black centres, or, if only tiny dark centres, scales at stipe/rachis junction with colourless, fimbriate margins at their bases.....	5
	Indusia uniformly pale brown, or absent; scales at stipe/rachis junction with entire or ciliate margins.....	7
5	Scales at stipe/rachis junction appearing hair-like to the naked eye (<130 µm wide); indusia often lacking an obvious dark centre.....	<i>wawranum</i>
	Scales at stipe/rachis junction obviously scale-like to the naked eye (>130 µm wide); indusia always with an obvious dark centre.....	6
6	Scales at stipe/rachis junction ovate or broadly ovate, >750 µm wide (and usually >1000 µm wide); spores 36–48 µm long, 27–36 µm wide.....	<i>oculatum</i>
	Scales at stipe/rachis junction ovate or narrowly ovate, <650 µm wide; spores 46–58 µm long, 36–45 µm wide.....	<i>neozelandicum</i>
7	Scales at stipe/rachis junction concolorous.....	8
	Scales at stipe/rachis junction bicolorous, with shiny dark centres and pale margins.....	9

-
- 8 Stipe and rachis scales entire; indusia markedly convex; plants of alpine regions..... *cystostegia*
 Stipe and rachis scales irregularly toothed; indusia $\pm$ flat; naturalised plants of urban areas..... *polyblepharum*
- 9 Indusia absent; costae of primary pinnae with narrow wings..... *sylvaticum*
 Indusia present; costae of primary pinnae lacking wings..... *vestitum*

Distribution: *Polystichum* is widespread in north and south temperate regions, and in montane to alpine regions of the warm temperate and tropical zones. The centres of diversity are in southern Asia, and in Central and South America (Zhang & Barrington 2013a); 208 species in China (Zhang & Barrington 2013a), 22 in Africa and Indian Ocean islands (Roux 2009), four in Australia (Jones 1998), perhaps five in the south Pacific, and three in Hawai'i (Palmer 2003). Ten species in New Zealand; five endemic, one indigenous, and four naturalised or casual.

Biostatus: Indigenous (Non-endemic).

Table 7: Number of species in New Zealand within *Polystichum* Roth

Category	Number
Indigenous (Endemic)	5
Indigenous (Non-endemic)	1
Exotic: Fully Naturalised	2
Exotic: Casual	2
Total	10

Recognition: In New Zealand, species of *Polystichum* are recognised by their terrestrial habit, erect rhizomes, 1–3-pinnate fronds, abundant and sometimes bicolorous scales, and round sori protected by round indusia. Three naturalised species are bulbiferous, unlike any other species of Dryopteridaceae in New Zealand. The spores are tuberculate or cristate, often with complex fenestration and reticulation (Large & Braggins 1991).

Cytology: The base chromosome number in *Polystichum* is $x = 41$ (Kramer 1990).

Hybridisation: Hybridisation is common amongst the indigenous species of *Polystichum* in New Zealand. Seven different combinations were recorded by Perrie et al. (2003a, 2003b). Plants of hybrid origin can be identified by their abnormally formed spores, but determining parentage depends on morphology and field observations of what species were growing in the immediate vicinity of the putative hybrid.

***Polystichum cystostegia* (Hook.) J.B.Armstr., *Trans. & Proc. New Zealand Inst.* 13: 364 (1881)**

as "*cystostigium*"

≡ *Aspidium cystostegia* Hook., *Sp. Fil.* 4, 26, t. 227 (1862)

≡ *Dryopteris cystostegia* (Hook.) Kuntze, *Revis. Gen. Pl.* 2, 813 (1891)

Lectotype (selected by Brownsey et al. 2019): Middle Island, Discovery Peaks, 5800 feet, Travers, Herb. Hooker., K 001040190!

Etymology: From the Greek *kystis* (bladder), and *stege* (roof, shelter), a reference to the swollen, umbrella-like indusia covering the sori

Vernacular names: alpine shield fern; mountain shield fern

Rhizomes erect, densely scaly. Rhizome scales ovate, 8–28 mm long, 3–8 mm wide, uniformly pale orange-brown, margins entire. Fronds 40–440 mm long, or rarely to 550 mm long. Stipes 5–240 mm long, pale orange-brown, densely scaly proximally but less abundant distally; scales ovate to narrowly ovate, uniformly pale orange-brown, apices acuminate, margins entire. Rachises pale brown, sulcate, narrowly winged only at distal end, abundantly scaly; scales on both surfaces narrowly ovate to linear, pale orange-brown. Laminae 2–3-pinnate, narrowly elliptic, 35–320 mm long, 13–75 mm wide, light green on both surfaces, coriaceous, bearing abundant pale brown scales on abaxial costae and lamina surfaces, sparser on adaxial surfaces. Primary pinnae in 12–27 pairs below pinnatifid apex, overlapping distally, widely spaced proximally, ovate; the longest at or near the middle, 6–42 mm long, 4–27 mm wide, apices acute, bases stalked; costae winged throughout except in largest fronds. Secondary pinnae decreasing in length along the primary pinnae to the distal end; the longest secondary pinnae ovate, 2–18 mm long, 2–10 mm wide, apices acute, margins serrate to deeply divided, bases stalked. Tertiary segments narrowly elliptic, up to 8 mm long and 2 mm wide. Sori

round, medial or nearer margin than costa, confined to pinnae in distal half of lamina; indusia round, inflated, 1.0–1.9 mm diameter, $\pm$ concolorous, lacking a dark central area.

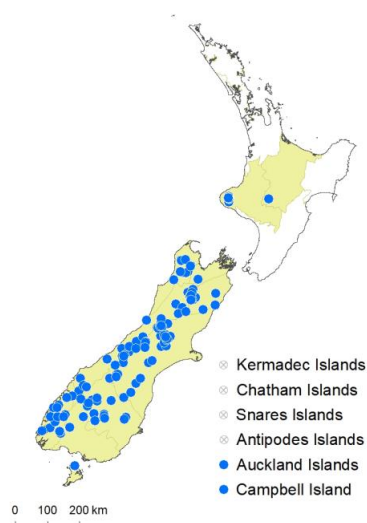


Fig. 105: *Polystichum cystostegia* distribution map based on databased records at AK, CHR & WELT.

Distribution: North Island: Volcanic Plateau, Taranaki.

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

Stewart Island, Auckland Islands, Campbell Island.

Altitudinal range: 900–2150 m.

In the North Island *Polystichum cystostegia* is confined to subalpine and alpine areas from c. 900 m to 2150 m on Mt Taranaki and at c. 1630 m on Mt Ruapehu. There is also a single specimen said to have been collected from the vicinity of Judd Ridge in the Tararua Ranges at 600 m in podocarp forest (WELT P025319), a locality which needs confirmation. Cheeseman (1906, 1925) erroneously recorded it from Mt Tongariro, and also cited a collection by Buchanan from the Tararuas, for which there is no extant supporting specimen. In the South Island it extends from north-west Nelson to southern Fiordland, occurring in alpine areas from 900 m, up to 1900 m in the Spencer Range, Nelson. It also occurs on Mt Anglem, Stewart Island, and on the Auckland and Campbell Islands.

Biostatus: Indigenous (Endemic).

Habitat: *Polystichum cystostegia* occurs in alpine and subalpine herbfield, tussock grassland, flushes, dry creek beds, rock crevices, among boulders, on rock faces, and among shingle slips in alpine areas, rarely extending into forest at the treeline. It is one of the few truly alpine ferns in New Zealand and occurs at higher altitudes than most other New Zealand pteridophytes.

Recognition: *Polystichum cystostegia* is distinguished from all other species in New Zealand by its alpine habitat, large inflated indusia, concolorous orange-brown stipe and rhizome scales, and lack of bulbils. The species is likely to be confused only with *P. vestitum*, which has bicolorous scales and lacks inflated indusia.

Cytology: $n = 82$ (Brownlie 1958).

Hybridisation: There is evidence that *Polystichum cystostegia* hybridises with *P. vestitum* (Perrie et al. 2003b).

Notes: The name *Polystichum cystostegia* has sometimes been altered to *P. cystostegium* or even *P. cystostigium* (e.g. Armstrong 1881), but in the original description Hooker (1862b) treated the specific epithet as a noun in apposition (Art. 23.1), indicated by his spelling of *Cystostegia* with a capital letter. His original spelling should therefore be retained.



Fig. 106: *Polystichum cystostegia*. Mature 2-pinnate-pinnatifid fronds.



Fig. 107: *Polystichum cystostegia*. Plants growing amongst alpine boulders.



Fig. 108: *Polystichum cystostegia*. Abundant, narrowly ovate, pale brown scales on the rachis, and ovate scales on the stipes.



Fig. 109: *Polystichum cystostegia*. Abaxial surface of fertile frond showing long, linear scales, and round sori.



Fig. 110: *Polystichum cystostegia*. Abaxial surface of fertile frond showing linear scales, and concolorous, round, peltate, inflated indusia.



Fig. 111: *Polystichum cystostegia*. Erect rhizome densely covered in orange-brown, ovate scales.

***Polystichum lentum* (D.Don) T.Moore, *Index Fil.* 86, 95 (1858)**

≡ *Aspidium lentum* D.Don, *Prodr. Fl. Nepal.* 4 (1825)

Lectotype (selected by Fraser-Jenkins et al. 2018): Nepalia [Nepal], *Wallich* 360, Herb. Hooker., K 001040147 (online)

Etymology: From the Latin *lentus* (tough), a reference to the nature of the frond.

Distribution: North Island: Northland.

Altitudinal range: c. 20 m.

Polystichum lentum has been collected once from Onerahi, near Whangārei.

It is a Himalayan species, which occurs naturally in western China, Bhutan, Nepal and north-east India (Zhang & Barrington 2013b).

Biostatus: Exotic; casual.

Habitat: Recorded growing on dumped clay on a clay bank.

First record: Brownsey (1981). Voucher WELT P010777, 1980.

Recognition: *Polystichum lentum* has an erect rhizome and narrowly elliptic laminae up to 450 mm long and 95 mm wide, which often bear a single bulbil near the apex of the rachis. The primary pinnae are deeply toothed to about ½ way to the midrib for most of their length, but those near the base of the lamina are often completely divided into a single basal acroscopic secondary pinna (Brownsey & Smith-Dodsworth 2000; Zhang 2012; Zhang & Barrington 2013b).

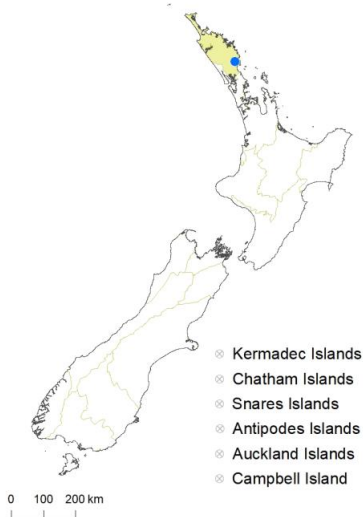


Fig. 112: *Polystichum lentum* distribution map based on databased records at AK, CHR & WELT.



Fig. 113: *Polystichum lentum*. Herbarium specimen from Whangārei, WELT P010777/A, showing fertile frond bearing a large bulbil at the apex of the rachis.



Fig. 114: *Polystichum lentum*. Close up of WELT P010777/B, showing deeply divided primary pinnae and round sori.

***Polystichum neozelandicum* Fée, *Mém. Foug.*, 8. Descr. Esp. Nouv. 99 (1857)**

as "*Polystichum neo-zelandicum* "

Holotype: Nelle Zélande [New Zealand], *S. Mossman* 617, 1854, P 00138616!

= *Aspidium richardii* Hook., *Sp. Fil.* 4, 23, t. 222 (1862) – as richardii

≡ *Polystichum richardii* (Hook.) J.Sm., *Hist. Fil.* 220 (1875)

≡ *Dryopteris richardii* (Hook.) Kuntze, *Revis. Gen. Pl.* 2, 813 (1891) – as richardii

Lectotype (selected by Perrie et al. 2003, fig. 15): Wycare River [Waikare River, Bay of Islands], *J.D. Hooker*, K 001040185! (= *Polystichum neozelandicum* subsp. *neozelandicum*)

= *Aspidium zerophyllum* Colenso, *Trans. & Proc. New Zealand Inst.* 29: 418 (1897)

≡ *Polystichum zerophyllum* (Colenso) C.Chr., *Index Filic.* 98, 589 (1906)

≡ *Polystichum aculeatum* var. *zerophyllum* (Colenso) Domin, *Biblioth. Bot.* 20(85): 56 (1913)

≡ *Polystichum neozelandicum* subsp. *zerophyllum* (Colenso) Perrie in Perrie et al., *New Zealand J. Bot.* 41: 209 (2003)

Lectotype (selected by Perrie et al. 2003, fig. 16): Dannevirke, Hawke's Bay, *W. Colenso*, Herb. Cheeseman, AK 139720!

Etymology: *neozelandicus* (Latin) – from New Zealand.

Vernacular names: black shield fern; common shield fern; pikopiko; pīpiko; shore shield fern; tutoke

Rhizomes erect, densely scaly. Rhizome scales narrowly ovate, 7–15 mm long, 1–2 mm wide, bicolorous with dark centres and narrow pale margins, margins toothed. Fronds 140–1000 mm long. Stipes 50–560 mm long, yellow-brown, abundantly scaly throughout; scales at very base similar to those of rhizome; those at mid-stipe narrowly ovate, blackish-brown, apices acuminate, margins with a few protrusions, bases densely fimbriate; those from the stipe/rachis junction 135–570 µm wide at mid-length. Rachises yellow-brown, sulcate, narrowly winged only at distal end, abundantly scaly. Laminae 2-pinnate or rarely 3-pinnate proximally, ovate or elliptic, 90–600 mm long, 32–235 mm wide, dark green adaxially, paler green abaxially, coriaceous, bearing abundant pale brown scales on abaxial costae and lamina surfaces, sparsely scaly on adaxial costae, ± glabrous on adaxial lamina surface. Primary pinnae in 9–26 pairs below pinnatifid apex, slightly overlapping distally, narrowly ovate to ovate; the longest at or near the middle, 18–140 mm long (very rarely to 185 mm long), 10–48 mm wide, apices acuminate, bases stalked; costae winged throughout. Secondary pinnae decreasing gradually in length along the primary pinna to the distal end; the longest secondary pinnae narrowly ovate or narrowly elliptic to ovate, 5–30 mm long, 3–13 mm wide, apices often acute to sharply acute or occasionally obtuse, margins entire or serrate, bases adnate or stalked. A few tertiary segments rarely present on proximal pinnae, ovate, up to 10 mm long and 4 mm wide. Sori round, medial or nearer margin than costa; indusia round, 0.9–1.5 mm diameter, with conspicuous dark central area (5–60% of surface area). Mean spore size 46–58 µm long, 36–45 µm wide.

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

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

Chatham Islands, Stewart Island.

Altitudinal range: 0–880 m.

Polystichum neozelandicum occurs in coastal, lowland and montane areas throughout the North Island from Te Pahi to Wellington, although apparently absent from parts of inland Taranaki and the East Cape district. It ranges from sea level, up to 800 m in the Ruahine Ranges. It also occurs in coastal, lowland and montane areas throughout the South Island, but mainly east of the main divide, and is absent from most of Westland. It grows from near sea level to 880 m near the Riwaka River, north-west Nelson. It extends also to Stewart Island and the Chatham Islands.

Biostatus: Indigenous (Endemic).

Habitat: *Polystichum neozelandicum* occurs in coastal, broadleaved, podocarp and beech forest, under mānuka and kānuka scrub, under conifer plantations and willows, and in

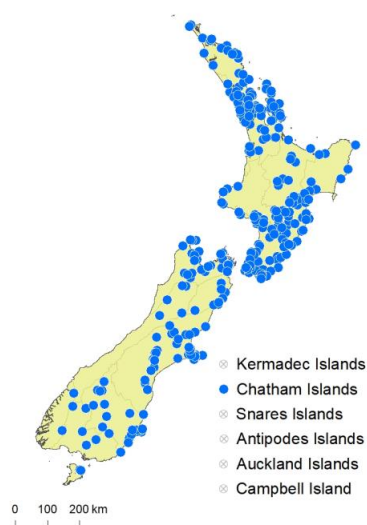


Fig. 115: *Polystichum neozelandicum* distribution map based on databased records at AK, CHR & WELT.

regenerating bush, reverting pasture and among flax, usually in drier, well-lit conditions. It grows on coastal rocks and cliffs, hillsides, road cuttings, clay banks, river banks, alluvial terraces, tracksides, among rocks and tree roots, on rotting logs, and on the forest floor. It is found on greywacke, mudstone, scoria, limestone and sandy substrates.

Recognition: *Polystichum neozelandicum* is distinguished by the scales at the stipe/rachis junction, which are narrowly ovate, blackish-brown, ciliate on the margins and sparsely fimbriate at their bases (Perrie et al. 2003a, fig. 5). The indusia have a conspicuous black centre (*ibid.*, fig. 6). The laminae are dark green on the adaxial surfaces and paler green abaxially. It is likely to be confused only with *P. oculatum*, which has broader scales (135–570 µm wide, cf. 770–2280 µm wide) and smaller spores (36–48 µm long, 27–36 µm wide, cf. 46–58 µm long, 36–45 µm wide). Further, while the primary costae and lamina are concolorous on the abaxial surface in *P. oculatum*, the primary costae are usually darker in *P. neozelandicum* (concolorous exceptions being mostly confined to Otago).

Polystichum neozelandicum is distinguished from most of the naturalised species by its lack of bulbils, from *P. vestitum* and *P. sylvaticum* by its concolorous rather than bicolorous scales at the stipe/rachis junction, from *P. cystostegia* by its flat rather than inflated indusia, and from *P. wawranum* by its broader scales and indusia with prominent dark centres. *P. neozelandicum* can also be distinguished by having stalked secondary pinnae only in the proximal half of the primary pinnae, whereas *P. vestitum* and *P. sylvaticum* have stalked secondary pinnae extending into the distal half of the primary pinnae.

Cytology: $n = c. 164$ (Perrie et al. 2003a).

Hybridisation: There is evidence that *Polystichum neozelandicum* hybridises with *P. oculatum* and *P. wawranum* (Perrie et al. 2003a), and with *P. vestitum* (Perrie et al. 2003a, 2003b).

Notes: Perrie et al. (2003a) recognised two subspecies within *Polystichum neozelandicum* – subsp. *neozelandicum* from Te Paki to Kāwhia and the Bay of Plenty, and subsp. *zerophyllum* from Taupō south to Stewart Island. AFLP DNA-fingerprinting analysis of populations of *P. neozelandicum* showed low genetic variation within each subspecies, but significant variation between them, suggesting quite different evolutionary lineages for the two groups. Perrie et al. (2003a) were unable to determine whether the two lineages represented two independent allopolyploid origins, or a single allopolyploid origin with subsequent divergence. However, despite the clear genetic distinction, Perrie et al. (2003a) found only slight morphological differences between the two groups. In particular, the dark central area of the indusia was larger in subsp. *neozelandicum* than in subsp. *zerophyllum* (15–60% cf. 5–30% of the surface area – see Perrie et al. 2003a, fig. 6). However, in practice the two groups were distinguished more readily by their geographical distribution (Perrie et al. 2003a, fig. 1). The two subspecies are not recognised here to be consistent with the treatment of other polyploids containing multiple lineages, such as *Asplenium gracillimum* (Brownsey & Perrie 2018).

The name *Polystichum aristatum* C.Presl, as used by Hooker (1854–1855), and combinations based on it, are misidentifications.

An abnormal form of *P. neozelandicum* with very short pinnae, collected on Kāpiti Island by A. Wilkinson, was identified as *P. mohrioides* (Bory) C.Presl (Allan 1961). Plants of *P. cystostegia* from the Auckland Islands and Campbell Island were also referred to this species by Kirk (1882). However, *P. mohrioides* was listed as erroneously reported for New Zealand by Brownsey et al. (1985).



Fig. 116: *Polystichum neozelandicum*. Adaxial surface of mature 2-pinnate frond.



Fig. 117: *Polystichum neozelandicum*. Adaxial surface of mature 2-pinnate frond.



Fig. 118: *Polystichum neozelandicum*. Adaxial surface of mature 2-pinnate frond.



Fig. 119: *Polystichum neozelandicum*. Mature plant growing from an erect rhizome.



Fig. 120: *Polystichum neozelandicum*. Abaxial surface of fertile frond showing narrowly ovate, blackish-brown scales with fimbriate bases.



Fig. 121: *Polystichum neozelandicum*. Abaxial surface of fertile frond showing round, peltate indusia with dark centres and pale margins.

***Polystichum oculatum* (Hook.) J.B.Armstr., *Trans. & Proc. New Zealand Inst.* 13: 364 (1881)**

≡ *Aspidium oculatum* Hook., *Sp. Fil.* 4, 24, t. 228 (1862)

≡ *Dryopteris oculata* (Hook.) Kuntze, *Revis. Gen. Pl.* 2, 813 (1891)

≡ *Polystichum richardii* var. *oculatum* (Hook.) C.Chr., *Index Filic.* 85, 280 (1905)

Lectotype (selected by Perrie et al. 2003, fig. 13): Akaroa, *E.F.A. Raoul*, Herb. Hooker., K 001040186!

Etymology: From the Latin *oculatus* (eyed), a reference to the appearance of the indusia in this species.

Rhizomes erect, densely scaly. Rhizome scales ovate, 9–19 mm long, 1–5 mm wide, bicolorous with dark centres and pale margins, margins toothed. Fronds 125–780 mm long. Stipes 55–500 mm long, yellow-brown, moderately to sparsely scaly throughout; scales at very base similar to those of rhizome; those at mid-stipe narrowly ovate to ovate, blackish-brown or irregularly bicolorous, apices acuminate, margins ciliate, bases sparsely fimbriate; those from the stipe/rachis junction 770–2280 µm wide at mid-length. Rachises yellow-brown, sulcate, narrowly winged only at distal end, scaly. Laminae 2-pinnate or rarely 3-pinnate proximally, ovate or elliptic, 75–410 mm long, 26–200 mm wide, blue-green adaxially, paler green abaxially, coriaceous, bearing abundant pale brown scales on abaxial costae and lamina surfaces, sparsely scaly on adaxial costae, ± glabrous on adaxial lamina surface. Primary pinnae in 8–24 pairs below pinnatifid apex, slightly overlapping distally, narrowly ovate; the longest at or near the middle, 15–115 mm long, 6–50 mm wide, apices acuminate, bases stalked; costae narrowly winged throughout. Secondary pinnae decreasing gradually in length along the primary pinna to the distal end; the longest secondary pinnae ovate, 4–32 mm long, 2–17 mm wide,

apices sharply pointed, margins sharply and often deeply serrate, bases adnate or stalked. A few tertiary segments sometimes present on proximal pinnae, ovate, up to 12 mm long and 5 mm wide. Sori round, medial or nearer margin than costa; indusia round, 0.7–1.4 mm diameter, with conspicuous dark central area (5–50% of surface area). Mean spore size 36–48 µm long, 27–36 µm wide.

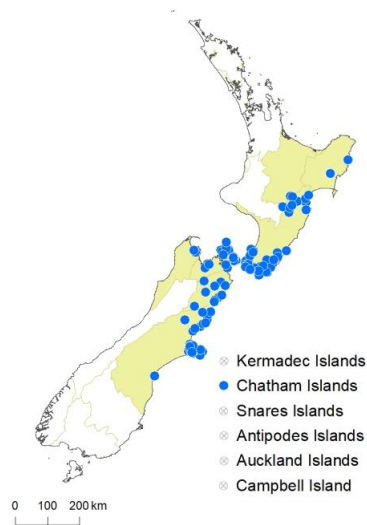


Fig. 122: *Polystichum oculatum* distribution map based on databased records at AK, CHR & WELT.

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

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

Chatham Islands.

Altitudinal range: 0–900 m.

Polystichum oculatum occurs in coastal, lowland and montane areas of the eastern North Island from East Cape and the Hawke's Bay ranges to Wairarapa and the Cook Strait region. It grows from sea level up to 740 m in the Kāweka Range. It is found in coastal, lowland and montane regions of the eastern South Island from Cook Strait to Timaru, ranging from sea level, up to 900 m at Jordan Stream Reserve, Marlborough. It also occurs on the Chatham Islands.

Biostatus: Indigenous (Endemic).

Habitat: *Polystichum oculatum* occurs in drier coastal, broadleaved, podocarp and beech forest, under mānuka and kānuka, in pine plantations, on forest margins, and in grassland. It grows on coastal cliffs, hillsides, roadside banks, in rocky gullies, among boulders, on scree, and on river banks.

It is found on greywacke, basalt, limestone and marble substrates.

Recognition: *Polystichum oculatum* is distinguished by the scales at the stipe/rachis junction, which are broad, blackish-brown or irregularly bicolorous, ciliate on the margins and sparsely fimbriate at their bases (Perrie et al. 2003a, fig. 5). The indusia have a conspicuous black centre (*ibid.*, fig. 6). The laminae are blue-green on the adaxial surfaces and paler green abaxially. It is likely to be confused only with *P. neozelandicum*, which has narrower scales (135–570 µm wide, cf. 770–2280 µm wide), and larger spores (46–58 µm long, 36–45 µm wide, cf. 36–48 µm long, 27–36 µm wide). Further, while the primary costae and lamina are concolorous on the adaxial surface in *P. oculatum*, the primary costae are usually darker in *P. neozelandicum* (concolorous exceptions being mostly confined to Otago).

Polystichum oculatum is distinguished from most of the naturalised species by its lack of bulbils, from *P. vestitum* and *P. sylvaticum* by its usually concolorous rather than bicolorous scales at the stipe/rachis junction, from *P. cystostegia* by its flat rather than inflated indusia, and from *P. wawranum* by its much broader scales and indusia with dark centres.

Cytology: n = 82 (Brownlie 1958 – as *Polystichum richardii*; Perrie et al. 2003a).

Hybridisation: There is evidence that *Polystichum oculatum* hybridises with *P. neozelandicum* and *P. vestitum* (Perrie et al. 2003a).



Fig. 123: *Polystichum oculatum*. Adaxial surface of mature 2-pinnate frond showing concolorous costae and lamina, and sharply serrate ultimate segments.



Fig. 124: *Polystichum oculatum*. Abaxial surface of rachis showing broad, irregularly bicolorous scales with sparsely fimbriate bases.



Fig. 125: *Polystichum oculatum*. Mature plant growing from an erect rhizome.



Fig. 126: *Polystichum oculatum*. Abaxial surface of fertile frond showing broadly ovate, blackish-brown scales on the rachis.



Fig. 127: *Polystichum oculatum*. Abaxial surface of fertile frond showing immature sori and round, peltate indusia with dark centres and pale margins.



Fig. 128: *Polystichum oculatum*. Abaxial surface of fertile frond showing mature sori and round, peltate indusia with dark centres and pale margins.

***Polystichum polyblepharum* (Roem. ex Kunze) C.Presl, *Epimel. Bot.* 56 (1851)**

≡ *Aspidium polyblepharum* Roem. ex Kunze, *Bot. Zeitung (Berlin)* 6: 672 (1848) – as *Aspidium polyblepharon*

Syntype: Japan, *Zollinger* 20, L 0052005 (lonline)

Etymology: From the Greek *poly-* (many), and *blepharon* (fringed), alluding to the frond divisions.

Distribution: North Island: Northland, Auckland.

Altitudinal range: 10–110 m.

Polystichum polyblepharum has been recorded from Kerikeri and Auckland city, and is seemingly quite common around Hamilton based on iNaturalist observations. It occurs naturally in eastern China, Korea and Japan (Zhang & Barrington 2013b).

Biostatus: Exotic; casual.

Habitat: Wild plants of *Polystichum polyblepharum* are mostly found in cultivated areas or garden centres, occurring as self-sown plants in pots, on ponga logs, on basalt rock faces or on clay banks.

First record: Heenan et al. (2004). Voucher AK 221536, 1994.

Recognition: *Polystichum polyblepharum* has an erect rhizome, dense greyish-brown scales that are ovate and irregularly toothed on the margins, and fronds up to c. 600 mm long that lack bulbils. The laminae are 2-pinnate and dark, glossy green. The secondary pinnae have a basal acroscopic lobe, and are sharply toothed on the margins and apices,

ending in extended hair-points. The abaxial surfaces are abundantly covered in long hair-like scales with toothed margins. The indusia are concolorous, flat and situated closer to the margin than to the costa.

Notes: *Polystichum polyblepharum* is often sold in New Zealand erroneously under the name *P. braunii* (Spenn.) Fée, which is a different species from the northern hemisphere.

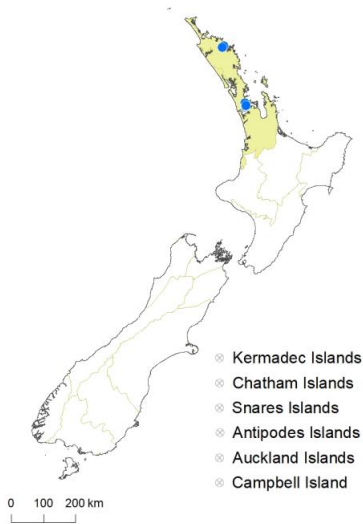


Fig. 129: *Polystichum polyblepharum* distribution map based on databased records at AK, CHR & WELT.



Fig. 130: *Polystichum polyblepharum*. Mature plant growing from erect rhizome.



Fig. 131: *Polystichum polyblepharum*. Erect rhizome and stipe bases densely covered in ovate, greyish-brown scales.



Fig. 132: *Polystichum polyblepharum*. Adaxial surface of mature 2-pinnate fronds.



Fig. 133: *Polystichum polyblepharum*. Glossy green, adaxial surface of mature 2-pinnate frond, showing elongated basal acroscopic secondary pinnae on primary pinnae.

***Polystichum proliferum* (R.Br.) C.Presl, Tent. Pterid. 83 (1836)**

≡ *Aspidium proliferum* R.Br., *Prodr. Fl. Nov. Holland.* 147 (1810)

≡ *Hypopeltis prolifera* (R.Br.) Bory in Bélanger, *Voy. Indes Or., Bot.* 67 (1833)

≡ *Polystichum aculeatum* var. *proliferum* (R.Br.) Domin, *Biblioth. Bot.* 20(85): 54 (1913)

Lectotype (selected by Tindale 1961): Derwent, [Tasmania], *R. Brown Iter Austral.* 17, 1802-05, BM 001048778!

Etymology: From the Latin *prolifer* (proliferous), a reference to the occurrence of bulbils in this species.

Vernacular name: mother shield fern

Rhizomes erect, densely scaly. Rhizome scales ovate to narrowly ovate, 16–20 mm long, 2.5–6 mm wide, bicolorous with dark centres and pale margins, margins ciliate; scales at the base of the stipe much narrower, 0.5–0.6 mm wide. Fronds 540–900 mm long. Stipes 120–350 mm long, dark brown proximally, pale brown distally, abundantly scaly throughout; scales narrowly ovate to ovate, bicolorous with dark centres and paler margins, apices acuminate, margins entire. Rachises yellow-brown, sulcate, not winged, bearing 1–3 bulbils near the apices; abundantly scaly; scales on abaxial surface narrowly ovate and bicolorous, gradually replaced distally by narrowly ovate to ± linear pale brown scales. Laminae 2–3-pinnate, narrowly elliptic, 340–740 mm long, 80–270 mm wide, dark green adaxially, paler green abaxially, coriaceous, bearing abundant pale brown scales on abaxial costae and lamina surfaces, sparsely scaly on adaxial costae, ± glabrous on adaxial lamina surfaces. Primary pinnae in 25–35 pairs below short pinnatifid apex, slightly overlapping to narrowly spaced, narrowly ovate or narrowly elliptic, rarely bearing bulbils near the apices; the longest at or near the middle, 60–135 mm long, 18–35 mm wide, apices acute or acuminate, bases stalked; costae narrowly winged distally. Longest secondary pinnae oblong or ovate with an expanded basal acroscopic lobe, 9–18 mm long, 4–10 mm wide, apices sharply pointed, bases stalked, margins serrate or deeply divided; a single basal acroscopic tertiary pinna or pair of pinnae often produced proximally on the proximal secondary pinnae, elliptic, up to 6 mm long and 3 mm wide. Sori round, medial; indusia round, 0.5–0.6 mm diameter, with a conspicuous dark central area.

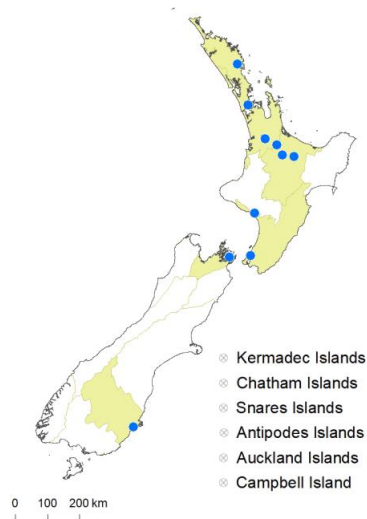


Fig. 134: *Polystichum proliferum* distribution map based on databased records at AK, CHR & WELT.

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

South Island: Sounds-Nelson, Otago.

Altitudinal range: 0–60 m.

Polystichum proliferum is naturalised in a few places from Whangārei to the shores of Cook Strait, and in Dunedin.

It occurs naturally in Australia (New South Wales, Victoria, Tasmania; Jones 1998).

Biostatus: Exotic; fully naturalised.

Habitat: *Polystichum proliferum* occurs in disturbed habitats and has been recorded under scrub, on bush margins, on roadside clay banks, on old dunes under *Eucalyptus*, on wetland margins under willows, under *Pinus radiata*, and amongst blackberry and bracken.

First record: Field (1890). Voucher WELT P015841, 1850.

Recognition: *Polystichum proliferum* is distinguished from most other New Zealand species of the genus by the presence of 1–3 bulbils on the rachis near the frond apex. It is similar in this regard to *P. lentum*, but the laminae are more divided, with

several stalked secondary pinnae produced along the length of the primary pinnae. In *P. lentum* the primary pinnae are often deeply divided, but only bear a single stalked secondary pinna on each primary pinna.

The fronds of *P. proliferum* are most similar in general appearance to those of *P. vestitum*, and bear bicolorous scales on the stipes and rachises. However, the presence of bulbils on the rachis, and the indusia with dark centres, distinguish *P. proliferum* from *P. vestitum*.



Fig. 135: *Polystichum proliferum*. Mature 2-pinnate frond with a bulbil growing near the apex of the rachis.



Fig. 136: *Polystichum proliferum*. Apex of frond showing a bulbil growing from the rachis.



Fig. 137: *Polystichum proliferum*. Apex of frond with two bulbils growing from the rachis.



Fig. 138: *Polystichum proliferum*. Mature plant growing from an erect rhizome.



Fig. 139: *Polystichum proliferum*. Herbarium specimen from Palmerston North, WELT P020470, showing mature, bulbiferous fronds, and narrowly ovate bicolorous scales.



Fig. 140: *Polystichum proliferum*. Close up of WELT P009023/A, showing bulbil near the apex of the rachis, and round indusia with dark centres.

***Polystichum setiferum* (Forssk.) T.Moore ex Woyn., Mitt. Naturwiss. Vereines Steiermark 49: 181 (1913)**

≡ *Polypodium setiferum* Forssk., *Fl. Aegypt.-Arab.* 185 (1775)

Holotype: ad Dardenellos [Dardanelles, Turkey], *Forsskål* 814, C 10002817 (online)

Etymology: From the Latin *setifer* (bristly), a reference to the bristly tips on the secondary pinnae.

Vernacular name: soft shield fern

Rhizomes erect, densely scaly. Rhizome scales ovate, 15–16 mm long, 4.5–7 mm wide, uniformly pale orange-brown, margins entire. Fronds 450–600 mm long, often prostrate. Stipes 25–120 mm long, pale or yellow-brown, densely scaly throughout; scales ovate or narrowly ovate, uniformly pale orange-brown, apices acuminate, margins ciliate or toothed. Rachises pale or yellow-brown, sulcate, not winged, often bearing bulbils at junctions with the primary pinnae, densely scaly; scales on both surfaces narrowly ovate to ± linear, pale orange-brown. Laminae 3-pinnate at base, narrowly ovate or narrowly triangular, 420–600 mm long, 90–200 mm wide, pale green on both surfaces, coriaceous, bearing abundant pale brown scales on abaxial costae and lamina surfaces, ± glabrous on adaxial surfaces. Primary pinnae in 40–60 pairs below pinnatifid apex, slightly overlapping, narrowly ovate or narrowly oblong; the longest at or near the base, 60–110 mm long, 15–25 mm wide, apices acuminate,

bases stalked; costae not winged, or winged only near the pinna apex. Secondary pinnae decreasing in length only near the apices of the primary pinnae; the longest oblong or ovate, 10–18 mm long, 2–6 mm wide, apices drawn into long sharp points, margins sharply and deeply serrate, or divided into tertiary pinnae, bases stalked. Tertiary pinnae ovate, up to 4 mm long, and 2 mm wide. Sori round, medial or nearer margin than costa; indusia round, 1–1.2 mm diameter, $\pm$ concolorous, lacking a dark central area.

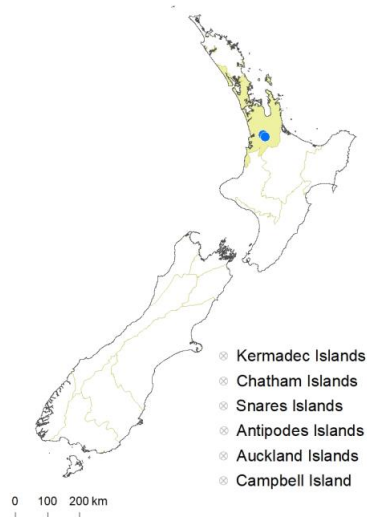


Fig. 141: *Polystichum setiferum* distribution map based on databased records at AK, CHR & WELT.

Distribution: North Island: Auckland.

Altitudinal range: 20–40 m.

A cultivar of the common European species, *Polystichum setiferum*, is widely grown in gardens and has been recorded as a garden escape in a few places around Hamilton.

Biostatus: Exotic; fully naturalised.

Habitat: *Polystichum setiferum* occurs as an escape on clay or sandy banks and waste land, often under willows, acacias or light shade, or among blackberry and bracken.

First record: Brownsey (1981). Voucher WELT P010261, 1979.

Recognition: *Polystichum setiferum* is readily distinguished by its prostrate fronds with narrowly ovate or narrowly triangular laminae, and the presence of bulbils at the junctions of the primary pinnae and rachis. No other species of *Polystichum* in New Zealand produces bulbils in this way.

Notes: The naturalised plants in New Zealand are all the cultivar 'Divisilobum Pulcherrimum' of the European species.



Fig. 142: *Polystichum setiferum*. Adaxial surface of mature 3-pinnate frond.



Fig. 143: *Polystichum setiferum*. Mature plant growing from an erect rhizome.



Fig. 144: *Polystichum setiferum*. Herbarium specimen from Matangi, WELT P017595, showing 3-pinnate frond with stipe and rachis densely covered in ovate, orange-brown scales.



Fig. 145: *Polystichum setiferum*. Close up of WELT P017595/A, showing bulbils at junctions of the primary pinnae and rachis.

***Polystichum sylvaticum* Diels in Engler & Prantl, *Nat. Pflanzenfam.* 1(4), 192 (1899)**

nom. nov. pro *Polypodium sylvaticum* Colenso 1845
as "silvaticum"

≡ *Polypodium sylvaticum* Colenso, *Tasmanian J. Nat. Sci.* 2: 163 (1845) nom. illeg., non *Polypodium sylvaticum* Schkuhr 1809

≡ *Polystichum vestitum* subsp. *sylvaticum* (Diels) C.Chr., *Index Filic.* 588 (1906)

≡ *Aspidium aculeatum* var. *sylvaticum* (Colenso) Cheeseman, *Man. New Zealand Fl.* 998 (1906) nom. illeg.

≡ *Polystichum aculeatum* var. *sylvaticum* (Diels) Domin, *Biblioth. Bot.* 20(85): 56 (1913) – as *silvaticum*
Lectotype (selected by Brownsey et al. 2019): near Tolaga Bay, E. Coast, *W. Colenso*, Dec. 1841, WELT P003188!

Etymology: From the Latin *sylvaticus* (of woodlands), a reference to the forest habitat of this species.

Rhizomes erect, densely scaly. Rhizome scales narrowly ovate, 7.5–25 mm long, 1.2–2.3 mm wide, some bicolorous with dark centres and pale margins, others uniformly pale brown, margins entire or with a few cilia. Fronds 150–800 mm long. Stipes 50–330 mm long, pale or yellow-brown, densely scaly throughout; scales narrowly ovate to ovate, bicolorous with dark centres and pale margins, or uniformly pale brown, apices acuminate, margins entire or ciliate. Rachises pale or yellow-brown, sulcate, narrowly winged only at distal end, abundantly scaly; scales on both surfaces narrowly ovate and bicolorous, and narrowly ovate to ± linear and pale brown. Laminae 2-pinnate or rarely 2-pinnate-pinnatifid, elliptic or narrowly elliptic, 110–630 mm long, 45–220 mm wide, dark green adaxially, paler green abaxially, coriaceous, bearing abundant pale brown scales on abaxial costae and lamina surfaces, sparser on adaxial surfaces. Primary pinnae in 13–32 pairs below pinnatifid apex, widely spaced, narrowly ovate; the longest at or near the middle, 25–120 mm long, 10–32 mm wide, apices acuminate, bases stalked; costae usually winged throughout, or only in distal half in largest fronds. Secondary pinnae decreasing in length only near the primary pinna apices; the longest secondary pinnae elliptic or ovate, 7–20 mm long, 4–7 mm wide, apices sharply pointed, margins sharply and often deeply serrate, bases stalked. Sori round, medial or nearer margin than costa, sometimes protected by a few small scales; indusia absent.

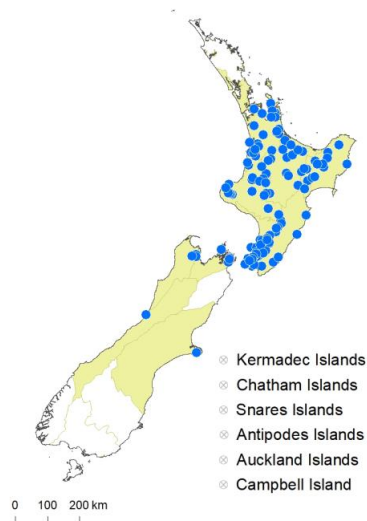


Fig. 146: *Polystichum sylvaticum* distribution map based on databased records at AK, CHR & WELT.

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

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

Altitudinal range: 20–985 m.

Polystichum sylvaticum occurs in lowland and montane forest of the North Island from Coromandel and the Hunua Ranges to Wellington, reaching 960 m near East Cape and 985 m on Mt Taranaki. In the South Island it occurs in north-west Nelson and the Marlborough Sounds, with outlying populations at Hokitika and on Banks Peninsula. It reaches 450 m on D’Urville Island and in the Tākaka Hill area.

Biostatus: Indigenous (Endemic).

Habitat: *Polystichum sylvaticum* occurs in damp, dark, podocarp and broadleaved forest. It grows on hillsides, clay banks, tracksides, river banks, alluvial terraces, damp rock faces, and in wet gullies and seepages.

Recognition: *Polystichum sylvaticum* is distinguished by the scales at the stipe/rachis junction, many of which are markedly bicolorous, with dark centres and pale margins. Indusia are

absent, and the sori are protected only by a few small scales. The laminae are elliptic, dark green on the adaxial surface, and the primary costae are narrowly winged throughout their length except in the largest fronds. The species is likely to be confused only with *P. vestitum*, which also has bicolorous scales, but has well-formed indusia, and narrow wings on the primary costae only at their distal end. Its laminae are relatively long and narrow with $\pm$ parallel sides, and dark shiny green on the adaxial surface. *P. sylvaticum* is distinguished from most of the naturalised species by its lack of bulbils, and is clearly distinct from *P. cystostegia*, which has inflated indusia and is largely confined to alpine areas.

Cytology: $n = c. 82$ (Brownsey in Dawson et al. 2000).

Hybridisation: There is evidence that *Polystichum sylvaticum* hybridises with *P. vestitum* (Perrie et al. 2003b).

Notes: The name *Polypodium sylvaticum*, as described by Colenso (1845), is illegitimate (Art. 6.4), being a later homonym of *P. sylvaticum* Schkuhr (1809). Diels (in Engler & Prantl 1898–1902) intended to create a new combination in *Polystichum* by writing “*P. silvaticum* (Colenso als *Polypodium*) Diels”. However, Diels’s name is a new name (Art. 6.12a, 6.14), validated by Colenso’s description of *Polypodium sylvaticum*. Diels was obligated to adopt Colenso’s epithet with the original spelling (Art. 60.1, 60.2), unless he explicitly changed the spelling and stated that he was making a correction; but there is no evidence of such intent. The correct name and spelling for this species is *Polystichum sylvaticum* Diels in Engler & Prantl, Nat. Pflanzenfam. 1(4): 192, 1899 (‘*silvaticum*’), not *P. silvaticum* (Colenso) Diels. (In making this determination we are very grateful for extensive and valuable discussion with John McNeill, Royal Botanic Gardens, Edinburgh).



Fig. 147: *Polystichum sylvaticum*. Adaxial surface of mature 2-pinnate-pinnatifid frond.



Fig. 148: *Polystichum sylvaticum*. Ovate, bicolorous scales near stipe/rachis junction.



Fig. 149: *Polystichum sylvaticum*. Mature plant growing from an erect rhizome.



Fig. 150: *Polystichum sylvaticum*. Abaxial surface of fertile frond showing wings on costae of primary pinnae.



Fig. 151: *Polystichum sylvaticum*. Abaxial surface of fertile frond showing immature, round, exindusiate sori.



Fig. 152: *Polystichum sylvaticum*. Abaxial surface of fertile frond showing mature, round, exindusiate sori.

***Polystichum vestitum* (G.Forst.) C.Presl, Tent. Pterid. 83 (1836)**

≡ *Polypodium vestitum* G.Forst., *Fl. Ins. Austr.* 82 (1786)

≡ *Aspidium vestitum* (G.Forst.) Sw., *J. Bot. (Schrader)* 1800(2): 37 (1801)

≡ *Aspidium aculeatum* var. *vestitum* (G.Forst.) Hook. ex Hook.f., *Handb. New Zealand Fl.* 375 (1864)

≡ *Polystichum aculeatum* var. *vestitum* (G.Forst.) Domin, *Biblioth. Bot.* 20(85): 55 (1913)

Lectotype (selected by Nicolson & Fosberg 2003): no locality, Herb. G. Forster 282, BM 001048431!

= *Polystichum venustum* Hombr. in Hombr. & Jacquinot, *Voy. Pôle Sud, Bot.* t. 5 m–n (1844)

≡ *Aspidium venustum* (Hombr.) Hook.f., *Bot. Antarct. Voy. I. (Fl. Antarct.) Part I*, 106 (1844)

Lectotype (selected by Perrie et al. 2003, fig. 13): Iles Auckland – sud de la Nouvelle Zélande, Hombr., 1841, P! (photo WELT neg. no. B13602)

= *Aspidium pulcherrimum* Colenso, *Tasmanian J. Nat. Sci.* 2: 167 (1845)

Lectotype (selected by Perrie et al. 2003, fig. 14): Waikare Lake [Lake Waikaremoana], W. Colenso, Dec. 1841, WELT P003201!

= *Aspidium waikareense* Colenso, *Tasmanian J. Nat. Sci.* 2: 168 (1845)

Lectotype (selected by Perrie et al. 2003, fig. 15): Waikare Lake [Lake Waikaremoana], W. Colenso, Dec. 1841, WELT P003200! (the larger frond)

= *Aspidium perelegans* Colenso, *Trans. & Proc. New Zealand Inst.* 29: 416 (1897)

≡ *Polystichum perelegans* (Colenso) C.Chr., *Index Filic.* 87, 586 (1906)

≡ *Polystichum aculeatum* var. *perelegans* (Colenso) Domin, *Biblioth. Bot.* 20(85): 56 (1913)

Lectotype (selected by Perrie et al. 2003, fig. 16): Dannevirke, H[awke's] B[ay], Herb. W. Colenso, WELT P002577!

Etymology: From the Latin *vestitus* (clothed), a reference to the abundant covering of scales in this species.

Rhizomes erect, sometimes forming a trunk up to 600 mm tall, densely scaly. Rhizome scales narrowly ovate, 10–40 mm long, 1.3–4.0 mm wide, bicolorous with dark centres and pale margins, margins entire. Fronds 220–1700 mm long [2250 mm long]*. Stipes 45–500 mm long [800 mm long], pale brown, densely scaly throughout; scales usually narrowly ovate to ovate, bicolorous with dark centres and pale margins, apices acuminate, margins entire [or rarely pale brown, concolorous, apices acuminate, margins toothed or ciliate, with only scattered bicolorous scales]. Rachises pale brown, sulcate, narrowly winged only at distal end, abundantly scaly; scales on abaxial surface narrowly ovate and bicolorous [not Chathams] to narrowly ovate or ± linear and pale brown; scales on adaxial surface ovate to ± linear and pale brown. Laminae 2-pinnate or rarely 3-pinnate, narrowly elliptic, 110–1200 mm long [1460 mm long], 48–250 mm wide [480 mm wide], dark shiny green adaxially, paler green abaxially, coriaceous, bearing abundant pale brown or colourless scales on abaxial costae and lamina surfaces, sparsely scaly on adaxial costae, ± glabrous on adaxial lamina surfaces. Primary pinnae in 16–55 pairs below pinnatifid apex, slightly overlapping to widely spaced, narrowly oblong or narrowly triangular; the longest at or near the middle, 25–125 mm long [270 mm long], 8–32 mm wide [50 mm wide], apices acute or acuminate, bases stalked; costae winged distally. Secondary pinnae decreasing in length only near the primary pinna apices; the longest secondary pinnae oblong or ovate, 4–16 mm long [34 mm long], 3–10 mm wide [14 mm wide], apices sharply pointed, margins sharply and often deeply serrate, bases stalked. Rarely the basal pair of secondary pinnae on a primary pinna divided into a single pair of tertiary pinnae, elliptic, up to 6 mm long [13 mm long] and 4 mm wide [6 mm wide]. Sori round, medial or nearer margin than costa; indusia round, 0.7–1.0 mm diameter, ± concolorous, lacking a dark central area. Mean spore size 36–44 µm long, 26–32 µm wide.

Note: measurements in square brackets are taken from plants from the Chatham Islands, the islands off Stewart Island, and the Snares Islands, which can have longer and wider fronds than those on the main islands of New Zealand.

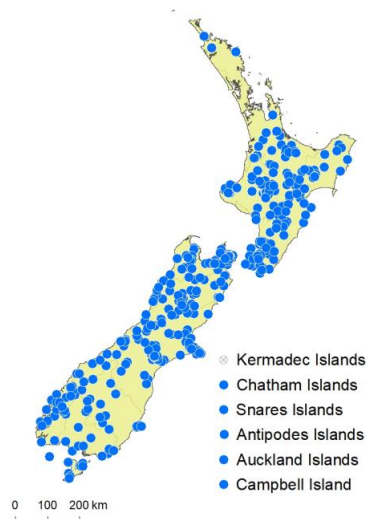


Fig. 153: *Polystichum vestitum* distribution map based on databased records at AK, CHR & WELT.

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

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

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

Altitudinal range: 0–1700 m.

Polystichum vestitum occurs in lowland to subalpine areas throughout the North Island, but is uncommon north of Hamilton and the Bay of Plenty. It ranges from sea level, reaching 1400 m on Mt Taranaki and in the Ruahine Ranges. In the South Island it occurs in lowland to subalpine regions throughout. It reaches 1700 m on Ben Lomond near Lake Wakatipu. It extends also to the Chatham Islands, Stewart Island, and all the subantarctic islands.

Also Macquarie Island (Du Puy & Orchard 1993).

Biostatus: Indigenous (Non-endemic).

Habitat: *Polystichum vestitum* occurs in broadleaved, podocarp, beech, and coastal *Olearia*, *Dracophyllum* and *Metrosideros umbellata* forest, under mānuka and kānuka,

amongst flax, under introduced conifers and willows, in bracken and other scrub, in open grassland, and in subalpine tussock and herbfield. It grows on the forest floor, on bush margins, at the base of cliffs, on roadside banks, on river banks, in swamp forest, on boggy ground, and on coastal cliffs. It is found on a variety of substrates including greywacke, mudstone, limestone, andesite, volcanic ash and pumice, scoria, and schist.

Recognition: *Polystichum vestitum* is distinguished by the scales at the stipe/rachis junction, which are usually markedly bicolorous, with dark centres and pale margins (Perrie et al. 2003b, fig. 2). The indusia are flat and concolorous, lacking dark centres. The laminae are relatively long and narrow with $\pm$ parallel sides, dark shiny green on the adaxial surface, and paler green on the abaxial surface. The species is likely to be confused only with *P. sylvaticum*, which also has bicolorous scales, but lacks indusia and has narrow wings along the length of the primary costae, or with *P. cystostegia*, which has inflated indusia and is largely confined to alpine areas. It is distinguished from most of the naturalised species by its lack of bulbils.

Some plants from the Chatham Islands, islands off Stewart Island, and subantarctic islands, particularly the Snares Islands, have larger and wider fronds with longer primary pinnae (see measurements in square brackets in the description). Bicolorous scales are very scattered on the stipe and rachis, and most of the scales are uniformly pale brown, and often fimbriate on the margins. Several authors (e.g. Brownsey & Smith-Dodsworth 2000; de Lange et al. 2011) have suggested that these plants may belong to a different species, but analysis of morphological and AFLP DNA fingerprinting data by Perrie et al. (2003b) provided no strong evidence that they constitute an evolutionary lineage distinct from mainland plants. They are treated here as part of *P. vestitum* but need further investigation.

Cytology: $n = 82$ (Brownlie 1954).

Hybridisation: There is evidence that *Polystichum vestitum* hybridises with *P. neozelandicum*, *P. oculatum* and *P. wawranum* (Perrie et al. 2003a), and with *P. cystostegia* and *P. sylvaticum* (Perrie et al. 2003b).

Notes: Nicolson & Fosberg (2003) designated a lectotype for *Polypodium vestitum* (BM 001048431) almost contemporaneously with Perrie et al. (2003b), who chose a different Forster collection (BM – photo WELT neg. no. B13608). It transpires that Nicolson & Fosberg's book was published in the first week of December 2003 (Koelz, pers. comm., 20 Sept. 2018) whereas the paper by Perrie et al. was published on 10 December 2003, about a week later (see *New Zealand Journal of Botany* 42, Number 1, title page, 2004). Nicolson & Fosberg's designation of the lectotype therefore takes precedence.

The names *Aspidium proliferum* R.Br. and *Aspidium aculeatum* Sw. used in earlier Flora treatments are misidentifications of *Polystichum vestitum*.



Fig. 154: *Polystichum vestitum*. Mature plant growing from an erect rhizome.



Fig. 155: *Polystichum vestitum*. Adaxial surface of mature 2-pinnate frond.



Fig. 156: *Polystichum vestitum*. Mature plant growing from an erect rhizome.



Fig. 157: *Polystichum vestitum*. Mature plant growing from an erect rhizome.



Fig. 158: *Polystichum vestitum*. Erect rhizome forming a short trunk in two plants.



Fig. 159: *Polystichum vestitum*. Narrowly ovate, bicolorous scales near the stipe/rachis junction.



Fig. 160: *Polystichum vestitum*. Abaxial surface of fertile frond showing immature sori protected by concolorous, round, peltate indusia.



Fig. 161: *Polystichum vestitum*. Abaxial surface of fertile frond showing mature sori, and concolorous, round, peltate indusia.

***Polystichum wawranum* (Szyszyl.) Perrie in Perrie et al., *New Zealand J. Bot.* 41: 204 (2003)**

≡ *Aspidium wawranum* Szyszyl. in Wawra von Fernsee, *Itin. Princ. S. Coburgi* 2, 126, t. 15 (1888) – as *Aspidium wawraeanum*

Holotype: New Zealand, Waitemata, *H. Wawra* 242, 1872–73, W! (photo WELT neg. no. 13595; see Perrie et al. 2003, fig. 12)

Etymology: Named in honour of Heinrich Wawra Ritter von Fernsee (1831–1887), a Czech-Austrian physician and botanist who collected in New Zealand during a voyage around the world (1872–1873) with Prince Phillip and Prince August von Sachsen-Coburg-Kohary.

Rhizomes erect, densely scaly. Rhizome scales narrowly ovate, 11–17 mm long, 1–3 mm wide, bicolorous with dark centres and pale margins, margins toothed. Fronds 275–1270 mm long. Stipes 105–700 mm long, pale brown, abundantly scaly throughout; scales at very base similar to those of rhizome; those at mid-stipe linear, blackish-brown, apices filiform, margins with a few protrusions, bases densely fimbriate; those from the stipe/rachis junction 40–120 µm wide at mid-length. Rachises pale brown, sulcate, narrowly winged only at distal end, abundantly scaly. Laminae 2-pinnate or rarely 3-pinnate proximally, ovate or elliptic, 150–730 mm long, 60–330 mm wide, olive-green to blue-green adaxially, paler green abaxially, coriaceous, bearing abundant pale brown or colourless scales on abaxial costae and lamina surfaces, sparsely scaly on adaxial costae, ± glabrous on adaxial lamina surfaces. Primary pinnae in 12–35 pairs below pinnatifid apex, slightly overlapping distally, narrowly ovate; the longest at or near the middle, 35–170 mm long, 13–55 mm wide, apices acuminate, bases stalked; costae narrowly winged throughout. Secondary pinnae decreasing very gradually in length along the primary pinna to the distal end; the longest secondary pinnae oblong or ovate, 8–40 mm long, 5–12 mm wide, apices rounded, margins entire to deeply serrate, bases adnate or stalked. A few tertiary segments sometimes present on proximal pinnae, ovate, up to 9 mm long and 4 mm wide. Sori round, medial or nearer margin than costa; indusia round, 0.7–1.5 mm diameter, with inconspicuous dark central area (1–17% of surface area). Mean spore size 40–48 µm long, 29–36 µm wide.

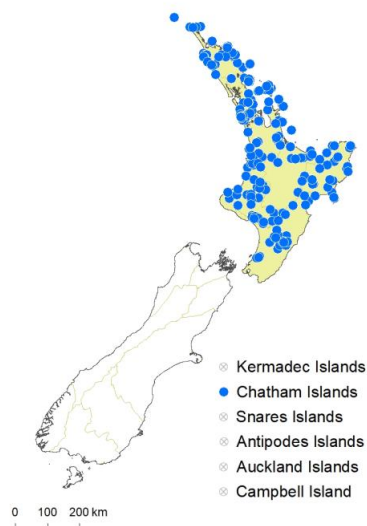


Fig. 162: *Polystichum wawranum* distribution map based on databased records at AK, CHR & WELT.

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

Three Kings Islands, Chatham Islands.

Altitudinal range: 0–880 m.

Polystichum wawranum occurs in lowland and montane regions throughout the North Island from Te Paki to Ōtaki. It ranges from sea level up to 880 m in the Raukūmara Ranges. It extends also to the Three Kings Islands and Chatham Islands, but does not reach the South Island.

Biostatus: Indigenous (Endemic).

Habitat: *Polystichum wawranum* occurs in kauri, podocarp, broadleaved, beech and coastal forest, under mānuka and kānuka, amongst flax and coastal scrub, and on grassy slopes, usually in drier and more open conditions. It is found on coastal cliffs, hillsides, tracksides, roadside banks, streambanks and river terraces, in gullies, and on the forest floor. It grows on greywacke and limestone substrates.

Recognition: *Polystichum wawranum* is distinguished by the scales at the stipe/rachis junction that are very narrow, blackish-brown, hair-like and abundantly fimbriate at their

bases (Perrie et al. 2003a, fig. 5). The indusia are either concolorous or have tiny black centres (*ibid.*, fig. 6). The laminae are olive- to blue-green on the adaxial surfaces and paler green abaxially.

P. wawranum is likely to be confused only with *P. neozelandicum*, which has wider scales (40–120 µm wide, cf. 135–570 µm wide), indusia with larger dark centres, and larger spores (40–48 µm long, 29–36 µm wide, cf. 46–58 µm long, 36–45 µm wide).

Polystichum wawranum is distinguished from most of the naturalised species by its lack of bulbils, from *P. vestitum* and *P. sylvaticum* by its concolorous rather than bicolorous scales at the stipe/rachis junction, from *P. cystostegia* by its flat rather than inflated indusia, and from *P. oculatum* by its much narrower scales.

Cytology: $n = c. 82$ (Perrie et al. 2003a).

Hybridisation: There is evidence that *P. wawranum* hybridises with *P. neozelandicum* and *P. vestitum* (Perrie et al. 2003a).



Fig. 163: *Polystichum wawranum*. Adaxial surface of mature 2-pinnate frond.



Fig. 164: *Polystichum wawranum*. Abaxial surface of fertile 2-pinnate frond.



Fig. 165: *Polystichum wawranum*. Mature plant growing from an erect rhizome.



Fig. 166: *Polystichum wawranum*. Abaxial surface of fertile pinna showing linear scales on the costae, and ± concolorous indusia protecting immature sori.



Fig. 167: *Polystichum wawranum*. Abaxial surface of fertile frond showing mature sori protected by concolorous, round, peltate indusia.



Fig. 168: *Polystichum wawranum*. Abaxial surface of fertile frond showing mature round sori, and linear blackish-brown scales with fimbriate bases.

***Rumohra* Raddi, *Opusc. Sci.* 3: 290, t. 12, f. 1 (1819)**

Type taxon: *Rumohra aspidioides* Raddi

Etymology: Named in honour of Karl von Rumohr Holstein (1785–1843), a German patron of the arts and sciences.

Terrestrial or epiphytic, evergreen ferns. Rhizomes long-creeping or climbing, scaly. Rhizome scales non-clathrate, ovate or narrowly ovate, margins entire or minutely toothed, attached at base or peltate, concolorous, pale to dark brown. Fronds monomorphic, not bulbiferous. Stipes and rachises scaly, adaxially sulcate. Laminae 2–3-pinnate, coriaceous, scaly. Veins free. Sori round, borne on abaxial surface, away from the margin, in 1 row either side of midrib; indusia round, peltate. Spores monolet; perispores coarsely rugose or tuberculate, smooth on the surface.

Taxonomy: A genus of seven species included in the subfamily Elaphoglossoideae (Bauret et al. 2017).

Rumohra is considered to be monophyletic, and sister to *Megalastrum*, with the two genera together sister to *Lastreopsis sens. str.* (Labiak et al. 2014).

Only one widespread species, *Rumohra adiantiformis*, is present in New Zealand.

Distribution: *Rumohra* is a small genus of seven species, with three endemic to Madagascar, one to Juan Fernandez Island, and two to Brazil. One species is widespread in tropical and south temperate

regions from South and Central America to Africa, Madagascar, Australasia, New Guinea and the South Pacific (Sundue et al. 2013; Labiak et al. 2014; Bauret et al. 2017). One non-endemic species in New Zealand.

Biostatus: Indigenous (Non-endemic).

Table 8: Number of species in New Zealand within *Rumohra* Raddi

Category	Number
Indigenous (Non-endemic)	1
Total	1

Recognition: In New Zealand, the sole species of *Rumohra* is distinguished by its terrestrial or climbing habit, long-creeping rhizomes, 2–3-pinnate scaly fronds, and round sori protected by round indusia. The spores are coarsely rugose or tuberculate, and smooth on the surface (Large & Braggins 1991).

Cytology: The base chromosome number in *Rumohra* is $x = 41$ (Kramer 1990).

***Rumohra adiantiformis* (G.Forst.) Ching, *Sinensia* 5: 70 (1934)**

≡ *Polypodium adiantiforme* G.Forst., *Fl. Ins. Austr.* 82 (1786)

≡ *Polystichum adiantiforme* (G.Forst.) J.Sm., *Hist. Fil.* 220 (1875)

≡ *Dryopteris adiantiformis* (G.Forst.) Kuntze, *Revis. Gen. Pl.* 3, 378 (1898)

Lectotype (selected by Nicolson & Fosberg 2003): New Zealand, Herb. G. Forster 291, BM 001048410! (left-hand specimen)

= *Polypodium coriaceum* Sw., *Prodr. [O. P. Swartz]* 133 (1788)

≡ *Aspidium coriaceum* (Sw.) Sw., *J. Bot. (Schrader)* 1800(2): 40 (1801)

≡ *Tectaria coriacea* (Sw.) Link, *Hort. Reg. Bot. Berol.* 2, 127 (1833)

≡ *Hypopeltis coriacea* (Sw.) Bory, *Voy. Indes Or., Bot.* 70 (1833)

≡ *Polystichum coriaceum* (Sw.) Schott, *Gen. Fil.* t. 9 (1834)

Isotype: Jamaica, Herb. Thunberg 24647, UPS (!online; see Proctor 1985)

= *Aspidium capense* Willd., *Sp. Pl.* 5(1), 267 (1810)

≡ *Polystichum capense* (Willd.) J.Sm., *Companion Bot. Mag. New Ser.* 2: 35 (1846)

Holotype: South Africa, ad Cap. b. spei [Cape of Good Hope], no collector, no date, Herb. Willdenow, B-W 19803-01 0 (!online; see Roux 2009)

= *Aspidium cunninghamii* Colenso, *Tasmanian J. Nat. Sci.* 1: 379 (1843)

Holotype: Ruatahuna, Herb. W. Colenso, WELT P003344! (labelled “*Aspidium cunninghamii*” in Colenso’s hand)

= *Aspidium cunninghamianum* Colenso, *Tasmanian J. Nat. Sci.* 2: 166 (1845)

Lectotype (selected by Allan 1961): near Ruatahuna, W. Colenso, Jan. 1842, WELT P003198!

Etymology: From Latin – *formis* (resembling) and the genus *Adiantum*, alluding to the similarity to *Adiantum*.

Vernacular names: climbing shield fern; leathery shield fern

Rhizomes long-creeping, up to 340 mm long (in herbarium material), 3–6 mm diameter, densely scaly. Rhizome scales narrowly ovate to ovate, 5.5–12 mm long, 1.4–2.4 mm wide, chestnut-brown, concolorous or with darker centres, margins entire or minutely toothed. Fronds 85–1020 mm long. Stipes 5–540 mm long, pale or yellow-brown, scaly, especially near junction with rhizome; scales narrowly ovate, chestnut-brown or sometimes with darker centres, up to 10 mm long and 2 mm wide. Rachises yellow-brown, sulcate, narrowly winged distally, scaly; scales scattered throughout, narrowly ovate, chestnut-brown, up to 6 mm long and 1 mm wide. Laminae 2–3-pinnate proximally, ovate, 55–560 mm long, 24–300 mm wide, shining bright green or yellow-green adaxially, paler dull green abaxially, coriaceous, bearing ovate or narrowly ovate scales on abaxial costae, almost glabrous adaxially; bearing tiny, sessile, flattened, reddish or yellowish glands surrounded by shiny patches, mainly on the abaxial surface (sometimes lost with age). Primary pinnae in 5–18 pairs below pinnatifid apex, widely spaced especially proximally, narrowly ovate distally, ovate proximally; the longest at or near the base, 16–300 mm long, 10–150 mm wide, apices acute to acuminate, bases stalked, costae narrowly winged for most of their length. Acroscopic secondary pinnae decreasing in length along the primary pinna to the distal end; the basal basispic secondary pinna the longest, oblong or narrowly ovate, 8–100 mm long, 4–45 mm wide, apices acute or obtuse, bases stalked or adnate, margins incised or divided into tertiary segments. Tertiary segments oblong, the longest 5–33 mm long,

3–10 mm wide, apices obtuse or rounded, margins $\pm$ entire or divided $\frac{1}{2}$ way to midrib, bases stalked. Sori round, medial; indusia round, 1.2–2.2 mm diameter, with dark centres, glabrous.

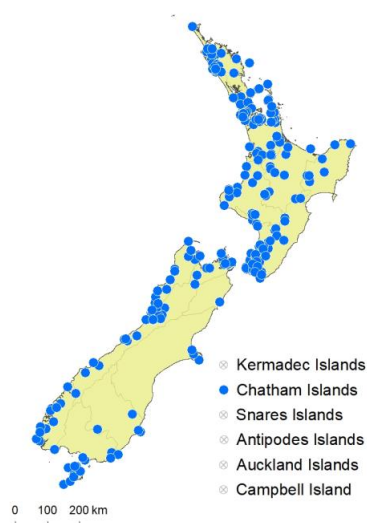


Fig. 169: *Rumohra adiantiformis* distribution map based on databased records at AK, CHR & WELT.

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

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

Chatham Islands, Stewart Island.

Altitudinal range: 0–975 m.

Rumohra adiantiformis occurs in lowland and montane areas throughout the North Island from Kaitiāia to Wellington, although rare along the east coast. It ranges from sea level to 975 m on Mt Hauhungatahi in the central North Island. In the South Island it occurs more frequently west of the main divide from the Marlborough Sounds and north-west Nelson to Fiordland and Southland, with scattered populations on the east coast. It is absent from the drier parts of inland Marlborough, Canterbury and Otago. It grows from near sea level, up to 550 m on Martyr Spur in south Westland. It extends also to Stewart Island and the Chatham Islands.

Also Bermuda and Greater Antilles (Proctor 1985), Argentina, Bolivia, Brazil, Chile, Peru, Uruguay and Venezuela, Galapagos Islands, Juan Fernandez Island (Sundue et al. 2013; Bauret et al. 2017), southern Africa and Madagascar

(Roux 2009), Australia (Queensland, New South Wales, Victoria, Tasmania) and Papua New Guinea (Jones 1998).

Biostatus: Indigenous (Non-endemic).

Habitat: *Rumohra adiantiformis* occurs in kauri, podocarp, broadleaved and beech forest, in kānuka and coastal scrub, under *Pinus radiata*, among flax and bracken, and rarely in dune hollows and on swamp margins amongst rushes. It is usually a climbing epiphyte, but also grows on fallen logs, and on the ground amongst roots and boulders, at the base of tree trunks, in gullies, on rock faces, and on forest margins. It has been recorded growing epiphytically on *Cyathea dealbata*, *C. smithii*, *Dicksonia fibrosa* and *D. squarrosa*.

Recognition: *Rumohra adiantiformis* is recognised by its terrestrial or climbing habit, long-creeping rhizomes densely covered in conspicuous chestnut-brown scales, 2–3-pinnate laminae bearing scales and tiny red or yellow glands on the abaxial surface, and conspicuous round sori protected by round indusia with dark centres.

Cytology: $n = 41$ (Brownlie 1958).

Notes: Mazumdar et al. (2019) lectotypified *Polypodium adianthoides* Burm.f. with a specimen in G-PREL collected by Pryon in Indonesia. The collection is a specimen of *Rumohra adiantiformis* (Mazumdar 2019, fig. 4) and hence *Polypodium adianthoides* (Burmans 1768) predates *P. adiantiforme* (Forster 1786), the basionym of *Rumohra adiantiformis*. In order to avoid an unfortunate nomenclatural change to a well-known and widespread fern, Mazumdar (2019) has proposed conserving Forster's name over Burman's.

The names *Polypodium coriaceum* Sw. and *Aspidium capense* Willd., and combinations based on them, were used in earlier New Zealand Floras but are currently regarded as synonyms of *Rumohra adiantiformis*, with types from Jamaica and South Africa, respectively.

Bauret et al. (2017) showed that *Rumohra adiantiformis* from across its geographical range was "grossly polyphyletic". They recognised six geographically structured and supported lineages in the Neotropics, southern South America, South Africa, the Comoros, the Western Indian Ocean islands (Madagascar, Mascarenes and Seychelles), and Australasia (Australia, New Zealand and Papua New Guinea). However, they found no distinctive morphological characters to distinguish these lineages, and, until further in-depth investigation is undertaken, recognised them as cryptic species within *Rumohra adiantiformis*. The type of *R. adiantiformis* was collected in New Zealand and, even if six different species are subsequently recognised, the name will continue to apply to the Australasian lineage. However, the basionyms *Polypodium coriaceum* and *Aspidium capense* probably relate to other lineages.



Fig. 170: *Rumohra adiantiformis*. Adaxial surface of mature 2-pinnate-pinnatifid frond growing epiphytically.



Fig. 171: *Rumohra adiantiformis*. Adaxial surface of mature 3-pinnate frond growing epiphytically on a tree fern trunk.



Fig. 172: *Rumohra adiantiformis*. Mature plant climbing a tree fern trunk.



Fig. 173: *Rumohra adiantiformis*. Long-creeping rhizome densely covered in ovate, chestnut-brown scales.



Fig. 174: *Rumohra adiantiformis*. Abundant, narrowly ovate, chestnut-brown scales at stipe/rachis junction.



Fig. 175: *Rumohra adiantiformis*. Abaxial surface of fertile frond showing immature sori protected by round, peltate indusia.



Fig. 176: *Rumohra adiantiformis*. Abaxial surface of fertile frond showing mature sori protected by round, peltate indusia with dark centres.



Fig. 177: *Rumohra adiantiformis*. Abaxial surface of fertile frond showing mature round sori and residual indusia.

References

- Adanson, M. 1763: *Familles des Plantes*. Vol. 2. Vincent, Paris.
- Allan, H.H. 1961: *Flora of New Zealand*. Vol. I. *Indigenous Tracheophyta: Psilopsida, Lycopsidea, Filicopsida, Gymnospermae, Dicotyledones*. Government Printer, Wellington.
- Alston, A.H.G. 1955: A new combination in *Ctenitis*. *American Fern Journal* 45(4): 160.
- Armstrong, J.B. 1881: A natural arrangement of the New Zealand ferns founded on the system of Smith's "Historia Filicum", with critical notes on certain species. *Transactions and Proceedings of the New Zealand Institute* 13: 359–368.
- Bauret, L.; Rouhan, G.; Hirai, R.Y.; Perrie, L.; Prado, J.; Salino, A.; Senterre, B.; Shepherd, L.; Sundue, M.; Selosse, M.-A.; Gaudeul, M. 2017: Molecular data, based on an exhaustive species sampling of the fern genus *Rumohra* (Dryopteridaceae), reveal a biogeographical history mostly shaped by dispersal and several cryptic species in the widely distributed *Rumohra adiantiformis*. *Botanical Journal of the Linnean Society* 20: 1–19.
- Bélanger, C.P. 1833: *Voyage aux Indes Orientales. Botanique*. Part II *Cryptogamie*. Paris.
- Blume, C.L. 1828: *Enumeratio Plantarum Javae*. J.W. van Leeuwen, Leiden.
- Brackenridge, W.D. 1854: *United States Exploring Expedition*. Vol. 16. *Botany. Cryptogamia. Filices*. Sherman, Philadelphia.
- 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. 1958: Chromosome numbers in New Zealand ferns. *Transactions of the Royal Society of New Zealand* 85: 213–216.
- Brownlie, G. 1961: Additional chromosome numbers – New Zealand ferns. *Transactions of the Royal Society of New Zealand. Botany* 1: 1–4.
- Brownsey, P.J. 1981: Checklist of pteridophytes naturalised in New Zealand. *New Zealand Journal of Botany* 19: 9–11.
- Brownsey, P.J. 1998: Incertae sedis. In: *Flora of Australia*. Vol. 48. 496.
- Brownsey, P.J.; Given, D.R.; Lovis, J.D. 1985: A revised classification of New Zealand pteridophytes with a synonymic checklist of species. *New Zealand Journal of Botany* 23(3): 431–489.
- Brownsey, P.J.; Perrie, L.R. 2018: Aspleniaceae. In: Breitwieser, I.; Wilton, A.D. (ed.) *Flora of New Zealand — Ferns and Lycophytes*. Fascicle 18. Manaaki Whenua Press, Lincoln.
- Brownsey, P.J.; Perrie, L.R.; Field, A.R. 2019: Taxonomic notes on the New Zealand flora: lectotypes in Dryopteridaceae and Nephrolepidaceae. *New Zealand Journal of Botany* 57(1): 32–38.
- Brownsey, P.J.; Smith-Dodsworth, J.C. 2000: *New Zealand ferns and allied plants*. Edition 2. David Bateman, Auckland.
- Burmah, N.L. 1768: *Flora Indica: cui accedit series zoophytorum indicorum, nec non Prodromus Florae Capensis*. Cornelius Haak, Leiden.
- Cheeseman, T.F. 1906: *Manual of the New Zealand Flora*. Government Printer, Wellington.
- Cheeseman, T.F. 1925: *Manual of the New Zealand Flora*. Edition 2. Government Printer, Wellington.
- Ching, R.C. 1934: A revision of the compound-leaved *Polystichia* and other related species in the continental Asia including Japan and Formosa. *Sinensia* 5: 23–91.
- Ching, R.C. 1938: A revision of the Chinese and Sikkim-Himalayan *Dryopteris* with reference to some species from neighbouring regions. *Bulletin of the Fan Memorial Institute of Biology* 8: 157–268.
- Ching, R.C. 1940: On natural classification of the family "Polypodiaceae". *Sunyatsenia* 5(4): 201–268.
- Christ, H. 1904: Filices Faurieanae. V. Filices Formosanae. *Bulletin de l'Herbier Boissier, série 2*, 4: 609–618.
- Christensen, C. 1905–1906: *Index Filicum*. Hagerup, Copenhagen.
- Colenso, W. 1843: Description of some new ferns lately discovered in New Zealand. *Tasmanian Journal of Natural Science* 1: 375–379.
- 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. 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. 1947: *Genera Filicum*. Chronica Botanica Co., Waltham, Mass.
- Crouch, N.R.; Klopper, R.R.; Burrows, J.E.; Burrows, S.M. 2011: *Ferns of southern Africa. A comprehensive guide*. Struik Nature, Cape Town.
- 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.
- Dawson, M.I.; Brownsey, P.J.; Lovis, J.D. 2000: Index of chromosome numbers of indigenous New Zealand pteridophytes. *New Zealand Journal of Botany* 38(1): 25–46.
- de Lange, P.J.; Heenan, P.B.; Rolfe, J.R. 2011: *Checklist of vascular plants recorded from Chatham Islands*. Department of Conservation, Wellington Hawke's Bay Conservancy.
- de Lange, P.J.; Murray, B.G.; Datson, P.M. 2004: Contributions to a chromosome atlas of the New Zealand flora – 38. Counts for 50 families. *New Zealand Journal of Botany* 42: 873–904.
- de Lange, P.J.; Rolfe, J.R.; Barkla J.W.; Courtney, S.P.; Champion, P.D.; Perrie, L.R.; Beadel, S.N.; Ford, K.A.; Breitwieser, I.; Schönberger, I.; Hindmarsh-Walls, R.; Heenan, P.B.; Ladley, K. 2018: Conservation status of New Zealand indigenous vascular plants, 2017. *New Zealand Threat Classification Series* No. 22.
- Domin, K. 1913: Beiträge zur Flora und Pflanzengeographie Australiens. *Bibliotheca Botanica* 20(85): 1–239.
- Don, D. 1825: *Prodromus Florae Nepalensis*. J. Gale, London.
- Du Puy, D.J.; Orchard, A.E. 1993: Dryopteridaceae. In: *Flora of Australia*. Vol. 50. 558–562.
- 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.
- Fabbri, F. 1963: Primo supplemento alle "Tavole cromosomiche delle Pteridophyta" di Alberto Chiarugi. *Caryologia* 16: 237–335.
- Fée, A.L.P. 1857–1858: *Mémoires sur les Familles des Fougères. 8. Descriptions d'espèces nouvelles*. Baillière, Paris.
- Field, A.R. 2020: Classification and typification of Australian lycophytes and ferns based on Pteridophyte Phylogeny Group classification PPG 1. *Australian Systematic Botany* 33: 1–102.
- Field, H.C. 1890: *The ferns of New Zealand*. A.D. Willis, Wanganui.
- Forsskål, P. 1775: *Flora Aegyptiaco-Arabica*. Möller, Copenhagen.
- Forster, J.G.A. 1786: *Florulae Insularum Australium Prodromus*. Dietrich, Göttingen.
- Franchet, A.R.; Savatier, P.A.L. 1877–1879: *Enumeratio Plantarum in Japonia sponte crescentium*. Vol. 2. Savy, Paris.
- Fraser-Jenkins, C.R. 1979a: A new name for a European *Dryopteris*. *Fern Gazette* 12: 56.
- Fraser-Jenkins, C.R. 1979b: *Dryopteris stewartii*, a new fern from the West Himalayas. *Kalikasan* 7: 269–274.
- Fraser-Jenkins, C.R. 1980a: *Dryopteris affinis*: a new treatment for a complex species in the European Pteridophyte flora. *Willdenowia* 10: 107–115.
- Fraser-Jenkins, C.R. 1980b: Nomenclatural notes on *Dryopteris*: 4. *Taxon* 29: 607–612.
- Fraser-Jenkins, C.R. 1986: A classification of the genus *Dryopteris* (Pteridophyta: Dryopteridaceae). *Bulletin of the British Museum (Natural History). Botany* 14: 183–218.
- Fraser-Jenkins, C.R.; Gandhi, K.N.; Kholia, B.S. 2018: *An annotated checklist of Indian pteridophytes. Part 2. Woodsiaceae to Dryopteridaceae*. Bishen Singh Mahendra Pal Singh, Dehra Dun, India.
- Fuchs, H.P. 1959: Identification et validité du *Polypodium pteridoides* Lamarck. *Bulletin de la Société Botanique de France* 105: 338–343.
- Gardner, J.J.S.; Perrie, L.; Shepherd, L.; Nagalingum, N.S. 2017: Taxonomic placement of unassigned species of Lastreopsid ferns (Dryopteridaceae) using phylogeny. *Systematic Botany* 42: 385–391.
- Gray, A. 1848: *A manual of the botany of the Northern United States*. James Munroe & Co., Boston.
-

-
- Green, P.S. 1994: Dryopteridaceae. In: *Flora of Australia*. Vol. 49. 600–606.
- He, H.; Wu, S.; Xiang, J.; Barrington, D.S. 2013: *Arachniodes*. In: Zhengyi, W.; Raven, P.H.; Deyuan, H. (ed.) *Flora of China. Lycopodiaceae through Polypodiaceae*. Vol. 2–3. Science Press, Beijing.
- Healy, A.J. 1958: Contributions to a knowledge of the adventive flora of New Zealand, No.6. *Transactions of the Royal Society of New Zealand* 85(4): 531–549.
- 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.
- Heenan, P.B.; de Lange, P.J.; Cameron, E.K.; Parris, B.S. 2008: Checklist of dicotyledons, gymnosperms, and pteridophytes naturalised or casual in New Zealand: additional records 2004–06. *New Zealand Journal of Botany* 46: 257–283.
- Herter, W.G.F. 1949: Flora del Uruguay. *Revista Sudamericana de Botánica* 9: 1–28.
- Hoffmann, G.F. 1796: *Deutschland Flora*. Vol. 2. J.J. Palm, Erlangen.
- Holttum, R.E. 1947: A revised classification of Leptosporangiate ferns. *Journal of the Linnean Society. Botany* 53: 123–158.
- Holttum, R.E. 1955: *A revised Flora of Malaya. Vol. II. Ferns of Malaya*. Government Printing Office, Singapore.
- Hombron, J.B.; Jacquinot, C. 1843–1853: *Botanique, Atlas*. Dumont D'Urville, J.S.C. (ed.) *Voyage au Pôle Sud et dans l'Océanie, sur les Corvettes l'Astrolabe et la Zélée: exécuté par ordre du roi pendant les années 1837-1838-1839-1840*. Gide & Baudry, Paris.
- Hooker, J.D. 1844–1845: *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*. I. Flora Antarctica. Part I. Botany of Lord Auckland's Group and Campbell's Island. Reeve, Brothers, London.
- 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, J.D. 1864: *Handbook of the New Zealand Flora: a systematic description of the native plants of New Zealand and the Chatham, Kermadec's, Lord Auckland's, Campbell's and Macquarie's Islands*. Part I. Reeve, London.
- Hooker, W.J. 1862a: *Species Filicum*. Vol. 4 (part 14). Pamplin, London.
- Hooker, W.J. 1862b: *Species Filicum*. Vol. 4, (part 13). Pamplin, London.
- Hoshizaki, B.J.; Moran, R.C. 2001: *Fern Grower's Manual*. Timber Press, Portland, Oregon.
- Houlston, J.; Moore, T. 1851: The genera and species of cultivated ferns. *Gardeners' Magazine of Botany, Horticulture, Floriculture, and Natural Science* 3: 314–332.
- Hylander, N. 1953: Taxa et nomina nova in opera meo: Nordisk kärlväxtflora I (1953) inclusa. *Botaniska Notiser* 1953(3): 352–359.
- Jones, D.L. 1998: Dryopteridaceae. In: *Flora of Australia*. Vol. 48. 393–418.
- Jonsell, B.; Jarvis, C.E. 1994: Lectotypifications of Linnaean names for the Flora Nordica Vol. 1 (Lycopodiaceae - Papaveraceae). *Nordic Journal of Botany* 14: 145–164.
- Kirk, T. 1882: Notes on plants from Campbell Island. *Transactions and Proceedings of the New Zealand Institute* 14: 387–389.
- Kramer, K.U. 1990: Dryopteridaceae. In: Kramer, K.U.; Green, P.S. (ed.) *The families and genera of vascular plants. 1 Pteridophytes and gymnosperms*. Springer-Verlag, Berlin.
- Kuntze, C.E.O. 1891: *Revisio Generum Plantarum*. Vol. 2. Arthur Felix, Leipzig.
- Kuntze, C.E.O. 1898: *Revisio Generum Plantarum*. Vol. 3 (Pars III). Arthur Felix, Leipzig.
- Kunze, G. 1848: Pteridographia Japonica. *Botanische Zeitung (Berlin)* 6: 569–573.
- Labiak, P.H.; Sundue, M.; Rouhan, G.; Hanks, J.G.; Mickel, J.T.; Moran, R.C. 2014: Phylogeny and historical biogeography of the lastreopsid ferns (Dryopteridaceae). *American Journal of Botany* 101: 1207–1228.
- Labiak, P.H.; Sundue, M.; Rouhan, G.; Moran, R.C. 2015a: New combinations in *Lastreopsis* and *Parapolystichum* (Dryopteridaceae). *Brittonia* 67: 79–86. (Published online: 2014)
- Labiak, P.H.; Sundue, M.; Rouhan, G.; Moran, R.C. 2015b: *Rhopalotricha*, a new subgenus of the fern genus *Lastreopsis* (Dryopteridaceae). *American Fern Journal* 105: 20–30.
-

-
- Large, M.F.; Braggins, J.E. 1991: *Spore atlas of New Zealand ferns and fern allies*. SIR Publishing, Wellington.
- Le Péchon, T.; He, H.; Zhang, L.; Zhou, X.-M.; Gao, X.-F.; Zhang, L.-B. 2016: Using a multilocus phylogeny to test morphology-based classifications of *Polystichum* (Dryopteridaceae), one of the largest fern genera. *BioMed Central Evolutionary Biology* 16: 55.
- Link, J.H.F. 1833: *Hortus Regius Botanicus Berolinensis*. Vol. 2. Reimer, Berlin.
- Linnaeus, C. 1753: *Species Plantarum*. Impensis Laurentii Salvii, Stockholm.
- Linné, C. von. 1782: *Supplementum plantarum*. Braunschweig, Germany.
- Liu, H.-M.; Zhang, X.-C.; Wang, M.-P.; Shang, H.; Zhou, S.-L.; Yan, Y.-H.; Wei, X.-P.; Xu, W.-B.; Schneider, H. 2016: Phylogenetic placement of the enigmatic fern genus *Trichoneuron* informs on the infra-familial relationships of Dryopteridaceae. *Plant Systematics and Evolution* 302: 319–322.
- Löve, Á.; Löve, D.; Pichi Sermolli, R.E.G. 1977: *Cytotaxonomical atlas of the Pteridophyta*. Cramer, Vaduz.
- Lovis, J.D. 1977: Evolutionary patterns and processes in ferns. *Advances in Botanical Research* 4: 229–415.
- Lovis, J.D. 1980: Adventive pteridophytes in Christchurch. *Canterbury Botanical Society Journal* 14: 1–4.
- Lowe, E.J. 1857: *Ferns: British and exotic*. Vol. 6. Groombridge & Sons, London.
- Lowe, R.T. 1838: Novitiae Florae Maderensis: or notes and gleanings of Maderan botany. *Transactions of the Cambridge Philosophical Society* 6: 523–551.
- Lu, N.T.; Ebihara, A.; He, H.; Zhang, L.; Zhou, X.-M.; Knapp, R.; Kamau, P.; Lorence, D.; Gao, X.-F.; Zhang, L.-B. 2019: A plastid phylogeny of the fern genus *Arachniodes* (Dryopteridaceae). *Molecular Phylogenetics and Evolution* 133: 214–235.
- Mazumdar, J. 2019: (2723) Proposal to conserve the name *Polypodium adiantiforme* (*Rumohra adiantiformis*) against *P. adianthoides* (Dryopteridaceae). *Taxon* 68: 1365.
- Mazumdar, J.; Callmander, M.W.; Fumeaux, N. 2019: Typification and nomenclature of the ferns described in N.L. Burman's Flora Indica. *Candollea* 74: 93–109.
- Mettenius, G.H. 1856: *Filices Horti Botanici Lipsiensis*. Leopold Voss, Leipzig.
- Michaux, A. 1803: *Flora Boreali-Americana*. Vol. 2. Crapelet, Paris.
- Moore, T. 1857–1862: *Index Filicum*. Pamplin, London.
- Morton, C.V. 1960: Observations on cultivated ferns. VI. The ferns currently known as *Rumohra*. *American Fern Journal* 50: 145–155.
- Mueller, F. 1864: *The vegetation of the Chatham Islands*. Government Printer, Melbourne.
- Müller, O.F. 1767: *Flora Fridrichsdalina*. J.G. Bauer, Strasbourg.
- Nakamura, M. (ed.) 2008: *Illustrated flora of ferns and fern allies of South Pacific Islands*. National Museum of Nature and Science Book Series No. 8. Tokai University Press, Tokyo.
- Nicolson, D.H.; Fosberg, F.R. 2003: The Forsters and the Botany of the Second Cook Expedition (1772–1775). *Regnum Vegetabile* 139: 1–760.
- Ogle, C.C.; de Lange, P.J.; Cameron, E.K.; Parris, B.S.; Champion, P.D. 2021: Checklist of dicotyledons, gymnosperms and pteridophytes naturalised or casual in New Zealand: additional records 2007–2019. *Perspectives in Biosecurity Research Series* 5: 45–116.
- Page, C.N. 1982: *The ferns of Britain and Ireland*. Cambridge University Press, Cambridge.
- Palmer, D.D. 2003: *Hawai'i's ferns and fern allies*. University of Hawai'i Press, Honolulu.
- Perrie, L.R.; Amice, R.; Shepherd, L.D.; Brownsey, P.J. 2021: *Lastreopsis abscondita* (Dryopteridaceae), a new fern species endemic to New Caledonia. *New Zealand Journal of Botany*: (published online) <https://doi.org/10.1080/0028825X.2021.1876742>.
- Perrie, L.R.; Brownsey, P.J. 2012: *Lastreopsis kermadecensis*, a new fern species from Raoul Island in the Kermadec Islands, New Zealand, with notes on *L. pacifica*. *New Zealand Journal of Botany* 50(1): 29–36.
- Perrie, L.R.; Brownsey, P.J.; Lockhart, P.J.; Large, M.F. 2003a: Evidence for an allopolyploid complex in New Zealand *Polystichum* (Dryopteridaceae). *New Zealand Journal of Botany* 41(2): 189–215.
-

-
- Perrie, L.R.; Brownsey, P.J.; Lockhart, P.J.; Large, M.F. 2003b: Morphological and genetic diversity in the New Zealand fern *Polystichum vestitum* (Dryopteridaceae), with special reference to the Chatham Islands. *New Zealand Journal of Botany* 41(4): 581–602.
- Perry, M.C. 1856: *Narrative of the expedition of an American squadron to the China Seas and Japan*. Beverley Tucker, Senate Printer, Washington.
- Pichi Sermolli, R.E.G. 1977: Tentamen Pteridophytorum genera in taxonomicum ordinem redigendi. *Webbia* 31: 313–512.
- Pichi Sermolli, R.E.G. 1984: A new species of *Dryopteris* from Tropical East Africa. *Webbia* 37: 329–339.
- PPG 1 2016: A community-derived classification for extant lycophytes. *Journal of Systematics and Evolution* 54(6): 563–603.
- Presl, C.B. 1825–1830: *Reliquiae Haenkeanae, seu, descriptiones et icones plantarum, quas in America meridionali et boreali, in insulis Philippinis et Marianis collegit Thaddaeus Haenke*. Vol. 1. Calve, Prague.
- Presl, C.B. 1836: *Tentamen Pteridographiae*. Haase, Prague.
- Presl, C.B. 1851: *Epimeliae botanicae*. Haase, Prague.
- Proctor, G.R. 1985: *Ferns of Jamaica*. British Museum (Natural History), London.
- Raddi, G. 1819: Synopsis filicum Brasiliensium. *Opuscoli Scientifici* 3: 279–294.
- Richard, A. 1832: Essai d'une Flore de la Nouvelle Zélande. In: Dumont d'Urville, J. *Voyage de découvertes de l'Astrolabe*. Botanique. Tastu, Paris.
- Roth, A.W. 1799: *Tentamen Florae Germanicae*. Vol. 3. Gleditsch, Leipzig.
- Roux, J.P. 2009: Synopsis of the Lycopodiophyta and Pteridophyta of Africa, Madagascar and neighbouring islands. *Strelitzia* 23: 1–296.
- Schkuhr, C. 1809: *Vier und zwanzigste Klasse des Linnéischen Pflanzensystems oder kryptogamische Gewächse*. Heft 1. Verfasser, Wittenberg.
- Schlechtendal, D.F.L. von 1825: *Adumbrationes Plantarum*. Fasc. 2. Dümmler, Berlin.
- Schott, H.W. 1834: *Genera filicum*. J.B. Wallishausser, Vienna.
- Smith, A.R. 1993: Dryopteridaceae. In: *Pteridophytes and Gymnosperms*. Vol. 2. In: Flora of North America Editorial Committee (ed.) *Flora of North America*. Oxford University Press, New York.
- 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. 1841: An arrangement and definition of the genera of ferns, with observations on the affinities of each genus. *Journal of Botany (Hooker)* 4: 147–198.
- Smith, J. 1846: An enumeration of ferns cultivated in the Royal Gardens at Kew, in December 1845: with characters and observations on some of the genera and species. *Companion to the Botanical Magazine New Series* 2: 7–39.
- Smith, J. 1875: *Historia Filicum; an exposition of the nature, number, and organography of ferns*. Macmillan, London.
- Sprengel, K.P.J. 1827: *Systema vegetabilium. Editio decima sexta*. Vol. 4. Dieterich, Göttingen.
- Sundue, M.; Hirai, R.Y.; Prado, J. 2013: *Rumohra glandulosissima* (Dryopteridaceae) a new species from the Atlantic rainforest, and revision of the species occurring in Brazil. *Systematic Botany* 38: 915–924.
- Swartz, O. 1788: *Nova Genera et Species Plantarum seu Prodrromus*. Swederus, Stockholm.
- Swartz, O.P. 1801: Genera et species filicum ordine systematico redactarum. *Journal für die Botanik (Schrader)* 1800(2): 1–120.
- Sykes, W. R. 1977: Kermadec Islands Flora: An annotated check list. *New Zealand Department of Scientific and Industrial Research Bulletin* 219: [1]–216.
- Tagawa, M. 1933: Spicilegium Pteridographiae Asiae Orientalis V. *Acta Phytotaxonomica et Geobotanica* 2: 189–205.
- Tindale, M.D. 1957: A preliminary revision of the genus *Lastreopsis* Ching. *Victorian Naturalist* 73: 180–185.
- Tindale, M.D. 1961a: Aspidiaceae. *Contributions from the New South Wales Herbarium, Flora Series* 211: 47–78.
-

-
- Tindale, M.D. 1961b: Studies in Australian Pteridophytes. No. 3. *Contributions from the New South Wales National Herbarium* 3: 88–92.
- Tindale, M.D. 1965: A monograph of the genus *Lastreopsis* Ching. *Contributions from the New South Wales National Herbarium* 3: 249–339.
- Tindale, M.D.; Roy, S.K. 2002: A cytotaxonomic survey of the Pteridophyta of Australia. *Australian Systematic Botany* 15: 839–937.
- Tutin, T.G.; Heywood, V.H.; Burges, N.A.; Valentine, D.H.; Walters, S.M.; Webb, D.A. (ed.) 1964: *Flora Europaea. Vol. 1. Lycopodiaceae to Platanaceae*. Cambridge University Press, Cambridge.
- Villars, D. 1786: *Histoire des plantes de Dauphiné*. Vol. 1. Prevost, Paris.
- Wawra von Fernsee, H. 1888: *Itinera principum S. Coburgi*. Vol. 2. Carl Gerold's Sohn, Vienna.
- Willdenow, C.L. 1810: *Species Plantarum*. Vol. 5 (1). G.C. Nauk, Berlin.
- Wilson, H.D. 1982: *Field Guide: Stewart Island Plants*. Field Guide Publications, Christchurch.
- Woynar, H. 1913: Bemerkungen über Farnpflanzen Steiermarks. *Mitteilungen des Naturwissenschaftlichen Vereines für Steiermark* 49: 120–200.
- Wu, S.; Xiang, J.; Lu, S.; Wang, F.; Xing, F.; Dong, S.; He, H.; Zhang, L.; Barrington, D.S.; Christenhusz, M.J.M. 2013: *Dryopteris*. In: Zhengyi, W.; Raven, P.H.; Deyuan, H. (ed.) *Flora of China. Lycopodiaceae through Polypodiaceae*. Vol. 2–3. Science Press, Beijing.
- Zhang, L.; Barrington, D.S. 2013a: *Cyrtomium*. In: Zhengyi, W.; Raven, P.H.; Deyuan, H. (ed.) *Flora of China. Lycopodiaceae through Polypodiaceae*. Vol. 2–3. Science Press, Beijing.
- Zhang, L.; Barrington, D.S. 2013b: *Polystichum*. In: Zhengyi, W.; Raven, P.H.; Deyuan, H. (ed.) *Flora of China. Lycopodiaceae through Polypodiaceae*. Vol. 2–3. Science Press, Beijing.
- Zhang, X. 2012: *Lycophytes and ferns of China*. Peking University Press, Beijing.

Acknowledgements

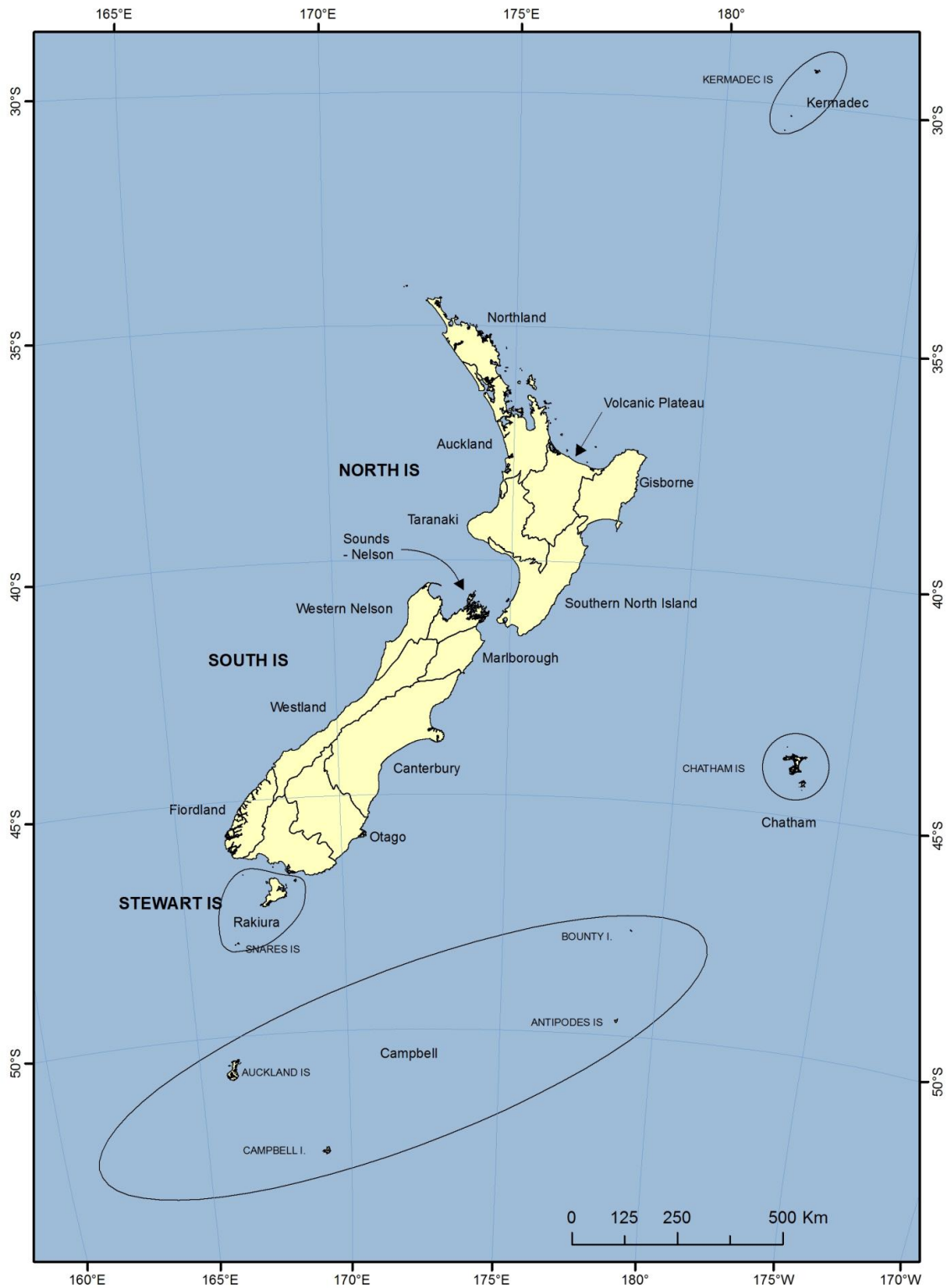
We thank the staff at AK, CHR and WELT for loans of specimens, and for databasing and providing spreadsheets of collection data. We are grateful to staff at CHR for the preparation of maps and for assistance in editing and formatting the text, to Chris Fraser-Jenkins for discussion relating to typification and etymology in *Dryopteris*, to Chris Ecroyd for making new collections of weedy species from Nelson, to Bridget Hatton for images of herbarium specimens at WELT, to Peter de Lange and Auckland Museum for use of their images, and to Barbara Parris for reviewing the manuscript.

P.J. Brownsey and L.R. Perrie

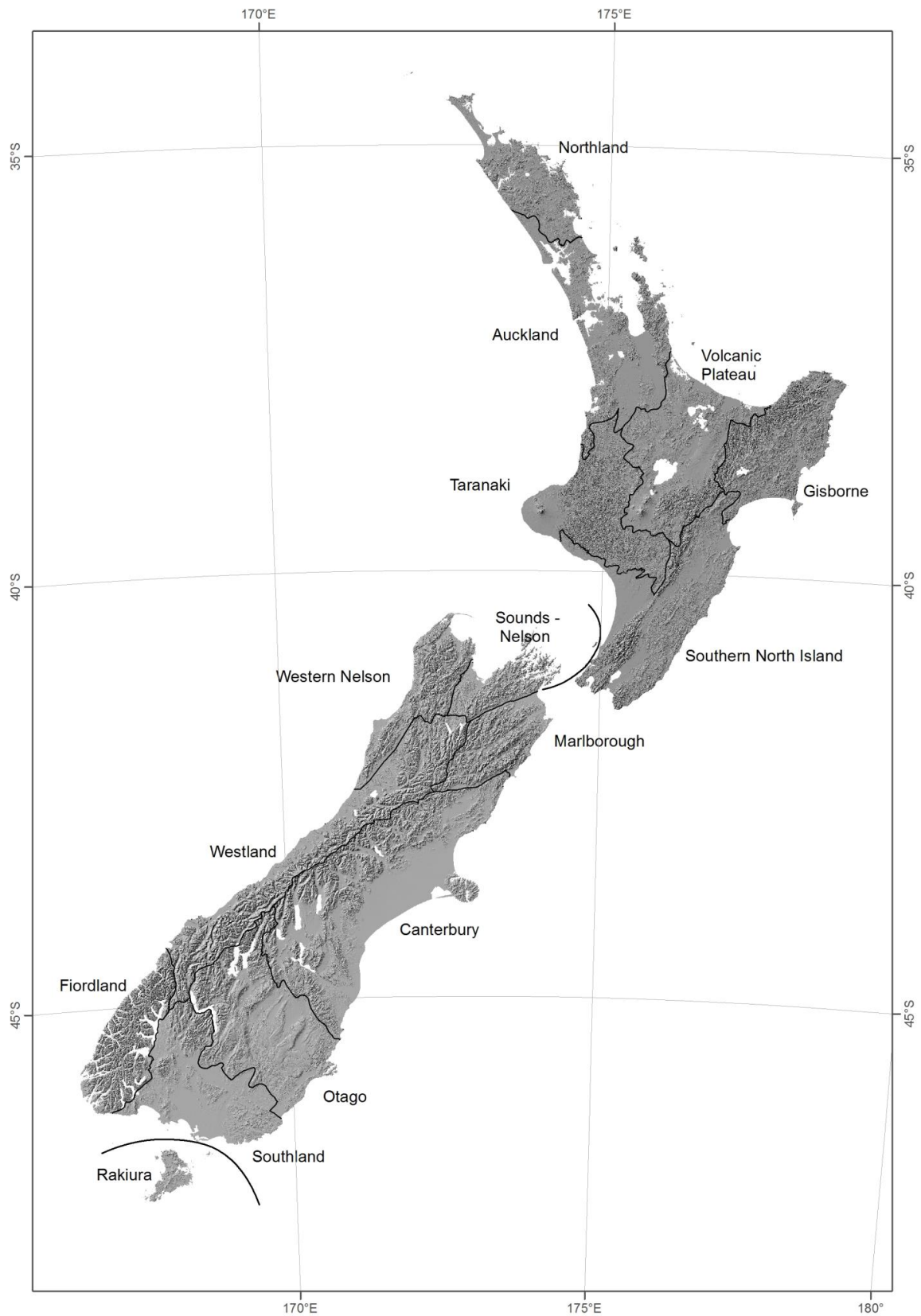
Museum of New Zealand Te Papa Tongarewa, PO Box 467, Wellington 6140, New Zealand

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

Index

Page numbers are in **bold** for the main entry, and *italic* for synonyms.

- Arachniodes* Blume 1, 2, **3**, 6, 9, 44
Arachniodes aristata (G.Forst.) Tindale 1, 3, **4**
Aspidium aculeatum var. *sylvaticum* (Colenso) Cheeseman 59
Aspidium aculeatum var. *vestitum* (G.Forst.) Hook. ex Hook.f. 62
Aspidium aristatum (G.Forst.) Sw. 4
Aspidium capense Willd. 68
Aspidium coriaceum (Sw.) Sw. 68
Aspidium cunninghamianum Colenso 68
Aspidium cunninghamii Colenso 68
Aspidium cycadinum Franch. & Sav. 13
Aspidium cystostegia Hook. 45
Aspidium erythrosorum D.C.Eaton 18
Aspidium falcatum (L.f.) Sw. 7
Aspidium formosanum Christ 22
Aspidium glabellum (A.Cunn.) E.J.Lowe 36
Aspidium hispidum Sw. 29
Aspidium inaequale Schldl. 23
Aspidium lentum D.Don 48
Aspidium oculatum Hook. 51
Aspidium perelegans Colenso 62
Aspidium polyblepharum Roem. ex Kunze 54
Aspidium proliferum R.Br. 55
Aspidium pulcherrimum Colenso 62
Aspidium richardii Hook. 49
Aspidium sieboldii van Houtte ex Mett. 25
Aspidium velutinum A.Rich. 32
Aspidium venustum (Hombr.) Hook.f. 62
Aspidium vestitum (G.Forst.) Sw. 62
Aspidium waikarense Colenso 62
Aspidium wallichianum Spreng. 27
Aspidium wawranum Szyszyl. 65
Aspidium zerophyllum Colenso 49
Byrsopteris C.V.Morton 3
Byrsopteris aristata (G.Forst.) C.V.Morton 4
Ctenitis glabella (A.Cunn.) Copel. 36
Ctenitis pentangularis (Colenso) Alston 32
Ctenitis velutina (A.Rich.) Copel. 32
Cyrtomium C.Presl 1–3, **6**, 44
Cyrtomium falcatum (L.f.) C.Presl 1, 6, **7**
Dryopteridaceae Herter 1, **2**, 45
Dryopteris Adans. 1–3, 6, **9**, 44
Dryopteris adiantiformis (G.Forst.) Kuntze 68
Dryopteris affinis (Lowe) Fraser-Jenk. 9, **10**, 20, 24
Dryopteris aristata (G.Forst.) Kuntze 4
Dryopteris carthusiana (Vill.) H.P.Fuchs 9, **12**
Dryopteris cycadina (Franch. & Sav.) C.Chr. 9, **13**
Dryopteris cystostegia (Hook.) Kuntze 45
Dryopteris dilatata (Hoffm.) A.Gray 9, 13, **15**
Dryopteris erythrosora (D.C.Eaton) Kuntze 9, **18**
Dryopteris falcata (L.f.) Kuntze 7
Dryopteris filix-mas (L.) Schott 1, 9, 11, **19**
Dryopteris formosana (Christ) C.Chr. 9, **22**
Dryopteris glabella (A.Cunn.) C.Chr. 36
Dryopteris hispida (Sw.) Kuntze 29
Dryopteris inaequalis (Schldl.) Kuntze 9, **23**
Dryopteris kinkiensis Koidz. ex Tagawa 9, **24**
Dryopteris oculata (Hook.) Kuntze 51
Dryopteris richardii (Hook.) Kuntze 49
Dryopteris sieboldii (van Houtte ex Mett.) Kuntze 9, **25**
Dryopteris stewartii Fraser-Jenk. 9, **26**
Dryopteris velutina (A.Rich.) Kuntze 32
Dryopteris wallichiana (Spreng.) Hyl. 9, **27**
Hypopeltis Michx. 44
Hypopeltis coriacea (Sw.) Bory 68
Hypopeltis prolifera (R.Br.) Bory 55
Lastrea aristata (G.Forst.) T.Moore 4
Lastrea glabella (A.Cunn.) Houlston & T.Moore 36
Lastrea hispida (Sw.) Houlston & T.Moore 29
Lastrea velutina (A.Rich.) Brack. 32
Lastreopsis Ching 1, 2, **28**, 34, 35, 39
Lastreopsis glabella (A.Cunn.) Tindale 36
Lastreopsis hispida (Sw.) Tindale 1, 28, 29, **29**
Lastreopsis kermadecensis Perrie & Brownsey 38
Lastreopsis microsora (Endl.) Tindale 41
Lastreopsis microsora subsp. *pentangularis* (Colenso) Tindale 32
Lastreopsis velutina (A.Rich.) Tindale 1, 29, **32**, 35, 42
Nephrodium affine Lowe 10
Nephrodium aristatum (G.Forst.) C.Presl 4
Nephrodium decompositum var. *glabellum* (A.Cunn.) Hook.f. 36
Nephrodium decompositum var. *microphyllum* Hook. 36
Nephrodium decompositum var. *pubescens* Hook.f. 41
Nephrodium glabellum A.Cunn. 36
Nephrodium hispidum (Sw.) Hook. 29
Nephrodium microsorum Endl. 41
Nephrodium pentangulare Colenso 32
Nephrodium velutinum (A.Rich.) Hook.f. 32
Parapolystichum (Keyserl.) Ching 1, 2, 28, 29, **34**, 39
Parapolystichum glabellum (A.Cunn.) Labiak, Sundue & R.C.Moran 1, 35, **36**, 39, 42
Parapolystichum kermadecense (Perrie & Brownsey) Perrie & L.D.Sheph. 1, 37, **38**, 42
Parapolystichum microsorum (Endl.) Labiak, Sundue & R.C.Moran 1, 33, 37, **41**
Parapolystichum microsorum subsp. *pentangulare* (Colenso) Labiak, Sundue & R.C.Moran 32
Phanerophlebia falcata (L.f.) Copel. 7
Polypodium adiantiforme G.Forst. 68
Polypodium aristatum G.Forst. 4
-

Polypodium carthusiana Vill. 12
Polypodium coriaceum Sw. 68
Polypodium dilatatum Hoffm. 15
Polypodium falcatum L.f. 7
Polypodium filix-mas L. 19
Polypodium setiferum Forssk. 57
Polypodium setosum G.Forst. 29
Polypodium sylvaticum Colenso 59
Polypodium vestitum G.Forst. 62
Polystichopsis (J.Sm.) Holttum 3
Polystichopsis aristata (G.Forst.) Holttum 4
Polystichum Roth 1, 2, 6, **44**, 58, 60
Polystichum aculeatum var. *perelegans*
(Colenso) Domin 62
Polystichum aculeatum var. *proliferum* (R.Br.)
Domin 55
Polystichum aculeatum var. *sylvaticum* (Diels)
Domin 59
Polystichum aculeatum var. *vestitum* (G.Forst.)
Domin 62
Polystichum aculeatum var. *zerophyllum*
(Colenso) Domin 49
Polystichum adiantiforme (G.Forst.) J.Sm. 68
Polystichum aristatum (G.Forst.) C.Presl 4
Polystichum capense (Willd.) J.Sm. 68
Polystichum coriaceum (Sw.) Schott 68
Polystichum cystostegia (Hook.) J.B.Armstr. 1,
44, **45**, 50, 52, 60, 63, 66
Polystichum falcatum (L.f.) Diels 7
Polystichum hispidum (Sw.) J.Sm. 29
Polystichum lentum (D.Don) T.Moore 44, **48**, 56
Polystichum neozelandicum Fée 1, 44, **49**, 52,
63, 66
Polystichum neozelandicum subsp.
zerophyllum (Colenso) Perrie 49
Polystichum oculatum (Hook.) J.B.Armstr. 1, 44,
50, **51**, 63, 66
Polystichum perelegans (Colenso) C.Chr. 62
Polystichum polyblepharum (Roem. ex Kunze)
C.Presl 44, **54**
Polystichum proliferum (R.Br.) C.Presl 44, **55**
Polystichum richardii (Hook.) J.Sm. 49
Polystichum richardii var. *oculatum* (Hook.)
C.Chr. 51
Polystichum schkuhrii C.Presl 29
Polystichum setiferum (Forssk.) T.Moore ex
Woy. 44, **57**
Polystichum sylvaticum Diels 1, 44, 50, 52, **59**,
63, 66
Polystichum venustum Hombr. 62
Polystichum vestitum (G.Forst.) C.Presl 1, 44,
46, 50, 52, 56, 60, **62**, 66
Polystichum vestitum subsp. *sylvaticum* (Diels)
C.Chr. 59
Polystichum wawranum (Szyszyl.) Perrie 1, 44,
50, 52, 63, **65**
Polystichum zerophyllum (Colenso) C.Chr. 49
Rumohra Raddi 1, 2, 29, **67**
Rumohra adiantiformis (G.Forst.) Ching 1, 67,
68

Rumohra aristata (G.Forst.) Ching 4
Rumohra hispida (Sw.) Copel. 29
Tectaria coriacea (Sw.) Link 68

Image Information

Image	Creator	Copyright	Licence
Front cover	L.R. Perrie	© Leon Perrie	CC-BY-NC 3.0 NZ
Fig. 1	K.Boardman	© Landcare Research 2020	CC-BY 4.0
Fig. 2	P.J. de Lange	© Peter de Lange	All rights reserved
Fig. 3	B. Hatton	© Te Papa	CC-BY-NC 3.0 NZ
Fig. 4	B. Hatton	© Te Papa	CC-BY-NC 3.0 NZ
Fig. 5	K.Boardman	© Landcare Research 2020	CC-BY 4.0
Fig. 6	L.R. Perrie	© Leon Perrie	CC-BY-NC 3.0 NZ
Fig. 7	L.R. Perrie	© Leon Perrie	CC-BY-NC 3.0 NZ
Fig. 8	L.R. Perrie	© Leon Perrie	CC-BY-NC 3.0 NZ
Fig. 9	L.R. Perrie	© Leon Perrie	CC-BY-NC 3.0 NZ
Fig. 10	L.R. Perrie	© Leon Perrie	CC-BY-NC 3.0 NZ
Fig. 11	L.R. Perrie	© Leon Perrie	CC-BY-NC 3.0 NZ
Fig. 12	K.Boardman	© Landcare Research 2020	CC-BY 4.0
Fig. 13	L.R. Perrie	© Leon Perrie	CC-BY-NC 3.0 NZ
Fig. 14	L.R. Perrie	© Leon Perrie	CC-BY-NC 3.0 NZ
Fig. 15	L.R. Perrie	© Leon Perrie	CC-BY-NC 3.0 NZ
Fig. 16	L.R. Perrie	© Leon Perrie	CC-BY-NC 3.0 NZ
Fig. 17	L.R. Perrie	© Leon Perrie	CC-BY-NC 3.0 NZ
Fig. 18	L.R. Perrie	© Leon Perrie	CC-BY-NC 3.0 NZ
Fig. 19	K.Boardman	© Landcare Research 2020	CC-BY 4.0
Fig. 20	Auckland Museum	© Auckland Museum	All rights reserved
Fig. 21	Auckland Museum	© Auckland Museum	All rights reserved
Fig. 22	K.Boardman	© Landcare Research 2020	CC-BY 4.0
Fig. 23	L.R. Perrie	© Leon Perrie	CC-BY-NC 3.0 NZ
Fig. 24	L.R. Perrie	© Leon Perrie	CC-BY-NC 3.0 NZ
Fig. 25	L.R. Perrie	© Leon Perrie	CC-BY-NC 3.0 NZ
Fig. 26	L.R. Perrie	© Leon Perrie	CC-BY-NC 3.0 NZ
Fig. 27	B. Hatton	© Te Papa	CC-BY-NC 3.0 NZ
Fig. 28	B. Hatton	© Te Papa	CC-BY-NC 3.0 NZ
Fig. 29	K.Boardman	© Landcare Research 2020	CC-BY 4.0
Fig. 30	L.R. Perrie	© Leon Perrie	CC-BY-NC 3.0 NZ
Fig. 31	L.R. Perrie	© Leon Perrie	CC-BY-NC 3.0 NZ
Fig. 32	L.R. Perrie	© Leon Perrie	CC-BY-NC 3.0 NZ
Fig. 33	L.R. Perrie	© Leon Perrie	CC-BY-NC 3.0 NZ
Fig. 34	L.R. Perrie	© Leon Perrie	CC-BY-NC 3.0 NZ
Fig. 35	L.R. Perrie	© Leon Perrie	CC-BY-NC 3.0 NZ
Fig. 36	K.Boardman	© Landcare Research 2020	CC-BY 4.0
Fig. 37	L.R. Perrie	© Leon Perrie	CC-BY-NC 3.0 NZ
Fig. 38	L.R. Perrie	© Leon Perrie	CC-BY-NC 3.0 NZ
Fig. 39	L.R. Perrie	© Leon Perrie	CC-BY-NC 3.0 NZ
Fig. 40	L.R. Perrie	© Leon Perrie	CC-BY-NC 3.0 NZ
Fig. 41	L.R. Perrie	© Leon Perrie	CC-BY-NC 3.0 NZ
Fig. 42	Auckland Museum	© Auckland Museum	All rights reserved
Fig. 43	K.Boardman	© Landcare Research 2020	CC-BY 4.0
Fig. 44	L.R. Perrie	© Leon Perrie	CC-BY-NC 3.0 NZ
Fig. 45	L.R. Perrie	© Leon Perrie	CC-BY-NC 3.0 NZ
Fig. 46	L.R. Perrie	© Leon Perrie	CC-BY-NC 3.0 NZ
Fig. 47	L.R. Perrie	© Leon Perrie	CC-BY-NC 3.0 NZ
Fig. 48	L.R. Perrie	© Leon Perrie	CC-BY-NC 3.0 NZ
Fig. 49	L.R. Perrie	© Leon Perrie	CC-BY-NC 3.0 NZ
Fig. 50	L.R. Perrie	© Leon Perrie	CC-BY-NC 3.0 NZ
Fig. 51	L.R. Perrie	© Leon Perrie	CC-BY-NC 3.0 NZ
Fig. 52	K.Boardman	© Landcare Research 2020	CC-BY 4.0
Fig. 53	Auckland Museum	© Auckland Museum	All rights reserved
Fig. 54	Auckland Museum	© Auckland Museum	All rights reserved
Fig. 55	K.Boardman	© Landcare Research 2020	CC-BY 4.0
Fig. 56	Auckland Museum	© Auckland Museum	All rights reserved

Fig. 57	K.Boardman	© Landcare Research 2020	CC-BY 4.0
Fig. 58	Auckland Museum	© Auckland Museum	All rights reserved
Fig. 59	K.Boardman	© Landcare Research 2020	CC-BY 4.0
Fig. 60	Auckland Museum	© Auckland Museum	All rights reserved
Fig. 61	Auckland Museum	© Auckland Museum	All rights reserved
Fig. 62	K.Boardman	© Landcare Research 2020	CC-BY 4.0
Fig. 63	Auckland Museum	© Auckland Museum	All rights reserved
Fig. 64	Auckland Museum	© Auckland Museum	All rights reserved
Fig. 65	K.Boardman	© Landcare Research 2020	CC-BY 4.0
Fig. 66	Auckland Museum	© Auckland Museum	All rights reserved
Fig. 67	Auckland Museum	© Auckland Museum	All rights reserved
Fig. 68	K.Boardman	© Landcare Research 2020	CC-BY 4.0
Fig. 69	L.R. Perrie	© Te Papa	CC-BY-NC 3.0 NZ
Fig. 70	L.R. Perrie	© Te Papa	CC-BY-NC 3.0 NZ
Fig. 71	L.R. Perrie	© Leon Perrie	CC-BY-NC 3.0 NZ
Fig. 72	L.R. Perrie	© Leon Perrie	CC-BY-NC 3.0 NZ
Fig. 73	L.R. Perrie	© Leon Perrie	CC-BY-NC 3.0 NZ
Fig. 74	L.R. Perrie	© Leon Perrie	CC-BY-NC 3.0 NZ
Fig. 75	K.Boardman	© Landcare Research 2020	CC-BY 4.0
Fig. 76	L.R. Perrie	© Leon Perrie	CC-BY-NC 3.0 NZ
Fig. 77	L.R. Perrie	© Leon Perrie	CC-BY-NC 3.0 NZ
Fig. 78	L.R. Perrie	© Leon Perrie	CC-BY-NC 3.0 NZ
Fig. 79	L.R. Perrie	© Leon Perrie	CC-BY-NC 3.0 NZ
Fig. 80	L.R. Perrie	© Leon Perrie	CC-BY-NC 3.0 NZ
Fig. 81	L.R. Perrie	© Leon Perrie	CC-BY-NC 3.0 NZ
Fig. 82	K.Boardman	© Landcare Research 2020	CC-BY 4.0
Fig. 83	L.R. Perrie	© Te Papa	CC-BY-NC 3.0 NZ
Fig. 84	L.R. Perrie	© Te Papa	CC-BY-NC 3.0 NZ
Fig. 85	L.R. Perrie	© Leon Perrie	CC-BY-NC 3.0 NZ
Fig. 86	L.R. Perrie	© Te Papa	CC-BY-NC 3.0 NZ
Fig. 87	L.R. Perrie	© Leon Perrie	CC-BY-NC 3.0 NZ
Fig. 88	L.R. Perrie	© Leon Perrie	CC-BY-NC 3.0 NZ
Fig. 89	K.Boardman	© Landcare Research 2020	CC-BY 4.0
Fig. 90	P.J. de Lange	© Peter de Lange	All rights reserved
Fig. 91	P.J. de Lange	© Peter de Lange	All rights reserved
Fig. 92	P.J. de Lange	© Peter de Lange	All rights reserved
Fig. 93	P.J. de Lange	© Peter de Lange	All rights reserved
Fig. 94	B. Hatton	© Te Papa	CC-BY-NC 3.0 NZ
Fig. 95	B. Hatton	© Te Papa	CC-BY-NC 3.0 NZ
Fig. 96	K.Boardman	© Landcare Research 2020	CC-BY 4.0
Fig. 97	L.R. Perrie	© Leon Perrie	CC-BY-NC 3.0 NZ
Fig. 98	L.R. Perrie	© Leon Perrie	CC-BY-NC 3.0 NZ
Fig. 99	L.R. Perrie	© Leon Perrie	CC-BY-NC 3.0 NZ
Fig. 100	L.R. Perrie	© Leon Perrie	CC-BY-NC 3.0 NZ
Fig. 101	L.R. Perrie	© Leon Perrie	CC-BY-NC 3.0 NZ
Fig. 102	L.R. Perrie	© Leon Perrie	CC-BY-NC 3.0 NZ
Fig. 103	L.R. Perrie	© Leon Perrie	CC-BY-NC 3.0 NZ
Fig. 104	L.R. Perrie	© Leon Perrie	CC-BY-NC 3.0 NZ
Fig. 105	K.Boardman	© Landcare Research 2020	CC-BY 4.0
Fig. 106	L.R. Perrie	© Leon Perrie	CC-BY-NC 3.0 NZ
Fig. 107	L.R. Perrie	© Leon Perrie	CC-BY-NC 3.0 NZ
Fig. 108	L.R. Perrie	© Leon Perrie	CC-BY-NC 3.0 NZ
Fig. 109	L.R. Perrie	© Leon Perrie	CC-BY-NC 3.0 NZ
Fig. 110	L.R. Perrie	© Leon Perrie	CC-BY-NC 3.0 NZ
Fig. 111	L.R. Perrie	© Leon Perrie	CC-BY-NC 3.0 NZ
Fig. 112	K.Boardman	© Landcare Research 2020	CC-BY 4.0
Fig. 113	B. Hatton	© Te Papa	CC-BY-NC 3.0 NZ
Fig. 114	B. Hatton	© Te Papa	CC-BY-NC 3.0 NZ
Fig. 115	K.Boardman	© Landcare Research 2020	CC-BY 4.0
Fig. 116	L.R. Perrie	© Leon Perrie	CC-BY-NC 3.0 NZ
Fig. 117	L.R. Perrie	© Leon Perrie	CC-BY-NC 3.0 NZ
Fig. 118	L.R. Perrie	© Leon Perrie	CC-BY-NC 3.0 NZ

Fig. 119	L.R. Perrie	© Leon Perrie	CC-BY-NC 3.0 NZ
Fig. 120	L.R. Perrie	© Leon Perrie	CC-BY-NC 3.0 NZ
Fig. 121	L.R. Perrie	© Leon Perrie	CC-BY-NC 3.0 NZ
Fig. 122	K.Boardman	© Landcare Research 2020	CC-BY 4.0
Fig. 123	L.R. Perrie	© Leon Perrie	CC-BY-NC 3.0 NZ
Fig. 124	L.R. Perrie	© Leon Perrie	CC-BY-NC 3.0 NZ
Fig. 125	L.R. Perrie	© Leon Perrie	CC-BY-NC 3.0 NZ
Fig. 126	L.R. Perrie	© Te Papa	CC-BY-NC 3.0 NZ
Fig. 127	L.R. Perrie	© Leon Perrie	CC-BY-NC 3.0 NZ
Fig. 128	L.R. Perrie	© Leon Perrie	CC-BY-NC 3.0 NZ
Fig. 129	K.Boardman	© Landcare Research 2020	CC-BY 4.0
Fig. 130	L.R. Perrie	© Leon Perrie	CC-BY-NC 3.0 NZ
Fig. 131	L.R. Perrie	© Leon Perrie	CC-BY-NC 3.0 NZ
Fig. 132	L.R. Perrie	© Leon Perrie	CC-BY-NC 3.0 NZ
Fig. 133	L.R. Perrie	© Leon Perrie	CC-BY-NC 3.0 NZ
Fig. 134	K.Boardman	© Landcare Research 2020	CC-BY 4.0
Fig. 135	L.R. Perrie	© Leon Perrie	CC-BY-NC 3.0 NZ
Fig. 136	L.R. Perrie	© Leon Perrie	CC-BY-NC 3.0 NZ
Fig. 137	L.R. Perrie	© Leon Perrie	CC-BY-NC 3.0 NZ
Fig. 138	L.R. Perrie	© Leon Perrie	CC-BY-NC 3.0 NZ
Fig. 139	B. Hatton	© Te Papa	CC-BY-NC 3.0 NZ
Fig. 140	B. Hatton	© Te Papa	CC-BY-NC 3.0 NZ
Fig. 141	K.Boardman	© Landcare Research 2020	CC-BY 4.0
Fig. 142	L.R. Perrie	© Leon Perrie	CC-BY-NC 3.0 NZ
Fig. 143	L.R. Perrie	© Leon Perrie	CC-BY-NC 3.0 NZ
Fig. 144	B. Hatton	© Te Papa	CC-BY-NC 3.0 NZ
Fig. 145	B. Hatton	© Te Papa	CC-BY-NC 3.0 NZ
Fig. 146	K.Boardman	© Landcare Research 2020	CC-BY 4.0
Fig. 147	L.R. Perrie	© Leon Perrie	CC-BY-NC 3.0 NZ
Fig. 148	L.R. Perrie	© Te Papa	CC-BY-NC 3.0 NZ
Fig. 149	L.R. Perrie	© Leon Perrie	CC-BY-NC 3.0 NZ
Fig. 150	L.R. Perrie	© Leon Perrie	CC-BY-NC 3.0 NZ
Fig. 151	L.R. Perrie	© Leon Perrie	CC-BY-NC 3.0 NZ
Fig. 152	L.R. Perrie	© Leon Perrie	CC-BY-NC 3.0 NZ
Fig. 153	K.Boardman	© Landcare Research 2020	CC-BY 4.0
Fig. 154	L.R. Perrie	© Leon Perrie	CC-BY-NC 3.0 NZ
Fig. 155	L.R. Perrie	© Te Papa	CC-BY-NC 3.0 NZ
Fig. 156	L.R. Perrie	© Te Papa	CC-BY-NC 3.0 NZ
Fig. 157	L.R. Perrie	© Leon Perrie	CC-BY-NC 3.0 NZ
Fig. 158	L.R. Perrie	© Te Papa	CC-BY-NC 3.0 NZ
Fig. 159	L.R. Perrie	© Te Papa	CC-BY-NC 3.0 NZ
Fig. 160	L.R. Perrie	© Te Papa	CC-BY-NC 3.0 NZ
Fig. 161	L.R. Perrie	© Te Papa	CC-BY-NC 3.0 NZ
Fig. 162	K.Boardman	© Landcare Research 2020	CC-BY 4.0
Fig. 163	L.R. Perrie	© Leon Perrie	CC-BY-NC 3.0 NZ
Fig. 164	L.R. Perrie	© Leon Perrie	CC-BY-NC 3.0 NZ
Fig. 165	L.R. Perrie	© Te Papa	CC-BY-NC 3.0 NZ
Fig. 166	L.R. Perrie	© Te Papa	CC-BY-NC 3.0 NZ
Fig. 167	L.R. Perrie	© Leon Perrie	CC-BY-NC 3.0 NZ
Fig. 168	L.R. Perrie	© Leon Perrie	CC-BY-NC 3.0 NZ
Fig. 169	K.Boardman	© Landcare Research 2020	CC-BY 4.0
Fig. 170	L.R. Perrie	© Te Papa	CC-BY-NC 3.0 NZ
Fig. 171	L.R. Perrie	© Te Papa	CC-BY-NC 3.0 NZ
Fig. 172	L.R. Perrie	© Leon Perrie	CC-BY-NC 3.0 NZ
Fig. 173	L.R. Perrie	© Te Papa	CC-BY-NC 3.0 NZ
Fig. 174	L.R. Perrie	© Te Papa	CC-BY-NC 3.0 NZ
Fig. 175	L.R. Perrie	© Te Papa	CC-BY-NC 3.0 NZ
Fig. 176	L.R. Perrie	© Leon Perrie	CC-BY-NC 3.0 NZ
Fig. 177	L.R. Perrie	© Leon Perrie	CC-BY-NC 3.0 NZ
Map 1	A.D. Wilton	© Landcare Research 2014	CC-BY 3.0 NZ
Map 2	A.D. Wilton	© Landcare Research 2014	CC-BY 3.0 NZ

Flora of New Zealand: PDF publications

The electronic Flora of New Zealand (**eFloraNZ**) project provides dynamic, continually updated, online taxonomic information about the New Zealand flora. Collaborators in the project are Manaaki Whenua – Landcare Research, the Museum of New Zealand Te Papa Tongarewa, and the National Institute of Water and Atmospheric Research (NIWA).

The eFloraNZ presents new systematic research and brings together information from the Manaaki Whenua – Landcare Research network of databases and online resources. New taxonomic treatments are published as fascicles in PDF format and provide the basis for other eFloraNZ products, including the web profiles.

eFloraNZ will have separate sets of PDF publications for algae, lichens, liverworts and hornworts, mosses, ferns and lycophytes, and seed plants.

For each eFloraNZ set the PDF files are made available as dated and numbered fascicles. With the advent of new discoveries and research the fascicles may be revised, with the new fascicle being treated as a separate version under the same number. However, superseded accounts will remain available on the eFlora website.

Fern and Lycophyte Set (ISBN 978-0-478-34761-6)

The Fern and Lycophyte Set includes ferns and lycophytes indigenous to New Zealand, together with exotic species that have established in the wild. Species that are found only in cultivation are excluded.

Editor-in-Chief: Aaron Wilton

Series Editor: Ilse Breitwieser

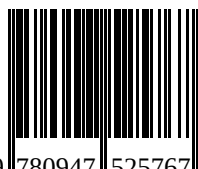
Steering committee: Ilse Breitwieser, Pat Brownsey, Wendy Nelson, Rob Smissen, Aaron Wilton

Technical production: Kate Boardman, Bavo de Pauw, Sue Gibb, Ines Schönberger, Katarina Tawiri, Margaret Watts, Aaron Wilton

Copy Editor: Ray Prebble



ISBN 978-0-947525-76-7



9 780947 525767