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Cover image: *Hymenophyllum demissum*. Mature fertile frond.

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Contents

Introduction

Hymenophyllaceae is the largest family of ferns in New Zealand with 31 indigenous species, of which 17 are endemic. In the interests of nomenclatural stability and because of the difficulty of identifying segregate genera morphologically, two umbrella genera, *Hymenophyllum* and *Trichomanes*, are recognised here. *Abrodictyum*, *Crepidomanes* and *Polyphlebium* are segregates of *Trichomanes sensu lato*, and *Cardiomanes* is now included within *Hymenophyllum*.

The family comprises terrestrial or epiphytic ferns that have long-creeping or erect rhizomes, an indumentum of hairs, membranous and often translucent laminae, marginal sori, tubular or bivalvate indusia, extended receptacles, sporangia with an oblique annulus, and trilete, green spores. In New Zealand, most species of *Hymenophyllum* are characterised by their bivalvate indusia and receptacles that are included within the valves, but three New Zealand species have receptacles that are sometimes exserted for a short distance beyond the indusium, and in *H. nephrophyllum* the indusia are urceolate. The rhizomes are generally almost glabrous or bear only scattered hairs near the stipe bases. By contrast, species of *Trichomanes* have tubular indusia with long-exserted receptacles, and rhizomes which are abundantly covered in red-brown hairs. The three trichomanoid segregates in New Zealand are difficult to separate morphologically and are distinguished primarily on the basis of molecular differences.

DNA sequence data indicates that the hymenophylloid clade has diversified more recently than the trichomanoid clade. It also displays less morphological variation and ecological diversification. Ten subgenera in *Hymenophyllum* are recognised worldwide, of which nine occur in New Zealand and two are endemic to the region, suggesting that New Zealand and the Pacific is a centre of diversity for the genus.

Of the 31 species of Hymenophyllaceae occurring in the New Zealand region, three are found only on the Kermadec Islands or with an outlying population in Northland. Of the remaining 28 species, 21 have a widespread or westerly distribution in the North Island but are largely, or completely, confined to western parts of the South Island, reflecting a preference for wetter habitats. Three species, *Hymenophyllum australe*, *H. cupressiforme* and *Trichomanes endlicherianum*, are widespread in the North Island, but in the South Island are more common on the eastern side. Four species, *Hymenophyllum minimum*, *H. multifidum*, *H. peltatum* and *H. villosum*, are widespread in both islands. Eight species, *H. bivalve*, *H. malingii*, *H. minimum*, *H. peltatum*, *H. pulcherrimum*, *H. rufescens*, *H. villosum* and *Trichomanes colensoi* are rare or absent north of latitude 38°S; three species, *Trichomanes elongatum*, *T. endlicherianum* and *Hymenophyllum cupressiforme*, are rare or absent in the southern half of the South Island, and a further three, *H. flexuosum*, *H. malingii* and *Trichomanes colensoi*, extend to the southern South Island but are absent from Stewart Island.

Hymenophyllaceae Mart., *Consp. Regn. Veg.,* 3 (1835)

Epiphytic, terrestrial or rupestral ferns. Rhizomes often long-creeping or occasionally erect, bearing multicellular hairs, lacking scales. Fronds monomorphic, not articulated to rhizome. Laminae undivided to 5-pinnatifid, or flabellate, digitate or dichotomously divided, anadromous or catadromous, membranous and usually one cell thick or occasionally 2–4 cells thick, often translucent, lacking stomata, glabrous or hairy. Veins free (NZ) or rarely anastomosing (not NZ). Sori terminal on veins at margins of lamina; paraphyses absent; indusia urceolate, campanulate, tubular or deeply bivalvate; receptacles short, capitate or clavate to long and exserted; maturation of sporangia gradate, developing basipetally. Sporangia with oblique annulus, 32–256 spores per sporangium. Homosporous; spores trilete, papillate to echinate, chlorophyllous.

Taxonomy: A family with c. 600 species (Iwatsuki in Kramer & Green 1990). Nine genera have been proposed by Ebihara et al. (2006). However, in the interests of nomenclatural stability we prefer to recognise two traditional umbrella genera in New Zealand.

Numerous subdivisions of the Hymenophyllaceae have been proposed in the past resulting in several fundamentally different classifications. Most recently, the family has been revised by Ebihara et al. (2006). They recognised two major clades largely corresponding to the traditional umbrella genera, *Hymenophyllum* and *Trichomanes*, albeit with a few small groups transferred to the hymenophylloid lineage. The hymenophylloid clade appears to have diversified more recently than the trichomanoid clade, and displays less morphological variation and ecological diversification.

Ebihara et al. (2006) proposed a single genus (*Hymenophyllum*) for the hymenophylloid clade, with 10 subgenera. By contrast, they proposed eight genera (*Abrodictyum*, *Callistopteris*, *Cephalomanes*, *Crepidomanes*, *Didymoglossum*, *Polyphlebium*, *Trichomanes* and *Vandenboschia*) in the trichomanoid clade, each with one to four subgenera. The molecular phylogeny showed that the monotypic genus *Cardiomanes*, previously regarded as trichomanoid (Copeland 1933), actually belongs in the *Hymenophyllum* lineage. Nine genera were accepted by Smith et al. (2006).

If the subdivision of Hymenophyllaceae proposed by Ebihara et al. (2006) is accepted, the family is represented in New Zealand by four indigenous genera, *Hymenophyllum*, *Abrodictyum*, *Polyphlebium*, and *Crepidomanes*. However, it is virtually impossible to find macro-morphological characters that consistently discriminate these genera for all species. In New Zealand, where Hymenophyllaceae is the largest family of ferns, and many of the species are widespread, this is very unsatisfactory. Previously, two umbrella genera, *Hymenophyllum* and *Trichomanes*, have generally been recognised in New Zealand (Allan 1961; Brownsey et al. 1985; Brownsey & Smith-Dodsworth 2000), and the segregate genus *Cardiomanes* has sometimes been used for the distinctive endemic kidney fern (e.g. Crookes 1963). Since both *Hymenophyllum* and *Trichomanes* are monophyletic when interpreted broadly, and are generally readily distinguished morphologically, we prefer to retain them here. While the segregates of *Trichomanes* proposed by Ebihara et al. (2006) are all monophyletic, in the absence of a widely accepted criterion for ranking clades as genera, the interests of nomenclatural stability are best served with a broad *Trichomanes*.

Retaining *Cardiomanes* would make *Hymenophyllum* non-monophyletic as molecular evidence indicates that *Hymenophyllum dilatatum*, *H. pulcherrimum* and the South American *H. fuciforme* are more closely related to *Cardiomanes* than they are to other *Hymenophyllum* species (Schuettpelz & Pryer 2007; Hennequin et al. 2010). Consequently, we adopt the transfer of *Cardiomanes* to *Hymenophyllum* – as *H. nephrophyllum* – by Ebihara et al. (2006). However, the urceolate indusia with exserted receptacles and distinctive kidney-shaped lamina several cells thick in *H. nephrophyllum* make it anomalous within *Hymenophyllum*.

1	Laminae undivided	*Hymenophyllum*
	Laminae pinnately or dichotomously divided	2
2	Indusia bivalvate; receptacles not or only slightly exserted; rhizomes nearly glabrous or only sparsely hairy	*Hymenophyllum*
	Indusia tubular or campanulate; receptacles long-exserted; rhizomes abundantly covered in hairs	*Trichomanes*

Distribution: The family has its greatest diversity in tropical and south temperate regions, but a few species also extend into the north temperate zone. Two non-endemic genera with 31 species in New Zealand; 17 species endemic.

Biostatus: Indigenous (Non-endemic).

Table 1: Number of species in New Zealand within *Hymenophyllaceae* Mart.

Category	**Number**
Indigenous (Endemic)	17
Indigenous (Non-endemic)	14
Total	**31**

Recognition: The Hymenophyllaceae comprises terrestrial or epiphytic ferns with long-creeping or erect rhizomes, an indumentum of hairs, membranous and often translucent laminae, marginal sori, tubular or bivalvate indusia, extended receptacles, sporangia with an oblique annulus, and trilete, green spores.

Notes: The growth forms and distribution of species of Hymenophyllaceae in New Zealand, particularly in Westland, were analysed in detail by Holloway (1923, 1924). He also described the gametophytes and development of the sporophytes in *H. nephrophyllum* (as *Cardiomanes reniforme*) and *Hymenophyllum pulcherrimum* (Holloway 1930, 1944).

Hymenophyllum Sm., *Mém. Acad. Roy. Sci. (Turin)* 5: 418 (1793)

= *Cardiomanes* C.Presl, *Hymenophyllaceae,* 12 (1843)

Type taxon: *Hymenophyllum tunbridgense* (L.) Sm.

Etymology: From the Greek *hymeno-* (membranous), and *-phyllus* (leaved), a reference to the membranous fronds.

Vernacular names: filmy fern; mauku

Epiphytic, terrestrial or rupestral ferns. Rhizomes long-creeping or erect, usually filiform or wiry, nearly glabrous or bearing sparse multicellular hairs or occasionally densely hairy; roots few and fine. Fronds monomorphic. Laminae undivided to 5-pinnatifid, or flabellate, digitate (not NZ) or dichotomously divided, membranous and usually one cell thick or rarely 2–4 cells thick, often translucent, glabrous or hairy; margins entire or toothed, differentiated marginal cells sometimes forming a distinct border. Veins free. Sori terminating veins at margins of lamina. Indusia usually bivalvate or rarely urceolate, not widened at the mouth; receptacles usually included within indusial flaps, or rarely short-exserted. Spores trilete, radially symmetrical, papillate to echinate.

Taxonomy: A genus of c. 330 species (Iwatsuki in Kramer & Green 1990) as defined by Ebihara et al. (2006).

The genus *Hymenophyllum* was re-defined by Ebihara et al. (2006) to include a number of taxa previously thought to belong in *Trichomanes sens. lat.* (notably *Cardiomanes, Microtrichomanes* and *Pleuromanes*). The Pacific species of the genus *Hymenophyllum* have been enumerated by Ebihara & Iwatsuki (2007) and Ebihara et al. (2010).

New Zealand species are assigned to the following subgenera:-

Subgenus *Hymenophyllum*: *H. armstrongii*, *H. bivalve*, *H. cupressiforme*, *H. minimum*, *H. multifidum*, *H. peltatum*, *H. revolutum* (7 species).

Subgenus *Sphaerocionium*: *H. frankliniae*, *H. lyallii*, *H. malingii* (3 species).

Subgenus *Mecodium*: *H. polyanthos*, *H. rarum* (2 species).

Subgenus *Globosa*: *H. australe*, *H. demissum*, *H. flexuosum*, *H. pluviatile* (4 species).

Subgenus *Pleuromanes*: *H. flabellatum*, *H. rufescens* (2 species).

Subgenus *Myrmecostylum*: *H. sanguinolentum*, *H. scabrum*, *H. villosum* (3 species).

Subgenus *Fuciformia*: *H. pulcherrimum* (1 species).

Subgenus *Diploophyllum*: *H. dilatatum* (1 species).

Subgenus *Cardiomanes*: *H. nephrophyllum* (1 species).

1 Margins of ultimate lamina segments prominently toothed or spiny 2
Margins of ultimate lamina segments entire 9

2 Margins of ultimate lamina segments bearing branched hairs ..... *lyallii*
Margins of ultimate lamina segments lacking hairs 3

3	Laminae undivided or forked or 1-pinnatifid, usually <20 mm long (range 3–28 mm)	4
	Laminae at least 2-pinnatifid, usually >20 mm long (range 7–280 mm)	5
4	Sori stalked, terminating rachises; indusial flaps toothed, spiny on the outer surfaces	*minimum*
	Sori lacking stalks, terminating lamina segments; indusial flaps entire, lacking spines	*armstrongii*
5	Laminae 7–120 mm long, 5–30 mm wide, 1–3-pinnatifid, more or less flat; 1–3 sori on each primary pinna	6
	Laminae 10–280 mm long, 7–165 mm wide, usually 4–5-pinnatifid (rarely 3-pinnatifid), often with the margins curved downwards; 1–several sori on each primary pinna	8
6	Rachises winged only in distal half; indusial flaps deeply toothed	*revolutum*
	Rachises winged throughout; indusial flaps entire or only slightly toothed	7
7	Secondary pinnae arising on both sides of primary pinnae; 1 sorus on each primary pinna; indusial flaps slightly toothed	*cupressiforme*
	Secondary pinnae arising only on acroscopic side of primary pinnae; 1–3 sori on each primary pinna; indusial flaps entire	*peltatum*
8	Sori occurring only close to the rachis, bent up at 90º to plane of frond; indusial flaps fused for half their length into a tube; receptacles usually exserted (up to 6 mm); rachis wings toothed	*multifidum*
	Sori occurring throughout the length of the pinna, not bent upwards; indusial flaps free almost to base; receptacles not or rarely exserted; rachis wings entire or very shallowly toothed	*bivalve*
9	Rhizomes, stipes and/or laminae distinctly hairy	10
	Rhizomes, stipes and laminae glabrous, or bearing only very scattered hairs	17
10	Hairs more or less absent from lamina surfaces	11
	Hairs present on lamina surfaces	13
11	Indusial flaps with distinct crests on their outer surfaces; fronds strongly aromatic, staining paper yellow or brown when dried	*sanguinolentum*
	Indusial flaps lacking crests; fronds rarely aromatic, or staining paper when dried	12
12	Stiff bristly hairs densely covering stipe and lower rachis; laminae olive-green; pinnae ovate, never flabellate	*scabrum*
	Tufts of long yellowish hairs on rhizomes, stipes and rachises; laminae yellow-green; pinnae often flabellate	*flabellatum*
13	Lamina hairs mostly confined to margins; laminae flabellate, segments forking	*lyallii*
	Lamina hairs either absent from margins, or on surfaces and margins; laminae ovate, elliptic or triangular, 1–5-pinnatifid	14
14	Lamina hairs stellately branched	15
	Lamina hairs unbranched, or only rarely branched	16
15	Hairs grey on adaxial lamina surface, reddish brown on abaxial surface; ultimate lamina segments round in cross-section; ferns confined to *Libocedrus* or sometimes *Metrosideros* and *Halocarpus* trunks	*malingii*
	Hairs tawny or rusty-brown on both lamina surfaces; ultimate lamina segments flattened; common on tree fern and other trunks	*frankliniae*
16	Laminae triangular, 8–55 mm long, usually shorter than stipes, 1–3-pinnatifid, densely covered in long, woolly hairs	*rufescens*
	Laminae ovate or elliptic, 20–200 mm long, longer than stipes, 3–5-pinnatifid, variably covered in short, slightly curled hairs	*villosum*

17 Laminae undivided, reniform .... *nephrophyllum*
Laminae 1–5 pinnatifid, generally ovate or elliptic, never reniform 18

18 Stipes not winged, or only slightly winged distally 19
Stipes winged for at least half their length, sometimes very narrowly 20

19 Laminae 2–3-pinnatifid, 10–200 mm long, 8–40 mm wide; sori sunk in apices of ultimate lamina segments, solitary .... *rarum*
Laminae 3–5-pinnatifid, 45–270 mm long, 22–160 mm wide; sori free on apices of short ultimate segments, often paired .... *demissum*

20 Rhizomes erect or short-creeping .... *pulcherrimum*
Rhizomes long-creeping 21

21 Wings on stipe and rachis flexuous throughout ..... *flexuosum*
Wings on stipe and rachis planate, or only slightly or partly flexuose 22

22 Indusial flaps with distinct crests on their outer surfaces; fronds strongly aromatic, staining paper yellow or brown when dried ..... *sanguinolentum*
Indusial flaps lacking crests; fronds rarely aromatic, or staining paper when dried 23

23 Sori partially immersed in lamina segments; indusial flaps elliptic, orbicular or obovate 24
Sori adnate to lamina segments; indusial flaps usually triangular or ovate, rarely elliptic or orbicular 25

24 Ultimate lamina segments 0.8–1.2 mm wide, apices obtuse, truncate or emarginate; indusial flaps elliptic to obovate; plants confined to Raoul Island ..... *polyanthos*
Ultimate lamina segments 1.3–2.5 mm wide, apices acute or obtuse but never emarginate; indusial flaps elliptic to orbicular; plants widespread ..... *dilatatum*

25 Laminae 4–5-pinnatifid; lamina segments divaricate, not curved towards frond apex; apices of segments rounded or shallowly emarginate; stipe usually only winged in distal half .... *pluviatile*
Laminae 2–4-pinnatifid; lamina segments in distal half curved towards frond apex; apices of segments usually strongly emarginate; stipe winged for most of its length .... *australe*

Distribution: Distributed throughout the tropics and south temperate regions, with a few species extending also into north temperate regions. Nine of the ten subgenera of *Hymenophyllum* recognised by Ebihara et al. (2006) occur in the Pacific region, and 63 of c. 330 species are represented there. All of those nine subgenera also occur in New Zealand. *Diploophyllum* and *Cardiomanes* are endemic to New Zealand, and the region is probably the centre of diversity of subgenus *Pleuromanes* (Ebihara et al. 2010). 24 species in New Zealand; 14 endemic.

Biostatus: Indigenous (Non-endemic).

Table 2: Number of species in New Zealand within *Hymenophyllum* Sm.

Category	**Number**
Indigenous (Endemic)	14
Indigenous (Non-endemic)	10
Total	**24**

Recognition: *Hymenophyllum* is characterised morphologically by its bivalvate indusia and receptacles that are usually included within the valves. However, three New Zealand species, *H. minimum*, *H. multifidum* and *H. nephrophyllum*, often have receptacles that are exserted for a short distance beyond the indusium, and in several other species the receptacles are occasionally slightly exserted. In *H. nephrophyllum* the indusia are also urceolate. The rhizomes in species of *Hymenophyllum* are generally almost glabrous or bear only scattered hairs near the stipe bases, in contrast to those in *Trichomanes* which are abundantly covered in red-brown hairs.

Most New Zealand species of *Hymenophyllum* have lamina segments that are a single cell thick, except for the costae. A few species have a differentiated margin which may be more than one cell thick, and three species, *H. dilatatum*, *H. nephrophyllum* and *H. scabrum*, have laminae that are 2–4

cells thick throughout. However, these characters are not especially useful in identification of individual species.

Cytology: Base chromosome numbers of x = 11 to 36 are recorded for *Hymenophyllum* (Ebihara et al. 2006).

Notes: The following species were excluded from the New Zealand flora by Brownsey et al. (1985): *Hymenophyllum ciliatum* (Sw.) Sw., *Hymenophyllum emarginatum* Sw., *Hymenophyllum secundum* Hook. et Grev. and *Hymenophyllum tortuosum* Hook. & Grev.

Hymenophyllum armstrongii (Baker) Kirk, *Trans. & Proc. New Zealand Inst.* 10 (app.): app. 43, t. 21a (1878)

≡ *Trichomanes armstrongii* Baker in Hooker & Baker, *Syn. Fil.,* 452 (1868)
≡ *Hymenophyllum cheesemanii* var. *armstrongii* (Baker) Cheeseman, *Man. New Zealand Fl.,* 938 (1906)
≡ *Microtrichomanes armstrongii* (Baker) Copel., *Philipp. J. Sci.* 73: 457 (1941)
≡ *Craspedophyllum armstrongii* (Baker) Rae ex Copel., *Gen. Fil.,* 33 (1947)
Holotype: New Zealand, *Armstrong*, rec'd 1868, K (fragment only)!

= *Hymenophyllum cheesemanii* Baker in Hooker, *Hooker's Icon. Pl. 12,* 30, t. 1132 (1873) — as cheesemanni
≡ *Craspedophyllum cheesemanii* (Baker) N.A.Wakef., *Victoria Naturalist* 66: 59 (1949)
Holotype: New Zealand, Titirangi Ranges, 1200 ft, *T.F. Cheeseman*, rec'd 1871, K! (photo WELT E468/14); probable isotypes: AK 139865!, Herb. Armstrong, CHR 633537!, WELT P006111!, US (*n.v.*)

= *Hymenophyllum melanocheilos* Colenso, *Trans. & Proc. New Zealand Inst.* 17: 255 (1885)
Lectotype (selected by Allan 1961): Whangaroa, *R.W. Rowson*, 28 Feb. 1885, Herb. W. Colenso, WELT P003295!

Etymology: Named in honour of J.B. Armstrong (1850–1926), botanist and nurseryman at the Christchurch Botanic Gardens.

Epiphytic or rupestral ferns. Rhizomes long-creeping, filiform, <0.1 mm diameter, glabrous or bearing scattered red-brown hairs <0.1 mm long. Fronds 4–32 mm long. Stipes 0.5–10 mm long, dark brown throughout, not winged, glabrous or with a few short scattered hairs. Laminae undivided or forked 1–3 times, dark green with dark brown midribs, membranous, glabrous; undivided laminae oblong or narrowly oblong or linear, 3–28 mm long, 1–3 mm wide; divided laminae elliptic or obovate or obtriangular, 4–25 mm long, 3–20 mm wide. Ultimate lamina segments oblong, 4–24 mm long, 0.9–2.5 mm wide; margins entire, bearing dark brown or blackish spines and sometimes with a distinct blackish border of elongated cells. Sori terminating lamina segments, solitary, partially immersed in lamina; indusia bivalvate; indusial flaps ovate, 1–2 mm long, apices obtuse, margins entire, sometimes with a dark brown or blackish border; receptacles included within indusial flaps.

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

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

Stewart Island, Auckland Islands.

Altitudinal range: 10–1450 m.

Hymenophyllum armstrongii occurs in lowland to subalpine areas of the western and central parts of the North Island, from Kaitaia to the southern Rimutaka Range, but is absent from Gisborne and the entire east coast. It is uncommon below 300 m but reaches over 1300 m in the Tararua Ranges. In the South Island it is confined to western districts, occurring sporadically in the Marlborough Sounds and from north-west Nelson to Fiordland, with an outlying population in the Leith Valley, Dunedin. It extends from sea level near Haast to 1450 m in the Allen Range, north-west Nelson.

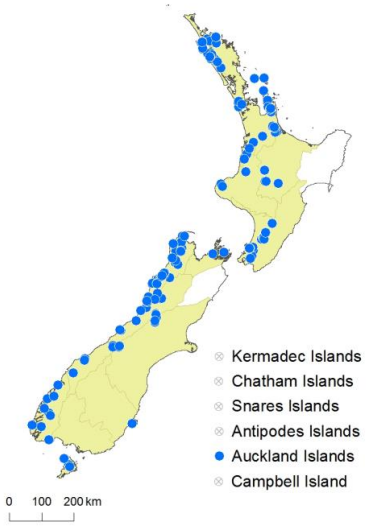

Fig. 1: *Hymenophyllum armstrongii* distribution map based on databased records at AK, CHR, OTA and WELT.

Biostatus: Indigenous (Endemic).

Habitat: Occurs most frequently as an epiphyte at lower altitudes, often intertwined with mosses and liverworts, on the branches of a wide variety of forest trees, but it is also found forming mats on damp rock, in rock crevices and under overhangs at higher altitudes. It occurs under kauri, podocarp, beech and broadleaved forest and in subalpine scrub, herbfield and tussock grassland. It has been recorded growing on *Agathis australis*, *Dacrydium cupressinum, Dacrycarpus dacrydioides*, *Halocarpus biformis*, *Lepidothamnus intermedius*, *Phyllocladus alpinus*, *P. trichomanoides*, *Podocarpus laetus*, *Prumnopitys ferruginea*, *Archeria racemosa*, *Ixerba brexioides*, *Knightia excelsa*, *Kunzea ericoides*, *Metrosideros excelsa*, *M. robusta*, *M. umbellata*, *Quintinia* sp., *Weinmannia racemosa*, *W. silvicola* and species of Nothofagaceae, but never on tree fern trunks.

Recognition: *Hymenophyllum armstrongii* is recognised by its diminutive size, laminae with dark brown midribs and dark brown or blackish marginal spines, and solitary sori that terminate the lamina segments. It is easily overlooked, hidden among bryophytes, when growing epiphytically on tree branches.

Cytology: n = 13 (Lovis in Brownsey 1991; Lovis in Dawson et al. 2000).

Notes: The holotype specimen of *Trichomanes armstrongii* at K is a fragment only. There is a more complete specimen collected by J.B. Armstrong from the Black Range, Canterbury in March 1867 (WELT P006098), which may be the source of the material sent to Kew, but which cannot be definitely identified as an isotype.

Hymenophyllum melanocheilos was described by Colenso (1885) from collections made at Whangaroa, County of Mongonui [Mangonui] in 1884 by R.W. Rowson.The lectotype was chosen by Allan (1961), citing “woods, Whangaroa, *R.W. Rowson*” in WELT (now WELT P003295). There is a syntype in the Cheeseman herbarium (AK 139868). Both specimens bear the date 1885, rather than 1884 given in the protologue, and one or other date is assumed to be incorrect.

Fig. 2: *Hymenophyllum armstrongii*. Plants growing epiphytically amongst bryophytes.

Fig. 3: *Hymenophyllum armstrongii*. Plants growing epiphytically amongst bryophytes, with prominent dark brown costae.

Fig. 4: *Hymenophyllum armstrongii*. Plants with entire or forked laminae.

Fig. 5: *Hymenophyllum armstrongii*. Fertile fronds with dark brown borders, marginal spines and costae.

Fig. 6: *Hymenophyllum armstrongii*. Laminae with dark brown borders, marginal spines and solitary apical sori.

Fig. 7: *Hymenophyllum armstrongii*. Sori with entire indusial flaps, each with a dark brown border.

Hymenophyllum australe Willd., *Sp. Pl. 5 (1),* 527 (1810)

≡ *Sphaerocionium australe* (Willd.) C.Presl, *Hymenophyllaceae,* 35 (1843)
≡ *Mecodium australe* (Willd.) Copel., *Philipp. J. Sci.* 67: 24 (1938)
Holotype: Nova Hollandia [Australia], *J.J. Labillardière*, Herb. Willdenow, B–W 20232-01 0 (*n.v.*; see Bostock & Spokes 1998)

= *Hymenophyllum atrovirens* Colenso, *Tasmanian J. Nat. Sci.* 2: 186 (1845)
≡ *Hymenophyllum javanicum* var. *atrovirens* (Colenso) Hook. & Baker, *Syn. Fil., ed. 2.,* 60 (1874)
≡ *Hymenophyllum australe* var. *atrovirens* (Colenso) C.Chr., *Index Filic.,* 357 (1905)
≡ *Mecodium atrovirens* (Colenso) Copel., *Philipp. J. Sci.* 73: 457 (1941)
Lectotype (selected by Allan 1961): Waikare Lake [Lake Waikaremoana], *W. Colenso*, 1841, WELT P003267!

= *Hymenophyllum montanum* Kirk, *Trans. & Proc. New Zealand Inst.* 10: 394. t. 21b (1878)
≡ *Mecodium montanum* (Kirk) Copel., *Philipp. J. Sci.* 67: 22 (1938)
Holotype: Wakatipu, *Mrs Mason*, Herb. T. Kirk, WELT P008988!; isotype: near Lake Wakatipu, Otago, *Mrs Mason*, Herb. T. Kirk, CHR 293758!

Etymology: From the Latin *australis* (southern), a reference to its occurrence in Australia and New Zealand.

Rupestral ferns or rarely low epiphytes. Rhizomes long-creeping, 0.2–0.5 mm diameter, glabrous or bearing scattered red-brown hairs up to 0.5 mm long clustered at stipe bases. Fronds 38–210 mm long. Stipes 10–80 mm long, dark brown throughout, narrowly winged almost to the base, bearing a

few scattered hairs proximally; stipe wings planate. Laminae 2–4-pinnatifid, narrowly ovate to ovate or occasionally elliptic, 24–140 mm long, 10–60 mm wide, dark green, membranous, glabrous. Rachises winged throughout, dark brown proximally, pale brown distally, glabrous; rachis wings planate or slightly flexuous. Primary pinnae in 6–15 pairs, scarcely overlapping, winged throughout; distal portion of primary pinnae incurved acroscopically; distal primary pinnae narrowly elliptic or narrowly ovate, adnate; proximal primary pinnae ovate or narrowly ovate, adnate; the longest primary pinnae at or near the base, 9–45 mm long, 6–21 mm wide. Secondary pinnae arising both acroscopically and basiscopically, slightly overlapping, winged throughout, elliptic to ovate, adnate; the longest secondary pinnae 5–12 mm long, 1–7 mm wide. Ultimate lamina segments oblong or linear, up to 5 mm long, 0.4–1.0 mm wide; apices obtuse or truncate or emarginate; margins entire, sometimes with an indistinct thickened border; distal segments on primary pinnae often curved towards frond apex. Sori borne on short acroscopic and basiscopic segments throughout pinnae, solitary or in pairs, many on each primary pinna, adnate; indusia bivalvate; indusial flaps triangular or ovate or sometimes elliptic, 0.75–2 mm long, apices usually acute or sometimes obtuse or truncate, margins slightly toothed or bifid; receptacles included within indusial flaps.

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

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

Stewart Island.

Altitudinal range: 30–850 m.

Hymenophyllum australe has been sporadically recorded in the North Island from Northland, Mt Pirongia, the Kaimai Ranges, Rotorua district, Lake Waikaremoana, Pureora, Egmont National Park and the Akatarawa Ranges, and in the South Island from north-west Nelson, north and inland Canterbury, Banks Peninsula, Lake Wakatipu, Dunedin and two localities in Fiordland. It also occurs on Stewart Island. It is apparently absent from much of the west coast of the South Island. In the North Island it ranges from 120 m up to 850 m on Mt Pirongia, and in the South Island from 30 m to 550 m on Mt Burnett and Banks Peninsula, and to over 600 m at Morrison's Creek, Dunedin.

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

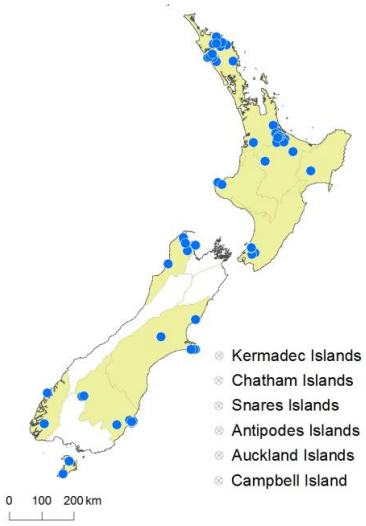

Fig. 8: *Hymenophyllum australe* distribution map based on databased records at AK, CHR, OTA and WELT.

Biostatus: Indigenous (Non-endemic).

Hymenophyllum australe (as *atrovirens*) was given a conservation status of Naturally Uncommon by de Lange et al. (2013).

Habitat: In New Zealand *Hymenophyllum australe* is restricted to a very specific habitat, usually growing on rock, or rarely low on tree trunks, in and around flowing water in shaded habitats. It can grow partially submerged or just above the level of flowing water, on boulders in stream beds, beside waterfalls or in seepages. In Australia the species grows in a wider range of habitats, extending to rock away from water, and as an epiphyte.

Recognition: *Hymenophyllum australe* is a small to medium-sized filmy fern distinguished by its narrowly ovate frond, planate wings on the stipe, and habitat on rocks in or near streams. It can be distinguished from other species with winged stipes by its creeping rhizome (cf. erect rhizome in *H. pulcherrimum*), indusial flaps lacking crests (cf. crested indusial flaps in *H. sanguinolentum*), planate stipe wings (cf. flexuous wings in *H. flexuosum*), and smaller lamina (30–140 mm long, 10–60 mm wide cf. 60–430 mm long, 40–170 mm wide in *H. dilatatum* and *H. flexuosum*). *Hymenophyllum australe* is most easily confused with *H. pluviatile* but can be distinguished by its distinctive habitat (cf. epiphytic, terrestrial or rupestral in *H. pluviatile*), its less divided frond (2–4-pinnatifid, cf. 4–5-pinnatifid), stipe wings which are broader and extend almost to the base, primary pinnae which tend to be curved acroscopically rather than straight, and ultimate lamina segments which are curved towards the frond apex rather than divergent, and are often emarginate rather than obtuse or truncate.

Cytology: n = 36 (Brownlie 1965).

Notes: This species was previously known as *H. atrovirens* and considered endemic to New Zealand (Allan 1961; Brownsey et al. 1985; Brownsey & Smith-Dodsworth 2000). However, recent revisions

(Ebihara et al. 2010; Perrie et al. 2013) have shown that the New Zealand plants are conspecific with *H. australe*, previously considered endemic to Australia.

H. atrovirens was described by Colenso (1845) from collections he made on the shores of Lake Waikaremoana in December 1841. The lectotype was chosen by Allan (1961), citing "*Colenso*, 1841" in WELT (now WELT P003267). There is also a specimen at K (*Colenso 275)* which, although labelled "Bay of Islands" in Hooker's hand-writing, was probably collected on Colenso's journey through the Urewera district in 1841 and could be a syntype (photo WELT E468/12).

Fig. 9: *Hymenophyllum australe*. Plants growing on rock just above a stream.

Fig. 10: *Hymenophyllum australe*. Narrowly ovate fronds, becoming darker with age.

Fig. 11: *Hymenophyllum australe*. Frond showing slightly flexuous wings on the rachis.

Fig. 12: *Hymenophyllum australe*. Lamina showing segments with entire margins, flexuous wings on the rachis, and solitary or paired indusia with slightly toothed ovate flaps.

Hymenophyllum bivalve (G.Forst.) Sw., *J. Bot. (Schrader)* 1800(2): 99 (1801)

≡ *Trichomanes bivalve* G.Forst., *Fl. Ins. Austr.,* 84 (1786)
≡ *Sphaerocionium bivalve* (G.Forst.) C.Presl, *Hymenophyllaceae,* 34 (1843)
≡ *Meringium bivalve* (G.Forst.) Copel., *Philipp. J. Sci.* 67: 44 (1938)
Lectotype (selected by Tindale 1963): New Zealand, G. Forster's Herbarium 301.466, BM 001048387!

= *Hymenophyllum spathulatum* Colenso, *Tasmanian J. Nat. Sci.* 2: 184 (1845)
Lectotype (selected by Brownsey & Perrie 2016): Waikare Lake [Lake Waikaremoana], *W. Colenso*, 1841, WELT P003272!

= *Hymenophyllum pyriforme* Bosch, *Ned. Kruidk. Arch.* 5(3): 173 (1863)
Syntype: no locality or collector, B 200100381 (!online)

Etymology: From the Latin *bivalvis* (two-valved), a reference to the form of the indusium.

Terrestrial, rupestral or occasionally epiphytic ferns. Rhizomes long-creeping, 0.5–0.75 mm diameter, bearing red-brown hairs up to 1 mm long, dense at bases of stipes, scattered elsewhere. Fronds 90–350 mm long. Stipes 16–170 mm long, dark brown throughout, not winged, bearing scattered hairs. Laminae 4–5-pinnatifid, ovate to triangular, 45–210 mm long, 30–165 mm wide, light green, membranous, glabrous or with scattered hairs on costae. Rachises narrowly winged throughout, brown, usually with a few scattered hairs; rachis wings planate or sometimes slightly flexuose, margins entire or very shallowly toothed. Primary pinnae in 7–15 pairs, overlapping, winged throughout; distal portion of primary pinnae strongly incurved acroscopically; distal primary pinnae narrowly ovate, adnate; proximal primary pinnae ovate, more or less stalked; the longest primary pinnae at or near the base, 17–100 mm long, 15–60 mm wide. Secondary pinnae arising both acroscopically and basiscopically, overlapping, winged throughout, adnate; narrowly ovate to ovate on distal primary pinnae, elliptic to ovate on proximal primary pinnae; the longest secondary pinnae 10–60 mm long, 5–30 mm wide. Ultimate lamina segments oblong or linear, up to 5 mm long, 0.5–1.0 mm wide; apices acute or obtuse; margins shallowly toothed, lacking a distinct border; distal segments on primary pinnae strongly curved towards frond apex. Sori borne on short acroscopic and basiscopic segments throughout pinnae, usually solitary or rarely paired, many on each primary pinna, partially immersed in lamina; indusia bivalvate; indusial flaps elliptic, 1–2 mm long, apices obtuse, margins entire; receptacles included within indusial flaps.

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

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

Chatham Islands, Stewart Island.

Altitudinal range: 10–1050 m.

Hymenophyllum bivalve occurs in lowland and montane areas of the North Island from Great Barrier Island (*C.P. Winkelmann*, Jan. 1886, AK 139881) and Auckland City southwards, but is absent from most of the east coast, and scarce north of latitude 38ºS. It has been recorded from near sea level but is rare below 150 m, growing up to 1050 m on Mt Hauhungatahi. In the South Island it is common west of the main divide, but absent from most of the interior and recorded only sporadically from the east coast. It occurs from 40 m, up to 950 m in the Nelson Lakes District. It extends to Stewart Island and there is a single 19th century collection from the Chatham Islands (WELT P003472).

Also Australia (Queensland, New South Wales).

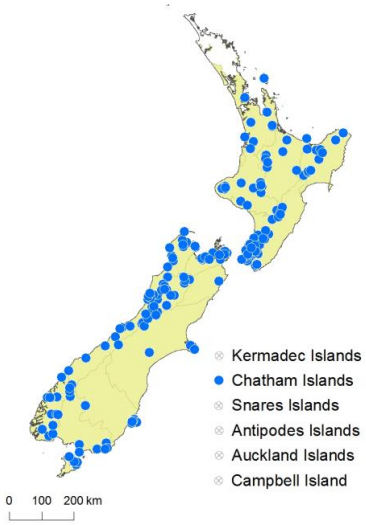

Fig. 13: *Hymenophyllum bivalve* distribution map based on databased records at AK, CHR, OTA and WELT.

Biostatus: Indigenous (Non-endemic).

Habitat: Occurs under podocarp, beech or broadleaved forest, and in kānuka or open scrub, growing on the ground, on rocks, banks, road cuttings, fallen trunks, at the base of tree trunks, or as a trunk epiphyte. It has been recorded growing on *Cyathea dealbata*, *Dicksonia fibrosa*, *D. squarrosa*, *Griselinia littoralis*, *Libocedrus* sp., *Litsea calicaris*, *Weinmannia racemosa* and species of Nothofagaceae.

Recognition: *Hymenophyllum bivalve* is a highly divided, medium-sized filmy fern with a toothed margin. It is larger and more divided than all other New Zealand species with a toothed margin except *H. multifidum*, which is of comparable size. The two species are very hard to distinguish when sterile, but *H. bivalve* has laminae which are sometimes slightly larger, less obviously curled downwards, and more shallowly toothed on the margins, especially on the rachis wings. When fertile, the sori of *H. bivalve* are much smaller and never bent upwards at 90º to the plane of the frond.

Cytology: n = 22 (Brownlie 1958).

Notes: *Hymenophyllum pyriforme* was described by van den Bosch (1863) from specimens collected in New Zealand by D'Urville and by J.D. Hooker (the latter "inter specimina *H. demissi* H. Reg. Berol."). However, no original material has been located in L, identified as Bosch's main herbarium by

Stafleu & Cowan (1976). Only one original specimen (B 200100381), without collector or locality but determined by Bosch in 1857 as *H. pyriforme*, has been located. Brownsey & Perrie (2016) noted that the specimen at B is clearly original material, and serves to confirm that *H. pyriforme* is synonymous with *H. bivalve*, but it does not accord with either of the specimens cited in the protologue. It is a candidate for lectotype if the specimens cited in the protologue cannot be located.

The name *Trichomanes pacificum* Hedw., sometimes included in the synonymy of *Hymenophyllum bivalve*, is illegitimate because only the captions and not the plate were published (see Nicolson & Fosberg 2003).

Hymenophyllum bivalve was recorded from the Auckland Islands by Johnson & Campbell (1975) and by Brownsey & Smith-Dodsworth (2000). However, the voucher specimens (OTA 33132, 33133) were misidentified and are actually *H. multifidum*.

Fig. 14: *Hymenophyllum bivalve*. Ovate, 4-pinnatifid lamina with sori lying in the plane of the frond, not bent upwards.

Fig. 15: *Hymenophyllum bivalve*. Mature frond, characteristically curling downwards.

Fig. 16: *Hymenophyllum bivalve*. Lamina with toothed margins on the lamina segments, and entire wings on the rachis.

Fig. 17: *Hymenophyllum bivalve*. Solitary sori partially immersed in the lamina segments, with ovate entire indusial flaps.

Hymenophyllum cupressiforme Labill., *Nov. Holl. Pl. 2,* 102, t. 250, f.2 (1806)

≡ *Hymenophyllum tunbridgense* var. *cupressiforme* (Labill.) Hook.f., *Bot. Antarct. Voy. II (Fl. Nov.-Zel.) Part II,* 11 (1854)

Lectotype (selected by Tindale 1963): Nova Hollandia et Terra Diemen [Australia and Tasmania], Herb. Webbianum ex Herb. Labillardière, FI 004205 (!online)

= *Hymenophyllum antarcticum* C.Presl, *Hymenophyllaceae,* 50, t. 12a (1843)
Lectotype (selected by Brownsey & Perrie 2016): In Nova Hollandia ad Port Jackson, *Sieber*, Synops. Filicum No 134, PRC 452914, Herb. Presl (image!) - excluding frond at bottom left.

Etymology: From the Latin *cupressiformis* (shaped like a Cypress), a reference to the shape of the frond.

Terrestrial or rupestral ferns. Rhizomes long-creeping, 0.2–0.25 mm diameter, bearing very scattered red-brown hairs up to 0.5 mm long. Fronds 15–75 mm long. Stipes 3–25 mm long, dark brown throughout, often narrowly winged in distal half, bearing very scattered hairs; stipe wings planate. Laminae 2–3-pinnatifid, ovate or elliptic or narrowly elliptic or narrowly obovate, 10–60 mm long, 5–25 mm wide, green, membranous, virtually glabrous. Rachises narrowly winged throughout, brown, glabrous or with a few very scattered hairs; rachis wings planate. Primary pinnae in 4–12 pairs, scarcely overlapping, winged throughout, ovate or elliptic, adnate; distal portion of primary pinnae straight; the longest primary pinnae above or at or below middle, 4–15 mm long, 2–8 mm wide. Secondary pinnae arising both acroscopically and basiscopically. Ultimate lamina segments oblong or linear, up to 4 mm long, 0.5–1.4 mm wide; apices acute or obtuse; margins toothed, lacking a distinct border; distal segments on primary pinnae divergent, not or scarcely curved towards frond apex. Sori borne on short acroscopic segments at the base of primary pinnae, solitary on each segment, one on each primary pinna, adnate; indusia bivalvate, usually in plane of frond or rarely bent upwards; indusial flaps usually elliptic or occasionally obovate, 1–2.5 mm long, apices obtuse or truncate, margins entire or shallowly toothed; receptacles included within indusial flaps or occasionally slightly exserted.

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

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

Chatham Islands.

Altitudinal range: 0–760 m.

Hymenophyllum cupressiforme occurs in lowland to montane areas of the North Island from Te Paki to Mt Pirongia, but further south it is largely confined to the eastern side of the island. It is apparently absent from Taranaki, the Bay of Plenty and inland Gisborne. It occurs from sea level to 670 m in the Kaweka Ranges and 700 m on Mt Pirongia. In the South Island it is confined to lowland and montane areas of north-west Nelson, Lake Rotoiti, Marlborough and eastern Canterbury, extending from near sea level to 760 m on Banks Peninsula. It is known from a single collection on the Chatham Islands (AK 300747). Its overall distribution is unusual in being most abundant in central New Zealand either side of Cook Strait.

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

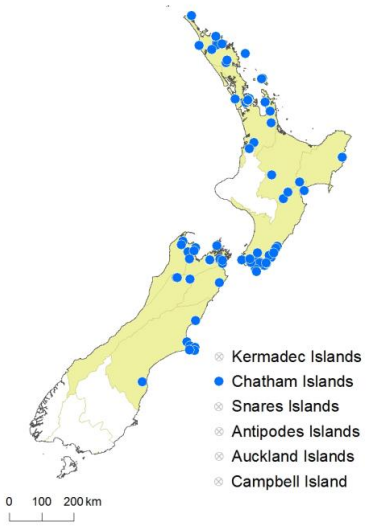

Fig. 18: *Hymenophyllum cupressiforme* distribution map based on databased records at AK, CHR, OTA and WELT.

Biostatus: Indigenous (Non-endemic).

Habitat: Occurs under light shade in kānuka and mānuka scrub, and in beech forest, less commonly in podocarp or broadleaved forest, usually growing on the ground, on rocks, scoria, or banks in damp areas.

Recognition: *Hymenophyllum cupressiforme* is one of several small filmy ferns in New Zealand with toothed margins. It is smaller than either *H. bivalve* or *H. multifidum*, and lacks the spines on the lamina margins of *H. armstrongii*, or the spines on the outer surfaces of the indusial flaps of *H. minimum.* It is very similar to *H. revolutum* and *H. peltatum*, but distinguished from the former by its rachises which are winged throughout, and its indusial flaps which are less prominently toothed, and from the latter by its solitary sori on each primary pinna, and by its secondary pinnae which arise both acroscopically and basiscopically. Occasionally the receptacles are slightly exserted, and the indusia bent upwards at an angle to the plane of the frond.

Notes: Tindale (1963) stated that the holotype of *H. cupressiforme* was in FI, noting that Labillardière's original description in his hand-writing was affixed to the specimen (FI 004205). However, there are also two other Labillardière collections in P which Tindale did not mention: Van

Diemen [Tasmania], *Labillardière*, P 00623471! (photo WELT E476/9); Nov. Holland. [Australia], *Labillardière*, P – herb. Jussieu No. 1507! (photo WELT E478/7). We interpret these as separate syntypes. Nevertheless, Tindale's original statement constitutes effective lectotypification.

Hymenophyllum antarcticum was described as a new species by Presl (1843) citing "*H. tunbridgense*, Sieb. syn. fil. n. 134, flora mixta n. 254. Habitat in Nova Hollandia ad Port Jackson, ubi legit Sieber". There are collections labelled "Nova Hollandia, *Sieber 134*" or "Synops. Filicum No. 134" in many European herbaria including B, BR, E, L, LE, P, PRC, S and W. Presl's own herbarium is held at PRC (Stafleu & Cowan 1983). A specimen of *H. antarcticum*, labelled "Neu Hollandia, Siber" in Presl's handwriting, was seen at "PR" by Croxall (1975) but identified by him only as a "probable isotype". *Hymenophyllum antarcticum* was accepted as a distinct species by Copeland (1938, p. 93), but reduced to synonymy under *H. cupressiforme* by Tindale (1963), Croxall (1975) and Bostock & Spokes (1998), but none of these authors identified the holotype or selected a lectotype. PRC 452914, excluding the frond at bottom left, was selected as lectotype by Brownsey & Perrie (2016).

The occurrence of *Hymenophyllum cupressiforme* in New Zealand was first recorded by Parris & Croxall (1972); before then it had been confused with *H. peltatum* and *H. revolutum*.

Fig. 19: *Hymenophyllum cupressiforme*. Plants growing on a bank.

Fig. 20: *Hymenophyllum cupressiforme*. Frond showing toothed margins on the lamina segments and the rachis winged throughout.

Fig. 21: *Hymenophyllum cupressiforme*. Solitary sori on each primary pinna, with shallowly toothed indusial flaps.

Fig. 22: *Hymenophyllum cupressiforme*. Frond showing toothed margins, winged rachis and stipe, and shallowly toothed indusial flaps.

Hymenophyllum demissum (G.Forst.) Sw., *J. Bot. (Schrader)* 1800(2): 100 (1801)

≡ *Trichomanes demissum* G.Forst., *Fl. Ins. Austr.,* 85 (1786)
≡ *Sphaerocionium demissum* (G.Forst.) C.Presl, *Hymenophyllaceae,* 35 (1843)
≡ *Mecodium demissum* (G.Forst.) Copel., *Philipp. J. Sci.* 67: 24 (1938)
Lectotype (selected by Fosberg in Nicolson & Fosberg 2003): no locality, G. Forster's Herbarium 305.468, BM 001048388!

= *Hymenophyllum aucklandicum* Bosch, *Ned. Kruidk. Arch.* 4: 393 (1859)
≡ *Hymenophyllum australe* var. *aucklandicum* (Bosch) C.Chr., *Index Filic.,* 357 (1905)
Type: not located (see Brownsey & Perrie 2016)

= *Hymenophyllum erecto-alatum* Colenso, *Trans. & Proc. New Zealand Inst.* 11: 431 (1879)
Lectotype (selected by Allan 1961): Norsewood, Herb. W. Colenso, mounted on two sheets, WELT P003007, P003286!

= *Hymenophyllum megalocarpum* Colenso, *Trans. & Proc. New Zealand Inst.* 15: 308 (1883)
≡ *Hymenophyllum demissum* var. *megalocarpum* (Colenso) C.Chr., *Index Filic.,* 364 (1905)
Lectotype (selected by Brownsey & Perrie 2016): Dannevirke, Herb. W. Colenso, WELT P003287!

= *Hymenophyllum polychilum* Colenso, *Trans. & Proc. New Zealand Inst.* 24: 395 (1892)
≡ *Hymenophyllum demissum* var. *polychilum* (Colenso) Domin, *Biblioth. Bot.* 20 (85): 24 (1913)
Lectotype (selected by Brownsey & Perrie 2016): Dannevirke, Herb. W. Colenso, WELT P003285!

Etymology: From the Latin *demissus* (hanging down), a reference to the habit of the frond.

Vernacular names: drooping filmy fern; irirangi; piripiri

Epiphytic, terrestrial or rupestral ferns. Rhizomes long-creeping, 0.5–1 mm diameter, glabrous or with a few red-brown hairs at bases of stipes up to 1 mm long. Fronds 75–450 mm long. Stipes 25–190 mm long, brown or red-brown throughout, not winged, glabrous or bearing a few scattered hairs. Laminae 3–4-pinnatifid or rarely 5-pinnatifid, elliptic or ovate or narrowly ovate, 45–270 mm long, 22–160 mm wide, pale green, membranous, glabrous or with very short scattered hairs on costae. Rachises narrowly winged throughout, reddish brown, glabrous or with a few scattered hairs; rachis wings planate. Primary pinnae in 7–20 pairs, overlapping, winged throughout, narrowly ovate to ovate, adnate; distal portion of primary pinnae straight or incurved acroscopically; the longest primary pinnae between middle and base, 18–85 mm long, 10–45 mm wide. Secondary pinnae arising both acroscopically and basiscopically, scarcely overlapping, winged throughout, elliptic to ovate, adnate; the longest secondary pinnae 6–30 mm long, 3–14 mm wide. Ultimate lamina segments oblong, up to 5 mm long, 0.5–1.5 mm wide; apices acute or obtuse; margins entire, with a distinct thickened border; distal segments on primary pinnae divergent or slightly curved towards frond apex. Sori borne on short acroscopic and basiscopic segments throughout pinnae, usually paired or rarely solitary, many on each primary pinna, adnate; indusia bivalvate; indusial flaps ovate or elliptic, 0.75–1.5 mm long, apices acute or obtuse, margins entire or notched; receptacles included within indusial flaps.

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

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

Kermadec Islands, Chatham Islands, Stewart Island, Auckland Islands.

Altitudinal range: 10–1170 m.

Hymenophyllum demissum occurs in lowland and montane areas throughout the North Island, extending from near sea level to 1070 m at Erua in the central North Island and on Maungapōhatu in the Urewera Range, and up to 1170 m on Mt Taranaki. In the South Island it is largely confined to western districts, with only scattered populations in the east from coastal Marlborough to Southland. It grows from near sea level to over 900 m in north-west Nelson and inland Marlborough. In the Auckland Islands, it is known from a single collection on Adams Island (CHR 134141).

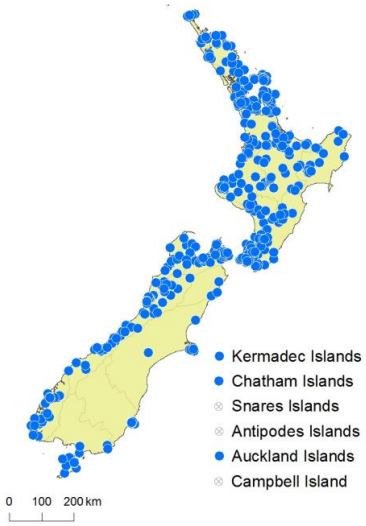

Fig. 23: *Hymenophyllum demissum* distribution map based on databased records at AK, CHR, OTA and WELT.

Biostatus: Indigenous (Endemic).

Habitat: *Hymenophyllum demissum* is the most common of all filmy ferns, growing in kauri, podocarp, beech and broadleaved forest and in tall kānuka scrub and swamp forest, most frequently on the ground, or on rocks, banks and fallen trunks and stumps, but also as an epiphyte. It has been recorded on the trunks of *Cyathea dealbata*, *C. kermadecensis*, *C. smithii*, *Dicksonia squarrosa*, *Agathis australis*, *Beilschmiedia tawa*, *Dacrydium cupressinum*, *Elaeocarpus dentatus*, *Fuscospora truncata*, *Lophozonia menziesii*, *Metrosideros excelsa*, *Prumnopitys taxifolia* and *Rhopalostylis sapida*.

Recognition: *Hymenophyllum demissum* is a medium to large filmy fern and the most common of all New Zealand filmy ferns. It is also the hardest to characterise, having few distinctive features, but can generally be recognised by its large, glabrous fronds with entire margins which are thickened to form a distinct border. The rachis is winged throughout but the stipe has no wing. The sori are often rather narrow and borne in pairs. The frond rarely curls up, even in dry weather, and the plant is often sterile over large areas.

Some plants on the Kermadec Islands are distinctly smaller than those on the main islands, having fronds just 55 mm long, stipes 22 mm long, laminae 35 mm long and 18 mm wide, and the primary pinnae 13 mm long and 7 mm wide.

Cytology: n = 36 (Brownlie 1954, 1958).

Notes: *Hymenophyllum erecto-alatum* was described by Colenso (1879) from collections he made in dry forests near Forty-mile Bush, Norsewood in 1876 and 1878. There are two sheets at WELT and another at AK, all labelled “Norsewood”. WELT P003007 and AK 119 are annotated “type of *H. erecto-alatum* Col.” in Cheeseman’s hand-writing, whilst WELT P003286 has a label in Zotov’s writing copied from WELT P003007. Allan (1961, p. 28) cited a Colenso collection at WELT as the type but did not distinguish between the two sheets held there. However, Zotov’s label on WELT P003286 indicates that it is a copy of Cheeseman’s label on WELT P003007, and also that the material is part of the same specimen. It seems that Zotov segregated specimens from some of Colenso’s collections and re-labelled them (Brownsey 1979). In this case, Colenso’s material is now mounted on two sheets (with different registration numbers) but is part of the same specimen (Art. 8.3). Allan’s statement “Type: W, *Colenso*” can therefore be taken as a lectotypification and relates to these two sheets (WELT P003007 and P003286).

No type material of *H. aucklandium* has been located, and its inclusion in the synonymy of *H. demissum* relies on the opinion of Capeland (1937, p. 160) who said that he was unable to distinguish it from a small *H. demissum* (see Brownsey & Perrie 2016).

Fig. 24: *Hymenophyllum demissum*. Frond growing epiphytically on a tree fern trunk.

Fig. 25: *Hymenophyllum demissum*. Frond showing sori arranged in pairs.

Fig. 26: *Hymenophyllum demissum*. Portion of the lamina showing segments with entire margins, narrowly winged rachis, and sori arranged in pairs.

Fig. 27: *Hymenophyllum demissum*. Sori with ovate, entire indusial flaps.

Hymenophyllum dilatatum (G.Forst.) Sw., *J. Bot. (Schrader)* 1800(2): 100 (1801)

≡ *Trichomanes dilatatum* G.Forst., *Fl. Ins. Austr.,* 85 (1786)
≡ *Sphaerocionium dilatatum* (G.Forst.) C.Presl, *Hymenophyllaceae,* 35 (1843)
≡ *Diploophyllum dilatatum* (G.Forst.) Bosch, *Verslagen Meded. Afd. Natuurk. Kon. Akad. Wetensch.* 11: 323 (1861)
≡ *Mecodium dilatatum* (G.Forst.) Copel., *Philipp. J. Sci.* 67: 24 (1938)
Lectotype (selected by Fosberg in Nicolson & Fosberg 2003): New Zealand, *Forster*, UPS-T 25182 (*n.v.*)

= *Leptocionium sororium* C.Presl, *Gefässbündel Farrn,* 28 (1847)
≡ *Hymenophyllum sororium* (C.Presl) Bosch, *Ned. Kruidk. Arch.* 4: 395 (1859)
Lectotype (selected by Brownsey & Perrie 2016): N[ova] Zeelandia [New Zealand], *Hügel*, Herb. Presl, PRC 455142, central specimen (image!)

Etymology: From the Latin *dilatatus* (widened), a reference to the broad frond segments.

Vernacular names: matua; mauku

Epiphytic or rarely terrestrial ferns. Rhizomes long-creeping, 1–1.5 mm diameter, bearing thick red-brown hairs up to 2 mm long, densely clustered at bases of stipes, scattered elsewhere. Fronds 60–570 mm long. Stipes 10–150 mm long, brown or sometimes green distally, narrowly winged for at least half their length, glabrous or bearing a few scattered hairs; stipe wings planate. Laminae 3–4-pinnatifid, ovate or elliptic, 45–450 mm long, 40–170 mm wide, green, membranous, 2–4 cells thick, glabrous or with very short scattered hairs on costae. Rachises broadly winged throughout, reddish brown or sometimes green distally, glabrous or with a few scattered hairs; rachis wings planate. Primary pinnae in 6–20 pairs, overlapping, winged throughout; distal portion of primary pinnae recurved or straight or incurved; distal primary pinnae narrowly ovate or narrowly elliptic or ovate or elliptic, adnate; proximal primary pinnae ovate to broadly ovate, adnate; the longest primary pinnae from the middle to the base, 20–140 mm long, 13–75 mm wide. Secondary pinnae arising both acroscopically and basiscopically, sometimes overlapping, winged throughout, adnate; narrowly elliptic to narrowly ovate on distal primary pinnae, ovate or elliptic on proximal primary pinnae; the longest secondary pinnae 9–45 mm long, 3–20 mm wide. Ultimate lamina segments oblong, up to 10 mm long, 1.5–2 mm wide; apices obtuse or occasionally acute; margins entire, with a slightly thickened indistinct border; distal segments on primary pinnae slightly recurved or divergent or slightly curved towards frond apex. Sori borne on short acroscopic and basiscopic segments throughout pinnae, solitary on each segment, many on each primary pinna, partially immersed in lamina; indusia bivalvate; indusial flaps elliptic to almost orbicular, 1.3–2.5 mm long, apices obtuse, margins entire; receptacles included within indusial flaps or slightly exserted.

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

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

Chatham Islands, Stewart Island, Auckland Islands.

Altitudinal range: 0–1060 m.

Hymenophyllum dilatatum occurs in lowland to montane forest throughout the North Island from Cape Reinga southwards, except for some of the east coast. It grows from sea level to over 1060 m on Mt Hauhungatahi in the central North Island. In the South Island it is largely confined to lowland and montane areas west of the main divide. It is absent from most of the east coast and interior except for populations around Dunedin, the Catlins district and isolated populations on the Marlborough and south Canterbury coast. It extends from sea level to 950 m near Boulder Lake, north-west Nelson.

Although *Hymenophyllum dilatatum* has been reliably reported from Banks Peninsula (Lovis & Daellenbach 1982; Koller & Tripp 2010; Wilson 2013), no voucher specimen has been found in AK, CHR or WELT, and its presence there is not shown on the distribution map.

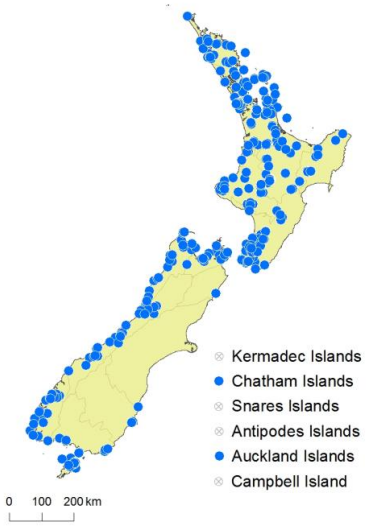

Fig. 28: *Hymenophyllum dilatatum* distribution map based on databased records at AK, CHR, OTA and WELT.

Biostatus: Indigenous (Endemic).

Habitat: Occurs under tall kānuka scrub, and in kauri, podocarp, beech and broadleaved forest, growing on the ground, on river banks, rock faces and fallen logs and trunks, or as an epiphyte in wet areas. It has been recorded most frequently on *Cyathea medullaris*, *Dicksonia fibrosa* and *D. squarrosa* but also on *Elaeocarpus dentatus*, *Melicytus ramiflorus*, *Prumnopitys taxifolia* and *Coprosma chathamica* (on the Chatham Islands).

Recognition: *Hymenophyllum dilatatum* is the largest of the New Zealand filmy ferns, recognisable by its creeping rhizomes, glabrous laminae with entire margins, broad flat wing along the rachis and much of the stipe, very broad pinnae and pinna segments, and large almost round indusia partially immersed in the lamina.

Cytology: n = 36 (Brownlie 1958).

Notes: *Hymenophyllum dilatatum*, together with *H. nephrophyllum* and *H. scabrum*, is unusual in the genus in having a frond that is more than one cell thick. Holloway (1923) showed that sporelings had a lamina only one cell thick and that the multi-layered condition developed with maturity.

Fig. 29: *Hymenophyllum dilatatum*. Plants growing epiphytically on a leaning trunk.

Fig. 30: *Hymenophyllum dilatatum*. Fertile frond showing broad lamina segments, and broad planate wings on the rachis.

Fig. 31: *Hymenophyllum dilatatum*. Fertile frond with entire margins on the broad lamina segments, and broad planate wings on the rachis and stipe.

Fig. 32: *Hymenophyllum dilatatum*. Fertile frond with lamina segments curved towards the frond apex, and solitary sori with entire broadly elliptic indusial flaps.

Hymenophyllum flabellatum Labill., *Nov. Holl. Pl. 2,* 101, t. 250, f. 1 (1807)

≡ *Mecodium flabellatum* (Labill.) Copel., *Philipp. J. Sci.* 67: 21 (1938)
Lectotype (selected by Tindale 1963): Nova Hollandia et Terra Diemen [Australia and Tasmania], *Labillardière*, Herb. Webbianum, FI 004176 (!online)

= *Hymenophyllum nitens* R.Br., *Prodr. Fl. Nov. Holland.,* 159 (1810)
Lectotype (selected by Tindale 1963): Derwent, *R. Brown Iter Australiense 1802–05, No. 98*, BM 001044304!

Etymology: From the Latin *flabellatus* (fan-shaped), a reference to the shape of the pinnae.

Vernacular name: fan-like filmy fern

Epiphytic, terrestrial or rupestral ferns. Rhizomes long-creeping, 0.25–0.75 mm diameter, bearing abundant fine yellow-brown hairs up to 3 mm long. Fronds 25–390 mm long. Stipes 5–165 mm long, red-brown, not winged, bearing dense yellow-brown hairs near junction with rhizome, more scattered distally. Laminae 3–4-pinnatifid or with the primary pinnae stalked, ovate or narrowly ovate or elliptic or narrowly elliptic, 20–290 mm long, 13–65 mm wide, pale or yellow-green, membranous, with scattered

yellow-brown hairs on costae. Rachises narrowly winged in distal half, red-brown or sometimes green distally, bearing fine yellow hairs clustered more densely at pinna junctions; rachis wings planate. Primary pinnae in 3–15 pairs, overlapping, winged for most of their length; distal portion of primary pinnae strongly incurved acroscopically; distal primary pinnae narrowly elliptic or narrowly ovate or ovate, adnate; proximal primary pinnae flabellate or ovate, usually stalked; the longest primary pinnae from the middle to the base, 9–63 mm long, 6–45 mm wide. Secondary pinnae arising both acroscopically and basiscopically, overlapping, winged throughout, adnate; elliptic or narrowly elliptic or narrowly obovate on distal primary pinnae, ovate or elliptic or narrowly elliptic on proximal primary pinnae; the longest secondary pinnae 9–22 mm long, 3–9 mm wide. Ultimate lamina segments oblong, up to 3 mm long, 0.7–1.5 mm wide; apices acute or obtuse or truncate; margins entire, lacking a distinct border; distal segments on primary pinnae slightly curved towards frond apex. Sori borne on acroscopic and basiscopic segments mostly at the distal ends of the pinnae, solitary on each segment, many on each primary pinna, adnate or partially immersed in lamina; indusia bivalvate; indusial flaps ovate or elliptic or almost orbicular, 0.75–1.5 mm long, apices obtuse, margins entire; receptacles included within indusial flaps.

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

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

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

Altitudinal range: 10–1150 m.

Hymenophyllum flabellatum is widely distributed in the New Zealand region from the Kermadec Islands to the Chatham and Auckland Islands. It occurs in lowland and montane areas throughout the North Island, ranging from near sea level to 1050 m at Lake Waikaremoana and on Mt Honokawa, Gisborne. In the South Island it is found most commonly west of the main divide, but also occurs in scattered populations in coastal and inland eastern areas. It is apparently absent from much of inland Otago and south Canterbury. It grows from near sea level to 1150 m on Mt Perry on the Heaphy Track.

Also Australia (Queensland, New South Wales, Victoria, Tasmania), Vanuatu, Fiji, Samoa, Society Islands, Marquesas Islands.

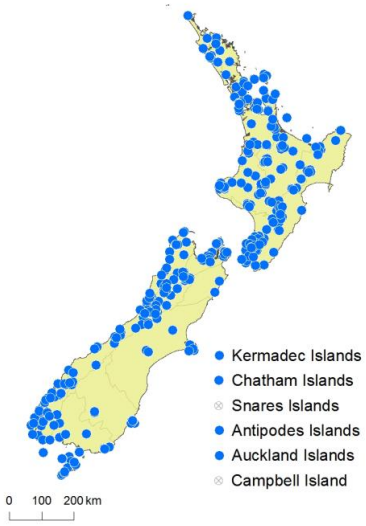

Fig. 33: *Hymenophyllum flabellatum* distribution map based on databased records at AK, CHR, OTA and WELT.

Biostatus: Indigenous (Non-endemic).

Habitat: Occurs under kauri, podocarp, beech, broadleaved forest and *Olearia colensoi* scrub, usually as an epiphyte but also hanging from rotten logs, fallen trunks and steep banks, at the base of trunks, and on boulders and wet rock faces. It has been recorded growing epiphytically on *Cyathea dealbata*, *C. smithii*, *Dicksonia fibrosa*, *D. squarrosa*, *Beilschmiedia tawa*, *Libocedrus bidwillii*, *Melicytus ramiflorus*, *Metrosideros excelsa*, *M. kermadecensis*, *M. robusta*, *M. umbellata*, *Weinmannia racemosa*, species of Nothofagaceae and hanging from *Astelia* clumps.

Recognition: *Hymenophyllum flabellatum* is recognised by its pale or yellow-green fronds, flabellate pinnae, entire lamina margins and tufts of long yellow-brown hairs on the rhizome and stipes. When young, or growing on tree fern trunks, the species has small fronds with markedly fan-shaped pinnae which tend to curl upwards, away from the plane of the frond. Older fronds, or those growing on wet banks or rock overhangs, are much longer, with more drawn-out and dissected pinnae.

The species is closely related to *H. rufescens* but grows at lower altitudes, and can usually be distinguished by its larger and almost glabrous laminae. Intermediate forms are sometimes found in areas where the two species meet, but whether these are hybrids is unclear. DNA sequencing suggests that the two species are distinct (Perrie et al. 2016).

Cytology: n = 36 (Brownlie 1954).

Notes: Plants of *Hymenophyllum flabellatum* in Australia tend to have larger fronds with more finely divided pinnae and narrower ultimate lamina segments. The pinnae are less obviously flabellate, and the small forms seen in New Zealand with markedly fan-shaped pinnae curling upwards are rare in Australia. The same chromosome number has been reported from populations in both countries (Brownlie 1954; Tindale & Roy 2002). Molecular evidence also suggests that populations in New

Zealand and Australia probably belong to the same species, but that material from Fiji and Tahiti ascribed to *H. flabellatum* clearly belongs to a different species (Perrie et al. 2016).

Tindale (1963) stated that the holotype of *H. flabellatum* was in FI, noting that Labillardière's original description in his hand-writing was affixed to the specimen (FI 004176). However, there are also other Labillardière collections in B, GH and P which Tindale did not mention: Nov. Holland. [Australia], Ins. King [King Island], P – Herb. Jussieu No. 1506! (photo WELT E478/6); Nova Hollandia, Labillardière, GH 00021352 (!online); Labillardière, B – Herb. Willd. No. 20230-01 0 (!online; see Bostock & Spokes 1998). We interpret these as separate syntypes. Nevertheless, Tindale's original statement constitutes effective lectotypification.

Fig. 34: *Hymenophyllum flabellatum*. Plants growing epiphytically on a tree fern trunk.

Fig. 35: *Hymenophyllum flabellatum*. Plants growing epiphytically on a tree fern trunk.

Fig. 36: *Hymenophyllum flabellatum*. Abundant yellowish hairs on the rhizome.

Fig. 37: *Hymenophyllum flabellatum*. Fine yellow hairs on the unwinged stipe.

Fig. 38: *Hymenophyllum flabellatum*. Fertile frond showing distinctive flabellate pinnae in the proximal half, and entire margins on the lamina segments.

Fig. 39: *Hymenophyllum flabellatum*. Fertile frond showing red-brown, unwinged rachis, and sori with entire ovate indusial flaps.

Hymenophyllum flexuosum A.Cunn., *Companion Bot. Mag.* 2: 369 (1837)

≡ *Hymenophyllum australe* var. *flexuosum* (A.Cunn.) C.Chr., *Index Filic.,* 361 (1905)
≡ *Mecodium flexuosum* (A.Cunn.) Copel., *Philipp. J. Sci.* 67: 24 (1938)
Holotype: Wangaroa [Whangaroa], *R. Cunningham*, 1834, Herbarium Hookerianum, K! (photo WELT E468/22)

= *Hymenophyllum neozelandicum* Gand., *Bull. Soc. Bot. France* 60: 28 (1913) — as H. neo-zelandicum
Holotype: Nova Zelandia [New Zealand], *B.C. Aston*, 1901, Herb. Gandoger, LY!

Etymology: From the Latin *flexuosus* (flexuose), a reference to the flexuous wing on the stipe and rachis.

Terrestrial, rupestral or occasionally epiphytic ferns. Rhizomes long-creeping, 0.25–0.75 mm diameter; rhizome hairs pale brown, up to 1 mm long, clustered at bases of stipes, scattered elsewhere. Fronds 70–390 mm long. Stipes 20–125 mm long, reddish brown, with a broad wing almost to the base, glabrous or bearing a few scattered hairs especially proximally; stipe wings flexuous or rarely planate. Laminae 4–5-pinnatifid, or 3-pinnatifid in sterile fronds, narrowly ovate or ovate or elliptic, 45–295 mm long, 30–140 mm wide, green, membranous, glabrous or with very short scattered hairs on costae. Rachises with a broad wing throughout, reddish brown, glabrous or with a few scattered hairs; rachis wings flexuous or occasionally partly planate. Primary pinnae in 9–17 pairs, scarcely overlapping, with a flexuous wing throughout; distal portion of primary pinnae straight or slight incurved acroscopically; distal primary pinnae narrowly ovate or ovate or elliptic, adnate; proximal primary pinnae ovate to broadly ovate, adnate; the longest primary pinnae at or below the middle, 21–110 mm long, 12–45 mm wide. Secondary pinnae arising both acroscopically and basiscopically, scarcely overlapping, with a flexuous wing throughout, adnate; ovate or elliptic or obovate on distal primary pinnae, ovate or elliptic on proximal primary pinnae; the longest secondary pinnae 8–30 mm long, 4–13 mm wide. Ultimate lamina segments oblong, up to 5 mm long, 0.6–1.3 mm wide, sometimes flexuous; apices obtuse or truncate or occasionally emarginate; margins entire, lacking a distinct border; distal segments on primary pinnae divergent. Sori borne on short acroscopic and basiscopic segments throughout pinnae, solitary or sometimes paired, many on each primary pinna, adnate; indusia bivalvate; indusial flaps ovate or elliptic or oblong or broader than long, 1–1.5 mm long, apices obtuse or truncate, margins almost entire or irregularly dentate; receptacles included within indusial flaps.

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

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

Chatham Islands.

Altitudinal range: 0–975 m.

Hymenophyllum flexuosum occurs in lowland forest throughout most of the North Island from the Maungataniwha Range south, extending locally into montane forest, especially in the higher parts of Northland. It grows from sea level to about 700 m in the Waima Forest and on Mt Taranaki, and to 975 m on Mt Pihanga near Taupō. In the South Island, it occurs from the Marlborough Sounds to north-west Nelson and along the west coast to Fiordland. There are also a few scattered records on the east coast, but it is absent from large areas of the interior, and from Stewart Island. It ranges from near sea level to 460 m on Mt George near Greymouth.

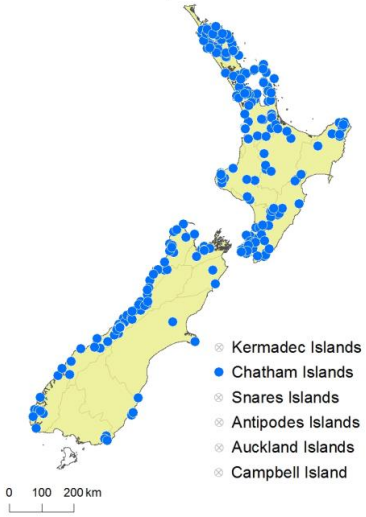

Fig. 40: *Hymenophyllum flexuosum* distribution map based on databased records at AK, CHR, OTA and WELT.

Biostatus: Indigenous (Endemic).

Habitat: Occurs in podocarp, beech and broadleaved forest, and under mature kānuka, growing on the ground, in damp hollows, on damp rocks and banks, streamsides, under overhangs, on tree roots, on rotten logs and old tree stumps, and as a low trunk epiphyte. It has been recorded growing epiphytically on *Cyathea dealbata*, *Dysoxylum spectabile*, *Fuchsia excorticata*, *Melicytus ramiflorus*, *Metrosideros* sp., *Rhopalostylis sapida* and species of Nothofagaceae.

Recognition: *Hymenophyllum flexuosum* is distinguished from almost all other species of the genus in New Zealand by the broad flexuous wings on the stipes, rachises and primary pinnae. It is similar only to *H. australe* and *H. pluviatile*.

It can be distinguished from *H. australe* by its more divided laminae (4–5-pinnatifid cf. 2–4-pinnatifid), larger laminae (60–295 mm long, 40–140 mm wide, cf. 30–140 mm long, 10–60 mm wide), lamina shape (usually less than three times as long as broad cf. usually more than three times as long as broad) and flexuous rather than planate stipe and rachis wings. *Hymenophyllum australe* is further distinguished by growing only on rock in or beside streams, whereas *H. flexuosum* also grows epiphytically and on soil and rock away from streams.

Hymenophyllum flexuosum can be distinguished from *H. pluviatile* by its larger laminae (60–295 mm long, 40–140 mm wide, cf. 40–130 mm long, 20–70 mm wide), flexuous and broad stipe wings that extend almost to the base, rather than very narrow planate stipe wings usually confined to the distal half, and generally wider lamina segments.

Cytology: n = 36 (Brownlie 1961).

Notes: The names *Hymenophyllum javanicum* Spreng. and *H. crispatum* Hook. & Grev. have been misapplied to this species by some New Zealand authors.

Fig. 41: *Hymenophyllum flexuosum*. Plants growing on a bank.

Fig. 42: *Hymenophyllum flexuosum*. Fertile fronds with broad wings extending to the base of the stipes.

Fig. 43: *Hymenophyllum flexuosum*. Broad flexuous wings on the stipe and rachis.

Fig. 44: *Hymenophyllum flexuosum*. Broad flexuous wings on the rachis and costae of the primary pinnae.

Fig. 45: *Hymenophyllum flexuosum*. Fertile frond showing broad flexuous wings on the rachis and costae of the primary pinnae.

Fig. 46: *Hymenophyllum flexuosum*. Lamina segments with entire margins; solitary sori with broadly elliptic, irregularly dentate indusial flaps.

Hymenophyllum frankliniae Colenso, *Tasmanian J. Nat. Sci.* 1: 378 (1843)

≡ *Hymenophyllum franklinianum* Colenso, *Tasmanian J. Nat. Sci.* 2: 183 (1845)
≡ *Sphaerocionium frankliniae* (Colenso) K.Iwats., *J. Fac. Sci. Univ. Tokyo, Sect. 3, Bot.* 13: 213 (1982)
Lectotype (selected by Brownsey & Perrie 2016): Waikare Lake [Lake Waikaremoana], *W. Colenso*, 1841, WELT P003269!

= *Hymenophyllum aeruginosum* var. *franklinianum* Hook., *Sp. Fil. 1,* 94 (1844)
Holotype: New Zealand, *Colenso 272*, Herbarium Hookerianum, K! (photo WELT E468/19)

Etymology: Named in honour of Lady Jane Franklin (1791–1875), wife of Sir John Franklin, Governor of Tasmania.

Vernacular name: rusty filmy fern

Usually epiphytic ferns, rarely terrestrial or rupestral. Rhizomes long-creeping, 0.2–0.4 mm diameter, bearing unbranched pale red-brown hairs up to 3 mm long, densely clustered at bases of stipes, more evenly distributed elsewhere. Fronds 40–295 mm long. Stipes 10–80 mm long, red-brown, not winged, bearing abundant tawny or red-brown stellate hairs. Laminae 3-pinnatifid or rarely 4-pinnatifid, narrowly ovate or narrowly elliptic or ovate or elliptic, 25–230 mm long, 15–78 mm wide, olive-green, membranous, densely covered in tawny or rusty brown stellate hairs, especially on margins and costae. Rachises narrowly winged at least in distal half, red-brown, densely covered in tawny or rusty brown stellate hairs. Primary pinnae in 5–30 pairs, scarcely overlapping or sometimes overlapping, winged throughout, all adnate or surcurrent; distal portion of primary pinnae straight or slightly incurved acroscopically; distal primary pinnae narrowly ovate or ovate, proximal primary pinnae ovate to narrowly ovate; the longest primary pinnae at or below the middle, 10–60 mm long, 5–23 mm wide, but individual pinnae sometimes greatly extended. Secondary pinnae arising both acroscopically and basiscopically, scarcely overlapping, winged throughout, adnate; elliptic on distal primary pinnae, ovate or elliptic on proximal primary pinnae; the longest secondary pinnae 3–20 mm long, 2–7 mm wide. Ultimate lamina segments oblong, up to 3 mm long, 0.7–1.6 mm wide; apices obtuse; margins entire, lacking a distinct border; distal segments on primary pinnae narrowly divergent. Sori terminating ultimate segments throughout pinnae, solitary, many on each primary pinna, immersed in lamina; indusia bivalvate; indusial flaps broadly elliptic or broader than long, 0.5–0.75 mm long, apices obtuse, margins entire, densely hairy on outer surfaces and margins; receptacles included within indusial flaps or slightly exserted.

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

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

Stewart Island.

Altitudinal range: 15–925 m.

Hymenophyllum frankliniae occurs in lowland and montane areas throughout the North Island from the Maungataniwha Range southwards. It ranges from 70 m along the Whanganui River to 925 m in the Kaitake Range, Taranaki. In the South Island it is confined to lowland areas from the Marlborough Sounds to north-west Nelson, and along the west coast to Fiordland and Southland. It is absent from Marlborough, Canterbury and much of Otago and inland Southland. It is recorded on the east coast only from the Catlins district and Dunedin. It occurs from near sea level to 450 m in the Tākaka River gorge.

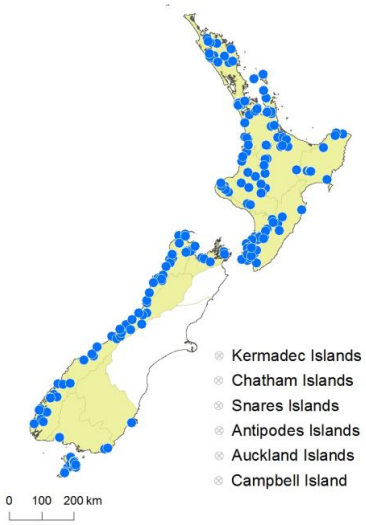

Fig. 47: *Hymenophyllum frankliniae* distribution map based on databased records at AK, CHR, OTA and WELT.

Biostatus: Indigenous (Endemic).

Habitat: Occurs in wet kauri, podocarp, beech and broadleaved forest, most commonly as an epiphyte but also on rotten logs and stumps, and on wet rocks, bluffs or banks. It grows frequently on trunks of *Dicksonia squarrosa* and *Cyathea smithii*, but has also been recorded on *C. medullaris, C. dealbata* and *Prumnopitys taxifolia*.

Recognition: *Hymenophyllum frankliniae* is immediately recognisable by the dense covering of tawny or rusty brown stellate hairs throughout the olive-green fronds. The only other New Zealand filmy ferns

with branched hairs are *H. lyallii*, which has a light green flabellate frond with minute teeth and bifurcate hairs on the margins, and *H. malingii*, which has stellate grey hairs on the adaxial lamina surface, rusty brown hairs on the abaxial surface, and ultimate segments that are almost round in cross-section.

Cytology: n = 36 (Brownlie 1958).

Notes: Colenso (1843) first described this species as *Hymenophyllum frankliniae*, using the genitive form for the epithet. However, he later re-described it as *H. franklinianum* (Colenso 1845) using the adjectival form for the epithet. The name commemorates Lady Franklin, wife of Sir John Franklin, the then Governor of Tasmania, but since she did not actually collect the species and Colenso was merely commemorating her patronage, the adjectival form was considered more appropriate. The later name was subsequently cited in all subsequent New Zealand Floras, and the earlier name only mentioned again in the Supplementary Notes to Allan's Flora (Allan 1961). However, the name *H. frankliniae* was published first, is correctly formed and cannot be considered an orthographic error to be corrected; it is therefore the correct name for this species when treated in *Hymenophyllum*. In his later description of *H. franklinianum*, Colenso (1845) cites *H. frankliniae* in synonymy. Hence *H. franklinianum* was nomenclaturally superfluous when published because the name that should have been used was cited in synonymy (Art. 52.1, 52.2e). It is best treated as a nomenclatural synonym of *H. frankliniae* based on the same type.

The issue was further complicated by Hooker (1844–1846) who published the name *H. aeruginosum* var. *franklinianum* based on *Colenso 272* sent to him as "*Hymenophyllum franklinianum* n.sp." by Colenso in a letter dated 1 September 1842 (St. George 2009). The publication of this name postdates Colenso's *H. frankliniae* of 1843, but predates his *H. franklinianum* of 1845. It must therefore be treated as a separate basionym with a different type.

The basionyms *Hymenophyllum aeruginosum* Carmich., *H. subtilissimum* Kunze and *H. ferrugineum* Colla, and combinations based on them, have been widely misapplied to the species in New Zealand (Allan 1961; Brownsey et al. 1985; Brownsey & Smith-Dodsworth 2000; see Ebihara et al. 2010). Morphological and molecular data indicate that *H. ferrugineum* and *H. frankliniae* are distinct species distributed in South America and New Zealand respectively (Iwatsuki 1982; Ebihara et al. 2004).

Fig. 48: *Hymenophyllum frankliniae*. Plants growing epiphytically on a tree fern trunk.

Fig. 49: *Hymenophyllum frankliniae*. Mature frond with narrowly winged rachis and dense covering of rusty brown stellate hairs.

Fig. 50: *Hymenophyllum frankliniae*. Portion of lamina showing entire margins on segments and immersed solitary sori.

Fig. 51: *Hymenophyllum frankliniae*. Stellate hairs densely covering the lamina segments and outer surfaces of the indusial flaps.

Hymenophyllum lyallii Hook.f., *Bot. Antarct. Voy. II (Fl. Nov.-Zel.) Part II,* 16 (1854)

≡ *Trichomanes lyallii* (Hook.f.) Hook. ex Hook. & Baker, *Syn. Fil.,* 77 (1867)
≡ *Sphaerocionium lyallii* (Hook.f.) Copel., *Philipp. J. Sci.* 67: 33 (1938)

Lectotype (selected by Brownsey & Perrie 2016): New Zealand, Thomson's Sound, SW coast, Middle Island, *D.Lyall*, March 1851, Herbarium Hookerianum, K, labelled only "*H. lyallii*"! (photo WELT E469/22)

Etymology: Named in honour of David Lyall (1817–1895), a Scottish botanist who visited New Zealand in HMS *Terror* as part of Ross's Antarctic Voyage (1839–1843).

Usually epiphytic ferns, rarely terrestrial or rupestral. Rhizomes long-creeping, 0.1–0.2 mm diameter, bearing unbranched pale brown hairs up to 1.5 mm long, clustered at bases of stipes, more evenly distributed elsewhere. Fronds 9–90 mm long. Stipes 4–70 mm long, dark brown, not winged, bearing long brown bifurcate hairs. Laminae 2–4-pinnatifid or branching pseudodichotomously 2–4 times, ovate or flabellate or almost orbicular, 4–40 mm long, 6–34 mm wide, pale green, membranous, with marginal teeth bearing long bifurcate hairs, and sparse bifurcate hairs on costae. Rachises winged, dark brown, bearing sparse bifurcate hairs. Primary pinnae in 2–5 pairs, not overlapping, winged throughout, obovate or flabellate, all adnate; distal portion of primary pinnae straight; the longest primary pinnae at the base, 6–21 mm long, 3–13 mm wide. Secondary pinnae arising basiscopically or both basiscopically and acroscopically, not overlapping, obovate, winged throughout, adnate; the longest secondary pinnae 2–18 mm long, 2–10 mm wide. Ultimate lamina segments oblong, up to 6 mm long, 1.1–2.4 mm wide; apices obtuse or truncate or emarginate; margins with minute teeth, lacking a distinct border; distal segments on primary pinnae divergent. Sori terminating ultimate segments throughout primary pinnae, solitary, many on each primary pinna, immersed in lamina; indusia bivalvate; indusial flaps obovate or obtriangular or broader than long, 1–2 mm long, apices obtuse or truncate, margins entire, hairy on margins; receptacles included within indusial flaps.

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

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

Chatham Islands, Stewart Island, Auckland Islands.

Altitudinal range: 0–925 m.

Hymenophyllum lyallii occurs in lowland and montane areas of the North Island from Doubtless Bay to Rotorua and Mt Taranaki, with an outlying population on Mt Arawaru, Tararua Ranges. There is also an unlocalised collection in the Cheeseman Herbarium made by Colenso from the Ruahine Ranges (AK 142002). The species has only rarely been recorded below 250 m but reaches 850 m on Mt Kaitarakihi and Mt Pirongia, and 925 m on Mt Te Aroha. In the South Island, it occurs in lowland and montane areas of the west coast from Nelson to Fiordland, western Southland and Stewart Island. It ranges from sea level up to 1000 m in the Bryant Range, north-west Nelson and Mt Davy, Paparoa Range. It is known from a single collection each on the Chatham Islands (AK 305162, WELT P023356) and Auckland Islands (CHR 323171).

Also Australia (New South Wales).

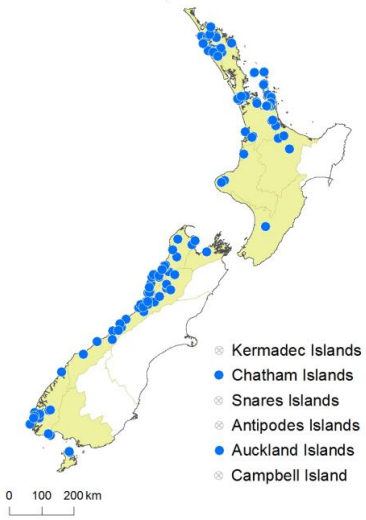

Fig. 52: *Hymenophyllum lyallii* distribution map based on databased records at AK, CHR, OTA and WELT.

Biostatus: Indigenous (Non-endemic).

Habitat: Occurs in kauri, podocarp, beech and broadleaved forest, usually as an epiphyte or at the base of trunks, but also on old stumps, mossy banks, rock faces and under overhangs. It has been recorded growing on *Cyathea dealbata*, *C. smithii*, *Dicksonia squarrosa*, *Dacrydium cupressinum*, *Lepidothamnus intermedius*, *Libocedrus bidwillii*, *Lophozonia menziesii*, *Metrosideros* sp., *Quintinia serrata* and *Weinmannia racemosa*.

Recognition: *Hymenophyllum lyallii* is distinguished by its flabellate fronds with minute marginal teeth bearing bifurcate hairs. No other New Zealand species of filmy fern has flabellate fronds or bifurcate hairs, although stellate hairs are present in *H. frankliniae* and *H. malingii*. However, sterile fronds of *H. lyallii* are often confused with a group of common liverworts, including *Hymenophyton flabellatum* and *Symphyogyna* species.

Cytology: n = 36 (Brownlie 1965).

Notes: *Hymenophyllum lyallii* has been recorded for New Caledonia by Ebihara et al. (2004). However, DNA sequencing suggests that New Caledonian plants are not closely related to Australian and New Zealand plants and may belong to a different species (Perrie et al. 2016).

Fig. 53: *Hymenophyllum lyallii*. Plants growing epiphytically on a tree fern trunk.

Fig. 54: *Hymenophyllum lyallii*. Flabellate fronds with segments branching dichotomously.

Fig. 55: *Hymenophyllum lyallii*. Mature fertile fronds.

Fig. 56: *Hymenophyllum lyallii*. Fertile frond showing solitary sori immersed in the lamina segments with obovate indusial flaps.

Hymenophyllum malingii (Hook.) Mett., *Hymenophyllaceae,* 489 (1864)

≡ *Trichomanes malingii* Hook., *Gard. Ferns,* t. 64 (1862)
≡ *Apteropteris malingii* (Hook.) Copel., *Philipp. J. Sci.* 67: 35, t. 1 (1938)
≡ *Sphaerocionium malingii* (Hook.) K.Iwats., *J. Fac. Sci. Univ. Tokyo, Sect. 3, Bot.* 13: 214 (1982)
Lectotype (selected by Tindale 1963): New Zealand, between Blind Bay and Massacre Bay, *C. Maling*, Herbarium Hookerianum, K! (photo E 468/24)

Etymology: Named in honour of Christopher L. Maling (1841–1916), a surveyor and amateur naturalist in New Zealand.

Usually epiphytic ferns, rarely terrestrial or rupestral. Rhizomes long-creeping, 0.25–0.5 mm diameter, bearing stellate pale red-brown hairs up to 1 mm long, densely clustered at bases of stipes, more evenly distributed elsewhere. Fronds 40–360 mm long. Stipes 10–100 mm long, reddish brown, not winged, bearing pale brown stellate hairs, especially near rachis and rhizome junctions. Laminae 3–4-pinnate, narrowly ovate or ovate or narrowly elliptic, 25–310 mm long, 8–55 mm wide, segments comprised entirely of enlarged costae, completely covered in grey stellate hairs on adaxial surface and rusty-brown stellate hairs on abaxial surface. Rachises not winged, completely covered in grey or red-brown stellate hairs. Primary pinnae in 5–30 pairs, not overlapping, not winged, narrowly elliptic or elliptic or narrowly ovate or ovate, stalked; distal portion of primary pinnae straight or slightly incurved acroscopically; the longest primary pinnae near the base (or rarely near the apex in large aberrant fronds), 9–60 mm long, 3–12 mm wide. Secondary pinnae arising both acroscopically and basiscopically, not overlapping, not winged, stalked; linear or obovate on distal primary pinnae, elliptic or obovate on proximal primary pinnae; the longest secondary pinnae 4–10 mm long, 1–5 mm wide. Ultimate lamina segments linear, up to 4 mm long, 0.4–0.7 mm wide, comprised entirely of enlarged costae; apices obtuse or truncate; margins entire; distal segments on primary pinnae divergent. Sori terminating ultimate segments throughout pinnae, solitary, many on each primary pinna, immersed in lamina; indusia bivalvate; indusial flaps elliptic or broadly elliptic or broader than long, 0.5–1 mm long, completely covered by hairs; receptacles usually slightly exserted.

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

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

Altitudinal range: 80–1380 m.

Hymenophyllum malingii occurs in montane and subalpine areas of the North Island from Mt Te Aroha and the Raukūmara Ranges southwards, occurring most frequently on Mt Taranaki, the central North Island mountains, and Ruahine Ranges. It grows from about 630 m near National Park to 1380 m in the Ruahine Ranges. In the South Island, it occurs mainly west of the main divide in lowland to subalpine areas from Nelson to Haast, with outlying populations in the Mt Aspiring National Park, and around Dunedin and Lake Manapouri. It extends from about 80 m in the Westport area to 1200 m in north-west Nelson.

The record of *Hymenophyllum malingii* from Banks Peninsula is based on two specimens in the Armstrong Herbarium (CHR 633530) collected in 1868 and 1873 from Church Bay, Lyttleton Harbour, and reports of it from near Port Levy by Potts (1878, 1882, pp. 64–65, 249). However, the species has not been seen on Banks Peninsula since, and it is presumed to be locally extinct (Wilson 2013).

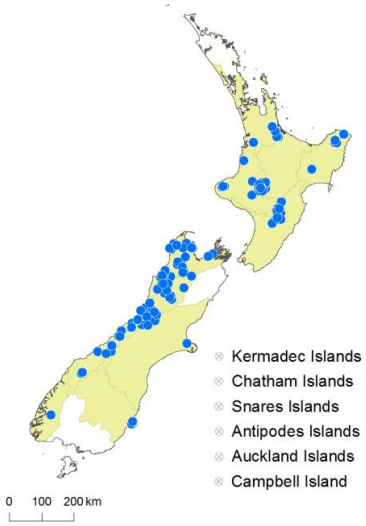

Fig. 57: *Hymenophyllum malingii* distribution map based on databased records at AK, CHR, OTA and WELT.

Biostatus: Indigenous (Endemic).

Habitat: Occurs most frequently on dead trunks of *Libocedrus bidwillii*, more rarely on trunks of *Halocarpus biformis*, *Metrosideros umbellata*, species of Nothofagaceae, and occasionally on boulders, rock faces and banks in montane beech or podocarp forest, or in subalpine tussock.

Recognition: *Hymenophyllum malingii* is immediately recognisable by the complete covering of dense grey stellate hairs on the adaxial lamina surface, and rusty-brown stellate hairs on the abaxial surface. The laminae are usually narrowly ovate, and the lamina segments are almost round in cross-section, comprised entirely of enlarged costae. The only other New Zealand filmy ferns with branched hairs are *H. lyallii,* which has a light green flabellate frond with minute teeth and bifurcate hairs on the margins, and *H. frankliniae*, which has stellate tawny or rusty-brown hairs on the lamina surfaces. Unlike *H. malingii, H. frankliniae* has “normal” flattened lamina segments adjacent to the costae, and unbranched hairs on the rhizome.

Cytology: n = 36 (Brownlie 1965).

Notes: In addition to the lectotype chosen by Tindale (1963) there are two other syntype specimens at K: between Blind Bay and Massacre Bay, *Brunner*, Herbarium Hookerianum, K! (photo WELT E468/23), and New Zealand, Nelson, Golden Bay Ranges, *C. Maling*, Herbarium Hookerianum, K! (photo WELT E468/25).

Fig. 58: *Hymenophyllum malingii*. Plants growing epiphytically on fallen *Libocedrus* trunk.

Fig. 59: *Hymenophyllum malingii*. Plants growing on a trunk amongst liverworts.

Fig. 60: *Hymenophyllum malingii*. Narrowly ovate fertile frond with reduced lamina segments that are almost round in cross-section.

Fig. 61: *Hymenophyllum malingii*. Fertile frond showing solitary sori.

Fig. 62: *Hymenophyllum malingii*. Adaxial lamina surface with grey-brown stellate hairs densely covering the segments and indusial flaps.

Fig. 63: *Hymenophyllum malingii*. Abaxial lamina surface with rusty brown hairs densely covering the segments.

Hymenophyllum minimum A.Rich., *Voy. Astrolabe, Essai* 91, t. 14, f. 2 (1832)

≡ *Meringium minimum* (A.Rich.) Copel., *Philipp. J. Sci.* 73: 457 (1941)
Holotype: Nova Zeelandia, *D'Urville*, Herb. Richard, P 00623489!

= *Hymenophyllum pygmaeum* Colenso, *Trans. & Proc. New Zealand Inst.* 13: 376 (1881)
Lectotype (selected by Brownsey & Perrie 2016): Commissioner's Bluff, Okarito, Westland, *A. Hamilton*, 1878, WELT P005939!

Etymology: From the Latin *minimus* (least), a reference to the small size of this species.

Terrestrial or rupestral ferns or occasionally epiphytic. Rhizomes long-creeping, 0.1–0.2 mm diameter, bearing very scattered red-brown hairs up to 0.3 mm long. Fronds 6–30 mm long. Stipes 2–15 mm long, dark brown throughout, not winged, bearing very scattered hairs. Laminae 1-pinnatisect or 1-pinnatisect with pinnatifid secondary pinnae or 1-pinnate with pinnatifid secondary pinnae, ovate or elliptic or obovate or orbicular, 3–25 mm long, 3–12 mm wide, green, membranous, virtually glabrous. Rachises not winged or occasionally winged distally, dark brown to red-brown, glabrous or with a few very scattered hairs. Primary pinnae in 1–6 pairs, not overlapping, elliptic when undivided, ovate or elliptic or obovate when divided, the longest sometimes divided almost to the base to form 1 or 2

acroscopic segments, adnate to decurrent; distal portion of primary pinnae straight or recurved basiscopically; the longest primary pinnae variably positioned from base to apex of lamina, 2–9 mm long, 0.75–4 mm wide. Ultimate lamina segments oblong to elliptic, up to 5 mm long, 0.7–2.0 mm wide; apices acute or obtuse or truncate; margins deeply toothed, lacking a distinct border. Sori terminating the rachis, solitary, adnate or stalked; indusia bivalvate; indusial flaps elliptic or usually obovate, 2–4 mm long, apices obtuse or truncate, margins and outer surfaces spiny or toothed; receptacles exserted up to 2 mm.

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

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

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

Altitudinal range: 0–1650 m.

Hymenophyllum minimum has a very scattered distribution in coastal and lowland areas of the North Island, extending locally into montane areas. It is found from Mt Te Aroha south to Mt Pirongia, Rotorua and the Hawke's Bay ranges, and again from Wellington to southern Wairarapa, extending from sea level to 1650 m in the Kaweka Ranges. It is absent from Gisborne, Taranaki and most of the central North Island and Hawke's Bay regions. In the South Island it occupies coastal and lowland sites, extending locally to montane and subalpine areas. West of the main divide it occurs from north-west Nelson to Fiordland and Southland. There are also scattered populations east of the main divide and along the coast from Marlborough to the Catlins District. It ranges from sea level to 1650 m in the St Arnaud Range and extends to Solander Island, Stewart Island and all the subantarctic islands except the Snares Islands.

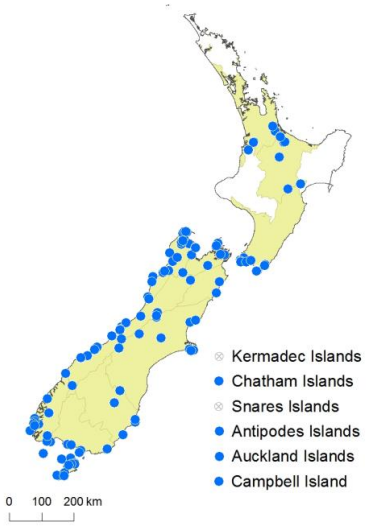

Fig. 64: *Hymenophyllum minimum* distribution map based on databased records at AK, CHR, OTA and WELT.

Biostatus: Indigenous (Endemic).

Habitat: Grows most frequently on rocks, clay banks, logs and under overhangs, from exposed coastal sites to damp stream banks in mānuka, kānuka and *Dracophyllum* scrub, stunted southern rātā forest, beech forest or subalpine tussock. It often forms extensive mats on rock faces or turfs in exposed coastal habitats, but can also grow epiphytically on *Melicytus ramiflorus*, *Metrosideros umbellata* and *Weinmannia racemosa*. In the subantarctic it has been recorded growing on *Carex sectoides* in swamps.

Recognition: *Hymenophyllum minimum* is one of the smallest filmy ferns in New Zealand. It is distinguished by its small size, toothed pinnae, a solitary sorus terminating each rachis, indusial flaps with toothed margins and spines on the outer surfaces, and receptacles that are often exserted for a short distance. When fertile, the usually stalked terminal sori will distinguish this species from other small species with toothed lamina margins, notably *H. armstrongii*, *H. cupressiforme*, *H. peltatum* and *H. revolutum.* Sterile fronds of *H. minimum* are usually simply pinnate and less divided than the latter three species, and lack the dark brown midribs and black marginal spines of *H. armstrongii*.

Cytology: n = 26 (Lovis in Dawson et al. 2000).

Notes: *Hymenophyllum pumilio* Rosenst. from New Caledonia was reduced to synonymy with *H. minimum* by Ebihara & Iwatsuki (2007), but the occurrence of the latter species in New Caledonia seemed improbable since it is absent from much of northern New Zealand. Perrie et al. (2016) reinstated *H. pumilio* as a New Caledonian endemic distinct from *H. minimum.*

Lovis (1982) demonstrated that Colenso's *Hymenophyllum pygmaeum* was a synonym of *H. minimum* rather than *H. revolutum*, the species with which it had been compared by earlier authors, including Allan (1961).

Fig. 65: *Hymenophyllum minimum*. Plants growing on a track bank.

Fig. 66: *Hymenophyllum minimum*. Fronds showing toothed margins on the lamina segments.

Fig. 67: *Hymenophyllum minimum*. Fertile fronds showing spines on the outer surfaces of the indusial flaps.

Fig. 68: *Hymenophyllum minimum*. Fertile fronds showing toothed margins on the lamina segments, and solitary indusia terminating the rachis.

Fig. 69: *Hymenophyllum minimum*. Fertile fronds showing sori with exserted receptacles and spines on the outer surface of the indusial flaps.

Hymenophyllum multifidum (G.Forst.) Sw., *J. Bot. (Schrader)* 1800(2): 102 (1801)

≡ *Trichomanes multifidum* G.Forst., *Fl. Ins. Austr.,* 85 (1786)
≡ *Davallia multifidum* (G.Forst.) Spreng., *J. Bot. (Schrader)* 1799(2): 271 (1800)
≡ *Meringium multifidum* (G.Forst.) Copel., *Philipp. J. Sci.* 67: 44 (1938)
Lectotype (selected by Brownsey & Perrie 2016): New Zealand, Dusky Bay?, G. Forster's Herbarium No. 304.473, BM 001048393!

= *Hymenophyllum truncatum* Colenso, *Trans. & Proc. New Zealand Inst.* 23: 390 (1891)
≡ *Hymenophyllum multifidum* var. *truncatum* (Colenso) Domin, *Biblioth. Bot.* 20 (85): 25 (1913)
Lectotype (selected by Brownsey & Perrie 2016): Dannevirke, Herb. W. Colenso, WELT P003008!

= *Hymenophyllum alpinum* Colenso, *Trans. & Proc. New Zealand Inst.* 31: 263 (1899)
≡ *Hymenophyllum multifidum* var. *alpinum* (Colenso) Domin, *Biblioth. Bot.* 20 (85): 25 (1913)
Lectotype (selected by Brownsey & Perrie 2016): Ruahine Range, *H. Hill*, Herb. W. Colenso, WELT P003012!

= *Hymenophyllum oligocarpum* Colenso, *Trans. & Proc. New Zealand Inst.* 31: 264 (1899)
≡ *Hymenophyllum multifidum* var. *oligocarpum* (Colenso) Domin, *Biblioth. Bot.* 20 (85): 25 (1913)
Lectotype (selected by Brownsey & Perrie 2016): Lake Waikaremoana, *H. Hill*, Herb. W. Colenso, WELT P003013!

Etymology: From the Latin *multi* (much) and *fidus* (divided), a reference to the toothed lamina.

Vernacular name: much-divided filmy fern

Epiphytic, terrestrial or rupestral ferns. Rhizomes long-creeping, 0.2–0.5 mm diameter, bearing red-brown hairs up to 1 mm long, clustered at bases of stipes, scattered elsewhere. Fronds 13–380 mm long. Stipes 5–150 mm long, dark brown throughout, not winged or occasionally with a narrow wing in the distal half, bearing scattered hairs. Laminae usually 4-pinnatifid or rarely 3-pinnatifid or 5-pinnatifid, ovate or elliptic or triangular or broadly ovate, 8–225 or very rarely to 280 mm long, 7–120 mm wide, dark green, membranous, glabrous or with a few scattered hairs on the costae. Rachises winged throughout, dark brown or red-brown, glabrous or with a few scattered hairs; rachis wings planate or occasionally slightly flexuouse, margins toothed. Primary pinnae in 5–20 pairs, overlapping, winged throughout; distal portion of primary pinnae straight or incurved acroscopically; distal primary pinnae narrowly ovate or ovate or elliptic, adnate; proximal primary pinnae narrowly ovate or ovate or broadly ovate, adnate or occasionally the basal pair of pinnae almost stalked; the longest primary pinnae at or near the base, 4–120 mm long, 2–35 mm wide. Secondary pinnae arising both acroscopically and basiscopically, overlapping, winged throughout, adnate; narrowly ovate to narrowly elliptic on distal primary pinnae, ovate or narrowly ovate on proximal primary pinnae; the longest secondary pinnae 6–30 mm long, 4–15 mm wide. Ultimate lamina segments oblong or linear, up to 5 mm long, 0.4–1.3 mm wide; apices obtuse or truncate; margins toothed, lacking a distinct border; distal segments on primary pinnae curved towards frond apex. Sori borne on short acroscopic and basiscopic segments in proximal half of primary pinnae, solitary, 1–many on each primary pinna, adnate; indusia bivalvate, fused into a tube in proximal half, usually bent upwards at 90º to plane of frond; indusial flaps elliptic or obovate, 2–4 mm long, apices obtuse or truncate, margins entire or shallowly toothed; receptacles exserted up to 6 mm.

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

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

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

Altitudinal range: 0–1800 m.

Hymenophyllum multifidum occurs in lowland to subalpine areas throughout the North Island from Doubtless Bay southwards. It is rarely found below 120 m, but extends up to 1400 m on Mt Hikurangi and in the Kaimanawa Ranges, and to 1600 m on Mt Ruapehu. In the South Island it occurs in lowland to alpine areas in all but the driest regions. It ranges from sea level to 1800 m in the Malte Brun Range, Mt Cook National Park. It is found on Solander Island, Stewart Island and all the subantarctic islands except the Snares Islands, reaching 450 m on Campbell Island. It has one of the largest altitudinal ranges of any New Zealand fern.

Also Lord Howe Island, Vanuatu, Fiji, Samoa.

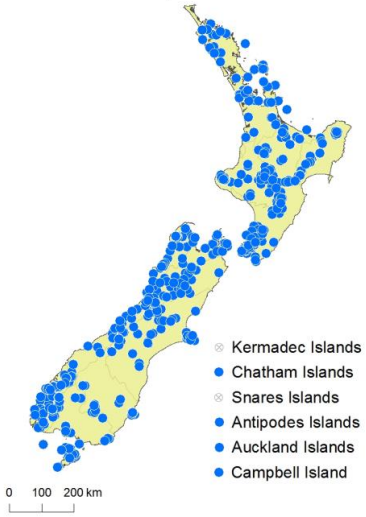

Fig. 70: *Hymenophyllum multifidum* distribution map based on databased records at AK, CHR, OTA and WELT.

Biostatus: Indigenous (Non-endemic).

Habitat: Occurs in a wide variety of habitats from kauri, podocarp, beech and broadleaved forest, to mānuka, kānuka, *Olearia* and *Dracophyllum* scrub, subalpine herbfield and tussock grassland. It grows on the ground, in boggy areas, on humus hummocks, *Sphagnum*, rocks, scoria, banks, cuttings, in rock crevices, on rotten stumps and logs, and at the base of trunks. It also grows epiphytically on a wide variety of trees, including *Beilschmiedia tawa*, *Coprosma rugosa*, *Dacrycarpus dacrydioides*, *Dacrydium cupressinum*, *Dracophyllum filifolium*, *Elaeocarpus dentatus*, *Ixerba brexioides*, *Knightia excelsa*, *Metrosideros umbellata*, *Olearia colensoi*, *Prumnopitys ferruginea*, *Weinmannia racemosa* and species of Nothofagaceae. Unusually for a species of *Hymenophyllum*, it is rarely found on tree fern trunks except on the Chatham Islands where is has been recorded from *Dicksonia squarrosa*.

Recognition: *Hymenophyllum multifidum* is usually a medium-sized filmy fern, but varies considerably in size from small forms at high altitudes or in the far south of the country, to much larger plants in high rainfall areas of the west coast of the South Island. It is distinguished by its generally glabrous or sparsely hairy fronds, toothed margins, and large sori which are bent upward at right angles to the plane of the frond and have the receptacle exserted for a distance similar to the length of the indusial flaps. Plants in the far south of the South Island and on the subantarctic islands tend to have more divided fronds with narrower ultimate segments, slightly hairier laminae, and longer hairs on the rhizome compared to those further north. *Hymenophyllum multifidum* is a very tolerant and widespread species, growing best in damp areas, but curling tightly when dry.

Sterile fronds are hard to distinguish from those of *H. bivalve*. However, *H. multifidum* generally has laminae which are slightly smaller, often obviously curled downwards, and have more pronounced teeth, especially on the rachis wings.

Cytology: n = 26 (Brownlie 1954).

Fig. 71: *Hymenophyllum multifidum*. Fertile frond showing toothed wings on the rachis.

Fig. 72: *Hymenophyllum multifidum*. Fertile frond showing toothed margins on the lamina segments.

Fig. 73: *Hymenophyllum multifidum*. Indusia with entire margins, bent upwards at 90° to the plane of the frond.

Fig. 74: *Hymenophyllum multifidum*. Portion of lamina showing toothed margins on lamina segments, and indusia bent upwards at 90° to the plane of the frond.

Fig. 75: *Hymenophyllum multifidum*. Indusia with exserted receptacles and shallowly toothed margins on the indusial flaps.

Fig. 76: *Hymenophyllum multifidum*. Tightly curled fertile fronds growing in a subalpine environment.

Hymenophyllum nephrophyllum Ebihara & K.Iwats. in Ebihara et al., *Blumea* 51: 234 (2006)

nom. nov. pro *Trichomanes reniforme* G.Forst. 1786 (non *Hymenophyllum reniforme* Hook. 1844)

≡ *Trichomanes reniforme* G.Forst., *Fl. Ins. Austr.,* 84 (1786)

≡ *Cardiomanes reniforme* (G.Forst.) C.Presl, *Hymenophyllaceae,* 13 (1843)

Lectotype (selected by Nicolson & Fosberg 2004): no locality, *Forster*, UPS-T 25164 (*n.v.*)

Etymology: From the Greek *nephro-* (kidney-shaped), *-phyllus* (-leaved), a reference to the shape of the frond.

Vernacular names: kidney fern; konehu; kopakopa; raurenga

Terrestrial, rupestral or low epiphytic ferns. Rhizomes long-creeping, 0.5–1 mm diameter; rhizome hairs red-brown, dense at bases of stipes, scattered elsewhere, up to 2 mm long. Fronds 40–280 mm long. Stipes 20–240 mm long, reddish brown throughout, narrowly winged distally for more than half their length, brittle, glabrous or with a few short scattered hairs. Laminae undivided, reniform or almost orbicular, fertile 17–65 mm long, 25–105 mm wide, sterile sometimes a little larger and more irregular in outline, shiny green, herbaceous, two or more cells thick, glabrous; margins entire, thickened to form a distinct border. Rachises absent. Primary pinnae absent. Ultimate segments absent. Sori borne around lamina margin, many on each lamina, crowded, partially to deeply immersed in lamina; indusia urceolate, 1–2 mm long, not widened at mouth, margins entire; receptacles exserted up to 4 mm.

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

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

Chatham Islands, Stewart Island.

Altitudinal range: 10–780 m.

Hymenophyllum nephrophyllum occurs throughout the North Island in lowland and montane forest, but is absent from much of the east coast. It ranges from sea level to about 750 m near Lake Waikaremoana, on Mt Taranaki and in the Tararua Ranges, reaching 780 m in the western Raukūmara district. In the South Island it extends from the Marlborough Sounds through north-west Nelson, Westland and Fiordland to southern Southland. It grows from sea level up to 600 m in the Nelson Lakes District.

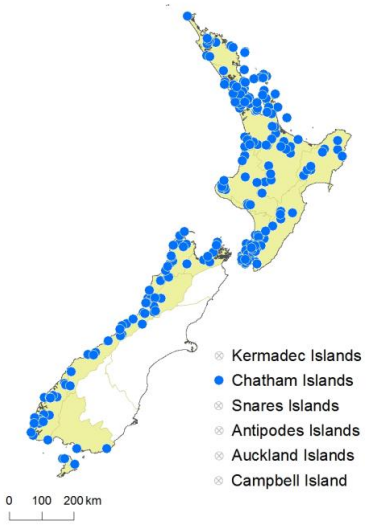

Fig. 77: *Hymenophyllum nephrophyllum* distribution map based on databased records at AK, CHR, OTA and WELT.

Biostatus: Indigenous (Endemic).

Habitat: *Hymenophyllum nephrophyllum* forms extensive mats on the forest floor, on fallen trunks, on banks and rocks, on lava fields, in moss forest, at the base of tree trunks and as a low epiphyte in kauri, podocarp, broadleaved and beech forest, and in old kānuka scrub.

Recognition: *Hymenophyllum nephrophyllum* is immediately recognised by its undivided, kidney-shaped lamina bearing numerous sori around the margin. The urceolate indusia and slightly exserted receptacles are unusual in *Hymenophyllum*, and account for the fact that the species has previously been included in *Trichomanes* (Allan 1961; Brownsey et al. 1985; Brownsey & Smith-Dodsworth 2000) or the segregate genus *Cardiomanes* (Crookes 1963). It is now treated in the monotypic subgenus *Cardiomanes* (Ebihara et al. 2006).

Cytology: n = 36 (Brownlie 1958).

Notes: *Hymenophyllum nephrophyllum* is a *nomen novum* for *Cardiomanes reniforme*, required because the name *Hymenophyllum reniforme* is pre-occupied (Ebihara et al. 2010).

Hymenophyllum nephrophyllum, together with *H. dilatatum* and *H. scabrum*, is unusual in the genus in having a frond that is more than one cell thick. Holloway (1923) showed that sporelings had a lamina only one cell thick and that the multi-layered condition developed with maturity.

Fig. 78: *Hymenophyllum nephrophyllum*. Plants growing on a fallen, rotten trunk.

Fig. 79: *Hymenophyllum nephrophyllum*. Plants growing epiphytically on a tree fern trunk.

Fig. 80: *Hymenophyllum nephrophyllum*. Young sterile frond showing the winged stipe and thickened border on the lamina.

Fig. 81: *Hymenophyllum nephrophyllum*. Fertile frond showing free veins, and immature sori around the margin.

Fig. 82: *Hymenophyllum nephrophyllum*. Urceolate indusia with immature sporangia on exserted receptacles.

Fig. 83: *Hymenophyllum nephrophyllum*. Fertile frond with sporangia maturing basipetally on receptacles exserted beyond the indusial cups.

Hymenophyllum peltatum (Poir.) Desv., *Mém. Soc. Linn. Paris* 6: 333 (1827)

≡ *Trichomanes peltatum* Poir., *Encycl.,* 76 (1808)
Holotype: Ile de France [Mauritius], *Bory de Saint-Vincent*, P (*n.v.*; see Tindale 1963)

= *Hymenophyllum unilaterale* Willd., *Sp. Pl. 5 (1),* 521 (1810)
≡ *Hymenophyllum tunbridgense* var. *unilaterale* (Willd.) G.M.Thomson, *Ferns New Zealand,* 36 (1882)
Holotype: Bourbon [Reunion], *Bory de Saint Vincent*, Herb. Willdenow 117, B–W 20225–00 0 (!online)

Etymology: From the Latin *peltatus* (peltate, attached to the stalk by the centre), a reference to the attachment of the indusia to the pinnae.

Epiphytic, terrestrial or rupestral ferns. Rhizomes long-creeping, 0.1–0.3 mm diameter, bearing very scattered red-brown hairs up to 0.3 mm long. Fronds 20–140 mm long. Stipes 3–30 mm long, dark brown throughout, not winged, bearing very scattered hairs. Laminae 2-pinnatifid or rarely 3-pinnatifid, narrowly ovate or narrowly elliptic, 16–120 mm long, 8–25 mm wide, green, membranous, glabrous. Rachises narrowly winged throughout, brown, glabrous; rachis wings planate, margins entire. Primary pinnae in 6–15 pairs, not overlapping, winged throughout, narrowly ovate or ovate or elliptic, adnate; distal portion of primary pinnae strongly incurved acroscopically; the longest primary pinnae at or below the middle, 5–15 mm long, 2–7 mm wide. Ultimate lamina segments arising only acroscopically on primary pinnae, oblong or linear, up to 8 mm long, 0.6–1.5 mm wide; apices acute or obtuse; margins toothed, lacking a distinct border; segments on primary pinnae directed to frond apex. Sori borne on short acroscopic segments at the base of primary pinnae, solitary on each segment, 1–3 on each primary pinna, adnate; indusia bivalvate; indusial flaps usually ovate or elliptic, 1–2 mm long, apices obtuse, margins entire; receptacles included within indusial flaps or slightly exserted up to 0.5 mm.

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

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

Solander Island, Stewart Island.

Altitudinal range: 150–1700 m.

Hymenophyllum peltatum occurs extensively in montane to subalpine areas of the North Island from Mt Te Aroha southwards, occupying an altitudinal zone from about 450 m in the Ruahine and Kaweka Ranges to 1500 m on Mt Taranaki and the Ruahine Ranges. In the South Island it occurs on both sides of the main divide, growing in lowland to alpine areas, extending from 150 m in Westland to 1700 m on Malte Brun, Mt Cook.

Also Chile, South Africa, Mascarene Islands, Borneo (Mt Kinabalu), Papua New Guinea (Mt Victoria), Australia (Queensland, New South Wales, Victoria, Tasmania), Macquarie Island (Ebihara & Iwatsuki 2007).

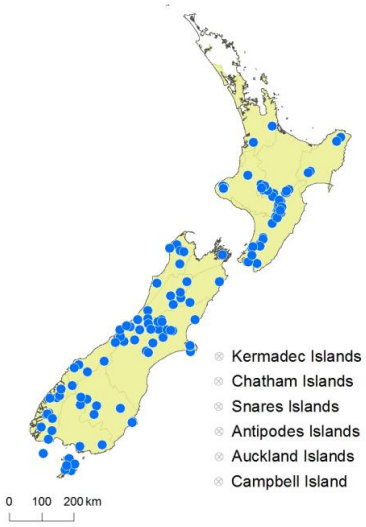

Fig. 84: *Hymenophyllum peltatum* distribution map based on databased records at AK, CHR, OTA and WELT.

Biostatus: Indigenous (Non-endemic).

Habitat: Grows on the ground, or on rocks, banks, fallen logs or epiphytically, most frequently in beech, podocarp forest or *Weinmannia* forest, or in subalpine scrub or herbfield. It has been recorded as an epiphyte on *Dracophyllum traversii*, *Fuchsia excorticata*, *Libocedrus bidwillii*, *Lophozonia menziesii*, *Metrosideros umbellata* and *Olearia colensoi*. Unusually for a species of *Hymenophyllum*, it has not been recorded on tree fern trunks.

Recognition: *Hymenophyllum peltatum* is one of several small filmy ferns in New Zealand with toothed lamina margins. It is smaller than either *H. bivalve* or *H. multifidum*, and lacks the marginal spines on the lamina segments in *H. armstrongii* or the spines on the back of the indusial flaps in *H. minimum.* It is very similar to *H. revolutum* and *H. cupressiforme*, but distinguished from the former by its rachises which are winged throughout and its indusial flaps which are entire, and from the latter by having up to three sori on each primary pinna rather than one, by its secondary pinnae which arise only acroscopically, and by its indusial flaps which are entire rather than shallowly toothed.

Cytology: n = 11 (Brownlie 1958).

Notes: A collection from the Waitakere Ranges made by Cheeseman (CHR 293698) is labelled by him as *H. cheesemanii* (= *H. armstrongii*). However, the sheet includes material of both *H. armstrongii* (at the top) and *H. peltatum* (in the centre). The latter species is not known from the Waitakere Ranges today (Peter de Lange, pers. comm.), no other collections north of Mt Te Aroha are known, and it is unlikely to have been collected from Waitakere by Cheeseman. The sheet is from the Carse Herbarium and the specimen of *H. peltatum* was probably added in error after receipt from Cheeseman.

Fig. 85: *Hymenophyllum peltatum*. Plants growing amongst the moss *Dicranoloma*.

Fig. 86: *Hymenophyllum peltatum*. Plants growing epiphytically on a tree fern trunk.

Fig. 87: *Hymenophyllum peltatum*. Lamina showing ultimate segments arising only acroscopically on the primary pinnae, and with deeply toothed margins.

Fig. 88: *Hymenophyllum peltatum*. Lamina showing the rachis winged throughout, and indusial flaps with entire margins.

Fig. 89: *Hymenophyllum peltatum*. Sporangia maturing basipetally on receptacles exserted beyond the bivalvate indusia.

Fig. 90: *Hymenophyllum peltatum*. Elongated frond with deeply toothed margins.

Hymenophyllum pluviatile Perrie & Brownsey in Perrie et al., *New Zealand J. Bot.* 51: 317 (2013)

Holotype: New Zealand, South Island, near Franz Josef, *L.R. Perrie 6728 et al.*, 30 May 2012, WELT P024270 (mounted on sheets A and B). Isotype: CHR.

Etymology: From the Latin *pluviatile* (of or pertaining to rain), a reference to the distribution of this species in areas of high rainfall.

Terrestrial, rupestral or occasionally epiphytic ferns. Rhizomes long-creeping, 0.5–1 mm diameter, glabrous or bearing pale brown hairs up to 1 mm long clustered at bases of stipes. Fronds 75–190 mm long. Stipes 30–90 mm long, reddish brown, very narrowly winged in distal half, glabrous or bearing a few scattered hairs at base; stipe wing planate. Laminae 4–5-pinnatifid, elliptic or ovate or rarely triangular, 40–130 mm long, 20–70 mm wide, green, membranous, glabrous. Rachises winged throughout, reddish brown, glabrous; rachis wing planate or slightly flexuous. Primary pinnae in 5–15 pairs, scarcely overlapping, winged throughout; distal portion of primary pinnae straight; distal primary pinnae narrowly ovate or ovate, adnate; proximal primary pinnae ovate, adnate; the longest primary pinnae at or below the middle, 11–55 mm long, 11–25 mm wide. Secondary pinnae arising both acroscopically and basiscopically, scarcely overlapping, winged throughout, adnate; ovate or elliptic on distal primary pinnae, ovate or elliptic on proximal primary pinnae; the longest secondary pinnae 7–17 mm long, 4–11 mm wide. Ultimate lamina segments oblong, up to 5 mm long, 0.5–1.2 mm wide, planate or slightly flexuous; apices obtuse or truncate or occasionally emarginate; margins entire, lacking a distinct border; distal segments on primary pinnae divergent. Sori borne on short acroscopic and basiscopic segments throughout pinnae, solitary or sometimes paired, many on each primary pinna, adnate; indusia bivalvate; indusial flaps ovate or elliptic or almost orbicular, 0.75–1.5 mm long, apices acute, obtuse or truncate, margins almost entire or irregularly dentate; receptacles included within indusial flaps.

Distribution: North Island: Northland, Auckland, Volcanic Plateau.
South Island: Western Nelson, Westland, Fiordland.

Altitudinal range: 20–800 m.

Hymenophyllum pluviatile is confined to areas of high rainfall on the west coast of both islands, apart from one collection from Tauhara near Taupō. It extends from Waimā Forest in Northland to Doubtful Sound in Fiordland, and a more southerly but imprecisely located 1918 collection "on track to Preservation Inlet" (AK 139880). In the North Island it grows mostly above 400 m, reaching 800 m on Mt Pirongia, and possibly up to 1000 m on Tauhara. In the South Island it extends from 20 m in Fiordland to over 600 m on Mt Burnett, north-west Nelson. It has been observed on Stewart Island (see NatureWatchNZ 1467047), but not yet collected from there, and hence not recorded on the distribution map.

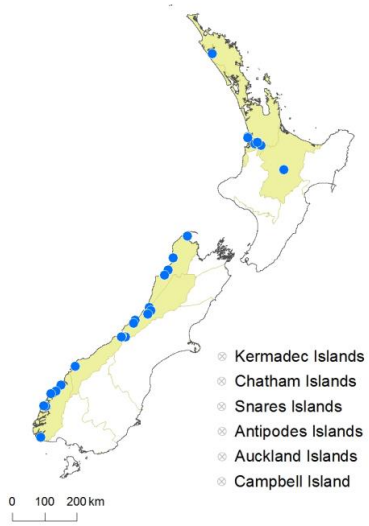

Fig. 91: *Hymenophyllum pluviatile* distribution map based on databased records at AK, CHR, OTA and WELT.

Biostatus: Indigenous (Endemic).

Hymenophyllum pluviatile was given a conservation status of Nationally Vulnerable (as the taxonomically indeterminate *H.* aff. *flexuosum*) by de Lange et al. (2013).

Habitat: *Hymenophyllum pluviatile* grows on rock, on soil banks, or as a low epiphyte on mossy tree trunks in wet, shaded beech, podocarp or broadleaved forest in areas with rainfall exceeding 1000 mm per year, and usually more than 1500 mm. It has been recorded as an epiphyte on *Dacrydium cupressinum*, *Podocarpus* sp., *Prumnopitys ferruginea*, *Beilschmiedia tawa*, *Metrosideros umbellata* and *Myrsine* sp.

Recognition: *Hymenophyllum pluviatile* is a small to medium-sized filmy fern distinguished by its ovate or triangular frond and narrow planate wings on the stipe. It can be distinguished from other species with winged stipes by its creeping rhizome (cf. erect rhizome in *H. pulcherrimum*), indusium flaps lacking crests (cf. crested indusial flaps in *H. sanguinolentum*), narrow planate stipe wings (cf. broad, usually flexuous wings in *H. flexuosum*), and smaller laminae (40–130 mm long, 20–70 mm wide cf. 60–430 mm long, 40–170 mm wide in *H. dilatatum* and *H. flexuosum*).

Hymenophyllum pluviatile is most easily confused with *H. australe* but can be distinguished by its epiphytic, rupestral or terrestrial habitat (cf. confined to rock in and near streams), its more divided frond (4–5-pinnatifid, cf. 2–4-pinnatifid), stipe wings which are very narrow and largely confined to the distal half, primary pinnae which tend to be straight rather than curved acroscopically, and ultimate lamina segments which are divergent rather than curved towards the frond apex, and are obtuse or truncate rather than emarginate.

Fig. 92: *Hymenophyllum pluviatile*. Plants growing epiphytically on a trunk.

Fig. 93: *Hymenophyllum pluviatile*. Frond showing the slightly flexuous wing on the stipe and rachis.

Fig. 94: *Hymenophyllum pluviatile*. Sterile frond showing the slightly flexuous wing on the stipe and rachis, and narrow lamina segments with entire margins.

Fig. 95: *Hymenophyllum pluviatile*. Fertile frond with solitary sori on the lamina segments.

Hymenophyllum polyanthos (Sw.) Sw., *J. Bot. (Schrader)* 1800(2): 102 (1801)

≡ *Trichomanes polyanthos* Sw., *Prodr.,* 137 (1788)

Syntypes: Jamaica, *Swartz*, S (numerous), BM 000936765, B (*n.v.*; see Proctor 1985)

Etymology: From the Greek *polys* (many) and *anthos* (flower).

Epiphytic ferns. Rhizomes long-creeping, c. 0.3 mm diameter, bearing red-brown hairs up to 0.1 mm long clustered at bases of stipes. Fronds 90–100 mm long. Stipes 20–35 mm long, red-brown, narrowly winged for at least half their length, glabrous or bearing a few scattered hairs at base; stipe wing planate. Laminae 3–4-pinnatifid, elliptic or ovate, 60–80 mm long, 20–50 mm wide, green turning red-brown with age, membranous, glabrous. Rachises winged throughout, red-brown, glabrous; rachis wing planate. Primary pinnae in 10–12 pairs, scarcely overlapping, winged throughout, ovate, adnate; distal portion of primary pinnae straight; the longest primary pinnae at or below the middle, 16–25 mm long, 7–13 mm wide, the proximal primary pinnae sometimes greatly reduced. Secondary pinnae arising both acroscopically and basiscopically, scarcely overlapping, winged throughout, ovate, often divided into two segments of unequal size and dissection, adnate; the longest secondary pinnae 5–8 mm long, 3–5 mm wide. Ultimate lamina segments oblong, up to 2 mm long and 1 mm wide, planate; apices obtuse or truncate or slightly emarginate; margins entire, lacking a distinct border; distal segments on primary pinnae divergent. Sori terminating ultimate segments at the distal ends of the pinnae, solitary on each segment, several on each primary pinna, partially immersed in lamina; indusia bivalvate; indusial flaps elliptic or obovate, 1.5–1.75 mm long, apices obtuse or truncate, margins entire; receptacles included within indusial flaps.

Distribution: Kermadec Islands.

Altitudinal range: c. 450 m.

Hymenophyllum polyanthos is a rare fern in New Zealand, at the southern limit of its distribution, and known only from Raoul Island, Kermadec Islands.

Also Australia (Queensland), Solomon Islands, Vanuatu, Fiji, Samoa, Cook Islands, Society Islands, Marquesas Islands, Austral Islands and pantropical in the New and Old World.

Biostatus: Indigenous (Non-endemic).

Hymenophyllum polyanthos was given a conservation status of Naturally Uncommon by de Lange et al. (2013).

Habitat: Recorded growing on *Melicytus ramiflorus* in wet *Metrosideros* forest at 450 m on Raoul Island, associated with *Hymenophyllum demissum* and *Plagiochila pacifica*.

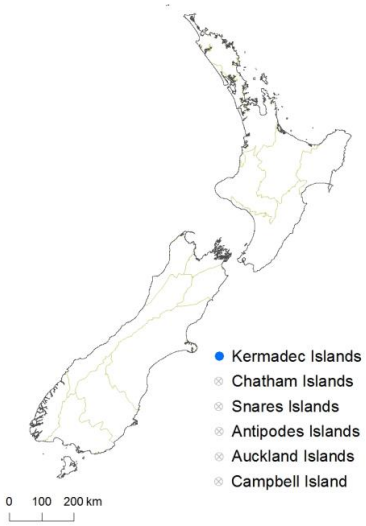

Fig. 96: *Hymenophyllum polyanthos* distribution map based on databased records at AK, CHR, OTA and WELT.

Recognition: *Hymenophyllum polyanthos* is similar to *H. dilatatum*, *H. pluviatile* and *H. australe* in having a planate wing extending at least half way down the stipe from the rachis. It can be distinguished from *H. pluviatile* and *H. australe* by the sori which are sunk into the lamina segments, rather than being adnate to the segments. It differs from *H. dilatatum* by the narrower ultimate lamina segments (c. 1 mm rather than 1.5–2 mm wide), the often emarginate rather than acute or obtuse apices, and the shape of the indusia which tend to be obovate rather than orbicular. It is also confined in New Zealand to the Kermadec Islands, unlike the other species which occur on the main islands.

Notes: Ebihara et al. (2010) noted that *H. polyanthos* in the Pacific region forms a clade distinct from plants in the Neotropics and East Asia, and that it probably requires a new name.

Fig. 97: *Hymenophyllum polyanthos*. Dried frond.

Fig. 98: *Hymenophyllum polyanthos*. Dried specimen showing the winged rachis at the base of the lamina.

Fig. 99: *Hymenophyllum polyanthos*. Dried specimen showing the winged rachis at mid-lamina.

Fig. 100: *Hymenophyllum polyanthos*. Dried specimen showing sori immersed in the ultimate lamina segments, with obovate, entire indusial flaps.

Hymenophyllum pulcherrimum Colenso, *Tasmanian J. Nat. Sci.* 2: 185 (1845)

≡ *Mecodium pulcherrimum* (Colenso) Copel., *Philipp. J. Sci.* 67: 24 (1938)

Lectotype (chosen by Allan 1961): Waikare Lake [Lake Waikaremoana], *W. Colenso*, 1841, WELT P003271!

Etymology: From the Latin *pulcherrimus* (most beautiful), a reference to the perceived attractiveness of this species.

Vernacular name: tufted filmy fern

Epiphytic, terrestrial or rupestral ferns. Rhizomes erect or short-creeping, bearing red-brown hairs up to 7 mm long. Fronds 120–720 mm long. Stipes 25–160 mm long, pale brown or red-brown throughout, winged almost to the base, glabrous. Laminae 4–5-pinnatifid, narrowly ovate or ovate or narrowly elliptic, 80–580 mm long, 35–175 mm wide, green, membranous, glabrous. Rachises winged throughout, pale brown, glabrous; rachis wings planate, margins entire. Primary pinnae in 10–20 pairs, usually overlapping, winged throughout, all adnate; distal portion of primary pinnae straight or incurved acroscopically; distal primary pinnae narrowly ovate to ovate; proximal primary pinnae ovate to broadly ovate; the longest primary pinnae below the middle, 35–190 mm long, 20–50 mm wide. Secondary pinnae arising both acroscopically and basiscopically, scarcely overlapping, winged throughout, elliptic to ovate, adnate; the longest secondary pinnae 14–45 mm long, 12–20 mm wide. Ultimate lamina segments oblong, up to 6 mm long, 0.8–1.9 mm wide, planate or slightly flexuous; apices obtuse or truncate or slightly emarginate; margins entire, lacking a distinct border; distal segments on primary pinnae divergent. Sori borne on short acroscopic and basiscopic segments throughout primary pinnae, solitary, many on each primary pinna, adnate; indusia bivalvate; indusial flaps ovate or elliptic or almost orbicular, 1–1.5 mm long, apices obtuse, margins entire; receptacles included within indusial flaps.

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

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

Stewart Island, Auckland Islands.

Altitudinal range: 40–1170 m.

Hymenophyllum pulcherrimum occurs in lowland to montane areas of the North Island from Mt Te Aroha and Pukeamaru, East Cape southwards, ranging from 200 m in the Wairarapa to 1170 m on Mt Taranaki. In the South Island, it is largely confined to areas west of the main divide, with only scattered populations in inland Canterbury and on the east coast. It ranges from 40 m near Haast to 975 m in the Paparoa Ranges.

Biostatus: Indigenous (Endemic).

Habitat: Occurs in podocarp, beech and broadleaved forest, growing on rock, banks, rotting logs, at the base of tree trunks or epiphytically. It has been recorded growing on *Coprosma* sp., *Griselinia littoralis*, *Nestegis cunninghamii*, *Podocarpus laetus*, *Weinmannia racemosa* and species of Nothofagaceae. Unusually for a species of *Hymenophyllum*, it does not grow on tree fern trunks.

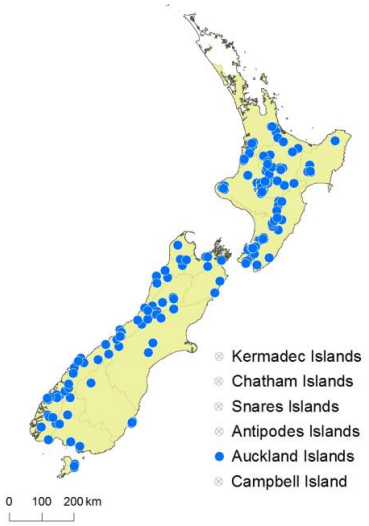

Fig. 101: *Hymenophyllum pulcherrimum* distribution map based on databased records at AK, CHR, OTA and WELT.

Recognition: *Hymenophyllum pulcherrimum* is the only New Zealand species of *Hymenophyllum* to have an erect or short-creeping rhizome. In addition, it can be recognised by its long, pendulous, glabrous and often rather flexuous fronds with winged rachises and stipes. It can sometimes be confused with *H. flexuosum* but the abundant red-brown rhizome hairs up to 7 mm long in *H. pulcherrimum* are very different to the scattered pale brown hairs up to 1 mm long confined to the stipe bases of *H. flexuosum*.

Cytology: n = 36 (Brownlie 1961).

Notes: *Hymenophyllum pulcherrimum* was described by Colenso (1845) from collections he made on the shores of Lake Waikaremoana in December 1841. The lectotype was chosen by Allan (1961), citing "*Colenso*, December 1841" in WELT (now WELT P003271). There is also a specimen at K (*Colenso 273*) which is a syntype (photo WELT E468/26). Neither specimen bears the month "December" cited by Allan, and this is assumed to have been taken from the protologue.

Fig. 102: *Hymenophyllum pulcherrimum*. Plant growing epiphytically on a tree trunk from an erect rhizome.

Fig. 103: *Hymenophyllum pulcherrimum*. Plant growing epiphytically on a tree trunk.

Fig. 104: *Hymenophyllum pulcherrimum*. Stipes with broad planate wings almost to the base, growing from an erect rhizome.

Fig. 105: *Hymenophyllum pulcherrimum*. Lamina with slightly flexuous wings on the rachis and planate wings on the stipe.

Fig. 106: *Hymenophyllum pulcherrimum*. Lamina with narrow, almost planate, wings on the rachis.

Fig. 107: *Hymenophyllum pulcherrimum*. Fertile frond showing sori with elliptic or almost orbicular indusial flaps.

Hymenophyllum rarum R.Br., *Prodr. Fl. Nov. Holland.,* 159 (1810)

≡ *Mecodium rarum* (R.Br.) Copel., *Philipp. J. Sci.* 67: 21 (1938)
Lectotype (selected by Tindale 1963): Derwent [Tasmania], *R. Brown Iter Australiense No. 97*, 1802–05, BM 001044791!

= *Hymenophyllum semibivalve* Hook. & Grev., *Icon. Fil. 1,* t. 83 (1828)
Holotype: New Zealand, *A. Menzies*, labelled “Hymenophyllum asplenioides”, K! (photo WELT E 469/29; see Tindale 1963)

= *Hymenophyllum imbricatum* Colenso, *Tasmanian J. Nat. Sci.* 2: 187 (1845) nom. illeg. non *Hymenophyllum imbricatum* Blume 1828
Lectotype (selected by Brownsey & Perrie 2016): Pataua Inlet, East Coast, *W. Colenso*, 1842, WELT P003263!

Etymology: From the Latin *rarus* (far apart, scattered), a reference to the widely spaced fronds along the rhizome.

Vernacular name: tufted filmy fern

Epiphytic, terrestrial or rupestral ferns. Rhizomes long-creeping, 0.1–0.2 mm diameter, glabrous or bearing very scattered red-brown hairs up to 0.3 mm long. Fronds 13–235 mm long. Stipes 3–90 mm

long, dark brown throughout, not winged, glabrous. Laminae 2–3-pinnatifid or occasionally irregularly divided, narrowly ovate or ovate or narrowly elliptic or elliptic, rarely narrowly obovate in very long fronds with the lower pinnae abraded, 10–200 mm long, 8–40 mm wide, grey-green, membranous, glabrous. Rachises winged for most of their length, dark brown proximally, red-brown distally, glabrous; rachis wings planate or sometimes slightly flexuose. Primary pinnae in 4–30 pairs, often markedly overlapping, winged throughout, adnate; distal portion of primary pinnae straight or slightly incurved acroscopically; distal primary pinnae elliptic or obovate; proximal primary pinnae ovate; the longest primary pinnae below the middle, 7–40 mm long, 3–10 mm wide, but individual primary pinnae occasionally greatly extended. Secondary pinnae usually arising acroscopically or occasionally also basiscopically, slightly overlapping, winged throughout, elliptic to obovate, adnate; the longest secondary pinnae 3–12 mm long, 1–5 mm wide. Ultimate lamina segments oblong or linear, up to 4 mm long, 1.2–2.7 mm wide; apices obtuse or truncate or slightly emarginate; margins entire, lacking a distinct border; distal segments on primary pinnae sometimes curved towards frond apex. Sori borne on acroscopic and basiscopic segments at the distal ends of the pinnae, solitary, a few on each primary pinna, immersed in lamina segments; indusia bivalvate; indusia elliptic to almost orbicular, 1.5–2.5 mm long, apices obtuse, margins entire; receptacles included within indusial flaps.

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

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

Kermadec Islands, Chatham Islands, Stewart Island, Auckland Islands.

Altitudinal range: 0–1400 m.

Hymenophyllum rarum occurs in lowland to subalpine areas throughout the North Island, except along the east coast, ranging from near sea level up to 1400 m on Mt Taranaki and in Tongariro National Park. In the South Island it occurs in lowland and montane areas of the Marlborough Sounds, north-west Nelson, Westland and Fiordland, extending to the Catlins, Dunedin and Banks Peninsula on the east coast. It is absent from much of the drier inland regions of Marlborough, Canterbury and Otago. It reaches 1150 m in the Rolleston Range, Canterbury.

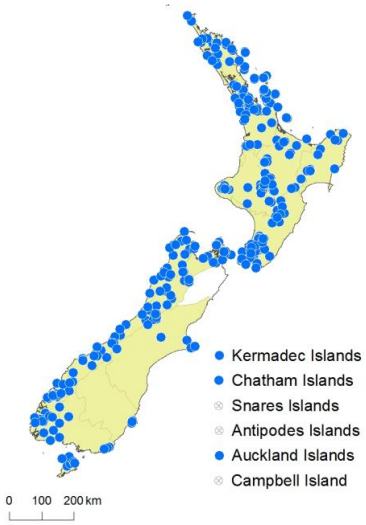

Fig. 108: *Hymenophyllum rarum* distribution map based on databased records at AK, CHR, OTA and WELT.

There is a single collection from Raoul Island made “between Green and Blue Lakes” by R.C. Cooper in 1956 (AK 44332). However, the species has not subsequently been recorded for the Kermadec Islands (Allan 1961; Sykes 1977; Sykes & West 1996; Brownsey & Smith-Dodsworth 2000) and may now be very localised, or even extinct on Raoul (Peter de Lange, pers. comm.). The area from which it was collected has been particularly prone to damage from volcanic activity (Sykes 1977).

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

Biostatus: Indigenous (Non-endemic).

Habitat: Occurs under kauri, podocarp, beech and broadleaved forest, and in mānuka, kānuka and subalpine scrub, often as an epiphyte but also growing on the ground, on dead stumps, at the base of tree trunks, on rock faces, clay banks, under overhangs and on scoria. It can grow in exposed sites as well as in shaded forest or scrub. It has been recorded growing epiphytically on a wide range of species including *Cyathea dealbata*, *Dicksonia squarrosa*, *Beilschmiedia tawa*, *B. tarairi*, *Dacrycarpus dacrydioides*, *Elaeocarpus dentatus*, *Hedycarya arborea*, *Metrosideros excelsa*, *Olearia colensoi*, *Podocarpus laetus*, *P. totara*, *Prumnopitys ferruginea*, *Weinmannia racemosa*, *W. silvicola* and species of Nothofagaceae, as well as hanging from clumps of *Astelia*.

Recognition: *Hymenophyllum rarum* is a small filmy fern recognisable by its grey-green, very thin, glabrous laminae with entire margins, and sori immersed in the broad ultimate lamina segments. Despite its very thin frond, the species has remarkable resistance to drought, rarely curling up even in the driest conditions.

Plants are occasionally found in which the primary pinnae are greatly extended, sometimes apparently growing out from the apices of the originally-formed pinnae, and occurring randomly along the length of the lamina.

Cytology: n = 36 (Brownlie 1954).

Notes: New Zealand plants of *Hymenophyllum rarum* often have slightly broader and more imbricate lamina segments than Australian plants which have narrower and more widely spaced segments. New Zealand plants also tend to be grey-green in colour unlike Australian plants which are dark green. Tindale (1963) noted that Australian plants had a “peculiar odour”, although whether this was in fresh or dried material was not stated. No reference was made to New Zealand plants, but some local botanists have noted a distinct metallic fragrance in New Zealand plants, especially in dried material (Peter de Lange, pers. comm.). Tindale & Roy (2002) reported n = 56–58 and n = 58 in two populations from New South Wales, whereas Brownlie (1954) reported n = 36 in a plant from New Zealand. Brownlie’s count was not supported by a photograph of the meiotic preparation so it is impossible to verify, but the number alone suggests that populations in Australia and New Zealand might be fundamentally different. Subgenus *Mecodium*, to which *H. rarum* belongs, has a base chromosome number of n = 28 (Ebihara et al. 2006).

The lectotype of *H. rarum* was collected in Tasmania by Robert Brown, whereas the holotype of *H. semibivalve* was collected in New Zealand by Archibald Menzies (probably from Dusky Sound). However, the morphological differences usually apparent between Australian and New Zealand populations are not evident in these two collections which are both more similar to Australian plants. The lectotype of *H. imbricatum*, from the North Island of New Zealand, has broad and strongly imbricate lamina segments, but the name is illegitimate, being a later homonym of *H. imbricatum* Blume.

The existing evidence is therefore equivocal but suggests that further work is needed to establish whether New Zealand and Australian plants belong to different species, or whether more than one taxon is present in either New Zealand or Australia or both.

Fig. 109: *Hymenophyllum rarum*. Plants growing on a bank.

Fig. 110: *Hymenophyllum rarum*. Laminae showing imbricate primary pinnae.

Fig. 111: *Hymenophyllum rarum*. Fertile frond with winged rachis, entire margins on the lamina segments, and sori immersed in the lamina segments with broadly ovate indusial flaps.

Fig. 112: *Hymenophyllum rarum*. Sori with bivalvate indusia and receptacles included within the indusial flaps.

Hymenophyllum revolutum Colenso, *Tasmanian J. Nat. Sci.* 2: 186 (1845)

Lectotype (chosen by Allan 1961): Waikare Lake [Lake Waikaremoana], *W. Colenso*, 1841, WELT P003270!

= *Hymenophyllum zeelandicum* Bosch, *Ned. Kruidk. Arch.* 5(3): 175 (1863)
Lectotype (selected by Brownsey & Perrie 2016): New Zealand, *J.D. Hooker*, Herbarium Hookerianum 1867, K! (photo WELT) - four clumps of material and several annotations on blue card at bottom of sheet shared with lectotype of *H. pusillum*.

= *Hymenophyllum pusillum* Colenso, *Trans. & Proc. New Zealand Inst.* 12: 365 (1880) nom. illeg. non *Hymenophyllum pusillum* Schott 1859
Lectotype (selected by Brownsey & Perrie 2016): New Zealand, com. W. Colenso Sept 1883, Herbarium Hookerianum, K! (photo WELT E468/35)

Etymology: From the Latin *revolutus* (revolute, rolled back), a reference to the nature of the pinnule lobes.

Epiphytic, terrestrial or rupestral ferns. Rhizomes long-creeping, c. 0.2 mm diameter, bearing very scattered red-brown hairs up to 0.5 mm long, clustered at bases of stipes. Fronds 11–100 mm long. Stipes 2–35 mm long, dark brown throughout, not winged, glabrous or bearing very scattered hairs. Laminae 1-pinnate-pinnatifid to 1-pinnate-bipinnatifid, elliptic or narrowly elliptic or rarely ovate, 7–70 mm long or rarely up to 100 mm in attenuate forms, 6–30 mm wide, light green, membranous, bearing scattered hairs on costae and especially at bases of indusia. Rachises narrowly winged only in distal half, brown, bearing scattered hairs; rachis wings planate, margins entire. Primary pinnae in 1–15 pairs, not overlapping; distal portion of primary pinnae straight or slightly incurved acroscopically; distal primary pinnae ovate or elliptic or obovate, winged throughout, adnate; proximal primary pinnae ovate, or elliptic or broadly elliptic, winged in distal half, stalked; the longest primary pinnae at or below the middle, 4–19 mm long, 3–10 mm wide. Ultimate lamina segments mostly arising acroscopically but at least some basiscopically on primary pinnae, oblong or elliptic, up to 6 mm long, 0.8–2.0 mm wide; apices obtuse or truncate; margins markedly toothed, lacking a distinct border; segments on primary pinnae mostly curved towards frond apex. Sori borne on short acroscopic segments at the base of primary pinnae, solitary on each segment, 1 on each primary pinna, adnate; indusia bivalvate; indusial flaps ovate or elliptic or almost orbicular, 1.5–2.5 mm long, apices obtuse or truncate, margins deeply toothed, outer surfaces sometimes hairy at base; receptacles included within indusial flaps or rarely slightly exserted.

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

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

Chatham Islands, Stewart Island.

Altitudinal range: 0–1000 m.

Hymenophyllum revolutum occurs in lowland and montane areas throughout the North Island from Cape Reinga southwards except for the east coast. It ranges from sea level to 900 m in the Ruahine Ranges and just over 1000 m on Mt Taranaki, although it is mostly found below 750 m. In the South Island it occurs in lowland and montane areas of the Marlborough Sounds, north-west Nelson, Westland, Fiordland and Southland as far east as the Catlins, with outlying populations around Dunedin and on Banks Peninsula. It reaches 800 m in the Edith Valley, Fiordland.

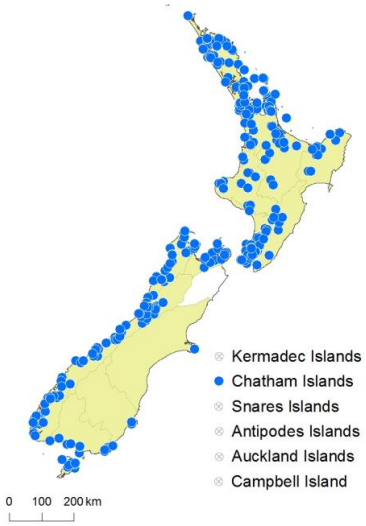

Fig. 113: *Hymenophyllum revolutum* distribution map based on databased records at AK, CHR, OTA and WELT.

Biostatus: Indigenous (Endemic).

Habitat: Occurs under kauri, podocarp, beech and broadleaved forest, in kānuka and mānuka scrub and rarely in subalpine scrub, growing on the ground, on damp moss-covered banks and rocks, on rotten logs and stumps, at the base of tree trunks and as an epiphyte. It has been recorded growing on *Cyathea dealbata*, *C. medullaris*, *C. smithii*, *Dicksonia squarrosa*, *Cordyline australis*, *Dacrydium cupressinum*, *Metrosideros excelsa*, *Myrsine salicina*, *Pseudopanax chathamicus*, *Weinmannia racemosa* and species of Nothofagaceae.

Recognition: *Hymenophyllum revolutum* is one of several small filmy ferns in New Zealand with toothed margins. It is smaller than either *H. bivalve* or *H. multifidum*, and lacks the marginal spines on the lamina segments in *H. armstrongii* or the spines on the outer surfaces of the indusial flaps in *H. minimum.* It is very similar to *H. peltatum* and *H. cupressiforme*, but distinguished by its rachises which are winged only in the distal half and its indusial flaps which are strongly toothed. It is further distinguished from *H. peltatum* by having a single sorus on each primary pinna rather than up to three, and by its secondary lamina segments which arise basiscopically as well as acroscopically. Small sterile fronds may be confused with those of *H. minimum* but are usually at least pinnate-pinnatifid rather than pinnate.

Cytology: n = 22 (Brownlie 1958).

Notes: The name *Hymenophyllum tunbridgense* (L.) Sm., a species of western Europe, has been widely misapplied to this species.

Hymenophyllum revolutum was described by Colenso (1845) from collections he made on the shores of Lake Waikaremoana in December 1841. The lectotype was chosen by Allan (1961), citing “WELT, *Colenso*” (now WELT P003270). There are also syntype specimens at K (*Colenso 276* – photo WELT E468/28) and in the Cheeseman Herbarium (AK 128411).

Hymenophyllum zeelandicum was described by Bosch (1863) from specimens collected by J.D. Hooker at the Bay of Islands, and by Wilkes in New Zealand. No original material was located in L, identified as Bosch’s main herbarium by Stafleu & Cowan (1976). However, a specimen in K, indentified by Bosch, has been designated as lectotype by Brownsey & Perrie (2016).

Fig. 114: *Hymenophyllum revolutum*. Plants growing on a bank.

Fig. 115: *Hymenophyllum revolutum*. Fertile fronds with the margins of the lamina segments and indusial flaps deeply toothed.

Fig. 116: *Hymenophyllum revolutum*. Fertile lamina showing the rachis winged only in the distal half, and ultimate lamina segments arising both acroscopically and basiscopically from the primary pinnae.

Fig. 117: *Hymenophyllum revolutum*. Fertile frond showing scattered hairs on the unwinged rachis, and deeply toothed indusial flaps.

Hymenophyllum rufescens Kirk, *Trans. & Proc. New Zealand Inst.* 11: 457, t. 19a (1879)

≡ *Mecodium rufescens* (Kirk) Copel., *Philipp. J. Sci.* 67: 21 (1938)

Lectotype (selected by Brownsey & Perrie 2016): South Island, Okarito, *A. Hamilton*, rec'd June 1878, K! (photo WELT E468/29)

Etymology: From the Latin *rufescens* (reddish), a reference to the colour of the hairs on this species.

Epiphytic, terrestrial or rupestral ferns. Rhizomes long-creeping, 0.2–0.4 mm diameter, bearing abundant fine pale brown hairs up to 1 mm long, clustered at bases of stipes. Fronds 25–130 mm long. Stipes 8–85 mm long, pale brown or red-brown, not winged, bearing villous pale brown or whitish hairs throughout. Laminae 1-pinnatifid to 1-pinnate-bipinnatifid, ovate or triangular, 8–55 mm long, 7–50 mm wide, yellow-green, membranous, with abundant villous pale brown or whitish hairs up to 2 mm long on costae and lamina surfaces, often clustered at bases of indusial flaps. Rachises narrowly winged in distal half, pale brown or red-brown, bearing villous pale brown hairs; rachis wings planate. Primary pinnae in 1–6 pairs, not overlapping, winged; distal portion of primary pinnae straight or slightly incurved acroscopically; distal primary pinnae elliptic or obovate, adnate; proximal primary pinnae flabellate or ovate, adnate or stalked in very large fronds; the longest primary pinnae at or near the base, 4–26 mm long, 3–19 mm wide. Secondary pinnae arising both acroscopically and basiscopically, not overlapping, winged throughout, oblong or obovate, adnate; the longest secondary pinnae 4–18 mm long, 2–9 mm wide. Ultimate lamina segments oblong, up to 4 mm long, 0.8–1.2 mm

wide; apices obtuse; margins entire, lacking a distinct border; distal segments on primary pinnae not curved towards frond apex. Sori borne on acroscopic and basiscopic segments at the distal ends of the pinnae, solitary on each segment, many on each primary pinna, adnate or partially immersed in lamina; indusia bivalvate; indusial flaps ovate or elliptic or broader than long, 0.75–1 mm long, apices obtuse or truncate, margins entire or shallowly toothed, outer surfaces with occasional villous hairs; receptacles included within indusial flaps.

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

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

Stewart Island.

Altitudinal range: 60–1250 m.

Hymenophyllum rufescens is an uncommon species of montane areas in the North Island recorded from Mt Honokawa and Mt Te Aroha, south to the Ruahine Ranges, ranging from 650 to 1250 m. It is more common in lowland and montane areas of the South Island but found only west of the main divide except for an outlying population near Dunedin (AK 215140). It occurs from 60 m in the lower Buller Gorge to 1100 m on Mt Arthur.

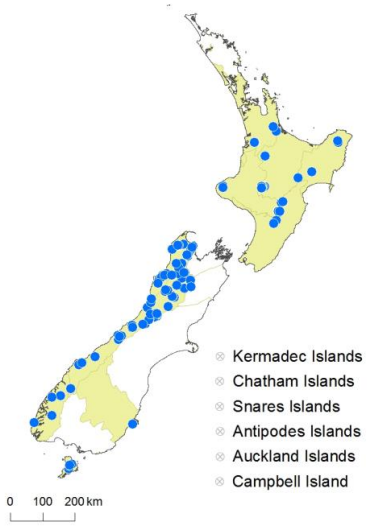

Fig. 118: *Hymenophyllum rufescens* distribution map based on databased records at AK, CHR, OTA and WELT.

Biostatus: Indigenous (Endemic).

Habitat: Occurs in podocarp, beech and broadleaved forest growing on rocks, banks, rotten logs and stumps, on tree roots, the bases of tree trunks and as a low epiphyte on the trunks of *Dacrydium cupressinum*, *Libocedrus bidwillii*, *Metrosideros umbellata*, *Podocarpus laetus*, and on species of *Phyllocladus*, *Quintinia* and Nothofagaceae. It has not been recorded from tree fern trunks.

Recognition: *Hymenophyllum rufescens* is recognised by its fronds with usually small triangular laminae abundantly covered in villous pale brown hairs, and stipes which are as long as, or longer than, the laminae. It is closely related to *H. flabellatum* but grows at higher altitudes, and can usually be distinguished by its smaller and much hairier laminae. Intermediate forms are sometimes found in areas where the two species meet, but whether these are hybrids is unclear.

Cytology: n = 36 (Brownlie 1965).

Notes: The original lectotype designated by Allan (1961, p. 26) has been lost and a replacement lectotype selected by Brownsey & Perrie (2016).

DNA sequencing suggests that *Hymenophyllum rufescens* is clearly distinct from both Australian and New Zealand populations of *H. flabellatum* (Perrie et al. 2016).

Fig. 119: *Hymenophyllum rufescens*. Plants growing epiphytically on a tree trunk.

Fig. 120: *Hymenophyllum rufescens*. Plants growing on an old stump, showing the triangular laminae.

Fig. 121: *Hymenophyllum rufescens*. Fertile frond with villous hairs on the lamina surface, and sori immersed in the lamina segments.

Fig. 122: *Hymenophyllum rufescens*. Fertile frond with abundant villous hairs on the surface of the lamina, and ovate indusial flaps.

Hymenophyllum sanguinolentum (G.Forst.) Sw., *J. Bot. (Schrader)* 1800(2): 101 (1801)

≡ *Trichomanes sanguinolentum* G.Forst., *Fl. Ins. Austr.,* 84 (1786)
≡ *Sphaerocionium sanguinolentum* (G.Forst.) C.Presl, *Hymenophyllaceae,* 35 (1843)
≡ *Mecodium sanguinolentum* (G.Forst.) C.Presl, *Epimel. Bot.,* 258 (1851)
≡ *Hymenophyllum polyanthos* var. *sanguinolentum* (G.Forst.) Hook. ex Hook.f., *Bot. Antarct. Voy. II (Fl. Nov.-Zel.) Part II,* 14 (1854)
Lectotype (selected by Nicolson & Fosberg 2003): Nova Zelandia, G. Forster's Herbarium 303.465, BM 001048395!

= *Hymenophyllum lophocarpum* Colenso, *Trans. & Proc. New Zealand Inst.* 17: 255 (1885)
≡ *Hymenophyllum sanguinolentum* var. *lophocarpum* (Colenso) Domin, *Biblioth. Bot.* 20 (85): 24 (1913)
Lectotype (selected by Allan 1961): Dannevirke, Herb. W. Colenso, mounted on two sheets, WELT P002923, P003302!

= *Hymenophyllum cristulatum* Rosenst., *Feddes Repert. Spec. Nov. Regni Veg.* 5: 14 (1908)
Lectotype (selected by Brownsey & Perrie 2016): Wahi Punamu, Nelson, in vale fl. Inangahua, *T. Ranft*, 1885, BM 001044306!

Etymology: From the Latin *sanguinolentus* (smelling of dried blood), a reference to the distinctive smell of this species when pressed.

Vernacular name: piripiri

Epiphytic, terrestrial or rupestral ferns. Rhizomes long-creeping, 0.5–0.75 mm diameter, bearing sparse to abundant pale brown hairs up to 1.2 mm long. Fronds 50–440 mm long. Stipes 12–90 mm long, dark brown or black, narrowly winged for most of their length, glabrous or sparsely covered in pale brown hairs proximally. Laminae usually 4-pinnatifid or rarely 3-pinnatifid, ovate or elliptic, 30–360 mm long, 20–130 mm wide, dark green, membranous, glabrous or with very scattered hairs on the costae. Rachises narrowly winged throughout, dark brown or black, often zig-zagged distally, glabrous or bearing a few scattered hairs proximally; rachis wings planate or slightly flexuose. Primary pinnae in 8–25 pairs, overlapping, winged throughout; distal portion of primary pinnae straight or slightly incurved acroscopically; distal primary pinnae ovate or elliptic or obovate, adnate; proximal primary pinnae narrowly ovate or ovate, adnate; the longest primary pinnae at or below the middle, 12–170 mm long, 10–20 mm wide. Secondary pinnae arising both acroscopically and basiscopically, scarcely overlapping, winged throughout, adnate; ovate or elliptic or obovate on distal primary pinnae, ovate or elliptic on proximal primary pinnae; the longest secondary pinnae 6–16 mm long, 6–10 mm wide. Ultimate lamina segments oblong, up to 5 mm long, 0.8–1.5 mm wide; apices obtuse or truncate; margins entire, lacking a distinct border; distal segments on primary pinnae divergent. Sori borne on short acroscopic and basiscopic segments throughout the pinnae, solitary, many on each primary pinna, adnate; indusia bivalvate; indusial flaps elliptic or orbicular or broader than long,

1–2 mm long, apices obtuse, margins entire, crested on outer surfaces; receptacles included within indusial flaps.

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

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

Kermadec Islands, Stewart Island.

Altitudinal range: 0–900 m.

Hymenophyllum sanguinolentum occurs in lowland to montane forest throughout the North Island from Te Paki southwards, ranging from sea level to 900 m on Mt Honokawa, Raukūmara Range. In the South Island it mostly occupies lowland regions, principally west of the main divide but also in scattered localities in eastern areas, reaching 850 m on Banks Peninsula. It is apparently absent from much of central Otago and south Canterbury.

Also Cook Islands (AK 320150).

Biostatus: Indigenous (Non-endemic).

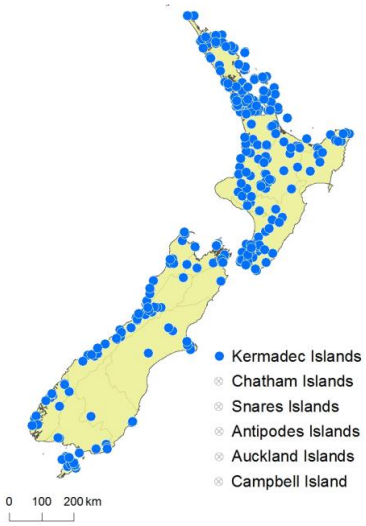

Fig. 123: *Hymenophyllum sanguinolentum* distribution map based on databased records at AK, CHR, OTA and WELT.

Habitat: Occurs under kauri, podocarp, beech and broadleaved forest or in mānuka and kānuka scrub, growing on the ground, on rocks and lava, on banks, rock faces, rotten logs and stumps or as an epiphyte. It has been recorded on a wide variety of forest trees including *Cyathea dealbata*, *C. medullaris*, *C. milnei*, *Beilschmiedia tawa*, *Carpodetus serratus*, *Dacrycarpus dacrydioides*, *Dacrydium cupressinum*, *Dysoxylum spectabile*, *Griselinia littoralis*, *Knightia excelsa*, *Kunzea* spp., *Leptospermum scoparium*, *Metrosideros excelsa*, *M. umbellata, Phyllocladus trichomanoides*, *Podocarpus totara*, *Prumnopitys ferruginea*, *P. taxifolia*, *Vitex lucens* and *Weinmannia racemosa* as well as hanging from clumps of *Astelia*.

Recognition: *Hymenophyllum sanguinolentum* is a small to medium-sized filmy fern distinguished by its entire lamina margins, black zig-zagged rachis, winged rachis and stipe, and crests on the outer surfaces of the indusial flaps. It is more or less glabrous throughout much of its range but generally somewhat hairier in the northern part of its distribution. When dry it has a strong smell and stains paper dark brown or yellow. It is a very drought resistant filmy fern, curling into a tight ball in dry weather. It is very similar to *H. villosum*, but is usually distinguished by its glabrous to sparsely hairy fronds, broader ultimate segments (0.8–1.5 mm wide cf. 0.4–1.2 mm wide), and indusial flaps which are often broader than long and have crests on their outer surfaces. The crests on the indusial flaps are not found in any other New Zealand species, but they are not always obvious, especially in dried specimens. *Hymenophyllum sanguinolentum* generally grows at lower altitudes than *H. villosum* (0–900 vs 370–1300 m in the North Island; 0–850 vs 30–1650 m in the South Island). Nevertheless there is a significant zone of overlap and plants of both species occur together in several places.

Cytology: n = 34, 68 (Daellenbach 1982), 36, 72 (Brownlie 1954, 1961)

Notes: The name *Hymenophyllum polyanthos* (Sw.) Sw. has been widely misapplied to this species.

Hymenophyllum sanguinolentum was recorded from the Auckland Islands by Johnson & Campbell (1975) but the voucher specimen (OTA 33363) was misidentified and is actually *H. villosum.* It was also recorded from the Three Kings Islands, in error for the Kermadec Islands, by Brownsey & Smith-Dodsworth (2000).

Hymenophyllum lophocarpum was described by Colenso (1885) from collections he made in Seventy-mile Bush, County of Waipawa, from 1860–84. There are two specimens at K labelled "*Hymenophyllum lophocarpum* Col. sp. nov." in Colenso's writing; one is annotated "New Zealand, *W. Colenso*, rec'd xii 1885" (photo WELT E468/32), and the other "70 m[ile] Bush, com. W. Colenso 5/1890" (photo WELT E468/31). There are another two specimens at WELT. One is labelled "Dannevirke, type of *H. lophocarpum"* in Cheeseman's writing and "*Hymenophyllum lopho/,* sent Kew the best spns" in Colenso's writing (WELT P002923). The other has a label copied from WELT P002923 in Zotov's writing (WELT P003302). There are also two specimens at AK labelled "Dannevirke, type of *H. lophocarpum"* in Cheeseman's writing (AK 83, 218893). Allan (1961, p. 26) cited a Colenso collection at WELT as the type but did not distinguish between the two sheets held there. However, Zotov's label on WELT P003302 indicates that the material on that sheet is part of the collection labelled by both Colenso and Cheeseman (WELT P002923). It seems that Zotov segregated

specimens from some of Colenso's collections and re-labelled them (Brownsey 1979). In this case, Colenso's material is now mounted on two sheets (with different numbers) but is part of the same specimen (Art. 8.3). Allan's statement that the type is in WELT can therefore be taken as a lectotypification and relates to these two sheets (WELT P002923 and P003302).

Some plants of *H. sanguinolentum* and all of *H. villosum* that have been examined have n = 34 or 36. However, tetraploid plants of *H. sanguinolentum* with n = 68 or 72 have been recorded from the Port Hills, Banks Peninsula, Mt Grey and Peel Forest in Canterbury (see Dawson et al. 2000). Hybrid plants have also been detected at Mt Grey, Canterbury that show formation of trivalents, bivalents and univalents at meiosis (Lovis in Dawson et al. 2000). Analysis of the meitotic pairing indicated that these are likely to have been hybrids between tetraploid *H. sanguinolentum* and diploid *H. villosum.*

Some plants appear morphologically intermediate between the two presumed diploid species. Most frequently, such plants are recognised by having hairy fronds similar to *H. villosum* but indusia which bear crests on the outer surfaces similar to *H. sanguinolentum.* Plants of this description have been recorded from the Ruahine Forest Park (WELT P018742), Kaimanawa Forest Park (WELT P018741), Kaituna Valley, near Blenheim (CHR 46297), Kekerengu Range, Marlborough (CHR 387557), Blue Duck Reserve, Marlborough (CHR 387980), Port Hills, Christchurch (CHR 235775, 278448, 397939), Banks Peninsula (AK 278431, CHR 178338, 517421), Peel Forest (CHR 386696, 386702) and Tautuku Forest, Southland (CHR 403680). More rarely, plants lacking crests and having almost glabrous fronds have been recorded from Banks Peninsula (CHR 276234, WELT P000506, P005992), Alton Burn, Southland (CHR 403717) and near Dunedin (CHR 144311).

It is possible that the plants of intermediate morphology correspond to the tetraploid forms of *H. sanguinolentum.* The voucher specimens from the Port Hills for Brownlie's report of n = 72 (CHR 397939), and from near Akaroa for Large's unpublished count of n = 72 (AK 278431), are both listed above. However, further work is needed to determine whether all plants of intermediate morphology are tetraploids. If that could be demonstrated, it is likely that they represent an undescribed allopolyploid species derived from hybridisation between diploid plants of *H. sanguinolentum* and *H. villosum*. Apart from two records in the Ruahine and Kaimanawa Ranges, all plants of intermediate morphology have been collected from the eastern or southern South Island.

Fig. 124: *Hymenophyllum sanguinolentum*. Plants growing on a rotten branch

Fig. 125: *Hymenophyllum sanguinolentum*. Pale brown hairs on the base of the stipe and the creeping rhizome.

Fig. 126: *Hymenophyllum sanguinolentum*. Abaxial surface of lamina showing the winged rachis, and bearing only very scattered hairs.

Fig. 127: *Hymenophyllum sanguinolentum*. Sori with indusial flaps bearing prominent crests on their outer surfaces.

Fig. 128: *Hymenophyllum sanguinolentum*. Fertile frond showing a black, zig-zag, winged rachis and lamina segments with entire margins.

Fig. 129: *Hymenophyllum sanguinolentum*. Sori with elliptic indusial flaps that have crests on their outer surfaces, and entire margins.

Hymenophyllum scabrum A.Rich., *Voy. Astrolabe, Essai* 90, t. 14, f. 1 (1832)

≡ *Sphaerocionium scabrum* (A.Rich.) C.Presl, *Hymenophyllaceae,* 34 (1843)

≡ *Diploophyllum scabrum* (A.Rich.) Bosch, *Verslagen Meded. Afd. Natuurk. Kon. Akad. Wetensch.* 11: 323 (1861)

≡ *Mecodium scabrum* (A.Rich.) Copel., *Philipp. J. Sci.* 67: 24 (1938)

Holotype: Nouvelle Zélande [New Zealand], *D'Urville*, Herb. A. Richard, P 00623460!

= *Sphaerocionium glanduliferum* C.Presl, *Epimel. Bot.,* 22, t. 12 (1851)

Lectotype (selected by Brownsey & Perrie 2016): N[ova] Zeelandia [New Zealand], *Hügel*, and Nova Zeelandia, *R. Cunningham*, both mounted on one sheet, Herb. Presl, PRC 455139, right-hand specimen (image!)

= *Hymenophyllum scabrum* var. *hirtum* Colenso, *Trans. & Proc. New Zealand Inst.* 13: 379 (1881)

Lectotype (selected by Brownsey & Perrie 2016): New Zealand, *W. Colenso*, K! (photo WELT E468/33)

Etymology: From the Latin *scabrus* (with a rough surface), a reference to the scabrid stipe.

Vernacular name: rough filmy fern

Epiphytic, terrestrial or rupestral ferns. Rhizomes long-creeping, 0.5–1.0 mm diameter, bearing abundant pale brown hairs up to 1 mm long, clustered at bases of stipes. Fronds 100–780 mm long. Stipes 40–170 mm long, dark brown throughout, not winged, densely covered in bristly hairs up to 5 mm long. Laminae usually 4-pinnatifid, rarely 3- or 5-pinnatifid, ovate or elliptic, 65–630 mm long,

40–150 mm wide, olive-green, membranous, 2–4 cells thick, with scattered hairs on costae and especially at bases of indusia. Rachises narrowly winged for most of their length, dark brown, bearing bristly hairs; rachis wings planate. Primary pinnae in 10–25 pairs, scarcely overlapping, winged throughout, narrowly ovate or ovate, adnate; distal portion of primary pinnae straight or slightly incurved acroscopically; the longest primary pinnae at or below the middle, 25–140 mm long, 14–50 mm wide. Secondary pinnae arising both acroscopically and basiscopically, scarcely overlapping, ovate to elliptic, winged throughout, adnate; the longest secondary pinnae 12–39 mm long, 6–18 mm wide. Ultimate lamina segments oblong, up to 4 mm long, 0.6–1.4 mm wide; apices obtuse or truncate; margins entire, lacking a distinct border; distal segments on primary pinnae divergent or slightly curved towards frond apex. Sori borne on acroscopic and basiscopic segments at the distal ends of the pinnae, solitary, many on each primary pinna, adnate or slightly immersed in lamina; indusia bivalvate; indusial flaps broadly elliptic or broader than long, 0.75–1.5 mm long, apices obtuse or truncate, margins minutely or irregularly toothed, bearing capitate hairs when young, outer surfaces hairy at base; receptacles included within indusial flaps.

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

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

Chatham Islands, Solander Island, Stewart Island.

Altitudinal range: 0–1100 m.

Hymenophyllum scabrum occurs in lowland and montane areas of the North Island from the Mangamuka Range southwards. It ranges from sea level, reaching 1100 m on Mt Taranaki and Mt Hauhungatahi. In the South Island it occurs in lowland and montane areas of the Marlborough Sounds, north-west Nelson, Westland, Fiordland and Southland, extending to Dunedin and a few scattered localities in Marlborough and Canterbury. It reaches 925 m on Key Summit.

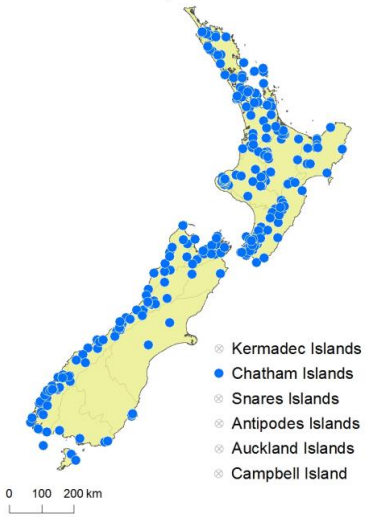

Fig. 130: *Hymenophyllum scabrum* distribution map based on databased records at AK, CHR, OTA and WELT.

Biostatus: Indigenous (Endemic).

Habitat: Occurs in kauri, podocarp, beech and broadleaved forest growing on the ground, on rocks, banks, rock faces, rotten logs and stumps, and as an epiphyte. It has been recorded growing on *Cyathea dealbata*, *C. medullaris*, *Dicksonia fibrosa*, *D. squarrosa*, *Coriaria arborea*, *Fuchsia excorticata*, *Griselinia littoralis*, *Lophozonia menziesii*, *Prumnopitys taxifolia*, *Pseudowintera colorata*, *Schefflera digitata*, and *Weinmannia racemosa*.

Recognition: *Hymenophyllum scabrum* is a large filmy fern easily recognised by its olive-green laminae, segments with entire margins, and long bristly hairs on the stipe and indusial flaps, with the latter being minutely toothed and often broader than long.

Cytology: n = 36 (Brownlie 1958).

Notes: *Hymenophyllum scabrum*, together with *H. dilatatum* and *H. nephrophyllum*, is unusual in the genus in having a frond that is more than one cell thick. Holloway (1923) showed that sporelings had a lamina only one cell thick and that the multi-layered condition developed with maturity.

Fig. 131: *Hymenophyllum scabrum*. Fertile fronds growing on a bank.

Fig. 132: *Hymenophyllum scabrum*. Fertile frond growing on a tree fern trunk.

Fig. 133: *Hymenophyllum scabrum*. Stipe densely covered in bristly hairs.

Fig. 134: *Hymenophyllum scabrum*. Sterile fronds showing the winged rachis, and bristly hairs on the stipe and rachis.

Fig. 135: *Hymenophyllum scabrum*. Fertile lamina showing the winged rachis, and sori at the distal ends of the pinna segments.

Fig. 136: *Hymenophyllum scabrum*. Sori with broadly elliptic indusial flaps that are irregularly toothed.

Hymenophyllum villosum Colenso, *Tasmanian J. Nat. Sci.* 2: 185 (1845)

≡ *Mecodium villosum* (Colenso) Copel., *Philipp. J. Sci.* 67: 24 (1938)

Lectotype (chosen by Allan 1961): near Ruatahuna, *W. Colenso*, 1841, WELT P003273!

Etymology: From the Latin *villosus* (with long rough hairs), a reference to the hairiness of the frond.

Vernacular name: hairy filmy fern

Epiphytic, terrestrial or rupestral ferns. Rhizomes long-creeping, 0.4–0.6 mm diameter, bearing sparse to abundant pale or red-brown hairs up to 2 mm long, clustered at bases of stipes. Fronds 25–275 mm long. Stipes 5–100 mm long, dark brown or black, narrowly winged for most of their length, sparsely to abundantly covered in pale brown hairs. Laminae usually 4-pinnatifid or rarely 3-pinnatifid or 5-pinnatifid, ovate or broadly ovate or elliptic, 17–200 mm long, 12–110 mm wide, dark green, membranous, sparsely to abundantly covered in pale brown hairs on the costae. Rachises narrowly winged throughout, dark brown or black, often zig-zagged distally, sparsely to abundantly covered in pale brown hairs; rachis wings planate or slightly flexuose. Primary pinnae in 8–25 pairs, overlapping, winged throughout; distal portion of primary pinnae straight or slightly to strongly incurved acroscopically; distal primary pinnae ovate or elliptic or obovate, adnate; proximal primary pinnae narrowly ovate or ovate, adnate; the longest primary pinnae at or below the middle, 8–100 mm long, 6–30 mm wide. Secondary pinnae arising both acroscopically and basiscopically, scarcely overlapping, winged throughout, adnate; ovate or elliptic or obovate on distal primary pinnae; ovate or elliptic on proximal primary pinnae; the longest secondary pinnae 4–25 mm long, 3–10 mm wide. Ultimate lamina segments linear, up to 5 mm long, 0.4–1.2 mm wide, often recurved when dry; apices obtuse or truncate; margins entire, lacking a distinct border; distal segments on primary pinnae divergent. Sori borne on short acroscopic and basiscopic segments throughout pinnae in distal half of lamina, solitary, many on each primary pinna, adnate; indusia bivalvate; indusial flaps ovate, 1–2.5 mm long, about twice as long as broad, apices acute or obtuse, margins entire, outer surfaces smooth, sometimes hairy at base; receptacles included within indusial flaps.

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

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

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

Altitudinal range: 30–1700 m.

Hymenophyllum villosum occurs in montane and subalpine areas of the North Island from Mt Moehau southwards, ranging from 370 m up to 1300, although it is only occasionally found below 600 m. In the South Island it occurs in lowland to alpine areas throughout except for the driest areas, ranging from 30 m to over 1700 m in the St Arnaud Range, but is rare below 200 m. It also extends south to the subantarctic islands, and is known from one collection on the Chatham Islands (AK 296082).

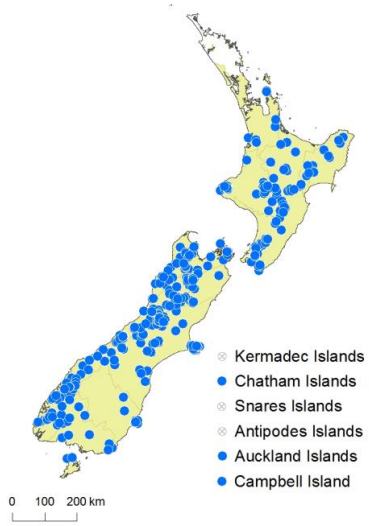

Fig. 137: *Hymenophyllum villosum* distribution map based on databased records at AK, CHR, OTA and WELT.

Biostatus: Indigenous (Endemic).

Habitat: Occurs in podocarp, beech and broadleaved forest, in mānuka, kānuka and subalpine scrub, and in tussock and alpine herbfield, growing on the ground, on rocks and banks, on rock faces, under overhangs, on fallen logs and as an epiphyte. It has been recorded on trunks and branches of *Archeria traversii*, *Dacrycarpus dacrydioides*, *Dacrydium cupressinum*, *Griselinia littoralis*, *Ixerba brexioides*, *Metrosideros umbellata*, *Olearia chathamica*, *O. colensoi*, *Phyllocladus alpinus*, *Podocarpus laetus*, *P. totara*, *Pseudowintera colorata*, *Quintinia serrata*, *Weinmannia racemosa* and species of Nothofagaceae. It has also been recorded from the trunk of *Leptopteris*, but not from any tree fern species.

Recognition: *Hymenophyllum villosum* is a small to medium-sized filmy fern distinguished by its entire lamina margins, often black zig-zagged rachis, winged rachis and stipe, and hairy fronds. The fronds are often tightly coiled in exposed situations. Plants in the South Island generally have much hairier fronds and narrower ultimate segments (usually less than 1 mm wide) than those in the North Island which are sometimes only sparsely hairy. When dry it has a strong smell and stains paper dark

brown or yellow. It is very similar to *H. sanguinolentum*, but is usually distinguished by its hairy fronds, narrower ultimate segments (0.4–1.2 mm wide cf. 0.8–1.5 mm wide), and indusial flaps which are usually about twice as long as broad and lack crests on their outer surfaces. The distinction between the two species is more obvious in the South Island where *H. villosum* is usually very hairy and has narrower ultimate segments. *Hymenophyllum sanguinolentum* generally grows at lower altitudes than *H. villosum* (0–900 vs 370–1300 m in the North Island; 0–850 vs 30–1650 m in the South Island). Nevertheless there is a significant zone of overlap and plants of both species occur together in several places.

Hymenophyllum villosum grows frequently with *H. multifidum* and the two can be confused, especially when sterile or the fronds are tightly coiled. However, they can always be distinguished by the entire lamina margin in the former, and toothed margin in the latter.

Cytology: n = 34 (Daellenbach 1982), 36 (Brownlie 1954).

Notes: *Hymenophyllum villosum* was described by Colenso (1845) from collections he made in forests near Ruatāhuna in January 1842. The lectotype was chosen by Allan (1961), "WELT, near Ruatahuna, *Colenso*" (now WELT P003273). There is also a specimen at K (*Colenso 288*) which is a syntype (photo WELT E469/30). The date on the WELT specimen is 1841, rather than 1842 as in the protologue, but one or other is assumed to be incorrect.

For comments on plants of intermediate morphology between *H. villosum* and *H. sanguinolentum,* and their cytology, see Notes under *H. sanguinolentum*.

Fig. 138: *Hymenophyllum villosum*. Plants growing epiphytically on a branch amongst mosses and liverworts.

Fig. 139: *Hymenophyllum villosum*. Plants growing in crevice of exposed rocks.

Fig. 140: *Hymenophyllum villosum*. Frond showing narrow lamina segments with entire margins.

Fig. 141: *Hymenophyllum villosum*. Abaxial surface of lamina with abundant brown hairs on the costae.

Fig. 142: *Hymenophyllum villosum*. Lamina showing the winged rachis, and sori with ovate indusial flaps lacking crests.

Fig. 143: *Hymenophyllum villosum*. Lamina showing sori with ovate indusial flaps lacking crests.

Trichomanes L., *Sp. Pl.,* 1097 (1753)

= *Abrodictyum* C.Presl, *Hymenophyllaceae,* 20, t. 7 (1843)

= *Trichomanes* subgen. *Crepidomanes* C.Presl, *Epimel. Bot.,* 17 (1851)
≡ *Crepidomanes* (C.Presl) C.Presl, *Epimel. Bot.,* 258 (1851)

= *Phlebiophyllum* Bosch, *Verslagen Meded. Afd. Natuurk. Kon. Akad. Wetensch.* 11: 321 (1861)
≡ *Polyphlebium* Copel., *Philipp. J. Sci.* 67: 55 (1938) nom. nov. pro *Phlebiophyllum* Bosch 1861 (non *Phlebophyllum* Nees 1832)

Type taxon: *Trichomanes crispum* L.

Etymology: Either, from the Greek *trichos* (hair), and *manes* (a kind of cup), a reference to the hair-like receptacles exserted from the indusia; or *trichos* (hair), and *manes* (an extreme profusion), a reference to the conspicuous and persistent receptacles in the type species (Gardner 2014).

Epiphytic, terrestrial or rupestral ferns. Rhizomes erect or short to long-creeping, filiform to rather thick, bearing dense multicellular light brown or red-brown or blackish hairs; roots absent or few and fine or numerous and robust. Fronds monomorphic. Laminae entire (not NZ) or 1–4-pinnatifid (NZ) or 1–3-pinnate (NZ) or 4–5-pinnate (not NZ), membranous and usually one cell thick, or with multistratose false veins present either side of true veins (not NZ), often translucent, glabrous or hairy; margins entire or shallowly lobed, sometimes a single row of elongate marginal cells forming a distinct border. Veins free. Sori terminating veins at margins of lamina. Indusia tubular to campanulate, widened or not at the mouth; receptacles long-exserted. Spores trilete, radially symmetrical, papillate to echinate.

Taxonomy: Ebihara et al. (2006) recognised eight genera (*Abrodictyum*, *Callistopteris*, *Cephalomanes*, *Crepidomanes*, *Didymoglossum*, *Polyphlebium*, *Trichomanes* and *Vandenboschia*) within the trichomanoid clade, each with one to four subgenera. Of these, three (*Abrodictyum*, *Polyphlebium* and *Crepidomanes*) are represented in New Zealand. However, following Allan (1961) and Brownsey & Smith-Dodsworth (2000), only one umbrella genus is accepted here in the interest of nomenclatural stability and because of the difficulty of distinguishing the three segregate genera morphologically.

1	Rhizomes erect	2
	Rhizomes long-creeping	3
2	Laminae narrowly elliptic, medium green; a single unbranched vein in each ultimate lamina segment	*strictum*
	Laminae broadly triangular, dark olive-green; veins forking several times in each ultimate lamina segment	*elongatum*

3	Ultimate lamina segments lacking a distinct border	4
	Ultimate lamina segments with a distinct border	5
4	Plants epiphytic; laminae light green; veins prominent, forking many times in each ultimate segment; sori sunk in lamina	*venosum*
	Plants terrestrial or rupestral; laminae dark green; veins obscure, forking 1–2 times in each ultimate segment; sori stalked	*colensoi*
5	Lamina border comprising short cells with transverse end-walls	*caudatum*
	Lamina border comprising elongated cells with oblique end-walls	6
6	Lamina border unistratose; roots few and fine	*endlicherianum*
	Lamina border bistratose; roots absent	*humile*

Distribution: A genus of about 260 species distributed in south temperate regions and montane areas of the tropics (Iwatsuki in Kramer & Green 1990). 7 species in New Zealand; 3 endemic.

Biostatus: Indigenous (Non-endemic).

Table 3: Number of species in New Zealand within *Trichomanes* L.

Category	**Number**
Indigenous (Endemic)	3
Indigenous (Non-endemic)	4
Total	**7**

Recognition: *Trichomanes* is characterised morphologically by its tubular or campanulate indusia and receptacles that are usually long-exserted, in contrast to those in *Hymenophyllum* which are bivalvate, or rarely urceolate, with receptacles usually included within the valves, or rarely shortly exserted. The rhizomes in species of *Trichomanes* are abundantly covered in red-brown hairs, whereas those in *Hymenophyllum* are generally almost glabrous or bear only scattered hairs near the stipe bases.

Cytology: Base chromosome numbers of x = 32 to 36 are recorded for *Trichomanes* (Ebihara et al. 2006).

Notes: The synonymy given here only includes names relevant to New Zealand.

Trichomanes caudatum Brack., *U.S. Expl. Exped., Filic. 16,* 256, t. 36, f. 5 (1854)

≡ *Macroglena caudata* (Brack.) Copel., *Philipp. J. Sci.* 67: 84 (1838)
≡ *Cephalomanes caudatum* (Brack.) Bostock in Bostock & Spokes, *Fl. Austral. 48,* 706 (1998)
≡ *Abrodictyum caudatum* (Brack.) Ebihara & K.Iwats. in Ebihara et al., *Blumea* 51: 243 (2006)
Holotype: Tahiti, *C. Wilkes*, US 00134593 (!online, previously US 51176, image in Copeland 1933, fig. 58)

Etymology: From the Latin *caudatus* (tailed), a reference to the pinnae which taper to a tail-like point.

Epiphytic ferns. Rhizomes short to long-creeping, c. 0.5 mm diameter, bearing red-brown hairs up to 2 mm long. Fronds 18–65 mm long. Stipes 2–20 mm long, brown, not winged or with a very narrow wing distally, glabrous or with short scattered hairs. Laminae 1–3-pinnatifid, elliptic or ovate or narrowly ovate, 12–50 mm long, 8–16 mm wide, green, membranous, glabrous or with very short scattered hairs on veins. Rachises narrowly winged throughout, brown or becoming green distally, glabrous or with very short scattered hairs. Primary pinnae in 2–10 pairs, not overlapping, narrowly ovate to broadly ovate, winged throughout; distal primary pinnae adnate; proximal primary pinnae almost stalked; the longest primary pinnae at or below the middle, 5–10 mm long, 2–8 mm wide. Ultimate segments linear, entire, up to 4 mm long, 0.4–0.8 mm wide, adnate, each with a single unbranched vein; apices obtuse; margins entire with a clearly defined border of shorter cells with transverse end-walls. Sori borne on short acroscopic segments near bases of primary pinnae, one on each primary pinna, adnate; indusia campanulate, 1–1.5 mm long, widened at mouth; sporangia borne on a fine receptacle up to 6 mm long, projecting well beyond the indusia at maturity.

Distribution: North Island: Northland.

Kermadec Islands.

Altitudinal range: 10–20 m (Northland), c. 450 m (Raoul Island).

Trichomanes caudatum is a rare fern in New Zealand, known only from Raoul Island, Kermadec Islands, and from near Kerikeri in Northland.

Also Australia (Queensland, New South Wales, Victoria), New Caledonia, Fiji, Samoa, Cook Islands, Society Islands.

Biostatus: Indigenous (Non-endemic).

Trichomanes caudatum (as *Abrodictyum*) from the Kermadec Islands was given a conservation status of Naturally Uncommon by de Lange et al. (2013), but they treated the Kerikeri population as a separate indeterminate taxon, "Abrodictyum aff. caudatum", which was listed as Nationally Critical.

Habitat: Occurs as an epiphyte on *Dicksonia squarrosa* in lowland podocarp and broadleaved forest on a river terrace near Kerikeri, and on massive trunks of *Cyathea milnei* in wet *Metrosideros* forest at c. 450 m on Raoul Island.

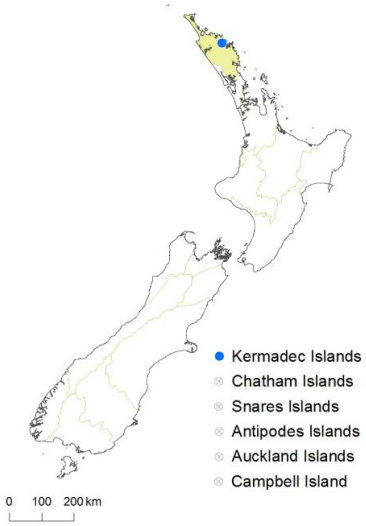

Fig. 144: *Trichomanes caudatum* distribution map based on databased records at AK, CHR, OTA and WELT.

Recognition: *Trichomanes caudatum* is distinguished from *T. elongatum* and *T. strictum* by its epiphytic habit, creeping rhizome, lamina segments with a clearly defined border, and campanulate indusia which are widened at the mouth. It is superficially similar to, and occupies the same habitat as, *T. venosum*, but can be distinguished by its bordered lamina segments, obtuse apices which are never emarginate, and ultimate lamina segments with a single unbranched vein. It is also superficially similar to *T. humile* but can be distinguished by the unistratose border of short cells with transverse end-walls.

Notes: In the classification of Ebihara et al. (2006), *Trichomanes caudatum* is treated as *Abrodictyum caudatum*.

There are differences between the Kerikeri and Raoul plants. The fronds of the Kerikeri plants grow downwards against the substrate, whereas Raoul plants appear slightly more upright. The indusia are more obviously flared in the Kerikeri plants, whereas the very few present in the Raoul material appear to be more truncate. Also the plants on Raoul grow at a much higher altitude than those at Kerikeri. Whether the two populations belong to the same species is uncertain.

Fronds of *Trichomanes caudatum* in New Zealand are much smaller and less divided than those in Australia or the Pacific. Nevertheless the cell structure of the lamina and the shape of the indusia suggest that they are correctly referred to this species. In Northland, the species is on the very southern edge of its distribution and the plants are probably poorly developed compared to those in tropical regions. DNA sequencing (Perrie et al. 2016) indicates that the Kerikeri plants group with those in Fiji, French Polynesia, and Australia. However, it also indicates that New Caledonian material of *T. caudatum* is different to that in Fiji, French Polynesia, and Australia, suggesting that more than one species may be present in the Pacific region.

Fig. 145: *Trichomanes caudatum*. Plants growing on trunk of *Dicksonia squarrosa*.

Fig. 146: *Trichomanes caudatum*. Fertile fronds with campanulate indusia.

Fig. 147: *Trichomanes caudatum*. Fertile fronds with campanulate indusia.

Fig. 148: *Trichomanes caudatum*. Fertile frond with campanulate indusia and exserted receptacle.

Trichomanes colensoi Hook.f. in Hooker, *Icon. Pl. 10,* t. 979 (1854)

≡ *Vandenboschia colensoi* (Hook.f.) Copel., *Philipp. J. Sci.* 67: 52 (1938)
≡ *Polyphlebium colensoi* (Hook.f.) Ebihara & K.Iwats. in Ebihara et al., *Blumea* 51: 240 (2006)

Holotype: New Zealand, between Waikare Lake [Lake Waikaremoana] and Ruatahuna, *W. Colenso 104*, 1844, Herbarium Hookerianum, K! (photo WELT E469/26)

Etymology: Named in honour of William Colenso (1811–1899), British-born printer, missionary and botanist, resident in New Zealand from 1834.

Terrestrial or rupestral ferns. Rhizomes long-creeping, filiform, c. 0.2 mm diameter, bearing dense red-brown hairs up to 0.5 mm long. Fronds 35–150 mm long. Stipes 3–40 mm long, not winged, brown proximally becoming green distally, glabrous or with a few scattered clavate hairs. Laminae 1-pinnate-pinnatifid near apex to 2-pinnate-pinnatifid at base, or 2-pinnate-pinnatifid throughout in large plants, elliptic or narrowly elliptic or obovate in largest fronds, 25–125 mm long, 10–30 mm wide, dark green, membranous, bearing scattered clavate hairs along veins. Rachises not winged, green, bearing scattered clavate hairs. Primary pinnae in 6–15 pairs, widely spaced, ovate or narrowly ovate, winged at their distal end, stalked at their proximal end, occasionally a few with long caudate apices greatly exceeding other pinnae; the longest primary pinnae near the middle, 10–25 mm long, 4–15 mm wide. Secondary pinnae ovate or elliptic or narrowly elliptic or obovate, winged; the distal secondary pinnae on each primary pinna adnate, the proximal stalked; the longest secondary pinnae 4–9 mm long, 2–4 mm wide. Ultimate segments narrowly elliptic, often deeply divided, up to 5 mm long, 0.4–1.2 mm wide, with veins forking 1–2 or rarely 3 times in each; apices acute, never emarginate; margins entire,

lacking a border. Sori borne on short acroscopic segments near bases of primary or secondary pinnae, 1 or rarely 2 on each primary pinna, adnate or stalked; indusia tubular, 1.5–2 mm long, widened at mouth; sporangia borne on a fine receptacle up to 12 mm long, projecting well beyond the indusia at maturity.

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

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

Chatham Islands.

Altitudinal range: 15–960 m.

In the North Island *Trichomanes colensoi* is found in montane forest from the Kaimai Ranges, extending east through the Urewera district to inland Gisborne and south to western Waikato and Mt Taranaki. It is found more abundantly in lowland to montane areas from the Tararua Ranges south to Wellington city. It is apparently absent from Northland, and most of Auckland, the central North Island and east coast. It grows from near sea level to 960 m on Maungatapere near Matawai. In the South Island it is largely confined to lowland areas of the west coast, extending from the Marlborough Sounds and north-west Nelson, through Westland and Fiordland, to Riverton and Dunedin. It occurs from about 15 m to nearly 560 m in the Kokatahi River catchment, Westland. There is a single collection from the Chatham Islands (AK 229973), but it is absent from Stewart Island.

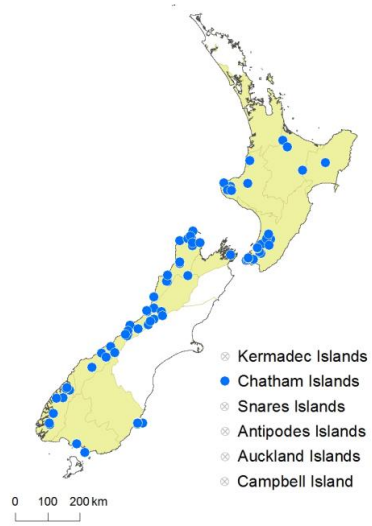

Fig. 149: *Trichomanes colensoi* distribution map based on databased records at AK, CHR, OTA and WELT.

Biostatus: Indigenous (Endemic).

Trichomanes colensoi (as *Polyphlebium*) was given a conservation status of Naturally Uncommon by de Lange et al. (2013).

Habitat: Occurs on damp rock, under overhangs or beside streams in dark, wet, podocarp, beech or broadleaved forest. It frequently grows with *T. endlicherianum* and bryophyte species.

Recognition: *Trichomanes colensoi* is similar in appearance and habitat to *T. endlicherianum*. It is distinguished by its very finely divided fronds, lack of a wing on the rachis, stalked pinnae, lamina segments lacking a border, and adnate or stalked indusia. It is distinguished from *T. venosum* by its non-epiphytic habitat, dark green frond, much finer ultimate segments, and lamina segments which are never emarginate.

Cytology: n = 36 (Brownlie 1958).

Notes: In the classification of Ebihara et al. (2006), *Trichomanes colensoi* is treated as *Polyphlebium colensoi*.

Fig. 150: *Trichomanes colensoi*. Plants growing on shaded rock.

Fig. 151: *Trichomanes colensoi*. Fertile fronds growing on a shaded bank.

Fig. 152: *Trichomanes colensoi*. Fertile frond with an unwinged rachis, stalked pinnae, narrow lamina segments and shortly stalked sori.

Fig. 153: *Trichomanes colensoi*. Fertile frond showing stalked pinnae and tubular indusia with long-exserted receptacles.

Trichomanes elongatum A.Cunn., *Companion Bot. Mag.* 2: 368 (1837)

≡ *Trichomanes rigidum* var. *elongatum* (A.Cunn.) Hook. & Baker, *Syn. Fil.,* 86 (1867)
≡ *Selenodesmium elongatum* (A.Cunn.) Copel., *Philipp. J. Sci.* 67: 82 (1938)
≡ *Abrodictyum elongatum* (A.Cunn.) Ebihara & K.Iwats. in Ebihara et al., *Blumea* 51: 244 (2006)
Holotype: In damp woods of Wangaroa [Whangaroa] & Hokianga, *R.Cunningham No. 56*, 1834, K! (photo WELT E469/24 – top right hand specimen)

= *Trichomanes polyodon* Colenso, *Trans. & Proc. New Zealand Inst.* 28: 618 (1896)
Lectotype (selected by Brownsey & Perrie 2016) New Zealand, *W. Colenso*, pres. 1897, K! (photo WELT E469/25)

Etymology: From the Latin *elongatus* (elongated), a reference to the elongated receptacle.

Vernacular name: bristle fern

Terrestrial or rupestral ferns. Rhizomes erect or short-creeping, bearing dark brown hairs 1–5 mm long. Fronds 95–360 mm long, held at an angle or horizonatally. Stipes 30–250 mm long, brown, glabrous or hairy proximally, not winged. Laminae 1–2-pinnate distally to 2–3-pinnate proximally, ovate or triangular, 48–140 mm long, 26–100 mm wide, dark olive-green, herbaceous, glabrous or with very short scattered hairs along veins. Rachises not winged or winged only near the lamina apices, brown or dark green, glabrous or occasionally hairy. Primary pinnae in 10–20 pairs, overlapping, narrowly winged in distal half, stalked; distal primary pinnae elliptic or narrowly ovate; proximal primary pinnae ovate; the longest primary pinnae at or near the base, 17–60 mm long, 7–26 mm wide. Secondary pinnae overlapping, winged in distal half, more or less stalked; narrowly elliptic or narrowly obovate on distal primary pinnae, narrowly elliptic or narrowly ovate or ovate on proximal primary pinnae; the longest secondary pinnae 7–18 mm long, 3–6 mm wide. Longest tertiary pinnae obovate or elliptic, deeply divided at apices, 4–10 mm long, 1.2–3.2 mm wide, adnate to decurrent, the veins forking several times in each; apices acute or obtuse; margins entire, lacking a border. Sori borne acroscopically and basiscopically in notches of ultimate segments at base of secondary pinnae close to costae of primary pinnae, several on each primary pinna, sessile or shortly stalked; indusia tubular, c. 2 mm long, scarcely widened at mouth; sporangia borne on a stout receptacle up to 25 mm long, projecting far beyond the indusia at maturity.

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

South Island: Western Nelson, Sounds Nelson, Westland.

Chatham Islands.

Altitudinal range: 10–700 m.

In the North Island *Trichomanes elongatum* occurs throughout Northland and Auckland, extending eastwards through the Bay of Plenty to East Cape, and down the west coast as far as Wellington. It is found in coastal and lowland forest, reaching 560 m in Kaihu Forest, Northland and 700 m on the summit of Little Barrier Island. In the South Island it is confined to coastal and lowland areas of the Marlborough Sounds and north-west Nelson below 90 m, with an outlying population at Lake Matheson, Westland. It is known from a single collection on the Chatham Islands (AK 300691).

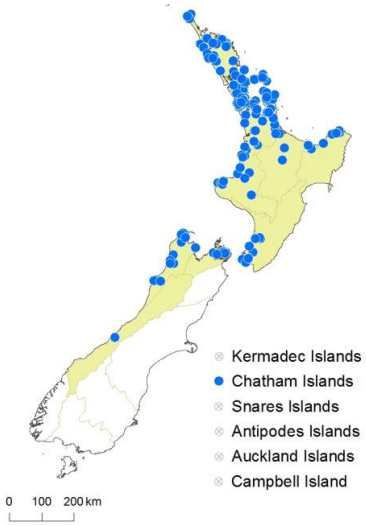

Fig. 154: *Trichomanes elongatum* distribution map based on databased records at AK, CHR, OTA and WELT.

Biostatus: Indigenous (Endemic).

Habitat: Occurs on the ground, amongst roots, on banks and rocks, under overhangs and beside streams in dark, damp kauri, podocarp and broadleaved forest and in old mānuka and kānuka scrub.

Recognition: *Trichomanes elongatum* is recognised by its erect rhizome, ovate or triangular dark olive-green laminae, lack of a wing on most of the rachis, broad and overlapping lamina segments with the veins forking several times in each, and conspicuous brown receptacles far-exserted beyond the indusial flaps. The laminae are often covered in epiphyllous mosses and liverworts.

Notes: In the classification of Ebihara et al. (2006), *Trichomanes elongatum* is treated as *Abrodictyum elongatum.*

Trichomanes elongatum was described by Cunningham (1837) citing a specimen from "Dark ravines in the forests of Wangaroa, etc. – 1834, *R. Cunningham*". Allan (1961) stated "Type: *R. Cunningham*, 1834, BM". However, the only specimens in BM from Cunningham's herbarium are labelled "Bay of Islands, New Zealand, May 1838" and "New Zealand, *A. Cunningham".* Both of these are in conflict with the protologue, and hence Allan's statement cannot be regarded as a lectotypification. Nevertheless, there is a specimen at K from Cunningham's herbarium which is labelled "In damp woods of Wangaroa & Hokianga, *R. Cunningham*, 1834". This specimen is the holotype (Brownsey & Perrie 2016).

Croxall (1975) considered that *Trichomanes elongatum* (as *Selenodesmium elongatum*) occurred in Queensland and New South Wales, although he conceded that the distinctions between it and *S. dentatum* (widespread in the Pacific) and *S. obscurum* (from Asia, Australia and the western Pacific) were far from clear. Bostock & Spokes (1998) recognised only the latter species in Australia (as *Cephalomanes obscurum*), leaving *Trichomanes elongatum* as endemic to New Zealand. Nevertheless, the relationships between these three species are close and worthy of further investigation.

Fig. 155: *Trichomanes elongatum*. Plant growing on a soil bank.

Fig. 156: *Trichomanes elongatum*. Erect rhizome giving rise to brown, unwinged stipes bearing scattered hairs proximally.

Fig. 157: *Trichomanes elongatum*. Dark green laminae with overlapping pinnae.

Fig. 158: *Trichomanes elongatum*. Adaxial surface of the lamina characteristically bearing epiphyllous bryophytes.

Fig. 159: *Trichomanes elongatum*. Abaxial surface of lamina showing tubular indusia and exserted receptacles.

Fig. 160: *Trichomanes elongatum*. Abaxial surface of lamina with tubular indusia and stout, far-exserted receptacles.

Trichomanes endlicherianum C.Presl, *Gefässbündel Farrn,* 25 (1847)

≡ *Crepidopteris endlicheriana* (C.Presl) Copel., *Philipp. J. Sci.* 67: 58 (1938)
≡ *Crepidophyllum endlicherianum* (C.Presl) C.F.Reed, *Amer. Fern J.* 38: 89 (1948)
≡ *Reediella endlicheriana* (C.Presl) Pic.Serm., *Webbia* 24: 719 (1970)
≡ *Crepidomanes endlicherianum* (C.Presl) P.S.Green, *Kew Bull.* 48: 618 (1993)
≡ *Polyphlebium endlicherianum* (C.Presl) Ebihara & K.Iwats. in Ebihara et al., *Blumea* 51: 240 (2006)
Holotype: Norfolk Island, *F.L. Bauer*, 1804–1805, W (*n.v.*; see Green 1993); isotype: K (*n.v.*; see Croxall 1975)

= *Trichomanes aureum* Bosch, *Ned. Kruidk. Arch.* 5(3): 208 (1863)
Lectotype (selected by Brownsey & Perrie 2016): New Zealand, Hauraki Gulf, Kawau, *D. Lyall*, Dec. 1840, Herbarium Hookerianum, K! photo WELT E 469/23)

Etymology: Named in honour of Stephan L. Endlicher (1804–1849), Austrian botanist and Director of the Vienna Botanical Garden, who published early works on the flora of Australia and Norfolk Island.

Usually terrestrial or rupestral ferns, occasionally at the base of trunks. Rhizomes long-creeping, filiform, c. 0.2 mm diameter, bearing dense brown hairs up to 0.5 mm long. Fronds 22–130 mm long. Stipes 2–30 mm long, brown proximally becoming green distally, winged for at least half their length,

glabrous or with a few short scattered clavate hairs. Laminae 2-pinnatifid or rarely 1-pinnatifid, rather irregular in outline (narrowly elliptic or elliptic or narrowly obovate or obovate), 17–110 mm long, 5–27 mm wide, dark green, membranous, glabrous or bearing short scattered clavate hairs along the veins. Rachises winged throughout, dark green, glabrous or bearing short scattered clavate hairs. Primary pinnae in 3–10 pairs, not overlapping, linear or narrowly elliptic or elliptic or obovate, adnate or decurrent; the longest primary pinnae at or above or below the middle, 5–38 mm long, 1.5–12 mm wide. Ultimate segments linear or oblong, up to 10 mm long, 0.8–1.5 mm wide, with a single unbranched vein in each; apices obtuse, often emarginate; margins entire with a clearly defined unistratose border of elongated cells with oblique end-walls. Sori borne on short acroscopic segments near bases of primary pinnae, 1 on each primary pinna, immersed in lamina with a wing 3 or more cells wide at mid-length; indusia tubular, 1.5–2.5 mm long, widened at mouth; sporangia borne on a fine receptacle up to 20 mm long, projecting well beyond the indusia at maturity.

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

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

Kermadec Islands, Three Kings Islands, Chatham Islands.

Altitudinal range: 0–830 m.

In the North Island *Trichomanes endlicherianum* is widespread from Kaitaia south to Mt Taranaki and the Hawke's Bay ranges. It is absent from much of the central North Island, but occurs from the Tararua Ranges south to Wellington city. It occurs in lowland to montane forest, extending from near sea level to 600 m in Waimā Forest, Northland, and 830 m on Mt Pirongia. In the South Island *T. endlicherianum* is confined to coastal and lowland forest from the Marlborough Sounds and north-west Nelson, south to Greymouth on the west coast, with outlying populations on Banks Peninsula and around Dunedin on the east coast. It reaches 260 m near Karamea. There is a single collection from the Chatham Islands (AK 228204).

Also Borneo (Mt Kinabalu), Papua New Guinea, Australia (Queensland), Norfolk Island, Vanuatu, Fiji, Samoa, Society Islands, Marquesas Islands, Austral Islands, Pitcairn Island.

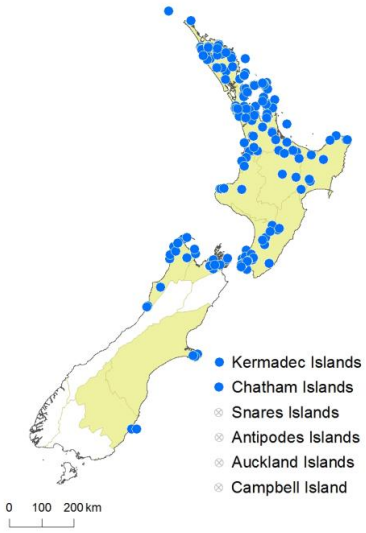

Fig. 161: *Trichomanes endlicherianum* distribution map based on databased records at AK, CHR, OTA and WELT.

Biostatus: Indigenous (Non-endemic).

Habitat: Occurs on damp rock, under overhangs, at the base of *Rhopalostylis sapida* trunks or occasionally on *Dicksonia squarrosa*, on the underside of fallen trunks, or beside streams in dark, wet, broadleaved forest, or rarely in beech forest. It often grows with *Trichomanes colensoi* and *Loxogramme dictyopteris*.

Recognition: *Trichomanes endlicherianum* is similar in appearance and habitat to *T. colensoi*. It is distinguished by its less divided frond, winged stipe and rachis, adnate pinnae, lamina segments with a distinct border, and indusia immersed in the lamina. It is distinguished from *T. venosum* by its terrestrial habitat, dark green frond and ultimate segments with a single unbranched vein. It is superficially very similar to *T. humile* but can be distinguished by the presence of roots, the unistratose rather than bistratose border, and by the wing of laminal cells either side of the sori which are 3 or more cells wide at mid-length, rather than only 1–2 cells wide.

Notes: In the classification of Ebihara et al. (2006), *Trichomanes endlicherianum* is treated as *Polyphlebium endlicherianum.*

The name *Trichomanes humile* Forst.f., and combinations based on it, have been widely misapplied to this species in New Zealand, but both species are now known to occur on the Kermadec Islands.

Copeland (1933), Allan (1961) and Brownlie (1977) included *T. alternans* Carruth. (type from Fiji), *T. tenue* Brack. (type from Tahiti) and *T. erectum* Brack. (type from Fiji) in synonymy with *T. endlicherianum.* However, some plants from Fiji and French Polynesia are very different genetically to New Zealand plants (Perrie et al. 2016). Plants from Fiji and Samoa are also morphologically different, having much narrower lamina segments, and indusia that are not immersed in the lamina, but plants from Tahiti are rather similar to those of New Zealand, Norfolk Island and Australia. The relationship of plants in New Zealand to those in the Pacific requires further investigation.

Fig. 162: *Trichomanes endlicherianum*. Plants growing on shaded soil bank.

Fig. 163: *Trichomanes endlicherianum*. Fertile fronds growing on rock.

Fig. 164: *Trichomanes endlicherianum*. Sterile frond with winged rachis and broad, adnate lamina segments with a single vein in each.

Fig. 165: *Trichomanes endlicherianum*. Fertile frond showing sori immersed in the lamina segments, and indusia slightly widened at the mouth with exserted receptacles.

Trichomanes humile G.Forst., *Fl. Ins. Austr.,* 84 (1786)

≡ *Didymoglossum humile* (G.Forst.) C.Presl, *Hymenophyllaceae,* 23 (1843)
≡ *Crepidomanes humile* (G.Forst.) Bosch, *Hymenophyll. Javan.,* 16, t.11 (1861)
≡ *Crepidopteris humilis* (G.Forst.) Copel, *Philipp. J. Sci.* 67: 58 (1938)
≡ *Crepidophyllum humile* (G.Forst.) Reed, *Amer. Fern J.* 38: 89 (1948)
≡ *Reediella humilis* (G.Forst.) Pic.Serm., *Webbia* 24: 719 (1970)

Lectotype (selected by Nicolson & Fosberg 2003): no locality, *Forster*, “from Forster’s Herb.”, K (*n.v.*)

Etymology: From the Latin *humilis* (low-growing), a reference to the short stature of the plant.

Epiphytic ferns. Rhizomes long-creeping, 0.2–0.3 mm diameter, bearing red-brown hairs up to 0.5 mm long. Fronds 25–35 mm long. Stipes 4–10 mm long, brown proximally, green distally, narrowly winged for at least half their length, glabrous or with short scattered hairs. Laminae 1–2-pinnatifid distally to 2–3-pinnatifid proximally, ovate or elliptic or narrowly elliptic or narrowly obovate, 22–25 mm long, 4–12 mm wide, green, membranous, glabrous or with a few short scattered clavate hairs. Rachises winged throughout, green, glabrous or with a few short scattered clavate hairs. Primary pinnae in 4–6 pairs, not overlapping, narrowly ovate to broadly ovate, winged throughout; distal primary pinnae decurrent; proximal primary pinnae almost stalked; the longest primary pinnae just above or below the middle, 4–9 mm long, 2–6 mm wide. Ultimate segments linear, entire, up to 2 mm long, 0.6–1.0 mm wide, adnate, each with a single unbranched vein; apices obtuse; margins entire with a clearly defined bistratose border of elongated cells with oblique end-walls. Sori borne on short acroscopic segments near bases of primary pinnae, one on each primary pinna, immersed in lamina with a wing 1–2 cells

wide at mid-length; indusia tubular, 1.5–2.5 mm long, widened at mouth; sporangia borne on a fine receptacle up to 1 mm long, projecting beyond the indusia at maturity.

Distribution: Kermadec Islands.

Altitudinal range: 450 m.

Trichomanes humile is a rare fern in New Zealand, at the southern extent of its distribution, known only from a single collection on Raoul Island, Kermadec Islands (AK 329225, WELT P026050).

Also Taiwan, Thailand, Malaysia, Philippines, Indonesia, Papua New Guinea, Australia (Queensland), Micronesia, Solomon Islands, New Caledonia, Vanuatu, Fiji, Samoa, Tonga, Cook Islands, Society Islands, Austral Islands.

Biostatus: Indigenous (Non-endemic).

Trichomanes humile (as *Crepidomanes*) was given a conservation status of Naturally Uncommon by de Lange et al. (2013).

Habitat: Occurs as an epiphyte on *Cyathea milnei* in dense, deeply shaded wet forest under *Metrosideros kermadecensis* at 450 m altitude.

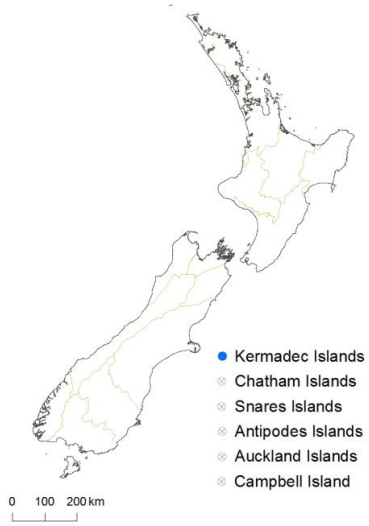

Fig. 166: *Trichomanes humile* distribution map based on databased records at AK, CHR, OTA and WELT.

Recognition: *Trichomanes humile* is superficially similar to *T. endlicherianum* and *T. caudatum* but can be distinguished by its bistratose border of elongated cells, and sometimes by the absence of roots. *Trichomanes caudatum* has a border of shorter cells and *T. endlicherianum* a border of elongated cells, but neither are bistratose. *Trichomanes humile* is further distinguished by the wing of laminal cells either side of the sori which are only 1–2 cells wide at mid-length, whereas in *T. endlicherianum* they are 3 or more cells wide.

Notes: In the classification of Ebihara et al. (2006), *Trichomanes humile* is treated as *Crepdiomanes humile*.

Fig. 167: *Trichomanes humile*. Dried specimen showing rhizome and fertile fronds.

Fig. 168: *Trichomanes humile*. Dried specimen showing portion of laminae with indusia.

Trichomanes strictum Menzies ex Hook. & Grev., *Icon. Filic. 2,* t. 122 (1829)

≡ *Trichomanes rigidum* var. *strictum* (Menzies ex Hook. & Grev.) Field, *Ferns New Zealand,* 72 (1890)
≡ *Macroglena stricta* (Menzies ex Hook. & Grev.) Copel., *Philipp. J. Sci.* 67: 85 (1938)
≡ *Abrodictyum strictum* (Menzies ex Hook. & Grev.) Ebihara & K.Iwats. in Ebihara et al., *Blumea* 51: 243 (2006)
Holotype: New Zealand, Dusky Bay, *A. Menzies*, Herbarium Hookerianum, K! (photo WELT E469/19); isotype?: Nova Zelandia [New Zealand], Dusky Sound, *A. Menzies*, BM 001044796!

= *Trichomanes leptophyllum* A.Cunn., *Companion Bot. Mag.* 2: 368 (1837)
Lectotype (selected by Brownsey & Perrie 2016): New Zealand, Hokianga, near Tauraki [?], *R. Cunningham*, 1834, K! (photo WELT E469/17)

Etymology: From the Latin *strictus* (very straight, erect), a reference to the upright habit of the fronds.

Vernacular name: erect bristle fern

Terrestrial ferns. Rhizomes erect, bearing red-brown hairs 1–3 mm long. Fronds 65–350 mm long, held upright. Stipes 20–160 mm long, pale brown sometimes becoming green distally, often very narrowly winged for a short distance distally, glabrous or with scattered hairs. Laminae 2-pinnatifid distally to 3-pinnatifid or rarely 4-pinnatifid proximally, narrowly elliptic or elliptic or narrowly ovate or ovate, 40–260 mm long, 15–80 mm wide, green, membranous, glabrous or with scattered hairs. Rachises narrowly winged throughout, brown or green, glabrous or with scattered hairs. Primary pinnae in 15–25 pairs, overlapping, narrowly elliptic or narrowly ovate or ovate, winged throughout; distal primary pinnae adnate; proximal primary pinnae more or less stalked; the longest primary pinnae at or below the middle, 10–67 mm long, 4–20 mm wide. Secondary pinnae overlapping, elliptic or obovate, winged throughout, more or less adnate; the longest 4–14 mm long, 2–6 mm wide. Ultimate segments linear or oblong, entire, up to 4 mm long, 0.4–1.2 mm wide, adnate, each with a single unbranched vein; apices acute to obtuse; margins entire, with an indistinct border of shortened cells. Sori borne on short acroscopic and basiscopic segments near bases of secondary pinnae, several on each primary pinna, adnate; indusia tubular, 1–1.5 mm long, slightly widened at mouth; sporangia borne on a fine receptacle up to 19 mm long, projecting far beyond the indusia at maturity.

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

South Island: Western Nelson, Sounds Nelson, Westland, Fiordland.

Chatham Islands, Stewart Island.

Altitudinal range: 10–900 m.

In the North Island *Trichomanes strictum* occurs in montane areas from Northland through Coromandel to the Bay of Plenty and East Cape, and south to western Waikato. Elsewhere in the North Island it is confined to Mt Taranaki and the Tararua Ranges. It grows from about 300 m in the foothills of the Tararua Ranges to 870 m on Mt Taranaki and the Pukeamaru Range, East Cape, and to 900 m on Mt Te Aroha. In the South Island it occurs in the Marlborough Sounds, and from Whanganui Inlet to Fiordland and Stewart Island. It extends from near sea level on Stewart Island to 700 m on the Stockton Plateau.

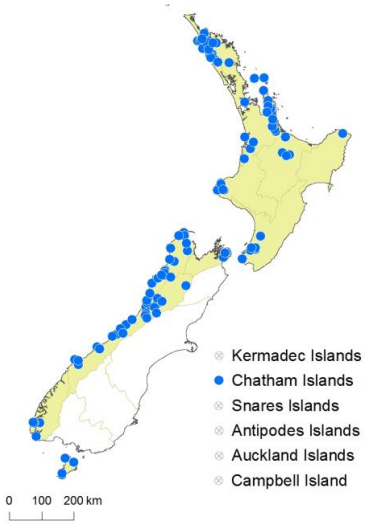

Fig. 169: *Trichomanes strictum* distribution map based on databased records at AK, CHR, OTA and WELT.

Biostatus: Indigenous (Endemic).

Habitat: Occurs on the ground, among roots, at the base of trunks, on rotting logs, on banks and damp rock faces, under overhangs, or on mossy streamsides in damp, shaded kauri, podocarp, beech and broadleaved forest.

Recognition: *Trichomanes strictum* is recognised by its erect rhizomes, fronds which are held upright, narrowly ovate laminae, winged rachises, linear ultimate segments with unbranched veins, and fine brown receptacles far-exserted beyond the indusial flaps.

Notes: In the classification of Ebihara et al. (2006), *Trichomanes strictum* is treated as *Abrodictyum strictum*.

Fig. 170: *Trichomanes strictum*. Plants growing terrestrially in leaf litter.

Fig. 171: *Trichomanes strictum*. Narrowly ovate fronds with overlapping pinnae.

Fig. 172: *Trichomanes strictum*. Plant with erect rhizome.

Fig. 173: *Trichomanes strictum*. Fertile frond with tubular indusia and exserted receptacles.

Trichomanes venosum R.Br., *Prodr. Fl. Nov. Holland.,* 159 (1810)

≡ *Phlebiophyllum venosum* (R.Br.) Bosch, *Verslagen Meded. Afd. Natuurk. Kon. Akad. Wetensch.* 11: 321 (1861)

≡ *Polyphlebium venosum* (R.Br.) Copel., *Philipp. J. Sci.* 67: 55 (1938)

≡ *Crepidomanes venosum* (R.Br.) Bostock in Bostock & Spokes, *Fl. Austral. 48,* 706 (1998)
Lectotype (selected by Tindale 1963): Derwent, Ins. Van Diemen [Tasmania], *R. Brown Iter Australiense No. 96*, 1802–5, BM 1044772!

= *Trichomanes venustulum* Colenso, *Trans. & Proc. New Zealand Inst.* 12: 366 (1880) — as venustula
Lectotype (selected by Brownsey & Perrie 2016): Norsewood, Herb. W. Colenso, WELT P003018!

Etymology: From the Latin *venosus* (conspicuously veined), a reference to the prominent, much-branched veins in the lamina.

Epiphytic, or rarely rupestral ferns. Rhizomes long-creeping, filiform, c. 0.2 mm diameter, bearing dense red-brown hairs up to 0.5 mm long. Fronds 25–165 mm long. Stipes 8–50 mm long, rarely to 80 mm long, dark brown proximally, becoming pale brown distally, not winged, glabrous or with a few short scattered hairs. Laminae 1-pinnatifid near apex to 1-pinnate or 1-pinnate-pinnatifid at base, rather irregular in outline (generally elliptic or obovate), 15–140 mm long, 6–60 mm wide, light green, membranous, glabrous or bearing very short scattered hairs along the veins. Rachises not winged or winged only near lamina apex, pale brown, glabrous or bearing short scattered hairs. Primary pinnae

in 3–16 pairs, widely spaced; undivided primary pinnae oblong, crenate, 5–60 mm long, 1.5–4 mm wide; divided primary pinnae ovate, slightly or irregularly lobed or with 1–3 sometimes greatly extended pinnatifid segments, 10–60 mm long, 4–23 mm wide; distal primary pinnae adnate; proximal primary pinnae stalked; the longest primary pinnae usually at or above the middle. Ultimate segments oblong, up to 17 mm long, 1.2–3.5 mm wide, with veins forking many times in each; apices obtuse or truncate or emarginate; margins shallowly lobed to crenate, lacking a distinct border. Sori borne acroscopically near bases of primary pinnae, 1 or rarely 2 on each primary pinna, either partially immersed in lamina or free and stalked; indusia tubular, 1.5–2.5 mm long, widened at mouth; sporangia borne on a fine receptacle up to 24 mm long, projecting well beyond the indusia at maturity.

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

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

Kermadec Islands, Chatham Islands, Solander Island, Stewart Island.

Altitudinal range: 0–900 m.

Trichomanes venosum occurs throughout the North Island in wet lowland to montane forest, extending from sea level to 760 m near Erua on the volcanic plateau, and to 900 m in Urewera National Park. In the South Island it occurs from the Marlborough Sounds and north-west Nelson through Westland and Fiordland to Southland, south-east Otago and Banks Peninsula, with isolated populations in Marlborough and inland Canterbury. It is largely confined to lowland forest, but reaches nearly 500 m on D'Urville Island and 600 m on Banks Peninsula.

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

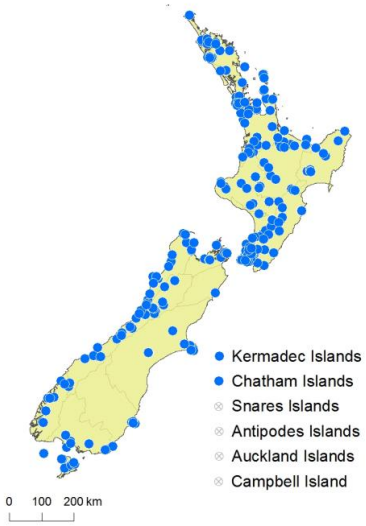

Fig. 174: *Trichomanes venosum* distribution map based on databased records at AK, CHR, OTA and WELT.

Biostatus: Indigenous (Non-endemic).

Habitat: Occurs most commonly on tree fern trunks, especially *Cyathea dealbata*, *C. smithii* and *Dicksonia squarrosa*, in podocarp, beech, broadleaved and kānuka forest. Occasionally it is found on *Cyathea medullaris*, *Weinmannia racemosa* or *Melicytus ramiflorus* trunks, on fallen trunks, damp banks, or on wet rock faces and overhangs.

Recognition: *Trichomanes venosum* is distinguished by its epiphytic habitat, light green translucent fronds, and prominent veins which fork many times in each ultimate lamina segment.

It is superficially similar to, and occupies the same habitat as, *T. caudatum*, but can be distinguished by its unbordered and emarginate lamina segments, and ultimate lamina segments with veins forking many times in each.

Cytology: n = 36 (Brownlie 1954).

Notes: In the classification of Ebihara et al. (2006), *Trichomanes venosum* is treated as *Polyphlebium venosum*.

Trichomanes venosum was described from Tasmania and New South Wales, Australia by Brown (1810) as "D" (Insula Van Diemen) and "J" (the area from Sydney north to Newcastle). There is one sheet at BM labelled "Derwent, Ins. Van Diemen, 1804, *R. Brown*, No. 96" (BM 1044772), and another at K labelled "Derwent, *R. Brown* No. 96" (photo WELT E469/16). Tindale (1963) referred to these as the holotype and isotype respectively, but did not mention another specimen labelled "Derwent, *R. Brown* No. 96" (E 00208910). We interpret these as separate syntypes, with Tindale's statement of "holotype" constituting effective lectotypification. There are other possible syntype specimens collected by Brown from Tasmania at LE, MEL and US.

Fig. 175: *Trichomanes venosum*. Plants growing epiphytically on tree fern trunk.

Fig. 176: *Trichomanes venosum*. Plants growing epiphytically on tree fern trunk.

Fig. 177: *Trichomanes venosum*. Fertile frond with irregularly lobed lamina segments, and veins forking several times in each segment.

Fig. 178: *Trichomanes venosum*. Fertile frond showing sori partially immersed in lamina segments, and tubular indusia widened at their mouths, with receptacles far-exserted.

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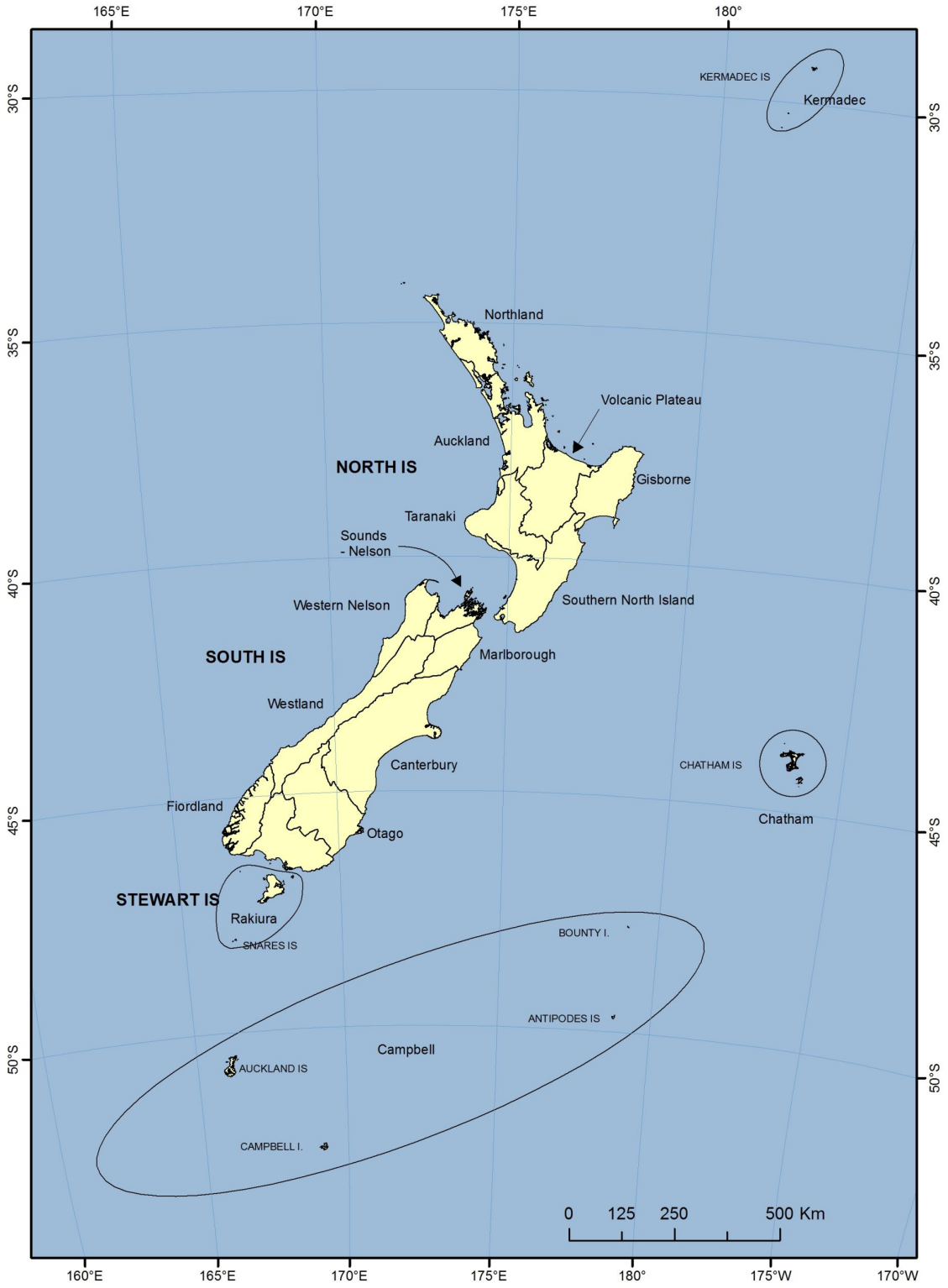
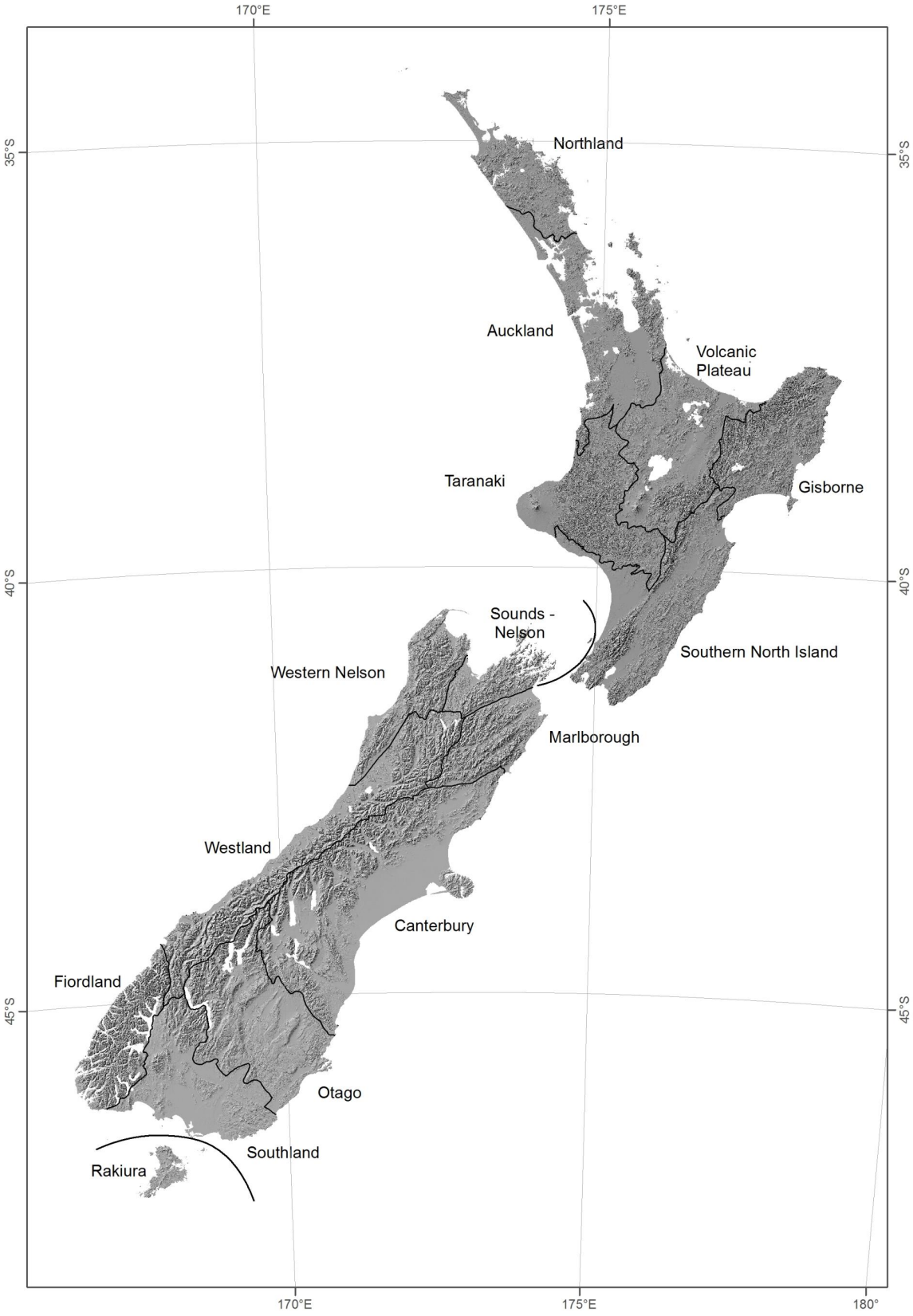


Map 1: Map of New Zealand and offshore islands showing Ecological Provinces



Map 2: Map of New Zealand showing Ecological Provinces

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