

FLORA OF NEW ZEALAND

FERNS AND LYCOPHYTES

TECTARIACEAE



P.J. BROWNSEY & L.R. PERRIE

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Cover image: *Arthropteris tenella*. Mature fertile frond bearing lobed primary pinnae.

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Introduction

Tectariaceae is a medium-sized pantropical family, which extends to southern temperate regions and is represented in New Zealand by a single species. *Arthropteris tenella* is an indigenous species, which occurs in coastal and lowland areas of the North Island but is absent from the central high country, and in the South Island is confined to coastal and lowland parts of Marlborough, Nelson and north Westland, with an outlying population on Banks Peninsula. It is also found in eastern Australia, Norfolk Island and Lord Howe Island. It is a forest species and one of the few genuine climbing ferns in New Zealand, but is often found scrambling over rock when still juvenile. *Arthropteris tenella* is characterised by pinnate fronds, shallowly lobed pinnae, which are jointed to the rachis, and round exindusiate sori near the lamina margins.

The family placement of *Arthropteris* has been contentious for many years, but analysis of plastid and molecular markers now suggest its placement in the Tectariaceae.

Tectariaceae Panigrahi, *J. Orissa Bot. Soc.* 8: 41 (1986)

Type taxon: *Tectaria* Cav.

Climbing or terrestrial ferns. Rhizomes long-creeping (NZ) or short-creeping to erect (not NZ), scaly, bearing short phyllopodia (NZ) or phyllopodia absent (not NZ). Fronds monomorphic (NZ) or dimorphic (not NZ), articulated to the phyllopodia (NZ) or not articulated (not NZ). Laminae 1-pinnate (NZ) or entire to 4-pinnate-pinnatifid (not NZ), catadromous, herbaceous or coriaceous, scaly and hairy. Veins free (NZ) or reticulate (not NZ). Sori round (NZ) or elongate or anastomosing in lines (not NZ), superficial, borne on abaxial surface, near the margin (NZ) or throughout the lamina (not NZ), paraphyses present (NZ) or absent (not NZ); indusia absent (NZ) or reniform or peltate or elongate (not NZ); sporangial maturation mixed. Sporangia with vertical annulus, usually 64 spores per sporangium. Homosporous; spores monolete, lacking chlorophyll; perispores with irregular wing-like folds (NZ) or very variably ornamented (not NZ).

Taxonomy: A family of seven genera and about 250 species (PPG 1 2016).

The extent of the Tectariaceae and the generic limits within the family were considered to be very uncertain by Smith et al. (2006). In particular, the placement of *Arthropteris* was contentious. The genus was previously allied with *Oleandra* in the Oleandraceae (Kramer 1990), and before that with *Nephrolepis* in the Nephrolepidaceae (Pichi Sermolli 1977). Allan (1961) and Bell (1998) included it in the Davalliaceae. More recent studies have suggested a sister relationship with *Tectaria* and related ferns (Liu et al. 2007; Schuettpeiz & Pryer 2007). Based on more extensive sampling using chloroplast DNA, Liu et al. (2013) showed that *Psammiosorus*, a monotypic genus from Madagascar, and *Arthropteris* together form a well-supported and morphologically distinct clade. They proposed a new family, Arthropteridaceae, which included the single genus *Arthropteris*. However, the new family has not been widely accepted, and work by Zhang et al. (2016), based on plastid and nuclear markers, suggests that Tectariaceae comprises seven genera: *Arthropteris*, *Draconopteris*, *Hypoderris*, *Malaifilix*, *Pteridrys*, *Tectaria* and *Triplophyllum*.

Distribution: A pantropical family, but with several species extending into north and south temperate regions. The greatest diversity is found in the Old World tropics. One non-endemic genus and species in New Zealand.

Biostatus: Indigenous (Non-endemic).

Table 1: Number of species in New Zealand within *Tectariaceae* Panigrahi

Category	Number
Indigenous (Non-endemic)	1
Total	1

Recognition: Tectariaceae is a diverse and difficult family to characterise morphologically, especially with the inclusion of *Arthropteris*. However, in New Zealand, the only representative is a single species of *Arthropteris*, for which the distinguishing characters are atypical of the family as a whole. They are described under the genus.

Arthropteris* J.Sm. ex Hook.f., *Bot. Antarct. Voy. II (Fl. Nov.-Zel.) Part II, 43, t. 82 (1854)

Type taxon: *Arthropteris tenella* (G.Forst.) J.Sm. ex Hook.f.

Etymology: From the Greek *arthro* (jointed) and *pteris* (a fern), a reference to the nature of the fronds, which are jointed at their base.

Climbing or terrestrial ferns. Rhizomes long-creeping, scaly, bearing short phyllopodia. Rhizome scales peltate, ovate. Fronds monomorphic, articulated to the phyllopodia. Stipes bearing scales and multiseptate hairs. Laminae 1-pinnate to 1-pinnate-pinnatifid, herbaceous to coriaceous, scaly and hairy. Pinnae articulated to rachis, entire or lobed, often auricled on acroscopic side. Veins free or rarely anastomosing, ending in hydathodes inside the lamina margin. Sori round, superficial, near the margin; paraphyses present. Indusia absent (NZ) or reniform (not NZ). Spores monolete; perispores with irregular wing-like folds.

Taxonomy: *Arthropteris* is a clearly defined genus. However the delimitation of several species within the genus remains unresolved, with conflicting interpretations of the *A. palisotii* complex provided in Flora treatments for Malesia and Australia (Holttum 1964; Bell 1998), and for which genetic analysis has found no clear answer (Liu et al. 2013).

The family relationships of *Arthropteris* have been contentious. In New Zealand, the genus was previously included within the Davalliaceae by Allan (1961) and Brownsey et al. (1985), and in the Oleandraceae by Brownsey & Smith-Dodsworth (2000). Following Zhang et al. (2016) it is included here with Tectariaceae, but there have been suggestions that it warrants a family of its own (Liu et al. 2013).

Distribution: A genus of 10–20 species centred on the Old World tropics but extending to temperate regions in New Zealand, southern China and as far east as the Juan Fernández Islands (Liu et al. 2013): six species in Africa (Roux 2009), six in Malesia (Holtum 1964), one in China (Fuwu et al. 2013), four in Australia (Bell 1998), and about five in the Pacific (2008). One non-endemic species in New Zealand.

Biostatus: Indigenous (Non-endemic).

Table 2: Number of species in New Zealand within *Arthropteris* J.Sm. ex Hook.f.

Category	Number
Indigenous (Non-endemic)	1
Total	1

Recognition: In New Zealand, *Arthropteris* can be recognised by its long-creeping and climbing rhizomes, pinnate fronds that are articulated to phyllopodia on the rhizome, pinnae that are shallowly lobed, auricled on the acroscopic side and articulated to the rachis, and round exindusiate sori situated just inside the margin. The spores have irregular wing-like folds (Large & Braggins 1991).

Cytology: The base chromosome number in *Arthropteris* is $x = 41$ or 42 (Tindale & Roy 2002).

***Arthropteris tenella* (G.Forst.) J.Sm. ex Hook.f., *Bot. Antarct. Voy. II* (Fl. Nov.-Zel.) Part II, 43, t. 82 (1854)**

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

Lectotype (selected by Tindale 1961): No locality or date, Herb. G. Forster 277, BM 001048430!

= *Arthropteris filipes* T.Moore, *Gard. Chron.* 23: 388 (1855)

Holotype: Hort. Henderson, Edgeware Road [London], 1853, ex New Zealand – fide R. Parker, Herb. T. Moore, K 001089466 (online; see Tindale 1961)

Etymology: From the Latin *tenellus* (delicate, tender), a reference to the nature of the frond in this species.

Vernacular name: jointed fern

Rhizomes long-creeping, up to 1150 mm long (in herbarium specimens), 1.5–2 mm in diameter, with stipes arising 10–70 mm apart; densely covered in scales. Rhizome scales ovate, peltate, 1.5–5 mm long, 0.5–1.2 mm wide, with blackish centres and pale brown margins. Fronds 85–560 mm long. Stipes 7–80 mm long, yellow-brown, bearing frequent multiseptate hairs up to 0.2 mm long and more scattered golden-brown narrowly ovate scales up to 1.5 mm long. Rachises yellow-brown throughout, not winged or narrowly winged distally, bearing curved hairs up to 0.2 mm long, and scattered scales to 1 mm long. Laminae 1-pinnate, ovate or elliptic or obovate, scarcely tapering at the apices, with a conform terminal pinna, 75–520 mm long, 35–175 mm wide, adaxial surface shiny green, abaxial surface paler green, herbaceous or coriaceous, variably covered in curved hairs along pinna costae and occasionally on abaxial surface of lamina. Primary pinnae in 3–18 pairs below terminal pinna, widely spaced, narrowly ovate or narrowly elliptic, articulated to the rachis; the longest variably positioned from near the apex to the base, 25–100 mm long, 5–15 mm wide, apices acute to acuminate, costae prominent, margins entire (mostly on sterile pinnae) or shallowly lobed, rarely with a few deep lobes proximally, bases often auricled on acroscopic side, short-stalked. Sori round, 1–2 mm diameter, exindusiate; hairs present amongst sporangia.

Distribution: North Island: Northland, Auckland, Volcanic Plateau, Gisborne, Taranaki, Southern North Island.
South Island: Western Nelson, Sounds-Nelson, Canterbury.
Three Kings Islands, Chatham Islands.

Altitudinal range: 0–400 m.

Arthropteris tenella is found on the Three Kings Islands and is common in coastal and lowland districts from near Kaitiāia to Waikato. It occurs around the west coast to Wellington, and around the Bay of Plenty and east coast as far as Hawke's Bay, but is apparently absent from most of southern Hawke's Bay and Wairarapa. It is common in lowland districts from Palmerston North to Wellington. It grows from near sea level, reaching 400 m in Waimā Forest, Northland, and on Mt Hobson, Great Barrier Island. In the South Island it occurs around the coast from the Marlborough Sounds to the Porarari River, north Westland, with an outlying population on Banks Peninsula. It ranges from near sea level to 265 m at Dry River, Tākaka. It also reaches the Chatham Islands.

Also Australia (Queensland, New South Wales), Norfolk Island and Lord Howe Island.

Biostatus: Indigenous (Non-endemic).

Habitat: *Arthropteris tenella* often scrambles over rocks, boulders and stumps before climbing a tree trunk and forming fertile fronds. It is most commonly found in coastal and broad-leaved forest, or sometimes in kauri or podocarp forest or under tall kānuka. It frequently grows on limestone but also on greywacke, basalt, lava, scoria and other acidic rock. It favours rocky ground under forest, in stream beds, on river terraces, in gorges and gullies, and on forest margins.

Recognition: Mature plants of *Arthropteris tenella* are recognised by their long-climbing rhizomes, pinnate fronds, narrowly ovate and shallowly lobed pinnae jointed to the rachis, and round exindusiate sori near the lamina margins. Measurements in the description are for fertile fronds only. Juvenile plants are frequently found climbing over rocks and boulders, and bear much smaller sterile fronds with fewer pairs of shorter pinnae; fronds on such plants are occasionally bipinnate. Larger fertile fronds are rarely produced until the rhizome climbs a tree trunk. Plants from the Three Kings Islands have sterile fronds with ovate pinnae up to 63 mm long and 18 mm wide (e.g. AK 353108, which is larger than any seen elsewhere, although the fertile pinnae are within the range for the species).

Cytology: n = c. 42 (Brownlie 1958).

Notes: *Arthropteris tenella* is closely related to *A. submarginalis* from Queensland (Zhang et al. 2016), differing in its larger frond and exindusiate sori.

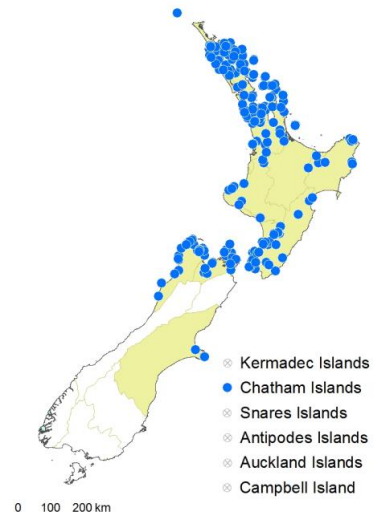


Fig. 1: *Arthropteris tenella* distribution map based on databased records at AK, CHR and WELT.



Fig. 2: *Arthropteris tenella*. Mature fertile frond bearing lobed primary pinnae.



Fig. 3: *Arthropteris tenella*. Mature plants with long-creeping rhizomes climbing a tree trunk.



Fig. 4: *Arthropteris tenella*. Close up of creeping rhizome densely covered in bicolorous scales.



Fig. 5: *Arthropteris tenella*. Juvenile fronds produced on rhizomes near the base of a tree trunk.



Fig. 6: *Arthropteris tenella*. Small juvenile fronds produced on rhizomes growing on the ground.



Fig. 7: *Arthropteris tenella*. Mature fertile frond bearing lobed primary pinnae.



Fig. 8: *Arthropteris tenella*. Close up of abaxial surface of primary pinnae showing round exindusiate sori near the lobed margins.



Fig. 9: *Arthropteris tenella*. Abaxial surface of primary pinnae showing over-mature round sori.

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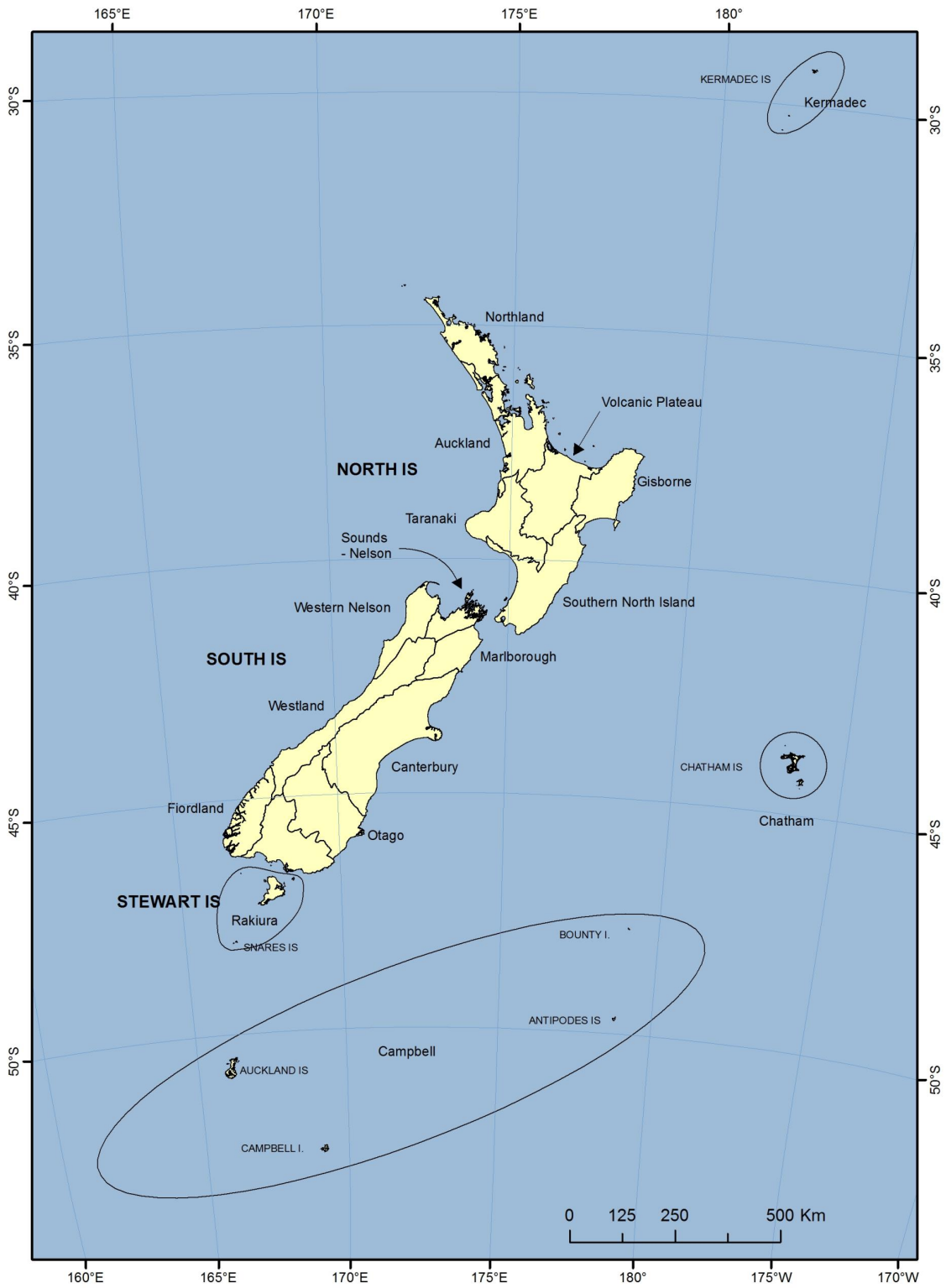
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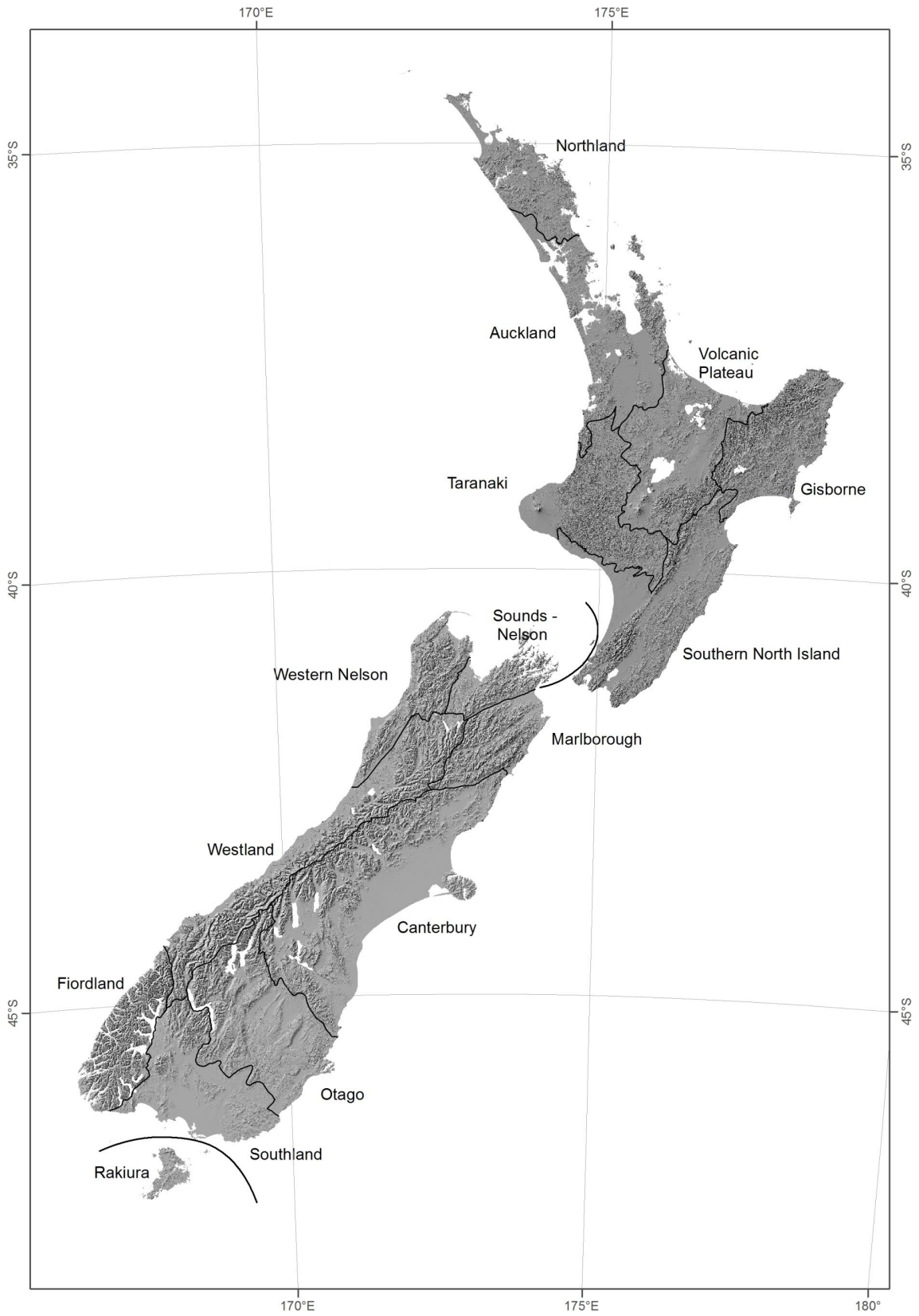
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Map 1: Map of New Zealand and offshore islands showing Ecological Provinces



Map 2: Map of New Zealand showing Ecological Provinces

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