



FLORA OF NEW ZEALAND
FERNS AND LYCOPHYTES

MARATTIACEAE



P.J. BROWNSEY & L.R. PERRIE

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Cover image: *Ptisana salicina*, mature frond.

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Introduction

The family Marattiaceae is represented in New Zealand by just one genus, with one non-endemic species, confined to the northern part of the North Island. *Ptisana salicina* is characterised by very large fronds that grow from a basal rhizome, swellings at the bases of the laminae and pinnae, and sporangia that are fused into synangia. The species was once common in northern forests, and was cultivated by Māori as a food crop, but is now declining because of predation by wild pigs and habitat loss.

Marattiaceae Kaulf., Enum. Filic., 31 (1824) nom. cons.

Type taxon: *Marattia* Sw.

Terrestrial (NZ) or occasionally epiphytic (not NZ) ferns. Rhizomes usually erect, obscured by pairs of large stipules protecting the young croziers. Fronds monomorphic (NZ) or dimorphic (not NZ). Stipes and stipules often bearing conspicuous lenticels. Laminae undivided, palmately divided, or 1 to many times pinnately divided (2-pinnate in NZ), bearing hairs and scales. Pulvini present at base of lamina, bases of pinnae, and sometimes on the stipe. Veins free and generally undivided or once-forked (NZ), or reticulate (not NZ); false veins sometimes present between true veins (not NZ). Sori elongate along veins, close to lamina margin, superficial (NZ) or sunken into the lamina or stalked (not NZ), composed of two rows of sporangia either side of the vein (NZ) or sporangia in a ring (not NZ), often surrounded by a ring of paraphyses, exindusiate. Sporangia thick-walled, free (not NZ) or fused into synangia (NZ), lacking an annulus and dehiscing by a slit (NZ) or pore (not NZ), maturing ± simultaneously, with 1000s of spores per sporangium. Homosporous; spores monolete (NZ) or trilete (not NZ), granulate or verrucate (NZ) or spiny (not NZ), lacking chlorophyll.

Taxonomy: A family of six genera and c. 60 species. The treatment here follows the revision of Marattiaceae by Murdock (2008a) which, in turn, was based on current understanding of the phylogeny of marattioid ferns (Murdock 2008b).

Murdock's investigation recognised that *Marattia*, as traditionally defined, was paraphyletic. He split the genus into three morphologically distinct and monophyletic genera: *Marattia sens. str.*, restricted to the Neotropics and Hawai'i; *Eupodium*, in the Neotropics; and *Ptisana*, widely distributed in the Palaeotropics from Ascension Island to the Marquesas Islands, extending south to New Zealand.

Species delimitation varies widely in the family, especially in *Danaea* and *Angiopteris*. Numbers vary between 17 and c. 60 in *Danaea* and anything from one polymorphic species to over 200 poorly defined species in *Angiopteris* (Murdock 2008a). Considerable species-level revision remains to be done in a family that potentially includes many threatened and highly restricted endemic species.

The family name Marattiaceae Kaulf. includes the type of Danaeaceae C.Agardh, and since the latter is an earlier name it has priority over Marattiaceae (Murdock et al. 2006). Pichi Sermolli (1970) suggested that the even earlier name, Marattiaceae Berchtold & Presl (1820), published as "Marattiae", constituted valid publication of the family name. However, a change to the rules of botanical nomenclature in the Vienna Code of 2006 (Art. 18.2, Note 1, Ex. 4) specifically states that "names published at the rank of order ("řad") by Berchtold & Presl (1820) are not to be treated as having been published at the rank of family, since the term family ("řeled") was sometimes used to denote a rank below the rank of order". Since the name Marattiaceae becomes a synonym when that family is defined to include Danaeaceae, Marattiaceae Kaulf. has now been conserved against Danaeaceae C.Agardh.

Distribution: Throughout the tropics and subtropics with three species extending into southern temperate regions (Murdock 2008a). One genus and species in New Zealand; none endemic.

Biostatus: Indigenous (Non-endemic).

Table 1: Number of species in New Zealand within *Marattiaceae* Kaulf.

Category	Number
Indigenous (Non-endemic)	1
Total	1

Recognition: The Marattiaceae comprises terrestrial ferns characterised by large starchy stipules at the base of the stipe, pulvini on the fronds, sporangia in a double row or ring, or fused laterally into synangia, each opening by a longitudinal slit or pore, and a base chromosome number of 39 or 40.

***Ptisana* Murdock, Taxon 57: 744 (2008)**

Type taxon: *Ptisana salicina* (Sm.) Murdock

Etymology: From the Latin *ptisana* (pearl barley), a reference to the form of the synangium which is reminiscent of pearl barley.

Terrestrial ferns. Rhizomes short, erect. Fronds monomorphic. Stipes bearing non-clathrate, fimbriate scales. Laminae 2–4-pinnate, catadromous, bearing hairs and scales. Terminal segments on primary pinnae usually with a prominent suture at the point of attachment; margins of ultimate segments usually toothed. Pulvini absent from stipes, present at the base of pinnae and, obscurely, the ultimate segments. Veins free and undivided or 1-forked; false veins absent between true veins. Sori

superficial, marginal to medial, surrounded by nest-like rings of paraphyses, composed of two opposing rows of sporangia either side of vein, each fully fused into a synangium. Synangia sessile, not sulcate along the septa between the sporangia when mature, deeply cut when open with no central pad of tissue. Sporangia each dehiscing via a vertical slit, the apertures lacking labia or slightly labiate. Spores monolete, bilaterally symmetrical, granulate or verrucate.

Taxonomy: A genus of about 20 species. Murdock (2008a) split *Marattia sens. lat.* into three monophyletic genera: *Eupodium*, *Marattia sens. str.* and *Ptisana*. The first two genera are confined to the Neotropics and Hawai'i whereas *Ptisana* occurs widely in the Old World. *Eupodium* is morphologically distinguished by its prominently stalked synangia, presence of awns along the veins on the adaxial surface of the pinnae, and its habit of producing only one or two fronds at a time. *Ptisana* is characterised by having the terminal segment on each primary pinna with a distinct suture at the point of attachment, lack of false veins, synangia that are not sulcate along the septa between the sporangia, and sporangial apertures that are not or only slightly labiate. *Marattia* lacks a suture on the terminal pinna, sometimes has false veins and has sulcate synangia and labiate sporangial apertures.

Distribution: About 20 species widely distributed in the Palaeotropics, with one on Ascension Island, one in southern Africa and the Indian Ocean, 12 in Malesia extending north to Vietnam, and six in the Pacific from eastern Australia to Micronesia and the Marquesas Islands.

Biostatus: Indigenous (Non-endemic).

Table 2: Number of species in New Zealand within *Ptisana* Murdock

Category	Number
Indigenous (Non-endemic)	1
Total	1

Cytology: $n = 39, 78$ (Murdock 2008a). A base number of $x = 40$ is recorded for *Danaea*, *Christensenia*, *Marattia* and *Angiopteris* (Camus 1990). No chromosome number has been reported for *Eupodium*, and further investigation is required to determine whether $x = 39$ is a synapomorphy for *Ptisana*.

***Ptisana salicina* (Sm.) Murdock, Taxon 57: 746 (2008)**

≡ *Marattia salicina* Sm. in Rees, *Cycl.*, 22 (1812)

Holotype: Norfolk Island (erroneously labelled "New South Wales"), *Molesworth s.n.*, K (*n.v.*); (isotype: LINN-HS 1644-3!)

Etymology: From the Latin *salicinus* (resembling willow, *Salix*), a reference to the shape of the pinnae.

Vernacular names: horseshoe fern; king fern; para

Rhizomes short, erect, forming a hard mass, with pairs of large ear-like lobes protecting new fronds. Fronds 2000–2800 mm long (up to 4000 mm in cultivation). Stipes 1000–1500 mm long, 30–40 mm in diameter at base above swollen junction with rhizome, not winged, green, smooth except for abundant, very narrowly ovate, fimbriate, non-clathrate scales up to 15 mm long, 1.5 mm wide. Laminae 2-pinnate, ovate, 1100–1400 mm long (up to 3000 mm in cultivation), 1100–1500 mm wide (up to 2000 mm in cultivation), dark glossy green on upper surfaces, paler on lower surfaces, coriaceous; scales abundant on abaxial surface of rachis, pinna midribs and costae, narrowly ovate to linear, pale brown, fimbriate. Primary pinnae in 6–11 pairs, oblong, the longest 385–650 mm long, 155–330 mm wide, stalked; pulvini present at the junction with rachis. Secondary pinnae in 13–24 pairs, narrowly oblong or narrowly ovate, the longest 95–185 mm long (205 mm in cultivation), 13–23 mm wide, shortly stalked; apex attenuate to acuminate; margins serrate or serrulate; base unequal, cuneate to truncate; pulvini present but obscure at the junction with pinna midrib. Veins free, undivided or occasionally 1-branched. Synangia oblong with rounded ends, 1.5–3.5 mm long, on veins just inside the pinna margin, comprising 2 rows of 5–14 fused sporangia; paraphyses present as very narrow, hair-like scales surrounding the synangia.

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

Altitudinal range: 0–400 m.

Confined to coastal and lowland regions of the North Island, extending locally to mid-elevations in the Kaimai Ranges and Mt Pirongia. The species is found throughout Northland and Auckland, the Bay of Plenty as far east as Waihou Bay and the Waioeka Gorge, and in Taranaki south to the Kaitake Range, Egmont National Park.

Collections in MPN, NZFRI, and WELT from south of Taranaki (e.g. Kapiti, Wellington, Marlborough Sounds, Palmerston North areas) are likely to have been from cultivated plants.

Also Norfolk Island, New Caledonia, Cook Islands, Austral Islands, Society Islands, Marquesas Islands. Murdock (2008a) suggested that the species may also be present in the Eungella Range of Queensland, Australia.

Biostatus: Indigenous (Non-endemic).

The species was given a conservation status of declining by de Lange et al. (2013). It was once common in northern New Zealand, but is palatable to stock and has been decimated by pigs.

Habitat: Occurs in kauri, podocarp and broadleaved forest, often in deep, shaded gullies or on the banks of streams and creeks, especially where it is secure from stock and pigs.

Recognition: This species is easily recognised by its very large fronds growing from a low, compact rhizome. The laminae are always bipinnate, with swellings (pulvini) at the junctions of the primary pinnae and rachis. The sporangia are characteristically fused into synangia and open by lengthwise slits, unlike any other fern in New Zealand. In dry conditions, water is lost preferentially from the pulvini causing the pinnae to droop vertically in dramatic fashion.

Ptisana salicina has been confused with *P. oreades* (Domin) Murdock, which is endemic to eastern Queensland and readily distinguished by a prickly stipe. It is also closely related to *P. smithii* (Mett. ex Kuhn) Murdock from Vanuatu, Fiji, Samoa and Tonga, which generally has more deeply serrate pinnules, especially in juvenile fronds, and synangia that are 2–4 mm from the margin. *P. howeana* (W.R.B.Oliv.) Murdock, endemic to Lord Howe Island, has longer synangia with 15–22 pairs of sori, and secondary pinnae that are glabrous on the underside (Green 1994).

Cytology: n = 39 (Brownlie 1961).

Notes: *Ptisana salicina* was previously thought to be confined to New Zealand and Norfolk Island (Green 1994; Brownsey & Smith-Dodsworth 2000). However, Murdock (2008a) reduced *Marattia stokesii* E.D.Br., *M. cincta* Copel. and *M. grantii* Copel. to synonymy and extended the distribution of *P. salicina* to include New Caledonia, the Cook Islands and French Polynesia. However, he conceded that it “likely encompasses several distinct taxa”. New Zealand plants were widely misidentified in earlier literature as *Marattia fraxinea* Sm., but that species is now believed to be confined to Africa, Madagascar, the Indian Ocean and India (Murdock 2008a).

Ptisana salicina, or para, was cultivated by Māori, and the large stipules on the rhizome were considered a delicacy (Crowe 1981).

The species is cultivated in many botanic gardens in New Zealand where it frequently grows much larger than any known plants in the wild.

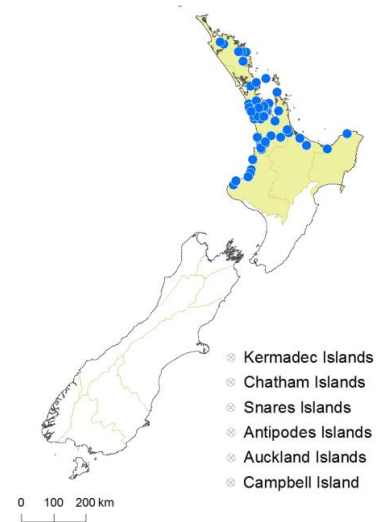


Fig. 1: *Ptisana salicina* distribution map based on databased records at AK, CHR, NZFRI, WAIK and WELT.



Fig. 2: *Ptisana salicina*: mature frond.



Fig. 3: *Ptisana salicina*: juvenile frond.



Fig. 4: *Ptisana salicina*: rhizome and scaly, swollen bases of stipes protected by ear-like lobes.



Fig. 5: *Ptisana salicina*: underside of secondary pinnae showing free venation, pulvini at junctions with pinna midrib, and sporangia fused into synangia and opening by longitudinal slits.

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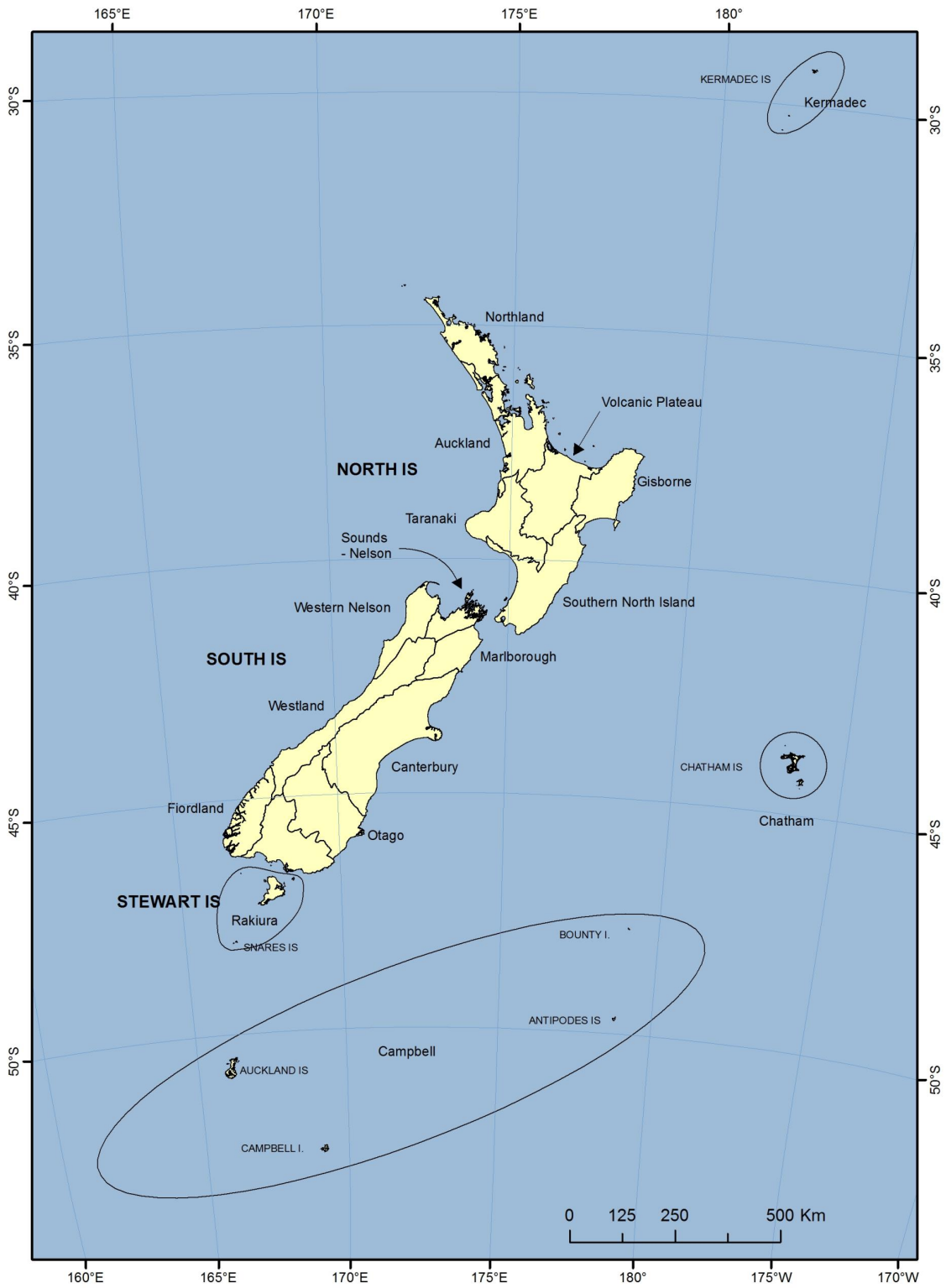
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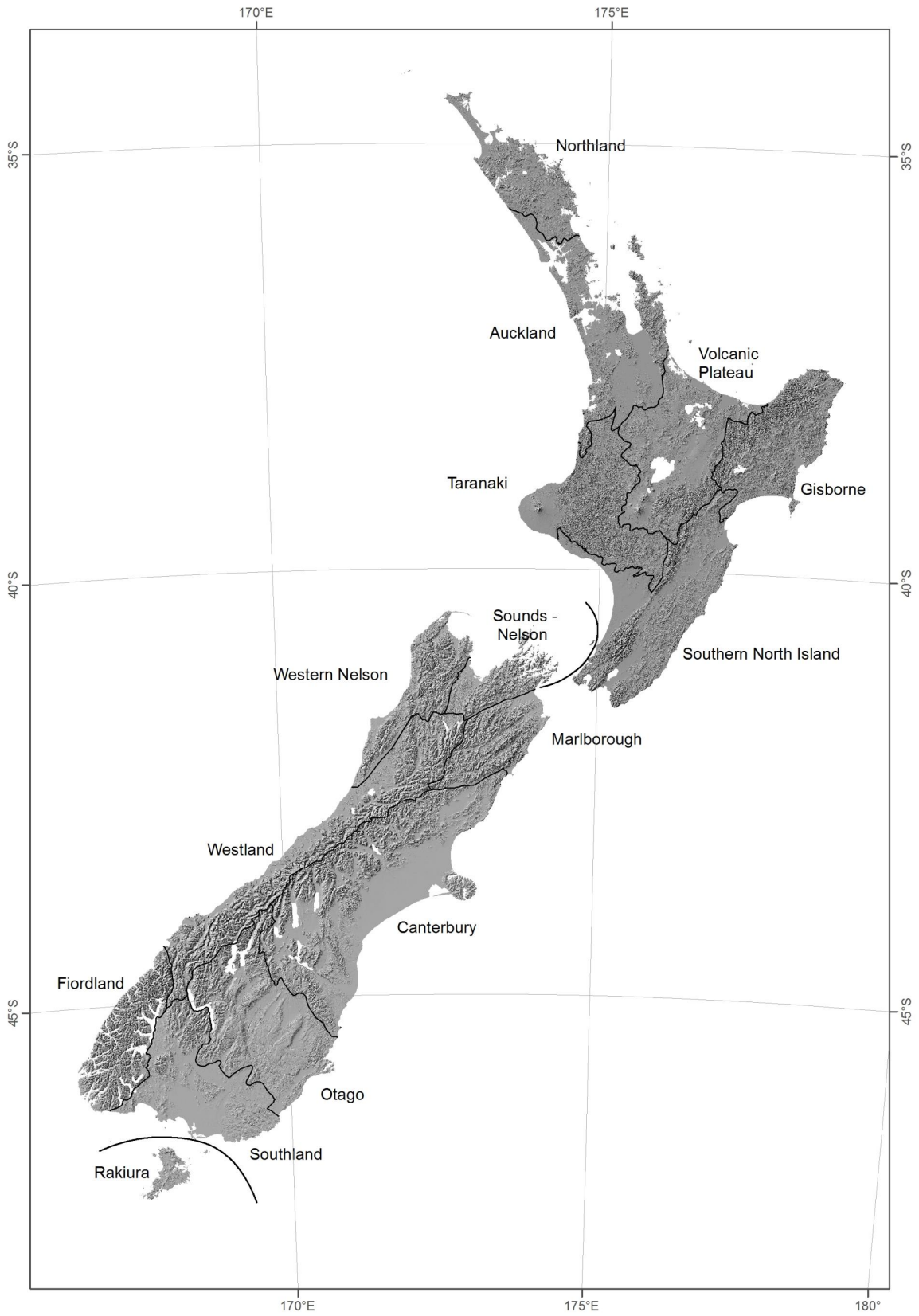
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Map 1: Map of New Zealand and offshore islands showing Ecological Provinces



Map 2: Map of New Zealand showing Ecological Provinces

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

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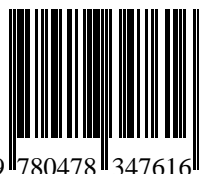
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