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PARAHAKI BUSH, WHANGAREI

# **NEW ZEALAND FERNS**

by

### H. B. DOBBIE

PHOTOGRAPHS BY F. W. BIRCH

(Second Edition, Revised and Greatly Enlarged)

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## New Zealand Ferns

TRIBUTE to the ferns of New Zealand in the form of a popular illustrated description may not come amiss during the Great War, that titanic conflict in which our soldiers have borne the National Emblem with honour round the world. The enemies of the British Empire have been taught to fear, the Allies to respect, the down-trodden peoples to hail as deliverers, those vigorous young battalions bearing as their badge the fern-leaf of New Zealand.

There can have been no hesitation in choosing the fern as the national plant; it is questionable if ferns formed so large a proportion of the vegetation in any other country as they did in New Zealand before the advent of the white man. Even now there are thousands upon thousands of acres monopolised by the bracken; groves upon groves of tree-ferns in the sequestered glades of our forests, on river banks and hillsides; mile upon mile of roads, and gullies innumerable bordered with the palm-like fronds of *Lomaria*; millions of tree trunks decked and festooned from root to summit with the most beautiful forms imaginable; square miles of the moist Westland forests carpeted with the translucent cups of the kidney fern. It is the same story from one end of the Dominion to the other-ferns everywhere; on surf-beaten rocks, rolling downs, swamps, hungry clay land that will hardly support a blade of grass, shady forests where they revel in the greatest luxuriance, mountain tops up to the snow line, upon lava flows-even the black cinder slopes of Rangitoto.

To a newcomer the variety and abundance of the ferns is simply bewildering. Noble tree-ferns raising their feathered tops high above the bushes until a hillside when viewed from a distance appears to be clothed with nothing else. Tree trunks adorned with pellucid fronds that give an indescribable luxuriance to the scene; drooping species of Asplenium hanging from the forks of great trees; broad glistening leaves that brighten the gloom of a shady dell; fronds of pure tender green rising from the ground in graceful curves to the height of a man; the sides and summits of grey weather-beaten rocks made beautiful with masses of shining Polypod*ium*; acre upon acre of the sweet-scented *Pteris*; banks of trembling maidenhair. Their beauties are endless. One could fill a volume and still not describe a tithe of Nature's prodigality.

#### SPECIES

The study of botany as a science is comparatively modern, dating, practically from the time of Linnaeus, who introduced his initial reform in the year 1736. He was the first to attempt a classification of the ferns, of which he enumerated 190 species, using as a guide to his genera the outward appearances of the plants, a plan which naturally led to some confusion. Dr. Swartz, in 1806, increased the number of species to 700, Sprengel to 1,309 in 1836, and Sir William Hooker to 2,400 in 1846. At the present day there are not less than 3,500.

If Linnaeus got into difficulties with the classification of 190 species, the attempt to classify 3,500 on the same system would have ended in chaos. Some more reliable guide than the shape of the plant had to be discovered. It was found in the seeds and their receptacles and in their position on the veins. Hooker and Baker's "Synopsis Filicum" divided the species into 75 genera, 31 of which are represented in New Zealand. But even the present system is not quite perfect, as can be shown by the genus *Polypodium*—many footed, in allusion to the number of rootlets by which some of the species hold on to the rocks and trees up which they climb. The seeds of the common *Polypody* of Europe are placed on the back of the frond in roundish masses without any protective covering—indusium, as the botanists call it. Therefore all ferns bearing such seeds are classed as *Polypodium*, though a large number of them have but a single tufted root, and do not climb. Consequently it must be borne in mind that the name *Polypodium* does not necessarily imply a many-footed plant, but one that bears naked, roundish seeds.

Mr. John Smith, for many years curator of Kew Gardens, suggested a system based on the growth of ferns, but he found few followers, and Hooker's system is the one generally adopted in the British Empire and America.

Before the advent of Darwin's theory of the "Origin of Species," most botanists believed that each species was a separate creation and immutable, entitled therefore, to a separate name. This led to frequent misunderstandings about the intermediate forms that connect some of the species with each other, a difficulty which Darwin's theory explains, though it does not make the classification any easier. To be told that plants are always producing varieties, and that if any of these are profitable to the plant, that one will have a better chance of surviving, seems to make a hard and fast division only more difficult.

To take a concrete example. *Pellaea falcata* and *P. rotundifolia* are to be found near Auckland, growing together in the same locality, though *rotundifolia* is far the more abundant plant. Typical specimens of the two are very different from each other, yet there are a number of gradations which connect them. Which is the original type? One might say *falcata*, it is being left behind and slowly exterminated in the struggle for existence by the more prolific *rotundifolia*, which also explains its rarity. Yet, how do we know that *falcata* is not the new type, which in course of time will swamp the other? Or the original form may be midway between the two.

To paraphrase Darwin, we are so profoundly ignorant of the plants living round us, that no one can tell why one species spreads and is numerous, and another has a narrow range and is rare.

Take that most puzzling genus Asplenium. One could not have more divergent-looking species than *A. bulbiferum* and *A. flaccidum*; the one terrestrial, viviparous, with a broad succulent frond; the other epiphytic, generally non-viviparous, with narrow tough fronds. Yet they are connected with each other by a series of intermediate forms.

One is forced to Darwin's conclusion that the term species is arbitrarily given for the sake of convenience. The manner of bearing seeds in *Asplenium* gives us a convenient and easily-recognised guide to a large group of ferns. The collector must not expect every rarity he finds to be a new species or even a new variety; it may be only one of the puzzling connecting links.

No doubt locality has something to do with the divergent forms. I remember spending a day on the Moro-tiri Islands; the leaves of all the trees had a slightly different appearance from those on the mainland. There seems a probability that *Asplenium lucidum* and *A. obtusatum* —the roots of one luxuriating in the rich vegetable mould of the shady forest, the other existing precariously on storm-beaten cliffs near the sea—are really the same species growing in different environments, though it is not likely that they could be brought together again. The stunted, dwarfed *obtusatum* must have existed in its present habitat for such countless ages that it would possibly take as long a period to re-develop and re-expand its growth to the extent of *A. lucidum*.

Botanists, who are by no means at one on the question of species, may be divided into two camps—what might be called Liberals and Conservatives—those who would increase the number of genera and species, and those who would reduce them. Until the advent of Hooker the Liberals held the field; the number of varieties recorded was appalling. In his "British Ferns," Thos. Moore describes 44 species and no less than 462 *varieties*! Since the publication of his book in 1875 the pendulum has swung the other way—botanists have become more conservative.

No doubt a man of world-wide experience like Dr. Hooker; who had access to the great British herbarium at Kew numbering 50,000 specimens, would be inclined to lump together a number of examples from different countries; whereas the local collector, from his narrower outlook, would separate them.

I am inclined to think some of the New Zealand botanists err on the conservative side. Bearing in mind Darwin's conclusion that the term species is arbitrarily given for the sake of convenience, not because all fulfil the character implied by the name, a genus of ferns has been given the name of *Polypodium*, though a large number of them are not many-footed.

Some argue that if two species are connected by a series of intermediates they should be classed as one and the same species. That is to say, they should be differently treated from two other species where the intermediates have disappeared. This seems to be harking back to the original creation theory. What we require is a convenient division of the genus into certain easily recognised groups.

Pteris macilenta, Var. pendula, and P. comans have a strong family likeness to one another, but are sufficiently distinct to be easily recognised; to class them as one species would lead only to confusion. Indeed, a further division of P. macilenta might be of advantage to collectors. The two specimens illustrated on pages 173 and 175 have well-marked and very constant features, which they maintain even when growing side by side under cultivation. In the same way, I believe, as the numbers of observers increase and ferns are more carefully studied, the time will come when some of the stepping stones between the species of Asplenium will be classed as distinct varieties, if not species. The variation of species must be an extremely slow operation in nature. If the plants on a certain area have been striving for a "better place in the sun" for millions and millions of years, every conceivable form of variation must have been exhausted many times over. It is only when something extraordinary happens to upset the balance of Nature that the change is visible to the human eye; for example, the introduction of the furze bush into New Zealand.

The other day I was exploring one of the few wild places near Auckland. Every step over the rough scoria rocks brought before my eyes some fresh beauty—a pile of hoary slabs grey with lichen, decked with the radiating fronds of *Pellaea rotundifolia*, the chinks giving shelter to tender sprays of *Asplenium flabellifolium*; bunches of Astelia beneath which peeped handsome fronds of *Asplenium falcatum*; an aged ngaio tree renewing its youthful appearance with a gay cloak of *Polypodium serpens*; miniature forests of *Cheilanthes Sieberi*, their trim fronds as straight as pine trees.

Then I encountered a thicket of furze pushing its way ruthlessly over everything, choking and smothering each native plant that came in its path. Climbing a wall to gain the road, I entered a land of desolation—black earth, black rocks, black furze stumps; not a sign of the delicate trailing ferns, the climbing *polypodium*, the grey lichen; not a green blade to be seen! This was a visible change with a vengeance; the beautiful native flora utterly killed by the prickly alien, which would come up all the thicker for having been burnt—a veritable Hun in Arcadia!

To lighten this gloomy picture of the march of "progress" (?) I will give an example of retrocession. In 1878 I was stationed at Picton. The sweet-smelling musk from some garden had run wild over a large area of swamp land skirted by the railway line. Not only was the surface of the swamp yellow with flowers, but the scent was quite noticeable on the train as one went by. Twenty years later I was again in Picton. Remembering my former experience, I looked out for the musk it was gone! Only after a careful search along the edge of the swamp did I find a solitary plant—and there had formerly been hundreds of acres!

#### NOMENCLATURE

Several attempts have been made to find popular names for the New Zealand ferns. Mr. T. W. Potts went into the question whole-heartedly. No matter how uncouth or crabbed the scientific names, he roped them all in. *Gleicheuia* became "Tangle-fern"; *Aspleuium flaccidum*, "Hanging-tree Spleenwort" (I prefer Miss Pules' "Feeble Spleenwort"); *Nephrodium hispidum*, "Hairy Boss-fern"; *Nothochlaena distans*, "Woollycloak Fern" (one of the best); *Schizaea fistulosa*, "Slender Comb-fern"; *Lygodium articulatum*, "Climbingstring Fern"; *Loxsoma* seems to have floored him; he could do nothing better than "Loxsoma-fern." The quaintest I keep to the last, *Adiantum hispidulum*, "Hairy Maidenhair" (the inclination to drop the last syllable is irresistible).

Mr. H. C. Field also tried his hand, but with more restraint. *Adiantum formosum*, "Plumed Maidenhair"; *Adiantum acthiopicum*, "African Maidenhair" (I fancy it will always be called "The True Maidenhair"); *Pteris trenula*, "Scented Fern" (surely this is more applicable to *P. scaberula?*). When he calls *Nephrodium velutinum*, one of our most beautiful species, "Dirty-fern," it makes my gorge rise.

With names, as with species, I fancy it will be a case of the survival of the fittest. If Mr. Potts' "Woollycloak Fern," Miss Pules' "Feeble Spleenwort," and Mr. Field's "Plumed Maidenhair" survive, they have each done something to be proud of.

Four of the Maori names—the natives distinguished only a few of the species—may persist. *Cyathea medullaris*, "Mamaku or Korau"; *Cyathea dealbata*, "Ponga"; Marattia fraxinea, "Para" (pronounced short); Lygodium articulatum, "Mange-mange." Some of the popular names have come to stay. Trichomanes reniforme, "Kidney-fern"; Cyathea medullaris "Black Tree-fern"; Cyathea dealbata, "Silver King"; Adiantum aethiopicum, "Maidenhair"; Gleichenia Cunninghamii, "Umbrella-fern"; Todea Superba, "Prince of Wales Feathers"; Marattia fraxinea, "King-fern."

When all is said, a name is not of vital importance, but it is as easy to select a good one as a bad one, a truth which the great European botanists do not seem to have realised. There is something revolting in calling such a dainty creation as a fern, a plant that cannot endure the least foulness of soil, air, or water, by such a name as "pustulatum" (covered with pustules); that its obvious perfections should be overlooked in favour of so repulsive a comparison.

One does not expect much imagination in a German botanist; but Dr. Swartz might have managed something better, when naming one of the noblest families of tree-ferns in the world, than an allusion to a microscopic peculiarity of the seed vessels; a more dignified title for the "Silver King" tree-fern than "The white fern with a cup-shaped seed vessel"; something more inspiring for the monarch of the fern grove, a giant who towers to a height of 50ft., one of the loftiest in the world, than "The pithy fern with a cup-shaped seed vessel"; the imagination is not exalted by the mention of such a poor material as pith.

Why should the most beautiful fern in New Zealand be called "Herr Tode's superb"? to make a literal translation; it smacks too much of labelling a cask of lager beer. This is a name which may very well be altered.

No systematic plan has been followed in finding names for the 31 genera existing in New Zealand. Fourteen refer to the seeds, six are called after individuals, three from the frond, and one each from the habitat, medicinal properties, root, and stalk. In selecting the individuals for so distinguished an honour a cosmopolitan taste has been shown. Two were Scotchmen, two Germans, one Italian, and one Englishman—Mr. Doody, a London apothecary.

I understand that some of the names will be altered in the forthcoming revised edition of Mr. Cheeseman's Manual. But as it may be two or three years before this is out, I think it wiser not to attempt any alterations. This changing of names is a source of irritation to the public, who would prefer something fixed and immutable. They are only concerned in a designation by which they may know the fern; advertising the name of the finder does not interest the general public.

#### ARRANGEMENT OF THE BOOK

As a photographic picture of the plant itself will give a more accurate representation than the most laboured description, and in a fraction of the time. I have obtained an illustration of practically each known species and variety of fern in New Zealand, and have confined the description to those points beyond the power of a photograph to portray. First of all the characteristic feature of the plant is set down, so that the reader may at once grasp the clue. Then comes a short description of the size, colour, habitat, etc., generally taken from Mr. T. F. Cheeseman's Manual, which, for clearness of expression, terseness, and accuracy, leaves nothing to be desired. (Of course, Mr. Cheeseman is in no way responsible for my translation of botanical terms, or for additions and omissions). Then come observations on the growth, and other particulars that may interest the reader. The size of the picture from which the photograph was taken is noted at the top of each illustration.

I have followed the order and classification of Mr. Cheeseman's Manual, entering as authentic only the species and varieties therein contained. In the illustrations I have endeavoured to follow his example by keeping to medium-sized specimens. Had I attempted to portray curiosities, abnormal, bifurcated, or crested forms there would have been no end to the illustrations.

Some species and varieties of ferns that have been announced in the "Transactions of the New Zealand Institute" since the publication of Mr. Cheeseman's Manual, and others that appear to be worthy of note, I have recorded and illustrated.

The colour of ferns varies according to age and locality, the young fronds being of a much lighter fresher green than the mature ones. Exposure to the sun imparts a yellow or golden green, sometimes a reddish brown. The green of the mature leaves differs less when placed side by side on a table than one would expect from their appearance in the bush. In the tree ferns there is a great similarity; *Dicksonia squarrosa*, *D. lanata*, and *Cyathca dealbata* being of almost exactly the same shade. When held up to the light, *D. squarrosa* looks a little darker.

As most of my study and collecting of ferns has been in the Auckland Province, and my fernery is situated there, my experiences apply more especially to that part of the Dominion.

The plates illustrating the manner in which the seeds are carried, both in Mr. Field's book and the one I had published in 1880, were copied from Hooker and Baker's "Synopsis Filicum." In this edition I have adopted a more direct method. It occurred to me that an enlarged photograph of the actual leaf bearing the seeds would give a more faithful picture, and one more easily recognised. Thanks to the untiring skill and enthusiasm of Mr. F. W. Birch and the initial help of Mr. S. G. Frith and Mr. F. G. Radcliffe, I have succeeded beyond myexpectations. Hooker's plates are of little value to a New Zealand student; they give sketches of species usually unrepresented in this country.

The work of an artist, however proficient, cannot be so exact as a photograph, and, as most of my illustrations have been taken from green specimens, there has been none of that distortion which sometimes occurs in specimens that have been dried—see the illustration of *Loxsoma* in the "Synopsis Filicum." The photographs in this work are all of New Zealand species, no pains having been spared to obtain typical specimens. The student, with a little application, should be able torecognise all the herbaceous ferns. The tree-ferns differ so much in size and general appearance that the written description should be sufficient guide.

This has no pretension to being a scientific work. The language is what I hope the average reader will understand. I have been tempted to use the botanical term "sori" when alluding to the fructification of the ferns, but, in a popular work, the arguments in favour of the older word "seeds" seem to me to be unanswerable. As defined in modern popular dictionaries it is exactly applicable—"That part of a plant which contains the rudiment or embryo of the future plant." Nine hundred and ninety-nine people out of a thousand do not know the meaning of "sori"—the botanist possibly being the solitary exception—but they understand what is meant by "seeds." This is a popular work, written for the nine hundred and ninety-nine majority. To quote J. H. Fabre in his "Life of a Grasshopper," page 69, "Convinced as I am that barbarous terms are only a cumbersome impediment to science."

I have striven after accuracy, and have always tried to verify my facts; if mistakes have crept in, I can only crave forbearance. With the exception of the scientific names which are absolutely necessary, both for the sake of accuracy and because most of our ferns have no other —they are no more uncouth than those of many garden flowers—I have purposely avoided botanical scientific terms. This book is not a primer. I claim no special knowledge of the subject, only an intense love for the beautiful plants and a desire to encourage others in their study. As a boy I collected ferns in England; when, therefore, I landed in Auckland, after a long voyage in a sailing ship, I knew something about them. So eager was I to explore the New Zealand bush that I walked out to Waitakere—there was no railway in 1875—a few days after coming ashore. Scrambling over some fern hills, I entered a belt of tall manuka and emerged suddenly into a bush gully. Never shall I forget that first half hour; the sensation of beholding entirely new ferns in whichever direction I turned my eyes. As I had seen no work on the New Zealand ferns—not even a collection —they were just as great a find to me as to the first discoverer.

After a bewildered look all round, my attention was arrested by a handsome Lomaria (discolor), a spreading crown of broad leaves surrounding the central group of upright fronds; then, luxuriant plants of Asplenium (lucidum and bulbiferum) which I could measure by feet, not inches as in Cumberland; feathery fronds of a buckler fern (Nephrodium hispidum) carpeting the sward. Not until several minutes had elapsed did I raise my eyes to the trees—I had been trained to cast them down when looking for the lowly plants in England there were as many there as on the ground; drooping Aspleniums, climbing Lomarias and Polypodiums. But the filmy ferns! I had not the remotest conception that such plants existed; they fairly took away my breath; I seemed to be in fairyland.

There were six times as many species as I had ever seen growing in one locality in the Old Country. And the profusion! No painful search for perfect specimens, they were at my hand literally in hundreds. So vivid was the impression on my mind that I can recall the sensation as if it were vesterday instead of 43 years ago.

In these days of material striving, when a man's worth is measured by his credit balance at the bank, it is not out of place to make an attempt to inspire the rising generation with a love of the beautiful, the simple, the rare, as exemplified by our ferns. Something that is valued for itself alone, not for the reflected glory its possession gives the owner. The pride which a fern collector takes in showing a friend some rare specimen is not measured by its intrinsic value, but by the difficulty involved, the patience endured, his good luck in finding it. His first impulse after gathering and recording a prize is to get some for his friends.

There were several ferns that I had never collected, others of which my specimens were poor, or not typical. Only to mention my want to other fern collectors was to ensure their giving me of their best. My warmest thanks are especially due to Mr. T. F. Cheeseman, Mr. D. Petrie, Mr. H. B. Matthews, Messrs. Hunt and Davis, and Mr. H. Carse for serving me in this direction.

One word of warning, O trustful reader; when you see a species marked "abundant," do not be too sanguine. I have searched for some so described for 40 years, and never found them.

H. B. DOBBIE.

Auckland, 1916.

### A Few Notes on Cultivation

Generally speaking, ferns with tufted roots are more easily transplanted and grow better than those with creeping roots. The same rule is more or less true with regard to those growing in rich or poor soil, some of the latter being almost impossible to transplant. When both a creeping root and a preference for poor soil occur in one and the same plant, then you reach the extreme of intractibility—as instanced in *Lindsaya linearis* and *Gleichenia Cunninghamii*.

All the *Hymenophyllums*, *Trichomanes* and the two filmy *Todeas* grow best in a Wardian case.

For some years I tried in vain to establish a fernery in my garden; the plants would not thrive. Then the ferns themselves showed me where they wished to grow. Some four or five feet below the surface of the ground occurs a stratum of hard sand or tufa that can be cut into blocks with a sharp spade. With these I faced several terraces. The wet years of 1916 and 1917 induced an abundant crop of moss on the steeply sloping surface, to be followed by a luxuriant growth of ferns upon those which faced the south (the tiny seedlings appear about September and October). One wall, shaded by a young totara tree, was covered in a few months with a dense growth of graceful ferns.

As the southern aspect exposed them to cold winds, I built a protecting wall of the same porous material about 5ft. high. When this, in turn, began to grow moss and ferns, I kept the surface damp by making a shallow trough along the top and keeping it filled with water. The fernery now requires little attention beyond removing the young tree-ferns and the more robust species, which, if allowed to grow, would soon bring down the structure in ruins.

I have also had to wage war upon the slugs and snails, whose depredations were almost incredible. For months they devoured the young shoots of Asplenium, Cheilanthes, and Nothochlacna distans as fast as they appeared. My reliance on the ducks to keep the fernery clear of these pests was not warranted. I set about twenty slug traps—flat pieces of wood sprinkled with bran. Upon the first night I caught 340, and for six weeks averaged 50 a night; it was only after three months of unremitting attention that the nightly catch dropped below 20. But, meanwhile, the ferns were left alone, and grew apace. The traps should be set at sundown and examined at about 11 p.m., the early hours of the night being the slugs' feeding time. I have visited them at 3 a.m. with but little success. There is also a greygreen caterpillar that feeds upon the young fronds of Pteris tremula; it is very voracious.

The following is a list of those ferns which grew spontaneously on the damp sand-blocks in my garden, and three (102, 130, 133) on a young totara tree. At the top of the list I have placed the most prolific, and at the bottom those least so.

#### LIST OF SELF-SOWN FERNS AUCKLAND, 1915-18

- Pteris tremula. Hundreds of plants. (63)
- (67) Pteris incisa. Scores of plants.
- (31)Cyathea medullaris. The black tree-fern. Scores of plants.
- Pteris aquilina. The common bracken. Scores of plants. (61)(130) Polypodium serpens. Dozens of plants.
- (123) Polypodium pennigerum. More than a dozen plants.
- Doodia media. More than a dozen plants. (83)
- (30)Cyathea dealbata. Silver King tree-fern. Several plants. (76)Lomaria capensis. Several plants.
- (133) Polypodium Billardieri. Several plants.
- Pteris macilenta. Several plants. (65)
- (65)Pteris macilenta, Var. Saxitilis. Several plants.

- (108) Aspidium Richardi. Several plants.
- (102) Asplenium flaccidum. Three plants.(37) Dicksonia squarrosa. Tree-fern. Three plants.
- Pteris scaberula. Two plants. (62)
- (54) Hypolepis tenuifolia. Several plants.
- (117) Nephrodium hispidum. Two plants.(132) Polypodium pustulatum. One plant.
- (78) Lomaria filiformis. One plant.

## Table of Genera, Species, and Varieties

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species					134
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Reported from both Islands	. 106	18
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## Ferns Found Only in New Zealand

44 Species, 13 Varieties, 3 of which are doubtful

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### I. HYMENOPHYLLUM

HYMENOPHYLLUM (hymen, membrane; phyllon, leaf). "Filmy ferns." A genus of about 90 species, represented in New Zealand by 19 authentic species and two varieties. Found only in shady forests where the air is moist and still; mostly of small size, covering trees and rocks with lovely drooping fronds, through which the light glances, or with feathery mats of a tender translucent green. Seeds in little cup-shaped vessels on the margins of the leaflets.



#### H. RARUM

(1) H.rarum (rare—meaning thin). A small, delicate fern of a pale glistening green; pendulous from trees and rocks; of a broader pattern than the other small members of the genus.

Description.—Roots small, wiry, black. Fronds very variable, 1 to 4 inches long, but sometimes dwarfed to  $\frac{1}{2}$  in. or lengthened to 8 inches; narrow, rarely exceeding 1 inch in width; flaccid and quite smooth. thin, membranous, pale-green. Seeds large, near the summit of the frond.

From Mongonui and Kaitaia southwards, not uncommon. Sealevel to 3,000 feet.

This slender delicate species occurs in shady forests in both islands. It is difficult to cultivate, because the wiry roots creep under the bark and fibres of the trees upon which it grows; the best plan is to bring away some of the bark with the plant growing upon it.

Distributed widely in both hemispheres.

NOTE.-The popular terms "root" and "seeds" are used throughout, in place of the botanical terms "rhizome" and "sori."

#### Hymenophyllum

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TITIRANGI.

(2) *H. polyanthos* (many flowers—in connection with the seed vessels) *Var sanguinolentum* (reddish). "Piri-piri." A medium-sized species; fronds often curved; leaflets closely set, undulating, of a somewhat opaque olive-green.



Description.—Forming matted patches on the trunks or branches of trees, or on rotten logs. Root rather stout, creeping, usually bristly with reddish-brown hairs. Stalks stout, narrowly winged above. Fronds 2 to 9 inches long by 1 to 3 inches broad, erect or curved, dull-green to olive-green. Seeds small, usually on upper portion of leaf. Midrib sinuous.

Abundant throughout the Dominion. Sea-level to 3,000 feet.

The crowded tilted leaflets give the frond a thick appearance. Sometimes it grows in extraordinary abundance, covering every trunk and branch with a lovely tapestry of transparent green. Its identity can be fixed with certainty in the course of drying for the herbarium as it stains the paper brown and gives off a peculiar scent, which hangs about the specimen for years.

It is found in almost all tropical countries, but apparently not in Australia.

#### Hymenophyllum

29 SIZE, 9<sup>1</sup>/<sub>2</sub>in. x 8<sup>1</sup>/<sub>2</sub>in.



(2) HYMENOPHYLLUM POLYANTHOS, VAR. SANGUINOLENTUM. TITIRANGI. A Large Specimen. Upper Side.

(3) *H. villosum* (bearing long hairs). A small mountain species, sometimes confused with H. polyanthos. The smaller size of the fronds, the hairiness of the stalks and midribs, the more finely-cut leaves, and the narrower final divisions—almost like threads—sufficiently distinguish it.

Description.—Root wiry, creeping. Stalks 1 to 3 inches long, hairy, ultimate leaflets crowded and very narrow. Fronds erect or curved, 2 to 6 inches long by 1 to  $1\frac{1}{2}$  inches broad, opaque, dull brownish-green.

Mountains, North Island. Hawke's Bay—Tukituki River, Ruahine Mountains. Wellington—Tararua Ranges. South Island: In sub-alpine forests not uncommon throughout. Stewart Island, Auckland Islands. Usually from 2,000 to 4,000 feet, but descends almost to sea-level in Westland.

It is confined to New Zealand.

#### Hymenophyllum

#### 31 SIZE, 6in. x 4in.



(4) *H. australe* (southern). Readily distinguished by the crinkled wing running both along the stalks and throughout the whole frond, which gives the species a wonderfully pellucid appearance; called "Javanicum" in the older works.



Description.—Roots creeping, branched, wiry. Stalks, midribs, indeed the whole frond, more or less winged throughout. Fronds erect or curved, very membranous, 3 to 9 inches long by  $1\frac{1}{2}$  to 4 inches broad; forming matted patches on rocks or among the moss on tree trunks; pale-green when young, becoming luridgreen with age. Seeds numerous, terminal on the leaflets.

Not uncommon in damp woods throughout the Dominion. Sealevel to 2,000 feet.

A beautiful soft-looking plant of an engaging appearance most attractive to the fern collector. Abundant on the west coast of Otago.

A fairly wide-spread plant.


KAIPARA.

(5) *H. atrovirens* (blackish-green). Smaller than *H. australe*, from which it differs chiefly in the narrower and more sparingly divided frond, and in the wings of the stalk and midrib being flat, not crinkled.

Description.—Usually terrestrial. Root slender, wiry, creeping. Stalks about half the length of the frond, winged almost to the base. Fronds few, somewhat rigidly erect, membranous, dull dark-green, 2 to 6 inches long by  $\frac{1}{2}$ in. to 1 inch broad. Seeds few, terminating the leaflets.

A rare fern. Auckland—Bay of Islands, Whangarei, Mamaku near Rotorua, Lake Waikaremoana. South Island: Wakatipu. Sea-level to 2,500 feet.

Apparently confined to New Zealand.

SIZE, 5in. x 3<sup>1</sup>/<sub>2</sub>in.

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WHANGAREI.

(6) *H. pulcherrimum* (most beautiful). A large and very distinct species; recognised by its great length of leaf in comparison with its width, the much finer and more open pattern, the smaller seeds, and the winged stalk.



Description.—Roots short, stout, densely covered with redbrown scales. Stalks 2 to 6 inches long, winged to the base, wings not crinkly. Fronds very handsome, pale-green, erect or pendulous, 9 to 30 inches long, including the stalk, by 2 to 6 inches broad. Seeds small, terminating the ultimate divisions.

North Island: Mountains of the interior, from Te Aroha and Lake Waikaremoana southwards. South Island: Rare and local in Nelson, Marlborough and Canterbury; abundant in Westland and Otago. Stewart Island. Sea-level to 3,000 feet.

This lovely fern is not difficult to grow under glass. It is confined to New Zealand.



TARANAKI.

(7) *H. dilatatum* (widened). Easily recognised by the large size of its leaves and the great width of the ultimate divisions. The broad pellucid fronds look like a superfine seaweed.



Description.—Root long, stout, wiry, smooth. Stalks 2 to 6 inches long, winged almost to the base, wings not crinkly. Fronds remarkably handsome, pale-green to deep-green, erect or pendulous, 9 to 30 inches long, including the stalk, by 3 to 6 inches broad. Seeds numerous, terminating the ultimate divisions.

Abundant in the woods throughout the Dominion. Sea-level to 3,000 feet.

A large and very handsome filmy fern, of a bright pellucid green, clothing the trunks and branches of trees and rotting stumps. I shall never forget my first sight of the glossy green leaves hanging in profuse luxuriance from the tree trunks. To one who had seen only the filmy ferns of England—an inch or two long—this was a positive giant. Even now, after 40 years in New Zealand, the glorious broad-leaved fronds fascinate me. Given conditions like its natural environment, it can be grown as easily as the other filmy ferns. Found also in several of the Polynesian Islands and Java.



(8) *H. demissum* (drooping). "Piri-piri." This species grows more stiffly and more upright than the other large members of the genus; it is also a good deal more finely cut than *H. dilatatum*, the final divisions of the leaf measuring only 1-20th inch in width. In lowland districts it is the most abundant of the species, often carpeting large areas of the forest floor.



Description.—Root long, wiry, creeping. Stalks 2 to 6 inches long, smooth, wiry, not winged. Fronds erect or curved, membranous, bright pale-green, 4 to 16 inches long, including the stalk, by 2 to 5 inches broad. Seeds small, very numerous, at the tips of the leaflets.

Abundant in woods throughout the Dominion. Sea-level to 3,000 feet.

When the sun shines on this beautiful fern after a shower, the light glances from its crowded seeds as from a hundred emeralds. Of the filmy ferns it is one of the easiest to grow under glass. In her "British Ferns" Miss Pules includes it in her list of the most attractive greenhouse ferns—"Pendant filmy fern. This is the New Zealand brother of our minute native hymenophyllum, and may be considered by them as a veritable giant, for the fronds exceed a foot in length!" What would she have said to *H. dilatatum*, which often attains a length of 2 feet 6 inches?

It is found also in Polynesia, Java, and the Philippine Islands.



WAIRARAPA.

(9) H. scabrum (rough). One of the largest and handsomest species of the genus; easily recognised by the reddish appearance given by a thick growth of hairs on stalk and midribs; usually hanging pendant from the tree trunks.



Description .- Root long, creeping, bristly with reddish-brown scales. Stalks 2 to 6 inches long, not winged. Fronds very variable in size, dark olive-green, or tinged with brown, erect or pendulous, 6 to 20 inches long by 2 to 5 inches broad, sometimes attaining a length of 30 inches. Seeds numerous, terminal. Moist forests from Mangonui and Hokianga southwards, not

uncommon. Sea-level to 3,000 feet.

A strikingly handsome fern; one that sorely tempts the collector by its production of unusually perfect specimens. It prefers a very damp situation, and under such conditions will grow readily under glass. Found only in New Zealand.

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KAIPARA.

#### NEW ZEALAND FERNS

(10) *H. flabellatum* (fan-like). So named from the shape of the leaflets, which, by an effort of the imagination, may be likened to fans. A pale-green pendulous fern, growing in patches on the trunks of trees.



Description.—Root long, wiry, creeping, more or less clothed with woolly brown hairs. Stalks slender, smooth, except for a tuft of silky hairs at the base. Fronds very variable in size and shape, usually 3 to 9 inches long, but sometimes reduced to less than an inch, at others attaining a length of 12 inches. The smaller specimens generally erect, the larger pendulous, pale shining-green or yellow-green. Seeds small, terminal.

Not uncommon throughout the Dominion. Sea-level to 2,500 feet.

Usually a small, delicate fern, seldom more than  $1\frac{1}{2}$  inch wide, though sometimes reaching a length of 12 inches. Like *H. rarum*, it is somewhat difficult to cultivate. Found also in Tasmania and South-eastern Australia, and reported from Sumatra and the Philippine Islands.

45 SIZE, 9in. x 6in.



(11) *H.rufescens* (reddish). A very curious little mountain fern, the stalks longer than the triangular leaves, the whole being covered with silky hairs that look like spun glass.

*Description.*—Root very slender, almost thread-like, creeping, clothed with soft spreading hairs. Stalks much longer than the leaf, 1 to 2 inches, hair-like. Fronds  $\frac{1}{2}$ in. to  $1\frac{1}{2}$  inches long by  $\frac{1}{2}$ in. to  $\frac{3}{4}$ in. broad at the base, more or less covered with long silky hairs.

North Island: Te Aroha, Ruahine Range, Mount Egmont. South Island: Nelson—Mount Arthur Plateau, Takaka Valley, Mount Rochefort; Westland; Stewart Island. 1,000 to 3,000 feet.

Nearest to H. flabellatum, some mountain forms of which approach it very closely, but are separated by the much longer hair-like stalks, the shorter, broader, more delicate fronds and the copious hairs. It often forms mats on the trunks of trees and the perpendicular faces of shaded rocks.

It is confined to New Zealand.

NOTE.—*H. ciliatum* is not included in this book, as it has been only once reported, and that 50 years ago.



(12) *H. subtilissimum* (very delicate). A mediumsized filmy fern, usually pendulous from the stems of tree-ferns or tree trunks; most readily distinguished by the curious colour—a dull green tinged with brown, given to the leaf by a dense clothing of silky hairs; if examined through a magnifying glass the surfaces have a rough, almost furry appearance.



Description.—Forming dense mats on the stems of tree-ferus, tree trunks, or the perpendicular faces of shaded rocks. Root long, slender, creeping, covered with red-brown hairs. Stalks narrow, not winged. Fronds 2 to 10 inches long by  $\frac{3}{4}$ in. to 2 inches broad, thin and membranous, dark-green to reddish-green, sometimes tawny, usually pendulous. Seeds numerous, small, terminal.

Not uncommon in damp forests from Mangonui southwards; rare and local on the East Coast of the South Island. Sea-level to 2,500 feet.

This graceful fern, which looks something like a small copy of H. scabrum, is also found on the island of Juan Fernandez and in Chili.



A Large Specimen. Upper Side.

TITIRANGI.

(13) *H. Malingii* (Mr. Maling). A most curious little mountain fern of an opaque, slate-green colour on the upper and reddish-brown on the under side. The fronds, when examined closely, appear to be built up of innumerable short pieces of brown cord, generally terminated by a knob. The leaflets are not flat, the cross-section being round.



*Description.*—Roots slender, creeping. Stalks 1 to 3 inches long, very slight, almost thread-like. Fronds 2 to 8 inches or even 20 inches long by  $\frac{1}{2}$ in. to  $1\frac{1}{2}$  inches broad, erect or pendulous, opaque, rigid, slate-green, covered densely everywhere with small hairs. Seeds small, terminating the leaflets like little knobs.

North Island: Te Aroha, Mount Egmont, Ruahine Mountains, Ruapehu. South Island: Mountains Nelson, Westland, Otago, Banks Peninsula.

A rare fern, found sparingly on the mountains of both islands, though fairly abundant in the Libocedrus forests near Waimarino; almost confined to the kawaka trees. Named after its first discoverer, Mr. Maling, a surveyor, who was killed at the Wairau massacre. It is confined to New Zealand.



(14) *H. Cheesemanii* (Mr. Cheeseman). A very minute fern, found among moss on the branches of trees or on perpendicular rocks. A glance at the illustration, which is life size, will show how easily it may be overlooked.

Description.—Root creeping, wiry. Stalks very short,  $\frac{1}{8}$ in. to  $\frac{1}{4}$ in., thread-like. Fronds very small,  $\frac{1}{4}$ in. to 1 inch long, simple or forked, dark-green, texture firm.

Found in a number of localities in both Islands. Sea-level to 3,500 feet.

This tiny species was first detected by Mr. Cheeseman at Titirangi on the tops of some trees that had been felled in road-making. It forms cushions on the branches of trees, or creeps among the moss and hepaticæ. It is confined to New Zealand.



(15) Var. Armstrongii. Precisely similar in size and habit to the foregoing, but firmer in texture and the margins thickened. Originally called *Trichomanes* Armstrongii.

(16) *H. minimum* (very small). A minute fern, forming matted patches on the trunks of trees and on rocks; even rarer than the last.

Description.—Roots creeping, thread-like, smooth,  $\frac{1}{2}$  in. to  $\frac{1}{2}$  in. long. Fronds very small,  $\frac{1}{4}$  in. to  $\frac{3}{4}$  in. long, firm, pale-green. Seeds never more than one in a frond.

A littoral plant. South Island: Tasman Bay; Westland—coast near Okarito; Otago—Resolution Island; East Coast. Stewart Island, not uncommon. Auckland Islands.

A very small species, never found far from the seacoast. Easily confounded with H. tunbridgense, from which it differs by the uniformly solitary and terminal seeds. It is confined to New Zealand.

(17) *H. tunbridgense* (from near Tunbridge). A small fern, with distinctly serrated margins, growing in thick masses on rocks and tree trunks where the shade is densest. May be mistaken for moss by the unobservant.



Description.—Root long, wiry, creeping. Stalks  $\frac{1}{2}$ in. to  $1\frac{1}{2}$  inches long, slender, wiry, naked. Fronds variable in size,  $\frac{1}{2}$ in. to 3 inches long by  $\frac{1}{2}$ in. to 1 inch broad, pale-green, membranous. Seeds usually near the midrib. Forming matted patches on rocks or the trunks of trees.

Abundant throughout the Dominion. Sea-level to 3,000 feet.



WHANGAREI.

I have often seen this little fern covering the trunks of tree-ferns from top to bottom with a feathery green mat. There is surely something more than coincidence in the fact of this delicate, fragile little plant holding its own all over the world, just as a minute weak-flying butterfly, a small species of "blue," is found everywhere, even in the Arctic regions.

(18) Var. cupressiforme (cypress-like). Fronds taller and narrower, more erect, I to 4 inches high, more open in texture.



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(19) *H. unilaterale* (one-sided). Very similar to *H. tunbridgense*, but the frond is usually taller, more rigid, more sparingly divided, and the leaflets are often one-sided.

Description.—Root long, creeping. Stalks  $\frac{1}{2}$ in. to  $1\frac{1}{2}$  inches long, slender, wiry, naked. Fronds 1 to 4 inches long by  $\frac{1}{2}$ in. to 1 inch broad, dark-green, rigidly membranous, margins serrated. Seeds near the midrib, as in *H. tunbridgense*.

From Te Aroha southwards, chiefly in mountain forests, somewhat scarce. Sea-level to 3,500 feet.

The geographical range of this species is nearly the same as that of *H. tunbridgense*, but it is a rarer plant.

NATURAL SIZE.



59

(20) *H. multifidum* (much cleft). A medium-sized filmy fern; the margins of the leaflets serrated like the two preceding species, but a much larger plant, finely cut, leaflets often overlapping.

Description.—Root creeping, wiry. Stalks 1 to 5 inches long, wiry, naked. Fronds variable in size, usually 4 to 8 inches high, including stalks, but sometimes dwarfed to 1 inch, and occasionally attaining 12 inches, erect, curved, or even pendulous, dark olive-green to light-green, membranous. Margins of the leaflets serrate. Seeds few, large, mostly in the upper part of the frond.

Abundant throughout the Dominion. Sea-level to 4,000 feet.

This delicately beautiful fern is found growing in patches on the ground when the leaflets are close and overlapping, or on the trunks and branches of trees when they are more open. It is also found in Fiji and other Pacific Islands.



(20) HYMENOPHYLLUM MULTIFIDUM. Large to Medium Specimen. Upper Side.

PICTON.

(21) *H. bivalve* (two-valved). A very graceful medium-sized fern, usually growing among moss on the ground, more rarely on trees. Allied to *H. multifidum*, but larger, less rigid, and of a paler green; usually with far more numerous seeds.



Description.—Roots stout, wiry, creeping; rootlets densely hairy. Stalks 2 to 5 inches long, wiry, smooth, not winged. Fronds, including stalks, usually from 6 to 9 inches high by 2 to 4 inches broad, but luxuriant specimens reach 12 to 14 inches, erect, curved, rather rigid, margins of leaflets serrate. Seeds usually numerous, enclosed in a two-valved vessel.

Hilly forests from Great Barrier and Cape Colville southwards to East Cape, somewhat scarce. South Island, Stewart Island, Chatham Island, not uncommon. Sea-level to 3,000 feet.

A very beautiful species, confined to New Zealand.



(21) HYMENOPHYLLUM BIVALVE. A Large Specimen. Upper Side.

PICTON.

# II. TRICHOMANES

TRICHOMANES (thrix, a hair; manos, soft). "Bristle ferns." A genus of about 90 species, with 7 in New Zealand. Small filmy ferns, differing from *Hymcnophyllum* by the presence of a hair, or short spike, proceeding from the trumpet-shaped seed vessel, except in *T. Lyallii*, which is intermediate between *Hymenophyllum* and *Trichomanes*.



T. VENOSUM

(22) *T.reniforme* (kidney-shaped). "Rau-renga," "Kidney-fern." Distinguished at once by its broad kidney-shaped fronds, quite entire and of a pellucid green.

Description.—Root stout, hard, wide-creeping; rootlets woolly. Stalks 2 to 8 inches long, erect, wiry, smooth. Fronds 2 to 4 inches broad, of the purest light-green when young, dark-green when old, glossy, undulating. Seeds very numerous in a fringe round the margin of the leaf.

Abundant in damp woods throughout the Dominion except the East Coast of the South Island, where it is rare and local. Sea-level to 3,000 feet.

# TRICHOMANES

SIZE, 6in. x 6in.



The most remarkable fern in New Zealand. In outward appearance the seeds resemble *Loxsoma* more than *Trichomanes*. Those who have been brought up in the land of the kidney-fern can hardly realise how unique is the form of the frond. I shall never forget my first sight of it. I could not believe it was a fern; none of the leaves happened to be unrolling. For half an hour I sat in doubt, deciding at last that perhaps it  $\alpha as$  a fern. Since then I have seen it hundreds of times, but it does not lose its glamour; there is still a return of that first thrill when I thought it *might* be a fern.



This species is found only in New Zealand; had it been known to the Old World the weavers of fairy tales would have transformed its dainty green chalice cushioned in moss into a cup for the wood-nymphs, or some such fanciful conceit. This gem of the vegetable kingdom is so plentiful that we are apt to lose sight of its rare beauty. One can hardly enter an undisturbed piece of bush without finding it clustered about the tree roots or upon decaying trunks. Recently, when searching for a seeded specimen wherewith to illustrate this book, I came across a sylvan arch, formed by a massive trunk bridging the space between two trees. From end to end it was robed with the clustering green cups. I might have taken a thousand specimens without marring Nature's masterpiece. It often surprises one in the most unlikely spots, such as the cinder slopes of Rangitoto, where it grows luxuriantly, notwithstanding the total absence of soil. It is not difficult to cultivate if conditions are suitable. For many years it has been a great favourite in the fern-houses of Europe. (23) **T.** Lyallii (Mr. Lyall). The daintiest, most delicate little fern, often broader than it is long, shaped like a fairy fan, sometimes covering with a feathery green mat the trunk of every tree and sapling within a radius of many yards.



Description.—Roots branched, creeping, hair-like. Stalks slender, thread-like, 1 to 2 inches long. Fronds  $\frac{1}{4}$ in. to  $1\frac{1}{2}$  inches long by  $\frac{3}{8}$ in. to  $1\frac{1}{2}$  inches broad, delicately membranous, nearly transparent, light-green. Seeds large for the size of the frond, at the tips of the leaflets, giving them the appearance of being cut off square.

Not uncommon from Kaipara southwards in dense moist forests, except on the East Coast of the South Island, where it is rare and local. Sea-level to 3,000 feet.

The species is intermediate between *Trichomanes* and *Hymenophyllum*, and was classed under the latter genus by Dr. Hooker in his great work on the ferns of the world. There is no bristle protruding from the seed. An exquisite little fern, found nowhere but in New Zealand.


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(24) *T. humile* (lowly). A modest little fern that hides its head in some retired shady nook, where the light is screened and the air still; easily recognised by the hairs which proceed from the trumpet-shaped seed vessel on each side of the midrib.



Description.—Roots slender, creeping, matted. Stalks slender,  $\frac{1}{4}$ in. to  $\frac{1}{2}$ in. long, winged almost to the base. Fronds 1 to 3 inches long by  $\frac{1}{4}$ in. to  $\frac{2}{3}$ in. broad, smooth, membranous, dark dull-green, pendulous. Seeds producing thread-like hairs, down the centre of the frond.

From the North Cape southwards not uncommon in dark woods. South Island: Nelson, Marlborough, Banks Peninsula. Sea-level to 2,000 feet.

I first gathered this tender little fern in the year 1880 at the bottom of Pohe-rua crater, Bay of Islands, at that time so choked with bushes and small trees as to produce the effect of a dim twilight down below. The whole of the ground—rocks, stones, and earth—was carpeted a shadowy-green; I could not set down my foot without crushing the humble little fronds.

It is also found in Java and the Pacific Islands.

## TRICHOMANES

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(25) *T. venosum* (veined). A curious, delicate little fern, generally growing pendulous from tree-ferns; the sinuous veins which show clearly in the illustration, are very remarkable, quite unlike those of any other species of filmy fern.



Description.—Root short, slender, wide-creeping. Stalks  $\frac{1}{2}$ in. to 2 inches long, very slender, hair-like. Fronds 1 to 4 inches long by  $\frac{3}{4}$ in. to  $1\frac{1}{4}$  inches broad, very delicate, translucent, shining, pale-green. Seeds irregular, but usually occurring down each side of the midrib.

Abundant throughout the Dominion. Sea-level to 3,500 feet.

Though not much larger than *T. Lyalli* and *T. humile*, this little fern succeeds in making itself far more conspicuous. Instead of hiding its charms in dark nooks and corners like *T. humile*, it prefers the open glade, flaunting its bright-green fronds in the checkered light that filters through the tree-ferns.

Found also in Australia and Tasmania.



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WAIKUMETE.

(26) T. Colensoi (Mr. Colenso). A somewhat rare fern, differing from T. humile in being more finely cut, the leaflets more branched and open, and the stalk running through the centre of the frond more hair-like, not winged.



Description.—Root branching, wide-creeping, hair-like. Stalks short, very slender. Fronds rather distant, 2 to 5 inches long by  $\frac{1}{2}$ in. to 1 inch broad. Seeds small, near the centre stalk, provided with long hair-like bristles.

North Island: Rotorua, Waikaremoana, Mount Egmont Ranges, Tararua Ranges. South Island: Nelson, Collingwood, Takaka Valley, West Wanganui, Banks Peninsula, Okarito, near Dunedin, Lake Wanaka. Sea-level to 3,000 feet.

This elegant little fern grows pendulous from rocks and trees. It is confined to New Zealand.



NELSON.

(27) T.strictum (narrow and upright). A stiff, upright little fern, hardly thin enough in the leaves to be called "filmy." The fronds, of a pale-green, grow in crowded tufts; a scarce fern.



*Description.*—Root very short, erect or inclined, not creeping, stout, woody. Stalks 2 to 4 inches long, stiff, erect with a tuft of reddish-brown bristles at the base. Fronds 3 to 6 inches by  $1\frac{1}{2}$  to  $2\frac{1}{2}$  inches, rigidly erect, yellowish-green. Seeds small, not very numerous, producing hair-like bristles.

North Island: Mangonui County to Wellington, somewhat rare. South Island: Nelson, Westland, Otago. Sea-level to 3,000 feet.

A handsome fern of a distinct appearance, rather difficult to cultivate; the only chance of success is to move some of the sod of earth in which it is growing without in any way disturbing the roots. It is confined to New Zealand.





THAMES.

(28) **T. elongatum** (lengthened). Easily recognised by the dark olive-green, the broad triangular shape of the frond, and the long bristles that sometimes cover the under surface so thickly as to give it a brown colour—a peculiarity that no doubt suggested the name.



*Description.*—Root short, stout, erect or inclined, not creeping. Stalks 3 to 9 inches long, stout, rigid, with a tuft of bristles at the base. Fronds somewhat scanty, 3 to 8 inches long by  $1\frac{1}{2}$  to 3 inches broad. dark olive-green, often coated on the upper surface with moss. Seeds numerous.

North Island: Abundant in dark woods north of East Cape; irom thence to Cook Strait rare and local. South Island: Nelson, Marlborough, Canterbury. Sea-level to 2,500 feet.

To find this fern it is necessary to go to the wettest and shadiest corner of a bush gully, such as the steep mossy bank by a waterfall. A difficult species to grow; in transplanting, care must be taken not to disturb the roots. Though closely allied to the wide-spread *T. rigidum*, it is found only in New Zealand.

## TRICHOMANES



## III. LOXSOMA

LOXSOMA (loxos, oblique; soma, a band). A genus of a single species, found only in the north of New Zealand. An exceedingly beautiful fern; the seeds projecting so far from the cup-shaped seed vessel as to be visible on the upper side of the frond.



L. CUNNINGHAMII

(29) L. Cunninghamii (Mr. Cunningham). A remarkably handsome fern, sometimes standing 4 feet from the ground. Recognised most readily by the beautiful contour of the fronds, the lovely contrast between the cinnamon-brown stalks and the deep-green leaves, the lighter shade or milky-white of the under surface, and the remarkable shape and position of the seeds.

Description.—Root long, stout, creeping, densely covered with red-brown hairs. Stalks 1 to 2 feet high, light-brown when mature, smooth, polished, sometimes partially fluted. Fronds 9 to 24 inches long by 6 to 12 inches broad, texture firm, green, lightgreen, often yellow-green above, light-green or milky-white below. Seeds conspicuous, inserted in the notches.

North Island: In woods from Kaitaia and Mangonui southwards to Te Aroha, somewhat scarce and local. Sea-level to 1,200 feet.

### Loxsoma

SIZE, 13in. x 93in.



WAITEMATA.

This is one of the rare ferns of the world; it represents a genus of but one species; by far the most interesting fern in New Zealand. This somewhat bald description gives a very inadequate notion of the unique position held by this remarkable plant. By way of illustration, it might be supposed that, of the Order Ranuculus, consisting of 30 genera, one, the clematis, was represented by a single species, found only in the north of New Zealand. That is to say, this beautiful family of climbers would be known to mankind only by this one species. In its way, *Loxsoma* is just as beautiful as Clematis, and it is known to the world only from this limited locality in the north of New Zealand.

I shall never forget finding it for the first time. I had not been many months in New Zealand, and my only source of information about the ferns was represented by an album of dried specimens, which did not contain Loxsoma, so that it struck me with all the novely of an original discovery. On a journey from the Northern Wairoa to Anckland, I, arrived at Helensville several hours before the train left for Riverhead. Being young and full of zeal, I determined to walk across, a distance of 15 miles, in the hope of getting something new for my collection. I found absolutely nothing until crossing a small creek close to my destination. I can claim but little skill or sagacity in finding it, for the Loxsoma actually hit me in the face before I noticed anything unusual. A single glance told me it was something new, an examination of the seeds that it was of a different genus from anv fern I had seen. I called it "The Riverhead Fern." Many months elapsed before I met with anyone who could tell me its name.

It is fairly easy to grow. The young stalks, of a pale tender green, rise from the ground, slowly uncurl until the first leaves appear, the whole frond maturing in due course. I know of no colour like that of the young frond (*Ptcris incisa* approaching it most nearly), a soft, ethereal pastel green, as if Nature had put in a little white

## Loxsoma

SIZE, 8in. x 12in.



KERI KERI.

and a little blue pigment when mixing the colours on her palette. As the leaf matures this soft virginal colour gives place to a darker green—a more weather-beaten shade. There is something free and bold about the contour of the leaf, so very distinctive that one can recognise the species from a single barren leaflet. The curious seeds protrude so far beyond the cup-shaped vessel in which they rest as to be plainly visible on the upper side of the leaf.

The botanist responsible for the naming of this rare fern does not seen to have been endowed with much imagination, for here, if anywhere, was room for its display. Does the name advertise its extreme rarity, the lovely colour, the elegant outline of the frond, or the very unusual shape of the seeds? Nothing of the sort; it is merely "Cunningham's fern with the oblique band," in allusion to a microscopic peculiarity of the seeds, and to the man who first recorded its discovery. With all due respect to the great botanist, the discovery of this fern was no very wonderful feat; it might have discovered itself by hitting him in the face, as was my case. Why should this remarkable fern be cumbered with a name suggesting so little of interest? It is no answer to say that a name is of no importance; not only is a good name as easy to invent as a bad one, but it is much easier to remember



# IV. CYATHEA

CYATHEA (cyathos, a cup). A genus of 120 species, with 4 in New Zealand. Large tree-ferns, their classification based on a microscopic difference in the seed vessel—a cup surrounding the base of the seeds.



C. DEALBATA

(30) *C. dealbata* (whitish). "Ponga," "Silver King." There is no mistaking this noble tree-fern; the pure white underside of the fronds must attract the notice of the veriest tyro.

Description.—Trunk 10 to 30 feet high, about 8 inches thick, stalks rather slender, clothed at the base with shining dark-brown scales, elsewhere covered with yellow-brown hairs that drop off as the frond becomes older. Fronds numerous, spreading horizontally, 6 to 12 feet long by 2 to 4 feet broad, green or yellow-green above, pure white below from a coating of deciduous powder. Seeds small, round, copious, contained in a cup-shaped vessel.

Abundant throughout the Dominion, perhaps the most generally distributed among the arborescent species. Sea-level to 2.000 feet.



(30) CYATHEA DEALBATA. A Medium Specimen. Under Side.

WAITEMATA.

The numbers of this handsome tree-fern are almost incredible; not only does one come across them in endless groves, but they are scattered everywhere among the vegetation, singly and in groups. The warm, nutbrown colour of the trunks makes a pleasing contrast to the surrounding greenery.

The "bunga" of the bushman, used for all manner of purposes—fences, verandah posts, even for making roads. It puts forth its principal growth in the spring, when every tree is crowned with a ring of light-brown crooks. Compared with *C. medullaris*, its growth is slow, and the feathery crown is more horizontal, not so curved. When growing from the side of a ravine, the stem often leans towards the stream, and then, with a graceful curve, regains the vertical. Although unusually abundant, this species is almost restricted to the Dominion, being reported with certainty only from Lord Howe Island.

(31) *C. medullaris* (pithy). "Korau," "Mamaku," "Black tree-fern." The tallest of the tree-ferns, the great spreading crown supported on a slender black stem. Monarch of the grove. The curved fronds, covering an area 36 feet across, make a picture of unsurpassing splendour.



Description.—Trunks 20 to 50 feet high, or even more in old plants, furnished at the base with hard thick buttresses formed of matted aerial rootlets from 1 to  $2\frac{1}{2}$  feet in diameter, tapering to the trunk proper, which is slender for its height—7 to 8 inches through, black, and decorated with a formal hexagonal pattern running diagonally round the stem. Stalks stout, clothed at the base with copious black scales. Fronds numerous, 20 to 30 in Cyathea

SIZE, 24in. x 9in.



AUCKLAND.

a crown, curving, 8 to 20 feet long by 3 to 5 feet broad, darkish green above, paler beneath, texture firm. Midrib more or less clothed with silky tawny hairs. Seeds very numerous.

Abundant throughout the Dominion, except the east coast of Canterbury and Otago. Sea-level to 2,000 feet.

One of the tallest and handsomest tree-ferns in the world. It is seen to the greatest advantage when growing on a river bank, overhanging the water. One that grew on the river bank below my house at Whangarei measured 61 feet. I used to swim on my back in the pool below, and look up at the blue sky through its feathery fronds. It died of old age. I should imagine they do not live very long, rarely, if ever, attaining man's allotted span. On several occasions I have tested its rate of growth; it averages, roughly, a foot a year up to ten years, possibly it may be slower as they become old.

The fronds keep appearing all the year round. Who has not admired the majestic unrolling crooks densely covered with dark-brown scales to protect the tender life from sun and wind? It is averred that the Maori got his beautiful scrolls for carving and tattooing from the tree-fern. I had one growing near a totara tree, whose quickly spreading branches gradually thrust it out of the perpendicular. After an unusually wet winter and spring, it sent up a grand crown of fronds, more than the sloping trunk could support, for it snapped off close to the ground. It had been planted a seedling 11 years before, and had attained a height of 10 feet. I dug a hole, placed it in and rammed it tight, like a fencing post. After struggling through the summer, it began to put out new fronds, and now shows signs of complete recovery.

I can remember as a young man being shown the largest tree-fern in Scotland. The glasshouse had been specially raised to accommodate its aspiring head—*it* was  $4 \ feet \ high!$  a poor, scraggy specimen, but almost venerated by its owner. In New Zealand they are seldom less than 20 feet when mature, and so abundant that the



(31a) TREE-FERN, 61 FEET HIGH (CYATHEA MEDULLARIS). HATEA RIVER, WHANGAREL

settlers look upon them as only an encumbrance, to be cut down and burnt out of the way as soon as possible.

The pith of the trunk and lower part of the stalks from which the species receives its name—was formerly baked by the Maoris for food; when properly prepared it resembled dried apples.

This splendid fern is easily cultivated, growing luxuriantly on the lawns about Auckland, and giving to the suburbs quite a distinctive appearance.

The perfection of growth is well illustrated by the expanded frond. I have counted no less than 40,000 leaflets on one frond, all perfect, not one missing or deformed. No doubt the same may be said of most of Nature's work, it is only more visible to the eye in the prim regularity of a fern.

The rate of growth in the different species of treeferns varies considerably. *Cyathca medullaris* grows about a foot a year; I doubt if *Cyathca dealbata* grows more than 4 inches. The growth of the fronds I have measured more exactly. The plants were two years old.

				Greatest	Average
			D	aily growth	Daily growth
Dicksonia squarrosa				$2\frac{7}{8}$ in.	$1\frac{3}{4}$ in.
Dicksonia lanata	••		••	$2\frac{3}{4}$ in.	1 <u>3</u> in.
Cyathea dealbata				$1\frac{1}{8}$ in.	$\frac{7}{8}$ in.
Cyathea medullaris	••	••	••	4in.	2in.

These measurements were taken from 14 tree-ferns during the months of September and October.

A pumpkin runner averaged 6 inches a day for a month.

It is hard to believe that so soft and tender a plant as a fern could possess anything so harsh as a thorn. On visiting one of the remnants of real forest near Umtali, in Rhodesia, my guide assured me that the tree-ferns had thorns. I scoffed at the idea, but not for long. As I descended the steep path my foot slipped, and to save myself I grabbed the nearest support. I let go with a cry of pain, for it had torn my hand. Instead of showing

#### Cyathea

sympathy my guide laughed and pointed upwards—it was a tree-fern! the trunk very slender, perhaps 15 feet high, with a lovely spreading top. Not only were there thorns on the trunk, but even the lower part of the leafstalks was similarly provided. In the 'eighties of last century the market price for

In the 'eighties of last century the market price for tree-ferns in London ranged from £5 to £47. A few years ago Maori women peddled young tree-ferns from door to door in Auckland, exchanging them readily for an old skirt.

Found also in South-east Australia, Tasmania, and several of the Pacific Islands.

(32) C. Milnei (Mr. Milne). A noble tree-fern, allied to C. mcdullaris, but sufficiently distinct to be classified as a separate species. Found only on the Kermadec Islands.

Description.—Trunk 20 to 40 feet high, 1 foot in diameter at the base. Leaf-stalks stout, thickly clothed at the base with scales. Fronds numerous, 6 to 18 feet long by 2 to 4 feet broad, dark-green above, paler beneath. Seeds copious, rather large.

Kermadec Islands: Sunday Island, abundant from sea-level to the top of the highest hills—1,700 feet.

### Cyathea

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(32) CYATHEA MILNEI.

A Medium Specimen. Under Side.

KERMADEC ISLANDS.

(33) C. Cunninghamii (Mr. Cunningham). "Gully Fern." A graceful tree-fern, very similar to C. medullaris, but smaller, the trunk more slender—usually only half the diameter—the fronds less robust, wider in proportion to their length, more irregularly curved, not so drooping, more membranous. Midribs covered with yellowish hairs. Seeds smaller.

Description.—Trunk 8 to 20 feet or more high, 3 to  $3\frac{1}{2}$  inches diameter. Often coated at the base with matted aerial rootlets. Leaf-stalks rather slender. Fronds numerous, 20 to 30; 6 to 10 feet long by 2 to 4 feet broad, almost membranous, flaccid, dark-green above, paler beneath. Seeds copious.

North Island: Bay of Islands, Whangarei, Great Barrier, Waitakere, Hunua; Wellington—Hutt Valley. South Island: Nelson. Chatham Islands. Sea-level to 1,500 feet.

After fully describing the trunks and fronds of the tree-ferns, their beauties are not nearly exhausted. The fibrous trunks form natural hanging gardens for innumerable species of ferns and mosses, besides many flowering plants. I have observed some 40 or 50 species of ferns flourishing in this airy situation, from mats of tiny filmy ferns, pellucid cups of the kidney fern, to long pendulous fronds of *Hymenophyllum scabrum* and *H. dilatatum;* several species of climbing *Polypodium* and *Lomaria;* handsome fronds of *Aspidium capense* richly decorated with patches of black seeds; picturesque tufts of *Asplenium falcatum*, the broad shining leaves of *A. lucidum;* great hirsute fronds of *Nephrodium hispidum,* and the twining mange-mange, etc., etc. CYATHEA

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WHANGAREI.

# V. HEMITELIA

HEMITELIA (half complete). A genus of 45 species of tree-ferns, with one species and one recognised variety in New Zealand; not so big as Cyathea, from which it differs in the smaller size of the cup-shaped vessel supporting the seeds.



#### н. змітніі

(34) *H. Smithii* (Mr. Smith). Named after John Smith, curator of Kew Gardens. A very beautiful treefern, with the most tender foliage of any New Zealand arborescent species; easily recognised by the soft woolly scales of a light straw colour about the base of the fronds.

Description.—Trunk 6 to 25 feet high, about 9 inches diameter. Stalks slender, clothed at the base with a dense brush of chestnut-brown scales. Fronds numerous, spreading horizontally. 5 to 9 feet long by  $1\frac{1}{2}$  to  $2\frac{1}{2}$  feet broad, thin and membranous, bright fresh green. Seeds copious.

Abundant throughout the Dominion. Sea-level to 2,000 feet.

The species is easy of cultivation, though usually neglected for the more showy tree-ferns. The trunk is sometimes branched. It is found in the Auckland Islands (South latitude 47.20), the extreme limit of arborescent ferns, and is confined to New Zealand.

(35) *Var. microphylla* (small leaved). Fronds fewer, soft, delicately membranous, pale grass-green, more finely divided. Habitat similar to the foregoing.

## Hemitelia

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# VI. ALSOPHILA

ALSOPHILA (alsos, grove; philo, love). A genus of about 120 species, with one in New Zealand. Tree-ferns mostly tropical; the stem low or prostrate on the ground. A mountain species; the seed-covering altogether absent.



A. COLENSOI

(36) A. Colensoi (Mr. Colenso). "The Golden Tree Fern." A semi-prostate tree-fern found on the mountains of the interior.

Description.—Stem long, prostrate, rooting, seldom more than 8 inches in circumference, sometimes erect or ascending at the tip and attaining a height of 3 to 5 feet. Stalks short, densely covered with pale-brown scales. Fronds 2 to 5 feet long by  $\frac{3}{4}$  to 2 feet broad, membranous, yellowish-green or reddish-brown. Seeds conspicuous. Upper part of stalks and midribs thickly clothed with red-brown hairs intermixed with pale-coloured scales.

North Island: Mountains of the interior from Hikurangi and Mount Egmont southwards. South Island: Not uncommon in the sub-alpine forests throughout. Usually between 2,000 and 4,000 feet, descending to low levels in South Otago.

The hardiest of our tree-ferns; easily cultivated. Confined to New Zealand.

#### Alsophila

## 101 SIZE, 13<sup>1</sup>/<sub>2</sub>in. x 4<sup>1</sup>/<sub>2</sub>in.



<sup>(36)</sup> ALSOPHILA COLENSOI.

A Medium Specimen. Under Side.

# VII. DICKSONIA

DICKSONIA (named after James Dickson, a British cryptogamist). A genus of about 25 species, with 3 in New Zealand; usually medium-sized treeferns. Seeds marginal, contained in a two-valved vessel.



#### D. SQUARROSA

(37) **D**. squarrosa (rough). "Wheki." A mediumsized tree-fern, with slender trunk and leaf-stalks, fronds nearly horizontal. easily recognised by the red-brown dead leaves that hang down the stem from under the crown.

*Description.*—Trunk 6 to 20 feet high, slender, black or darkbrown. Stalks slender, dark-brown or black at the base, paler above, clothed when young with long dark-brown hairs, nearly smooth when old. Fronds 4 to 8 feet long by 2 to  $3\frac{1}{2}$  feet broad, rigid, harsh to the touch, dark-green, paler below. Seeds rather large, copious, covering the whole back of the frond.

Abundant throughout the Dominion. Sea-level to 2,500 feet.

This slender, somewhat trim species of tree-fern is confined to New Zealand, where it is exceedingly abundant. The trunk occasionally branches, and sometimes produces adventitious buds along its whole length crowned with miniature fronds. It is easily cultivated.



AUCKLAND.

(38) **D.** fibrosa (fibrous). "Wheki-ponga." A medium-sized tree-fern, with a stout columnar trunk everywhere thickly coated with matted, fibrous aerial rootlets; not found in the North.

Description.—Trunk 8 to 20 feet high, stout, columnar, coated with matted aerial rootlets, giving it a diameter when mature of from 1 to 2 feet. Stalks very short, clothed at the base with bright red-brown scales. Fronds numerous, 30 or more, spreading, 4 to 8 feet long by  $1\frac{1}{2}$  to 2 feet broad, not so harsh as *D*. squarrosa. Seeds small, very numerous, covering the whole back of the frond.

From Tauranga and middle Waikato southwards abundant. Sea-level to 2,500 feet.

A handsome, sturdy-looking species very closely allied to *D. antarctica*, and so named in the earlier works, but it is a much smaller plant, with smaller seeds. Confined to New Zealand. The Maoris used to slice the outside of the trunk into slabs for the construction of their foodhouses (whare puni), as they found the fibrous material almost impervious to rats. An easily cultivated plant, the spreading crown hardly affected by sun or wind.
## Dicksonia



(39) **D.** lanata (woolly). A semi-erect tree-fern; easily distinguished from the other *Dicksonias* by its short trunk, or absence of a trunk, and the broader, laxer fronds.



Description.—Trunk usually long, prostrate and rooting—as thick as the wrist—more rarely stout, erect, attaining a height of from 3 to 6 feet. Stalks from half as long to quite as long as the frond, pale, smooth, clothed at the base with brown scales; when young the upper part, together with the midrib, covered with soft woolly hairs. Fronds few, 3 to 6 feet long by 1 to 3 feet broad, thick, but hardly rigid, green to yellowish-green above, paler beneath. Seeds copious.

North Island: Hilly forests from Mangonui to Cook Strait, somewhat scarce and local. South Island: Nelson—Massacre Bay, Pakawa; Westland—Okarito; Canterbury—Banks Peninsula. Sea-level to 2,000 feet.

At Whangarei and further north this species usually possesses a short trunk, but to the south it is invariably stemless. It is an easy plant to cultivate. Four years ago I brought a seedling from Whangarei and planted it in Auckland. It will be interesting to see if it produces a stem similar to the parent plant. So far it has not, although it has put forth several seeded fronds, a sign of maturity.

### Dicksonia



(39) DICKSONIA LANATA.

A Medium Specimen. Under Side.

WHANGAREI.

## VIII. DAVALLIA

DAVALLIA (named to honour Edmond Davall, a Swiss botanist). A genus of over 100 species, with two authentic species in New Zealand, both mediumsized plants.

Seeds in small globular vessels near the margins of the leaflets.

(40) **D.** Tasmani (named to honour Tasman). Should any of my readers have the good fortune to land on the Three Kings Islands, they can hardly fail to find this fern, which its discoverer describes as abundant.

Description.—Root long, stout, as thick as the finger, densely clothed with chestnut-brown scales. Stalks strong, rigid, smooth, 3 to 9 inches long. Fronds 4 to 12 inches long by 3 to 9 inches broad, very thick and leathery, quite smooth. Seeds numerous, in cup-shaped vessels on the margins of the leaflets.

Three Kings Islands, abundant.

This most interesting fern was found by Mr. T. F. Cheeseman. Up to the present it has been reported from nowhere else in the world than these minute islets. In all its aspects it is much more like *D. solida*, a common Pacific species, than *D. novae zealandiae*. It is strange that it should have skipped the Kermadec Islands, which are several hundred miles nearer the headquarters of the genus, from whence the ancestor of the plant must have come and established itself on these small islets. This must have occurred at a remote period, to account for its divergence from its nearest ally.

### DAVALLIA

#### SIZE, 10<sup>1</sup>/<sub>2</sub>in. x 6in.



(40) DAVALLIA TASMANI.

NI. THREE KINGS ISLANDS. A Medium Specimen. Under Side. (41) *D. novae zealandiae* (New Zealand). A very handsome species, with wide-spreading finely-cut fronds of a lace-like texture, and numerous small seeds in detached vessels near the margins of the leaflets.



Description.—Root long, branched, wide-creeping, as thick as a quill, clothed with yellowish-brown scales. Stalks 6 to 18 inches long, red-brown, firm, erect, rough and bristly at the base, smooth and polished above. Fronds 1 to 2 feet long by 6 to 12 inches broad. Seeds very numerous, contained in round-shaped vessels. North and South Islands, in woods from Mangonui to Fo-

veaux Strait, but often local. Sea-level to 2,000 feet.

An elegant and very distinct species with an unusually fine-cut frond. It makes a beautiful specimen for the herbarium. Mr. Thomson reports it as growing readily under cultivation. It is found only in New Zealand.

NOTE.—D. FORSTERI is only known from Forster's specimens preserved in the British Museum Herbarium and labelled "Dusky Sound." It has not been found since, and was possibly collected in some of the Polynesian Islands, where the genus is very abundant. DAVALLIA

111 SIZE, 13in. x 7<sup>1</sup><sub>2</sub>in.



# IX. CYSTOPTERIS

CYSTOPTERIS (kystos, a cyst; pteris, a fern). "Bladder Fern." A genus of 5 species, with 1 in New Zealand. A small tender fern; the seeds covered by an egg-shaped envelope somewhat like a bladder.

(42) *C. fragilis* (fragile). A delicate, pale-green soft little mountain fern, growing among the clefts of rocks in dry open ground.



*Description.*—Root short, semi-erect, often branched near the top, clothed with red-brown scales. Stalks 1 to 4 inches long, slender, fragile, slightly scaly at base. Fronds 3 to 9 inches long by 1 to 2 inches broad, pale-green, thin and membranous. Seeds protected by a bladder-like covering.

North Island: Mount Egmont, Tararua Ranges, Wairarapa Valley. South Island: Not uncommon in mountainous districts throughout. 1,000 to 4,000 feet.

This delicate, unobtrusive little fern is found all over the world. Mr. Field describes it as growing easily under cultivation if sheltered from the wind.

#### Cystopteris



MOUNT EGMONT.

# X. LINDSAYA

LINDSAYA (to honour Dr. Lindsay, of Jamaica, a writer on the germination of mosses and ferns). A very distinct genus of about 60 species, with 3 species and 1 variety in New Zealand. Small, bright-green, terrestrial ferns. The margins of the leaflets have the appearance of being double, the seeds lying between.



L. TRICHOMANOIDES

(43) *L. linearis* (narrow). A small, very narrow fern, growing on poor, hungry land among light scrub; a very distinct species.



Description.—Root slender, creeping, clothed with yellowbrown scales. Stalks 2 to 9 inches long, slender, flexuous, wiry, dark red-brown, smooth and glossy. Fronds 3 to 8 inches long by  $\frac{1}{2}$ in. broad, barren ones shorter, broader, and less erect than the fertile, green to light-green. Seeds forming a continuous line along the upper edge of the leaflets.

Plentiful on clay hills and cold swampy soils from the North Cape to the East Cape; rare and local in the South Island. Sealevel to 2,000 feet.

### LINDSAYA



A Medium Specimen. Upper and Under Side.

KUMEU.

This pretty little fern is no believer in self-advertisement, for one rarely sees its trim fronds in the open. It is only by searching among the manuka or light scrub that one realises how plentiful it is in many localities. Although growing in such poor soil, it is difficult to cultivate; Mr. Field had recourse to a Wardian case before he succeeded. I have been quite unsuccessful. It is also found in Australia, Tasmania, Norfolk Island, and New Caledonia.

(44) L. trichomanoides (resembling Trichomanes). A little gem, perfect in all its aspects—outline, form, colour; usually growing on dry banks in thick scrub or bush. There is no mistaking the slender, polished, golden-brown stalks, the deep-green leaves, the narrow line of seeds round the margin.



*Description.*—Root slender, creeping, covered with reddishbrown scales. Stalks 3 to 8 inches long, slender, polished, shining red-brown, rather rigid. Fronds 3 to 8 inches long by  $1\frac{1}{2}$  to 4 inches broad, texture firm, green to dark-green. Seeds forming a continuous line round the margins of the leaflets.

Fairly abundant in the North Island; local in the South Island. Sea-level to 2,500 feet.

This lovely species varies greatly in appearance; the more northern specimens are not so much divided or so finely cut as those coming from further south.

It seems to grow well in a thin layer of vegetable mould above poor, hungry clay soil, yet it is a difficult species to transplant. Though I have tried many times, the plants gradually faded and died. Found also in Australia, Tasmania, and Fiji.



I have illustrated a form of this species that grew plentifully near Picton (44a), formerly classed as *Lind*saya microphylla. In my judgment it diverges further from *L. trichomanoides* than does *Lessonii*.





### 119 SIZE, 7in. x 7½m.



PICTON.

(45) Var. Lessonii (M. Lesson). Leaflets spreading laterally, not so much divided, the final divisions larger. It is the more usual form in the Auckland district. The curves of the leaflets are absolutely perfect in outline.



### LINDSAYA

121 SIZE, 12in. x 9in.



<sup>(45)</sup> LINDSAYA TRICHOMANOIDES, VAR. LESSONI. KAIPARA. A Large Specimen. Under Side. All five fronds are growing from one stalk.

(46) *L. viridis* (green). A very beautiful little fern, always found growing on dripping rocks set in a bed of moss, and usually shunning the sunlight. The long, narrow fronds are inclined to be pendulous. When seen growing on a shaded slope of moss-covered rock in crowded tufts, they give one the impression of intense, vivid green.



Description.—Root very short, inclined, not erect. Stalks densely tufted, 1 to 4 inches long, slender, wiry, dark chestnutbrown, polished and shining. Fronds 6 to 14 inches long by 1 to  $1\frac{1}{2}$  inches broad, bright-green to pale-green, firm in texture, midrib sinuous. Seeds very numerous, in a short line at the tips of the leaflets. A somewhat rare species.

North Island: Great Barrier, Little Barrier, Thames, Henderson, Huia Creek, Mauku, between Tauranga and Rotorua, East Cape, Mount Egmont, Upper Wanganui to Tararua Ranges. South Island: Massacre Bay, Torrent Bay, near Hokitika, Sounds of West Coast.

Mr. Field describes this species as not very difficult to grow if supplied with sufficient moisture; personally, I have not been very successful. It is the rarest of the New Zealand *Lindsayas* and is found in no other country.



HENDERSON.

# XI. ADIANTUM

ADIANTUM (adiantos, unwetted; from the property the leaves have of throwing off water). "Maidenhair," so called from the slender, hair-like stalks, or because it is sometimes made into a wash to promote the growth of hair. A very distinct genus of about 80 species, with 6 species and 1 variety in New Zealand. Seeds marginal, kidney-shaped in the New Zealand species.



#### A. FULVUM

(47) *A. aethiopicum* (African). "Makaka," "The True Maidenhair." Easily distinguished by the small roundish leaflets and the black, hair-like stalks. Usually growing in masses to the exclusion of other plants beneath manuka or small scrub.

*Description.*—Root creeping, sending out suckers. Stalks 4 to 10 inches high, very slender, dark-brown, almost black, shining, smooth. Fronds 6 to 12 inches long by 3 to 6 inches broad, erect or drooping, pale-green, very thin and membranous. Secondary leaf-stalks hair-like. Seeds placed in notches on the outer margins of the leaflets.

North Island: Plentiful in lowland districts from the North Cape to the Thames and Waikato; from thence rare and local to Hawke's Bay and Taranaki. South Island doubtful. Adiantum

125 SIZE, 11in. x 92in.



MURIWAI.

A most graceful species, almost indispensable for bridal bouquets. Although called "The Real Maidenhair," in distinction from the five other New Zealand species, it differs slightly from *A. capillus veneris* the Maidenhair of Europe—by the larger fronds and smaller leaflets. However, as the stalks are just as hairlike, I think it is equally entitled to the name.



The persistence of some small weak plants is very remarkable. I first gathered this fern in 1878 at Muriwai, near Helensville, at that time a populous Maori settlement, presided over by one of the old-time cannibal chiefs, a fine upstanding old man of eighty years, with all his teeth intact-no doubt a useful equipment in his young days. The fern grew in some high manuka just beyond the village; but there were no other trees in the vicinity. I next visited the spot 38 years later. Not only had the rangatira departed, but every vestige of the settlement was gone-the whares, the kumara fields, and the manuka. There was literally nothing to show where the village had been. The only thing to fix the spot in my memory-collectors know how rooted in one's recollection is the scene of a first find-was a large patch of the soft green maidenhair, shaded by umbrageous trees. The Maoris had vanished, the manuka was gone, yet, notwithstanding the advent of large trees, the humble little fern still held its ground.

It is a widely-distributed species in both tropical and sub-tropical countries. Easily grown, either in pots or in the fernery.



(48) A. diaphanum (semi-transparent). The smallest—referring to the whole frond—of the New Zealand species; either a single leaf or branched once or twice. Growing on dry banks under the shade of bushes.

Description.—Root very short, tufted; rootlets long, fibrous, densely hairy, bearing numerous small tubers. Stalks 2 to 6 inches long, very slender, almost hair-like, purplish-brown or nearly black, wiry, slightly scaly towards the base. Fronds 3 to 6 inches long, rarely more, either single or branched once to twice, each leaf  $\frac{1}{2}$ in. to 1 inch wide, thin and membranous, dark-green. Seeds placed in the notches of the upper and outer margins of the leaflets, surfaces sparingly covered with minute black hairs.

North Island: Not uncommon in woods at low elevation, usually in rich alluvial soil. South Island: Apparently rare and local. Nelson—Bateman's Gully, Collingwood; Canterbury—gorge of the Rakaia; Otago—various localities. Sea-level to 1,000 feet.

This modest little fern, though easily grown, is generally neglected in favour of its more showy brethren. Outside New Zealand it is a widely-spread species.

#### Adiantum

129



AUCKLAND.

(49) Var. polymorphum (many shaped). Fronds smaller, pale-green; leaves usually simple, rarely branched at the base; surface of the leaves quite smooth. Much the same habitat as *A. diaphanum*.

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(50) A. hispidulum (bristly). This differs from the other maidenhairs in the stiff, harsh texture of the fronds, their broad fan-shaped outline, the bright red colour of the young leaves, and its habit of growing in the open.

Description.—Root short, stout, creeping. Stalks 6 to 15 inches long, stout, erect, rough to the touch, dark-brown or almost black. Fronds broad, 6 to 12 inches or more across, widely fan-shaped, green to olive-green, often bright-red or reddishbrown when young; midribs rough and hairy. Seeds numerous, placed in the notches of the upper and outer margins.

North Island: Abundant as far south as East Cape and Raglan, from thence southwards rare and local to Cook Strait. South Island: Nelson—Bishopdale.

The fronds, usually with ten points in two groups of five like a pair of hands, when young are a bright pink, and make a very beautiful object when spangled with dew, the light scintillating through the drops as from burnished copper. At certain seasons a bank will be rosy-red with the opening crooks, for this hardy species braves the fiercest sunlight. I experienced no difficulty in growing it in my fernery. I have seen it badly cut at Whangarei by an unusually sharp frost. It is a widelyspread species.

#### Adiantum



WHANGAREI.

(51) *A. formosum* (beautiful). The largest of the New Zealand maidenhairs, apparently confined to two districts—the Northern Wairoa and the Manawatu and its tributaries. A handsome, branching fern, with small leaflets.



Description.—Root long, stout, creeping, scaly. Stalk 1 to 3 feet high, purplish-black or quite black, shining, sometimes hairy towards the base, rough throughout. Fronds  $1\frac{1}{2}$  to 3 feet long by 12 to 20 inches broad, dark-green, texture firm, under surface smooth, or bearing scattered hairs. Midrib sinuous, black and glossy. Seeds numerous, placed in shallow depressions at the top of the leaflets.

Alluvial banks of Northern Wairoa. Manawatu River and its tributaries from Woodville to below Palmerston North.

A very handsome species, sometimes attaining a height of 5 feet, with more than 20 branches and 1,000 leaflets. Mr. Field, who calls it "The Plumed Maidenhair," also states that it is easily grown in light sandy loam, but it is difficult to transplant on account of the deep roots. Found also in Eastern Australia.

#### Adiantum



NORTHERN WAIROA.

#### NEW ZEALAND FERNS

(52) A. affine (related). A lowland fern, fond of dry shady slopes; the most abundant maidenhair in New Zealand, with large-leaved straggling fronds.



Description.—Root long, creeping, stout, clothed with glossy dark chestnut-brown scales. Stalks 4 to 12 inches long, stout, erect, shining-black, rough and scaly at the very base, smooth and polished above. Fronds 6 to 15 inches long by 3 to 9 inches broad, green to pale-green above, usually sea-green below, quite smooth. Seeds numerous, rather large, placed in small notches on the upper and outer margins of the leaflets.

Abundant throughout the Dominion.

A very variable species in size, the amount of branching of the frond, and the shape of the leaflets. When growing on rock faces it is often dwarfed to an inch or two. It is easily cultivated. Found also in Australia. Adiantum

SIZE, 132in. x 9in.



A Large Specimen. Under Side.

KAIPARA.

(53) *A. fulvum* (tawny). The written description of this species differs but little from *A. affine*, yet a glance at the illustration shows a marked divergence. The fronds are a darker green, the under surface is not seagreen, the leaflets are narrower and more pointed, the stalks are rougher, and the whole frond more symmetrical.

The roughened stalk and the presence of tawny hairs upon the midribs distinguish this species most certainly from *.*-*l. affine*, but their detection requires the aid of a lens.

Description.—Root long, creeping, clothed with brown scales. Stalk 4 to 12 inches long, erect, dark reddish-brown or almost black, rough to the touch, scaly at the base. Fronds 6 to 15 inches long by 3 to 9 inches broad, olive-green or pale-green, not seagreen below. Midribs more or less covered with stiff tawny hairs. Seeds usually numerous, in shallow notches on the upper margins of the leaflets.

North and South Islands: Lowland districts as far south as Banks Peninsula, not uncommon.

This species is connected by intermediate forms with *A. affine*. It is found also in Norfolk Island, New South Wales, and Fiji.

Adiantum



KAIPARA.

# XII. HYPOLEPIS

HYPOLEPIS (hypo, under; lepis, a scale). A genus of 12 species, with 4 in New Zealand. Large to medium-sized branching ferns. Seeds small, placed in the notches of the leaflets. Margin of the leaf modified and curved so as partly to cover the seeds.



H. DISTANS

(54) *H. tenuifolia* (thin-leaved). A large, branching species; the soft pale-green fronds yielding to the touch. Usually found on the edge of bush or in clearings.



Description.—Roots long, stout, creeping, clothed with redbrown scales. Stalks 1 to 2 feet high or more, strong, erect, brown or yellow-brown, usually scaly towards the base. Fronds 1 to 3 feet long by 6 inches to 2 feet broad, pale-green, membranous, midribs covered with soft white hairs. Seeds numerous, small, at the bottom of the notches, shaped like an ear.

Abundant throughout the Dominion. Sea-level to 2,000 feet.




AUCKLAND.

After making several long and fruitless journeys in search of a young plant for my fernery, I discovered a seedling growing on a wall in my garden. It afforded me continual interest to watch its rapid development when moved to a suitable site. After sending up a few small fronds it became firmly established, putting out strong roots as thick as my finger and covered with dark-brown hairs, which crept boldly over the surface of the ground, each being preceded by a blunt foot of a lovely pellucid green thickly coated with white hairs. The growing end gradually widened and eventually divided, one part continuing to creep over the ground, the other rising in the form of a circular crook, of a pure indescribable green, softened by the clothing of white hairs, which were not thick enough to conceal the symmetrical outline. In a few days the handsome unfolding crozier stood majestically on a tall green column, the folded leaves packed so closely as to resemble a tightly-clenched fist. Then it divided and sent out two lateral crooks, which gradually disclosed their hidden treasures.

Within six months of planting out the seedling of H. *tenuifolia*, it had developed into a robust plant with strong roots radiating in all directions, great branching fronds nearly 6 feet long and 5 feet wide, of a soft tender green, yielding to the touch, and the seeds fully developed.

It is a most variable fern; in habit and general appearance very close to *Polypodium punctatum*. The partial seed covering is sometimes so feebly developed that the technical distinction separating *Hypolepis* from *Polypodium* is obliterated. It can usually be distinguished Hypolepis

from the latter plant by the curved margin of the leaf partially covering the seed, and the absence of sticky hairs on the midrib.

Found also in Norfolk Island, Australia, the Pacific Islands, and Java.

Note.—A description of the following new species was published in the "Transactions of the New Zealand Institute" by Mr. H. Carse. 24th May, 1918. Hypolepis Petrieana. A much smaller plant, and less hairy than *H. tenuifolia*, usually growing in the open.

Description.—Root slender, creeping, thickly covered with rusty scales. Stalks 4 to 6 inches long, rigid, moderately stout, yellow, or the lower part brownish, somewhat rough, but free from hairs. Fronds 12 to 14 inches long by 8 to 10 inches broad, light-green. Midrib sparingly clothed with delicate hairs. Seeds one, rarely two, on each ultimate division of the leaf.

North Island: Mangonui, Whangarei, Great Barrier, Port Charles (Coromandel), and Otorohanga (Waipa County), Kennedy Bay (Coromandel), Lower Waikato, Rotorua, Te Whaiti. Hypolepis

SIZE, 10in. x 12in.



A Small Specimen. Under Side.

KENNEDY BAY.

(55) *H. millefolium* (thousand-leaved). One of the most finely and openly cut of the New Zealand ferns. A mountain species, confined in the North Island to the high ranges of the interior. Wide-spread in the South Island, frequenting open, hilly ground.



*Description.*—Root long, slender, creeping, naked or nearly so. Stalks 3 to 9 inches long, rigid, erect, yellowish-brown, glossy, smooth, or slightly rough. Fronds 6 to 18 inches long by 3 to 9 inches broad, pale-green, firm. Midribs clothed with scattered hairs. Seeds numerous, placed in the notches of the leaflets.

North Island: East Cape, Ruapehu, Mount Egmont, Ruahine Mountains, Manawatu Gorge, Tararua Ranges. South Island: Not uncommon in mountain districts throughout. Usually 1,500 to 4,000 feet, but descends almost to sea-level in South Otago.

When growing in shade this fern has a beautiful, lace-like texture. I first gathered it at Picton in 1878. Setting out at dawn with the determination of scaling the highest peak—Piri-piri, 3,200 feet—I plunged into the narrow gorge above the railway viaduct. There was absolutely no track of any kind, and the bush was so dense, even on the summits of the mountains, that I had recourse to breaking off twigs of the Panax to mark my path for the return journey. There is no difficulty in finding one's way to the top of a bush-clad mountain, but it is not so easy to keep to the main ridge coming down, and a side spur would have landed me at the bottom of a rocky gorge where progress was well nigh impossible.

After a struggle of seven hours, which had yielded nothing new in the way of ferns, I came within sight of the summit, so crowded with gnarled birch trees, from which hung great festoons of moss and lichen as to rob Hypolepis

SIZE, 10in. x 104in.



me of any view the lofty peak promised of the surrounding country—I only got glimpses of Port Underwood between the tree trunks.

Upon the very apex, confined to a circuit of 150 yards, the ground was carpeted a soft green with the recumbent fronds of this delicate fern. I searched all round, but could find no trace of it below that central patch. Though disappointed in my view, I was more than satisfied by the addition of this beautiful fern to my collection. The soft, tender fronds covered the ground with an exquisite green lace-work in marked contrast to the gnarled, hoary-looking trees, bearded with moss, patriarchs of the forest. The return journey, thanks to my precaution with the Panax, was accomplished without mishap.

According to Mr. Field, it is not easily cultivated in the North Island, though it was successfully acclimatised in the Christchurch Botanical Gardens. It is confined to New Zealand.



(33a) CYATHEA CUNNINGHAMII. FULL-GROWN TREE. WHANGAREI. A full-grown tree-fern, about 26 feet high, the trunk 3in. to 32in, diameter. Behind is the head of a young 6. medullaris. Observe the more curving, more robust fronds.

#### New Zealand Ferns

(56) *H. distans* (distant). A fragile and extremely graceful fern, the leaflets, in opposite pairs, being further apart than in others of the genus; usually growing on mouldering tree stumps, decaying grass tussocks, or any accumulation of light mould on the forest floor.



Description.—Roots creeping, slender, rigid, clothed with redbrown scales. Stalks 3 to 9 inches long, slender, fragile, redbrown, glossy, yet rough to the touch. Fronds 6 to 15 inches long by 3 to 6 inches broad, bright-green to brownish-green, the larger specimens prostrate and interlacing with one another. Seeds small, placed in the indentations of the leaflets.

From the North Cape to South Otago, not common, usually at low elevations.

A graceful, delicate fern that does not always shun the sunbeams. It is not difficult to cultivate if planted in light mould, where the slender roots can push their way. Mr. Field describes it as looking very well when grown in a hanging basket; the long drooping fronds hang over the sides and interlace. Confined to New Zealand.

### Hypolepis

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HUNUA.

# XIII. CHEILANTHES

CHEILANTHES (cheilos, lip or margin; anthos, flower—the fructification on the margin). A genus of 60 species, with 2 in New Zealand. Small upright ferns, generally growing on rocks in the open. Seeds along the margins of the leaves, which curve over in indented folds.



S. SIEBERI

(57) *C. tenuifolia* (thin-leaved). A small upright fern growing in exposed situations; the leaves bright green, the shining stalks a golden-brown. A very much scarcer species than *C. Sieberi*, from which it differs in the width and shape of the frond. *C. tenuifolia* is, roughly, half as broad as it is long, *C. Sieberi* only one-sixth.

Description.—Root very short, clothed with silky scales. Stalks 3 to 9 inches long, wiry, erect, dark red-brown, smooth and polished. Fronds 4 to 10 inches long by 2 to 4 inches broad, rather membranous, yellow-green. Seeds along the margins of the leaflets.

Auckland—near Tauranga; Hawke's Bay—Mohaka; Wellington—near Wanganui. South Island: Canterbury—Banks Peninsula; Otago—Lakes Wakatipu and Wanaka. Sea-level to 2,500 feet.

This is a wide-spread species. The New Zealand specimens I have seen approach *C. Sieberi* much more closely than specimens gathered in Samoa and Fiji. It is easily cultivated, preferring an open, dry situation.

### CHEILANTHES

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OTAGO.

(58) C. Sieberi (Herr Sieber). A small species, growing rigidly upright; the prim, narrow fronds rarely exceeding an inch in width. Plentiful on the scoria fields about Auckland—even upon the cinder slopes of Rangitoto.



Description.—Root short, stout, creeping, clothed with chestnut-brown scales. Stalks 3 to 9 inches long, erect, rigid, wiry, bright chestnut-brown, polished. Fronds densely tufted, 3 to 9 inches long by  $\frac{3}{4}$ in. to  $1\frac{1}{2}$  inches broad, dark-green, smooth. Midrib smooth and glossy. Seeds round the margins of the leaflets, which curve over in indented folds.

North and South Islands, abundant in rocky places. Sea-level to 2,500 feet.

Excepting *Nothoclaena distans*, which it closely resembles, this quaint little species is quite unlike any other fern in New Zealand. It grows on summits of rocks exposed to the blazing sum—the very last place one would look for a fern. The trim fronds, standing in serried ranks on their glossy brown stalks, have the appearance of miniature pine forests.

According to Mr. Cheeseman this fern is often confused with *Nothoclacna distans*; so far as I am concerned he might have said "generally confused." Until I grew the plants side by side I was always in doubt.

The receptacle for the seeds by which the genus is determined is the most radical difference, but as this requires the aid of a magnifying glass or very sharp eyes, one needs a readier mode of discrimination. The unrolling fronds of *C. Sieberi* are of a fresh green, almost naked; those of *N. distans* are so covered with white hairs as to look like little tufts of cotton wool. In *N. distans* the leaflets are broader and blunter, and the whole plant has a woolly appearance.

Found also in Australia, New Caledonia, and the Isle of Pines.

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AUCKLAND.

# XIV. PELLAEA

14.—PELLAEA (pellos, dark coloured, referring to the frond). A genus of about 60 species, with 2 in New Zealand. Fronds long and narrow; seeds forming a wide band round the margins of the leaves.



#### P. FALCATA

(59) Pellaea falcata (scythe-shaped). A handsome, dark-green species, fond of dry stony ground; usually growing in the same locality as P. rotundifolia, though a very much rarer plant. When comparing the two species the barren fronds differ from each other far more than do the fertile ones.

Description.—Root stout, scaly, creeping. Stalks 3 to 6 inches long, strong, erect, dark red-brown or almost black, more or less bristly. Fronds 12 to 18 inches long or more by  $1\frac{1}{2}$  to 3 inches broad, dark-green, texture firm and smooth, shining, lighter below. Seeds forming a broad band round the margins of the leaflets, except the tips.

North Island: Mangonui County to Waikato River, rare and local. South Island: Dunn Mount Graham River.

For many years I looked upon this species as merely a robust form of *P. rotundifolia*. The leaves in typical specimens of the latter that I had planted in my fernery became longer and more falcate—scythe-shaped—this I attributed to the richer soil. Now that I have studied



(59) PELLAEA FALCATA. A Medium Specimen. Under and Upper Side.

AUCKLAND.

many plants, I am convinced that it is sufficiently different to be classed as a true species, possibly connected with the other by intermediates.

So ill had been my success in looking for this species that, in my secret heart, I had begun to doubt its existence, and only included it in my first edition out of respect for the botanists. But there is always hope—even for the blindest. After 40 years my eyes have been opened.

One day I was hunting in a rough piece of ground near Auckland for Nothoclaeua distans. I had not walked a hundred vards when I came to a chaos of rocks and loose scoria; but made beautiful with moss and lichen, lovely sprays of Asplenium flabbellifolium down in the interstices, quantities of Pellaea rotundifolia everywhere, and handsome patches of Polypodium Billardieri crowning the weather-beaten crags with masses of broad bright-green fronds. A dark-leaved plant at my feet caught my eve, evidently a seedling tree or bush. I was about to pass on, when a second glance arrested me--the tops of the sprays looked uncommonly like ferns, yet the leaves, wide and crowded together on the stalks, were unlike any that I knew. To make quite certain I went down on my knees and parted the foliage with my hands. The sight of a small hairy crook made me catch my breath-it was undoubtedly a fern! But what? I knew none like it. Then it dawned on my slow understanding that this must be P. falcata, whose occurrence in New Zealand I had always doubted. Needless to say, I was converted on the spot. The leaves were so entirely different from those of P. rotundifolia that there was no possibility of confounding the two.

If planted in leaf mould in a dry sunny locality, it is easily grown.

A wide-spread species, extending to Australia, the Malay Archipelago, and India.



(37a) DICKSONIA SQUARROSA. A MEDIUM SIZED TREE. A Tree-fern, not mature, about 16 feet high.

WHANGAREI.

(60) *P. rotundifolia* (round-leaved). Very similar to *P. falcata*, but the leaflets, as suggested by the name, are sometimes nearly circular. One of the most decorative ferns we have, equally at home in the bright sunshine or the gloomy shade of a cave-mouth. It is easily recognised by the single row of round leaflets on either side of the stalk, dark and shining, of a peculiar shade, as if the leaf had been blackleaded.

Description.—Root long, rigid, wiry, creeping, scaly. Stalks 3 to 6 inches long, densely covered with scales. Fronds 6 to 14 inches long or more by  $\frac{3}{4}$  in to  $1\frac{1}{2}$  inches broad, dark-green, shining, lighter below. Seeds forming a broad band round the margins of the leaflets, but not so continuous as in *P. falcata*.

Not uncommon in dry woods throughout the Dominion. Sealevel to 2,000 feet.

An easy fern to grow, making an attractive addition to the fernery; but the leaflets have a habit of falling and leaving the bare stalks exposed to view. The brown shaggy crook of a new frond is first seen in a semirecumbent position, then, rising as if hinged, it soon becomes upright. The leaves mature quickly. Found also in Norfolk Island. Pellaea

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AUCKLAND.

# XV. PTERIS

PTERIS (pterix, the Greek name for the bracken). A genus of about 125 species, with 6 species and 1 variety in New Zealand. Mostly large branching ferns; seeds in a line along the margins of the leaflets, which are slightly curved over as a protection.



#### P. INCISA

(61) *P. aquiliana* (aquiline), *Var. esculenta* (edible). "Rahurahu," "Bracken," the common "Fern," abundant —too abundant everywhere. The fronds curved like an eagle's beak.

Description.—Root thick, creeping below the ground, producing numerous scattered fronds. Stalks variable in length, stout, rigid, erect, smooth and shining. Fronds usually from 2 to 6 feet long, sometimes 10 to 12 feet, stiff and harsh, green to reddishgreen, lighter below. Seeds generally continuous round the margin of the fertile leaflets.

Abundant everywhere, except in dense forests. Sea-level to 4,000 feet.

The avowed enemy of the early settlers, many of whom spent their lives in trying to eradicate it from their pastures. Some, by an ingenious plan of fencing in small areas, tried to kill it off by heavily stocking with sheep—sometimes it was the sheep who suffered. Bearing in mind this extreme tenacity of life, it is interesting



(61) PTERIS AQUILINA, VAR. ESCULENTA. AUCKLAND. A Medium Specimen. Under Side. Seedling Frond, 4½in. long.

to read Mr. Field's experiments. He found it most difficult, almost impossible, to grow in his fernery, and came to the conclusion that it was cross-grained by nature, and would not stand petting.

It was one of the species that grew spontaneously in my garden. When young it is not in the least like the mature plant, either in outline, texture or colour. A friend dug up a plant with great care, under the impression that it was *Hypolepis distans*, and took the utmost pains in packing, watering and carrying it many miles to my fernery, where it proved its identity by giving up the ghost with the same promptitude as Mr. Field's plants. I have observed this delicate, drooping habit in a seedling with its roots near the surface; eventually it put out a strong underground root to the nearest open ground, which in due course sent up the coarse, robust frond associated with the name "bracken."

When thrusting their young shoots through the ground, it is the bend of the crook which bears the strain and first appears above the surface, not the tip, as with daffodils, lilies, etc. The shoulder of the crook is sufficiently rigid and strong to push its way through tough dry clay and to protect the tender folded tip.

The underground roots of this species, called "Aruhe" by the Maoris, used to be their principal food. It is the most universally distributed fern in the world.



(61a) PTERIS AQUILINA. FROND FROM IMMATURE PLANT. AUCKLAND. A Medium Specimen. Under Side. Full-grown Seedling Frond.

(62) *P. scaberula* (a little rough). A very fine-cut fern, rather harsh to the touch; sometimes called "The Scented Fern," or "The Lace Fern." It gives forth a sweet aromatic perfume, especially in the hot sunshine. Fond of growing on sunny banks to the exclusion of other plants.



Description.—Root wide-creeping, rigid, wiry, clothed with chestnut-brown scales. Stalks 4 to 12 inches long, rigid, erect, yellow-brown, rough to the touch, more or less bristly. Fronds 9 to 18 inches high, rarely more, by 4 to 9 inches broad, pale yellow-green, somewhat harsh to the touch. Midrib sinuous, rough. Seeds copious, when mature covering the under surface of the leaflets, except the extreme tips and the base.

Abundant throughout the Dominion. Sea-level to 2,500 feet.

This very beautiful and typically New Zealand fern will grow in the most unpromising situations imaginable, the dry clay cutting of a bush road being a favourite locality; indeed, it seems to prefer poor soil. Though a little difficult to transplant, it is apt to take charge when once established in the fernery. In her book "British Ferns," Miss Pules included it among the most attractive foreign ferns suitable for greenhouse cultivation, "8 or 9 inches high. A perfect little gem." The other day I walked through acres of it up to my knees; lovely soft-green fronds that filled the air with perfume. It is confined to New Zealand.



(62) PTERIS SCABERULA.

A Small Specimen. Under Side.

HUNUA.

(63) *P. tremula* (trembling). "Turawera." A handsome graceful fern, of a pure pale green, a favourite for pot culture; it prefers dry soil and a moderately sunny aspect. Very free in its growth, sowing itself on all sides.



Description.—Root short, stout, putting up tufts of numerous erect fronds. Stalks 1 to 2 feet high, stout, erect, smooth and polished, bright chestnut-brown. Fronds 1 to 3 feet long by 6 inches to 2 feet broad, bright-green, soft, membranous. Seeds copious, usually continuous in a narrow line along the margins of the leaflets.

Kermadec Islands and North Island, abundant. South Island, in various localities in Nelson and Marlborough; also recorded from Banks Peninsula. Sea-level to 2,500 feet.

This fern, called "The Shaking Brake" by Miss Pules, comes up all over my garden. It grows rapidly in a sheltered spot where it gets plenty of sunlight, soon attaining a height of 4 or 5 feet. The young fronds come up like a green shepherd's crook, bending over backwards as the leaves unroll. Perhaps the name "tremula" was given from its habit of growing in somewhat open bush, where its leaves are constantly agitated by the freely circulating air. It is very variable in the size and shape of the leaflets. Injured by frost, especially the older fronds. Eaten voraciously by the caterpillar *Agrotis compta*. See page 203. Found also in Australia, Tasmania, Norfolk Island, and Fiji.

## Pteris



(63) PTERIS TREMULA.

AUCKLAND.

A Medium Specimen. Under Side.

(64) *P. comans* (hairy). A large, handsome fern, with broad, irregular leaves. A northern species, plentiful on some of the outlying islands, rare and local on the mainland; at once distinguished from other species of the genus by the copiously netted veins.



Description.—Root short, stout. Stalks 1 to 2 feet long or more, erect, yellow-brown, polished, clothed at the base with dark-brown scales. Fronds 1 to 4 feet long by 6 inches to 3 feet broad, membranous, dark-green, quite smooth. Veins copiously netted. Seeds in a continuous line round the margins of the leaflets, except the tips.

Kermadec Islands, most abundant. North Island: From Three Kings Islands and North Cape to the Bay of Plenty, usually in shaded places near the sea; plentiful in the outlying islands; rare and local on the mainland.

Mr. Cheeseman says it is often confounded by fern collectors with large states of *P. macilenta*, *Var. pendula*, but it is an altogether different plant, with a coarser and stouter habit of growth, much broader and lessdivided fronds, and unusually long and narrow leaflets. I must confess to having always confounded it with *P. macilenta*. I did not realise my error until shown a specimen of the true *P. comans*. It is a very different and a much more tropical-looking fern. Found also in Australia, Tasmania, and the Pacific Islands. Pteris





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(65) *P. macilenta* (thin). A very beautiful fern of an open pattern like lace-work, soft and membranous; a lover of shade, though I have seen it growing where the bush had been cleared.



Description.—Roots very short. Stalks 6 to 18 inches long, pale yellow-brown, darker towards the base, smooth or slightly scaly below. Fronds 1 to 3 feet long by 9 to 18 inches broad, membranous, flaccid, glistening, green to pale-green, yellow-green in the open. Seeds marginal, in the notches of the leaflets, not nearly reaching the tips. Veins netted along the midrib, elsewhere free.

North Island: Not uncommon in dry woods. South Island: Near Nelson, Takaka; Marlborough. Also said to occur on Banks Peninsula and near Greymouth.





A Large Specimen. Under Side.

WAIKATO.

This fern thrives better than almost any other in my fernery. It is a very variable species. The smaller, more delicate specimen figured 65a is of so constant a type, and so different from the large states of *P. macilenta*, that I think it is worthy of being classed as a variety. Although the two plants grew spontaneously on an earthen bank in my garden within 12 inches of each other, and are subject to exactly the same environment, they have not in any way approached each other. It is confined to New Zealand. Since the above was written it has been described and named *Var. saxatilis* by Mr. H. Carse.

SIZE, 11in. x 8<sup>1</sup><sub>2</sub>in.



(66) Var. pendula (drooping). Not so finely divided as P. macilenta, the terminal leaflets larger. Growing in much the same habitat as P. macilenta.


(66) PTERIC MACHLENTA, VAR. PENDULA. A Medium Specimen. Under Side.

MANGONUI,

(67) *P. incisa* (toothed). A large, branching, somewhat straggling species. Readily distinguished by the pea-green, almost blue-green, of the young stalks and leaves, the luxuriant way in which the base of the leaflets overlap the central and side stalks, and the toothed, sawlike outline. Usually growing on the outskirts of the bush.



Description.—Root long, creeping, rather slender, producing numerous scattered fronds. Stalks 1 to 3 feet high or more, erect, smooth and glossy, yellow-brown to red-brown, sometimes nearly black when mature. Fronds variable in size, 2 to 4 feet long by 1 to 2 feet broad, quite smooth, bright-green to bluish-green. Seeds in nearly continuous rows along the margins of the leaflets, but never extending to the tips. Veins more or less netted near the midribs of the leaflets.

Abundant throughout the Dominion. Sea-level to 3,000 feet.

A strong-growing species, often forming thickets on the outskirts of the bush. It sowed itself about my garden in several places, sending out exploring surface roots in every direction; indeed, they grew so vigorously that I had to dock them to prevent their taking full charge of the fernery. It seems to thrive in every situation but the shady depths of the forest, and flourishes exceedingly among the hot springs of the thermal regions.

It is found also throughout the tropics and the south temperate zone. I shall never forget coming across it in Fiji; the smooth sea-green stalks, covered with a milkywhite bloom, growing out of the earth close to the path, 4 or 5 feet high and without a side shoot—only the tightly-rolled crook on the top. A full-grown trailing frond measured 23 feet.



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# XVI. LOMARIA

LOMARIA (loma, a fringe or border; referring to the seed cover). A genus of about 50 species, with 14 species and 1 variety in New Zealand; producing two kinds of fronds—barren and fertile. Seeds on narrow leaflets, in a continuous line occupying the whole space between the midrib and the margin, which curves over as a protection.



L. FRASERI

(68) L. Patersoni (Mr. Paterson). A very striking dark-green fern, with broad leaves, either entire or deepforked four to twelve times. A lover of moisture and shade; somewhat rare in the North Island.

Description.—Root short, stout, creeping, clothed with blackish-brown scales, sometimes sending out suckers. Stalks 3 to 9 inches long, stout, black, scaly at base. Barren fronds very variable; sometimes simple, 6 to 12 inches long by 1 to  $1\frac{1}{2}$  inches broad; sometimes broadly forked, 1 to 3 feet long or more by 6 inches to 1 foot wide, stiff, shining dark-green above, paler beneath. Veins numerous, forked. Fertile frond as long as the barren. Seeds continuous, ultimately covering the whole under surface.

North and South Islands, Stewart Island. Damp hilly forests from the Thames and Te Aroha southwards. Local on the east side of the South Island. Sea-level to 3,000 feet.



PICTON.

Somewhat rough-looking for a fern when examined closely; at a distance, on a steep bank, its glistening dark-green leaves have a very handsome appearance. According to Mr. Thomson it succeeds well in cultivation if provided with shade and an almost constant drip. I have had no difficulty in growing it.

Found also in the Pacific Islands, Malaya, and India. As in most species of the genus, the fronds are sometimes partly fertile and partly barren.

(69) *L. discolor* (different-coloured). "Piu-piu." An exceedingly handsome species, growing in great tufts, sometimes as much as 6 feet across; the broad barren fronds on the outside, the fertile standing stiffly upright in the centre; the whole forming an elegant crown, often raised from the ground on a short stem.



Description.—Root short, stout, producing suckers at the base, often lengthened into a stem 1 or 2 feet high. Stalks 3 to 6 inches long, stout, polished, densely covered at the base with darkbrown scales. Fronds numerous, forming an elegant crown 1 to 4 feet high; barren 2 to 6 inches broad in the middle, gradually tapering at both ends, texture stiff, glossy-green above, dirty-white or reddish-brown beneath. Fertile fronds about as long as the barren,  $1\frac{1}{2}$  to 3 inches wide, leaflets usually with a broad leafy base. Seeds continuous, covering the whole under surface except the midrib.

Abundant in open forests throughout the Dominion. Sea-level to 3,000 feet.

A gregarious species, often filling a glade to the exclusion of every other plant, and forming a picture hardly to be paralleled in the vegetable world.

It is also a native of Norfolk Island, Australia, and Tasmania.



KAIPARA.

(70) *L. vulcanica* (from a volcanic district?). Most readily distinguished by the general outline of the frond, which is wedge-shaped, the lowest leaflets being the longest. A rather local fern.

Description.—Root short, stout, woody, erect or inclined. Stalks 4 to 9 inches long, slender, pale yellowish-brown, clothed towards the base with dark-brown shining scales, smooth and polished above. Barren fronds 4 to 14 inches long, without the stalks, by 2 to 5 inches broad at the base, texture stiff, dull-green. Fertile fronds usually exceeding the barren. Seeds continuous.

North and South Islands, Stewart Island. In dry open woods from Auckland and Coromandel southwards; but often rare and local. More frequent in the sub-alpine forests of Nelson and Canterbury. Sea-level to 3,500 feet.

I did not come across this fern until quite recently. When bicycling between Rotorua and Taupo, along a bad road and against a head wind through the dreary punice country, I noticed a fern that struck me as strange growing about a rabbit hole. In a moment I was off the bicycle and held a frond in my hand. At a glance I saw it was "vulcanica." Then it became almost abundant, hardly a day passed that I did not find it, usually growing on rocky banks near the edge of the bush—at Aratiatia, Tauhara, Otukou Pa, and Waimarino. It extends northwards through Australia and the Pacific Islands to Malaya.



NELSON.

(71) *L. Norfolkiana* (after Norfolk Island). A large form of *L. lanceolata*, occurring on the Kermadecs, Three Kings, and Little Barrier.

*Description.*—Root short, stout, erect or inclined. Stalks short, stout, 2 to 4 inches long, scaly at base. Barren fronds numerous, forming a large, handsome crown, erect or spreading, 1 to 3 feet long by 3 to 6 inches broad, tapering from the middle to both ends, dark-green. Fertile fronds rather shorter than the barren.

Kermadec, Three Kings and Little Barrier Islands.

The species can be distinguished from L. lanceolata only by the greater size, the more pointed barren and the much longer fertile leaflets. Both on the Three Kings and the Little Barrier it seems to merge into L. lanceolata. Found also in Norfolk Island.

187 SIZE, 14in. x 9½in.



(71) LOMARIA NORFOLKIANA. KERMADEC ISLANDS. A Medium Specimen. Barren and Fertile Fronds.

(72) *L. lanceolata* (lance-like). A graceful symmetrical species, the long narrow fronds tapering from the middle to either end by a remarkably even gradation; usually found about river banks.

Description.—Roots stout, erect or inclined, rarely extending to a short stem. Stalks 2 to 6 inches long, firm, erect, dark-brown, scaly at the base, paler and smooth above. Barren fronds forming a handsome crown, erect or spreading, rather thin and membranous, often curved in general outline, 6 to 8 inches long by 2 to 4 inches broad, green or dark-green. Veins showing conspicuously. Fertile fronds usually shorter than the barren ones.

Abundant throughout the Dominion by the margins of streams, etc. Sea-level to 2,500 feet.

A hardy fern, thriving well under cultivation if supplied with damp and shade. The young fertile fronds are sometimes a deep pink. Found also in Victoria, Tasmania, South Australia, and the Pacific Islands.

189 SIZE, 11½in. x 9½in.



WAIKUMETE.

(73) *L. dura* (hard in texture). A seaside fern, confined to the southern portion of the South Island and some of the outlying islands. Easily recognised by the fleshy, leathery leaves of the barren fronds, and the crowded, close-set leaflets of the fertile ones.

*Description.*—Root stout, erect, sometimes extended to a short stem. Stalks 1 to 2 inches long, clothed at the base with large brown scales, paler and smooth above, firm, erect. Fronds numerous, tufted, forming a crown; barren 1 to  $2\frac{1}{2}$  feet long by  $1\frac{1}{2}$  to 4 inches broad, usually broadest above the middle, very gradually narrowed to the base, dark-green, fleshy to tough. Fertile fronds shorter and narrower than the barren. Seeds very copious, covering the whole under surface.

South Island: Banks Peninsula; eastern and southern coasts of Otago, not uncommon; West Coast Sounds, Stewart Island and Chatham Island, abundant. Auckland, Campbell, and Antipodes Islands.

This species is never found far from the influence of the sea spray. Mr. Field describes it as easy to grow, requiring no shelter. It is confined to New Zealand.



OTAGO.

(74) L. Banksii (Sir Joseph Banks). A seaside plant, never found beyond the influence of salt spray. Recognised by the short wide leaflets in the barren fronds attached to the midrib by a broad base, often alternate, and the fertile leaflets, which are sometimes curved like the roof of a pagoda.

Description.—Root short, stout, woody, erect or inclined. Stalks short, stout, dark-coloured, scaly at base. Fronds numerous; barren 4 to 12 inches high, rarely more, by  $\frac{1}{2}$ in. to 1 inch broad, rather firm in texture, dark-green, sometimes with a seagreen tinge. Fertile fronds usually shorter than the barren ones. Seeds copious, covering the whole under surface.

North Cape, Ahipara, Bay of Islands, Little Barrier, Manukau Heads, East Cape, Cape Egmont, Wellington Heads, Cape Terawhiti, Queen Charlotte Sound, Cape Farewell, West Wanganui, Banks Peninsula, Otago not uncommon both east and west coast, Stewart Island.

This species grows readily under cultivation. It is confined to New Zealand.



193 SIZE, 7in. x 7in.



(74) LOMARIA BANKSII. A Medium Specimen. Barren and Fertile Fronds.

OTAGO.

(75) *L. alpina* (alpine). Fronds much narrower than any others of the genus—half to three-quarters of an inch wide—usually in mountain regions; stalks unusually long, barren fronds shorter than the fertile.

Description.—Roots long, slender, creeping, clothed with rusty-looking scales. Stalks 2 to 6 inches long or more, slender, red-brown, smooth and polished, sparingly scaly. Fronds tufted along the root; barren shorter than the fertile, 4 to 18 inches long, including the stalks, by <u>3</u>in. to <u>3</u>in. broad, spreading or decumbent, dark-green, varying in texture from thick and firm to almost membranous. Fertile fronds erect. Seeds copious, covering the whole under surface.

North and South Islands, Chatham Island, Stewart Island. From the Upper Thames Valley and Rotorua southwards; abundant south of East Cape. Sea-level to 4,000 feet.

A very handsome little fern, easily cultivated. With me it thrives best under swamp conditions. Also found in South America and Australia.



(75) LOMARIA ALPINA. A Medium Specimen. Barren and Fertile Fronds.

WAIMARINO.

(76) *L. capensis* (native of the Cape). "Kio-kio." A species which rivals the tree-fern in dominating the land-scape: often completely clothing the banks of streams or the sides of roads with dense masses of great sweeping fronds that rattle in the breeze. Very variable in size, ranging from a half-starved leaf a few inches long growing in a rocky cleft, to great curved fronds to feet long, each bearing more than 40 pairs of leaflets.

Description.—Roots short, stout, often woody, erect or inclined, sometimes prostrate, clothed at the top with large chestnut brown scales. Stalks stout, long or short, usually densely scaly at the base. Fronds numerous, very variable in size, usually from 1 to 4 feet long, but in dry, exposed places often dwarfed to a few inches, while on the sides of deep wooded ravines they occasionally extend to 10 feet or even more, very stiff and rigid, or almost membranous, bright-green or brown-green, sometimes chequered with both colours, 6 to 24 inches broad. Leaflets of fertile fronds very narrow. Fertile and barren leaflets often mixed on the same stalk. Seeds copious, covering the under side. Most abundant throughout the Dominion. Sea-level to 4,000 feet.

Even more ubiquitous than the bracken, which shuns swamps and the deep shady forest; it grows everywhere, no soil or situation seeming to come amiss—on open downs, dry hill-sides and ridges, the clefts of rocky peaks, on dripping cliffs in deep ravines beside waterfalls, in wet swamps, on banks overlooking the sea.

In making my way up a narrow gully it has sometimes been necessary to leave the bed of the stream to avoid deep pools and clamber along the steep banks. Should these be clothed with *L. capensis* I know of no tougher battle than to struggle through the tangled fronds; they are too close to creep beneath, while to trample under foot the palm-like leaves that rise high above one's head is a herculean task.

The barren fronds are strikingly handsome, the shining leaves serrated finely along the margins, the undulating surface catching the light at different angles and giving the fronds a singularly glistening appearance.



WAITEMATA.

Even the parti-coloured leaves add an artistic charm, and the bright salmon-pink which the young fronds sometimes assume is indescribably beautiful.

Needless to say, this was one of the species that grew spontaneously in my garden. The young fronds soon make their appearance after transplanting, and grow rapidly. In a specimen from swampy ground the soft young shoots were very tender, of a delicate reddishgreen, that looked almost transparent, the leaves smooth and flat without any undulations, quite unlike the bright salmon-pink I have seen in specimens growing in drier localities. This abundant and very varied species was broken up into four varieties by Sir J. D. Hooker, but the definitions are hardly clear enough for anyone but a practised botanist to follow with any certainty.

On the roads between Picton, Nelson, and Hokitika I passed along miles where the upper bank was fringed with the great sweeping fronds, which gave quite a character to the landscape. It is widely distributed in the Southern Hemisphere, extending to Mexico and Malaya.

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(77) Var. minor (less). Smaller than the foregoing; I to 3 feet high, dark olive-green, sometimes a copperybrown; fertile fronds usually exceeding the barren; leaflets few, four to eight pairs. In some respects it approaches L. vulcanica. It has so different a habit and mode of growth from L. capensis that Mr. Cheeseman thinks it may prove to be a separate species.



(77) LOMARIA CAPENSIS, VAR. MINOR. A Medium Specimen. Barren and Fertile Fronds.

PICTON.

SIZE, 8in. x 8in.



PICTON.



(78) L. filiformis (thread-like—in allusion to the fertile fronds). An inveterate climber, usually seeding at some height above the ground, sometimes almost out of sight up lofty trees, most readily distinguished by the graceful fertile fronds.

Description.—Root long, stout, branched, climbing up trees to a great height, clothed with rough scales. Barren fronds very numerous, scattered along the root, those on the ground or the lower part of the creeping root, small, 3 to 6 inches long by  $\frac{1}{2}$ in. to 1 inch broad, sharply and deeply toothed, and those up the trees much larger, 12 to 30 inches long by 3 to 6 inches broad, pendulous, inclined to be stiff, green to dark-green. Fertile fronds from the upper part of the root. Leaflets numerous, 3 to 6 inches long by  $\frac{1}{8}$ in, broad, very narrow, almost thread-like. Seeds copious, covering the whole under side.

Abundant throughout the Dominion. Sea-level to 2,000 feet.

A species very remarkable for having two forms of barren fronds; the smaller, with sharp-toothed leaves 4 in. by 3 in., often covering the ground for a considerable area, is not accompanied by fertile fronds; it grows over everything—earth, stones, fallen logs, roots. On reaching a tree trunk it at once begins to mount, when a curious change takes place; the creeping root thickens, the leaves, assuming their second form, grow six times as large, attaining a size of 30 in. by 6 in., festooning lofty tree trunks with innumerable drooping fronds, and eventually putting forth those bearing seeds, which, seen high overhead against the sky, have the thread-like appearance that suggested the name.

If care be taken in selecting a terrestrial portion of the root it is easily cultivated. Specimens have been introduced into my fernery on the roots of other plants, and have become well established; in one instance it sowed itself spontaneously. Found also in the Fiji Islands.

### 205 SIZE, 13in. x 9<sup>1</sup>/<sub>2</sub>in.



(78) LOMARIA FILIFORMIS. WAITAKERE. A Small Specimen. Barren and Fertile Fronds. Small Ground Frond, 3½in. long.

(79) L. nigra (black). A small species, readily recognised by the blackish-green colour and the broadening out of the terminal part of the fronds. It is a scarce fern.

Description.—Root short, stout, semi-erect. Stalks densely clothed with chaffy scales, 1 to 3 inches long. Barren fronds in spreading tufts, 3 to 8 inches long by 1 to  $1\frac{1}{2}$  inches broad, membranous, blackish-green or lurid-green. Leaflets, 4 to 8 pairs, unequal in size, the terminal one much the largest, the lowest pair larger than those immediately above. Fertile fronds few, erect.

North Island and East Coast of South Island, scarce. 1,000 feet to 3,000 feet. Abundant in Westland, where it descends to the sea.

Almost a mountain species in the North Island, where it frequents dark, gloomy forest gullies. As it is difficult to reproduce its natural haunts it is not easily cultivated. Confined to New Zealand.



(80) *L. fluviatilis* (riverine). Most readily recognised by the fertile fronds on which the short leaflets grow very upright, almost parallel with the stalk. The barren fronds are not unlike those of *Pellaca rotundifolia* in general outline.

Description.—Root stout, semi-erect, often woody, densely clothed with chestnut-brown scales. Stalks very short, covered with scales. Barren fronds very numerous, 12 to 30 inches long by  $\frac{3}{4}$ in. to  $1\frac{1}{2}$  inches broad, texture rather membranous, dark-green to olive-green. Fertile fronds erect. Midribs densely scaly, giving a brown hue to the plant. Seeds copious, covering the whole surface.

Fairly abundant throughout the Dominion. Sea-level to 2,500 feet.

A very handsome, decorative species, hardy and easily cultivated, showing to perfection when the narrow darkgreen fronds droop over the edge of a flower pot and form a crown-like setting to the tall, erect fronds in the centre.<sup>\*</sup> It is also found in Victoria and Tasmania.



WAITAKERE.

(81) *L. membranacea* (membranous). A species that usually grows in tufts on river banks close to the water, and at first sight is apparently a small form of *L. lance-olata*, but, on a nearer inspection, the leaflets are seen to be shorter, rounder, more blunt, and distinctly separated from one another.



Description.—Root stout, semi-erect. Stalks very short, scaly at base. Fronds tufted, barren 3 to 10 inches long by  $\frac{3}{4}$ in. to  $1\frac{1}{2}$ inches broad, membranous, pale-green, smooth, margins coarsely toothed, veins conspicuous; fertile fronds usually longer than the barren. Seeds copious, covering the whole surface.

North Island: In shaded places by the banks of streams, not uncommon throughout. South Island: In various localities on the East Coast from Nelson to Otago, but rare and local. Sealevel to 2,000 feet.

Large forms of this species are difficult to distinguish from *L. lanccolata*, if, indeed, the two species do not pass directly into each other. It is easily cultivated, and is confined to New Zealand.



(82) *L. Fraseri* (Mr. Fraser). A very handsome and distinct species, sometimes covering the forest floor with miniature forests, for it usually grows upon a stem. Unlike the other species of *Lomaria*, the fertile and barren fronds bear a close resemblance to one another when viewed from above.



Description.—Roots erect, with a dense tuft of dark-brown scales at the tip, often elongated into a stem 6 to 24 inches high or more, resembling the trunk of a minute tree-fern. Stalks 3 to 9 inches high, scaly towards the base. Fronds 9 to 18 inches long by 3 to 6 inches broad, quite smooth, almost membranous, glistening, dark-green. Midrib and upper part of stalk furnished with deeply-indented wings. Fertile fronds similar to barren, but rather smaller and with narrower leaflets. Seeds copious, covering the whole under surface.

North Island: Abundant in dry woods from the North Cape to Upper Waikato and Taranaki. South Island: Massacre Bay, West Wanganui, extending along the West Coast to Charleston. Sea-level to 2,000 feet.

A very remarkable species; the curious toothed wing showing on either side of the midrib like triangular teeth, gives the frond a most unique appearance. It is most abundant in the North, sometimes covering acres of ground with innumerable tufts of shining, darkgreen fronds. It is not difficult to grow if young plants are taken from open situations. Confined to New Zealand.
Lomaria



WAITAKERE.

# XVII. DOODIA

DOODIA (to honour Mr. Doody, a London apothecary and British cryptogamist), A small genus of 5 species, with 2 species and 1 variety in New Zealand. Little tufted ferns with narrow fronds. Seeds oblong or slightly curved, generally in one row parallel to and on each side of the midrib, protected by a thin covering which springs from the under side of the leaf.



#### D. MEDIA

(83) **D.** media (intermediate). There is no mistaking the tufts of lance-like fronds, the sprouting young ones of a rosy-red that tinges a whole bank with colour. Seeds parallel to and nearer the midrib than the margin, a habit quite unlike that of any other New Zealand genus.

Description.—Root short, stout, semi-erect. Stalks 3 to 18 inches long, more or less scaly towards the base, smooth or rough, blackish-brown. Fronds 12 to 18 inches long by  $1\frac{1}{2}$  to 4 inches broad, texture firm and stiff, dark-green, rough to the touch. Seeds short, oblong, usually in one row on each side of the midrib, but sometimes portions of a second row are irregularly developed.

North Island: Abundant from the North Cape to the East Cape; from thence rare and local to Cook Strait. South Island: Port Hills, Nelson. Sea-level to 1,000 feet.

This species is very abundant about Auckland, being one of the last to disappear before settlement. One still Doodia

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(83) DOODIA MEDIA.

A Medium Specimen. Under Side.

ORAKEI.



(83a) DOODIA MEDIA.

A Medium Specimen. Under Side.

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MANUKAU.



FROM MANU BRIDGE, WHANGAREI

## NEW ZEALAND FERNS

sees it in the suburbs in situations where it cannot be trodden upon by grazing animals, such as under hedgerows. It also thrives on clay banks almost washed by the salt tide. I have gathered on Waiheke Island a form that has a double row of seeds on each side of the midrib throughout. An easy fern to cultivate in Auckland; one of those that sowed itself in my garden. When once established it does not mind the blazing sun or a few weeks' drought. Found also in Australia, Norfolk Island, and the Pacific Islands.

(84) Var. Milnei (Mr. Milne). Larger than D. mcdia; fronds 1 to 2 feet long by 6 to 12 inches broad. Leaflets closely placed, narrowed into long tapering points. Seeds copious in two rows on each side of the midrib. Kermadec Islands abundant.

Doodia



(81) DOODIA MEDIA, VAR. MILNEI. A Large Specimen. Under Side.

KERMADEC ISLANDS.

(85) **D.** caudata (tailed). "Moki-moki." A smaller and slighter plant than *D. media;* the leaflets of a different shape, stalked, much wider apart; it also has distinct barren and fertile fronds.

Description.—Root short, semi-erect. Stalks 2 to 4 inches long, slender, black or nearly so. Fronds numerous, densely tufted, 3 to 12 inches long, rarely more, by  $\frac{3}{4}$ in. to 2 inches broad, membranous, green to pale-green. Barren fronds usually shorter and less erect than the fertile, often decumbent. Fertile fronds harsher and more rigid. Seeds in a single row on each side of the midrib.

North Island: From Kaitaia southwards to Cook Strait; but local and often absent from large areas. Sea-level to 2,500 feet.

This species does not grow in the profuse abundance of D. mcdia. It is a pretty, dainty little fern; apparently a common plant in Australia.

According to Mr. Cheeseman, "A small variety found on the Rimutaka Ranges, Wellington, is said to have scented fronds, and to have been formerly collected by the Maoris for the purpose of mixing with oil for anointing the person; but I have never been able to perceive any fragrance. Perhaps *Polypodium pustulatum* has been mistaken for it."



(85) DOODIA CAUDATA. A Large Specimen. Barren and Fertile Fronds.

WHANGAREI.

# XVIII. ASPLENIUM

ASPLENIUM (splen, the spleen—used as a remedy for diseases thereof). A large genus of about 350 species, with 12 species and 8 varieties in New Zealand; very variable in size and shape. Seeds linear or oblong, placed obliquely to the midrib, protected by a blade-like covering springing from the under surface of the leaf.



A. LUCIDUM

(86) A. flabellifolium (fan-leaved). "Necklace fern." A charming little fern, quite different from any other New Zealand species of Asplenium. The small, fanshaped leaflets, set on each side of a long slender stalk, adapt themselves to the uneven surface of the rocks and stones, among which they love to grow.



Description.-Roots short, stout, clothed at the top with blackish scales. Stalks 1 to 4 inches long, rarely more, slender,





(86) ASPLENIUM FLABBELLIFOLIUM. Medium to Large Specimen. Upper and Under Side.

AUCKLAND.

green above, dark-brown below. Fronds few, tufted at the top of the root, weak and tender, decumbent, green to light-green, 6 to 14 inches long by  $\frac{1}{2}$ in. to 1 inch broad. Midrib smooth and green, rooting at apex. Seeds in short oblique lines.

From the Bay of Islands to Otago, not uncommon in rocky and stony places. Sea-level to 2,000 feet.

Besides the unusual property of taking root at the end of the long slender stalk and producing a fresh plant, the upper leaflets are sometimes extended into naked tips which also root and produce fronds. It is easily cultivated, either in a rockery or in hanging pots. Though usually growing in rocky or stony ground, I have found it luxuriating under a hawthorn hedge on rich alluvial soil at Tua-marina, near Blenheim.

The following account of this charming little fern is taken from a letter:—

The other day I set out to get a specimen for my fernery. After a considerable hunt I found some plants growing on a rough stone wall, but they were small and meagre. I turned to retrace my steps, disappointed at my failure, and had reached a swelling mound of lava, when a boy hailed me from over the wall.

"Are you getting ferns, mister?"

"I'm trying to-there's hardly one to be seen."

"Have you been into the cave?"

"I see no cave."

"Over there," he said, pointing to the bare mound behind me.

I could not perceive the least sign of a cave, and turned to see if the boy were in earnest. He got over the wall and showed me. Within ten yards of where I was standing was a slight depression in the ground, partially hidden by grass and weeds. Dropping to my hands and knees, and parting the herbage I looked down into the most lovely grotto I ever beheld. Below the narrow opening it widened out to a diameter of about six feet. Moss-grown rocks projected from the sides and bottom, almost hidden under a green tracery of the fan-leaved

#### Asplenium

fern, of a larger and more luxuriant growth than I had ever seen—a bridal veil of light-green lacework. Further down I caught sight of the little round leaves of *Pellaca rotundifolia* and a few ethereal-looking fronds of *Pteris tremula*; altogether an entrancing picture beyond the power of words to describe. After feasting my eyes for several minutes, I raised my head to look round; the contrast could not have been greater—a scanty turf, black rocks, a few coarse bushes of ink-weed!

It filled me with wonder to think of this fairy grotto within a few miles of a large city containing thousands of wanton hands that would have ravaged and despoiled it of its treasures did they but know of its existence. Was I the first to appreciate the beauty of those fragile fronds, clothing the moss-grown rocks with radiating sprays—one of Nature's masterpieces? The boy had certainly seen the grotto first, but he regarded it only with disfavour, having made the discovery by falling in and bruising his shins when driving home the cows.

Nature, with her scorn for vulgar advertisement and her prodigality of superlative workmanship, taught me a lesson. Had I created anything only a thousandth part as beautiful, instead of hiding it away with a chaste reserve, I should have brought all my friends to admire. The boy urged me to climb down and help myself, he could not understand my forbearance, my disinclination to mar such perfection.

The species is found also in temperate Australia and Tasmania.

(87) A. trichomanes (hair-like). A smaller and much more rigid species that A. flabellifolium, usually only 6 inches long, with a single row of closely-set leaflets on either side of the stalk, found generally in the mountains.

Description.—Roots short, stout, fibrous, more or less clothed with dark-brown scales. Stalks 1 to 4 inches long, dark chestnutbrown, smooth and glossy. Fronds tufted, rigid, erect, 3 to 12 inches by §in. to §in. broad, firm in texture, green to dull-green. Seeds in oblique lines.

North Island: Kaimanawa Mountains, Otorohanga, Petane, Puketapu, Mount Egmont, Tararua Ranges. South Island: Not uncommon in mountainous regions throughout. Sea-level to 4,000 feet.

For many years it was supposed to be confined to the South Island, but of late it has been found in several parts of the North Island. A very widely distributed species; the Maidenhair Spleenwort of England.

# Asplenium

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OTOROHANGA.

(88) *A. falcatum* (scythe-shaped). Most readily distinguished by the uneven shape of the leaflets—rounded above, hollowed or straight below. Seeds in long narrow lines slightly oblique.



Description.—Roots short, stout, creeping, more or less clothed with brown scales. Stalks 6 to 12 inches long, dark-brown, firm, hairy at the base, sometimes throughout. Fronds erect or pendulous, 1 to 3 feet long or more by 3 to 7 inches broad, texture firm, dark-green or brownish-green above, paler beneath. Veins close and distinct. Seeds numerous, diverging obliquely from the midrib.

Abundant throughout the Dominion. Sea-level to 2,000 feet.

An exceedingly handsome decorative species, varying greatly in size and shape, and growing everywhere—the trunks of trees, rocks, perpendicular or overhanging banks, among the crowded tufts of *Astelia* in tree-forks or upon rocks. One day I encountered a lovely sight; the roots had clasped a slender sapling about five feet from the ground, and thrown out a fringe of great sweeping fronds that nearly touched the earth—some measuring over 4 feet in length. A stray sunbeam, filtering through the branches of a giant kauri pine, lighted up the dark glossy leaves with splashes of silver.

Though it has an irresistible attraction for the fern gatherer, and often seems to subsist on nothing more substantial than air, it is by no means easy to transplant. The young crooks appear in the usual way, expanding the lower leaflets long before the upper ones come into Asplenium



(88) ASPLENIUM FALCATUM. Small to Medium Specimen. Upper and Under Side. AUCKLAND.

sight. It was one of those that sowed themselves in my garden. Widely distributed in the temperate regions of both hemispheres.

(89) A. caudatum (tailed). Hardly to be distinguished from A. falcatum; reported only from the Kermadec Islands. A widely distributed species, named caudatum because of the tailed-like terminations of the leaflets.

Description.—Root short, creeping, scaly. Stalks 6 to 9 inches long, scaly or not. Fronds 1 to 2 feet long by 3 to 8 inches broad, dark-green. Veins close and distinct. Seeds shorter than in A. falcatum, not nearly reaching the margin.

Kermadec Islands, Sunday Island, not uncommon.

A widely-spread plant; differing from *A. falcatum* only in the more tailed leaflets and the shorter seeds. "Apparently a form of *A. falcatum*," Sir J. D. Hooker.

## Asplenium



(89) ASPLENIUM CAUDATUM. A Medium Specimen. Under Side.

KERMADEC ISLANDS.

(90) A. obtusatum (blunt). A seaside plant, usually growing on rock faces; more plentiful on the outlying islands. Sometimes confused with A. lucidum, but a much smaller plant, with short, thick, bluntly-rounded leaflets.



Description.—Root short, thick, often forming a hard rounded mass, densely scaly. Stalks 2 to 6 inches long, erect, very stout, almost fleshy, greyish-green, scaly at base. Fronds 2 to 12 inches long, without the stalk, by 1 to 3 inches broad, very thick and tough, deep green. Seeds oblique, usually copious, not reaching midrib.

On maritime rocks throughout the Dominion.

My first sight of this curious-looking fern came as somewhat of a shock; the leaves were so round and packed so close together I took it for a large species of ice-plant—it was growing in a neighbouring fernery. It is easily cultivated. A widely-spread species in the Southern Hemisphere.

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COROMANDEL.

(91) A. lucidum (bright). "huruhuru-whenua." Perhaps the most easily found fern in New Zealand; there is no overlooking the broad glossy fronds that seem to wave an invitation to the fern gatherer—to be stuffed into a kerosene tin or an old box and allowed to languish in a neglected corner of the verandah! Easily recognised by the herring-bone pattern on the backs of the broad leaves.



Description.—Root short, stout, often forming a hard rounded mass, clothed at the top with large brown scales. Stalks 6 to 18 inches long, stout, densely scaly at base, sometimes dark-brown above and below, separated by a narrow hair-like line of green on either side. Fronds 12 to 36 inches long without the stalks, by 6 to 14 inches broad, erect or drooping, dark-green, glossy and shining, paler beneath, texture firm, margins of the leaflets finely serrated. Veins usually evident. Seeds very numerous, in long oblique lines.

Abundant in lowland districts throughout the Dominion.

A strikingly handsome species; its presence in a forest glade adds not a little to the richness and luxuriance of the scene. It differs markedly from all the other native species except *A. obtusatum*, with which it is connected by transitional forms. It grows in almost every situation —on dry rocky banks exposed to the blazing sun, in the deep cool shade of the forest, in the upper forks of tall trees, about old stumps, on the ground, on the stems of tree-ferns.

The growth of a young frond, though somewhat slow, is an interesting study. As the crook unrolls it exposes the side leaves, of a light vivid green, shining as if lacquered over with a transparent varnish. The young



(91) ASPLENIUM LUCIDUM. A Medium Specimen. Under Side.

WAITEMATA.

SIZE. 17in. x 15in.



WAITEMATA.



leaflets, standing in a row on either side of the upright midrib, slightly curved towards each other, give the impression of clasping something precious between their tender green tips. As the frond matures the colour darkens, the leaves flatten and soon develop the long conspicuous lines of seed. It is very easily grown—even surviving the neglected kerosene tin—and has a wide range outside New Zealand—Norfolk Island, Lord Howe Island, Australia, and some of the Pacific Islands.

(92) Var. obliquum (slanting). Fronds smaller and inclined to be leathery; leaflets placed closer, not so pointed; seeds shorter; approaches *A. obtusatum*. From the North Cape to Campbell Island.



(93) Var. scleroprium (scleros, hard; prion, a saw). Fronds fleshy, leathery, 12 to 18 inches high or more. Leaflets closely placed, deeply serrate or forked. Seeds linear, marginal. A transitional form from *A. flaccidum*. Here-kopere Island, near Stewart Island, Auckland and Campbell Islands.

### Asplenium

## 241 SIZE, 12<sup>1</sup>/<sub>2</sub>in. x 5in.



(93) ASPLENIUM LUCIDUM, VAR. SCLEROPRIUM. AUCKLAND ISLANDS. A Medium Specimen (Gathered by Sir J. D. Hooker). Under Side. (94) Var. Lyalli (Mr. Lyall). The same size and habit as the type, but more divided. In various localities from Mangonui and the Bay of Islands to Otago, but rare and local, and always in small quantities. Also in the Chatham Islands.

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(94) ASPLENIUM LUCIDUM, VAR. LYALLI. A Medium Specimen. Under Side.

CANTERBURY.

(95) Var. anomodum (?). Fronds small, 2 to 12 inches long, including the stalk, pale-green, almost membranous, more or less covered beneath with chaffy scales, the lower leaflets divided; seeds short, oblique. Found usually in limestone districts. Hawke's Bay—Petane, Te Aute, Norsewood, Takapau. Nelson—Whanga-peka Valley and Mount Arthur Plateau, ascending to nearly 4,000 feet.



(96) A. Hookerianum (Sir J. D. Hooker). A small, dark-green species with fronds of an open pattern, usually growing below overhanging banks, on steep faces, and on rocky ground.



Description.—Root short, stout, rounded, clothed at the top with brownish scales. Stalks 1 to 4 inches long or more, greyishgreen. Fronds tufted, spreading, 2 to 10 inches long, without the stalk, by 1 to 4 inches broad, almost membranous, dark-green. Seeds, 2 to 5 on a leaflet, short, oblong, remote from the margin.

From Mangonui and Kaitaia to the south of Otago; but often local. Sea-level to 2,500 feet.

A very variable little plant, reminding one of small forms of *A. bulbiferum*, but more open. It is easily cultivated. Found also in New South Wales and Victoria. Asplenium

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(96) ASPLENIUM HOOKERIANUM. A Large Specimen. Upper and Under Side.

WHANGAREI.

# NEW ZEALAND FERNS

NATURAL SIZE.



A Small Specimen. Under and Upper Side.

WAIRARAPA.
(97) Var. Colensoi (Mr. Colenso). A small fern with pale-green fronds, usually flaccid. Seeds oblong, solitary, along the margins of the leaflets. Found throughout the Dominion, but often local.

NATURAL SIZE.



(97) ASPLENIUM HOOKERIANUM, VAR. COLENSOI. A Small Specimen. Under and Upper Side. WAIRARAPA.

(98) A. bulbiferum (producing bulbs). Any person at all familiar with the New Zealand bush cannot fail to have noticed a very beautiful and typical fern leaf bearing on its surface a number of seedlings. With one somewhat rare exception this is the only native species possessing this mode of reproduction, consequently there can be no difficulty in fixing its identity. It is the most plentiful of the *Aspleniums* in New Zealand.



Description.—Root short, stout, erect or oblique, crowned with brown scales. Stalks 4 to 12 inches long or more, darkbrown below, green or greyish-green above, densely scaly at the base. Fronds 1 to 4 feet long or more by 6 to 12 inches broad, bright-green, firm, almost succulent, upright or drooping. Seeds short, oblique, often marginal.

Abundant throughout the Dominion, especially in damp woods. Sea-level to 3,000 feet.

A handsome, graceful species, a very giant in comparison with the English spleenworts. In damp sheltered gullies near Auckland I have seen the tender green fronds rising from the ground in graceful curves to a height of 6 feet—a sight not easily forgotten.



(98) ASPLENIUM BULBIFERUM. A Medium Specimen. Under Side.

WAIKUMETE.

The stalks and all the branches are grooved on the upper surface with a double furrow, which imparts an extraordinary richness to the appearance of the fronds. The little bulbs that appear on the face of the leaf are not true seedlings. Though they give the appearance of fertility to the leaf they are scattered too irregularly to add much to its beauty. I have gathered a large species of *Asplenium* in Samoa that had a row of these seedlings down each side of the midrib, one at the base of every leaflet; they looked extremely ornamental, like a double row of green rosettes. If these bulbs are carefully removed with a piece of the leaf to which they are attached, and planted on damp mould, they will strike root and produce mature plants. Probably the New Zealand badge of the fern-leaf was taken from this species.

A wide-spread, easily-cultivated plant.

ASPLENIUM

NATURAL SIZE.



(99) Var. laxum (loose). Fronds smaller, more slender, with narrower and more remote leaflets; more deeply divided, the upper surface glistening brightly, seeds often marginal; it does not produce bulbs. Found throughout the Dominion

### Asplenium

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AUCKLAND.

(100) Var. tripinnatum (three-pinnate). Fronds ample; thrice divided; leaflets narrow, resembling some forms of *A. flaccidum*, but more compound and the texture thinner; producing bulbs sparingly. Found throughout the Dominion. I have met with no more ravishing picture than the uncurling fronds of this species.

Mr. Cheeseman has an interesting note on this species. "The typical state of A. bulbiferum is a well-known plant throughout the whole of New Zealand, and is at once distinguished from the other species of the genus by the ample dark-green bipinnate fronds with comparatively broad pinnules, and especially by its habit of producing small bulbils on the upper surface of the frond. . . . When the bulbils are not developed, and the frond is more slender, with narrower and more deeply-divided pinnules, so that the sori are often almost marginal, the plant becomes Var. laxum. . . Var. tripinnatum has still narrower pinnules . . . and the sori are quite marginal. . . . In addition to the above varieties, there are a large number of puzzling forms which apparently connect the species with A. falcatum, A. lucidum Var. Lyalli, A. lucidum Var. scleroprium, A. Hookerianum, A. Rich ardi, and A. flaccidum. . . ."

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SIZE, 14in. x 8in.



(100) ASPLENIUM BULBIFERUM, VAR. TRIPINNATUM. Medium to Small Size. Under and Upper Side.

KAIPARA.

(101) A. Richardi (M. Richard). A somewhat puzzling species, standing midway between A. Hookerianum Var. Colensoi and A. flaccidum. A South Island fern, reported only from the Tararua Ranges in the North Island.

Description.—Root short, stout, usually forming a rounded knot-like stem, clothed at the top with dark-brown scales. Stalks 2 to 6 inches long, stout, rigid, erect, greenish, usually clothed with scales. Fronds tufted, 3 to 9 inches long, without the stalks, by 1 to 4 inches broad, dark-green, varying from firm to almost membranous in texture. Seeds short, broad, along the margins of the leaflets.

North Island: Tararua Ranges. South Island: Not uncommon in hilly and mountainous country throughout. Sea-level to 4,000 feet.

### Asplenium

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(101) ASPLENIUM RICHARDI. A Medium Specimen. Upper and Under Side. (102) A. flaccidum (limp). "Pohutu-kawa." When seen hanging from the forest trees, 3 feet long, the leaflets narrow and thick, as if cut from a piece of palegreen leather, it is an odd-looking plant, quite unlike any other New Zealand fern.



Description.—Root short, stout, erect, clothed at the top with dark-brown scales. Stalks usually rather short, greenish, scaly at the base. Fronds tufted, very variable in size and shape, 3 inches to 3 feet long or more by 2 to 9 inches broad, thick and leathery, flaccid and pendulous, or rigid and erect, green to pale-green, guite smooth. Seeds oblong, usually on the margins of the leaflets.

Abundant throughout the Dominion. Sea-level to 3,500 feet.

A most ubiquitous species, growing in all sorts of odd corners, most usually on trees and rocks, varying so much in size and appearance that division into groups would facilitate classification. It is putting a severe strain on the faith of a student to be asked to believe that a great pendulous frond hanging 3 feet from the trunk of a tree is the same species as a stiff, upright, almost spiky little plant a few inches high. Dr. Hooker enumerated five varieties in his Handbook; only one— *Shuttleworthianum*—has been retained by Mr. Cheeseman.

The illustrations show what very divergent forms are classed under *A. flaccidum*. It is easy of cultivation, being one of those which grew spontaneously in my garden. A wide-spread plant, occurring in Australia, Tasmania, and the Pacific Islands. Asplenium

SIZE, 10<sup>1</sup>/<sub>2</sub>in. x 8in.



A Medium Specimen. Under Side.

HUNUA.

SIZE, 6in. x 6in.



(102a) ASPLENIUM FLACCIDUM. DIVERGENT FORMS. UNDER SIDE.

SIZE, 11in. x 9<sup>1</sup><sub>2</sub>in.



(102b) ASPLENIUM FLACCIDUM. DIVERGENT FORMS.

UNDER SIDE. (See also page 271)

(103) Var. Shuttleworthianum (Mr. Shuttleworth). Fronds broader and much more compound, I to 2 feet long by 4 to 10 inches broad, leathery, dark-green. Seeds short, quite marginal. Kermadec Islands, abundant.

### ASPLENIUM

## SIZE, 17in. x 7<sup>1</sup>/<sub>2</sub>in.

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(103) ASPLENIUM FLACCIDUM, VAR. SHUTTLEWORTHIANUM. KERMADEC ISLANDS. A Medium Specimen. Under Side. (104) A. umbrosum (shady). A somewhat scarce fern in New Zealand, frequenting alluvial or calcareous soils in dark shady woods, or along river banks, disappearing before settlement. A large, handsome species, the little herring-bone rows of seeds very noticeable.



Description.—Root short, stout. Stalks 1 to 2 feet long, stout, erect, scaly at the base, brownish-green. Fronds variable in size, 1 to 4 feet long, without the stalks, by 9 inches to 3 feet broad, spreading, sometimes drooping at the tip, light to dark-green, membranous, flaccid. Seeds conspicuous, usually five to six rows on each leaflet, short, oblong.

North Island: Not uncommon from Mangonui County to the East Cape and Taranaki; from thence to Cook Straits somewhat rare. South Island: Picton, Nelson, Foxhill, West Wanganui. Sea-level to 1,800 feet.

I was unfortunate in my early search for this fern, finding it first at Koromiko, Picton, a locality not mentioned in Mr. Cheeseman's Manual.

Mr. Thomson describes it as too delicate\_for outdoor culture, an opinion not endorsed by Mr. Field. No doubt they are each right, for their respective districts—Dunedin and Wanganui. In Auckland it is one of the easiest ferns to grow.

It is a wide-spread species, found in Australia, India, Africa, Canary Islands, Azores and Madeira.

Asplenium

SIZE, 19in. x 14in.

267



PICTON.

(105) A. japonicum (from Japan). A small, delicate, pale-green fern, the rarest *Asplenium* in New Zealand; reported only from the Kermadec Islands and the northern end of the North Island. Usually growing on the shady banks of creeks.



*Description.*—Root long, slender, creeping, densely scaly at the tip. Stalks 3 to 9 inches long, slender, pale-brown or straw-coloured, scaly when young, especially near the base. Fronds 6 to 12 inches long, without the stalk, by  $2\frac{1}{2}$  to 5 inches broad, pale-green, thin and membranous. Seeds narrow, oblong.

Kermadec Islands, not uncommon. North Island: Fairly plentiful on banks of creeks, Mangonui County, Bay of Isalnds, Whangarei, Northern Wairoa.

The following extract from a letter to a brother collector describes my finding of this fern:—

"I experienced the most extraordinary luck at Whangarei. Whether due to my disturbed night on board the steamer or the ungodly hour at which I had been roused from my bunk I cannot say, but my wits were somewhat confused: I seemed to be in a kind of trance. On reaching the hotel I had three-quarters of an hour to wait for breakfast, with absolutely nothing to do, so I jumped on my bicycle and rode out in search of *Doodia* caudata, which I knew was to be found in the neighbourhood. It was a clear, still day, with very few people about. I looked absent-mindedly along the hedgerows, but my bicycle seemed to take charge; instead of continuing along the straight road it turned down one that led to the right, took me down a hill and then stopped dead; I could not move it a yard! In front was a level road, on the right a gate into a field where there was some bush, on the left an unusually stiff barbed-wire

Asplenium

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KAITAIA.

fence: yet it was this to which I was irresistibly drawn, and over which I had to climb.

Under some trees I saw plenty of *Doodia media* and some *Adiantums*, but no *D. caudata*, the fern for which I was looking. I also noticed several small pointed fronds of what I took to be *Hypolepis*, and I looked out for a full-grown specimen, but there was none. After traversing the patch of bush twice, I turned to retrace my steps, concluding that I had been an ass to put such a formidable fence between me and the road. Something unusual about the outline drew my eyes again to the young pointed fronds growing on the side of a little bank. Mechanically I stooped down and turned up the back of a frond—ASPLENIUM!!! Without a doubt, there were the little herringbone lines of seed—JAPON-ICUM!!! Yes, it must be, though it had never been reported from Whangarei.

Wonderful luck. Within half an hour of reaching Whangarei I had found a fern that I had not seen during my 40 years' collecting—what collectors call "beginner's luck." Digging up a root or two for my fernery in Auckland, I packed them carefully in my kit and returned to the hotel with my wits remarkably on the alert. I was so bursting with exultation that I had to tell the first person I met—a commercial traveller—my excitement being such that it stirred even his mercenary soul. Since this was written it has been reported from south-west of Taupo and Nelson."

This is a wide-spread species, ranging through Polynesia, Malay Archipelago, India, China, and Japan.



NATURAL SIZE.



4

MANUKAU HEADS. (See also page 260)

## XIX. ASPIDIUM

ASPIDIUM (aspidos, of a shield—the covering of the seeds). "Shield Fern." A genus of about 70 species, with 5 well-authenticated species and 1 variety in New Zealand.



#### A. CAPENSIS

(106) A. aculeatum (sharp pointed). Var. vestitum (clothed). Most easily recognised by the dark-coloured scales on the stalk and running right up the middle of the frond. Usually a terrestrial plant, forming a hand-some crown of radiating leaves.



Description.—Root short, stout, erect, sometimes extending to a stem, 1 to 4 feet high. Stalks 6 to 18 inches long, stout, erect, densely clothed with spreading scales, glossy, black or darkbrown with a pale margin, or tawny. Fronds numerous, forming a spreading crown, 1 to 3 feet long, without the stalks, by 4 to 9 inches broad; the points of the leaflets almost like prickles, texture firm, dark-green, sometimes with shades of brown. Seeds, 6 to 8 to a leaflet, in two rows nearer the midrib than the margin.

Found throughout the Dominion; rather local from Cape  $\overline{Col}$ ville to East Cape; not uncommon in hilly districts from thence to Wellington; abundant to the south of Cook Strait. Sea-level to 3,500 feet.

## Aspidium

273



PICTON.

An extremely handsome species; the conspicuous scales making a fine contrast to the dark-green leaves. It is easily cultivated, and makes a welcome addition to the fernery. The species varies greatly in the size, shape, and texture of the fronds, and in many other respects. The fronds are sometimes forked or crested at the tip, and are sometimes proliferous.

A. aculcatum, in some of its forms, is found in almost all parts of the world. The English type is known as the "Narrow Prickly Shield Fern." The New Zealand variety, mainly distinguished by the dark-coloured scales covering stalk and midrib, is also found in Australia, Tasmania, and Fuegia.

(107) *Var. sylvaticum* (sylvan). Smaller and much more slender. Fronds few, 12 to 24 inches long, including the stalks, less firm in texture and of a lighter green; the covering of the seeds not developed.

*Note.*—I have not included *A. mohriodes*, which has only once been reported from the Auckland Islands.

Aspidium

275



(107) ASPIDIUM ACULEATUM, VAR. SYLVATICUM. A Medium Specimen. Under Side.

WAIKATO,

(108) A. Richardi (M. Richard). A prickly-looking species, harsh to the touch, dark-green; the seeds when young covered by a circular disc with a black dot in the centre.



Description.—Root short, thick, densely clothed with darkbrown scales. Stalks 6 to 18 inches long, more or less clothed with scales and woolly hairs. Fronds few, tufted, 9 to 18 inches long, without the stalks, by 3 to 9 inches broad, dark-green, sometimes changing to red-brown towards the outer edges, lighter coloured beneath; leaflets pointed finely, like prickles. Seeds covered by a circular disc, in two rows on each leaflet, about midway between the midrib and the margin.

From the North Cape to South Otago, not uncommon, especially near the sea; abundant in the King Country, unusually large and luxurious on Mokoia Island, Rotorua.

A species easily grown, not averse to hot sunshine; one of those which sowed themselves in my garden. The unrolling crook is of a speckled grey colour, maturing quickly and soon producing seeds. Found also in Fiji.

The young fronds of this fern show none of the harshness and rigidity of the mature plant; the grey stalks making a lovely contrast to the tender-green leaves; the black-green stripe shooting like a dart along each midrib adds much to the beauty of the frond.

A very divergent form of this species is illustrated (108a) from the West Coast, near Manukau Heads. The difference between the young plants as pictured (108b) is very striking.

## Aspidium

## 277

SIZE, 12in. x 10in.



(108) ASPIDIUM RICHARDI. A Medium Specimen. Upper and Under Side. AUCKLAND.





(108a) ASPIDIUM RICHARDI. (Variety?) A Medium Specimen. Under Side.

MANUKAU HEADS.

Aspidium



(108b) ASPIDIUM RICHARDI. MANUKAU HEADS. From young plants growing in my garden. Upper Side. Left-hand Specimen.—Colour of frond bright glistening green, as if polished. No darkening of stalk or midribs, the leaf being of an even colour throughout. Growth decumbent, fronds curved, leaflets crowded, soft to the touch.

*Right-hand Specimen.*—Colour of frond dark dull-green, not shining. Stalk and midribs strongly defined by a dark, nearly black, spear-shaped line. Growth upright and straight, leaflets spaced at a little distance apart, harsh, almost prickly to the touch.

Both these varieties have grown spontaneously in my garden within a few yards of each other.

*Note.*—I have not included *A. oculatum*. Both Mr. Cheeseman and Mr. Baker consider it as only a trivial variety of A. Richardi.

(109) A. cystostegia (bearing coverings of bladders). A small, very distinct alpine species, easily recognised by the fluffy pale-brown scales on stalks and midribs.

Description.—Root short, stout, densely scaly, sometimes branched above. Stalks 2 to 6 inches high, pale-brown, clothed with large, membranous, light-brown scales. Fronds tufted, very numerous, 4 to 10 inches long, without the stalk, by  $1\frac{1}{2}$  to 2 inches broad, pale-green, soft, membranous and almost flaccid, both surfaces clothed with scales when young. Seeds numerous, 2 to 4 to a leaflet; covering of the seeds thin, membranous, pale-coloured, very convex.

North Island: Mount Egmont, Tongariro, Tararua Mountains. South Island: Not uncommon in alpine districts throughout. Auckland Islands. 3,000 to 5,500 feet.

A form with a firmer frond and dark-coloured scales on the stalks is occasionally met with. According to Mr. Thomson it is extremely hardy and easy of cultivation, but Mr. Field's experience was of a negative character. It is confined to New Zealand.

NELSON.

(110) A. capense (a native of the Cape). A remarkably handsome fern, whether viewed closely or at a distance. Most easily recognised by the large, circular, jet-black patches of seed. I have usually found it climbing trees, especially tree-ferns.



Description.—Root long, stout, creeping, covered with large, tawny, silky scales. Stalks 1 to 2 feet long, stout, erect, more or less densely clothed with scales. Fronds scattered along the root, 9 to 18 inches long, without the stalks, by 6 to 12 inches broad, texture very firm and rigid, smooth and shining on the upper surface, lighter below, brownish-green, bright-green, to goldengreen. Seeds conspicuous, in two rows near the midrib, often covering the whole under surface.

Abundant throughout the Dominion.

The seeds at a certain stage of their growth are jetblack, giving the leaf a very remarkable appearance when viewed from below. The graceful frond stands out silhouetted against the sky, with row upon row of conspicuous seeds showing on the under side. It also differs from the other New Zealand species in having blunt rounded points to most of the leaflets, and the veins show so distinctly in dark-green lines on the upper surface as to greatly enrich its appearance. (See page 237)

It is a somewhat difficult species to transplant; I have found the best plan is to cut away some of the fibres in which the rootlets are embedded. Mr. Field recommends taking up a very young plant and transferring it to good vegetable mould, when it will thrive well.

In the Auckland district it shows a preference for tree-ferns. The roots, rendered conspicuous by the thick



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## 283 SIZE, 12<sup>1</sup>/<sub>2</sub>in, x 4<sup>1</sup>/<sub>2</sub>in.



KAIPARA.

covering of pale-brown scales, can be traced through the moss, filmy ferns, and other creeping plants, as they branch and climb the stem, putting out here and there a few graceful fronds, which become larger and more plentiful near the summit, and culminate in one or two laden with jet-black seeds.

It is a widely distributed fern, found in temperate Australia, Polynesia, South Africa, Mauritius, and in America from Cuba to Patagonia.

(111) A. aristatum (awned). A wide-spread tropical species, extending to the Kermadec Islands, where it is abundant.

Description.—Roots long, stout, creeping, clothed with rusty scales. Stalks 9 to 18 inches long, stout, densely scaly towards the base. Fronds scattered along the root, 1 to 2 feet long by 9 to 12 inches wide, dark-green, glossy, the tips of the leaflets like prickles. Seeds rather small, in two rows near the midrib.

Kermadec Islands, Sunday Island, abundant.

Found also in Polynesia, Australia, Malaya, India, China, Japan, and South Africa.
### Aspidium

## SIZE, 14in. x 9<sup>1</sup>/<sub>2</sub>in.

285



(111) ASPIDIUM ARISTATUM. A Medium Specimen. Under Side.

KERMADEC ISLANDS.

# XX. NEPHRODIUM

NEPHRODIUM (nephros, kidney—shape of the seed cover). "Buckler Fern." A genus of over 400 species, with 8 in New Zealand. Medium-sized ferns; the round patches of seed protected by a kidney-shaped covering.



N. DECOMPOSITUM

(112) N. Thelypteris (lady-fern). Var. squamulosum (scaly). A marsh fern, with barren and fertile fronds; seeds covered with a kidney-shaped membrane.

Description.—Root long, slender, creeping, branched. Stalks 4 to 12 inches long, slender, smooth, straw-coloured. Fronds scattered along the root, 6 to 12 inches long, without the stalks, rarely more, by 2 to 5 inches broad, pale-green, membranous. Seeds numerous, small, in two rows, rather nearer the margin than the midrib.

North Island: Marshes from the North Cape to the East Cape, Taupo, and Wanganui; but often local. Sea-level to 2,000 feet.

The typical form is found in Europe, Asia, and America. Var. squamulosum is confined to New Zealand and South Africa.

### 287

SIZE, 132in. x 7in.



MAKETU.

(113) N. decompositum (decompound). A soft, palegreen fern, usually growing in alluvial soil near river banks. Perhaps the distinguishing feature, which it shares in common with the other species of the genus, is the larger size of the lowest pair of leaflets near the stalk.



Description.—Root long and slender, creeping, branched, more or less clothed with chaffy scales. Stalks 6 to 18 inches long, firm, erect, scaly towards the base, hairy above. Fronds scattered along the root, not tufted, though they sometimes grow in crowded groups, 9 to 18 inches long, without the stalks, often almost as broad, texture inclined to be firm, pale-green, more or less covered with fine hairs; midrib the same colour as the frond. Seeds rather large, distant, about half-way between the margin and the midrib.

From the North Cape to Foveaux Strait, not uncommon. Sealevel to 1,200 feet.

A pretty, soft-green fern, varying considerably in size. Upon the Island of Waiheke, in poor soil, I have found them under shady trees with fronds that did not rise 6 inches above the sward; while, in the Waitakere district, on alluvial soil and almost in the open, the sturdy fronds stood up 3 feet from the ground. It is an easy species to grow. Some which I brought from Waiheke have quickly responded to the richer soil by putting forth larger and stronger fronds. An abundant Australian plant, ranging from North Queensland to Tasmania and Norfolk Island.

### Nephrodium

#### SIZE, 11in. x 9<sup>1</sup>/<sub>2</sub>in.

289



(113) NEPHRODIUM DECOMPOSITUM. A Small Specimen. Under Side.

WAITAKERE.

(114) N. glabellum (smooth). Very similar in general appearance to N. decompositum, but the fronds are a darker green, more finely cut, somewhat smaller, and almost free from hairs. A closer inspection also reveals the fact that the root is short and tufted—not creeping.



Description.—Roots short, stout. Stalks 4 to 10 inches long, slender, firm, usually reddish-brown, scaly at base, smooth or nearly so above. Fronds tufted, 6 to 14 inches long or more, without the stalks, by 4 to 10 inches broad, membranous but firm, dark-green, glossy; the lowest pair of leaflets the largest; midrib reddish-brown. Seeds distant, about half-way between the margin and the midrib.

In dry woods from North Cape to Foveaux Strait, not uncommon.

This beautiful fern, with its tufts of glossy fronds, was for some time classed as a variety of N. *decompositum;* its recognition as a valid species is chiefly due to the entirely different rooting of the two plants. It is one of the easiest ferns to cultivate. Occurring in Australia and several of the Polynesian Islands.



(114) NEPHRODIUM GLABELLUM. A Medium Specimen. Under Side.

WAIRARAPA.

(115) *N. velutinum* (velvety). Distinguished by the reddish-brown colour of the stalks and midribs, which imparts to the frond a delicate tint of Indian red; the velvety feel of the leaves, and the large size of the lowest leaflets. The silky brown hairs which cover the whole frond are so abundant on the midribs as to give them a much darker hue than the rest of the leaf.

Description.—Root short, stout, erect. Stalks 9 to 18 inches long, firm, erect, densely hairy, clothed at the base with large red-brown scales. Fronds tufted, 9 to 18 inches long, without the stalks, almost the same in breadth, green to green with a reddishbrown tinge, membranous and soft, clothed on both surfaces with soft silky hairs; lower primary and secondary leaflets much the largest. Seeds copious, rather small.

In dry woods from the North Cape to Otago; but rather local in the South Island. Sea-level to 1,000 feet.

By some considered one of the most beautiful of our ferns, having three good claims to that distinction—the æsthetic colour of the broad fronds, their soft velvety texture, and the wonderfully graceful outline—the extension of the lower leaflets being more pronounced than in any other species of the genus. I have found it growing on dry banks overlooking the sea, sometimes within reach of the spray. It used to be plentiful near Auckland, about Hobson Bay and Orakei, but of late years I have not been able to find a plant. It is easily cultivated, sometimes developing forked tips to the fronds, and makes a very handsome addition to the fernery.

I know of nothing more daintily perfect than the young fronds of this species. One wonders at their soft bloom surviving undamaged the rude buffeting of the wind and the plash of heavy raindrops. The tender, immature leaves, perfect in every detail, of a virginal green shading off to a lighter tint at the margins, are greatly embellished by the soft brown of the stalks and midribs.

Found only in New Zealand.

Nephrodium

SIZE, 131in. x 91in.

293



ORAKEI.

(116) *N. setigerum* (bristly). Hitherto reported only from the Kermadec Islands.

Description.—Root short. Stalks 1 to 2 feet long or more, firm, erect, straw-coloured, slightly chaffy at the base, smooth above. Fronds tufted, 1 to 3 feet long by 9 to 18 inches broad, pale-green, membranous. Midribs densely clothed with hairs on upper surface; under side of the fronds bristly. Seeds copious, small.

Kermadec Islands: Ravines on north side of Sunday Island, not uncommon.

An abundant species throughout Polynesia, ranging from Australia to Malaya, India, China, and Japan.

SIZE, 112in. x 10in.



(117) N. hispidum (hairy). The most plentiful of the genus in New Zealand. Easily recognised by the excessive hairiness of the stalks and midribs, the finely-divided frond, and the thin, dry texture of the leaves.



Description.—Root long, stout, creeping, densely clothed with red-brown scales. Stalks 9 to 18 inches long, stout, erect, brown, everywhere bristly with long brown hairs. Fronds 9 to 18 inches long or more, without the stalks, by 6 to 12 inches broad, thin and firm in texture, green, yellow-green, sometimes tinged with brown. Midribs bristly, like the stalks. Seeds copious, large.

Abundant throughout the Dominion. Sea-level to 2,000 feet.

This species is so plentiful in lowland bush that it often covers the ground far and wide with a mat of feathery fronds; specimens for the herbarium may be gathered by the hundred, so flat and dry that little pressing is necessary. I have encountered it festooning the stem of a tree-fern with handsome fronds over 2 feet long, the under side heavy with an abundant crop of seed.

It is easily cultivated, sending up its perfect fronds with the same regularity in the fernery as it does in the forest. The colours of the young fronds are distractingly lovely, several shades appearing on the plants simultaneously—light shiny green, pale golden-brown with emerald tips, bronze-green shaded off into lighter hues at the margins.

Found also in Victoria, where it is rare and local.

Nephrodium

SIZE, 14in. x 11in.



HUNUA.

(118) N. unitum (united). A swamp-loving fern, for long reported only from the thermal springs district, but found of late years in the far north of Auckland; it is a larger and a darker green plant than N. thelypteris —our other marsh fern.

Description.—Root long, stout, creeping, sparingly clothed with dark-brown scales. Stalks 6 to 14 inches long, smooth, erect, almost black at the base, brownish above. Fronds 6 to 18 inches long, without the stalks, by 3 to 9 inches broad, somewhat rigid and dry in texture, smooth, dark-green. Seeds copious, nearer the margin than the midrib.

North Island: Swamps in the North Cape district, at Houhoura, Waihi, Rangaunu Harbour, Ahipara, etc.; hot springs at Miranda, Thames; hot water swamps in thermal springs district; not uncommon from Maketu and Rotorua to Waiotapu, Rotokawa, Wairakei, and Tokaanu. Sea-level to 1,800 feet.

When returning from a trip to the Taupo district with plants of our two swamp-loving ferns—N. thelypteris and N. unitum, I was at a loss where to put them. Then a happy and very obvious solution occurred to me—make a swamp! I made a swamp on a diminutive scale, and, so far, with complete success. Fresh fronds are appearing each week.

An abundant species in most tropical, and warm temperate countries.

### Nephrodium

### 299 SIZE, 13in. x 10in.



MANGONUI.

(119) N. molle (soft). Like N. unitum, this species was supposed to be confined to the thermal springs district until Mr. R. H. Matthews found a small patch growing beside the Mangatete Stream, near Rangaunu Harbour. The frond is not unlike that of Polypodium pennigerum, but the plant is very much smaller, softer and more tender, of a paler green, the midribs of a lighter colour than the leaves, not darker, as with P. pennigerum.



Description.—Root very short, creeping, erect. Stalks 9 to 24 inches long, slender, greenish, smooth or bearing a few soft hairs. Fronds tufted, 1 to 3 feet long by 6 to 12 inches broad, pale-green, membranous and flaccid. Midribs pale, furnished with downy hairs. Seeds copious, about half-way between the midrib and the margin.

Kermadec Islands. North Cape district; thermal springs, by banks of the Otumakokori, near Waiotapu; Wairakei.

A wide-spread species, abundant in tropical and semitropical countries. I have seen it growing vigorously under cultivation in an Auckland fernery.

### Nephrodium



(119) NEPHRODIUM MOLLE. A Medium Specimen. Under Side.

MANGONUI.

## XXI. NEPHROLEPIS

NEPHROLEPIS (nephros, kidney; lepis, scale). A genus of only 7 or 8 species, with 2 in New Zealand. Fronds long and narrow; seeds roundish, protected by a kidney-shaped covering.



#### N. CORDIFOLIA

(120) *N. cordifolia* (heart-leaved). There is no confusing this with any other New Zealand species; the long narrow frond with a close-set row of small leaflets on either side of the midrib is quite distinct. Found only in the thermal district.

Description.—Root short, semi-erect or oblique, producing numerous suckers, which root here and there, and produce new plants, sometimes bearing small scaly tubers. Stalks short, 1 to 4 inches long, red-brown, glossy, more or less clothed with scales. Fronds numerous, tufted, 1 to 3 feet long by  $1\frac{1}{2}$  to 2 inches broad, pale-green, membranous. Midrib usually shaggy with scales. Seeds in two rows on the leaflets, rather nearer the margin than the midrib.

North Island: Thermal springs district in localities heated by hot water, Otumakokori Stream near Waiotapu, Wairakei, Karapiti, and other localities at Taupo.

A species easily grown in the fernery, and a favourite pot plant. An abundant tropical fern, extending northwards to Japan and southwards to New Zealand. According to Mr. Thomson the roots bear egg-shaped tubers in tropical America and India, which constitute an article of food.

### Nephrolepis

### 303 SIZE, 12<sup>1</sup>/<sub>2</sub>in. x 2in.

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(121) N. exaltata (exalted). A fern with a very much broader frond than N. cordifolia, an abundant tropical species, so far reported only from the Kermadecs.

*Description.*—Root short, indistinct, emitting long, wiry creeping suckers. Stalks 3 to 9 inches long, stout, erect. Fronds numerous, 1 to 3 feet long by 4 to 5 inches broad, rather stiff in texture. Midribs and sometimes the under surface of the leaflets woolly. Seeds numerous, close to the margin, rather small.

Kermadec Islands: Sunday Island, sandy flats in Denham Bay; not seen elsewhere. An abundant tropical fern all round the world.



(121) NEPHROLEPIS EXALTATA. A Medium Specimen. Under Side.

KERMADEC ISLANDS.

# XXII. POLYPODIUM

POLYPODIUM (polys, many; podos, of a foot). A genus of over 500 species (the largest in the world), with 10 species and 3 varieties in New Zealand. Very variable in size, shape, and manner of growth. Seeds in roundish patches on the backs of the leaves, without any protective covering.



#### P. BILLARDIERI

(122) **P. punctatum** (dotted). A wide-spreading, handsome fern, resembling *Hypolepis tenuifolia* in habit and in the shape of the fronds, but the seeds have no protective covering, and are not placed so close to the margin, while both stalks and leaves are covered with sticky hairs.



Description.—Root long, creeping, clothed with red hairs. Stalks 6 to 18 inches long, firm, erect, red-brown, rough and densely covered with viscid hairs. Fronds scattered along the root, very variable in size, from 6 to 36 inches long by 3 to 18 inches broad, rather membranous, green to yellow-green and brown-green, both surfaces carrying small silky hairs. Midrib viscid and rough like the stalk. Seeds rather large, round, in two rows on the leaflets, close to the margin, often covering the whole under surface.

### Polypodium



(122) POLYPODIUM PUNCTATUM. A Small Specimen, Under Side.

HUNUA.

Abundant throughout the Dominion. Sea-level to 2,500 feet. The fundamental difference between this species and Hypolepis tenuifolia lies in the seeds, the former being devoid of any covering, the latter protected by a slight fold of the leaf, but, as this fold is sometimes absent, one must look for a more persistent divergence, perhaps the stickiness of *P. punctatum* is the surest guide; the stalks and midribs are provided with viscid glandular hairs. I have often seen thistle-down caught and held by these ferns. In the young state they are most dissimilar and can hardly be confused. Hypolepis is of a pale bright green, both stalks and leaves, covered with scattered white hairs. *Polypodium* is of a dull darkish green, the stalks and midribs reddish-brown, which gives to the frond a dusky aspect. A wide-spread species in the tropics and the south temperate zone.

(123) *P. pennigerum* (bearing wings). One of the most abundant ferns in New Zealand, forming handsome crowns of radiating leaves, often growing with a short stem; seeds small and round.



Description.—Root short, erect, sometimes lengthened into a stem 1 to 2 feet high. Stalks 6 to 12 inches long, stout, rather succulent, more or less clothed with brown scales near the base, smooth above. Fronds 2 to 5 feet long by 9 to 18 inches broad, thin and membranous, lightish-green. Seeds small, numerous, in two rows on the leaflets, much nearer the midrib than the margin.

### Polypodium

SIZE, 23in. x 18in.



(123) POLYPODIUM PENNIGERUM. A Medium Specimen. Upper Side. AUCKLAND.

Abundant in woods throughout the Dominion. Sea-level to 2.000 feet.

The beauty of this fern is greatly enhanced, the symmetrical frond much enriched, by the dark brown of the midribs, both primary and secondary, and the conspicuous veins. It seems to grow anywhere, but is most luxuriant in wet alluvial ground, where it often assumes the form of a miniature tree. Needless to say, it was one of those which grew spontaneously in my garden. It is easily cultivated, practically requiring no attention.

A very distinct species confined to New Zealand.

(124) Var. Hamiltoni (Mr. Hamilton). Smaller and more delicate. Fronds 1 to 2 feet long by 3 to 5 inches broad. Leaflets irregular, crisped, pale-green. Seeds midway between the midrib and the margin. A very peculiar plant, possibly an abnormal state. Reported only from Kereru, Hawke's Bay. Polypodium



(125) *P. australe* (southern). A small fern, with a narrow undivided leaf, seldom more than 6 inches long; usually found growing in small tufts upon rocks and tree trunks; seeds rather large for so small a plant, in a slanting row on either side of the midrib.

Description.—Roots very short, erect, or oblique, crowned with copious brown scales. Fronds numerous, crowded together, 1 to 6 inches long by din. todin. broad, green to dark-green, smooth, texture firm. Seeds in a single row on each side of the midrib, nearer to it than to the margin, oblong, oblique.

Not uncommon throughout the Dominion.

This species is not difficult to cultivate if part of the bark in which the roots are embedded is removed with the fern.

A very variable little plant, found also in Australia and Tasmania, Chili, Fuegia, Tristan d'Acunha, and Marion Island.

(126) Var. villosum (hairy). Stalks, margins, and the under surface of the fronds more or less covered with long spreading hairs, often partially concealing the seed. Much the same habitat as P. australe.

(127) Var. pumilum (dwarfed). Small, very densely matted. Root stout, creeping, sometimes I to 2 inches long, fronds  $\frac{1}{3}$ in. to  $\frac{3}{4}$ in. long, very thick and leathery, smooth or obscurely hairy beneath. Seeds large, roundish, solitary, usually near the tip of the frond. In mountain districts from East Cape southwards, ascending to over 5,000 feet.





(128) *P. grammitidis* (grammitis-like, the seeds being in a line). A small species; the leaf cut into narrow, toothed segments; almost confined to the trunks of trees.



Description.—Root short, crowned with scales. Stalks short, wiry, naked, 1 to 2 inches long. Fronds tufted, very variable in size and shape, 3 to 9 inches long by 1 to 3 inches broad, dark-green, firm in texture. Seeds oblong or rounded.

Abundant throughout the Dominion on trunks of trees, more rarely on rocks. Sea-level to 3,500 feet.

This species is not difficult to transplant if a part of the bark be removed with the plant. Found also in Australia and Tasmania.

315



(128) POLYPODIUM GRAMMITIDIS. A Medium Specimen. Upper and Under Side.

PICTON.

(129) *P. tenellum* (tender). A very elegant fern, usually growing on trees or stony ground; easily recognised from the illustration; the slightly scalloped margins of the seeded fronds give it a very attractive appearance.



Description.—Root very long, slender, rigid, wiry, climbing up the trunks of trees or over rocks, clothed with chestnut-brown scales. Stalks short, 1 to 3 inches long, jointed near the root. Fronds scattered, erect or pendulous, 1 to 2 feet long by 2 to 5 inches broad, dark-green, thin but firm in texture, leaflets jointed to the stalk. Seeds round, two rows on each leaflet close to the margin.

North Island: In woods from Three Kings Islands and North Cape to Cook Strait; but often local. South Island: Vicinity of Nelson, Banks Peninsula.

Mr. Field describes this as easy of cultivation; personally I have found it difficult to transplant, though I tried to carry out Mr. Field's instructions to the letter —"any bit of the terrestrial rhizomes (surface root) will grow if pegged down among leaf-mould and dead leaves." See page 325.

Also in Norfolk Island, Australia and New Caledonia.

Polypodium



(129) POLYPODIUM TENELLUM. A Medium Specimen. Under Side. AUCKLAND.

(130) *P. serpens* (creeping). A small climbing species, with very thick leaves, whitish or buff-coloured underneath, growing on rocks, trees, and old walls.

Description.—Root long, creeping, branched, climbing up the trunks of trees or over rocks, thickly clothed with brown scales. Stalks distant from each other,  $\frac{1}{2}$ in. to 3 inches long, firm, erect, jointed to the root. Fertile fronds 2 to 6 inches long by  $\frac{1}{2}$ in. to  $\frac{3}{2}$ in. broad, dark-green or yellow-green, densely clothed beneath with whitish or buff-coloured scales almost concealing the seeds. Barren fronds variable in size and shape, 1 to 3 or even 4 inches long by  $\frac{1}{2}$ in. to 1 inch broad, sometimes nearly round. Seeds very copious, irregularly scattered, prominent, often confined to the upper part of the frond.

Abundant throughout the Dominion. Sea-level to 3,500 feet.

A species that does not disappear before settlement; it has already taken possession of introduced trees and stone walls. It grows on the trees in my garden, having entered without the formality of an introduction. Indeed, it is somewhat of an importunate guest, almost as ubiquitous as the sparrow. The only trees which seem to escape this pushing visitor are the Californian redwood and the gums. It is already quite at home on the oak, the macrocarpa, and the Norfolk Island pine.

Plentiful in Eastern Australia; found also in Norfolk Island, and several of the Pacific Islands.

### Polypodium

SIZE, 6in. x 53in.



KAIPARA. (See also page 333.)

(131) P. Cunninghamii (Mr. Cunningham). A narrow-leaved fern, with big oval patches of brown seeds on the under side. Somewhat similar in outline to *P. scrpens,* but larger, very much thinner in texture, and green below, not covered with whitish scales. Usually climbing over trees and rocks.



Description.—Roots short, knot-like, densely clothed with brown scales, emitting woolly rootlets, some of which creep and produce new tufts of fronds. Stalks gradually expanding into the leaf, sometimes bearing a dense tuft of scales at the base. Fronds 4 to 12 inches long by  $\frac{2}{3}$  in. to  $\frac{3}{4}$  in. broad, bright-green, rather fleshy, inclined to be firm, quite smooth. Midrib stout, conspicuous. Seeds large, broadly oblong or rounded, prominent, in a single row on each side of the frond, nearer the midrib than the margin.

North Island: In forests from the North Cape to Cook Strait, not uncommon. South Island: Nelson—Matai Valley; Marlborough; Canterbury—Akaroa. Sea-level to 2,500 feet.

A very abundant species in the Auckland district. It sometimes covers every stone, rock, tree-root and the lower trunk, over large areas, with a verdant tapestry of tender green fronds. Found also in the New Hebrides.
### Polypodium

SIZE, 9½in. x 7½in.



(131) POLYPODIUM CUNNINGHAMII. AUCKLAND. A Large Specimen. Upper and Under Sides. The three plants are connected by rootlets. (132) *P. pustulatum* (covered with pustules). An inveterate climber; fronds long, irregularly cut, drooping and tender; the rounded seeds, forming a conspicuous row parallel with the margin, give to the under side a rich, fruitful appearance.



- Description.—Root very long, much branched, climbing up trunks of trees and over rocks, clothed everywhere with darkbrown scales. Stalks scattered along the root, 2 to 14 inches long, firm, slender, smooth. Fronds very variable in size and outline, dark-green, thin and membranous, quite smooth; sometimes long and narrow, 3 to 9 inches by 3 in. to 3 in., quite entire; at other times irregularly forked, 6 to 18 inches long by 2 to 6 inches broad. Veins not very distinct, netted. Seeds rather small compared with *P. Cunninghamii* and *P. Billardieri*, rounded, forming a parallel row with the margin and just within it, or overlapping it when ripe, sunk in a small cavity, which shows as a small bulge on the upper side of the leaf.

Abundant in woods from the North Cape to Nelson, Marlborough, and Westland; from thence to the south of Otago less plentiful. Sea-level to 2,500 feet.

A beautiful, graceful species, notwithstanding the unpleasant name with which it has been encumbered. Recently 1 came across one of those lovely pictures that only Nature can contrive. A fallen monarch of the forest lay prone upon the hillside, the unsightly ravages of age veiled under a cascade of the tender green fronds of this fern. It made me think hard things of the botanist who had cursed it with such a name.

The fronds are fragrant when freshly dried, and were formerly used by the Maoris for scenting oil. It is found also in Australia and Norfolk Island.

### Polypodium



(132) POLYPODIUM PUSTULATUM. A Medium Specimen. Barren Fronds. Upper and Under Sides.

HUNUA.

(133) **P. Billardieri** (M. Billardiere). Sometimes called "Hound's Tongue." A broad-leaved, bright-green species, climbing over rocks and trees with a thick creeping root; very irregular in shape and size; the large round seeds of a bright orange, most conspicuous.



Upper Side Seeds seen through the leaf. (See also page 306)

Description.—Root long, stout, creeping, often sea-green in colour, covered with black specks. Stalks jointed to the root, 2 to 8 inches long, stout, erect, smooth and glossy. Fronds numerous, scattered along the root, bright-green, stiff and firm in texture, polished and shining, varying greatly in shape, sometimes 3 to 9 inches long by  $\frac{1}{2}$ in. to 2 inches broad, quite entire; sometimes 6 to 18 inches long by 3 to 9 inches broad, deeply forked. Veins netted, and conspicuous in young fronds. Seeds numerous, large, round, orange-red, forming a single row on each side of the midrib, sunk in shallow cavities, which make a small bulge on the upper side of the frond.

Abundant throughout the Dominion, usually on rocks and trees, but sometimes on the ground. Sea-level to 3,000 feet.

The large glossy leaves of this handsome fern are very noticeable, giving an appearance of tropical luxuriance to the scene. The contrast of the brilliantly coloured discs of orange-red seeds with the bright green leaves makes them most attractive. The collector is lured to gather numerous specimens, which, alas! lose nearly all their glory in the process of drying.

It grows everywhere, in the shade or in the sun—one of those that sowed itself in my garden; very easy to cultivate. The stalk of the young frond uncoils slowly, expanding above into a small leaf, which increases in size (not by unrolling) until the full dimensions of the



frond are attained. The fresh virginal leaf, with its delicate, very distinct veining, is a beautiful object, as smooth and shining as glass, and of the purest and most delicate shades of green imaginable.

Found also in Norfolk Island, Lord Howe Island, Australia, and Tasmania.





(133a) POLYPODIUM BILLARDIERI. WAITEMATA. A Medium Specimen. Upper Side. A Young Frond, showing Veins.

(134) *P. novae zealandiae* (New Zealand). Though closely allied to *P. Billardicri*, this is a larger fern, the creeping root much stouter and covered with shaggy brown scales; the leaflets narrower, more pointed and more symmetrical. Confined to the forest country in the centre of the North Island.

Description.—Root long, stout, woody, as thick as the finger, densely clothed with tawny scales. Stalks 6 to 12 inches long. firm. erect, pale-brown, shining, quite naked. Fronds scattered along the root, large, 1 to 4 feet long by 6 to 14 inches broad, texture rather firm, dark-green, quite smooth. Seeds large, round, forming a single row on each side of the midrib.

North Island: Te Aroha, Pirongia, Karioi Mountain, Lake Waikaremoana, Waimarino Forest to the west of Ruapehu. Usually on logs or climbing up trees; rarely on the ground. 1.500 to 3,000 feet.

An extremely handsome species, apparently confined to the central portion of the North Island. Mr. Field never succeeded in growing it, though he took considerable pains. Found only in New Zealand. Polypodium



## XXIII. NOTHOCLAENA

NOTHOCLAENA (nothos, spurious; chlaena, cloak—imperfect seed covering. A genus of between 30 or 40 species, with 1 in New Zealand. Small, upright ferns, the under surface of the fronds more or less scaly or woolly; seeds marginal, partially covered by a fold of the leaf.



N. DISTANS

(135) *N. distans* (distant). A small tufted fern, generally growing on rocky or stony ground exposed to the full blaze of the sun; the dark-green fronds rigidly upright and narrow.

Description.—Root short, stout, semi-erect or prostrate, clothed at the base with rusty- looking scales. Stalks 1 to 4 inches long, stiff, wiry, erect, dark chestnut-brown, more or less scaly. Fronds numerous, tufted, 3 to 6 inches long, without the stalks, by  $\frac{1}{2}$ in. to 1 inch broad, erect, rigid, dark-green, firm in texture, slightly hairy above, densely so below. Seeds forming a continuous line round the margins of the leaflets.

North Island: Rocky places from Whangaroa and the Bay of Islands to Cook Strait; local. South Island: Near Nelson, Banks Peninsula and other localities in Canterbury. Sea-level to 2,500 feet.



PENROSE.

Called by Mr. T. H. Potts the "Woolly Cloak Fern." Though similar in some respects to *Cheilanthes Sieberi*, and growing in exactly the same localilties, it may be distinguished by the darker-green and the more blunted outline of the fronds, the general hairiness of the under side, and the woolly appearance of the young crooks. Its favourite situation on scoria rocks is a depression where some mould has collected. If the plant and soil be removed bodily and placed in a similar position in the fernery, it will continue to flourish without a check, sending up numerous crooks like tufts of white cotton; but it makes little or no growth in the coldest winter months, and suffers somewhat from frost.

Found also in Australia, Norfolk Island, and New Caledonia.

I had an unusually luxuriant specimen of this little plant growing on the rocks in my fernery. The old, frost-bitten fronds having turned an unsightly brown, I cut them off before the spring growth appeared. When week followed week, and spring was succeeded by summer, with no young crooks showing, I feared the plant was dead, for it is a quick-growing fern. Occasionally I had seen the woolly green head of a young crook pushing through the soil, but it never came to anything.

Thinking that my cutting away of the old fronds might have given the slugs access to the tender young shoots, 1 protected the plant with tobacco dust. In less than a week there were 15 vigorous fronds from 1 to 2 inches high, and now the fern has covered the summit of the rock with a forest of dark-green fronds.

I had known that slugs ate down the tender crooks of many ferns, but I was not aware how much protection was afforded by the old stalks. Nothoclaena



## XXIV. GYMNOGRAMME

GYMNOGRAMME (gymnos, naked; gramma, a line—referring to the seeds). A genus of over 100 species, with 2 very small ones in New Zealand. Seeds scattered along the veins without any covering.



G. LEPTOPHYLLA

(136) *G. rutaefolia* (rue-leaved). A small fern, covered all over with woolly hairs, growing in crevices on exposed cliffs.

Description.—Root short, thick, erect or ascending, clothed with blackish-brown scales. Stalks  $\frac{1}{4}$ in. to 1 inch long, everywhere densely woolly. Fronds 1 to 3 inches long by about  $\frac{1}{2}$ in. broad, firm in texture, dull-green, both surfaces densely clothed with woolly hairs. Seeds oblong, occupying most of the veins on the under surface.

North Island: Hawke's Bay— Petane, Kuripapanga; Wellington—cliffs in Cook Strait, Cape Terawhiti. South Island: Marlborough—D'Urville Island, Brothers Island; Canterbury—Banks Peninsula, Upper Ashburton, Upper Rangitata. Southern Alps, Otago, Blacks. Sea-level to 3,500 feet.

A rare fern, though widely distributed in Australia and Tasmania.

## **Gymnogramme**



(137) G. leptophylla (slender-leaved). A tiny little fern, an annual, yet a world-wide plant. What with its small size and restricted season, it is very easily over-looked.



Description.—Roots fibrous. Stalks  $\frac{1}{2}$ in. to 3 inches long, slender, brittle, smooth and glossy, bright chestnut-brown. Fronds 1 to 3 inches long by  $\frac{1}{2}$ in. to 1 inch broad, pale-green, shining, thin and membranous, quite smooth. Seeds oblong, upon the veins.

North Island: Volcanic hills about Auckland, once not uncommon, now rare; Mount Maunganui, near Tauranga; East Coast district; Hawke's Bay—Scinde Island; Ruahine Ranges; Wellington—Miramar. South Island: Canterbury—Lyttelton Harbour, abundant; Otago—near Dunedin; Upper Clutha. Sea-level to 1,500 feet.

I remember gathering this dainty little fern on Mount Smart (Rarotonga) near Auckland—then a shapely hill, now an ugly ruin, thanks to our Philistine Governments. This fern is becoming scarcer each year, probably eaten down by cattle and sheep.

The fronds begin to sprout about February, last through the winter, perfect the seeds in spring, and die in summer. It is not difficult to cultivate, and sows itself annually. Found also in Europe, North and South Africa, Persia, India, Australia, and South America.

### 337 NATURAL SIZE.



(137) GYMNOGRAMME LEPTOPHYLLA. A Large Specimen. Under Side. MOUNT SMART.

# XXV. GLEICHENIA

GLEICHENIA (to honour Baron P. von Gleichen, a German botanist). A genus of about 26 species, with 5 species and 2 varieties in New Zealand. Mediumsized straggling ferns; fronds branching in pairs with a terminal bud in the fork, often spreading in horizontal tiers. Seeds scattered over the under surface in symmetrical groups, without any covering.



#### G. FLABELLATA

(138) G. circinata (coiled into a ring). "Wae-waekaka." Not much like the popular conception of a ferm —wiry, scrambling, the branches so zigzagged and interlaced that it is not easy to determine the shape of the frond.

Description.—Very variable in size and mode of growth, sometimes stiff, erect, 1 to 3 feet high; sometimes weak and scrambling among other vegetation, attaining a height of 4 to 6 feet. Root long, slender, wiry, often much branched, more or less clothed with red-brown scales. Stalks smooth or scaly, of a rich red-brown, slender, cylindrical. Fronds usually forking in pairs; branches zigzag, spreading, often interlaced, light-green above, pale beneath. The upper surface often convex. Midribs generally clothed with rusty-red hairs. Ultimate leaflets about the size of a small pin's head. Seeds like grains of brown sand, in symmetrical groups of three, four, or five.

From the North Cape southwards to Cook Strait, plentiful. Rare and local in the South Island. Sea-level to 2,000 feet.

### Gleichenia



AUCKLAND.

This species seems to prefer poor clay soil in open land, or among light scrub, never growing in the deep shade of the forest. It is sometimes found among light scrub in dense interlaced masses of a bright shining green, the topmost branches straggling among the ma-



nuka with sprays of delicate green tracery, presenting to the eye one of those unstudied groupings of plants arranged by Nature with apparent carelessness, but with a consummate skill man may never hope to attain.

Mr. Thomson and Mr. Field are not agreed about the cultivation; my experience has been most encouraging. It is a wide-spread species south of the Equator.

(139) G. dicarpa (two-fruited). Like G. circinata, but smaller, 1 to 2 feet high. The margins of the leaflets curved over, giving the under side the appearance of open pouches, each containing two little round seeds.



Description.—Root slender, wiry, usually clothed with chaffy scales. Stalks smooth, slender, a rich red-brown. Fronds several times forking into pairs, branches spreading horizontally, often interlaced, the upper surface sometimes flat or even concave, dull-green above, often white beneath, harsh to the touch. Seeds small, round, two in each pocket-like cavity of the under leaf, sometimes quite concealed by woolly hairs. Gleichenia



Abundant in swampy places throughout the Dominion. Sealevel to 2,000 feet.

The ultimate segments in this species are even smaller than in *G. circirata*; their globular form giving them the appearance of a string of minute green beads. It is found also in Eastern Australia, New Caledonia, and Malaya.

(140) Var. hecistophylla (the leaf with baskets). Usually 1 to 3 feet high. The angle at which the fronds fork is wider, in the average, than in either G. circinata or G. dicarpa. Fronds spreading horizontally, green to dark-green above, sea-green to white beneath. Stalks and midribs densely woolly and scaly. Much the same habitat as G. dicarpa.

### Gleichenia



(110) GLEICHENIA DICARPA, VAR. HECISTOPHYLLA. A Medium Specimen. Under Side. WAITEMATA.

(141) *Var. alpina* (alpine). Smaller and more compactly tufted; 2 to 12 inches high; midribs, young shoots, and under surface of leaves clothed densely with rustycoloured scales and wool. Fronds much smaller and more sparingly divided.

Mountainous localities from Cape Colville and Rotorua southwards, ascending to 4,000 feet. Also in Tasmania.

The distinguishing features of the preceding Glcichenias are not easily described-circinata, dicarpa, hccistophylla—especially the last two. Circinata, when growing in the shade of light scrub near Auckland, is a very distinct plant, the leaflets open-five, six or seven to the inch-shining green above, light green and quite flat beneath. Hecistophylla from a similar station is somewhat smaller, the stalks and midribs more woolly and scaly, the leaflets closer-eight to ten per inchstraighter, dull green above, whitish and concave beneath, but often flat when growing in the shade. When growing in the direct sunlight it is usually from 6 inches to 2 feet high, closely matted together, the underside of the segments as much curved over as in *dicarpa*, but never so much as to hide the seeds-two to a pocket. Dicarpa is very similar to hecistophylla, but longer in the leaflets, which are spaced eight to ten per inch. The bead-like appearance of the segments when viewed from above give the leaves a slightly glistening appearance. The stalks and midribs are less woolly and scaly, the angles of divergence a little more acute.

Gleichenia



WAIMARINO.

(142) G. Cunninghamii (Mr. Cunningham). "Tapuwae-kotuku," "Umbrella Fern." Not unlike the two preceding species in manner of growth, but the leaves are much wider, closer, and more umbrageous; dark-green, spreading out from a centre not unlike a star-fish.



Description.—Usually from 1 to 3 feet high, but taller plants are sometimes seen. Root long, branched, creeping, stout and woody, clothed with red-brown scales. Stalks stout, erect, grooved down one side, densely clothed with scales when young, smooth when old. Fronds several times divided in pairs, spreading in a horizontal plane and forming an umbrella-like top; in large specimens sprouting from the centre, so that there are two to tour tiers of superimposed branches, dark-green and smooth above, sea-green and hairy below. Seeds copious. From North Cape to Cook Strait, abundant. South Island,

From North Cape to Cook Strait, abundant. South Island, local. Sea-level to 4,000 feet.

A very handsome and distinct species. Often, when growing near the edge of the bush, it has an odd habit of slanting rakishly to one side. It is very plentiful between Tokaanu and Waimarino, especially near Otukou Pa. A most difficult fern to cultivate, which is a pity, for it has a most attractive appearance. The description Mr. Field gives of his failures is almost pathetic. My attempts have been equally unsuccessful. There was never—not for one single moment—any doubt about its dying; within a few hours of being planted the leaves shrivelled; in three days they were quite black. Found only in New Zealand.

### Gleichenia



(143) G. flabellata (fan-like). A very beautiful fern with leaves spreading fan-wise. Found only to the north of Auckland; easily recognised by the long narrow divisions, like the teeth of a comb.



Description.—Root long, stout, branched, more or less clothed with reddish scales. Stalks erect, cylindrical, hard and smooth. Fronds several times forked in pairs, branches slanting upwards, not horizontal, sometimes superimposed in tiers, from 1 to 4 feet high, dark shining-green. Seeds copious, in groups, usually three to five.

From the North Cape to the Bay of Islands, not uncommon by the sides of streams, etc. Southwards to the Thames and Manukau Harbour, rare and local. Great Barrier, Coromandel Peninsula.

Mr. Thomson reports this very beautiful species as easily cultivated, requiring black sandy loam, good drainage, plenty of pot room, and an abundance of water. "In Kew Gardens a plant of this species has attained a circumference of 12 to 13 feet, with fronds  $4\frac{1}{2}$  feet high." Mr. Field describes it as difficult to grow; my experience is the opposite. In the outdoor fernery it has grown luxuriantly, as may be seen in the illustration on the paper wrapper. A potted plant, growing in the house flourished for a time and then died. A frond from this plant is reproduced in the illustration.

The growth is interesting. A slender stalk rises perpendicularly with a grey-green crook at the top, which presently separates into two, and these again divide, thus looking like a bird's inverted foot with four claws. The young fronds are very thin, with a shining surface like satin. The plant usually grows on alluvial soil by the sides of streams, sometimes in the open fully exposed to sun and wind. I have also found it high up on a steep hillside, growing in poor white clay. It is found also in Australia, Tasmania, and New Caledonia.

### Gleichenia

SIZE, 8<sup>1</sup><sub>2</sub>in. x 10in.

349



WHANGAREI

(144) G. dichotoma (forked). Most easily recognised by the small wing-leaves at the forks. Found growing only in the heated soil of the thermal springs district.

Description.—Usually from 2 to 4 feet high, sometimes dwarfed to a few inches, and occasionally reaching 6 feet. Root long, slender, clothed with reddish-brown scales. Stalks slender, smooth, and polished. Fronds repeatedly forked, pale-green above, sea-green below. Seeds small, uncovered.

On heated soil near hot springs, Otumakokori, Orakeikorako, Karapiti, Wairakei, Matata. Sea-level to 1,600 feet.

It is a curious fact that this common tropical species should be found only in the heated soil of the hot springs district—*Nephrolepis cordifolia* is in exactly the same position. It is probable that the minute seed grains of these ferns have been wafted on the winds from some tropical or semi-tropical country and deposited all over New Zealand. Meeting with the warmth necessary for germination on the hot ground adjacent to the thermal springs, they have grown only in those localities.



ROTOMAHANA

## XXVI. SCHIZAEA

SCHIZAEA (schizo, to divide—the split frond). A genus of about 18 species, with 3 species and 1 variety in New Zealand. Small, grass-like plants, the seeds clustered together in a tuft terminating the frond.



#### S. BIFIDA

(145) S. fistulosa (hollow like a rush). More like a very slender reed than a fern; it has no leaves whatever, merely a thin stalk topped by a bunch of seeds.



Description.—Root short, thick, creeping. Fronds rigid, very erect, clothed with chestnut-brown scales, numerous towards the end of the root, not distinct from the stalk, dark-brown below, greenish-brown above, 4 to 12 inches long by 1-40th inch broad, thread-like. Seed tufts terminating the frond,  $\frac{1}{2}$ in. to 1 inch long by  $\frac{1}{8}$ in. to  $\frac{1}{4}$ in. broad. Seeds in two closely-placed rows, covering the whole under surface.

Not uncommon in barren clay soils throughout the North Island; apparently rare and local south of Cook Strait. Sea-level to 4,000 feet.

This is so unlike a fern, such a small, insignificant, abnormal-looking plant, that it is apt to be overlooked. I have found it growing in short manuka on wet hungry land. It is found also in Australia, Tasmania, New Caledonia, Madagascar, Chili, and the Falkland Islands.





(145) SCHIZAEA FISTULOSA. A Large Specimen. Mature and Young Frands.

WHAU.

(146) Var. Australis (southern). Smaller, 1 to 3 inches high, root stouter in proportion to the whole plant. Seed tuft <u>1</u> in. to <u>1</u> in. long, with only six to eight pairs of leaflets; found in cold peaty localities in mountain districts south of Cape Colville, descending to sealevel in Stewart Island and Auckland Islands.



Schizaea

(116) SCHIZAEA FISTULOSA, VAR. AUSTRALIS. A Medium Specimen. Tuft of Fronds. TONGARIRO.

355

(147) S. bifida (two-lobed). A quaint-looking little plant, usually forked, sometimes twice; the tuft of seeds shorter and broader than in S. fistulosa.



*Description.*—Root very short, stout, creeping. Fronds close together along the root, not distinct from the stalks, 6 to 12 inches high or more, about 1-30th inch diameter, rigid, erect, wiry, more or less rough, usually forked at or below the middle, rarely undivided, the branches sometimes forked a second time. Seed tufts  $\frac{1}{2}$  in. to  $\frac{3}{4}$  in. long by  $\frac{1}{6}$  in to  $\frac{1}{3}$  in. broad.

North Island: On sterile clay or pumice soils from the North Cape to Cook Strait, but often local. South Island: Takaka and Paramahoi, Nelson. Sea-level to 2,000 feet.

Unbranched specimens are best distinguished from *S*. *fistulosa* by the rough feel of the stalks and the broader seed tuft. It is found also in Australia and Tasmania.


(117) SCHIZAEA BIFIDA. A Large Specimen. Fertile and Barren Fronds.

WHAU.

(148) S. dichotoma (divided). Though nearly as unlike a fern as the other species, this is a pretty fanshaped little plant. So far reported only from the North Island.



*Description.*—Root short, stout, creeping. Fronds few or many, close together, 6 to 14 inches long, erect, rigid, wiry. Lower portion not distinct from the stalk, upper portion repeatedly forked, forming a fan-like leaf, 2 to 4 inches or more across. Seeds tufted,  $\frac{1}{2}$ in, to  $\frac{1}{3}$ in, long, in two closely-placed rows.

North Island: In kauri forests from Kaitaia and Mangonui southwards to Tairua and the Lower Waikato River; rare. Growing in heated soil near the hot springs at Orakeikorako, Upper Waikato. Sea-level to 1,500 feet.

Once only did I gather this quaint little fern in New Zealand, although I have looked for it hundreds of times. When making a path through the bush at Whangarei my daughter spied the little fronds growing about the roots of a kauri tree. A wide-spread tropical and sub-tropical species.

Schizaea



WHANGAREI.

# XXVII. LYGODIUM

LYGODIUM (lygodon, flexible). A genus of about 20 species, with 1 in New Zealand. Climbing ferns with stems that twine. A very distinct species, usually tropical.

(149) L. articulatum (jointed). "Mange-mange." The climbing fern proper of New Zealand, ascending bushes and trees by means of a long twining stem—not by roots. Impossible to confound with any other.



Description.—Root slender, creeping, clothed with glossy brown scales. Stalks very numerous, long, slender, climbing, reaching the tops of tall forest trees, branched, wiry, often intertwined and forming impenetrable screens. Leaves 2 to 4 inches long by  $\frac{1}{2}$  in. to  $\frac{1}{2}$  in. broad, thin and tough, bright-green, often sea-green below. Seeds in branching clusters, usually at some height above the ground.

Abundant in woods from North Cape to the Bay of Plenty and Kawhia. Sea-level to 2,500 feet.

It was a most interesting study to watch the growth of this lovely fern. A slender stalk of a pale vernal green rose from the ground to the height of a few inches and



(149) LYGODIUM ARTICULATUM. A Medium Specimen. Barren and Fertile Fronds. WAITAKERE.

in a perfect frond, divided four times; thus there were sixteen small stalks separated into four groups, one in each group dividing again and bringing the total up to twenty, each little stalk ending in a rudimentary leaf. These were nearly round, small green discs, about  $\frac{1}{2}$  in. in diameter, spread out at right angles to the main stalk. So far the growth had been by unrolling; then the method changed, the leaves expanding gradually until mature, when they measured about 2 in by  $\frac{1}{2}$  in.

Not until the second year did the climbing stem appear, twining round the first available support from right to left, mounting upwards, sending forth fronds at intervals of a few inches. These differ considerably from those which spring from the ground, being shorter and wider, and dividing only three times, a perfect frond consisting of eight leaves—the usual form.

At certain points where the leaves issue from the climbing stem a secondary stalk springs forth and climbs upward, twining round the parent stem or any support that it can reach. A ground frond with twenty leaves is the exception, not the rule—they usually have fewer.

The leaves themselves are sometimes forked, which adds yet another diversity.

When the stem has climbed to some height the fertile fronds appear, branching several times and forming pretty clusters of brown seeds. As the plant matures the stalks turn a light brown, become hard and wiry like grape stalks, and exceedingly tough—a fact which is brought forcibly to one's notice in the bush when trying to break through their entangling tendrils.

Formerly the Maoris twisted the tough stalks into ropes for securing the thatch to the roofs of their huts.

The fact of the stems being nearly of the same thickness throughout, made them very suitable for the weaving of eel baskets. The more luxurious European sometimes uses them for mattresses.

Found only in New Zealand.





## XXVIII. TODEA

TODEA (to honour Henry Julius Tode, of Mecklenburg, a well-known student of fungi). A genus of 5 or 6 species, with 3 in New Zealand. Large to medium-sized ferns; the seeds scattered over the under surface like grains of sand.



(150) *T. barbara* (foreign). A large, handsome dark-green fern. The seeds covering the whole under surface of the lowest leaflets at the base of the frond only. Found in the far north of the Auckland Province.

Description.—Root stout, erect, sometimes forming a trunk 4 feet high and 2 feet in diameter. Stalks 1 to 2 feet long or more, stout, erect, quite smooth. Fronds 2 to 4 feet long by 9 to 12 inches broad, dark-green, tough and firm in texture, quite smooth. Seeds towards the base of the frond, usually occupying the whole of the under surface, the remainder of the frond barren.

From the North Cape to Mangonui, abundant in open gullies; southwards to Whangaroa, more sparingly.

Easily cultivated in the Auckland district; its large, shining, upright fronds make it a very attractive species. Also in Australia, Tasmania, and South Africa. In Australia the massive trunk sometimes weighs 1½ tons.

Todea



(150) TODEA BARBARA.

A Small Specimen. Under Side.

WHANGAROA.

(151) *T. hymenophylloides* (filmy-like). "Heruheru." A very beautiful, dark-green, crape-like fern; usually growing in the deepest recesses of the forest.



Description.—Root stout, erect, often produced into a thick stem. Stalks 6 to 12 inches long, slender, wiry, erect, brownishgreen. Fronds forming a crown, 1 to 2 feet long by 6 to 12 inches broad, very thin and membranous, pellucid, dark-green. Seeds on the middle of the leaflets, usually confined to the lower half.

Not uncommon in forest districts throughout the Dominion. Sea-level to 3,000 feet.

A soft feathery fern, leaves very finely cut and nearly transparent. Not difficult to cultivate if transplanted young, provided with good shade, and protected from the wind. A form with the leaves closer and the lower ones reduced in size, is often distinguished as *Var. intermedia* by fern collectors. Found only in New Zealand.

Todea



IIUNUA.

(152) *T. superba* (superb). "Heru-heru." The most beautiful fern in New Zealand; sometimes called "Prince of Wales Feathers," or "Crape Fern"; tall, handsome, dark-green plumes; the tiny leaflets standing up from the surface of the frond like pile.

Description.—Roots stout, forming a thick erect stem 1 to 3 feet high, coated with densely matted fibrous rootlets. Stalks short, 1 to 4 inches long, stout, erect, more or less woolly. Fronds  $1\frac{1}{2}$  to 4 feet long by 6 to 10 inches broad, narrowed very gradually to the base, dark-green, thin, membranous and pellucid, forming a handsome spreading crown. Seeds in the middle of the leaflets, usually confined to the lower half.

In dense forests from Te Aroha and Pirongia southwards, not uncommon, except in Marlborough, Canterbury and the north of Otago, where it is rare and local. Sea-level to 3,500 feet.

Neither of the popular names does justice to this magnificent fern. To compare it with crape is not a great compliment; no loom invented by man ever wove a fabric of such marvellous texture; nor can any feathers worn by a Prince of Wales compare with its exquisite crown of great sweeping plumes, the younger ones, of a translucent shining green, rising majestically in the centre.

Though connected by intermediate varieties with T. hymcnophylloides, the typical forms of either species are not easily confused with each other. The larger, but narrower, frond, the gradual tapering towards the base, and the closer, thicker appearance of the whole leaf, at once distinguish T. superba. The singularly soft, fluffy, feathery appearance of the frond is due to the crowded leaflets standing up like velvet pile.

All growers agree in the opinion that it is a difficult fern to transplant. The slightest breath of dry air shrivels the tender foliage like a blast of fire. As might be expected in a plant that has attained such perfection in form and colour, the least change of environment is fatal. Take away the umbrageous trees that screen it from sun and wind, the bushes and creepers that intercept any stray puffs while yet allowing the moistureTodea



(152) TODEA SUPERBA.

A Medium Specimen. Under Side.

MANGAPEHI,

laden atmosphere to refresh the great feathery fronds, and it is doomed.

The above description will prepare the reader for my difficulties in getting a leaf for photographing. Some plants were sent me from Mamaku, on the Rotorua railway. The day was moist and drizzling, which ensured their arriving in good order. The best leaf was photographed, but alas! it was not a perfect specimen, having suffered on the journey.

Realising more fully the obstacles that had to be overcome, I thought out a plan. To begin with, I spent many hours in making a flat, air-tight box, with cunning contrivances in the corners to hold damp moss, and a solid lid that screwed on tight, the whole being wrapped in waterproof paper. This was sent to my daughter in the King Country, where the fern grows in abundance, with the most elaborate instructions—the specimens were to be perfect, about 20 inches long, the stalks wrapped in a wet rag, nailed through the midrib, one frond to the bottom and one to the lid, and the space between packed with light moss, etc., etc. As the express did not stop at her station, it was to be forwarded by the goods train to Te Kuiti, catch the express at 3 a.m., and arrive in Auckland before 7.

When I heard from my daughter that the fern would be forwarded on Friday evening I hunted up the powers that be in Auckland, to make sure that there should be no hitch. I calculated, if everything went well, that the fern would be in the hands of the photographer—Mr. Birch—15 hours after it had been gathered, and I hoped that the air-tight box would preserve it for that length of time. However, the friend upon whose judgment I placed most reliance predicted that the fronds would be shrivelled and worthless within an hour of their being gathered; my only chance was to get a well-rooted plant packed in a large case, the top protected with bagging.

Meanwhile, my daughter and her henchman set out at 2 p.m. on horseback, the precious box slung in a sack over his back. After four miles up and down gullies littered with logs, they came to a terrific spur, where the horses' heads seemed to overhang a precipice on one side and their tails a sheer drop on the other, and eventually got down to a small piece of bush, very damp and swampy, where they searched for an hour and a half for a good specimen. The old growth had been battered and bruised by winter storms, and the young was not mature. At length a plant was found in a sheltered nook with perfect fronds. The box was opened, the moss gathered, the rag damped all ready, and then the fronds were cut, nailed into place, and the lid screwed on.

To quote my daughter's letter:—"The wind was so cold and cutting that the fronds were inclined to shrivel before we cut them, I expect they will arrive a withered up mass. We got home with it at 6 p.m., and went straight down to the train, which was late, and a good deal later by the time the guard had finished being an idiot (he refused to give the box to the stationmaster at Te Kuiti, as had been arranged). We found a very impatient family waiting for dinner when we got back at 7.30."

In Auckland I had been studying the weather—it had been a wet week—for I knew that much rain would render the bush tracks impassable for horses. On looking at the paper for the weather report on Friday evening I was dismayed to see that there had been landslips on the Main Trunk railway. In answer to my inquiries at the station, I was informed that the train would be twelve hours late! thus defeating all my plans for confining the railway journey to the cool hours of the night.

If everything had gone without a hitch there was just a chance of success; now that chance was gone. I was very much disappointed. For the last ninety-nine days the express had come through to time, and now, on the hundredth, the day that was to see the consummation of all my carefully-laid plans, it failed. Passing the railway station at a little after five on Saturday evening I asked at the parcel office when the express would arrive.

"Not for an hour or two," said the porter, civilly.

I began to bewail my hard luck, to tell him how I had enlisted the aid of my friends in the Traffic Department to get a box of botanical specimens through from the King Country before they had time to wither.

"That's a funny thing, sir," he said with sudden interest. "All the big bugs have been kicking up a dust about a box of ferns that came in by the goods half an hour ago."

"I wonder if that can be my parcel?"

"What might be your name, sir?"

"Dobbie."

"That's it, right enough," he said, disappearing into a dark corner of his office, and reappearing with the precious box.

In five minutes I was in the trancar with the case on my knee: it looked like a commonplace brown-paper parcel from the back; there was nothing to indicate the treasures within, or to show that it had made two long journeys by train, and had been carried over breakneck spurs on horseback. On the front it bore many cautionary instructions, including "VERY URGINT" in blue chalk.

By this time my expectations were down to zero. What chance had a delicate fern of surviving a twentytwo hours' journey on a jolting, clattering goods train, stopping at every station and shunting violently in and out of sidings?

I would not open it at home, or allow even a corner of the paper to be lifted until I got it to Mr. Birch and he had all his apparatus ready. The string was then untied, the waterproof paper removed, the lid unscrewed. It was a dramatic moment. I looked round impressively before uncovering the ruin, as I thought, of Nature's masterpiece.

#### TODEA

It was then the miracle happened. The beautiful green plume was as fresh as if it had just been gathered, not a withered or bruised leaflet; it was one of the pleasantest surprises I ever experienced. Mr. Birch lost no time in taking the photographs.

Thus were our efforts, threatened with failure, first by an inconsiderate landslip and then by the obstinacy of an intractable guard, crowned with success.

It is a difficult fern to transplant. Young plants may be coaxed to grow if kept in a still, moist atmosphere under good shade, but the surest plan is to grow from seed in a Wardian case.

Such is the fame of this splendid fern, the appreciation in which it is held, that it is often found in the ferneries of Europe. Imagine my astonishment on entering a private house in Carlisle, Cumberland, to behold fine specimens of this fern growing in a Wardian case in the hall.

It is confined to New Zealand.

## XXIX. MARATTIA

MARATTIA (to honour J. M. Maratti, of Tuscany, who wrote on ferns). A genus of 8 or 10 species, with 1 in New Zealand. One of the largest ferns that grows without a trunk. Seeds in little oval, boat-shaped vessels cleft down the middle, in a single row close to the margins of the leaflets.



(153) *M. fraxinea* (like an ash leaf). "Para," "King Fern," "Horseshoe Fern." The largest herbaceous fern in New Zealand; plentiful in the early days, now becoming scarce. The broad, glossy, dark-green fronds, and the little boat-shaped seed vessels are unmistakable.

Description.—Root a large, irregularly-shaped tuberous mass. Stalks stout, 1 to 2 feet long or more, brownish-green, jointed at the base. Fronds large, 6 to 12 feet long by 2 to 5 feet broad, dark-green, firm and stiff in texture. Seeds oblong, brownish, in a single row on the veins just within the margins of the leaflets.

North Island: Lowland forests from Mangonui southwards to Cape Egmont and Waitotara, not common; usually in rich damp soils. Sea-level to 1,000 feet.

The large starchy root was formerly eaten by the Maoris, who occasionally cultivated the plant near their

MARATTIA



(153) MARATTIA FRAXINEA.

A Small Specimen. Under Side.

TUAKAU.

villages. I have often seen it crested at the tips of the fronds. Wild pigs are said to have nearly exterminated it, and the existence of the few surviving plants is threatened by horses and cattle, who browse upon the succulent leaves, and that enemy whom nothing daunts —the fern collector!

It is easily grown, but will not bear frost. A great favourite for indoor cultivation. The broad, handsome fronds look as well in a hall, and give as tropical an aspect, as do young palm trees. In Auckland they grow so fast that, after three or four years, they become too large for the house, and have to be taken outside. They may be propagated by sets cut from the tuberous roots, as one treats potatoes. I knew a gentleman who took an especial pride in his para; on my last visit he showed me into his large drawing-room. The fern monopolised more than half the apartment; he had to make shift with what was left.

The species, though large in New Zealand, is almost gigantic in the tropics. I have seen them filling a gully in the jungle with radiating fronds from 20 to 30 feet long by 15 feet broad, a picture of tropical luxuriance I never saw surpassed. It is a wide-spread tropical and semi-tropical plant.



# XXX. OPHIOGLOSSUM

OPHIOGLOSSUM (ophios, of a serpent; glossa, a tongue). A genus of 8 to 10 species, with 2 in New Zealand; small succulent plants, the seeds carried on a projecting spike.



(154) O. lusitanicum (Portuguese). "Narrow-leaved Adder's Tongue." A small, insignificant-looking plant; easily missed by the casual collector; usually growing in grass.

Description.—Root cylindrical, semi-erect, slightly tuberous. Fronds, one to three from a root,  $\frac{1}{2}$ in. to 5 inches long, including the stalk and fertile spike. The barren leaf usually placed below the middle,  $\frac{1}{4}$ in. to 2 inches long by  $\frac{1}{8}$ in. to  $\frac{1}{3}$ in. broad, of a full green, texture firm and fleshy.

Kermadec Islands, North and South Islands, not uncommon throughout, ascending to 3,500 feet.

Personally I have failed to find it, though it is 50 years since I began to collect ferns. A very wide-spread plant.



(155) O. Vulgatum (common). "Adder's Tongue." Somewhat like O. lusitanicum, but rather larger; easily overlooked among the grass and bushes. Once only did 1 find a specimen—near St. John's Lake, Auckland.

Description.—Root short, cylindrical, often knotty. Fronds, one to two from a root, 4 to 12 inches long over all. Barren leaf placed near the middle,  $\frac{3}{4}$ in. to 3 inches long by  $\frac{1}{2}$ in. to  $1\frac{1}{2}$  inches broad, pale-green, very smooth, rather fleshy in texture. Fertile spike  $\frac{3}{4}$ in. to  $1\frac{1}{2}$  inches long, on a slender stalk, much longer than the barren leaf.

From the North Cape to Foveaux Strait, in moist grassy places by margins of swamps, etc. Sea-level to 2,000 feet.

A cosmopolitan plant, split up into a number of species by many authors.



(155) OPHIOGLOSSUM VULGATUM. ST. JOHN'S LAKE, AUCKLAND. A Medium Specimen. Barren and Fertile Fronds.

### XXXI. BOTRYCHIUM

BOTRYCHIUM (botrys, bunch—the seeds, like a bunch of grapes). A genus variously estimated at from 6 to 15 species, with 2 species and 1 variety in New Zealand. The stems are divided, one part supporting the leaf, the other the seed-spike.



(156) *B. lunaria* (moonwort). An odd-looking little plant, not in the least like other ferns; so far recorded only from Canterbury.

*Description.*—Roots short, tuberous. Fronds solitary, rarely two together, 3 to 6 inches high. Stalks stout, with one or two sheathing scales at the base. Barren leaves about the middle of the frond,  $\frac{3}{4}$ in. to 3 inches long by  $\frac{1}{2}$ in. to 1 inch broad, of a full green, rather fleshy. Fertile spike as high as or higher than the barren leaf,  $\frac{1}{2}$ in. to 3 inches long.

South Island: South-west slopes of Mount Torlesse, Canterbury; altitude 2,700 feet.

There is some doubt as to this fern being a native of New Zealand. To quote Dr. Cockayne's "New Zealand Plants," page 211, second edition:---"In the latter region (New Zealand) it has been recorded only

#### Botrychium

NATURAL SIZE.



ENGLAND,

#### NEW ZEALAND FERNS

from one spot—south-western slopes of Mount Torlesse, at 2,700 feet, where it was found many years ago by J. D. Enys, but has not been rediscovered."

A wide-spread species, always growing in the open.

(157) **B. ternatum** (divided in threes). "Parsley Fern." A fern with barren and fertile fronds branching from one stem, usually growing in shade when it is tender and succulent; the barren frond not unlike an uncurled parsley leaf.



Description.—Root short, stout. Fronds solitary, 6 to 18 inches long or more. Barren leaf variable in size, usually from 3 to 6 inches broad and long, but large specimens sometimes reach 9 to 13 inches, and small ones are often dwarfed to less than 2 inches, light-green to yellow-green, texture thick and fleshy. Fertile spike on a slender stalk, 4 to 12 inches long or more, nearly overtopping the barren leaf.

The ordinary form ranges from the North Cape to South Otago. Sea-level to 3,500 feet.

Personally I have rarely encountered this species. Mr. Thomson says:—"If lifted with some of the accompanying sod, this fern soon establishes itself in the fernery. It is much more readily shifted about than Ophioglossum, and is an extremely hardy plant."

Some authorities separate it into seven or eight distinct species, the New Zealand form being placed under *B. australe.* Found also in North America, Asia, Australia, and Tasmania.



385 SIZE, 13in. x 10in.



ORAKEI.

(158) *Var. dissectum* (much divided). Fronds more slender; barren leaf much more finely cut and narrowly divided, looking like moss.

Found throughout the Dominion, but often local—I never had the luck to find it.

#### Botrychium

#### SIZE, 133in. x 92in.



(158) BOTRYCHIUM TERNATUM, VAR. DISSECTUM. A Large Specimen. Barren and Fertile Frond. TARANAKI.

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# Maori Names for Ferns

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