Cynosurus cristatus, L. More generally naturalized in the Wellington district than any other.

Triticum sativum, L.

Lolium perenne, L.

italicum, A. Braun.

temulentum, L.

β. arvense. East Coast and Wairarapa.

* *Lepturus*, sp. Common on shingly beaches from Cape Palliser to Lowry Bay, and from Cape Terawiti to Miramar.

Hordeum vulgare, L.

murinum, L. Common near the sea; rare inland.

Anthistiria australis Br. Lower Rangitikei; Mount Victoria.

Note.—*Streptachne ramosissima*, Trin., discovered by Mr. Travers in the South Island, occurs in a naturalized condition at Miramar.

Panicum imbecille, Trin., occurs in an indigenous condition in the northern part of this island, and has become naturalized in the botanic gardens.

Art. LII.—*On the New Zealand Species of* Phyllocladus.

By T. Kirk, F.L.S.

[*Read before the Wellington Philosophical Society, 17th November*, 1877.]

With the exception of the kauri the celery-leaved pines are the most attractive members of our indigenous coniferæ; their striking appearance at once arrests the attention of the planter, while the singular structure of their foliaceous appendages gives them special interest in the eyes of the botanist. Only five species are known, three of which are found in New Zealand, in many localities forming a marked feature in the vegetation. Of the remaining species one is confined to the lofty mountains of Borneo, another which is closely allied to, if not identical with, the New Zealand *P. alpina*, is found in Tasmania, and, I believe, also in New Caledonia.

The species vary from dwarf alpine shrubs as *P. alpina* to handsome trees as *P. trichomanoides*, seventy feet in height, with a trunk from two to three feet in diameter, and affording timber of great strength and durability. All the species have the branches more or less arranged in whorls. *P. glauca* is invariably dicœcious, *P. trichomanoides* invariably moncœcious, *P. alpina* must be considered moncœcious also, but there is reason to believe that this species shows a tendency to assume a dicœcious character; this, however, has not been proved.

True leaves are only produced in the young state; they disappear before the plant attains its third year; rudimentary scale-like leaves, from the axils of which the broad foliaceous organs are produced, are developed on the branches, but soon fall off. The broad fern-like foliaceous expansions, which take the place of true leaves, are by some termed "cladodia," by others "phyllodia," according to the point of view from which they may be regarded, whether as consisting of abortive flattened branches when the former term is applied, or of a flattened and expanded petiole, or of coherent leaves, or of an expanded combination of leaves and petiole—to either of which the term phyllodia is applied. As, however, these organs develope flower-buds, a process of which true leaves are incapable, it is evident that they cannot be regarded merely as connate leaves, or any modification of leaves and petioles, so that the term cladodia is most closely applicable.

The cladodia are thick and coriaceous, more or less rhomboid in shape, with the upper margin more or less toothed, lobed, or erose; the lateral veins radiate from a central vein outwards, so that the organ bears a general resemblance to the pinnule of a large species of *Adiantum*. In *P. glauca* and *P. trichomanoides* the cladodia are arranged distichously on a rachis consisting of a peculiarly modified branch, and present the appearance of an ordinary pinnate leaf with alternate leaflets, forming in fact pinnate cladodia, the greater portion of which fall off when the lateral expansions have performed their function. But in *P. trichomanoides* during autumn or early spring a whorl of new cladodia is developed at the apex of an old rachis, the lateral cladodes of which soon after drop off and the rachis becomes a permanent branch. In the spring, male amenta are produced at the apex of a branch and surrounded by a whorl of cladodia with the lateral expansions greatly reduced in size and carrying female cones. This arrangement, however, is liable to several unimportant modifications. In *P. glauca* the process is somewhat different; a terminal rachis becomes elongated and thickened, assuming the character of a true branch; in the following spring the axis is slightly elongated and densely clothed with recurved rudimentary leaves surmounted by a whorl of large cladodia, which carry female flowers instead of lateral cladodia in the lower part of the rachis.

The female flowers are arranged in amenta, which are one-flowered in *P. trichomanoides*, two- to four-flowered in *P. alpina*, and from ten- to twenty-flowered in *P. glauca*. Each ovule is imbedded between two modified leaves, which become thickened and fleshy as the fruit approaches maturity, and in *P. glauca* at length woody. In that species the numerous nuts are arranged in slightly interrupted spirals, and in all the species the nuts are much compressed, and have the lower part invested by an arillode, which is most conspicuously developed in *P. alpina*.

No diagnosis of *P. glauca* has yet been published in the colony, although its discovery was announced in the first volume of our "Transactions."* A short time previously it had been described in France from young cultivated specimens supposed to have been obtained in Tasmania or raised from Tasmanian seed. I now give a diagnosis drawn from fresh specimens, and have added new descriptions of the other indigenous species, embodying all the information I have been able to obtain respecting them.

Phyllocladus glauca.

Carriere, Coniferes, p. 502; Gordon, Pinetum, p. 140; Henk. and Hochst., Nadelhölz, p. 173.

Phyllocladus trichomanoides, Don; *β. glauca*, DC., Prodromus, XVI., part ii., p. 498.

A dicœcious tree, 20–40 feet high, trunk 12–18 inches in diameter, branches stout; young leaves linear, glaucous beneath, crowded; scale leaves deciduous, recurved; cladodia distichous on a rachis 5–12 inches long; one or two at the end of a branch becoming produced into true branches, each developing a whorl of cladodia somewhat smaller than the original. Lateral cladodia glaucous when young, exceedingly coriaceous, rhomboid, or obliquely ovate-cuneate, deeply toothed or lobed; teeth obtuse. Flowers: male—amenta numerous, 10–20 at the tips of a branch, on stout radiating peduncles, including the peduncles about two inches long; scales obtuse; female—amenta distichous, shortly peduncled, 4–6 on each side of the lower part of a rachis; ovoid, half-an-inch long; nuts 10–20, much compressed.

Hab. North Island: Maungatawhiri—*R. Mair!* Great Omaha (1865), Great Barrier Island (1867), Cape Colville, Thames Gold Field—*T. K.;* Wairoa (East)—*W. J. Palmer.*

This species ascends from the sea level to 2,800 feet, attaining its largest dimensions in sheltered localities at the higher levels.

This is the toa-toa of the Maoris north of the Waitemata, but according to Colenso, the East Coast natives south of the Thames apply that name to the next species. Settlers in the South Island often apply it to *P. alpina.*

Although this species is glaucous in the young state, the specific name is not so appropriate as it would be to *P. alpina.*

The large size of the cladodia and the many-seeded fruit at once distinguish this fine species from its congeners; to these marked distinctive features may be added its dicœcious character and long peduncled male catkins, which are more numerous than in either *P. trichomanoides* or *P. alpina.* The female catkins are not borne on the margins of cladodia, but

* Trans. N.Z. Inst., I., p. 149.

on short peduncles which occupy their place and are confined to the lower part of the rachis. The nuts are arranged in slightly interrupted spirals.

The young leaves disappear about the second or third year. The mature plant bears some resemblance to the ginko, *Salisburia adiantifolia.*

Phyllocladus trichomanoides.

Don in Lamb. Pin., ed. 2, App.; Rich., Con., p. 129, t. 3; A. Cunn., Prodr.; Hook., Ic. Plant., t. 549, 550, 551; Endl., Conif., p. 225; Hook. fil., Fl. N.Z., I., 235—Handbook, p. 952; Carr., Conif., p. 449; Gord., Pin., p. 142; Parl. in DC. Prodromus, XVI., pt. II., p. 498.

P. rhomboidalis, A. Rich., Fl. Nov. Zel., p. 363. (not of C. L. Rich.)

A monœcious tree 60 feet high or more, trunk 2–3 feet in diameter, branches whorled, branchlets slender; young leaves linear, crowded, scale leaves acuminate, rachides 1–3 in. long, whorled, cladodia distichous, coriaceous, lobed or toothed, lobes truncate, erose. Fl.: male—amenta in terminal fasciculi of from 5 to 10, shortly pedicelled, scales acuminate; female—amenta solitary on the margin of cladodia, which are often reduced to mere peduncles, one-flowered, cup fleshy, nut much compressed.

Hab. North Island. Frequent in forests from the North Cape to Lake Taupo; less frequent southwards.

South Island: Mr. Travers informs me that this species occurs in the Maitai Valley, Nelson, where it attains the height of forty feet. I have not seen South Island specimens.

This species ranges from the sea-level to 2,500 feet.

It is the tanekaha of the northern natives, and, according to Colenso, the toa-toa of the natives south of the Thames.

It is easily distinguished by its slender twiggy branches and single seeded fruit. It is the loftiest of all the celery pines, in some cases attaining the height of seventy feet, and affording a timber of great strength and durability, capable of being worked with the greatest ease. The bark is valued for tanning and yields a black dye which has long been utilized by the natives.

The young leaves disappear the second year, and their transition to cladodia is somewhat abrupt; from the axils of the uppermost leaves pinnate or pinnatifid leaf-like organs are produced, the first two or three being about an inch in length with the lateral segments deeply laciniate or pinnatifid, but immediately above these others of larger dimensions are quickly produced, three to four inches in length, with the lateral segments acute and deeply laciniated, membranous, and glaucous beneath. These gradually pass into cladodia, which do not become coriaceous until the plant developes its second or third whorl of branches.

In an account of the building timbers of Otago,* Mr. Blair states that

* Trans. N.Z. Inst., IX., p. 163.

this species is common "at high altitudes on the west coast, but rare on the east coast of Otago," and that "it grows to a height of from fifty to sixty feet, with a straight clear trunk two to three feet in diameter for two-thirds of the distance." He adds, "A few trees are to be met with in the vicinity of Dunedin," etc. Unless Mr. Blair has been led astray by the native name tanekaha being misapplied to *P. alpina*, it is difficult to account for this error, as the present species does not occur in Otago, and *P. alpina*, although plentiful in the district mentioned by him, is usually little more than a bushy shrub, and never attains dimensions at all approaching those of *P. trichomanoides*.

Phyllocladus alpina.

Hook. f., Fl. N.Z., I., p. 235, t. 53—Handbook, p. 260; Carr., Conif., p. 501; Gord., Pin., p. 139; Henk. and Hochst., Nadelhölz, p. 373.

P. trichomanoides, Don, var. *alpina*; Parl. in DC. Prodromus, XVI., pl. II., p. 499.

A monœcious shrub or small tree, 5–20 feet high; branches numerous, short, stout; cladodia crowded glaucous, very coriaceous, varying greatly in size—half an inch to an inch in length,—cuneate, or linear rhomboid, or linear oblong, almost entire or variously lobed or toothed, margin erose. Fl.: male—in terminal fasciculi of 3–5 small, shortly peduncled catkins; female—on the margins of reduced cladodia or at the base of others; ovules two to four; cup fleshy, and largely compressed.

Hab. North Island: Ruahine Mountains—*Colenso;* Tongariro—*Bidwill.*

South Island: Common on the mountains; sea level near Hokitika, etc.,—*T.K.* Ascends to 5,000 feet near Nelson (according to *Bidwill.*)

The settlers in the South Island term this plant indifferently tanekaha and toa-toa.

Easily distinguished by its bushy habit, its crowded simple cladodia and 3–4-seeded fruit; the nuts are inverted, with a membranous arillode which is developed considerably above the margin of the fleshy cup.

The trunks of this species are used for levers by bushmen on the West Coast, but are rarely of sufficient dimensions to be valued for other purposes, except perhaps as fencing rails, for which their strength and durability would be well adapted. In the Handbook of the N.Z. Flora the trunk is said to be "sometimes two feet in diameter." I do not remember to have seen a specimen more than one-third of that size, and Mr. Buchanan informs me that his experience is the same.

The young state of this plant closely resembles that of *P. glauca*, but the first formed cladodia are shorter, broader, and more coriaceous in all stages; it is easily distinguished from that species and from *P. trichomanoides*, but I have no doubt that it will ultimately prove identical with the Tasmanian *P. rhomboidalis*, Rich., (*P. aspleniifolia*, Lab.), for although

specimens from alpine habitats look very different to that plant, fruited specimens from low levels are undistinguishable. I have not had the opportunity of examining male catkins of *P. rhomboidalis*, but believe they are longer and more slender than those of our plant.

ART. LIII.—*A revised Arrangement of the New Zealand Species of* Dacrydium, *with Descriptions of new Species.* By T. KIRK, F.L.S.

Plates XVIII.—XX.

[*Read before the Wellington Philosophical Society, 2nd February*, 1877.]

AMONGST the Protean plants of New Zealand few genera are in a more unsatisfactory condition than *Dacrydium*. The unisexual character of the species, the difficulty of procuring good flowering and fruiting specimens from the same individuals, and the local and difficult habitats of several forms, have led to great perplexity, through the combination of distinct species and a want of precision in the limitation of those admitted. It is hoped that the present paper will tend to remove these difficulties, although it must not be looked upon as final, since we may fairly expect that other species will yet be discovered in the mountain districts of the central portion of the North Island and the south-western portion of the South.

Although my attention has been specially directed to this genus for the last ten years, it was not until the commencement of last year that I was able to solve the difficulties by which it was surrounded, and to lay down more precise limitation for the recognized species with descriptions of others new to science. I am pleased to say that Sir Joseph Hooker and myself have independently arrived at the same conclusions, except with regard to a single species, and I take the opportunity of expressing my thanks to him for his valued notes, and for the opportunity so kindly afforded me of comparing several of the original specimens of Bidwill, Lyall, Colenso, and Hector, with my own collections.

The New Zealand species form two natural groups—the first distinguished by the young plants possessing terete spreading leaves which pass by very gradual transition, sometimes extending over a number of years, into the abbreviated and closely imbricated condition, characteristic of the mature state. With one exception all the species of this group are characterized by solitary fruit.

In the second group the young plants exhibit flat, linear, spreading leaves, which for the most part pass abruptly into the quadrifariously imbricated leaves characteristic of the fruiting state: leaves of an intermediate kind are