

narrowed into the very broad flat petiole, obtuse or slightly mucronate. Racemes two, rarely three, near the ends of the branches, much longer than the leaves, puberulous, loosely flowered, pedicels as long or longer than the calyx, calyx lobes ovate, obtuse, puberulous; corolla small; capsules not seen.

*Hab.*: Broken River, Canterbury. *Alt.*: 2,000 feet. J. D. Enys and T. Kirk.

Allied to *V. laevis*, Hook., f., from which it is readily distinguished by the larger leaves, the lax racemes, and peculiar habit.

*Veronica canescens*, n. s.

Plate XIX.

A small procumbent herb, stems 1–2 inches in length, more or less hispid. Leaves opposite,  $\frac{1}{2}$ – $\frac{1}{10}$  of an inch long, shortly petioled, broadly ovate, obtuse, nearly rounded at the tip, ciliated, and usually clothed on both surfaces with white retrorse hairs. Flowers solitary, axillary, on slender peduncles,  $\frac{1}{5}$ – $\frac{1}{3}$  inch long, with two hispid bracts near the base, sepals lanceolate, hispid; corolla very large for the size of the plant; capsule not seen.

*Hab.*: Lake Lyndon, Canterbury. *Alt.*: 2,800 feet. J. D. Enys and T. Kirk. Oamaru District, Otago. J. Buchanan.

This very distinct species is one of the most minute flowering plants in the New Zealand Flora, and is the only indigenous species which produces solitary axillary flowers.

It is probably not uncommon, as, from the grey tint of the hispid foliage, it is easily overlooked, except during the flowering season, when its delicate but showy pale blue corolla at once attracts attention. In habit this plant closely approaches *Anagallis tenella*, L.

DESCRIPTION OF PLATE.

PLATE XIX.—1. *Veronica canescens*, natural size. 2. Leaf. 3. Flower. 4. Pistil, enlarged.

ART. LXXIII.—On the Botany of Kawau Island: Physical features and causes influencing distribution of Species. By JOHN BUCHANAN, F.L.S.

[Read before the Wellington Philosophical Society, 2nd September, 1876.]

IN attempting a descriptive sketch of the botany of Kawau Island it will be necessary, for the better appreciation of the subject, to notice shortly some of

the influences which have contributed towards its existing facies. And first among these, and most important, is its geographical position.

Kawau, the property of Sir George Grey, K.C.B., stands as an outlying island on the east coast of the North Island, 27 miles north of Auckland, being one of many islands in that neighbourhood which no doubt at one time formed part of the main land, its proximity to the latter being distant only four miles, and possessing no higher altitudes, will naturally indicate a closely allied or nearly identical Flora.

The island is irregular in form, three and a half miles north and south, by three and a quarter miles east and west, and containing 5,200 acres of land.

According to Dr. Hector's Geological Report, the rocks from which the soil is derived are "palæozoic slates and tertiary sandstones." On the higher ridges and spurs are found stiff clay and sandy soils, similar to much of that on the main land; on the lower slopes again the soil is much superior; and on the lower levels and small vallies it is very rich, as shown by the luxuriant vegetation growing there.

The indirect influence of arid soils has through the progress of time produced much of the varied features of the existing vegetation, as from drought on stiff clay or sandy soils, making repeated burnings easy, and preventing the growth of trees, hence the present amount of scrub land and fern. Again, at critical times the native grasses are burnt out.

The whole surface drainage of the island is westerly, the easterly side presenting a precipitous face, a part of the island in that direction having apparently been removed by the action of the sea.

This peculiar system of drainage is more strikingly seen in the Island of Kapiti, in Cook Strait, where the highest altitudes are situated along the edge of the seaward cliff, which at one time appears to have formed the longitudinal centre of the island.

Kawau, viewed from the sea as it is approached from the south or west, presents a most picturesque combination of headlands, bays, and smooth grassy downs, with large masses of bush, reminding one of the cultivated park scenery of Britain. Much of the surface condition of New Zealand before settlement possessed this park-like appearance, being especially fine in Southland; but in the clearer atmosphere of the North the colour-effects are more varied and pleasing.

Kawau is well watered by numerous streams, which fall into the harbours and bays which indent its westerly shores. The surface configuration being rounded, and the higher elevations under 600 feet, the rugged and grand does not exist, but in its place a quiet beauty reigns, much of it in places being the outcome of artistic cultivation. On shore, as the island is

traversed, the ever-changing scenery is beautiful, and the Fauna might puzzle the visitor as to his whereabouts on the face of the earth. The Deer of Britain may be seen hurrying past to the covert; the Kangaroo of Australia, spanning across the path, pulls up erect to view the stranger; Tree Kangaroos from New Guinea are seen hopping up and down Puriri trees; the visitor is ever kept on the alert by the whirr of Californian Quail, or Chinese Pheasants, and the Wallabi Kangaroo, in numbers, keep zig-zagging across his path; the Cape Barren Goose might also exhibit to him the unusual sight of a bird carrying her young under her wings. The introduction of so many animals and plants must produce some influence on the indigenous Flora of the island either for good or evil in future years.

*Flora of the Island.*

The lists appended have no claim to be considered as exhaustive of the Flora of Kawau, and future collectors on the island may therefore search with hope of being rewarded for their labours by further discoveries both in native and introduced plants.

Many interesting plants collected by Mr. Kirk on the Great and Little Barrier Islands, and Arid Island to the eastward, do not seem to be found in Kawau. The absence of sufficient altitude may account for this with such species as *Ixerba brevifolia*, *Dacrydium colensoi*, *Phyllocladus glauca*, *Archieria racemosa*, and others, and the rare plant *Pisonia umbellifera* is not likely to be found so close to the main land.

*Indigenous Species.*

A remarkable feature in the indigenous Flora of Kawau Island is the great number of orders and genera represented by so few species. The following are the proportions:—75 orders, 189 genera, 348 species and varieties, which give nearly  $4\frac{3}{4}$  species to each order, and about  $1\frac{5}{8}$  species to each genus. When it is considered that the entire number of phænogamic orders given in Hooker's "Handbook for New Zealand" is only 87, it must be admitted that the indigenous Flora is well represented in families, if not in species.

*Introduced species.*

In this list only three cultivated garden plants are included, the others being chiefly accidentally, or otherwise, introduced weeds. They are, although numerous in species, with few exceptions, not abundant in numbers, and are represented by 31 orders, 96 genera, and 125 species, thus showing the same disproportion of species to genera and orders as the indigenous Flora.

In *Cryptogams*, of which ferns and allies only are given, there are 2 orders, 25 genera, and 90 species, including varieties.

*Botanical divisions of the Flora.*

The botanical divisions may be popularly arranged under three groups : Grass, Scrub, and Bush.

*Grass.*

The lists of indigenous and exotic grasses and other pasture plants were noted at an early period of the season, and consequently some might have been overlooked. The number of species, however, in the list is great, although a few are worthless as food, and several others, although valuable, are neither abundant nor wide spread. There are 65 species, including varieties, in all, among which the following are abundant everywhere, and which may be said to constitute the main part of the pasture.

*Dichelachne crinita*, *Dichelachne sciurea*, *Danthonia semi-annularis*, *Anthoxanthum odoratum*, *Holcus lanatus*, *Festuca myurus*, *Lolium perenne*, *Triticum scabrum*, *Agrostis vulgaris*, *Poa annua*, *Poa pratense*, *Poa anceps*, *Trisetum antarcticum*, *Aira caryophylla*, *Dactylis glomeratus*.

The early supply of food for sheep in spring depends largely on these fifteen species, and putting the comparative nutrient value of some of them aside, they may be considered the most valuable on the whole, as being available when most needed.

The following species on the list are worthless as food, and fortunately they are neither abundant or found on the pasture, being chiefly confined to the sea-shore :—

*Spinifex hirsutus*, *Arundo conspicua*, *Festuca littoralis*, *Bromus arenarius*, *Bromus sterilis*, *Hordeum murinum*, and *Avena pratensis*.

Among the remaining species on the list, several are valuable as pasture grasses, but seem to be either rare or confined to certain localities, as *Sporobolus elongatus*, and *Stenotaphrum glabrum*, both valuable because permanent, although inferior as sheep grasses.

The clovers are abundant and widespread, being adapted from their deep rooting to resist droughts.

The grasses on the more exposed ridges where stiff clay or sandy soil is present, are sparse, and suffer from the heats of summer. They are also liable to displacement by the growth of arid weeds, but the lower slopes and damp vallies carry a rich growth of superior grasses.

Stomachic plants are also present, so useful in preserving the health of stock. The following are common :—Parsley, Veronicas, Yarrow, Canadian Flea-bane, Centaury, etc.

There can be no doubt that the extensive pastures of Australia and New Zealand have been deteriorating during the past 20 years, and chiefly from the disappearance of the finer fibrous-rooted grasses, whose roots ramify near the surface of the ground. The cause of this is evident, by the exposure of

their roots to the excessive heat of the sun or frosts, from over-feeding with stock, and burning the grass at improper seasons. Any alleviation of this can only be obtained by the introduction of deep-rooting grasses; but the only permanent remedy will be got by the formation of resting-paddocks, or fenced divisions of the land, by which portions of the pasture may rest even for even a short time. Further notice of this does not, however, come within the limit of this paper.

#### Scrub.

The scrub vegetation of Kawai is the after-growth of fire, and at first is composed of species of arid growth, such as *Leptospermum* (Manuka), *Leucopogon* (Mingimingi), *Pomaderris* (Kumarahou), *Carmichaelia* (Whakaka), *Coprosma* (Karamu), etc. Under the shadow and shelter of their close growth numerous young plants of the larger trees soon appear, with a host of smaller species, and thus, after a long period of time, if no other fire occurs, is the gradual renovation of the bush accomplished.

When the dense scrub land of Otago was first burned 20 years ago, a rich growth of Native grasses sprung up afterwards, producing a pasture of the first class. It is probable, however, that, in Kawai and similar arid soils in Auckland, an early sowing of grass seed during cool moist weather would be necessary to ensure success after burning.

#### Bush.

Under this head are included extensive patches of valuable timber trees in general, mixed with numerous species of smaller growth, which although ornamental have little commercial value except as firewood. The growth is dense and luxuriant; in places where the Nikau Palm and Tree Ferns are abundant, as in some of the deeper vallies, forming a close canopy of foliage overhead, a gloomy silence prevails, unbroken by the sound of animal life, the numerous opossums and birds finding a more congenial sphere above in the sunshine of the higher trees.

The indigenous trees which contribute most to scenic effects are Pohutakawa (*Metrosideros tomentosa*), a valuable timber tree, in many places lining the shores of the island, and exhibiting a gorgeous beauty when in flower; Taraire (*Nesodaphne taraire*), having a rounded form of fine foliage; Puriri (*Vitex littoralis*), another valuable timber tree, with much of the sturdy gnarled aspect of the oak; Tawaapou (*Sapota costata*), with bright green foliage and rounded form; several species of pines (*Podocarpus* and *Dacrydium*), all valuable timber trees, and contrasting their peculiar small-leaved foliage with the large-leaved trees of the bush; Rewarewa (*Knightsia excelsa*), a tall tapering tree, is a prominent object on the hill slopes. The wood of this tree makes beautiful furniture work. The following species are rare:—Tawhairaunui (*Fagus fusca*)—very few specimens of this tree

are now found on the island. Kauri (*Dammara australis*)—this valuable pine, with the last, is confined to the higher palæozoic rocks. Pukatea (*Atherosperma novæ zealandiæ*), always known by its large buttressed trunk, and Tangeo (*Tetranthera calicaris*), of which only one specimen was seen.

As the visitor on leaving the island recedes from Moana Bay by steamer, the extreme beauty of the landscape, as its features change by distance, is very pleasing. There is seen to great advantage that scientific combination of nature and art, which is ever the aim of the landscape gardener. The object often necessary as a principle of this science being architecture, we have here in the middle distance Sir George Grey's residence at the head of the bay, surrounded by rare and beautiful trees and shrubs, many of them sub-tropical. On the lawn may be seen *Erythrina caffra*, the coral tree, covered with brilliant scarlet flowers; *Fourcroyia gigantea*, a plant of the Amaryllis family, with remarkable flowers. This tree produces a fine fibre, and grows well without any cultivation on the worst clay hills. *Fourcroyia flavavirides*, another fine fibre plant; *Chamaerops excelsa*, a palm tree also producing a fine fibre, and *Chaemaerops fortunei*, *Bœhmeria nivea*, another fine fibre tree belonging to the nettle family; *Musa textilis*, the Banana fibre tree from which the manilla fibre of commerce is procured; as also *Musa sapientum*, the fruit Banana, which yearly ripens fruit here; *Broussonetia papyrifera*, from which a kind of paper is made in Japan; *Punica granatum*, the pomegranate; *Olea europæa*, the Olive; a tree likely to become important in the North Island, from the oil product of its fruit as a commercial export; all the finest varieties of this valuable species are cultivated here. *Arduina grandiflora*, the Natal Plum, worthy of cultivation for its fruit; *Ficus carica*, the Fig tree, and several other species of this family; *Anona muricata*, the Custard Apple; *Ceratonia siliqua*, St. John's Bread tree; *Eriobotrya japonica*, the Loquat tree, which bears abundantly; *Zingiber officinalis*, Ginger, several species of this family; *Stillingia sebifera*, the Tallow tree, from which the Japanese manufacture candles. This plant, one of the Euphorbia family, succeeds well here. *Quercus suber*, the Cork tree, is represented by several large specimens; this tree is worthy of attention by the Forests Department. Several curious species of Japanese Oaks; groves of *Aralia papyrifera*, the Paper tree; *Xanthorea hastilis*, the curious Grass-tree of Australia; numerous species of Bamboos, including the gigantic Bamboo. These bamboos form good shelter hedges. When to this list are added Cinnamon, Camphor, Orange, Lemon, and Citron trees, sufficient proof is given of the existence of a remarkably mild climate.

It is Sir George Grey's opinion, that many of these valuable commercial plants are well adapted for the climate of Wanganui, and he is now making arrangements to send several young plants there as a trial.

The shore lines of massive Native trees flank this central portion of the landscape on either side; among them prominent, the Pohutakawa, in a full blaze of crimson blossom, harmonizing well with the dark green foliage of the Puriri and Tawaapou trees. On the rising background, numerous large grown trees, Australian and American Pines, including species of *Auracaria*, *Pinus*, *Cupressus*, etc., add to the beauty of the scene by their artistic groupings, in some places their sharp-pointed outlines, as seen against the sky, contrasting finely with the rounded forms of the Native species, and their sombre green relieved by the pale silvery-white foliage of the *Leucodendron argenteum* trees from the Cape of Good Hope. The visitor, as the island fades away from his view, can only wish that a settled population may never be found within its shores, and that its peace and beauty may always remain undisturbed.

—

*Indigenous Flowering Plants of Kawau.*

DICOTYLEDONS.

RANUNCULACEÆ.

- Clematis indivisa*, Willd. (Puwhananga), C.  
*foetida*, Raoul.  
*parviflora*, A. Cunn.  
*Ranunculus hirtus*, Banks and Sol.  
*rivularis*, Banks and Sol.  
*acaulis*, Banks and Sol.  
*parviflorus*, Linn., var. *australis*. (Korikori.)

CRUCIFERÆ.

- Nasturtium palustre*, D.C. (Kowhitiwhiti.)  
*Cardamine hirsuta*, Linn., var.  $\beta$ . *corymbosa*. (Panapana.)  
*Lepidium oleraceum*, Forst. (Eketere, D'U.).

VIOLARIÆ.

- Viola filicaulis*, Hook., fl.  
*Melicytus ramiflorus*, Forst. (Mahoe.)  
*lanceolatus*, Hook., fl.  
*Hymenanthera latifolia*, Endl.

PITTOSPOREÆ.

- Pittosporum tenuifolium*, Banks and Sol.  
 var. *fasciculatum*, (Kirk.)  
*crassifolium*, Banks and Sol. (Karo, Kihii.)  
*eugenioides*, A. Cunn. (Tarata), C.  
*cornifolium*, A. Cunn. (Karo), C.  
*intermedium*, Kirk.

## CARYOPHYLLÆ.

*Stellaria parviflora*, Banks and Sol. (Kohu Kohu.)

*Colobanthus billiardieri*, Fenzl.

*Spergularia rubra*, Pers., var. *marina*.

## PORTULACÆÆ.

*Montia fontana*, Linn.

## HYPERICINÆÆ.

*Hypericum japonicum*, Thunb.

## MALVACÆÆ.

*Plagianthus divdricatus*, Forst., Kirk.

*Hoheria populnea*, A. Cunn., var. *vulgaris*. (Houhere.)

var.  $\beta$ . *lanceolata*. (Houhere.)

## TILIACÆÆ.

*Entelea arborescens*, Br. (Whau.)

*Aristolelia racemosa*, Hook., fil. (Makomako), Cunn. ; (Mako.)

*Elæocarpus dentatus*, Vahl. (Hinau.)

## LINEÆÆ.

*Linum monogynum*, Forst. (Rauhuia), C.

*marginale*, A. Cunn.

## GERANIACÆÆ.

*Geranium dissectum*, Linn., var. *carolinianum*. (Pinaketere.)

var.  $\alpha$ . *pilosum*, Kirk.

var.  $\beta$ . *patulum*, Kirk.

*microphyllum*, Hook., fil.

*molle*, Linn.

*Pelargonium australe*, Willd., var. *clandestinum*. (Kopata.)

*Oxalis corniculata*, Linn., var.  $\beta$ . *stricta*.

var.  $\epsilon$ . *crassifolia*, Kirk.

## RUTACÆÆ.

*Phebalium nudum*, Hook., (Kirk.)

*Melicope ternata*, Forst. (Tataka), M. ; (Wharangi), C.

*simplex*, A. Cunn.

## MELIACÆÆ.

*Dysoxylum spectabile*, Hook., fil. (Kohe), C.

## RHAMNÆÆ.

*Pomaderris elliptica*, Labill. (Kumerahou), C.

*phyllicifolia*, Lodd.

## SAPINDACÆÆ.

*Dodonæa viscosa*, Forst. (Ake), C.

## ANACARDIACÆÆ.

*Corynocarpus lævigata*, Forst. (Karakā.)



CORIARIEÆ.

*Coriaria ruscifolia*, Linn. (Tupakihi, Tutu.)

LEGUMINOSÆ.

*Carmichellia australis*, Br. (Whakaka.)

*Sophora tetraptera*, Aiton., var. *grandiflora*. (Kowhai.)

ROSACEÆ.

*Rubus australis*, Forst. (Tataramoa), C.

var. *α. glaber*.

var. *β. schmideloides*.

var. *γ. cissoides*.

*Potentilla anserina*, Linn.

*Acæna sanguisorbæ*, Vahl. (Hutiwai.)

SAXIFRAGÆ.

*Quintinia serrata*, A. Cunn., (Kirk.)

*Carpodetus serratus*, Forst. (Piripiriwhata.)

*Weinmannia sylvicola*, Banks and Sol. (Towai.)

CRASSULACEÆ.

*Tillæa verticillaris*, D.C.

DROSERACEÆ.

*Drosera binata*, Labill.

*auriculata*, Backhouse.

HALORAGÆ.

*Haloragis alata*, Jacq. (Toatoa).

*tetragyna*, Labill. (Piripiri.)

*micrantha*, Br.

*Callitriche verna*, Linn.

MYRTACEÆ.

*Leptospermum scoparium*, Forst. (Kahikatoa), M.

*ericoides*, A. Rich. (Manuka) Col.

*Metrosideros florida*, Sm. (Ratapika), B. Cunn.

*albiflora*, Banks and Sol.

*hypericifolia*, A. Cunn.

*robusta*, A. Cunn. (Rata.)

*tomentosa*, A. Cunn. (Pohutakawa.)

*scandens*, Banks and Sol. (Akakura.)

*Myrtus bullata*, Banks and Sol., (Kirk.)

*Eugenia maire*, A. Cunn. (Whawhaka.)

ONAGRARIÆ.

*Fuchsia excorticata*, Linn., fil. (Kohutuhutu), C.

*Epilobium nummularifolium*, A. Cunn. (Hinatoli.)

*alsinoides*, A. Cunn.

- Epilobium rotundifolium*, Forst.  
*tetragonum*, Linn.  
*junceum*, Forst., (Kirk.)  
*pubens*, A. Rich.  
*billardierianum*, Seringe.  
*pallidiflorum*, Sol.

## PASSIFLOREÆ.

- Passiflora tetrandra*, Banks and Sol.

## CUCURBITACEÆ.

- Sicyos angulatus*, Linn.

## FIGOIDEÆ.

- Mesembryanthemum australe*, Sol.  
*Tetragonia expansa*, Murray. (Kohihi.)

## UMBELLIFERÆ.

- Hydrocotyle elongata*, A. Cunn.  
*americana*, Linn.  
*asiatica*, Linn.  
*pterocarpa*, F. Muell., (Kirk.)  
*moschata*, Forst.

- Crantzia lineata*, Nutt.

- Apium australe*, Thouars.

*leptophyllum*, F. Muell., considered indigenous by Kirk.

*filiforme*, Hook.

- Angelica rosæfolia*, Hook.

- Eryngium vesiculosum*, Labill.

- Daucus brachiatus*, Sieber.

## ARALIACEÆ.

- Panax simplex*, Forst.

*crassifolium*, Dene and Planche. (Hohoeaka.)

*lessonii*, D.C. (Whauwhau), R. Cunn.

*arboreum*, Forst. (Whauwhaupaku), C.

- Schefflera digitata*, Forst. (Pate, Patete.)

## CORNEÆ.

- Griselinia lucida*, Forst. (Pukatea), C.

- Corokia buddleoides*, A. Cunn., (Kirk.)

## LORANTHACEÆ.

- Loranthus micranthus*, Hook., fil., (Kirk.)

- Tupeia antarctica*, Cham. and Schl. (Pirita.)

## CAPRIFOLIACEÆ.

- Alseuosmia macrophylla*, A. Cunn.

*linariifolia*, A. Cunn.

*quercifolia*, A. Cunn., (Kirk.)

## RUBIACEÆ.

- Coprosma lucida*, Forst. (Karamu), C.  
*grandifolia*, Hook., fl. (Papaaumu), C.  
*baueriana*, Endl.  
*robusta*, Raoul. (Karamu.)  
*cunninghamii*, Hook., fl.  
*arborea*, Kirk, M.S., (Kirk.)  
*spathulata*, A. Cunn. (Mamangi.)  
*rotundifolia*, A. Cunn.  
*tenuicaulis*, Hook., fl.  
*divaricata*, A. Cunn., (Kirk.)  
*propinqua*, A. Cunn.  
*acerosa*, A. Cunn. (Tatarahake), C.  
*Nertera dichondraefolia*, Hook., fl.  
*Galium tenuicaule*, A. Cunn.  
*umbrosum*, Forst, (Kirk.)

## COMPOSITÆ.

- Olearia furfuracea*, Hook., fl. (Akepiro), C.  
*cunninghamii*, Hook., fl. (Akewharangi.)  
*albida*, Hook., fl.  
*Celmisia longifolia*, Cass.  
*Vittadenia australis*, A. Rich.  
*Lagenophora forsteri*, D.C.  
*petiolata*, Hook., fl.  
*Bidens pilosa*, Linn., (Kirk.)  
*Cotula coronopifolia*, Linn.  
*australis*, Hook., fl.  
*minor*, Hook., fl.  
*dioica*, Hook., fl., (Kirk.)  
*minuta*, Forst.  
*Cassinia leptophylla*, Br.  
*Craspedia fimbriata*, D.C.  
*Ozothamnus glomeratus*, Hook., fl.  
*Gnaphalium keriense*, A. Cunn.  
*fliccaule*, Hook., fl.  
*luteo-album*, Linn.  
*involucratum*, Forst.  
*collinum*, Labill.  
*Erechtites prenanthoides*, D.C.  
*arguta*, D.C.  
*scaberula*, Hook., fl., (Kirk.)

*Erechtites quadridentata*, D.C. (Pekapeka.)

*Senecio lautus*, Forst.

*Brachyglottis repanda*, Forst. (Pukapuka), C. ; (Rangiora), C.M.

*Sonchus oleraceus*, Linn. (Pororua, Puwha.)

CAMPANULACEÆ.

*Wahlenbergia gracilis*, A. Rich.

*Lobelia anceps*, Thunb.

*Pratia angulata*, Hook., fil.

*Sellieria radicans*, Cavan.

ERICACEÆ.

*Gaultheria antipoda*, Forst., var. *a.* (Kirk.)

var. *ε.* (Korupuku), C.

*Cyathodes acerosa*, Br. (Mingi), C.

*Leucopogon fasciculatus*, A. Rich. (Mingimingi.)

*frazeri*, A. Cunn. (Patotara).

MYRSINACEÆ.

*Myrsine salicina*, Heward.

*urvillei*, A. D.C. (Mapau), C. ; (Tipau, Matipau.)

PRIMULACEÆ.

*Samolus littoralis*, Br.

SAPOTACEÆ.

*Sapota costata*, A. D.C. (Tawaapou), C. ; (Orewa).

JASMINEÆ.

*Olea cunninghamii*, Hook., fil. (Maireraunui), C.

*lanceolata*, Hook., fil., (Kirk.)

APOCYNACEÆ.

*Parsonsia albiflora*, Raoul. (Kaiku.)

*rosea*, Raoul, (Kirk.)

LOGANIACEÆ.

*Geniostoma ligustrifolia*, A. Cunn. (Hangehange), C.

BORAGINACEÆ.

*Myosotis forsteri*, Roem. and Sch.

CONVOLVULACEÆ.

*Convolvulus sepium*, Linn. (Pohue, Panahi.)

*tuguriorum*, Forst., (Kirk.)

*soldanella*, Linn. (Nahinahi.)

*Dichondra repens*, Forst.

SOLANACEÆ.

*Solanum aviculare*, Forst. (Kohokohu, Poroporo).

*nigrum*, Linn.

## SCROPHULARINEÆ.

- Veronica salicifolia*, Forst. (Koromiko.)  
*macrocorpa*, Vahl. (Koromiko.)  
*parviflora*, Vahl.

## GESNERIACEÆ.

- Rhabdothamnus solandri*, A. Cunn. (Matata. Wainatua.)

## VERBENACEÆ.

- Vitex littoralis*, A. Cunn. (Puriri), C.  
*Avicennia officinalis*, Linn. (Manaawa), C.  
*Myoporum lætum*, Forst. (Ngaio), C.

## LABIATÆ.

- Mentha cunninghamii*, Benth.

## PLANTAGINEÆ.

- Plantago raoulii*, Decaisne. (Kopakopa.)

## CHENOPODIACEÆ.

- Chenopodium triandrum*, Forst.  
*urbicum*, Linn.  
*glaucum*, Linn., var. *ambiguum*, (Kirk.)  
*Atriplex billiardieri*, Hook., fil.  
*Salicornia indica*, Willd.

## PARONYCHIEÆ.

- Scleranthus biflorus*, Hook., fil. (Kohukohu.)

## POLYGONEÆ.

- Polygonum minus*, Huds., var. *decipiens*.  
*aviculare*, Linn. (Tutunawai), C.  
*Muhlenbeckia adpressa*, Lab.  
*complexa*, Meisn.  
*Rumex flexuosus*, Forst.

## LAURINEÆ.

- Tetranthera calicaris*, Hook., fil. (Tangeo.)  
*Nesodaphne tarairi*, Hook., fil. (Taraire.)  
*tawa*, Hook., fil. (Tawa.)

## MONIMIACEÆ.

- Atherosperma novæ zealandiæ*, Hook., fil. (Pukatea.)  
*Hedycarya dentata*, Forst. (Kaiwhiria, Porokaiwhiria.)

## PROTEACEÆ.

- Knightia excelsa*, Br. (Rewarewa.)

## THYMELEÆ.

- Pimelia longifolia*, Banks and Sol.  
*virgata*, Vahl.  
*prostrata*, Vahl., var. *a*.  
 var. *β.*, (Kirk.)

## SANTALACEÆ.

*Santalum cunninghamii*, Hook, fil. (Maire.)

## EUPHORBIACEÆ.

*Euphorbia glauca*, Forst. (Waiuatua), C.

## CUPULIFERÆ.

*Fagus fusca*, Hook., fil. (Tawhai.)

## URTICEÆ.

*Epicarpurus microphyllus*, Raoul. (Towhai), R.

*Urtica incisa*, Poiret. (Ongonga.)

*Parietaria debilis*, Forst.

## PIPERACEÆ.

*Peperomia urvilleana*, A. Rich.

*Piper excelsum*, Forst. (Kawakawa.)

## CONIFERÆ.

*Dammara australis*, Lambert. (Kauri.)

*Libocedrus doniana*, Endl.

*Podocarpus ferruginea*, Don. (Miro), Cunn.

*totara*, A. Cunn. (Totara), Cunn.

*spicata*, Br. (Maii), C.

*dacrydioides*, A. Rich. (Kahikatea), Cunn.

*Dacrydium cupressinum*, Sol. (Rimu), C.

## MONOCOTYLEDONS.

## ORCHIDEÆ.

*Earina mucronata*, Lindl.

*autumnalis*, Hook., fil.

*Dendrobium cunninghamii*, Lindl.

*Bolbophyllum pygmaeum*, Lindl. (Piripiri.)

*Sarcophilus adversus*, Hook., fil.

*Gastrodia cunninghamii*, Hook., fil. (Perei), C.

*Acianthus sinclairii*, Hook., fil., (Kirk.)

*Corysanthes oblonga*, Hook., fil.

*Microtis porrifolia*, Spreng.

*Caladenia minor*, Hook., fil.

*Pterostylis banksii*, Br.

*trullifolia*, Hook., fil., (Kirk.)

*Thelymitra longifolia*, Forst.

*pulchella*, Hook., fil. (Maikaikai.)

*Prasophyllum colensoi*, Hook., fil.

## IRIDEÆ.

*Libertia ixioides*, Spreng. (Turutu.)

*micrantha*, A. Cunn.

## PANDANEÆ.

*Freycinetia banksii*, A. Cunn. (Kiekie.)

## TYPHACEÆ.

*Typha latifolia*, Linn. (Raupo.)

## NAIADEÆ.

*Lemna minor*, Linn.*Triglochin triandrum*, Michaux.*Zostera marina*, Linn.

## LILIACEÆ.

*Rhipogonum scandens*, Forst. (Kareao.)*Cordyline australis*, Hook., fl. (Ti.)*banksii*, Hook., fl. (Tiparæ.)*pumilio*, Hook., fl.*Dianella intermedia*, Endl. (Turutu.)*Astelia cunninghamii*, Hook., fl. (Kowharawhara), C.*solandri*, A. Cunn. (Kahakaha), C.*trinervia*, (Kirk.)*banksii*, A. Cunn. (Kowharawhara), C.*Arthropodium cirrhatum*, Br. (Rengarenga.)*candidum*, Raoul.*Phormium tenax*, Forst. (Harakeke.)*colensoi*, Hook., fl. (Wharariki.)

## PALMEÆ.

*Areca sapida*, Sol. (Nikau.)

## JUNCEÆ.

*Juncus vaginatus*, Br. (Whiwhi).*australis*, Hook., fl.*communis*, E. Meyer.*planifolius*, Br.*holoschænus*, Thunb.*bufonius*, Linn.*novæ zealandiæ*, Hook., fl.*Luzula campestris*, D.C., var.  $\gamma$ . *pallida*.

## RESTIACEÆ.

*Leptocarpus simplex*, A. Rich. (Toetoe.)

## CYPERACEÆ.

*Cyperus ustulatus*, A. Rich. (Toetoe.)*Schænus axillaris*, Hook., fl.*tenax*, Hook., fl.*tendo*, Banks and Sol., (Kirk.)*Scirpus maritimus*, Linn. (Kiriwaka.)

- lacustris*, Linn.  
*triqueter*, Linn.  
*Eleocharis gracilis*, Br.  
     var.  $\beta$ . *gracillima*.  
     var.  $\gamma$ . *radicans*.  
     *acuta*, var. *platylepis*.  
*Isolepis nodosa*, Br. (Wiwi.)  
     *prolifer*, Br.  
     *riparia*, Br.  
     *aucklandica*, Hook., fil.  
*Desmoschœnus spiralis*, Hook., fil. (Pingao.)  
*Cladium glomeratum*, Br.  
     *junceum*, Br.  
     *gunnii*, Hook., fil., (Kirk.)  
     *sinclairii*, Hook., fil., (Kirk.)  
*Gahnia setifolia*, Hook., fil.  
     *procera*, Forst.  
     *lacera*, Steud.  
     *ebenocarpa*, Hook., fil.  
     *arenaria*, Hook., fil.  
     *pauciflora*, Kirk.  
*Lepidosperma tetragona*, Labill.  
     *concava*, Br., (Kirk.)  
*Uncinia australis*, Pers.  
     *cœspitosa*, Boott.  
     *banksii*, Boott.  
     *rubra*, Boott.  
*Carex inversa*, Br.  
     *virgata*, Sol.  
         var.  $\beta$ . *secta*.  
     *ternaria*, Forst. (Rautahi.)  
     *raoulii*, Boott.  
     *lucida*, Boott.  
     *pumila*, Thunb.  
     *forsteri*, Wahl.  
     *breviculmis*, Br., (Kirk.)  
     *lambertiana*, Boott, (Kirk.)  
     *vacillans*, Sol.

## GRAMINEÆ.

- Microlœna stipoides*, Br.  
     *avenacea*, Hook., fil.  
     *polynoda*, Hook., fil., (Kirk.)



- Alopecurus geniculatus*, Linn.  
*Hierochloe redolens*, Br. (Karetu.)  
*Spinifex hirsutus*, Labill.  
*Paspalum scrobiculatum*, Linn.  
     *distichum*, Burrman, (Kirk.)  
*Panicum imbecille*, Trinius.  
*Isachne australis*, Br., (Kirk.)  
*Echinopogon ovatus*, Palisot.  
*Dichelachne stipoides*, Hook, fil.  
     *crinita*, Hook., fil.  
     *sciurea*, Hook., fil.  
*Sporobolus elongatus*, Br.  
*Agrostis æmula*, Br.  
     *billardieri*, Br.  
     *quadriseta*, Br., (Kirk.)  
*Arundo conspicua*, Forst. (Kakaho, Toetoe.)  
*Danthonia semi-annularis*, Br.  
     var.  $\beta$ .  
     var.  $\gamma$ .  
*Deschampsia caespitosa*, Palisot.  
*Trisetum antarcticum*, Trinius.  
*Glyceria stricta*, Hook., fil.  
*Poa anceps*, Forst., var.  $\beta$ . *foliosa*.  
*Festuca littoralis*, Br.  
     *duriuscula*, Linn.  
*Bromus arenarius*, Labill.  
*Triticum multiflorum*, Banks and Sol., (Kirk.)  
     *scabrum*, Br.

## CRYPTOGAMIA.

## FILICES.

- Gleichenia circinata*, Swartz. (Waewaematuku), C.  
*Cyathea dealbata*, Swartz. (Ponga.)  
     *medullaris*, Swartz. (Mamaku).  
*Hemitelia smithii*, Hook.  
*Dicksonia squarrosa*, Swartz. (Weki.)  
*Hymenophyllum tunbridgense*, Sm.  
     var. *minimum*.  
     *multifidum*, Swartz.  
     *rarum*, Br.  
     *dilatatum*, Swartz.  
     *javanicum*, Spreng.

- Hymenophyllum polyanthos*, Swartz.  
*demissum*, Swartz.  
*scabrum*, A. Rich.  
*flabellatum*, Labill.
- Trichomanes reniforme*, Forst.  
*elongatum*, A. Cunn.  
*humile*, Forst.  
*venosum*, Br.
- Davallia novæ zealandiæ*, Col.
- Lindsaya linearis*, Swartz.  
*trichomanoides* Dryan.
- Adiantum hispidulum*, Swartz.  
*diaphanum*, Willd., (Kirk.)  
*affine*, Willd.  
*fulvum*, Raoul.
- Hypolepis tenuifolia* Bernh.  
*distans*, Hook.
- Pellaea rotundifolia*, Forst.
- Pteris aquilina*, Linn., var. *esculenta*. (Aruhe. Rahurahu.)  
*tremula*, Br. (Turawera), C.  
*scaberula*, A. Rich.
- Pteris incisa*, Thunb.  
*macilentata*, A. Rich.  
*comans*, Forst.
- Lomaria filiformis*, A. Cunn.  
*procera*, Spreng.  
var. *a*.  
var. *β*.  
var. *γ*.  
var. *δ*.  
*fluvialis*, Spreng.  
*elongata*, Blume.  
*lanceolata*, Spreng.  
*discolor*, Willd.  
*alpina*, Spreng.  
*banksii*, Hook., fil.  
*fraseri*, A. Cunn.
- Doodia media*, Br.  
*caudata*, Br.
- Asplenium obtusatum*, Forst. (Paretao), C.  
var. *lucidum*.  
var. *lyallii*.

- Asplenium flabellifolium*, Cavan.  
*falcatum*, Lam.  
*hookerianum*, Forst.  
*bulbiferum*, Forst.  
     var. *lava*.  
     var. *tripinnata*.  
*flaccidum*, Forst. (Pohutakawa), C.  
     var.  $\alpha$ .  
     var.  $\delta$ .  
*umbrosum*, J. Smith.
- Aspidium aculeatum*, Swartz.  
*richardi*, Hook.  
*capense*, Willd.
- Nephrodium velutinum*, Hook., fl.  
     *decompositum*, Br.  
     *hispidum*, Hook.
- Polypodium australe*, Mett.  
     *grammitides*, Br.  
     *tenellum*, Forst. (Kirk).  
     *punctatum*, var.  $\beta$   
     *pennigerum*, Forst., (Piupiu), C.  
     *serpens*, Niph.  
     *cunninghamii*, Hook.  
     *pustulatum*, Forst.  
     *billiardieri*, Br.
- Todea hymenophylloides*, Rich and Less.  
*Lygodium articulatum*, A. Rich.  
*Schizea dichotoma*, Swartz.  
*Ophioglossum lusitanicum*, Linn.

## LYCOPODIACEÆ.

- Lycopodium varium*, Br.  
     *billiardieri*, Spreng.  
     *densum*, Labill. (Waewaekoukou), C.  
     *laterale*, Br.  
     *cernuum*, Linn. (Kirk).  
     *voluble*, Forst. (Waewaekoukou.)
- Tmesipteris forsteri*, Endl.

*Introduced Flowering Plants of Kawau.*

## DICOTYLEDONS.

## RANUNCULACEÆ.

- Ranunculus repens*, Linn. (Creeping Crowfoot.)  
     *pusillum*, Linn.

## FUMARIACEÆ.

*Fumaria officinalis*, Linn. (Fumitory.)

## CRUCIFERÆ.

*Barbarea præcox*, Br. (Winter Cress.)

*Nasturtium officinale*, Br. (Common Watercress.)

*Sisymbrium officinale*, Linn. (Hedge Mustard.)

*Capsella bursa-pastoris*, D.C. (Shepherd's Purse.)

*Brassica sinapistrum*, Boiss. (Charlock.)

*Lepidium ruderales*, Linn. (Narrow-leaved Pepper-wort.)

*Senebiera coronopus*, D.C. (Swines' Cress.)

*didyma*, D.C. (Swines' Cress.)

*Brassica oleracea*, Linn. (Sea Kale or Cabbage.)

*Raphanus raphanistrum*, Linn. (Field Raddish or White Charlock.)

## CARYOPHYLLACEÆ.

*Silene quinquevulnera*, Linn. (Variegated Catchfly.)

*Sagina procumbens*, Linn. (Procumbent Pearl-wort.)

*Stellaria media*, With. (Common Chickweed.)

*Cerastium glomeratum*, Thuill. (Broad-leaved Mouse-ear Chickweed.)

*triviale*, Linn., (Kirk.)

## LINACEÆ.

*Linum usitatissimum*, Linn. (Common Flax.)

## MALVACEÆ.

*Malva sylvestris*, Linn. (Common Mallow.)

*rotundifolia*, Linn. (Dwarf Mallow.)

## HYPERICINEÆ.

*Hypericum androsæmun*, Linn. (Tutsan, St. John's Wort.)

*perforatum*, Linn. (Perforated St. John's Wort.)

## GERANIACEÆ.

*Geranium pratense*, Linn. (Meadow Crane's Bill.)

*Erodium cicutarium*, Sm. (Hemlock Stork's Bill.)

## LEGUMINOSÆ.

*Ulex uropæus*, Linn. (Furze.)

*Sarothamnus scoparius*, Wimm. (Yellow Broom.)

## ROSACEÆ.

*Fragaria vesca*, Linn. (Wood Strawberry.)

*Sanguisorbæ officinalis*, Linn. (Great Burnet.)

*Poteria sanguisorbæ*, Linn. (Common Salad-Burnet.)

*Rosa rubiginosa*, Linn., (Kirk.)

## ONAGRAREÆ.

*Oenothera stricta*. (Common Evening Primrose.)

## LYTHRACEÆ.

*Lythrum hyssopifolium*, Linn. (Hyssop-leaved, Purple Loose Strife.)

## PORTULACÆÆ.

*Portulaca oleracea*, Linn. (Common Purslane.)

## PARONYCHIACÆÆ.

*Polycarpon tetraphyllum*, Linn. (Four-leaved All Seed.)

## CUCURBITACÆÆ.

*Caladium esculentum*, Willd.

## UMBELLIFERÆ.

*Petroselinum segetum*, Benth. (Corn Parsley.)

*Caucalis nodosa*, Scop. (Hedge Parsley.)

## RUBIACÆÆ.

*Galium aperina*, Linn. (Goose Grass or Cleavers.)

*Sherardia arvensis*, Linn. (Blue Sherardia or Field Madder.)

## COMPOSITÆ.

*Hypochæris radicata*, Linn. (Long-rooted Cats-ear.)

*glabra*, Linn. (Smooth-leaved Cats-ear.)

*Helminthia echinoides*, Gaert.

*Taraxicum dens-leonis*, Desf. (Common Dandelion.)

*Crepis virens*, Linn., (Kirk.)

*Lapsana communis*, Linn. (Common Nipple-wort.)

*Carduus lanceolatus*, Gaert. (Spear Thistle.)

*Erigeron canadensis*, Linn. (Canadian Flea-bane.)

*Senecio vulgaris*, Linn. (Common Groundsel.)

*Bellis perrenis*, Linn. (Common Daisy.)

*Chrysanthemum leucanthemum*, Linn. (Great White Ox-eye.)

*Anthemis arvensis*, Linn. (Corn Chamomile.)

*Achilleæ millefolium*, Linn. (Common Yarrow.)

## APOCYNÆÆ.

*Vinca major*, Linn. (Greater Periwinkle.)

## GENTIANÆÆ.

*Erythræa centaurium*, Pers. (Common Centaury.)

## SOLANÆÆ.

*Physalis peruviana*, With. (Cape Gooseberry.)

## SCROPHULARINÆÆ.

*Veronica arvensis*, Linn. (Wall Chickweed, Speedwell.)

*serpyllifolia*, Linn. (Thyme-leaved Speedwell.)

*Verbascum thapsus*, Linn. (Great Mullein.)

## LABIATÆ.

*Stachys arvensis*, Linn. (Corn Woundwort.)

*Marrubium vulgare*, Linn. (White Horehound.)

*Prunella vulgaris*, Linn. (Self-heal.)

*Mentha piperita*, Smith. (Peppermint.)

*Satureia hortensis*, Linn. (Summer Savory.)

*Nepeta cataria*, Linn. (Cat-mint.)

VERBENACEÆ.

*Verbena officinalis*, Linn. (Common Vervain.)

PRIMULACEÆ.

*Anagallis arvensis*, Linn. (Common Scarlet Pimpernel.)  
var.  $\beta$ . *cærulea*. (Blue Pimpernel.)

PLANTAGINEÆ.

*Plantago major*, Linn. (Greater Plantain.)

*lanceolata*, Linn. (Ribwort Plantain.)

AMARANTHACEÆ.

*Amaranthus retroflexus*, Linn., Kirk.

POLYGONEÆ.

*Polygonum aviculare*, Linn. (Common Knot Grass.)

*Rumex obtusifolius*, Linn. (Broad-leaved Dock.)

*viridis*, Sibth. (Green-veined Dock.)

*acetosella*, Linn. (Sheeps' Sorrel.)

*crispus*, Linn. (Curled Dock.)

EUPHORBIACEÆ.

*Euphorbia peplus*, Linn. (Petty Spurge.)

MONOCOTYLEDONS.

IRIDEÆ.

*Iris germanica*, Willd. (Large White Iris.)

*Sisyrinchium bermudiana*, Linn. (Blue-eyed Grass.)

LILIACEÆ.

*Calla æthiopica*, Willd. (African Lily.)

*Introduced Forage and Pasture Plants.*

LEGUMINOSÆ.

*Vicia sativa*, With. (Common Vetch.)

*Medicago lupulina*, Linn. (Black Medick or Nonsuch.)

*maculata*, Sibth. (Spotted Medick.)

*denticulata*, Willd. (Reticulated Medick.)

*Melilotus officinalis*, Linn. (Common Yellow Melilot.)

*Trifolium repens*, Linn. (White Trefoil or Dutch Clover.)

*minus*, Relph. (Lesser Yellow Trefoil.) (Kirk.)

*pratense*, Linn. (Common Purple Clover.)

*medium*, Linn.

*Vicia tetrasperma*, Lois. (Smooth Tare.)

*hirsuta*, Koch. (Hairy Tare.)

## GRAMINEÆ.

- Digitaria sanguinalis*, Scop.  
*Anthoxanthum odoratum*, Linn. (Sweet-scented Vernal Grass.)  
*Phalaris canariensis*, Linn. (Canary Grass.)  
*Alopecurus pratensis*, Linn. (Meadow Fox-tail.)  
*Pheum pratense*, Linn. (Cat's-tail Grass.)  
*Agrostis australis*, Linn. (Bent Grass.)  
     *vulgaris*, With. (Fine Bent Grass.)  
     *alba*, Linn. (Marsh Bent Grass.)  
*Aira caryophylla*, Linn. (Hair Grass.)  
*Glyceria fluitans*, Br. (Floating Sweet Grass.)  
*Holcus lanatus*, Linn. (Soft Grass.)  
     *mollis*, Linn. (Kirk.)  
*Poa pratensis*, Linn. (Smooth Meadow Grass.)  
     *trivialis*, Linn. (Roughish Meadow Grass.)  
     *nemoralis*, Linn. (Wood Meadow Grass.)  
     *annua*, Linn. (Annual Meadow Grass.)  
*Eragrostis brownii*, Kunth. (No common name.)  
*Briza maxima*, Linn. (Quaking Grass.)  
     *minor*, Linn. (Quaking Grass.)  
*Dactylis glomerata*, Linn. (Cocksfoot Grass.)  
*Cynosurus cristatus*, Linn. (Dog's-tail Grass.)  
*Festuca myurus*, Smith. (Barren Fescue Grass.)  
     var. *sciuroides*. (Barren Fescue Grass.)  
*Bromus sterilis*, Linn. (Barren Brome Grass.)  
     *racemosus*, Linn. (Smooth Brome Grass.)  
     *mollis*, Linn. (Soft Brome Grass.)  
*Ceratochloa unioloides*, P. de Beauv. (Prairie Grass.)  
*Avena pratensis*, Linn. (Narrow-leaved Oat Grass.)  
*Hordeum murinum*, Linn. (Wall Barley.)  
*Lolium perenne*, Linn. (Rye Grass.)  
     var. *multiflorum*. (Rye Grass.)  
     var. *uniflorum*. (Rye Grass.)  
*Cynodon dactylon*, Pers. (Dog's-tooth or Doab Grass.)  
*Stenotaphrum glabrum*, Trinius. (Buffalo Grass.)

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*Critical Notes on certain Species of Plants doubtfully indigenous to Kawanu.*

By T. KIRK, F.L.S.

*Viola filicaulis*, Hook., fil. The most northern *habitat* known, and quite unexpected.

*Colobanthus billardieri*, Fenzl. This is extremely rare north of the Waikato; at least I never gathered it in Auckland district.