The rarity of flowers with blue corollas in the alpine plants of New Zealand, and in its Flora generally, is noteworthy. There is no plant in any way resembling the charming *Gentiana verna*, so abundant in certain localities in the west of Ireland and in the north of England, or *Veronica alpina*, *V. saxatilis*, and other species. The British veronicas, however, are without exception herbaceous,* and are closely represented by several New Zealand species, one of which is identical.

In closing this very imperfect sketch, I will simply add that although more than one hundred British species have become naturalized in New Zealand, only one (*Cotula coronopifolia*, L.) of our indigenous plants has become in any way established in Britain, and even that may prove to have been introduced from Australia or from Southern Europe.

Art. XLIV.—*Notes on the Local Distribution of Certain Plants common to the British Islands and New Zealand.*

By T. Kirk, F.L.S.

[*Read before the Auckland Institute, 28th August*, 1871.]

Ranunculaceæ.

Ranunculus parviflorus, L., var. *australis*. North of Waikato. Differs from the typical form in the hooked style only.

Cruciferæ.

Nasturtium palustre, DC.

Cardamine hirsuta, L.

Of general distribution in both countries. The last exhibits a much greater amount of variation in New Zealand than in Britain.

Barbarea vulgaris, L. North of Auckland; local.

Caryophylleæ.

Spergularia rubra, Pers., var. *marina*. Often local in the north of New Zealand; general in the south.

Portulaceæ.

Montia fontana, L. Not found north of Waikato; usually a mountain plant. Common in Britain.

Geraniaceæ.

Geranium dissectum, L., var. *caroliniarum*. Sometimes difficult to distinguish from the typical form. The root is often annual. Distribution—general.

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* *Veronica fruticulosa*, L., has no claim to be considered a British plant.

G. molle, L. Distribution—general.

Oxalis corniculata, L. Distribution—general. South-west of England.

ROSACEÆ.

Potentilla anserina, L. Distribution—South of Auckland Isthmus. In Britain general.

HALORAGEÆ.

Callitriche verna, L. I have not seen specimens of the typical form. Our plant is *C. Muelleri*, which resembles the British *C. platycarpa*, Kuetz., but is not identical with any European form. It is probably common throughout the islands.

ONAGRARIEÆ.

Epilobium tetragonum, L. Our plant differs considerably from either of the British forms referred to this species; from *E. tetragonum*, Curt., in its elongated stolons, and from *E. obscurum*, Schreb., in its remarkably stout erect habit, closely appressed leaves, and erect capsules. Distribution—general.

E. pallidiflorum, Sol., has the stolons and habit of *E. obscurum*, Schreb., differing only in the large white flowers.

COMPOSITÆ.

Gnaphalium luteo-album, L. Common on sandy coasts and in light soils. Alien in Britain.

Taraxacum Dens-leonis, Desf. All the New Zealand specimens I have seen belong to var. *palustre*, the montane form in Britain. Distribution—frequent south of Waikato; rare in the north.

Picris hieracioides, L. Distribution—chiefly north of Auckland. England.

Sonchus oleraceus, L., var. *aspera*. Distribution—general.

CONVOLVULACEÆ.

Convolvulus sepium, L.

„ *Soldanella*, L.

Distribution—general; the latter confined to the coast.

SOLANEÆ.

Solanum nigrum, L. Distribution—general. England.

SCROPHULARINEÆ.

Limosella aquatica, L., var. *tenuifolia*. Distribution—general, but often absent from extensive districts. Resembles the mountain form of Britain.

Veronica Anagallis, L. Distribution—East Coast, *Colenso*. General in Britain.

CHENOPODIACEÆ.

Chenopodium urbicum, L. Distribution—North and South Islands; extremely local.

Chenopodium glaucum, L., var. *ambiguum*. Distribution—common on the coasts.

Suæda maritima, Dumort. Distribution—general on the coasts.

Atriplex patula, L. Distribution—East Coast, *Colenso*. In Britain general.

POLYGONEÆ.

Polygonum minus, Huds., var. *decipiens*. Distribution—general.

P. aviculare, L. Distribution—general. The var. *Dryandri*, which is local in the North Island, occurs in immense abundance in Canterbury and Otago.

URTICEÆ.

Parietaria debilis, Forst. Distribution—general.

TYPHACEÆ.

Typha latifolia, L. Distribution—general. The male and female catkins are often separated.

T. angustifolia, L., has not been found in the colony.

Sparganium simplex, L. Distribution—North Island. Britain general.

NAIADEÆ.

Lemna minor, L. Distribution—North and South Islands, but local. In Britain general.

L. gibba, L. Distribution—North Island, East Coast, *Colenso*. England.

Potamogeton natans, L. Distribution—general. Two forms are confused under this name—the ordinary *P. natans*, in which submerged leaves are wanting, and a form with large submerged leaves, which is the more common of the two, and respecting which full information is desirable. Young states of this have been mistaken by myself and others for *P. heterophyllus*, Schreb., which has not been found in New Zealand.

P. polygonifolius, Pourrett. Distribution—North Island, Great Omaha, and Papakura.

P. gramineus, L. *P. ochreatus*, Raoul, which is equally distinct from *P. compressus*, Sm., and *P. gramineus*, "L.," has been mistaken for this; it is found at the Bay of Islands (*Colenso*), Waikato, Thames (*T.K.*), and Banks Peninsula (*Raoul*).

P. pectinatus, L. Distribution—North Island, Hawkes Bay, and Waikato. In Britain general.

Ruppia maritima, L. Distribution—Frequent on the coast; in fresh water lakes in Waikato.

Zannichellia palustris, L. Distribution—North Island, Waikato, East Coast.

Zostera marina, L. Distribution—All round the coast. Flowers and fruit not seen.

JUNCEÆ.

Juncus maritimus, Lam. Distribution—On all the coasts.

J. cummunis, E. Meyer.

J. bufonius, L.

Distribution general.

Luzula campestris, DC. Distribution—general; local in the north.

CYPERACEÆ.

Scirpus maritimus, L. Distribution—On all the coasts, and in fresh water lakes Waikato.

S. lacustris, L. Distribution—general.

S. triqueter, L. Distribution—North Island, local. South Island, frequent. In England confined to the south, and local.

S. fluitans, L. Distribution—North Island, Waikato. In Britain general.

Carex stellulata, Good. Distribution—North and South Islands, but extremely rare. General in Britain.

C. teretiuscula, Good. Distribution—North and South Islands, local. Generally distributed in Britain, but less frequent than the preceding.

GRAMINEÆ.

Alopecurus geniculatus, L. Distribution—General south of Waikato.

Agrostis canina, L. Distribution—Sub-alpine. In Britain general.

Phragmites communis, Fries. Distribution—Said to have been found in the province of Nelson. General in Britain.

Deschampsia cæspitosa, Pal. Distribution—Southwards from the East Cape. Sub-alpine in the South Island. General in Britain.

Kœleria cristata, Pers. Distribution—South Island. Local in England.

Festuca duriuscula, L. Distribution—General from the East Cape southwards. General in Britain.

FILICES.

Hymenophyllum Tunbridgense, Sm. Distribution—general. In Britain local.

H. unilaterale, Willd. Distribution—North and South Islands; local and sub-alpine. Local in Britain, but more frequent than the preceding, and ascending to a much greater altitude.

Cystopteris fragilis, Bernh. Distribution—North and South Islands, but local and sub-alpine. In Britain general.

Pteris aquilina, L., var. *esculenta*. Distribution—general. Of more rigid habit than the typical form.

Asplenium Trichomanes, L. Distribution—North and South Islands; local and sub-alpine. General in Britain.

Aspidium aculeatum, Swartz. Distribution—General from the Thames southward. Our plant is often non-indusiate, and differs from any of the British forms.

Nephrodium thelypteris, Schl., var. *squamulosum*. Distribution—North Island; extremely local. Differs from the typical form in the bullate scales only.

Ophioglossum vulgatum, L., var. *lusitanicum*. Distribution—general. *O. lusitanicum* is not found in Britain *proper*, confined to one of the Channel islands.

LYCOPODIACEÆ.

Lycopodium Selago, L. Distribution—South Island; sub-alpine.

L. clavatum, L., var. *magellanicum*. Distribution—North and South Islands; sub-alpine. Differs from the British form in the slender habit and spreading leaves, which are never hair-pointed.

ART. XLV.—*On the New Zealand Species of* Pittosporum, *with Descriptions of New Species.* By T. KIRK, F.L.S.

[*Read before the Auckland Institute, 2nd October*, 1871.]

AMONGST the genera of New Zealand plants which occupy a prominent position in the Flora, alike from their wide range of distribution, relative abundance, and number of species, the genus *Pittosporum* takes an important place. Although rarely of social character, its members form a considerable portion of the woodland Flora, and from their great variety in habit, stature, and inflorescence, present special features of interest.

In the "Flora Novæ Zelandiæ" ten species are described; in the "Handbook of the New Zealand Flora" the number is increased to thirteen, one of the additional forms having been described as a variety in the first-named work. Since the publication of the "Handbook" the number of species or subspecies has been increased by more than one-half, and the doubts expressed by

its author as to the specific validity of some of the forms originally described have been confirmed. It is, therefore, of some importance that our present knowledge of the genus should be arranged in a connected form, and made available for further research.

It must, however, be pointed out that the present information is not sufficiently complete to admit of the preparation of a permanent revision of the genus, chiefly owing to the absence of any knowledge of the limits of variation in the southern forms.

The New Zealand species vary from small shrubs one foot in height, to trees of forty feet and upwards; they usually occur on the margins of forests, or in low-growing bush, particularly affecting the sloping sides and spurs of open gullies. *P. crassifolium* and *P. umbellatum* are invariably confined to littoral habitats, although often found at a considerable height on the cliffs, *P. cornifolium* usually, and *P. Kirkii* occasionally are epiphytic. *P. pimeleoides*, a remarkably local species, is restricted to clay hills near the Bay of Islands, and from the undiscriminating manner in which the open country has been cleared by fire has become very rare in its limited area. The seeds of all the species are imbedded in a viscid pulp, and a resin is exuded from the bark of *P. crassifolium*, *P. eugenioides*, and others.

The genus exhibits a pre-eminently northern distribution in the colony, although a few species have a remarkably restricted range; only two species are known to occur from the North Cape to Invercargill; three species are common to both islands; two are peculiar to the South Island; eleven are confined to the North Island. Of these last eight are not known to occur south of the province of Auckland, and of these, again, four are restricted to the district north of the Auckland Isthmus.

The altitudinal range of the New Zealand species is, with one or two exceptions, extremely limited, as might fairly be expected from its horizontal distribution. *P. rigidum* and *P. Kirkii* are known to occur up to 2,000 feet, and will probably be found at greater altitudes in the central ranges of the North Island. *P. patulum*, a remarkably local species, occurs at 5,000 feet in the province of Nelson.

The absence of any member of the genus from the Auckland Islands and the Chathams is significant, although there is reason to believe that at least one of the forms of *P. tenuifolium* is found in the latter group. On the other hand, the islands of the east coast of the province of Auckland exhibit a profusion of species—seven are found on the small island of Kawau, and nine on the Great Barrier.

The trunk of *P. eugenioides* attains a diameter of nearly two feet, and is occasionally rivalled by *P. crassifolium*, which is usually much smaller. The wood is perishable and of little use, even for firewood; from its whiteness and

density it might prove of value to the inlayer and wood-turner. The only economic purposes to which any part of the plant has been adapted, so far as I am aware, is the use of the gummy matter, in which the seeds are imbedded, to mix with the juice of the sow-thistle as a masticatory by the natives, who are also said to have mixed the bruised leaves of *P. eugenioides* with fat, for the sake of the perfume.

P. tenuifolium is the "turpentine tree" of the Otago settlers, who plant it for hedges, as it bears clipping freely.

P. Buchanani and *P. eugenioides* appear to be constantly dicœcious. Other species exhibit a strong tendency in this direction, as well as towards a whorled arrangement of branches and leaves; this is constant in *P. cornifolium*, frequent in *P. reflexum* and *P. Kirkii*, and less developed in *P. umbellatum*, *P. eugenioides*, and *P. virgatum*.

A few species exhibit considerable variation in foliage. *P. rigidum* and *P. patulum*, in certain states, can with difficulty be distinguished from such widely different plants as *Melicytus micranthus*, *Melicope simplex*, *Panax anomalum*, and *Elœocarpus Hookerianus*.

The following arrangement is proposed for the New Zealand species :—

A. Flowers axillary (rarely terminal in *P. fasciculatum* and *P. rigidum*).

1. *P. tenuifolium*
   sub-species *Colensoi*
   „ *fasciculatum*
2. *Buchanani*
3. *Huttonianum*
4. *rigidum*
5. *obcordatum*
6. *pimeleoides*
   sub-species *reflexum*
7. *cornifolium*
8. *P. Kirkii*
9. *umbellatum*
10. *virgatum*
11. *patulum*
12. *Ralphii*
13. *crassifolium*
14. *intermedium*
15. *ellipticum*
    sub-species *ovatum*
16. *eugenioides*

1. *P. tenuifolium*, Banks and Sol.—Sub-species *Colensoi*.—Sub-species *fasciculatum*.

Throughout the islands, not confined to the east coast; the sub-species rare and local.

Flowers in October.

These forms vary considerably in all their parts, so that it would not be difficult to obtain a connected series of specimens, which should include the whole. I fully agree with Dr. Hooker in considering them much too closely allied to admit of their taking specific rank, although, perhaps, the differences are too highly developed to allow of their being treated as mere varieties. *P. Colensoi* is said by Buchanan to be frequent in the north. I never met with it north

of the Auckland Isthmus, and consider it a form of comparatively rare occurrence. Small forms of the typical *P. tenuifolium* are often referred to *P. Colensoi* by collectors.

2. *P. Buchanani*, Hook. f. North Island, Mongonui, *J. Buchanan*; near Mount Egmont. Dr. Hector informed me this species had not been found at Tongariro, as stated in the "Handbook."

3. *P. Huttonianum*, Kirk, *Trans.* N.Z. Inst., Vol. II., p. 92. Varying in habit and station from a laxly-branched shrub to a small tree 12–25 feet in height with strict branches; bark black, or dark brown; branches slender, and with the young leaves and petioles clothed with white floccose tomentum; leaves alternate, oblong or ovate, obtuse or acute, 3–5 inches long, slightly coriaceous; petioles slender, $\frac{1}{2}$–$\frac{3}{4}$ inch long. Flowers axillary, solitary, or rarely in twos on a common pedicel; peduncles downy, $\frac{1}{2}$–$\frac{3}{4}$ inch long; sepals lanceolate, acute, bullate at the base, downy; petals ligulate, sharply recurved at about two-thirds their length, the corolla never presenting the rotate appearance of *P. tenuifolium*; anthers very long, ovary pubescent, bracts at the base of the peduncle deciduous; capsules erect, pyriform, downy, 2–3-valved, larger than in *P. tenuifolium*.

North Island, Whangarei, *J. Buchanan*; Great Barrier Island, Thames Goldfield.

4. *P. rigidum*, Hook. f. The flowers are both axillary and terminal.

North and South Islands; in mountain districts rare.

I have received small flowerless branches of sinuate-dentate leaves, collected by Major Mair in the Uriwera country, which may be identical with this plant, and I have collected similar forms on the Cape Colville ranges and in the Kaipara district.

5. *P. obcordatum*, Raoul. South Island, Banks Peninsula.

I am informed by Mr. Potts that the capsule is small, globose, 2-valved.

6. *P. pimeleoides*, R. Cunn. A weak, much-branched shrub, 1–8 feet high; young shoots and leaves silky pubescent, linear-oblong, scattered or whorled, patent or appressed, acute or obtuse, entire. Flowers terminal in clusters of 3–6; peduncles 1-flowered, slender, silky, $\frac{1}{4}$–1 inch long; petals subulate, recurved, yellow, with a purple stripe; capsules erect, ovate-acuminate or conical, downy, 2-valved; valves membranous at length, deciduous, the nuts retaining their position on the peduncle long after the valves have fallen.

Sub-species *pimeleoides*, proper. Much and repeatedly branched, the branches and leaves usually whorled, 1–1$\frac{1}{4}$ inches long, $\frac{1}{4}$ inch wide, flowers clustered, valves of capsule with tips recurved.

Sub-species *reflexum*, R. Cunn. Leaves scattered, rarely whorled,

linear, lanceolate acuminate, $\frac{1}{16}$ inch wide, crowded. Flowers terminal, solitary or clustered; capsule ovoid-acuminate; tips of valves recurved. Var. *Gilliesianum*—very slender, leaves crowded, linear-lanceolate, acute, capsule conical, tips of valves straight. *P. Gilliesianum*, Kirk, *Trans.* N.Z. Inst., Vol. I., p. 143.

North Island, rare, Mongonui, Bay of Islands, and Whangaroa.

Flowers in April.

In size and habit there is a wide difference between the sub-species, but the fruit is closely alike in both. I have seen no specimens of *P. reflexum* with axillary flowers.

7. *P. cornifolium*, A. Cunn. Usually epiphytic, rarely terrestrial; branches often scarred with the marks of fallen leaves.

North Island, Spirits Bay to Cook Straits.

Flowers from August to November.

8. *P. Kirkii*, Hook. f., *Trans.* N.Z. Inst., Vol. II., p. 92. A laxly branched shrub, 3 to 15 feet high; branchlets stout, ascending; bark reddish purple; leaves erect, alternate, crowded or whorled, glabrous, linear-obovate, acute or obtuse, 2–5 inches long, narrowed into rather broad purple petioles, excessively coriaceous, pale green above, lighter below, midrib stout, prominent and curiously flattened beneath. Flowers terminal in 3–7 flowered umbels; peduncles slightly decurved; sepals broadly lanceolate, with membranous margin; petals ligulate, recurved, bright yellow; filaments short; ovary with a few long hairs, and narrowed into the short style; stigma 2-lobed; capsules erect, clustered, glabrous, elliptic, $1\frac{1}{2}$ inches long, obtuse, 2–3-valved, remarkably compressed.

North Island, rocky woods, Whangarei, *J. Buchanan*; Great Barrier Island and Omaha, *T.K.*; Titirangi, *T. F. Cheeseman*; Cape Colville and Thames, *T.K.* Altitudinal range 1,000 to 2,300 feet.

Flowers in December. Often epiphytic.

9. *P. umbellatum*, Banks and Sol. Var. *cordatum*. Leaves linear spathulate, narrowed into the petioles, capsules cordate, valves not lobed.

North Island; always near the sea, from the North Cape to Poverty Bay. Var. *cordatum*, Great Barrier Island.

Flowers in October.

Comparatively rare on the west coast. This species and *P. crassifolium* have the same range, and evince the same preference for a littoral habitat. Probably both will be found to extend to the East Cape or still further south.

10. *P. virgatum*, n. s. A slender twiggy tree, 20–25 feet high; young shoots, leaves, and pedicels clothed with pale ferruginous pubescence; leaves linear-lanceolate or ovate, or obovate, entire or variously lobed and

toothed. Flowers terminal, in 2–3-flowered umbels, or solitary; pedicels short, decurved; flowers small; sepals linear, silky; petals recurved at the tips; ovary conical, hirsute; stigma 2-lobed; capsules erect, globose, woody, 2-valved; valves 2-lobed, granulated on both surfaces.

Var. *cratægifolia*—leaves linear-lanceolate, irregularly lobed and toothed.

Var. *serratum*—leaves ovate, acute, crenate-serrate or dentate. In the young state of all the varieties the leaves are deeply incised and lobed.

North Island, Whangaroa North, Great Barrier Island.

Flowers in October.

11. *P. patulum*, Hook. f. Branches stout, glabrous; young leaves narrow linear, lobed or pinnatifid, 2 inches long; mature leaves spreading 1–1½ inches long, ⅓ broad, linear-oblong, narrowed at the base into a short broad petiole, obtuse, entire or crenate-serrate, very coriaceous and shining. Flowers in terminal 4–6-flowered umbels; pedicels patent, 1″ long, with scattered pubescence; sepals and petals not seen; ovary glabrous; style elongated; capsule nearly globose, compressed, broader than long; valves somewhat woody, brown, 2-lobed.

South Island, Wairau Mountains, altitude 5,000 feet, "Handbook New Zealand Flora."

The description in the "Handbook" is avowedly drawn from "a single fruiting specimen," and the fruit is said to be axillary. The valuable specimens for which I am indebted to Mr. W. T. L. Travers show both flower and fruit strictly terminal; by the time the fruit has arrived at maturity the peduncle has contracted to half its original length, and has become rigid and erect. The latter characteristic is manifested in *P. Kirkii* and *P. virgatum*, etc.

12 *P. Ralphii*, Kirk, *Trans.* N.Z. Inst., Vol. III., p. 161. A laxly branched shrub, 8 to 12 feet high in cultivation, with dark brown bark; branches spreading, young branches tomentose; leaves oblong or obovate, on long slender petioles, acute or obtuse, 3″–5″ long, 1″–2″ wide, coriaceous, clothed beneath with buff tomentum. Flowers in terminal 3–8-flowered umbels; peduncles ½″–⅝″ long, tomentose, decurved in fruit; sepals linear, obtuse, tomentose; petals narrow, recurved; capsules rounded, 3-lobed and valved.

North Island, Patea, *Dr. Ralph*; cultivated at Wellington, *J. Buchanan*; Great Barrier Island, *W. J. Palmer.*

Easily distinguished from *P. crassifolium* and *P. umbellatum* by its slender spreading branches and oblong leaves; from *P. crassifolium* it differs in addition in the larger leaves, which are never narrowed into the petiole or have the margins recurved, and are less coriaceous and tomentose,

and in the capsules being less than one-half the size of that species. From *P. umbellatum* it further differs in the tomentose leaves, woody 3-valved capsules, and large seeds.

13. *P. crassifolium*, Banks and Sol. An erect shrub or tree, 10 to 30 feet high, with black bark, branches stout, young shoots, leaves, and peduncles clothed with white tomentum; leaves alternate, narrow-obovate or linear-obovate, narrowed into the stout peduncle, acute or obtuse, excessively coriaceous, densely tomentose below, margins recurved. Flowers terminal, solitary or in 2–4-flowered umbels; bracts ovate, ciliate; pedicels decurved; sepals linear-oblong, tomentose; petals recurved, large; capsules terminal, $\frac{3}{4}''$–$1\frac{1}{4}''$ in diameter, 3-valved and lobed, on stout decurved pedicels 1″ long or more, usually solitary when mature; valves excessively stout and woody, downy.

Var. *strictum*—umbels terminal; capsules 3–5; pedicels strict.

North Island, by the sea, Spirits Bay to Poverty Bay.

Flowers in September.

As some confusion appears to exist amongst collectors respecting this very distinct species, I have ventured to add a few characters omitted from its diagnosis in the "Handbook."

14. *P. intermedium*, n. s. A small tree with black bark, in habit and foliage resembling large specimens of *P. tenuifolium*; young leaves and shoots pubescent; leaves $1\frac{1}{2}''$–2″ long, obovate, acuminate, narrowed at the base, flat, midrib pubescent, slightly coriaceous, erect. Flowers not seen; capsules terminal, on stout curved pedicels, solitary or in 2–3-flowered umbels, ovate-acuminate, $\frac{3}{4}''$ in diameter, 3-valved, downy.

North Island, Kawau Island.

I give this well-marked form specific rank with some hesitation; in foliage it resembles large forms of *P. tenuifolium*, while the capsule partakes of the characters of *P. crassifolium* and *P. ellipticum*. Dr. Hooker and Mr. Colenso consider it a new species, still it is possible that further observation may show the wisdom of uniting it with one or other of the above. I have been tempted to attribute its peculiarities to hybridization.

15. *P. ellipticum*, n. s. A small tree, with black bark; branches erect or spreading, puberulous; leaves ovate-lanceolate, or elliptic, or obovate, obtuse or acute, coriaceous, partially clothed with ferruginous pubescence beneath. Flowers in terminal 2–5-flowered umbels; pedicels short, decurved, tomentose; capsules globose, flattened, 2-valved, downy, stout.

Sub-species *ellipticum*, proper. Leaves ovate-lanceolate or elliptic; in the young state densely clothed on both surfaces with rusty coloured pubescence. Flowers terminal, in 3–5-flowered umbels; sepals broad,

ovate, pubescent; petals recurved, reddish brown or chocolate coloured; ovary hirsute; style slender; stigma 2-lobed; capsules ovate, acuminate at both ends, with slightly flattened sides; valves faintly 2-lobed.

Sub-species *ovatum*. Leaves obovate or ovate-acuminate, spreading, $1\frac{1}{2}''$–$2''$ long, pubescent beneath. Flowers not seen; capsules 2–4, in terminal clusters; peduncles stout, $\frac{1}{2}'$–$\frac{3}{4}''$ long, globose, downy, 2-valved.

North Island. *P. ellipticum*—Manaia Hills; *ovatum*—Whangaroa North, Manaia Hills, *T.K.*; western part of the Titirangi district, *T.K.*

Flowers in October.

The dense ferruginous pubescence covering the young twigs, leaves, and inflorescence, give this species a singular appearance in the spring months.

16. *P. eugenioides*, A. Cunn. In forests throughout the islands.

Flowers in August.

I am informed by Dr. Hooker that several of the New Zealand species produce self-sown hybrid forms freely under cultivation in the south of France.

ART. XLVI.—*On the Habit of the Rata* (Metrosideros robusta).

By T. KIRK, F.L.S.

[*Read before the Auckland Institute, 6th November*, 1871.]

THE occurrence of several climbing species of *Metrosideros* in New Zealand, coupled perhaps with the native application of the name "Rata" to the majority of species both scandent and erect, has led to a singular error in connection with the form now under consideration, affording a marked instance of the readiness with which erroneous statements relative to natural phenomena are accepted and repeated, although the exercise of a small amount of observation would suffice to detect the fallacy.

Few persons can have travelled amongst settlers in a forest district in the north without having their attention attracted by distorted giant Ratas, and hearing the commonly received opinion that these immense trees were originally weak climbing plants, the stems of which increased in bulk until they killed the fostering tree which had supported them, and ultimately united to form a solid trunk, perhaps some sixty or seventy feet in length, and with the branches perchance attaining a total height of 100 feet. The frequent repetition of these statements has led to the error being reproduced by many superficial writers on New Zealand, although in the original "Flora Novæ Zelandiæ," published twenty years ago, the plant is correctly described as never climbing. I copy, almost at random, the following extract respecting

the Rata from Wakefield's "Handbook for New Zealand":—"Rata (*Metrosideros robusta*). There are several varieties of this tree—one grows at first as a parasite, creeping in numerous stem-like ropes up the trunks of the other forest trees, gradually enclosing them till they perish, and then uniting to form a noble tree, taller than that which it has destroyed, with an enormous trunk, but hollow within."

It is, however, noteworthy that this opinion is not expressed by Dr. Hochstetter and the writers of other standard works on New Zealand, who simply speak of the Rata as a large tree with showy blossoms.

The general resemblance which the foliage and inflorescence of one of the scandent species exhibits to our plant has doubtless contributed to the perpetuity of the mistake. *M. florida*, which is also called Rata, is a climber in all stages of its existence, but may readily be distinguished by its larger leaves and flowers, its weak stems, and above all by the capsule being included within the calyx tube. More than half the capsule of *M. robusta* is not included in the calyx tube.

There can be no question that *M. robusta* is often found destroying trees by which it is supported, and these instances are adduced by the bushman as decisive proof of the climbing habit of the plant, and he attempts to confirm his view by calling the species just mentioned (*M. florida*) the young state of the destroyer—totally ignorant of the fact that he is confusing two widely separate plants. In reality, however, our plant is exactly the reverse of a climber—the so-called trunks or stems being truly aerial roots, sent down from an epiphytic plant in search of nourishment! The seeds of *M. robusta* are conveyed by birds, or blown by the wind, amongst the epiphytic masses of Asteliads, Lycopods, and Ferns, so abundant in the trees of the northern forests. In this situation the plant takes root and forms a small bush, for a time obtaining sufficient nourishment from the decaying vegetation in which it is growing, until the limited supply proving insufficient for the increasing demand, its roots stretch boldly down the trunk of the supporting tree in search of that full supply which can only be obtained from the earth. Sometimes only a single root is given off, at others one main root with one or two weaker roots are to be seen, and again several roots of about equal dimensions are to be found, but in nearly all cases the different roots or stems are bound together by smaller roots, which are given off at right angles to the trunk of the supporting tree, and become united with the adjacent main roots by inosculation; not unfrequently masses of fibrous roots are developed, which perish with the increase of the main root, after serving their purpose of deriving temporary nourishment from the atmosphere. In course of time the various stems become inosculated, to a greater or lesser extent, along their course, and the supporting tree is literally strangled by their iron embrace. Notwith-

standing the common belief that the stems ultimately become homogeneous, I have never met with an instance where they have united into a solid trunk; it is certainly true that straight stems of great bulk, sometimes twelve feet in diameter, are to be seen; but this is only the case when a single root stem has been formed, or when the specimen is entirely of terrestrial growth. This may be verified by examining the position of the pith. It is, however, to be noted that when several stems are given off, the pith in each will be found much closer to the side on which the root has been in contact with the supporting tree; this, however, arises chiefly from the unequal pressure to which the root has been subjected during growth. The roots or stems may be met with of all heights up to seventy feet, and from one to twelve feet in diameter.

That the habit of the plant is erect, and not scandent, is demonstrated by the young plants in cultivation in our gardens, and this leads me to mention another peculiarity of this species.* The young cultivated plants are always rigid, erect, and bushy, exactly resembling epiphytic specimens of similar size, or specimens growing on rocks. There is no tendency to a scandent habit, and not until the young plant attains a considerable size does it afford any decided indication of a true arboreal stem. It usually produces a few much-branched stems. This has led to the belief that the plant is naturally a shrub, and only becomes a tree when placed in a position to develop aerial roots. But the opinion cannot be maintained in presence of the occurrence of large terrestrial specimens in many localities. I am fully prepared to admit their rarity when compared with the abundance of specimens of epiphytic origin, still the fact remains that in some localities they are frequent enough to attract the special attention of the bushman, who calls this form the "inland pohutukawa," a designation he also bestows upon symmetrical specimens of true pohutukawa sometimes found in the forest. These terrestrial specimens of the Rata are usually found in comparatively open places in the forest, while the distorted giants which started in life as epiphytes are usually most abundant, and attain their greatest development in the denser parts, a condition which of itself goes far to account for the comparative rarity of terrestrial specimens. Occasionally dwarf specimens exactly resembling the *young* cultivated plants, except that they produce flowers, are found on elevated rocky places, but the cause of their stunted maturity is self-evident. It is uncertain if the aerial root of the Rata should be considered simply adventitious or as a special development of the original epiphytic root, although I am inclined to believe the latter. In any case the Rata stands alone amongst New Zealand trees in developing stems of large bulk and affording valuable timber from aerial roots.

* A characteristic specimen, which has been under cultivation for at least fifteen years without producing flowers, may be seen in the grounds of the Honourable James Williamson, Remuera.

The pohutukawa (*Metrosideros tomentosa*) sometimes produces aerial roots from the main trunk, but these are usually small and appressed. Our President has informed me of a remarkable instance on the west coast of the Great Barrier Island; the plant grows on the summit of a cliff and has given off a root, now become an immense stem, which has travelled down the face of the cliff some sixty or seventy feet to seek its nourishment in the soil at the base. The example is so striking as to have received a special name from the Maoris.

The only tree which the Rata seems powerless to injure is the puriri (*Vitex littoralis*); a fine example, surrounded by three or four large stems, which it has forced outwards at the base, is to be seen on land belonging to Mr. W. C. Daldy, by the Hotea River, Kaipara; similar instances are rare.

While on this subject I may be allowed to remark that our plant (*M. robusta*) has been largely used of late years in the place of the pohutukawa for shipbuilding; it is therefore desirable that the attention of shipbuilders and marine insurance companies should be drawn to the fact that for durability it is inferior to the pohutukawa, or even to the rawiri or tea-tree. Should its use be persisted in, considerable discredit will in a few years be brought on our ship yards.* The Rata of the south (*M. lucida*) is not more durable, and has the additional disadvantage of splitting with the slightest blow. It is remarkable that the pohutukawa and the kauri, the timbers best adapted for shipbuilding in the colony, are practically confined to the province of Auckland, the former only having a single outlying habitat at Waitara in the province of Taranaki.

M. robusta appears to have its centre of distribution in the Kaipara district, where it is abundant, and attains a large size. It occurs from the North Cape to Cook Straits, and has, I believe, been found in the province of Nelson. It is, however, comparatively rare from the Waikato southwards.

I am informed by Sir George Grey that only a single specimen is known on the island of Kawau, although it is abundant on the Great and Little Barriers, Waiheke, and other wooded islands in the Hauraki Gulf.

Art. XLVII.—*On the Botany of the Titirangi District of the Province of Auckland.* By Thomas F. Cheeseman.

[*Read before the Auckland Institute, 31st July,* 1871.]

The Titirangi district may be defined as the tract of country bounded on the north by a line drawn from the head of the Waitemata to the mouth of the Muriwai River, on the west by the sea, and on the south and east by the

* Since the above was written I have been informed by a well-known shipbuilder that although *M. robusta* is not durable when grown on low land or in gullies, yet when grown on hill sides it is equally durable with the pohutukawa.