

ART. LIV.—Notes on New Zealand Mosses: Genus  
Orthotrichum.

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Plates XXXV.—XLII.

FROM the following list of the genus *Orthotrichum* it will be seen that I have been enabled to collect and describe forty new species, and have still some others which I am at present keeping back by reason of insufficient material, data, &c.

There yet remain immense tracts of mountainous country in New Zealand that the foot of man has never trod, and, when systematic research in these localities is undertaken, it may confidently be expected that very many more species of this genus, as well as others, will be discovered.

In New Zealand, the species of this interesting genus are found either on trees or rocks, where a humid atmosphere surrounds them, principally in hilly or mountainous districts. They are very constant in their habitats, and particular as regards the conditions required by them. I have only thus far found two species growing on both trees and rocks—viz., *Orthotrichum brevisetum* and *O. latifolium* of this paper. A few of them have extended distribution, but by far the greater majority appear to be very local; and, until a more extensive search has taken place, it is not possible with certainty to say how or where they are distributed.

Species of this genus are found from near the sea-level to an altitude of upwards of 6,000ft., and may readily be distinguished from other mosses by their tufted habit of growth, their large mitriform calyptra (most commonly pilose), and their more or less pyriform capsules. The outer peristome has either 16 geminate or 8 bigeminate teeth. When the peristome is double the inner row consists of 8 cilia, alternating with the divisions of the outer teeth.

The colours of the calyptra and capsules in several of the species vary considerably, increasing in brightness as they approach maturity, and losing their rich red or golden colours as they fade away. Hence colour is of little value in the identification of species of this genus.

Excess of moisture is a condition which is very detrimental to the growth of the *Orthotrichum*. I had a good opportunity of verifying this fact during one of my collecting expeditions at the head of the South Fiord, Lake Te Anau, in December, 1888.

For the first twelve days there was but one dry day. It rained incessantly the whole time, both night as well as day. Dense bush covered the land from the water's edge to the line of scrub, the summit of the hills being the only portions uncovered. The prevailing cryptogamic vegetation was *Hepaticæ*, mosses being much less common. All were soaking with water, and growing in great luxuriance, and had been for ages. They had accumulated to a considerable depth, and the foot in walking over them left a track as if walking in snow. I saw no species of *Orthotrichum* in this locality, although constantly looking for them. They are also very rare between Milford Sound and Lake Te Anau, this also being a wet locality.

Bush-clearing has destroyed many of the habitats of this moss; but, on the other hand, where trees have been planted extensively, and allowed to remain for a number of years, new habitats have been created. As an instance of the latter, in November, 1886, I had been examining the trees in the neighbourhood of the River Avon, at Christchurch, for mosses, and on one only did I find two species. Since that period these species have extended to a large number of trees in that locality, and also to trees near the River Wairarapa, Fendalton.

Only ten New Zealand species have thus far been described or identified. Five of these are described in the "Handbook of the New Zealand Flora," viz., *O. calvum*, *O. pumilum*, *O. ruteum*, *O. crassifolium*, and *O. angustifolium*, the two last being found in Campbell Island. *O. pumilum* (from a very imperfect New Zealand specimen) has been identified as the moss of the same name growing in Europe.

From the description there given, I know I do not possess specimens of *O. crassifolium* and *O. angustifolium*; and from the brief description of the other three I am unable to identify a single plant out of my collection.

In the "Transactions and Proceedings of the New Zealand Institute," vols. xxv. and xxvi., Mr. Beckett has collected from various sources descriptions and identifications of four of the remaining five species—namely, *O. rupestre* (Sch.), *O. tasmanicum* (H. f. and W.), *O. lateciliatum* (Venturi), and *O. hortense* (Boswell). The remaining plant he (Mr. Beckett) has collected and described in vol. xxv. of the same publication, which has been named by Dr. Müller *O. graphiomitrium*. This last one I have been enabled to identify as a plant collected by me at Moa Creek, June, 1884, and since then in the bush near the River Whistler, Puketirake Range, Arthur's Pass, and Clinton Glen, head of Lake Te Anau, with this difference: that in all the specimens I have the leaves are erectopatient and not spreading as there described. This plant has

also the longest upper leaves of any of the New Zealand species I have yet seen.

The points of difference between a very great number of species of this genus are of the most minute character, and more details should have been given in describing species of this genus (as well as others) than appears to be the case in a large number of instances. The consequence is that it is impossible to identify a large number of mosses from their meagre printed description alone, owing to the very great similarity in point of detail between one species and another.

I have therefore treated the whole of the plants collected by me as new species, with the exception of *O. graphiomitrium* (Dr. Müller). There is just a possibility of some of these being plants already discovered and described; at the same time, it is more probable that all the mosses described in this paper are new.

#### SECTION A.

Calyptra pilose. Peristome single.

1. *Orthotrichum conicorostrum*, *sp. nov.*
2.       "       *pulvinatum*, *sp. nov.*
3.       "       *breve*, *sp. nov.*
4.       "       *ornatum*, *sp. nov.*
5.       "       *gracillimum*, *sp. nov.*
6.       "       *calcareum*, *sp. nov.*
7.       "       *obliquum*, *sp. nov.*
8.       "       *flexifolium*, *sp. nov.*
9.       "       *lancifolium*, *sp. nov.*
10.      "       *clintonii*, *sp. nov.*
11.      "       *inæquale*, *sp. nov.*
12.      "       *benmoreense*, *sp. nov.*
13.      "       *fimbriatum*, *sp. nov.*
14.      "       *reflexum*, *sp. nov.*
15.      "       *latorum*, *sp. nov.*

#### SECTION B.

Calyptra pilose. Peristome double.

16. *Orthotrichum cylindrothecum*, *sp. nov.*
17.       "       *tortulosum*, *sp. nov.*
18.       "       *longithecum*, *sp. nov.*
19.       "       *anomalum*, *sp. nov.*
20.       "       *brevisetum*, *sp. nov.*
21.       "       *acuminatum*, *sp. nov.*
22.       "       *obesum*, *sp. nov.*
23.       "       *magnothecum*, *sp. nov.*

## SECTION C.

Calyptra not pilose. Peristome single.

24. *Orthotrichum cyathiforme*, *sp. nov.*  
 25. " *acutifolium*, *sp. nov.*  
 26. " *hurunui*, *sp. nov.*  
 27. " *minutum*, *sp. nov.*  
 28. " *brevirostrum*, *sp. nov.*

## SECTION D.

Calyptra not pilose. Peristome double.

29. *Orthotrichum avonense*, *sp. nov.*  
 30. " *nudum*, *sp. nov.*  
 31. " *minimifolium*, *sp. nov.*  
 32. " *obtusatum*, *sp. nov.*

Calyptra pilose. Peristome not found.

33. *Orthotrichum parvulum*, *sp. nov.*  
 34. " *arctum*, *sp. nov.*

Calyptra not found. Peristome single.

35. *Orthotrichum parvithecum*, *sp. nov.*  
 36. " *latifolium*, *sp. nov.*  
 37. " *subulatum*, *sp. nov.*  
 38. " *erectum*, *sp. nov.*  
 39. " *robustum*, *sp. nov.*

Calyptra not found. Peristome double.

40. *Orthotrichum curvatum*, *sp. nov.*

## SECTION A.

Calyptra pilose. Peristome single.

1. *Orthotrichum conicorostrum*, *sp. nov.*

*Plants* monœcious, yellowish-green, growing in small tufts  $\frac{1}{4}$  in.— $\frac{1}{2}$  in. high, branched by innovations. *Branches* short, spreading. *Leaves* imbricating, spreading; lower ones small; middle and upper linear-lanceolate, tapering into an acute point from an ovate erect base, sheathing. *Margins* plain, entire, very concave. *Nerve* disappearing in the apex. *Areola*: Upper punctiform, lower oblong. *Leaves* suberect when dry. *Perichæcial leaves* erect, small, linear-lanceolate, obtuse, concave. *Margins* plain, entire. *Nerve* ending below the apex. *Fruitstalk*  $\frac{3}{16}$  in. long, capsule subpyriform, tapering into the fruitstalk. *Peristome* single, 8, bigeminate, entire. *Operculum* conic, one-third the length of the capsule. *Calyptra* as long as the capsule, mitriform, plicate, pilose.

*Hab.* On trees in bush near the Whistler River, Puketirake Range; December, 1888. Collected by R. B.

2. *Orthotrichum pulvinatum*, sp. nov.

*Plants* monœcious, dark-brown, growing in small dense tufts  $\frac{1}{4}$  in.— $\frac{3}{8}$  in. high, branched by innovations. *Branches* very short, fastigiate. *Leaves* closely imbricating, nearly erect, very similar in outline to the lower ones, small, increasing in size upwards, ovate or oblong-lanceolate, acute, concave. *Margins* entire, plain. *Nerve* ending below the apex. *Areola*: Upper punctiform, lower linear-oblong. *Leaves* when dry erect and adpressed. *Perichæcial leaves* erect, longer than the upper branch ones, oblong-lanceolate, acute, concave. *Margins* entire, plain. *Nerve* ending below the apex. *Fruitstalk* short, erect. *Capsule* immersed, shortly pyriform, slightly tapering into the fruitstalk. *Peristome* single, 8, bigeminate, irregular in the outline, perforated on the middle line, and sometimes on the lateral ones. *Operculum* conico-rostrate, straight, about half the length of the capsule. *Calyptra* mitriform, plicate, pilose.

*Hab.* Limestone rocks, Broken River, near Castle Hill; November, 1889. Mount Self, near the Hurunui River; March, 1893. Collected in both localities by R. B.

3. *Orthotrichum breve*, sp. nov.

*Plants* monœcious, dark-green at the apex, brown below, growing in very small tufts  $\frac{1}{4}$  in. high, branched by innovations. *Branches* very short,  $\frac{1}{3}$  in. long, fastigiate. *Leaves* erecto-patent, shortly imbricating, all very similar in outline, lower ones small, middle and upper ones larger, ovate-lanceolate, acute, concave. *Margins* entire, recurved from the base to near the apex. *Nerve* ending below or disappearing at the apex. *Areola*: Upper punctiform nearly to the base, lower linear-oblong. *Leaves* when dry erect. *Perichæcial leaves* erect, semi-convolute, incurved near the apex, ovate-lanceolate, acute. *Fruitstalk* very short, erect. *Capsule* immersed, narrow pyriform, tapering into the fruitstalk. *Peristome* single, 8, bigeminate, entire. *Operculum* small, convex, apiculate, one-fourth the length of the capsule. *Calyptra* mitriform, plicate, pilose, as long as the capsule. *Male inflorescence* gemmaceous in the axil of a leaf below the perichætium.

*Hab.* Trees in bush near Cooper's Nob, Port Lyttelton hills; August, 1884. Collected by R. B.

4. *Orthotrichum ornatum*, sp. nov.

*Plants* monœcious, reddish-brown, growing in dense pulvinate tufts  $\frac{1}{4}$  in.— $\frac{1}{2}$  in. high, branched by innovations, very short, fastigiate. *Leaves* closely imbricating, erecto-patent, oblong-

lanceolate, obtuse, concave. *Margins* entire, plain. *Nerve* ending below the apex. *Leaves* all very similar in outline, lower ones small, becoming larger upwards. *Areola* punctiform, lower oblong. *Leaves* when dry erect, and slightly twisted. *Perichæatial leaves* large, erect, ovate-lanceolate, acute, concave. *Margins* entire, plain. *Nerve* ending below the apex. *Fruitstalk* short, erect. *Capsule* small, pyriform, immersed, tapering into the fruitstalk. *Peristome* single, 8, bigeminate, perforated on the middle line towards the base. *Operculum* convex-rostrate, about one-third the length of the capsule. *Calyptra* mitriform, covering the capsule, plicate, pilose. *Male inflorescence* gemmaceous in the axil of a leaf below the perichæatium.

*Hab.* Limestone rocks, Broken River, near Castle Hill; November, 1889. Collected by R. B.

*Remarks.*—The outline of the capsule of this plant closely resembles the figure given of the capsule of *O. crassifolium*.

##### 5. *Orthotrichum gracillimum*, sp. nov.

*Plants* monœcious, dark-brown below, green at the tips, growing in small patches  $\frac{1}{2}$  in. high, branched by innovations. *Branches* short, fastigiate. *Leaves* small, densely imbricating, erecto-patent; lower ovate, linear-lanceolate, acute; middle and upper ones larger, semi-convolute, flexuous, ovate linear-lanceolate, acute, sheathing at the base. *Margins* entire, scarcely recurved. *Nerve* slender, keeled, ending below the apex. *Areola*: Upper punctiform, lower small quadrate. *Leaves* when dry slightly crisped. *Perichæatial leaves* erect, oblong-lanceolate, acute, very concave. *Margins* entire, plain. *Nerve* ending below the apex. *Fruitstalk* erect, about  $\frac{1}{2}$  in. long. *Capsule* exserted, narrow, pyriform, tapering into the fruitstalk. *Peristome* single, 8, bigeminate, entire. *Operculum* conico-rostrate, one-third the length of the capsule. *Calyptra* mitriform, shorter than the capsule, plicate, pilose.

*Hab.* Rocks, Mount Torlesse; January, 1886. Collected by R. B.

##### 6. *Orthotrichum calcareum*, sp. nov.

*Plants* monœcious, dark brownish-green, growing in small dense tufts, pulvinate,  $\frac{1}{2}$  in. high, branching by innovations. *Branches* closely arranged, short,  $\frac{1}{8}$  in. long, fastigiate. *Leaves* small, erecto-patent, closely imbricating, all very similar in outline, upper ones largest, ovate or oblong-lanceolate, acute, concave. *Margins* entire, plain. *Nerve* ending below the apex, slightly sheathing at the base. *Areola* upper punctiform to near the base. *Leaves* when dry erect, and adpressed. *Perichæatial leaves* larger than the upper ones, erect, oblong-lanceolate, obtuse, with a short hyaline apex, concave.

*Margins* entire, plain. *Nerve* ending below the apex. *Fruit-stalk* short, erect. *Capsule* subpyriform. *Peristome* single, 16, geminate, entire. *Operculum* conic, one-third the length of the capsule. *Calyptra* mitriform, plicate, slightly pilose. *Male inflorescence* gemmaceous in the axil of a leaf below the perichætium.

*Hab.* Limestone rocks, near Broken River; November, 1889. Collected by R. B.

#### 7. *Orthotrichum obliquum*, sp. nov.

*Plants* monœcious, brownish-green, growing in loose tufts  $\frac{1}{2}$  in.—1 in. high, branched by innovations. *Branches* variable in length, subfastigate. *Leaves* closely imbricating, erecto-patent; lower ones small, oblong-lanceolate, acute; middle and upper ones linear-lanceolate, from an ovate sheathing base, acuminate, concave. *Margins* entire, plain. *Nerve* continuous, or disappearing below the apex. *Areola*: Upper punctiform, lower linear-oblong near the base. *Leaves* when dry suberect. *Perichætial leaves* erect, shorter than the upper ones, oblong-lanceolate, acuminate, concave. *Margins* entire, plain. *Nerve* ending below the apex. *Fruitstalk* erect,  $\frac{1}{2}$  in. long. *Capsule* exserted, pyriform. *Peristome* single, 8, bigeminate, entire. *Operculum* not found. *Calyptra* mitriform, plicate, pilose, as long as the capsule. *Male inflorescence* gemmaceous in the axil of a leaf below the perichætium.

*Hab.* Trees near the River Teremakau; June, 1884. Collected by R. B.

#### 8. *Orthotrichum flexifolium*, sp. nov.

*Plants* monœcious, yellowish-green, growing in dense pulvinate tufts  $\frac{1}{2}$  in. to  $\frac{3}{4}$  in. high, branched by innovations. *Branches* short, closely arranged. *Leaves* closely imbricating, spreading, all very similar in outline, lower ones small, upper ones larger, linear-lanceolate, from an ovate sheathing base, acuminate, flexuous, semi-convolute. *Margins* entire, plain. *Nerve* continued to the apex, keeled, slender. *Areola*: Upper punctiform, lower, linear-oblong. *Leaves* when dry very crisped. *Perichætial leaves* erecto-patent, longer than the upper ones, linear-lanceolate, obtuse, very concave. *Margins* entire, plain. *Nerve* slender, continuous. *Fruitstalk* stout, erect,  $\frac{1}{2}$  in. long. *Capsule* pyriform. *Peristome* single, 8, entire, bigeminate. *Operculum* conico-rostrate, straight. *Calyptra* mitriform, shorter than the capsule, plicate, pilose. *Male inflorescence* gemmaceous in the axil of a leaf below the perichætium.

*Hab.* Trees, Clinton Glen, head of Lake Te Anau; January, 1890. Collected by R. B.

9. *Orthotrichum lancifolium*, sp. nov.

*Plants* monœcious, yellowish-green, growing in small tufts from  $\frac{1}{4}$  in. to  $\frac{1}{2}$  in. high, branched by innovations. *Branches* loosely spreading, short, subfastigate. *Leaves* closely imbricating, spreading, lower and middle ones very similar in outline, linear-lanceolate, acuminate, base of the leaves clasping the stem. *Margins* entire, very recurved from the base to above the middle of the leaves, upper ones larger, ovate-oblong or ligulate, acute, twice the breadth of the middle ones, concave. *Margins* entire, not recurved, or very slightly. *Nerve* indistinct near the apex. *Areola*: Upper punctiform, lower linear-oblong. *Perichæcial leaves* shorter than the upper ones, erect, ovate-lanceolate, acuminate. *Margins* entire, plain, concave. *Nerve* continued to the apex. *Fruitstalk* erect,  $\frac{1}{4}$  in. long. *Capsule* oblong-pyriform, tapering into the fruitstalk. *Peristome* single, 8, bigeminate, entire. *Operculum* not found. *Calyptra* mitriform, plicate, pilose, as long as the capsule. *Male inflorescence* gemmaceous in the axil of a leaf below the perichæcium.

*Hab.* Trees, Port Lyttelton hills, Banks Peninsula; August, 1883. Collected by R. B.

10. *Orthotrichum clintonii*, sp. nov.

*Plants* monœcious, brownish-green, growing in loose tufts  $\frac{1}{2}$  in.— $1\frac{1}{4}$  in. high, branched by innovations. *Branches* spreading, short. *Leaves* erecto-patent or spreading, imbricating, lower ones linear-lanceolate, acuminate; middle and upper leaves very similar in their outline, ovate or oblong-lanceolate, tapering into an acuminate point, base sheathing. *Margins* recurved from the base to above the middle leaves; papillose, concave, nerved to the apex. *Areola*: Upper punctiform, lower oblong. *Perichæcial leaves* much shorter than the upper ones, erect, oblong-lanceolate-acuminate, concave. *Margins* plain, entire. *Nerve* disappearing at the apex. *Fruitstalk*  $\frac{1}{4}$  in. long. *Capsule* exserted, ovate-oblong. *Peristome* single, 8, bigeminate, entire. *Operculum* mammillate. *Calyptra* mitriform, as long as the capsule, plicate, pilose. *Male inflorescence* in the axil of a leaf.

*Hab.* Trees near McKinnon's Pass, head of Clinton Glen; January, 1890. Collected by R. B.

11. *Orthotrichum inæquale*, sp. nov.

*Plants* monœcious, yellowish-green, growing in small tufts  $\frac{1}{4}$  in. high, branched by innovations. *Branches* short, fastigate. *Leaves* imbricating, erecto-patent, lower leaves small, ovate, subulate, middle and upper ones linear-lanceolate, tapering into an acute point from an erect ovate sheathing base, concave, upper leaves largest. *Margins* plain, entire. *Nerve*



keeled, disappearing in the apex. *Areola*: Upper punctiform, lower oblong. *Leaves* when dry suberect. *Perichætical leaves* erect, sheathing, half the length of the upper ones, the lower two-thirds of the leaves oblong, the upper one-third subulate, concave. *Margins* plain, entire. *Nerve* disappearing below the apex. *Fruitstalk*  $\frac{1}{3}$  in. long, erect. *Capsule* exserted, pyriform, narrowed slightly to the mouth. *Peristome* single, 8, bigeminate, entire. *Operculum* not found. *Calyptra* mitriform, as long as the capsule, plicate, pilose.

*Hab.* Trees, Moa Creek; May, 1885. Collected by R. B.

## 12. *Orthotrichum benmoreense*, sp. nov.

*Plants* monœcious, brownish-green, growing in small tufts  $\frac{1}{4}$  in. —  $\frac{3}{4}$  in. high, branched by innovations. *Branches* short, erect. *Leaves* erecto-patent, imbricating, lower ones linear-lanceolate, acute; middle and upper oblong-lanceolate or obtuse, concave, very similar in their outline. *Margins* entire, recurved from the base to near the apex. *Nerve* ending below the apex. *Areola*: Upper punctiform, lower oblong. *Leaves* erect when dry. *Perichætical leaves* erect, about the same length as the upper ones, oblong-lanceolate, obtuse, concave. *Margins* plain, entire. *Nerve* ending below the apex. *Fruitstalk* short, slender, erect. *Capsule* narrow, oblong, pyriform, tapering into the fruitstalk, immersed. *Peristome* single, 8, bigeminate, entire. *Operculum* conico-rostrate, beak slender. *Calyptra* mitriform, about as long as the capsule, plicate, pilose. *Male inflorescence* gemmaceous in the axil of a leaf.

*Hab.* Twigs of scrub, northern slope of Benmore Range; May, 1885. Collected by R. B.

## 13. *Orthotrichum fimbriatum*, sp. nov.

*Plants* monœcious, yellowish-green on the tips of the branches, dark-green below, growing in tufts about  $\frac{3}{4}$  in. high, branched by innovations. *Branches* stout, erect, fastigiate. *Leaves* closely imbricating, erecto-patent, middle and upper ones ovate-lanceolate, acute or acuminate. *Margins* recurved from the base to near the apex, concave, nerved to the apex, strongly papillose on the upper surface of the leaves, scarious, and hispid on the margins at the apex. *Areola*: Upper punctiform, lower oblong. *Leaves* when dry erect and nearly black. *Perichætical leaves* longer than the upper ones, erect, very concave, sheathing the capsule, ovate-lanceolate acute or obtuse. *Margins* scarious and hispid at the apex. *Fruitstalk* short, erect or slightly curved. *Capsule* immersed, ovate; mouth narrow, slightly tapering into the fruitstalk. *Peristome* single, 8 bigeminate perforated on the middle line, or 16 geminate connected at the base. *Operculum* small, convexo-rostrate. *Calyptra* mitriform, large, plicate, pilose, hairs scabrous. *Male*

*inflorescence* gemmaceous in the axil of a leaf below the perichætium.

*Hab.* Rocks, Mount Torlesse; June, 1884. Mount Herbert, Lyttelton hills, Banks Peninsula; December, 1885. Collected in these localities by R. B.

14. *Orthotrichum reflexum*, sp. nov.

*Plants* monœcious, yellowish-green above, dark-brown below, growing in small irregular patches  $\frac{1}{4}$  in.— $\frac{1}{2}$  in. high, branched by innovations. *Branches* short, fastigate. *Leaves* large, erecto-patent, closely imbricating; lower ones small, ovate-lanceolate, acuminate; middle and upper leaves oblong or ovate-lanceolate, rounded at the apex. *Margins* recurved from the base to near the apex, concave. *Nerve* keeled, ending below the apex, papillose on the upper surface of the leaves and on the upper portions of the margins. *Areola*: Upper punctiform, lower linear-oblong. *Leaves* when dry erect, and slightly twisted. *Perichætial leaves* longer than the upper ones, erect, semi-convolute, sheathing, ovate-lanceolate, subacute. *Margins* not recurved. *Nerve* ending below the apex, papillose. *Fruitstalk* short, about half the length of the capsule. *Capsule* large, pyriform immersed. *Peristome* single, 8, bigeminate, perforated on the middle line, and sometimes on the lateral ones. *Operculum* convexo-rostrate, one-third the length of the capsule. *Calyptra* shorter than the capsule, plicate, pilose, hairs scabrid. *Male inflorescence* gemmaceous in the axil of a leaf.

*Hab.* Rocks, Mount Torlesse; June, 1886. Collected by R. B.

15. *Orthotrichum latorum*, sp. nov.

*Plants* monœcious, yellowish-green above, very dark below, growing in tufts about 1 in. high, branched by innovations. *Branches* spreading, fastigate. *Leaves* closely imbricating, erecto-patent; lower ones small, oblong-lanceolate, acuminate; middle and upper leaves large, ovate-lanceolate, tapering into an acute point, concave. *Margins* entire, recurved from the base to near the apex, nerved to the apex. *Areola*: Upper punctiform, papillose; lower linear-oblong. *Leaves* erect when dry. *Perichætial leaves* shorter than the upper ones, erect, ovate or oblong-lanceolate, subacute. *Margins* entire, not recurved, concave. *Nerve* ending below the apex. *Fruitstalk* short, stout, erect, shorter than the capsule. *Capsule* large, broadly pyriform, mouth wide. *Peristome* single, 16, geminate. *Operculum* slightly convex, rostrate, beak stoutish. *Calyptra* longer than the capsule, mitriform, plicate, pilose. *Male inflorescence* gemmaceous in the axil of a leaf.

*Hab.* Rocks, Moa Creek; May, 1885. Collected by R. B.

## SECTION B.

Calyptra pilose. Peristome double.

16. *Orthotrichum cylindrothecum*, sp. nov.

*Plants* monœcious, brownish-green, growing in small patches,  $\frac{1}{4}$  in. high, branched by innovations. *Branches* extremely short, fastigate. *Leaves* small, closely imbricating, erecto-patent; lower ones ovate-subulate, acute; middle and upper very similar in their outline, ovate-lanceolate, tapering into an acute point, slightly falcate, concave. *Margins* entire. Sometimes a few leaves are recurved from the base to near the apex. *Nerve* continued to the apex. *Areola*: Upper punctiform; lower small, quadrate. Leaves when dry erect and adpressed. *Perichætil leaves* erect, about the same length as the upper ones, narrow, ovate-lanceolate, acute, concave. *Margins* plain, entire. *Nerve* continued to the apex. *Fruitstalk* erect,  $\frac{1}{8}$  in. long, stout. *Capsule* exserted, narrow, pyriform, tapering into the fruitstalk. *Operculum* convex, apiculate, one-fourth the length of the capsule. *Peristome* double, outer 8 bigeminate, entire; inner 8 cilia alternating with the outer, consisting of two rows of cells. *Calyptra* mitriform, shorter than the capsule, plicate, pilose. *Male inflorescence* gemmaceous in the axil of a leaf below the perichætium.

*Hab.* Trees, Mount Torlesse; January, 1886. Collected by R. B.

17. *Orthotrichum tortulosum*, sp. nov.

*Plants* monœcious, pale-green, growing in small tufts about  $\frac{1}{2}$  in. high, branched by innovations. *Branches* short, spreading, fastigate. *Leaves* closely imbricating, spreading, flexuous; middle and upper leaves nearly similar in their outline, ovate-lanceolate acute, base erect, sheathing, convolute. *Margins* plain, entire, nerved to the apex. *Areola*: Upper punctiform, lower linear-oblong. *Leaves* very crisp when dry, *Perichætil leaves* nearly erect, much larger than the upper ones, ovate-lanceolate, tapering into an obtuse point, sheathing at the base, semi-convolute. *Margins* plain, entire, nerved to the apex. *Fruitstalk* erect,  $\frac{1}{8}$  in. long. *Capsule* subpyriform, small. *Peristome* double: outer 8 bigeminate, entire or emarginate on the middle line; inner 8 cilia alternating with the outer, consisting of one single row of cells. *Operculum* stout, conico-rostrate. *Calyptra* mitriform, longer than the capsule, plicate, pilose. *Hairs* scabrid. *Male inflorescence*, gemmaceous in the axil of a leaf below the perichætium.

*Hab.* Scrub at head of River Clinton, Otago; January, 1890. Collected by R. B.

18. *Orthotrichum longithecum*, sp. nov.

*Plants* monœcious, yellowish-green, growing in dense pulvinate tufts, sometimes large,  $\frac{1}{4}$  in.— $\frac{3}{4}$  in. high, branched by innovations. *Branches* closely aggregated, short, fastigate. *Leaves* closely imbricating; lower spreading; upper nearly erect; lower ones ovate-lanceolate, obtuse, very concave; middle and upper leaves nearly similar in their outline; upper ones largest, oblong-lanceolate obtuse, semi-convolute; apex slightly cucullate. *Margins* entire, recurved from near the base to above the middle nerve, ending below the apex. *Areola*: Upper punctiform, lower oblong. *Leaves* when dry erect and adpressed. *Perichætil* leaves about the size of the upper ones, oblong-lanceolate, acute, erect, semi-convolute. *Margins* plain, entire. *Nerve* ending below the apex. *Fruit-stalk* erect,  $\frac{1}{2}$  in. *Capsule* long, narrow oblong, or cylindric. *Peristome* double: outer 8 bigeminate, entire, or minutely perforated on the middle line; inner 8 cilia alternating with the outer, consisting of one row of very narrow cells half the length of the outer. *Operculum* straight, conico-rostrate, about one-quarter the length of the capsule. *Calyptra* shorter than the capsule, mitriform, plicate, pilose. *Male inflorescence* gemmaceous in the axil of a leaf below the perichætium.

*Hab.* Röcks, Mount Torlesse; January, 1885. Palmer's Pass, at the head of the River Courtney; February, 1894. Collected in both localities by R. B.

19. *Orthotrichum anomalum*, sp. nov.

*Plants* monœcious, brownish-green, growing in loose tufts  $\frac{3}{4}$  in. high, branched by innovations. *Branches* stout, spreading,  $\frac{1}{8}$  in.— $\frac{1}{2}$  in. long, fastigate. *Leaves* closely imbricating, erecto-patent; lower ones ovate-lanceolate, tapering into an acuminate point; middle and upper similar in their outline, upper longest, oblong-lanceolate, tapering into an acuminate point sheathing at the base, very concave. *Margins* entire, recurved from the base to about the middle, papillose. *Nerve* ending below the apex. *Areola*: Upper punctiform, lower oblong-quadrate. *Leaves* when dry slightly twisted, sub-erect. *Perichætil* leaves shorter than the upper ones, erect, ovate-lanceolate, tapering sharply into an acuminate point, concave. *Margins* plain, entire. *Nerve* ending below the apex. *Fruitstalk*  $\frac{3}{8}$  in. long. *Capsule* long, oblong-pyriform, tapering into the fruitstalk. *Peristome* double: outer 8 bigeminate, entire; inner 8 cilia alternating with the outer, and consisting of two rows of cells, tapering from a broad base to a point. *Operculum* mammillate, small. *Calyptra* mitriform, shorter than the capsule, plicate, pilose. *Male inflorescence* gemmaceous in the axil of a leaf below the perichætium.

*Hab.* Trees, Mount Torlesse; January, 1886. Collected by R. B.

20. *Orthotrichum brevisetum*, sp. nov.

*Plants* monœcious, dark-green, growing in small dense tufts  $\frac{1}{4}$  in. high, branched by innovations. *Branches* very short, fastigate. *Leaves* erecto-patent, closely imbricating; lower ones oblong-lanceolate, shortly acute; middle and upper ones largest, oblong-lanceolate, subacute, concave. *Margins* entire, recurved from the base to near the apex. *Nerve* keeled, ending below the point. *Areola*: Upper punctiform, lower linear-oblong. *Perichæatial leaves* smaller than the upper ones, erect, oblong-lanceolate, acute, concave. *Margins* plain, entire. *Nerve* ending below the apex. *Fruitstalk* very short, erect. *Capsule* large, oblong, pyriform, tapering into the fruitstalk, subimmersed. *Peristome* double: outer 8 bigeminate, entire; inner 8 slender cilia alternating with the outer ones, consisting of one row of cells as long as the outer ones. *Operculum* small, conico-rostrate, straight. *Calyptra* mitriform, shorter than the capsule, plicate, pilose. *Male inflorescence* gemmaceous in the axil of a leaf below the perichætium.

*Hab.* Rocks, Lyttelton hills; 1884: and on trees in the same locality; August, 1894. Collected by R. B.

21. *Orthotrichum acuminatum*, sp. nov.

*Plants* monœcious, brownish-green, growing in loose tufts from lin. to  $1\frac{1}{2}$  in. high, branched by innovations. *Branches* long or short, spreading, fastigate. *Leaves* erecto-patent, closely imbricating; lower ones ovate-lanceolate, acute; middle and upper ones similar in their outline, upper largest, broad, ovate-lanceolate, tapering into a subapiculate point, concave. *Margins* plain, entire. *Nerve* continued to the apex. *Areola*: Upper punctiform, lower linear-oblong. *Leaves* when dry erect and adpressed. *Perichæatial leaves* longer than the upper ones, erect, narrow, ovate-lanceolate, tapering into an acute point, concave, sheathing. *Margins* plain, entire, nerved to the apex. *Fruitstalk* short, erect, slender at the base, thickened upwards. *Capsule* immersed, elliptic, narrowing into the mouth and tapering into the fruitstalk. *Peristome* double: outer 8 bigeminate, entire; inner 8 cilia consisting of two rows of irregular cells shorter than the outer ones and alternate with them. *Operculum* conico-rostrate; nearly one-third the length of the capsule; beak straight, slender. *Calyptra* mitriform, shorter than the capsule, plicate, slightly pilose. *Male inflorescence* gemmaceous in the axil of a leaf below the perichætium.

*Hab.* Rocks, Moa Creek, a tributary of the River Wilber-

force; May, 1885. Pukiterake Range; December, 1888. Collected by R. B.

22. *Orthotrichum obesum*, sp. nov.

*Plants* monœcious, yellowish-green above, brown below, growing in tufts 1½ in. high. *Stems* long, slender, branched by innovations. *Branches* short, fastigiate. *Leaves* nearly erect or erecto-patent, ovate-lanceolate, tapering into an acute point, middle and upper leaves larger, upper largest, ovate-lanceolate, tapering into an acute point, concave. *Margins* plain, entire. *Nerve* disappearing at the apex. *Areola*: Upper punctiform, lower linear-oblong. *Leaves* erect when dry. *Perichætial leaves* longer than the upper ones, erect, oblong-lanceolate, acute, concave. *Margins* plain, entire. *Nerve* disappearing at the apex. *Fruitstalk* very short, erect. *Capsule* immersed, broadly pyriform, narrowed into the mouth. *Peristome* double: outer 8 bigeminate, entire; inner 8 cilia consisting of two rows of cells shorter than the outer ones, alternating with them. *Operculum* stout, conico-rostrate, straight beak, nearly one-third the length of the capsule. *Calyptra* mitriform, shorter than the capsule, plicate, pilose. *Male inflorescence* gemmaceous in the axil of a leaf, below the perichætium.

*Hab.* Rocks, Moa Creek; May, 1885. Collected by R. B.

23. *Orthotrichum magnothecum*, sp. nov.

*Plants* monœcious, dark-green, growing in small tufts, ¼ in.—½ in. high, branched by innovations. *Branches* short, spreading, fastigiate. *Leaves* closely imbricating, spreading, lower ones ovate-lanceolate, acute or obtuse; middle and upper leaves very similar in their outline, broadly oblong-lanceolate, obtuse, concave. *Margins* entire, recurved from near the base to a little below the point. *Nerve* disappearing below the apex. *Areola*: Upper punctiform; lower narrow, oblong near the base. *Leaves* when dry suberect. *Perichætial leaves* erect, slightly broader than the upper ones, oblong-lanceolate, obtuse. *Margins* plain, entire, concave. *Nerve* ending below the apex. *Fruitstalk* erect, very short. *Capsule* large, broadly pyriform. *Peristome* double: outer 8 bigeminate, entire; inner 8 cilia composed of one row of cells as long as the outer, and alternate with them. *Operculum* large, conico-rostrate, one-third the length of the capsule. *Calyptra* mitriform, shorter than the capsule, plicate, pilose. *Male inflorescence* gemmaceous in the axil of a leaf below the perichætium.

*Hab.* Trees near the River Avon, and near Fendalton November, 1886. Collected in both localities by R. B.

## SECTION C.

Calyptra not pilose. Peristome single.

24. *Orthotrichum cyathiforme*, sp. nov.

*Plants* monœcious, brownish-green, growing in very small tufts  $\frac{3}{8}$  in. high, branched by innovations. *Branches* very short, fastigiate. *Leaves* closely imbricating, spreading, or erecto-patent; lower small, narrow, lanceolate, rounded at the apex; middle and upper ones similar in their outline, upper largest, ovate-lanceolate, rounded at the apex, concave. *Margins* entire, recurved from the base to near the apex. *Nerve* keeled, ending below the apex. *Areola*: Upper punctiform, lower oblong. *Leaves* when dry erect, and adpressed to the branch. *Perichætical leaves* shorter than the upper ones, erect, oblong-lanceolate, rounded at the apex. *Margins* plain, entire. *Nerve* ending below the apex, concave. *Fruitstalk* erect, extremely short, almost sessile. *Capsule* small, oblong, pyriform, immersed. *Peristome* single, 8, bigeminate, entire. *Operculum* not found. *Calyptra* mitriform, plicate, not pilose, shorter than the capsule.

*Hab.* Trees, Little River; June, 1882. Collected by R. B.

25. *Orthotrichum acutifolium*, sp. nov.

*Plants* monœcious, brownish-green above, dark-brown below, growing in small tufts  $\frac{1}{2}$  in. high, branched by innovations. *Branches* short, numerous, fastigiate. *Leaves* small, closely imbricating, erecto-patent. All the leaves are similar in their outline, lower ones smallest, subulate, acuminate from a cordate base, sheathing, concave. *Margins* entire, plain. *Nerve* disappearing in the apex. *Areola*: Upper punctiform, lower linear-oblong. *Leaves* when dry nearly erect. *Perichætical leaves* about as long as the upper ones, erect, oblong-lanceolate, acute, concave. *Margins* plain, entire. *Nerve* ending below the apex. *Fruitstalk* erect,  $\frac{1}{8}$  in. long. *Capsule* exserted, oblong-pyriform, tapering slightly into the fruitstalk. *Peristome* single, 8, bigeminate, entire. *Operculum* conico-rostrate, about one-fifth the length of the capsule. *Calyptra* mitriform, not pilose, plicate.

*Hab.* Trees near the River Teremakau; June, 1884; and Moa Creek; May, 1885. Collected in these localities by R. B.

26. *Orthotrichum hurunui*, sp. nov.

*Plants* monœcious, dark-green, growing in small dense tufts  $\frac{3}{8}$  in. high, branched by innovations. *Branches* short,  $\frac{1}{8}$  in., fastigiate. *Leaves* spreading from an erect base, closely imbricating; lower ones linear-lanceolate, acute, sheathing at the base; middle and upper ones similar in their outline, ovate-lanceolate, obtuse, concave, slightly hooded at the apex.

*Margins* plain, entire. *Nerve* ending below the apex. *Areola*: Upper punctiform, lower oblong. *Leaves* crisp when dry. *Perichæatial leaves* slightly shorter than the upper ones; outer one ligulate, rounded at the apex; inner one ligulate from an ovate sheathing base, rounded at the apex, concave. *Margins* plain, entire. *Nerve* ending below the apex. *Fruitstalk* inclined,  $\frac{1}{8}$  in. long. *Capsule* shortly ovate, exserted, annulate. *Peristome* single, 16, geminate, perforated on the middle line. *Operculum* conico-rostrate, beak very long, nearly as long as the capsule. *Calyptra* mitriform, plicate, not pilose, longer than the capsule. *Male inflorescence* gemmaceous, situated on the perichæatium.

*Hab.* Dry rocks, gorge of the Hurunui River; March, 1893. Collected by R. B.

27. *Orthotrichum minutum*, sp. nov.

*Plants* monœcious, brownish-green, growing in very small dense tufts from  $\frac{3}{16}$  in. to  $\frac{1}{4}$  in. high, branched by innovations. *Branches* short, fastigiata. *Leaves* small, erecto-patent or spreading at the top of the branch; lower ones small, linear-lanceolate, acute; middle and upper very similar in their outline, linear-lanceolate, subacute, flexuous; base erect, sheathing, concave. *Margins* plain, entire. *Nerve* continued to the apex. *Areola*: Upper punctiform, lower linear-oblong. *Leaves* crisp when dry. *Perichæatial leaves* erect; outer one largest, oblong-lanceolate, rounded to an obtuse point, concave. *Margins* plain, entire. *Nerve* continued to the apex. *Fruitstalk* short, slender, erect. *Capsule* small, pyriform, tapering into the fruitstalk. *Peristome* single, 8, bigeminate, entire. *Operculum* not found. *Calyptra* mitriform, as long as the capsule, plicate, not pilose.

*Hab.* Trees, Lyttelton hills; September, 1888. Collected by R. B.

28. *Orthotrichum brevirostrum*, sp. nov.

*Plants* monœcious, green above, very dark below, growing in small tufts  $\frac{3}{8}$  in. high, branched by innovations. *Branches* short,  $\frac{3}{16}$  in. long, fastigiata. *Leaves* closely imbricating, erecto-patent; lower and middle ones similar in their outline, becoming larger upwards, broadly ovate-lanceolate, rounded at the apex, concave. *Margins* entire, recurved from the base to near the apex, papillose. *Nerve* keeled, ending below the apex; upper leaves larger than the middle ones, but not recurved on the margin, otherwise similar. *Areola*: Upper punctiform to near the base, lower linear-oblong. *Leaves* when dry erect. *Perichæatial leaves* erect, smaller than the upper ones, oblong-lanceolate, rounded at the apex. *Margins* entire, not recurved, concave. *Nerve* ending below the top. *Fruit-*



stalk short, erect. *Capsule* immersed, large, oblong, pyriform, narrowed slightly to the mouth. *Peristome* single, 8, bigeminate. *Operculum* small, short, conico-rostrate. *Calyptra* mitriform, about half the length of the capsule, plicate, not pilose.

*Hab.* Rocks, Lyttelton hills; September, 1888. Collected by R. B.

## SECTION D.

Calyptra not pilose. Peristome double.

29. *Orthotrichum avonense*, sp. nov.

*Plants* monœcious, light-green, growing in small tufts about  $\frac{1}{4}$  in. high, branched by innovations. *Branches* short, fastigiate. *Leaves* erecto-patent, imbricating, small. *Leaves* very similar in their outline, the upper being largest, linear-lanceolate from an ovate erect sheathing base, acute, concave. *Margins* plain, entire. *Nerve* keeled, continued to the apex. *Areola* punctiform to near the base. *Leaves* erect when dry. *Perichætical leaves* very small, erect, oblong-lanceolate, acute, concave. *Margins* entire, plain. *Nerve* continued to the apex. *Fruitstalk* nearly erect,  $\frac{1}{8}$  in. long. *Capsule* small, exserted, pyriform, tapering into the fruitstalk, mouth wide. *Peristome* double: outer 8 bigeminate, entire; inner 8 cilia consisting of one row of slender cells nearly as long as the outer teeth. *Operculum* large, conic, acute, about one-half the length of the capsule. *Calyptra* mitriform, as long as the capsule, plicate, not pilose.

*Hab.* Trees near River Avon; November, 1886. Collected by R. B.

30. *Orthotrichum nudum*, sp. nov.

*Plants* monœcious, yellowish-green above, brown below, growing in small loose tufts from  $\frac{1}{4}$  in. to  $\frac{3}{4}$  in. high, branched by innovations. *Branches* spreading, subfastigiate. *Leaves* imbricating, spreading, oblong-lanceolate, acute; middle and upper ones larger but otherwise similar in their outline, oblong-lanceolate, acute, sheathing at the base, concave. *Margins* plain, entire. *Nerve* disappearing in the apex. *Areola*: Upper punctiform; lower small, oblong. *Leaves* slightly crisped when dry. *Perichætical leaves* smaller than the upper ones, oblong-lanceolate, acute, concave. *Margins* plain, entire. *Nerve* disappearing in the apex. *Fruitstalk*  $\frac{1}{8}$  in. long, erect. *Capsule* subimmersed, pyriform. *Peristome* double: outer 16 geminate, entire; inner 16 cilia consisting of one row of cells as long as the outer teeth. *Operculum* stout, conico-rostrate, beak short. *Calyptra* as long as the capsule, mitriform, plicate, not pilose. *Male inflorescence* gemmaceous in the axil of a leaf.

*Hab.* Twigs, Mount Torlesse; January, 1886. Collected by R. B.

31. *Orthotrichum minimifolium*, sp. nov.

*Plants* monœcious, brownish-green, growing in small dense tufts  $\frac{1}{4}$  in. high, branched by innovations. Branches short, fastigiate. *Leaves* spreading, closely imbricating; lower ones small, linear-lanceolate, subacute; middle and upper leaves very similar in their outline, linear-lanceolate, subacute, base erect, sheathing, semi-convolute. *Margins* entire, plain. *Nerve* ending below the apex. *Areola*: Punctiform upper, lower linear-oblong. *Perichæatial leaves*: Inner ovate-subulate; outer longer, ovate-subulate. *Nerve* ending below the apex. *Margins* entire, plain. *Fruitstalk* erect, short. *Capsule* small, immersed, ovate-oblong. *Peristome* double: outer 8 bigeminate, entire, or perforated in the middle line, and occasionally on the lateral ones; inner 8 cilia consisting of one slender row of cells nearly as long as the outer and alternating with them. *Calyptra* as long as the capsule, mitriform, plicate, not pilose. *Male inflorescence* gemmaceous in the axil of a leaf below the perichæatium.

*Hab.* Rocks, Moa Creek; May, 1885. Collected by R. B.

32. *Orthotrichum obtusatum*, sp. nov.

*Plants* monœcious, brownish-green, growing in small tufts  $\frac{1}{2}$  in. high, branched by innovations. Branches short, fastigiate. *Leaves* erecto-patent, imbricating, lower and middle ones small, upper large, all very similar in their outline, broadly ligulate, and round at the apex; base erect, sheathing, concave. *Margins* plain, entire. *Nerve* ending below the apex. *Areola*: Upper punctiform, lower oblong. *Leaves* when dry suberect. *Perichæatial leaves* larger and longer than the upper ones, oblong-lanceolate, acute. *Nerve* to the apex. *Margins* entire, plain. *Fruitstalk* short, erect. *Capsule* small, ovate, tapering slightly into the fruitstalk, immersed. *Peristome* double: outer 8 bigeminate, entire; inner 8 cilia alternate with the outer ones, and consisting of one row of cells, shorter than the outer teeth. *Operculum* conico-rostrate, one-third as long as the capsule; beak short. *Calyptra* smaller than the capsule, plicate, not pilose.

*Hab.* Rocks, Moa Creek; May, 1885. Collected by R. B.

*Calyptra* pilose. *Peristome* not found.

33. *Orthotrichum parvulum*, sp. nov.

*Plants* brownish-green, growing in very small tufts  $\frac{3}{16}$  in. high, branched by innovations. Branches less than  $\frac{1}{16}$  in. long, subfastigiate. *Leaves* closely imbricating, small, erecto-

patent; lower ones ovate, tapering into a subulate apex; middle leaves larger, lower half of leaves ovate, upper portion narrow-lanceolate, acute; upper ones cordate, then narrow lanceolate acute; base of the leaves broad, concave. *Margins* entire, plain. *Nerve* keeled, ending below the apex. *Areola*: Upper punctiform; lower small, oblong. *Leaves* erect when dry. *Perichætial leaves* longer than the upper ones, erect, oblong-lanceolate, subacute, concave. *Margins* entire, plain. *Nerve* ending below the apex. *Fruitstalk* erect, about  $\frac{1}{16}$  in. long. *Capsule* exserted, small, pyriform, tapering into the fruitstalk. *Peristome* and *operculum* not found. *Calyptra* mitriform, plicate, pilose, monœcious. *Male inflorescence* in the axil of a leaf below the perichætium.

*Hab.* Trees at Moa Creek; May, 1885. Collected by R. B.

### 34. *Orthotrichum aretum*, sp. nov.

*Plants* monœcious, brownish-green, growing in small tufts  $\frac{1}{2}$  in. high, branched by innovations. *Branches* short, fastigiate. *Leaves* closely imbricating, erecto-patent; lower ones oblong-lanceolate, obtuse; middle and upper nearly similar in outline, broadly lanceolate, rounded at the apex, concave. *Nerve* keeled, ending below the apex. *Margins* entire, plain. *Areola*: Upper punctiform, lower quadrate. *Leaves* when dry erect and adpressed. *Perichætial leaves* shorter than the upper ones, erect, broadly ovate-lanceolate, rounded at the apex, concave. *Margins* entire, plain. *Nerve* ending below the apex. *Fruitstalk* short, erect,  $\frac{1}{16}$  in. long. *Capsule* pyriform, immersed. *Peristome* very imperfect, single (?), 8, bigeminate. *Operculum* not found. *Calyptra* mitriform, plicate, pilose, as long as the capsule.

*Hab.* On trees, Little River, Banks Peninsula; June, 1882. Collected by R. B.

### 35. *Orthotrichum parvithecum*, sp. nov.

*Plants* monœcious, yellowish-green, growing in loose tufts 1 in. high, branched by innovations. *Branches* unequal in height. *Leaves* spreading, imbricating, linear-lanceolate from an ovate sheathing base, acute, concave. *Nerve* keeled, disappearing in the apex. *Margins* entire, plain; all the branch leaves are very similar in outline, the lower being slightly smaller than the upper ones. *Areola*: Upper punctiform; lower small, narrow, oblong. *Leaves* finely crisped when dry. *Perichætial leaves* smaller than the upper ones, the innermost being the smallest, erect, ovate or oblong-lanceolate, acute. *Margins* entire, plain. *Nerve* ending below the apex. *Fruitstalk* erect,  $\frac{1}{8}$  in. long. *Capsule* exserted, small, ovate, tapering slightly into the fruitstalk. *Peristome* single;

8, bigeminate, entire. *Operculum* and *calyptra* not found. *Male inflorescence* on separate branches.

*Hab.* Trees, Clinton Glen, head of Lake Te Anau; January, 1889. Collected by R. B.

36. *Orthotrichum latifolium*, sp. nov.

*Plants* monœcious, brownish-green or dark-green, growing in small dense tufts  $\frac{1}{4}$  in.— $\frac{3}{8}$  in. high, branched by innovations. *Branches* very short. *Leaves* erecto-patent, closely imbricating; middle leaves large, oblong-lanceolate, rounded to a subapiculate point; upper larger, very broadly ovate-lanceolate, rounded to a subapiculate point, base erect, sheathing, concave. *Margins* recurved from the base to above the middle. *Nerve* continued to the apex. *Areola*: Upper punctiform, lower oblong. *Leaves* when dry erect. *Perichætil* shorter and narrower than the upper leaves, erect, oblong-lanceolate, acute, concave. *Margins* plain, entire. *Nerve* continued to the apex. *Fruitstalk* very short. *Capsule* ovate-oblong, immersed. *Peristome* single, 8, bigeminate, entire. *Operculum* and *calyptra* not found.

*Hab.* Trees and rocks, Mount Torlesse; January, 1886. Collected by R. B.

37. *Orthotrichum subulatum*, sp. nov.

*Plants* monœcious, yellow-green at the top of the branches, dark-brown below, growing in loose tufts 1 in. to  $1\frac{1}{4}$  in. high, branched by innovations. *Branches* spreading, unequal, long or short. *Leaves* closely imbricating, erecto-patent, all very similar in outline, the upper ones being largest, cordate, subulate, acute, base sheathing. *Margins* plain, entire, and concave. *Nerve* disappearing in the apex. *Areola*: Upper punctiform, lower quadrate. *Leaves* when dry spreading from a sheathing base. *Perichætil leaves* much larger than the upper ones, erect, ovate-lanceolate, obtuse, concave. *Margins* entire, plain. *Nerve* ending below the apex. *Fruitstalk* erect,  $\frac{1}{4}$  in. long. *Capsule* exserted, pyriform, tapering into the fruitstalk. *Peristome* single, 8, bigeminate, entire. *Operculum* and *calyptra* not found. *Male inflorescence* gemmaceous in the axil of a leaf below the perichætilium.

*Hab.* Trees in bush, near the River Teremakau; June, 1884. Collected by R. B.

38. *Orthotrichum erectum*, sp. nov.

*Plants* monœcious, brownish-green, growing in small tufts  $\frac{3}{8}$  in. high, branched by innovations. *Branches* loose, spreading, fastigiata. *Leaves* closely imbricating, erecto-patent; lower ones narrow, linear-lanceolate, acuminate from an

ovate sheathing base; middle and upper linear-lanceolate, acuminate, base ovate, sheathing, concave. *Margins* entire, recurved from the base to a little above the middle. *Nerve* keeled, disappearing in the apex. *Areola*: Upper punctiform; lower small, linear-oblong. *Leaves* crisp, when dry. *Perichæatial* leaves erect, longer than the upper ones, linear-lanceolate from an ovate base, acuminate, concave. *Margins* not recurved, entire. *Nerve* disappearing in the apex. *Fruit-stalk* straight. *Capsule* large, pyriform, tapering into the fruitstalk. *Peristome* single, 8, bigeminate. *Operculum* and *calyptra* not found. *Male inflorescence* gemmaceous in the axil of a leaf below the perichæatium.

*Hab.* On trees near Castle Hill; November, 1889. Collected by R. B.

39. *Orthotrichum robustum*, sp. nov.

*Plants* monœcious, dark-green, growing in small tufts,  $\frac{1}{4}$  in.— $\frac{3}{8}$  in. high, branched by innovations. *Branches* short, fastigiate. *Leaves* closely imbricating, spreading; lower ones oblong-lanceolate, acute; middle and upper ones very similar in their outline, upper largest, ovate, lanceolate, acute, very concave. *Margins* entire, recurved from the base to above the middle. *Nerve* ending below the apex. *Areola*: Upper punctiform, lower oblong-quadrate. *Leaves* erect and adpressed to the branch when dry. *Perichæatial* leaves erect, as long as the upper ones, nearly convolute, oblong-lanceolate, acute, sheathing. *Margins* plain, entire. *Nerve* ending below the apex. *Fruitstalk* erect, short. *Capsule* large, subimmersed, ovate, oblong. *Peristome* imperfect, only the base of the outer remaining, 8, bigeminate. *Operculum* and *calyptra* not found.

*Hab.* Rocks, West Coast Road; June, 1884. Collected by R. B.

40. *Orthotrichum curvatum*, sp. nov.

*Plants* monœcious, light-green above, dark-brown below, growing in small tufts  $\frac{3}{4}$  in. high, branched by innovations. *Branches* loose, spreading, slender, fastigiate. *Leaves* imbricating, erecto-patent or spreading; lower ones small, linear-lanceolate from an ovate base, acute; middle and upper leaves very similar in their outline, linear-lanceolate, obtuse; base erect, sheathing, semi-convolute. *Nerve* keeled, disappearing below the apex. *Margins* plain, minute, papillose. *Areola*: Upper punctiform; lower narrow, oblong. *Leaves* when dry suberect. *Perichæatial* leaves shorter than the upper ones, erect, sheathing; outer ligulate from the middle, and rounded at the apex, lower half ovate; inner one much broader and shorter than the outer one, ovate, rounded at the apex, semi-convolute. *Nerve* ending below the apex.

*Fruitstalk* erect,  $\frac{1}{2}$  in. long. *Capsule* ovate-oblong, exserted. *Peristome* double: outer 8 bigeminate, entire; inner 8 cilia consisting of two rows of cells, alternating with the outer teeth. *Operculum* and *calyptra* not found. *Male inflorescence* gemmaceous in the axil of a leaf.

*Hab.* Rocks, Mount Torlesse; January, 1886. Collected by R.B.

## EXPLANATION OF PLATES XXXV.—XLII.

## PLATE XXXV.

Fig. 1.—*Orthotrichum conico-rostrum*.

1. Capsule and operculum.
2. Calyptra.
3. Peristome.
4. Inner perichæatial leaf.
5. Outer perichæatial leaf.
6. Outside the perichæatial leaf.
7. Upper stem leaf.
8. Middle stem leaf.

Fig. 2.—*Orthotrichum pulvinatum*.

1. Capsule.
2. Operculum.
3. Peristome.
4. Calyptra from immature plant.
5. Inner perichæatial leaf.
6. Outer perichæatial leaf.
7. Upper stem leaf.

Fig. 3.—*Orthotrichum breve*.

1. Capsule and operculum.
2. Calyptra.

3. Peristome.
4. Inner perichæatial leaf.
5. Outer perichæatial leaf.
6. Stem leaf (upper).

Fig. 4.—*Orthotrichum ornatum*.

1. Capsule.
2. Calyptra.
3. Peristome.
4. Inner perichæatial leaf.
5. Outer perichæatial leaf.
6. Upper stem leaf.
7. Middle stem leaf.

Fig. 5.—*Orthotrichum gracillimum*.

1. Capsule (scarcely matured).
2. Calyptra.
3. Inner perichæatial leaf.
4. Outer perichæatial leaf.
5. Outside the perichæatial leaf.
6. Upper stem leaf.
7. Lower stem leaf.
8. Peristome.

## PLATE XXXVI.

Fig. 6.—*Orthotrichum calcareum*.

1. Capsule.
2. Operculum.
3. Calyptra.
4. Peristome.
5. Inner perichæatial leaf.
6. Outer perichæatial leaf.
7. Upper stem leaf.
8. Middle stem leaf.

Fig. 7.—*Orthotrichum obliquum*.

1. Capsule.
2. Calyptra.
3. Inner perichæatial leaf.
4. Outer perichæatial leaf.
5. Upper stem leaf.
6. Middle stem leaf.

Fig. 8.—*Orthotrichum flexifolium*.

1. Capsule.
2. Calyptra.
3. Peristome.

4. Inner perichæatial leaf.
5. Outer perichæatial leaf.
6. Upper stem leaf.
7. Middle stem leaf.
8. Lower stem leaf.

Fig. 9.—*Orthotrichum lancifolium*.

1. Capsule.
2. Calyptra.
3. Inner perichæatial leaf.
4. Outer perichæatial leaf.
5. Outside the perichæatial leaf.
6. Middle stem leaf.

Fig. 10.—*Orthotrichum clintonii*.

1. Capsule.
2. Immature operculum.
3. Calyptra.
4. Inner perichæatial leaf.
5. Outer perichæatial leaf.
6. Male inflorescence.
7. Upper stem leaf.
8. Upper stem leaf.

## PLATE XXXVII.

Fig. 11.—*Orthotrichum inæquale*.

1. Capsule.
2. Calyptra.
3. Peristome.
4. Inner perichæatial leaf.
5. Outer perichæatial leaf.
6. Outside the perichæatial leaf.
7. Upper stem leaf.
8. Middle stem leaf.

Fig. 12.—*Orthotrichum benmoreense*.

1. Capsule.
2. Operculum.
3. Calyptra.
4. Peristome.
5. Perichæatial leaf.
6. Upper stem leaf.
7. Lower stem leaf.
8. Leaf from inflorescence.

Fig. 13.—*Orthotrichum fimbriatum*.

1. Capsule.
2. Calyptra.

3. Peristome.
4. Inner perichæatial leaf.
5. Outer perichæatial leaf.
6. Upper stem leaf.
7. Middle stem leaf.

Fig. 14.—*Orthotrichum reflexum*.

1. Capsule.
2. Calyptra.
3. Peristome.
4. Inner perichæatial leaf.
5. Upper stem leaf.
6. Middle stem leaf.

Fig. 15.—*Orthotrichum latorum*.

1. Capsule.
2. Operculum.
3. Calyptra.
4. Peristome.
5. Inner perichæatial leaf.
6. Upper stem leaf.
7. Lower stem leaf.

## PLATE XXXVIII.

Fig. 16.—*Orthotrichum cylindro-*  
*thecum*.

1. Capsule.
2. Operculum.
3. Calyptra.
4. Inner perichæatial leaf.
5. Outer perichæatial leaf.
6. Upper stem leaf.
7. Lower stem leaf.

Fig. 17.—*Orthotrichum tortulosum*.

1. Capsule.
2. Operculum.
3. Calyptra.
4. Peristome.
5. Inner perichæatial leaf.
6. Outer perichæatial leaf.
- 7; 8. Stem leaves.

Fig. 18.—*Orthotrichum longi-*  
*thecum*.

1. Capsule.
2. Calyptra.
3. Operculum.

4. Inner perichæatial leaf.
5. Upper stem leaf.
6. Upper stem leaf.
7. Lower stem leaf.

Fig. 19.—*Orthotrichum anomalum*.

1. Capsule.
2. Operculum.
3. Calyptra.
4. Peristome.
5. Inner perichæatial leaf.
6. Outer perichæatial leaf.
- 7, 8. Upper stem leaves.

Fig. 20.—*Orthotrichum brevisetum*.

1. Capsule.
2. Operculum.
3. Calyptra.
4. Peristome.
5. Inner perichæatial leaf.
6. Outer perichæatial leaf.
7. Upper stem leaf.
8. Lower stem leaf.

## PLATE XXXIX.

Fig. 21.—*Orthotrichum acumina-*  
*tum*.

1. Capsule.
2. Calyptra.
3. Peristome.
4. Inner perichæatial leaf.
5. Upper stem leaf.

Fig. 22.—*Orthotrichum obesum*.

1. Capsule.
2. Operculum.
3. Calyptra.
4. Peristome.
5. Inner perichæatial leaf.
6. Outer perichæatial leaf.
7. Upper stem leaf.

Fig. 23.—*Orthotrichum magno-*  
*thecum*.

1. Capsule.
2. Calyptra.
3. Peristome.
4. Inner perichæatial leaf.
5. Upper stem leaf.
6. Middle stem leaf.

Fig. 24.—*Orthotrichum cyathi-*  
*forme*.

1. Capsule.
2. Calyptra.
3. Peristome.
4. Inner perichæatial leaf.

5. Outer perichæatial leaf.
6. Upper stem leaf.
7. Lower stem leaf.

Fig. 25.—*Orthotrichum acutifolium*.

1. Capsule.
2. Capsule and operculum (immature).
3. Calyptra (immature).
4. Peristome.
5. Inner perichæatial leaf.
6. Outer perichæatial leaf.
7. Upper stem leaf.
8. Middle stem leaf.
9. Lower stem leaf.

## PLATE XL.

Fig. 26.—*Orthotrichum hurunui*.

1. Capsule.
2. Capsule with operculum scarcely mature.
3. Calyptra.
4. Peristome.
5. Inflorescence.
6. Inner perichæatial leaf.
7. Outer perichæatial leaf.
8. Upper stem leaf.

Fig. 27.—*Orthotrichum minutum*.

1. Capsule.
2. Calyptra.
3. Peristome.
4. Inner perichæatial leaf.
5. Outer perichæatial leaf.
6. Upper stem leaf.
7. Middle stem leaf.

Fig. 28.—*Orthotrichum breviro-*  
*strum*.

1. Capsule and operculum.
2. Calyptra.
3. Peristome.
4. Inner perichæatial leaf.
5. Outer perichæatial leaf.
6. Upper stem leaf.
7. Middle stem leaf.

Fig. 29.—*Orthotrichum avonense*.

1. Capsule.
2. Calyptra.
3. Peristome.
4. Inner perichæatial leaf.
5. Outer perichæatial leaf.
6. Upper stem leaf.
7. Middle stem leaf.
8. Lower stem leaf.

Fig. 30.—*Orthotrichum nudum*.

1. Capsule.
2. Calyptra.
3. Peristome.
4. Inner perichæatial leaf *in situ*.
5. Outer perichæatial leaf *in situ*.
6. Upper stem leaf.
7. Middle stem leaf.

Fig. 31.—*Orthotrichum minimi-*  
*folium*.

1. Capsule.
2. Operculum.
3. Calyptra.
4. Peristome.
5. Inner perichæatial leaf.
6. Outer perichæatial leaf.
7. Upper stem leaf.
- 8, 9. Middle stem leaves.

## PLATE XLI.

Fig. 32.—*Orthotrichum obtusatum*.

1. Capsule, with inner perichæatial leaf *in situ*.
2. Operculum.
3. Calyptra.
4. Peristome.
- 5, 6. Upper stem leaves.
7. Middle stem leaf.
8. Lower stem leaf.

Fig. 33.—*Orthotrichum parvulum*.

1. Capsule.
2. Calyptra.
3. Inner perichæatial leaf.
4. Outer perichæatial leaf.
5. Upper stem leaf.
6. Middle stem leaf.
7. Lower stem leaf.



Fig. 34.—*Orthotrichum arctum*.

1. Capsule.
2. Calyptra.
3. Inner perichæatial leaf.
4. Upper stem leaf.
5. Lower stem leaf.

Fig. 35.—*Orthotrichum parvithecum*.

1. Capsule.
2. Peristome.

3. Inner perichæatial leaf.
4. Outer perichæatial leaf.
5. Upper stem leaf.
6. Middle stem leaf.

Fig. 36.—*Orthotrichum latifolium*.

1. Capsule.
2. Inner perichæatial leaf.
3. Outer perichæatial leaf.
4. Outside the perichæatial leaf.
5. Upper stem leaf.

## PLATE XLII.

Fig. 37.—*Orthotrichum subulatum*.

1. Capsule.
2. Peristome.
3. Inner perichæatial leaf.
4. Outer perichæatial leaf.
5. Upper stem leaf.
6. Middle stem leaf.
7. Lower stem leaf.

Fig. 38.—*Orthotrichum erectum*.

1. Capsule.
2. Inner perichæatial leaf.
3. Outer perichæatial leaf.

4. Upper stem leaf.
5. Middle stem leaf.

Fig. 39.—*Orthotrichum robustum*.

1. Capsule.
2. Inner perichæatial leaf.
3. Outside the perichæatial leaf.
4. Upper stem leaf.

Fig. 40.—*Orthotrichum curvatum*.

1. Capsule.
2. Inner perichæatial leaf.
3. Outer perichæatial leaf.
4. Upper stem leaf.
5. Middle stem leaf.

ART. LV.—*On the Growth of Ferns; and on a New Fern now first reported.*

By H. C. FIELD.

[Read before the Wellington Philosophical Society, 17th October, 1894.]

ON the 2nd March I received a letter from Mr. James Patterson, of the Thames, informing me that some miles inland, and at an elevation of 1,725ft. above sea-level, he had found a tree-trunk covered to the height of 12ft. or 14ft. by an *Asplenium*, which climbed by means of fleshy creeping rhizomes similar to those of *Polypodium billardieri*. He also stated that he had found what he believed to be the same variety close to the coast, and at an altitude of only about 50ft. As no such widely-creeping *Asplenium* had been reported in the colony I was naturally interested in the discovery, and a few days later I received a parcel of specimens of the fern. On inspecting them I found that their long, straight sori, and the peculiar dark bluish-green colour of the