Orchids in the Transactions

Part 1

Orchids in the Transactions

Part 1: Volumes I to 56
(1868 to 1926)

compiled by Ian St George

No 8 in the New Zealand Native Orchid Group's Historical Series.
Dunedin, 1990
ISSN 0114-5568

Contents

1 Introduction

3 Papers and Extracts from the *Transactions and Proceedings of the New Zealand Institute*

3 *From* Kirk T. On the Botany of Great Barrier Island. 1868. I: 88-101.
4 *From* Buchanan J. Sketch of the Botany of Otago. 1868. I: 181-212.
5 *From* Kirk T. On the Botany of the Thames Gold-fields. 1869. II: 89-100.
5 *From* Armstrong JF. The Vegetation of the neighbourhood of Christchurch. 1869. II: 119-128.
6 *From* Kirk T and Buchanan J. List of Plants found in the Northern District of the Province of Auckland. 1869.II: 239-247.
7 *From* Kirk T. On the Flora of the Isthmus of Auckland and the Takapuna District. 1870. III: 148-161.
8 *From* Kirk T. On the Botany of the Northern Part of the Province of Auckland. 1870. III: 166-177.
9 *From* Kirk T. Descriptions of New Plants. 1870. III: 177-180.
10 *From* Kirk T. Notes on the Flora of the Lake District of the North Island. 1872. V: 322-345.
10 *From* Webb JS. Notes on Plants collected near Invercargill. 1872. V: 360-363.
10 *From* Kirk T. On the Botany and Conchology of Great Omaha. 1872. V: 363-369.
11 *From* Buchanan J. Notes on the Flora of the Province of Wellington, with a List of Plants collected therein. 1873. VI: 210-235.
11 *From* Buchanan J. On the Flowering Plants and Ferns of the Chatham Islands. 1874. VII: 333-341.
12 *From* Buchanan J. On the Botany of Kawau Island: Physical features and causes influencing distribution of Species. 1876. IX: 503-527.
12 *From* Thomson GM. Notes on some Otago Plants. 1876. IX: 538-542.
13 *From* Kirk T. On the Botany of Bluff Hill. 1877. X: 400-406.
13 *From* Kirk T. Contributions to the Botany of Otago. 1877. X: 406-417.

14 *From* Kirk T. An Enumeration of recent Additions to the New Zealand Flora, with Critical and Geographical Notes. 1877. X: Appendix xxviii-xiv.
14 Thomson GM. On the means of Fertilization among some New Zealand Orchids. 1878. XI: 418-426.
24 *From* Hamilton A. List of Plants collected in the District of Okarito, Westland. 1878. XI: 435-438.
24 *From* Kirk T. Notes on Mr.Hamilton's Collection of Okarito Plants. 1878. XI: 439-444.
24 *From* Kirk T. Notes on the Botany of Waiheke, Rangitoto, and other Islands in the Hauraki Gulf. 1878. XI: 444-454.
25 *From* Kirk HB. Notes of the discovery of *Calceolaria repens* Hook.f., and other Plants in the Wellington District. 1878. XI: 466-467.
25 *From* Kirk T. On the Relationship between the Floras of New Zealand and Australia. Presidential address. 1878. XI: 540-546.
26 *From* Armstrong JB. A short Sketch of the Flora of the Province of Canterbury, with Catalogue of Species. 1879. XII: 325-353.
26 *From* Thomson GM. On the Fertilization, etc., of New Zealand Flowering Plants. 1880. XIII: 241-288.
39 *From* Petrie D. A Visit to Stewart Island, with Notes on its Flora. 1880. XIII: 323-334.
39 *From* Buchanan J. On some Plants new to New Zealand, and Description of a new Species. 1881. XIV: 356-357.
40 *From* Kirk T. Notes on Plants from Campbell Island. 1881. XIV: 387-389.
40 *From* Buchanan J. Additions to the Flora of New Zealand. 1882. XV: 339-340.
41 *From* Adams J. On the Botany of the Thames Goldfields. 1883. XVI: 385-393.
42 *From* Buchanan J. Botanical Notes. 1883. XVI: 397.
43 *From* Kirk T. On the Flowering Plants of Stewart Island. 1884. XVII: 213-228.
44 *From* Adams J. On the Botany of Te Aroha Mountain. 1884. XVII: 275-287.
44 *From* Hamilton WS. Notes on the Occurence and Habits of some of our New Zealand Plants. 1884. XVII: 290-293.
45 *From* Kirk T. Additional Contributions to the Flora of the Nelson Provincial District. 1885. XVIII: 318-324.
45 *From* Buchanan J. On some New Native Plants. 1886. XIX: 213-216.

47 *From* Adams J. On the Botany of Te Moehau Mountain, Cape Colville. 1888. XXI: 32-41.
47 *From* Kirk T. On the Botany of Antipodes Island. 1890. XXIII: 436-441.
47 Kirk T. Notice of the Occurrence of Australian Orchids in New Zealand. 1891. XXIV: 425-428.
51 *From* Petrie D. Description of a New Genus and of New Species of Native Plants, &c. 1892. XXV: 269-275.
54 *From* Petrie D. Descriptions of New Native Plants, &c. 1893. XXVI: 266-274.
55 *From* Petrie D. List of the Flowering Plants indigenous to Otago, with Indications of their Distribution and Range in Altitude. 1895. XXVIII: 540-591.
58 *From* Kirk T. Notes on the Botany of the East Cape District. 1896. XXIX: 509-532.
59 *From* Adams J. On the Botany of Hikurangi Mountain. 1897. XXX: 414-433.
59 *From Proceedings of the Otago Institute.* 1898. XXXI: 747.
60 *From* Carse H. On the Flora of the Mauku District. 1901. XXXIV: 362-386.
62 *From* Cockayne L. A Botanical Excursion during Midwinter to the Southern Islands of New Zealand. 1903. XXXVI: 225-333.
63 *From* Townson W. On the Vegetation of the Westport District. 1906. XXXIX: 380-433.
67 *From* Petrie D. Account of a Visit to Mount Hector, a High Peak of the Tararuas, with a List of Flowering Plants. 1907. XXXX: 289-304.
67 *From Proceedings of the Otago Institute.* 1907. XXXX: 579-80.
68 *From* Cockayne L. Some Hitherto-unrecorded Plant-habitats. 1908. XXXXI: 399-403.
69 *From* Cockayne L. On a Collection of Plants from the Solanders. 1908. XXXXI: 404-405.
69 *From* Aston BC. Botanical Notes made on a Journey across the Tararuas. 1909. XXXXII: 13-25.
70 *From* Aston BC. Unrecorded Habitats for New Zealand Plants. 1909. XXXXII: 26-28.
70 *From* Oliver RB. The Vegetation of the Kermadec Islands. 1909. XXXXII: 118-175.
71 Lancaster TL. Preliminary Note on the Fungi of the New Zealand Epiphytic Orchids. 1910. XXXXIII: 186-191.
77 *From* Carse H. On the Flora of the Mangonui County. 1910. XXXXIII: 194-224.

81 *From* Aston BC. List of Phanerogamic Plants Indigenous in the Wellington Province. 1910. XXXXIII: 225-247.
82 *From* Crosby Smith J. Notes on the Botany of Lake Hauroko District. 1910. XXXXIII: 248-253.
82 *From* Speight R, Cockayne L, Laing RM. The Mount Arrowsmith District: a Study in Physiography and Plant Ecology. 1910. XXXXIII: 315-378.
83 *From* Laing RM. Some Notes on the Botany of the Spenser Mountains, with a List of the Species collected. 1911. XXXXIV: 60-75.
83 *From Abstracts*. 1911. XXXXIV: 32.
84 *From* Carse H. On some Additions to the Flora of the Mangonui County. XXXXV: 276-277.
84 *From* Poppelwell DL. Notes of the Botany of the Ruggedy Mountains and the Upper Fresh-water Valley, Stewart Island. 1912. XXXXV: 278-287.
85 *From* Poppelwell DL. Notes of a Botanical Excursion to Northern Portion of the Eyre Mountains. 1912. XXXXV: 288-293.
85 *From* Poppelwell DL. Notes on the Botany of Routeburn Valley and Lake Harris Saddle. 1913. XXXXVI: 22-29.
85 *From* Aston BC. Notes on the Phanerogamic Flora of the Ruahine Mountain-chain, with a List of the Plants observed thereon. 1913. XXXXVI: 40-54.
86 *From* Crosby Smith J. List of Phanerogamic Plants Indigenous in the Southland District. 1913. XXXXVI: 220-246.
87 *From* Aston BC. Plant-habitats Hitherto Unrecorded. 1914. XXXXVII: 67-70.
87 *From* Poppelwell DL. Notes on the Plant Covering of the Garvie Mountains, with a List of Species. 1914. XXXXVII: 120-142.
88 *From* Cockayne L, Foweraker CE. Notes from the Canterbury College Mountain Biological Station No.4: The Principal Plant Associations in the Immediate Vicinity of the Station. 1915. XXXXVIII: 166-186.
88 *From* Cockayne L. Some Hitherto-unrecorded Plant-habitats. 1915. XXXXVIII: 203-209.
89 *From* Carse H. Some Further Additions to the Flora of Mangonui County. 1915. XXXXVIII: 237-243.
89 *From* Poppelwell DL. Notes on the Plant-covering of the Breaksea Islands, Stewart Island. 1915. XXXXVIII: 246-52.

90 *From* Poppelwell DL. Botanical Results of an Excursion to the Upper Makarora Valley and the Haast Pass, supported by a List of the Species observed. 1916. XXXXIX: 161-166.
90 *From* Poppelwell DL, Thomson WA. Notes of a Botanical Visit to Hollyford Valley and Martin's Bay, with a List of Indigenous Plants. 1917. L: 146-154.
90 *From* Poppelwell DL. Notes of a Botanical Excursion to Bunkers Island (Stewart Island). 1917. L: 154-157.
91 *From* Poppelwell DL. Notes on a Botanical Visit to Coll or Bench Island (Stewart Island). 1917. L: 158-159.
91 *From* Petrie D. Descriptions of New Native Flowering-plants. 1917. L: 207-211.
92 *From* Petrie D. Descriptions of New Native Flowering-plants. 1919. LI: 106-107.
93 *From* Laing RM. The Vegetation of Banks Peninsula, with a List of Species (Flowering Plants and Ferns). 1919. LI: 355-408.
94 *From* Herriott EM. A History of Hagley Park, Christchurch, with Special Reference to its Botany. 1919. LI: 427-447.
95 *From* Poppelwell DL. Notes on the Indigenous Vegetation of the North-eastern Portion of the Hokonui Hills, with a List of Species. 1920. LII: 239-247.
95 *From* Poppelwell DL. Notes on the Indigenous Vegetation of Ben Lomond, with a List of Species. 1920. LII: 248-252.
96 Rogers RS. *Petalochilus* - a New Genus of New Zealand Orchids. 1926. 56: 16-18.
100 *From* Cockayne L and Allan HH. Notes on New Zealand Floristic Botany, including Descriptions of New Species. 1926. 56: 21-33.
101 *From* Andersen JC. Popular Names of New Zealand Plants. 1926. 56: 659-714.

Introduction

The history of the *Transactions* was detailed in 1977 at the time of the centennial of the Royal Society of New Zealand by CA Fleming -

> "One of the main reasons for federating local societies under the New Zealand Institute was to give a publication medium for New Zealand scientific research.... papers read at meetings of the Incorporated Societies were deemed to be communications to the NZI and might then be published in the *Proceedings* or *Transactions*, subject, however, to acceptance by the NZI. The privilege of publishing and the right to receive copies of the publications to its members, at first free of cost, were the chief material inducements for such societies to incorporate".
>
> "The content of the *Transactions* was at first broad, including philology, literature, history and mythology as well as the usual field sciences actively pursued in a young colony - botany, zoology, geology - with a sprinkling of physics and chemistry...".[1]

Medicine was excluded in 1869, almost from the start. In 1872 preference was give to papers adding to the knowledge of New Zealand, and by 1880 the claim could be made that the quantity and quality of papers were above those of any other colony. James Hector had been editor for the first thirty-five volumes, a huge achievement. John Buchanan had been lithographer for the first twenty volumes.

In the years that followed there were delays, disagreements about the value of publishing some specialised papers, and financial crises. The New Zealand Institute became the Royal Society in 1936. A smaller range of subjects followed the emergence of competing publications, but interest remained uneven, with criticisms leading in 1961 to the approval of separate series in botany, zoology, geology and general subjects. But after Volume 88 of the *Transactions,* Botany reached only a third volume before being merged with Zoology as a "Biological Series" in 1968.

Two years later the *Transactions* ceased, and were replaced by the periodical *Journal of the Royal Society of New Zealand.*

The *Transactions* stand now as an immensely valuable resource for any researcher into early work in the sciences in New Zealand. The sheer range of subject matter, and the attention to detail of many of the early authors are astonishing.

A full set is one of my treasured possessions.

Some of the extracts reprinted here are mere lists, often brief, of orchid species found in various localities, many inevitably now gone to land development, although some should still be of interest to those who

might thus be guided to "new" habitats for New Zealand orchids. Snatches of text referring to orchids have been taken from their context. Complete papers of major importance to New Zealand orchidologists are also reproduced.

Papers on the New Zealand orchids written by Colenso, Cheeseman and Hatch in the *Transactions* have appeared in earlier numbers of the Group's *Historical Series,* and are therefore not reproduced here.

I am grateful to the Royal Society of New Zealand for permission to reproduce papers from the *Transactions*.

Ian St George,
Dunedin,
26 May, 1990

Reference:

1. Fleming CA. Science, settlers and scholars. Royal Society of New Zealand, *Bulletin 25*: 171-293

Papers and extracts from the *Transactions and Proceedings of the New Zealand Institute*

From Kirk T. On the Botany of Great Barrier Island. 1863. I: 88-101.

CATALOGUE OF PLANTS OBSERVED ON THE GREAT BARRIER ISLAND.

Earina mucronata, *Lindl.*
„ autumnalis, *Hook. f.*
Dendrobium cunninghamii, *Lindl.*
Bolbophyllum pygmæum, *Lindl.*
Gastrodia cunninghamii, *Hook. f.*
Acianthus sinclairii, *Hook. f.*
Corysanthes oblonga? *Hook. f.*
„ rivularis, *Hook. f.*
Microtis porrifolia, *Sprengel.*
Pterostylis banksii, *Brown.*
„ trullifolia, *Hook. f.*
Thelymitra longifolia, *Forst.*
Prasophyllum colensoi, *Hook. f.*
Orthoceras solandri, *Lindl.*

CATALOGUE OF PLANTS FOUND ON THE SOUTH AND SOUTH-EAST COASTS OF THE LITTLE BARRIER ISLAND, DECEMBER, 1867.

Earina mucronata, *Lindl.*
Dendrobium cunninghamii, *Lindl.*
Bolbophyllum pygmæum, *Lindl.*
Microtis porrifolia, *Sprengel.*

The *Corysanthes* are now *Corybas. Microtis porrifolia* is now *M.unifolia. Orthoceras solandri* is now *O. novae-zeelandiae.*

From Buchanan J. Sketch of the Botany of Otago. 1863. I: 181-212.

The numerals in the respective columns, for each of the districts, indicate,—

1. The mere occurrence of a few individuals of the species;
2. The tolerable abundance of individuals in a few localities; and
3. The universal occurrence of the species, wherever the condition for its growth prevailed within the district.

The letters a b c in the first column refer to the altitude to which the species extend above the sea-level:

(a) From sea-level to 1,500 feet.
(b) From 1,500 feet to 4,000 feet.
(c) From 4,000 feet upwards.

LIST OF FLOWERING PLANTS FOUND IN OTAGO.

English and Maori Names.		Alt.	East Region.	West Region.
	MONOCOTYLEDONS.			
Orchis Family.	1. ORCHIDEÆ.			
	Earina mucronata, *Lindl.*	a	3	3
	„ autumnalis, *Hook. f.*	a	3	3
	Dendrobium cunninghamii, *Lindl.*	a	3	3
Piripiri.	Bolbophyllum pygmæum, *Lindl.*	a	1	2
Perei.	Gastrodia cunninghamii, *Hook. f.*	a	1	1
	Corysanthes triloba, *Hook. f.*	a	2	2
	„ oblonga, *Hook. f.*	a	2	2
	„ macrantha, *Hook. f.*	a	2	
	Microtis porrifolia, *Spreng.*	a	3	2
	Caladenia minor, *Hook. f.*	a	2	2
	„ lyallii, *Hook. f.*	a	2	2
	„ bifolia, *Hook. f.*	a	2	1
	Pterostylis banksii, *Brown*	a	3	2
	„ graminea, *Hook. f.*	a	2	2
	Lyperanthus antarcticus, *Hook. f.*	a b	3	1
—	Thelymitra longifolia, *Forst.*	a	2	2
	Thelymitra pulchella, *Hook. f.*	a	2	2
	„ uniflora, *Hook. f.*	a	3	2
	Prasophyllum colensoi, *Hook. f.*	a	3	3

Caladenia bifolia is now *Aporostylis bifolia*. *Thelymitra uniflora* is now *T.cyanea*.

From Kirk T. On the Botany of the Thames Gold-fields. 1869. II: 89-100.

The estimate of altitude affixed to many species, is chiefly based upon single observations with a pocket aneroid, and can therefore be regarded as approximative only.

Acianthus Sinclairii, —2000. Microtis porrifolia. Thelymitra longifolia. Orthoceras Solandri.

Earina mucronata. Bolbophyllum pygmæum, —2500. Sarcochilus adversus. Adenochilus gracilis. Corysanthus triloba,—1600. C. rivularis. Pterostylis Banksii. P. trullifolia, —1200.

Sarcochilus adversus is now *Drymoanthus adversus*.

From Armstrong JF. The Vegetation of the neighbourhood of Christchurch. 1869. II: 119-128.

HERBACEOUS PLANTS	Native or Settlers' Name.	Season of Flowering.	Riccarton Bush.	Dry Bush.	Mount Pleasant Bush.	Port hills, and Summer: north side of range.	Swamps.	Sand-hills.
Earina mucronata .		Dec.-Feb.				1		
Corysanthes macrantha .		Nov.			1	1		
„ triloba .		Nov.			1			
„ oblonga .		Nov.				1		
Thelymitra longifolia .		Dec.				1	1	1
Phrasophyllum Colensoi .		Dec.				1	1	1
Four other orchids .								1
One „ .							1	

From Kirk T and Buchanan J. List of Plants found in the Northern District of the Province of Auckland. 1869.II: 239-247.

Introductory Remarks by J. Buchanan.

The above area may be divided into eight districts, viz. :—

1. Wangarei,
2. Bay of Islands,
3. Wangaroa,
4. Stephenson's Island,

the latter as showing the comparative botany of a portion of land detached from the Main Island.

5. Mount Camel,
6. North Cape.

Nos. 5 and 6 are isolated districts, the latter, in a great measure, cut off from the general Flora by a peninsula of sand-hills, nearly 70 miles in length.

7. Kaitaia,
8. Hokianga.

Orchideæ.

Earina mucronata, 1 2 3 8
„ autumnalis, 1 2 3 8
Dendrobium Cunninghami, 1 2 3
Bolbophyllum pygmæum, 1 8
Corysanthes triloba, 1 2
Microtis porrifolia, 1 2 3 7 8
Pterostylis Banksii, 1 2 3 7
Prasophyllum pumilum, 2 6 7

From Kirk T. On the Flora of the Isthmus of Auckland and the Takapuna District. 1870. III: 148-161.

II.—MONOCOTYLEDONS.

10. Earina mucronata, *Lindl.*
10. „ autumnalis, *Hook.*
10. Dendrobium Cunninghamii, *Lindl.*
10. Bolbophyllum pygmæum, *Lindl.*
5. Sarcochilus adversus, *Hook. f.*
1. Gastrodia Cunninghamii, *Hook. f.*
15. Acianthus Sinclairii, *Hook. f.*
5. Cyrtostylis oblonga, *Hook. f.*
5. Corysanthes triloba, *Hook. f.*
5. „ oblonga, *Hook. f.*
3. „ macrantha, *Hook. f.*
3. „ Cheesemanii, *Hook. f.*
15. Microtis porrifolia, *Spreng.*
10. Caladenia minor, *Hook. f.*
10. Pterostylis Banksii, *Brown*
„ b. australis
5. „ graminea, *Hook. f.*
10. „ trullifolia, *Hook. f.*
5. Pterostylis puberula, *Hook. f.*
1. Chiloglottis cornuta, *Hook. f.*
15. Thelymitra longifolia, *Forst.*
3. „ pulchella, *Hook. f.*
1. Spiranthes australis, *Lindl.*, *T. F. Cheeseman*
15. Orthoceras Solandri, *Lindl.*
5. Prasophyllum pumilum, *Hook. f.*

Pterostylis puberula has been considered a synonym for *P.nana*, though Clements has recently suggested that the two are distinct, and that *P.puberula* is a NZ endemic. *Spiranthes australis* is *S.sinensis*.

From Kirk T. On the Botany of the Northern Part of the Province of Auckland. 1870. III: 166-177.

CORRECTIONS, ADDITIONAL LOCALITIES,* &c., TO PREVIOUS LIST.

(See Vol. ii., p. 242.)

Prasophyllum pumilum, *Hook. f.* Add 1.

---

* The districts as divided and numbered by Mr. Buchanan are — 1. Whangarei. 2. Bay of Islands. 3. Whangaroa. 4. Stephenson's Island. 5. Mount Camel. 6. North Cape. 7. Kaitaia. 8. Hokianga.

Sarcochilus adversus, *Hook. f.* 1.
Gastrodia Cunninghamii, *Hook. f.* 2.
Acianthus Sinclairii, *Hook. f.* 1 2.
Cyrtostylis oblonga, *Hook. f.* 2. *W. Colenso.*
Corysanthes oblonga, *Hook. f.* 2.
„ rivularis, *Hook. f.* 2. *W. Colenso.*
Caladenia minor, *Hook. f.* 1 2.
Pterostylis trullifolia, *Hook. f.* 1 2.

Thelymitra longifolia, *Forst.* 1 2 3 6.
„ Colensoi, *Hook. f.* 2. *W. Colenso.*
„ imberbis, *Hook. f.* 2. *W. Colenso.*
Orthoceras Solandri, *Lindl.* 1 2 3.

Thelymitra colensoi is regarded as a synonym of *T.pauciflora* in NZ, though Clements doubts if the latter is really a NZ plant. *T.imberbis* is *T.carnea.*

From Kirk T. Descriptions of New Plants. 1870. III: 177-180.

Corysanthes Cheesemanii, Hook. f. n. s.

Root of small tubers on rather stout caudicles. Leaf membranous, sessile, ½″ in diameter, ovate-cordate, apiculate. Bract very short, rarely petaloid and coloured. Flower ⅝″ long, rarely more, sessile or shortly peduncled. Upper sepal very large, helmet-shaped, curved over the lip, obovate, obtuse, rarely acute. Lip involute, large, the margins enclosing the column, two-lobed at the base, the lobes produced downwards into two horn-like processes, apex of the lip recurved. Lateral sepals 0, or rarely concealed under the lip, and spirally twisted. Petals minute or wanting, subulate, deflexed. Column stout, erect. Anther terminal, persistent. Peduncle elongating after flowering, capsule narrowed upwards, striate.

Te Whau, 1865, *T. K.* Ourakei, *Mr. T. F. Cheeseman*, 1867. Titirangi, *T. K.*

I obtained a few imperfect specimens of this interesting plant from the Whau District about five years ago, but not in a fit state to allow of a diagnosis being drawn. Mr. Cheeseman subsequently found it in some quantity, and has kindly favoured me with good specimens and valuable notes, of which I have availed myself in drawing the foregoing description.

It is the earliest-flowering species in this colony, usually displaying its dull purple flowers early in July. It will probably be found to have a wide range of distribution.

All the species of *Corysanthes* previously discovered in New Zealand belong to the sub-genus *Nematoceras*, Hook. f. The present species belongs to the typical section of the genus.

Corysanthes cheesemanii was relegated to synonymy with *Corybas aconitoflorus* by Moore, but since the latter has been recognised as an Australian endemic, *C.cheesemanii* is reinstated.

From Kirk T. Notes on the Flora of the Lake District of the North Island. 1872. V: 322-345.

Chiloglottis traversii, F. von Muell. (*Caladenia bifolia*, Hook. f.)—Specimens long past flowering; occurs at Motukino, 1,500 feet, and amongst moss on the summit of Tarawera mountain, where it reaches its northern limit. Distinguished from all other New Zealand orchids by its glandular pubescence.

Thelymitra longifolia, Forst.—Summit of Tarawera mountain, 3,600 feet.

***Chiloglottis traversii* is *Aporostylis bifolia*.**

From Webb JS. Notes on Plants collected near Invercargill. 1872. V: 360-363.

Prasophyllum colensoi.

From Kirk T. On the Botany and Conchology of Great Omaha. 1872. V: 363-369.

In some places they flow amongst fallen masses of sandstone covered with *Hypnum albicans* and other mosses not commonly met with, perchance between steep banks clothed with *Elatostemma rugosum* in vast abundance, or yet again between rocky wooded slopes often covered with masses of *Corysanthes*; nearly all the species of this charming genus occur in the district. The stream called by the settlers the Pakiri Creek has its stony bed above tide limits covered with a dense growth of *Nertera cunninghamii* to an extent rarely to be seen elsewhere.

Many small Orchids, besides the various species of *Nematoceras*, are found in the district. *Thelymitra pulchella* and *T. imberbis* are abundant. The rare *Adenochilus gracilis* and *Chiloglottis cornuta* attain their northern limit so far as at present ascertained.

From Buchanan J. Notes on the Flora of the Province of Wellington, with a List of Plants collected therein. 1873. VI: 210-235.

MONOCOTYLEDONS.

ORCHIDEÆ.

Earina mucronata, Lindl. Fl. Oct., Nov.; white, spotted pink.
autumnalis, Hook. f. Fl. Feb., March; white.
Dendrobium cunninghamii, Lindl. Fl. Nov.—Jan.
Bolbophyllum pygmæum, Lindl.
Sarcochilus adversus, Hook. f. Fl. Dec.; yellowish green.
Gastrodia cunninghamii, Hook. f. Fl. Nov.; white.
Acianthus sinclairii, Hook. f. Fl. March. Wanganui.
Corysanthes triloba, Hook. f. Fl. Oct., Nov.; purple.
rotundifolia, Hook. f. Fl. Oct., Nov.; purple.
Microtis porrifolia, Sprong. Fl. Nov., Dec.; yellowish green.
Caladenia minor, Hook. f. Fl. Nov., Dec.; pale greenish white.
Pterostylis banksii, Br. Fl. Nov., Dec.; pale green.
graminea, Hook. f. Fl. June—Aug.; pale green.
micromega, Hook. f. Fl. Oct.—Dec.
Thelymitra longifolia, Forst. Fl. Nov., Dec.; white and purple.
colensoi, Hook. f. Fl. Nov., Dec.; yellowish green.
Prasophyllum colensoi, Hook. f. Fl. Nov., Dec.; yellowish green.
nudum, Hook. f. Fl. Nov., Dec.; yellowish green.
Orthoceras solandri, Lindl. Wainuiomata. Fl. Dec., Jan.; yellowish green

***Corysanthes rotundifolia* is either *C.rivularis* or *C.oblongus*.**

From Buchanan J. On the Flowering Plants and Ferns of the Chatham Islands. 1874. VII: 333-341.

MONOCOTYLEDONS.

ORCHIDACEÆ.

Earina mucronata, Lindl.
Acianthus sinclairii, Hook. fil.
Corysanthes macrantha, Hook. fil.
Microtis porrifolia, Sprong.
Pterostylis banksii, Br.
banksii, Br., var. *b*.
micromega, Hook. fil.
Caladenia bifolia, Hook. fil. (*Chiloglottis traversii*, F. Muell., *l. c.*, 51.)
Chiloglottis cornuta, Hook. fil.
Thelymitra longifolia, Forst.

From Buchanan J. On the Botany of Kawau Island: Physical features and causes influencing distribution of Species. 1876. IX: 503-527.

MONOCOTYLEDONS.

ORCHIDEÆ.

Earina mucronata, Lindl.
autumnalis, Hook., fil.
Dendrobium cunninghamii, Lindl.
Bolbophyllum pygmæum, Lindl. (Piripiri.)
Sarcochilus adversus, Hook., fil.
Gastrodia cunninghamii, Hook., fil. (Perei), C.
Acianthus sinclairii, Hook., fil., (Kirk.)
Corysanthes oblonga, Hook., fil.
Microtis porrifolia, Spreng.
Caladenia minor, Hook., fil.
Pterostylis banksii, Br.
trullifolia, Hook., fil., (Kirk.)
Thelymitra longifolia, Forst.
pulchella, Hook., fil. (Maikaikai.)
Prasophyllum colensoi, Hook., fil.

From Thomson GM. Notes on some Otago Plants. 1876. IX: 538-542.

Order.—ORCHIDEÆ.

39. *Corysanthes rivularis* (Hook., f.), gullies near Dunedin and Stewart Island.

40. *Chiloglottis traversii* (F. Muëll.), Swampy Hill, 2,000 feet.

From Kirk T. On the Botany of Bluff Hill. 1877. X: 400-406.

The underwood and the herbaceous vegetation exhibited the greatest luxuriance of growth; *Chiloglottis cornuta*, an orchidaceous plant growing in several localities from Omaha to the Chatham and Auckland Islands, but remarkably local, exhibited a stout, robust habit quite new to me.

The following are the most interesting of the indigenous species:—

Caladenia bifolia, Hook. f. In the forest and on peaty ground near the summit; leaves varying greatly in size and shape.

Chiloglottis cornuta, Hook. f. Abundant in the forest and of large size.

Prasophyllum nudum, Hook. f. Open places near the summit.

ORCHIDEÆ.

Gastrodia cunninghamii, Hook. f.
Caladenia bifolia, Hook. f.
Pterostylis banksii, Br.
β.
Chiloglottis cornuta, Hook. f.
longifolia, Forst.
Thelymitra uniflora, Hook. f.
Prasophyllum nudum, Hook. f.
pumilum, Hook. f. (?)
Specimens imperfect.

From Kirk T. Contributions to the Botany of Otago. 1877. X: 406-417.

ORCHIDEÆ.

Chiloglottis cornuta, Hook. f. The Bluff Hill.

Prasophyllum pumilum, Hook. f. Several imperfect specimens collected on the Bluff Hill appear identical with this species.

nudum, Hook. f. Mountains above Lake Harris; the Bluff Hill, etc.

Prasophyllum nudum has not been confirmed south of *c.* lat.42°30', and *P.pumilum* south of *c.* lat 38°. Kirk noted that the specimens were imperfect, and was almost certainly seeing *P.colensoi*.

From Kirk T. An Enumeration of recent Additions to the New Zealand Flora, with Critical and Geographical Notes. 1877. X: Appendix xxviii-xiv.

ORCHIDACEÆ.

Corysanthes **cheesemannii**, Hook. f., Ic. Pl., t. 1,120; Kirk, Trans. N.Z. Inst., III., p. 180.

The only New Zealand species belonging to the typical section of the genus.

North Island—Titirangi; Te Whau; Remuera.

Thomson GM. On the means of Fertilization among some New Zealand Orchids. 1878. XI: 418-426.

[*Read before the Otago Institute, 11th June*, 1878.]

THE following notes drawn up from jottings made during the past spring and summer, are by no means exhaustive, but may rather be looked upon as a small contribution to our already existing information on this interesting subject.

Of the eleven genera which are represented in this part of the island, I have made more or less lengthened observations on ten, viz.: *Earina*, *Dendrobium*, *Corysanthes*, *Microtis*, *Caladenia*, *Pterostylis*, *Chiloglottis*, *Lyperanthus*, *Thelymitra* and *Prasophyllum*. I was not fortunate enough to obtain specimens of *Gastrodia*, which is a very readily overlooked plant.

Some of my specimens were cultivated, and thus yielded more certain information than those which were examined in the wild state.

One fact which has struck me during these investigations is, that I have hardly ever been able to capture insects carrying pollen on any part of their body. Only when examining beds of *Corysanthes* have I found insects with pollinia. It is possible that the general coldness of the past season, and the remarkable scarcity of all kinds of insects, have had a good deal to do with this. If this is the case, of course a disturbing element has been introduced to some extent into my observations.

Tribe EPIDENDREÆ.

(1.) *Earina autumnalis*.

I have had a large clump of this species in cultivation all summer, but owing probably to the want of warmth it only came into bloom towards the end of March. It produced abundance of flowers, however, having about 1100 on it when examined on 6th April.

The flowers are only about ½ of an inch in diameter, white in colour, with a yellow centre, and with an almost over-poweringly sweet perfume. The labellum is 3-lobed, stands nearly erect in front of the column, and has its lateral lobes produced forward at right angles to it. It bears two strongly marked longitudinal ridges on its surface, which almost touch the sides of the column, and leave a minute nearly square passage to its base. There is no nectary, but the tissue at the base of the labellum is easily punctured, and exudes beads of moisture. The column is short and erect, the stigmatic surface very concave, with the viscid rostellum projecting prominently forward above it. The anther is terminal and deciduous, and encloses four pyriform pollinia attached in pairs to a short caudicle.

From the position of the parts it appears to be impossible that self-fertilization could take place. The pollinia are remarkably coherent, and lie very closely ensconced in the anther case. For fertilization by insects, however, the parts are very simply fitted. The rostellum with the attached caudicle projects to a small point, and is viscid on the edge and under-surface. An insect visiting the flower would insert its head or proboscis into the small square aperture between the labellum and the column, and in withdrawing would inevitably touch the viscid surface. The slightest touch brings away the pollinia, usually all four, but sometimes only two. Were they to be withdrawn just as they lie on the summit of the column, they would hardly be in the position to strike the stigmatic surface of another flower; but in being withdrawn, the cap of the anther pulls them slightly downwards and depresses the caudicle considerably. I repeatedly imitated the action with the point of a pencil or needle, and found in every case that the pollinia came away readily, and were depressed considerably below a right-angle to the surface to which they adhered. In this position they were easily placed on the stigma of a second flower. I carefully examined 91 flowers, and found that the pollinia had been removed from the anthers in 41 cases, and remained intact in 50; this too in bright, warm weather. Of course the plants were not in their native habitat, which might account partly for lack of the usual bush-frequenting insects. Those spikes pro-

minently placed on the plant usually had the pollinia of their flowers more or less removed, while those which were buried among the leaves had not as a rule been visited.

Tribe Malaxeæ.

(2.) *Dendrobium cunninghamii.*

This beautiful orchid has its flowers evidently fitted for cross-fertilization. The upper sepal is lanceolate in form, and is the smallest in the whorl. The lateral sepals are broad at the base, and adnate to the produced base of the column. The lateral petals are linear oblong. The labellum is widely expanded above the middle, with two small lateral lobes, and bears on its face five elevated ridges or plates. It is attached to the base of the column by a short and very elastic claw. The column stands in the flower exactly like the letter J, being produced forward at the base, and terminated by a large green glandular swelling. When the flower is open, a small drop of nectar is always found at the base of this swelling. The erect portion or limb of the column is rather long. The anther is terminal, and encloses four narrow and flattish pollen masses, attached in pairs to a strap-shaped caudicle. The stigmatic surface is placed slightly below it, and is nearly square. When in the bud, the lower surface is hollowed into a deep pit, and on its summit, standing directly in front of the bases of the pollinia, is the rostellum, which at this early stage is membranous. As the flower opens, the cells of the rostellum become converted into a milky and excessively viscid substance, while the whole surface of the stigma secretes abundantly a clear, viscid matter, and a drop of sweet fluid is secreted at the base of the column.

The action of the parts is exceedingly simple. An insect alighting on the labellum weighs it down very easily, and thus gains access to the nectar at its base. The elasticity of the labellum, however, tends to keep it pressing against the column, and thus compels the insect to brush against the viscid rostellum. The pollinia are very easily withdrawn by an upward movement, as can be seen by introducing a needle or pencil point, and touching the rostellum in withdrawing it, when one or more of the pollinia will be withdrawn with it. The lateral lobes of the labellum and the guiding ridges on its surface would prevent an insect reaching the nectar without touching the rostellum when leaving the flower; and any insect entering another flower with pollinia on its head, could not fail to leave these on the stigma. By inserting a fly, this action was easily seen, all four pollinia

being withdrawn, with their caudicle glued over the insect's right eye. Out of twenty-two flowers examined, only five had their pollinia removed from the anther cases, but as the plant was growing on a veranda away from its native habitat, this was no criterion. I regret that I did not fertilize any of the flowers on this plant with their own pollen. Those fertilized by pollen from other flowers on the same plant produced fine capsules.

Tribe Arethuseæ.

(3.) *Corysanthes macrantha.*

Both this species and *C. rivularis* were examined by me, but the flowers are almost identical in structure, the difference not affecting the relations of the parts. They are very striking in appearance, owing to their lurid purple colour, and the long twisted sepals and petals, which give them an extraordinary resemblance to a large spider sitting on a leaf. The upper sepal is large, prominent, and helmet-shaped, and projects forward over the flower. The labellum is large and involute, almost semi-cylindrical, with its external margin fimbriated and expanded downwards into a longish tip. It is not attached continuously at its base. On each side of the flower, when in bud, a small slit is seen, which widens by an expansion of the margin (which is thus caused to arch slightly outwards) into a small circular aperture. By the contact of the in-turned edges of the labellum, and the overlapping of the upper sepal, a horizontal aperture is left in the mouth of the flower, which bends at right-angles a little way in, and opens into a tolerably large cavity. Placed quite at the bottom of this is the short, thick column, lying almost horizontally in *C. rivularis*, and somewhat more erect in *C. macrantha*. The stigmatic cavity is deep, and on its posterior margin is the rostellum. This is formed of large cells, covered with a very delicate membrane. If this be touched with a bristle, it is almost instantly ruptured, and a small, very viscid drop of matter exudes. In withdrawing the bristle the pollinia are brought away with it. The anther is terminal (posterior), and has broad lateral projections. The pollinia are four in number, in two pairs, and in the form of plates. The flowers do not appear to secrete any nectar, but when the surface of the labellum is slightly punctured, a considerable amount of sweetish purple juice exudes, which is probably grateful to insects. From the shape of the flowers, it is necessary to cut them longitudinally to see the parts. Looking at the position of the anther and stigma, it appears to me almost impossible that self-fertilization can take place; at the same time it is somewhat difficult to suggest any satisfactory way in which an insect could accomplish either this or cross-

fertilization. I presume that any insect entering the flower would have to back out again by the same way as it entered, and in doing so it would come in contact with the rostellum, and would remove the pollinia on its head. It is also probable that, in endeavouring to obtain from a second flower any of the sweet juices from the tissue at the base of the labellum, it would slightly advance its head, so as to bring the pollinia attached to it on to the stigma. Again, it is possible that self-fertilization might be secured by an insect thus getting the pollinia on its head, and then endeavouring to push its way down through the small lateral apertures. In doing so, it would almost certainly smear the stigma with pollen from the same flower, and I have sometimes been inclined to think that such did take place. At the same time, this would seem like putting an unnecessary difficulty in the way of what is usually a very simple process, and therefore no great value is to be attached to this idea.

For a time I could not understand why spiders frequented these flowers so much, but I soon found a sufficient cause. The only insects capable of removing pollen which were found about the flowers were small Diptera—probably a species of *Culex*. In several cases these small flies had penetrated into the tube of the flower, and, in their eagerness after the sweet juices found there, brought their heads in contact with both rostellum and stigma, and partly owing to the viscidity of these parts, and partly to the narrowness and bending of the tube, were unable to withdraw backwards. In some flowers insects were thus found still alive, in others they were dead, while in many others only portions of them, such as legs, wings, etc., were left, the spiders having devoured the rest. In every case in which a captured insect was withdrawn from its trap, the pollinia were removed also, securely attached to the front of the head.

I closely examined 143 flowers, and found that in 47 the pollinia were still in the anther cells; from 90 they had been removed, while in 6, dead or living insects were found glued to the stigma. Of the whole number examined, only a small proportion ultimately produced capsules.

The flowers of this genus will well repay examination.

(4.) *Microtis porrifolia.*

In the flowers of this species the column is protected by a broad, flat hood, formed by the posterior sepal and the two lateral petals. The lateral sepals are completely reflexed, and lie back against the ovary. The labellum is large and pendulous, hanging out from the front of the flower like a tongue. It is rectangular in shape, rather longer than broad, with

the margin crimped and curled, and bearing three glandular projections on its surface. Two of these are situated together near the base, and enclose a small depression or pit. This, from its position and appearance, I take to be a nectary, but I was unable to detect any liquid in it. The third gland is formed by an irregular wart-like mass of cells, and is situated near the apex of the labellum. I have not investigated its functions, nor do I know how its presence can be accounted for. The column is very short, and stands almost square, this appearance being caused by the wings or auricles which stand up on each side. Beneath these is the hooded anther, enclosing four pollinia, which lie very loosely in their cells. They present the appearance of two masses, but each is composed of a large outer and a smaller inner sheet, of a reniform shape, united by their threads to a short caudicle. In front of and somewhat below them is the viscid rostellum, towards the apex of which a minute white point is visible, which marks their point of attachment. The rostellum projects considerably outwards, so that the stigmatic surface is placed in a recess. The slightest touch on the viscid disc suffices to bring away one or both pollinia, the matter being excessively viscid. An insect alighting on the rostellum, and advancing its head to examine the glands at its base, would be certain to touch the rostellum and bring away the pollinia. These fall slightly by their own weight, so that on entering a second flower, they would be in such a position on the front of the insect's head as to touch the stigma immediately under the rostellum. In the first spike examined by me, 32 flowers were fully opened, and all but the top one had their pollinia removed.

Even when not fertilized by insects however, these flowers are readily self-fertilized, and during the past season this appears to have been the case with the great majority. After a time, the pollinia appear withered and brown, and somewhat dragged forward from their anther cells, while the ovary begins to enlarge, showing that pollination has taken place. If such flowers are examined carefully, it will be found that the pollen grains have emitted a great mass of tubes, which penetrate the upper margin of the stigma, thus ensuring fertilization. I found this to be the case in several hundred flowers which I examined. The position of the labellum on the underside of this flower is caused by the usual twisting of the pedicel or ovary, which is so common in many orchids. But in young buds the posterior sepal is lowest and placed on the side farthest from the axis of the spike; and it is during the gradual maturing of the flower that the twisting takes place, so that, by the time it opens, the labellum and posterior sepal have changed places.

This species, as might be expected from its facilities for reproduction, is one of the commonest plants of the class.

(5.) *Caladenia bifolia.*

Chiloglottis traversii, Müeller.

This is a most abundant orchid in upland districts at an elevation of 1500 to 3000 feet. The flower is solitary on an erect scape, three to four inches in height. The upper sepal is obtuse, somewhat arched forward, and slightly keeled. The lateral sepals are placed under the labellum, and extend forward almost horizontally. The labellum is broad; on each side of the expanded portion is a yellow-coloured patch bearing two or three brownish spots, while extending from the middle to the base are two rows of yellow glands. The column is long and erect, slightly winged above, and bearing a terminal anther which encloses four pollinia. The stigma is rounded and slightly hollowed out, and is placed in close contiguity to the anther. The arrangement of the parts is so simple that an insect alighting on the labellum and advancing its head into the base of the flower could hardly fail to remove the pollinia; nor could one entering with pollen on its head fail to leave these on the stigma, for in withdrawing pollinia from a flower they are always slightly depressed by the cap of the anther. The pollen of this plant is very incoherent, and the lower surface of the stigma projects a little, so that I am inclined to think self-fertilization takes place in flowers which have not been visited by insects. The majority of the flowers appear to set good capsules, and flowers which I fertilized artificially, produced good full seed-vessels. I examined one sunny day twenty-two flowers growing in the open; of these only three had both pollinia removed; in one the pollinia were removed from one anther lobe; in five others the pollen masses appeared more or less disturbed; while in the remaining thirteen the anthers were untouched.

(6.) *Pterostylis banksii.*

The fertilization of the flowers of this genus has been so well described by Mr. Cheeseman, in the Trans. N.Z. Inst., Vol. V., p. 352, that I cannot well add to it, but my observations on them more than ever induce me to consider that there has been an unusual scarcity of insect life during the past season. Out of all the flowers of the above species, and of *P. graminea*, examined, *not one* had the pollinia removed. The flowers are incapable of self-fertilization. Certain experiments made by me to test whether they were fertile with their own pollen were rendered useless by being conducted in the open, where the flowers were liable to be destroyed.

The rostellum of this orchid, when examined in bud, lies in front of and between the bases of the pollinia, but quite separate from them. At this early stage it consists of an oblong, pearly-white body, composed of large rounded cells, filled with granular fluid. The pollinia stand in a small hollow on the top of the column, and at this stage are attached only by a small posterior ligament at their base.

(7.) *Chiloglottis cornuta.*

In this species the flower is solitary, on a short scape, which lengthens after flowering, and is partly covered by an acute, sheathing bract. When fully developed, all the parts stand nearly erect, and thus leave no landing place for insects. The labellum is acutely trowel-shaped, with one broad central, and several narrow, lateral, longitudinal, purple glands. The column is curved back at the base, and then ascends in front of the upper sepal. The stigmatic surface is large, almost circular, quite flat and excessively viscid, there being no distinct rostellum. The anther is terminal, and encloses four plate-like pollinia, which are coherent, and are attached by their bases to the upper margin of the stigma (rostellum). Before the flower is open, and while yet almost sessile, and sheathed by the bract, the stigmatic surface becomes excessively viscid, and smears all the portion of the labellum immediately opposite to it. I could not ascertain how the pollen got on to the stigma, but in the few flowers I was enabled to examine, all four pollinia were on the stigma, and the anther cells were empty.

From the position of the flower when the parts are ripe for pollination, viz., low down between the two leaves, from its inconspicuous greenish colour, and the fact that viscidity is strongest in the unopened flowers, I am of opinion that this species is exclusively adapted for self-fertilization. The subsequent lengthening of the scape is probably only to aid in the dispersion of the seed.

(8.) *Lyperanthus antarcticus.*

In this orchid the flowers are solitary, or two on a scape, partially covered by a relatively large concave bract, and of a green colour throughout. The posterior sepal is large and broad, arched forward, and covering the column like a hood. The labellum is flat, broadly ovate and acute, quite glabrous, with two lateral and four median ridges. The column is broad, somewhat arched forward, and terminated by the acute anther. The rostellum placed directly above the stigmatic chamber, impinges on the base of the anther, and is slightly viscid. The pollen-masses, four in number, are very incoherent. From their inconspicuous colour, the fact of their being

very frequently closed, and the extreme incoherence of their pollen, I am inclined to think that the flowers of this plant are always self-fertilized. I examined 39 flowers, and found that the pollinia were present in all of them, but in the more advanced some of the pollen was scattered over the stigmas, and the ovaries appeared well-developed.

Tribe Neotteæ.

(9.) *Thelymitra longifolia.*

The fertilization of this orchid is treated of in Fitzgerald's "Australian Orchids," and quoted by Darwin. All the parts of the perianth, including the labellum, are similar in colour and shape. The column is nearly erect, and slightly hooded at the apex. On its front margin, and a little below the apex, a projection occurs on each side, bearing a tuft of exquisitely beautiful feathery hairs. These are the auricles or staminodia which represent two out of the three stamens of the inner whorl, the third being the only stamen fully developed. In this flower they form a very conspicuous feature, but I do not know their function, if any. Placed quite in at the back and near the base of the column, are the two persistent anther lobes. In very young buds these contain the pollinia, but as they approach maturity they become attached to the back of the stigma, which stands forward a slight distance from the column. The pollinia are composed of four sheets or plates of white, powdery, very incoherent pollen. The rostellum is hardly viscid at all, nor would this be of any use to the plant, as it is seldom, if ever, visited by insects. The flowers are seldom found open, and as a rule are probably self-fertilized. I presume that the pollen grains emit their tubes to the upper surface of the stigma, but I never succeeded in detecting this.

(10.) *Prasophyllum colensoi.*

The flowers are small and greenish-brown in colour. The base of the ovary is sheathed by a short truncate bract; the very short pedicel is not twisted, so that, as in *Thelymitra*, the labellum appears in its normal position above the flower. All the parts of the perianth are similar in form and colour. The column is very short and erect, with the anther placed at the back. At each side rises a small two-lobed appendage, representing a staminodium or imperfect stamen about half the height of the column. The stigmatic surface is broadly triangular, and is protected in front by the labellum, and latterly by the staminodia. The pollen grains are usually found adhering to the back of the stigma, some on its upper edge. When examined under the microscope, some of these were found to have emitted a mass of short tubes. The pollinia are two in number, and the

pollen grains forming them are bound together into small wedge-shaped masses. The flowers are somewhat sweet-scented, and though dull-coloured are tolerably conspicuous, but there appears to be no trace of a nectary. Nor from the position of the parts is it very probable that an insect could remove the pollinia, so as to place the loose, incoherent grains on the stigma of another flower. The species is evidently well fitted for self-fertilization. In nine spikes examined by me, containing altogether 75 open flowers, only four appeared to have the pollinia partially removed, and, even in these, pollen grains were adhering to the stigma and anthers.

Imperfect as the foregoing notes are, they still point to the correctness of the general principle that where it is advantageous to a plant to have its flowers cross-fertilized by pollen from another plant, there we find agencies for attracting suitable insects. Thus *Earina* has conspicuous flowers, sweet scent, and succulent tissue at the base of the flower; *Dendrobium* has showy flowers and a tolerably perfect nectary; while *Corysanthes* has conspicuous flowers and sweet juice. In all three, assistance from insects appears to be absolutely necessary. Again, *Caladenia*, which appears to be fitted for both means of fertilization, has tolerably conspicuous flowers, while *Microtis*, which is similarly favoured, has the rudiments of a nectary, but the former would seem to be more dependent on insect aid than the latter. In *Pterostylis* there seems to be nothing to attract insects, as the flowers are green, and, as pointed out by Mr. Cheeseman, do not appear to secrete any nectar, nor do they have any decided scent. Yet in none of the New Zealand orchids are the appliances to secure the desired end so perfect or so complex. In this plant only one species of insect appears adapted to each particular species of the genus. It would be interesting to discover whether this applies to other New Zealand genera. In those genera which are almost, if not altogether, exclusively self-fertilized, no special provision for attracting insects occurs, if we except the handsome perianth of *Thelymitra*.

Sarcochilus adversus mentioned here is almost certainly the unnamed *Drymoanthus* currently tagged "spotted leaf", rather than *Drymoanthus adversus*, which does not appear to exist in Eastern Otago.

From Hamilton A. List of Plants collected in the District of Okarito, Westland. 1878. XI: 435-438.

ORCHIDEÆ.
Earina autumnalis, Hook. f.
Dendrobium cunninghami, Lindl.
Bolbophyllum pygmæum, Lindl.
Corysanthes rivularis, Hook. f.
oblonga, Hook. f.
Microtis porrifolia, Spreng.
Prasophyllum nudum, Hook. f.
Pterostylis banksii, Br.
Spiranthes australis, Lindl.
Thelymitra pulchella, Hook. f.

From Kirk T. Notes on Mr.Hamilton's Collection of Okarito Plants. 1878. XI: 439-444.

Spiranthes australis, Linde.

The Okarito specimens of this local plant mark a considerable extension of its western range. Specimens mixed with *Microtis porrifolia*, apparently collected on Banks' Peninsula some years back by Mr. Armstrong, junr., are in the herbarium of the Christchurch Museum; the credit of its first discovery in the South Island is therefore due to that gentleman.

The other known localities for this species in New Zealand are Waikato, where it was originally discovered by Mr. Colenso; St. John's Lake, Auckland, whence I have a fine specimen collected by Mr. Cheeseman; and Kaitoke swamps on the Great Barrier Island, where I had the pleasure of collecting it some years past.

From Kirk T. Notes on the Botany of Waiheke, Rangitoto, and other Islands in the Hauraki Gulf. 1878. XI: 444-454.

Earina mucronata, Lindl.
Dendrobium cunninghamii, Lindl.
Bolbophyllum pygmæum, Lindl.
Acianthus sinclairii, Hook. f.
Microtis porrifolia, Spreng.
Thelymitra longifolia, Forst.
Prasophyllum pumilum, Hook. f. T.F.C., a single specimen only.
Orthoceras solandri, Lindl.

From Kirk HB. Notes of the discovery of *Calceolaria repens* Hook.f., and other Plants in the Wellington District. 1878. XI: 466-467.

Chiloglottis cornuta, Hook. Wainui-o-mata.
Corysanthes oblonga, Hook. Mungaroa.
,, *macrantha*, Hook. Okiwi.
Pterostylis trullifolia, Hook. Okiwi.

From Kirk T. On the Relationship between the Floras of New Zealand and Australia. Presidential address. 1878. XI: 540-546.

In Orchidaceæ there is a close generic relationship, no fewer than sixteen genera being common to both countries, but not more than six species, two alone of which are found elsewhere; the restricted distribution of the species of this order is strongly marked all over the world.

As the orchids of the two countries have become better understood, the number of shared species has fluctuated widely.

From Armstrong JB. A short Sketch of the Flora of the Province of Canterbury, with Catalogue of Species. 1879. XII: 325-353.

Catalogue of Canterbury Plants.

Abbreviations.—P., Banks Peninsula; L., Littoral; M., Lowland, or Middle District; A., Alpine; 3, Abundant; 2, Local; 1, Comparatively rare. All those not marked * are cultivated in the Christchurch Public Gardens.

ORCHIDEÆ. 12—25.
Earina mucronata, *Lind.* P.3.
autumnalis, *Hk.f.* P.3.
Dendrobium cunninghamii, *Lind.* P. M.2.
*pygmæum, *Smith.* P.2.
*Gastrodia cunninghamii, *Hk.f.* M. P.2.
Cyrtostylis oblonga, *Hk.f.* A.P.1.
Corysanthes triloba, *Hk.f.* P.M.A. 2.
*rotundifolia, *Hk.f.* M.P.2.
*rivularis. *Hk.f.* P.2.
macrantha, *Hk.f.* P.M.3.
Microtis porrifolia, *Spr.* L.M.3.
*Caladenia minor, *Hk.f.* A.P.1.
*lyallii, *Hk.f.* A.P.2.
bifolia, *Hk.f.* A.1.
Pterostylis banksii, *Br.* L.M.3.
graminea, *Hk.f.* L.M.2.
micromega, *Hk.f.* A.1.
*Pterostylis foliata, *Hk.f.* A.1.
*trullifolia, *Hk.f.* A.1.
Chiloglottis cornuta, *Hk.f.* (?). P. A.2.
*Lyperanthus antarcticus, *Hk.f.* P. A.3.
Thelymitra longifolia, *Fst.* L.M.3.
*uniflora, *Hk.f.* M.P.2.
Prasophyllum colensoi, *Hk.f.* M.3.
*nudum, *Hk.f.* M.1.

Dendrobium pygmaeum is *Bulbophyllum pygmaeum*.

From Thomson GM. On the Fertilization, etc., of New Zealand Flowering Plants. 1880. XIII: 241-288.

THE collection and examination of the flowering plants of this colony have occupied a good deal of my spare time during the last four or five years, and have enabled me to accumulate some materials for working out the various modes of fertilization which are to be found among them. These materials, even when made the most of, are however only sufficient to show how little is really known of this most interesting subject. In giving, then, the results of my imperfect observations, I do so in the form of a preliminary notice, which I trust will pave the way for fuller and more detailed work in the future. This subject of the fertilization of our flowering plants is necessarily so mixed up with the question of our insect fauna that I am led to unite the two to a certain extent, and show the relationship which exists between them.

At the risk of repeating to many here information which they already possess, I will—for the benefit of the uninitiated—shortly explain the phenomena of fertilization of flowering plants, as far as external manifestations are concerned. The sexual organs of such plants are contained in those parts of the flower termed, respectively, *stamens* and *pistil*. A stamen consists essentially of a 1-, 2-, or 4-celled cavity, called the *anther* (which may or may not be mounted on a stalk, or *filament)*, and which contains, usually, a vast number of small, variously-shaped, cellular bodies, the *pollen-grains*, which either are themselves, or contain, the male fertilizing element. The pistil consists of a 1- or more-celled cavity, the *ovary*, containing *ovules*, in which the female element occurs. External to the ovary is a glandular portion (of extremely various shapes in various plants), termed the *stigma*, which at a certain stage of the development of the flower becomes viscid, and so fitted to catch and retain the pollen-grains. In some cases the stigma is on a stalk, the *style*, in others it is sessile. The pollen-grains, when in contact with and apparently excited by the viscid secretion of the stigma, produce very slender tubes which grow down and penetrate the ovary, and finding their way to the *micropyles* (or apertures) of the ovules, bring about fertilization. Into this part of the subject I do not propose to enter, but will confine myself to the modes in which the pollen is transferred to the stigma. In a very large number of species, both stamens and pistil occur in the same flower, which is then said to be *hermaphrodite*. In other species, the stamens and pistil are in separate flowers, which are then *unisexual*. Unisexual plants are *monœcious* when the staminate and pistillate flowers are on the same plant, as in *Carex*, etc., and *diœcious* when they are on different plants, as in *Coprosma*. Lastly, some plants, as manuka *(Leptospermum scoparium)*, produce both hermaphrodite and unisexual flowers, and are then said to be *polygamous*.

At first sight it would seem as if all hermaphrodite flowers were self-fertilized, *i. e.* that the pollen from the anthers became transferred to the stigma of the same flower, and so brought about fertilization. On examination, however, it is found that this is not always the case; in fact it would seem not to be the case in a majority of instances. By a multiplicity of means and contrivances it happens that many hermaphrodite flowers can-

not be self-fertilized, but are dependent upon the pollen of other flowers, which may be brought to them in various ways. Unisexual flowers of course are always dependent on other flowers for their fertilization. The two great agents which carry out this cross-fertilizing process are insects and the wind, and plants are termed *entomophilous* or *anemophilous*, according as they are dependent on one or the other agency. Some birds (chiefly tuis and honey-birds in New Zealand) aid in the process, but only seven or eight species of Otago flowers are fertilized by them. (The following are the species with which I am acquainted, which are thus visited and aided:—*Clianthus puniceus*, *Sophora tetraptera*, *Metrosideros lucida*, *Fuchsia excorticata*, etc. *Loranthus colensoi (?)*, *Dracophyllum longifolium* occasionally, and *Phormium tenax*. Probably there are others.)

It is hardly worth while to discuss here and now the *pros* and *cons* of the theory first enunciated by Sprengel, but only fully explained by Darwin and his followers—that the characteristic features of each species of plant and animal have been acquired during a long "struggle for existence," and are the result of the adaptation of the species to its environments. It is sufficient to affirm that it is now held by most biologists that the colour, odour, and honey of flowers are designed to attract insects, and have been produced in accordance with the law of the survival and accumulation of favourable variations. Other flowers not furnished with these means of attraction have been developed into their present forms by the gradual production of certain other characters favouring their fertilization by wind, until they have become strictly anemophilous. In New Zealand we seem to see the transition stage to this state of things taking place among some species.

In whatever manner flowers may be fertilized, it is now known that pollen from a flower on a different plant seems to produce more and larger seeds, from which spring finer and stronger plants, than result from fertilization by pollen of the same flower applied to its own pistil. Hence probably, to a certain extent at least, the advantages of, and tendency to, separation of the sexual organs, which is so common a phenomenon among New Zealand flowers.

A point worthy of notice among entomophilous flowers is this,—that not only have flowers become modified for fertilization by insects, but even by certain insects only. Thus some are suited for fertilization by Lepidoptera alone, others by Diptera, Hymenoptera, or Coleoptera only, while some are actually dependent on certain species of insects. This seems to be the case with several species of the long-nectaried orchids of the subtropical genus *Angræcum*, and with *Trifolium pratense* (the common red

clover), which is apparently only fertilized by long-trunked bees of the genus *Bombus*. But even the converse probably holds good, viz., that many insects have become modified in certain respects by their becoming to some extent dependent on certain species of flowers. Thus it can only be moths or butterflies with an extremely long proboscis which can obtain honey from the whip-like nectary of *Angræcum sesquipedale*, which attains a length of eleven inches (though no species has yet been found which accomplishes this); and we can understand how completely dependent the flowers of this plant are upon such moths, and how the insects themselves must be advantaged in that no others can compete with them for this supply of food.

Among hermaphrodite flowers in which no special arrangement or contrivance exists for preventing self-fertilization, it does not follow that the pistils are always pollinated by the stamens which are included in the same perianth with them. Darwin* has pointed out that in very many plants the flowers of which are quite fertile with their own pollen, the pollen from other flowers is found to have a greater fertilizing power, and to produce fertilization of the ovules even after their own pollen has been scattered on the stigmas; so that the visits of pollen-carrying insects to such flowers are sure to be advantageous, even although not absolutely necessary for the production of seed. Hermaphrodite flowers show every gradation between perfect self-fertility, such as prevails in various species of Cruciferous and Caryophyllaceous plants, and absolute self-sterility, as in *Oxalis magellanica*, in which no seed is produced even after the stigma has been abundantly smeared with pollen from the adjacent anthers. This latter state of self-sterility is, however, attained in a variety of ways. Thus in some flowers, the anthers dehisce and scatter all their pollen before the stigmas are ready to receive any—this occurs in *Wahlenbergia*, *Gentiana*, etc., and such flowers are functionally unisexual, and are said to be *proterandrous*. But all have not this character so fully developed, and every gradation may be noticed from complete proterandry to the opposite extreme. Thus in buttercups, the outer anthers commence to dehisce first, and the process extends from without inwards; but considerably before the inner anthers have dehisced the stigmas have become viscid. In *Epilobium* again, at least among New Zealand species, I have never been able to notice any difference of time between the maturing of the anthers and stigmas. Here cross-fertilization, when it takes place, will be chiefly accomplished through the prepotency of the pollen brought from other flowers by insect visitants. But this func-

* "Cross- and Self-Fertilization of Plants," p. 391.

tional separation of the sexes is equally well accomplished by the opposite arrangement, viz., the maturing of the stigmas first, and the protrusion and dehiscence of the anthers only after the former have been pollinated and are withered up. This is very well exemplified in the various species of *Coriaria* (tutu). Such flowers are called *proterogynous*, while the term *dichogamy* is applied generally to the maturing of the sexual whorls at different times.

Another means of accomplishing the same end, viz., cross-fertilization, is attained by the occurrence of two or more forms of flowers in the same species *(heterostylism)*. Thus some species of *Primula* are *dimorphic*, having two forms, one with long style and short stamens, the other with short style and long stamens. Some few flowers are even *trimorphic*. For a more complete description of these forms I must refer to Darwin's work already quoted. I have not detected distinct heterostylism in any New Zealand plant as yet, though in some *Pimeleas*, *Asperula*, etc., I have found something very like it. Special structures of the perianth, or of the sexual whorls, serve to prevent self-fertilization among certain flowers, and to ensure their proper pollination, but these are so numerous and varied as to obtain only a passing notice here. I have detailed in the body of this paper the most conspicuous of these modes, as they are exemplified among New Zealand plants.

It is worthy of notice that entomophilous plants are usually furnished with flowers possessing, more or less markedly, the following characters:—(1.) *Conspicuous appearance*, attained in a variety of ways, viz., by individual size as in *Clematis indivisa*; aggregation into more or less dense clusters as in *Rubus australis*, and many of the Compositæ, etc.; or, brilliancy of colour as in our iron-wood, *(Metrosideros lucida)*. (2) *Fragrance*. (3) *Honey*. Sometimes all three characteristics are present, as in certain of the wild roses of Europe, but as a general rule a principle of economy prevails, so that if any one attraction is present to a great extent, the others are usually wanting. Thus *Clematis indivisa* has very conspicuous flowers, but they lack both scent and honey. *Clematis fœtida* is overpoweringly fragrant, but is not strikingly conspicuous and has no honey. *Fuchsia excorticata* and *Phormium tenax* are only partially conspicuous (as far as colour is concerned), have no scent, but produce great quantities of honey. *Tupeia antarctica* is very fragrant, and produces a comparative abundance of honey, but is extremely inconspicuous. Besides these three characteristics of attraction, we may note that entomophilous plants usually have comparatively small stigmas, and produce relatively a small quantity of pollen, and that both stigmas and anthers are so placed that it becomes difficult for

insects to enter the flower without coming into contact with one or other. In some flowers there are also irritable organs, as in the lamellate stigmas of *Mimulus*, the stamens of *Berberis*, etc. Very few such contrivances have, however, been noticed among our local flowers.

Before leaving this part of the subject, it is interesting to note that several species produce both entomophilous and also strictly self-fertilized flowers. These latter are usually very inconspicuous (hence called *cleistogamic*), and are produced after the ordinary conspicuous flowers. I have already recorded their occurrence in the genus *Viola*,* and believe they also occur in *Hypericum japonicum*. I have not investigated the subject, but I think that all the winter-produced flowers of *Trifolium minus*, a very common introduced plant, are cleistogamic. Flowers of this kind have been recorded as occurring in the following genera, which are represented in New Zealand, though I have never found them in our species, viz.:—*Oxalis*, *Drosera*, *Campanula (Wahlenbergia)*, *Cuscuta*, *Thelymitra*, *Juncus*, and *Danthonia*. Probably others have been recorded, which I have not noticed.

Among anemophilous plants, the following characteristics usually prevail:—(1) flowers usually inconspicuous and destitute of honey and fragrance, these being of no use to them; (2) the pollen usually light and powdery, and produced in great quantity in anthers which are generally so constructed as to be easily shaken; and (3) the stigmas of comparatively large size, greatly protruded and very papillose,—all characters favourable to the dispersion of the pollen by wind, and its transportation to and retention by the pistils.

Having noted shortly the means of fertilization among flowering plants, it may be asked,—How is the prevalent imperfection of our New Zealand flowers to be accounted for? That they are imperfect to a great degree (if separation of the sexes constitutes imperfection) is a fact well-known to botanists; perhaps in no other part of the world is this found to such an extent. Species, genera, and orders which are *characterized* by hermaphrodite flowers in other parts are frequently unisexual here. I am afraid the question cannot be satisfactorily answered yet; our knowledge of the subject is of too fragmentary and incomplete a nature. Mr. A. R. Wallace, who may be considered one of the most leading authorities on such a question, concludes that the poverty of insect life here is one of the chief causes.

* "Trans. N.Z. Inst.," Vol. XI., p. 415.

He says*—and I must be pardoned for quoting his opinion at some length—"In New Zealand, where insects are so strikingly deficient in variety, the flora is almost as strikingly deficient in gaily-coloured blossoms. Of course there are some exceptions, but, as a whole, green, inconspicuous, and imperfect flowers prevail to an extent not to be equalled in any other part of the globe, and affording a marvellous contrast to the general brilliancy of Australian flowers, combined with the abundance and variety of its insect-life. We must remember, too, that the few gay or conspicuous flowering-plants possessed by New Zealand are almost all of Australian, South American, or European genera; the peculiar New Zealand or Antarctic genera being almost wholly without conspicuous flowers.† * * * The poverty of insect-life in New Zealand must, therefore, be a very ancient feature of the country; and it furnishes an additional argument against the theory of land-connection with, or even any near approach to, either Australia, South Africa, or South America. For in that case numbers of winged insects would certainly have entered, and the flowers would then, as in every other part of the world, have been rendered attractive by the development of coloured petals; and this character once acquired would long maintain itself, even if the insects had from some unknown cause subsequently disappeared." "After the preceding paragraphs were written, it occurred to me that, if this reasoning were correct, New Zealand plants ought to be also deficient in scented flowers, because it is a part of the same theory that the odours of flowers have, like their colours, been developed to attract the insects required to aid in their fertilization. I therefore at once applied to my friend, Dr. Hooker, as the highest authority on New Zealand botany; simply asking whether there was any such observed deficiency. His reply was,—'New Zealand plants are remarkably scentless, both in regard to the rarity of scented flowers, of leaves with immersed glands containing essential oils, and of glandular hairs.' There are a few exceptional cases, but these seem even more rare than might be expected, so that the confirmation of the theory is very complete. The circumstance that aromatic leaves are also very scarce, suggests the idea that these, too, serve

* "The Geographical Distribution of Animals," Vol. I., pp. 457-464.

† The following exclusively New Zealand or Antarctic genera are surely exceptions: *Notothlaspi* (white), *Hectorella* (white), *Hoheria* (white), *Entelea* (white), *Pennantia* (white), *Notospartium* (pink), *Ixerba* (white), *Stilbocarpa* (yellowish), *Corokia* (yellow), *Pleurophyllum* (purple), *Raoulia* (white), *Helophyllum* (white), *Colensoa* (blue), *Myosotidium* blue), *Rhabdothamnus* (reddish), *Earina* (white and yellow), and *Phormium* (reddish). All these are more or less entomophilous.

as an attraction to insects. Aromatic plants abound most in arid countries and on alpine heights; both localities where winged insects are comparatively scarce, and where it may be necessary to attract them in every possible way.* Dr. Hooker also informs me, that since his 'Introduction to the New Zealand Flora' was written, many plants with handsome flowers have been discovered, especially among the *Ranunculi*, shrubby *Veronicas*, and herbaceous Compositæ. The two former, however, are genera of wide range, which may have originated in New Zealand by the introduction of plants with handsome flowers, which the few indigenous insects would be attracted by, and thus prevent the loss of their gay corollas; so that these discoveries will not much affect the general character of the flora, and its very curious bearing on the past history of the islands through the relations of flowers and insects."

It is impossible to differ from this reasoning *in toto*, because the statements and facts on which it is founded are to a great extent correct, though in the light of more recent knowledge they require considerable modification. I do not see, however, that the imperfection alluded to, viz., the great tendency among our plants to sexual separation, is yet explained. It may help to solve the question if the proportions of the various kinds, forms, colours, etc., of our flowers be examined. The following numbers may be taken as approximately correct; they are drawn up from those species only which I have personally examined and noted:—

TOTAL OF SPECIES EXAMINED, 433.

(1). Flowers conspicuous by themselves .. .. .. 131; over 30 per cent.
" " " association† .. .. .. 91; " 21 "
" " " inconspicuous‡ .. .. 211; nearly 49 "

(2). If we take, now, the colours of the whole we find—White (142 sp.), nearly 33 per cent.; yellow (48 sp.), over 11 per cent.; red, of all shades (21 sp.), abou 5 per cent.; blue or purple (11 sp.), or about 2½ per cent.; the remainder being greenish, or inconspicuous.‡

(3). In regard to the possession of fragrance, the numbers are—
Sweet scented .. .. 95 species; or nearly 22 per cent.
No scent perceptible .. .. .. 338 " " " 78 "

(4). Those noted as being melliferous, or not
Possessing honey .. .. .. 189 species; over 43 "
Not having honey .. .. .. 211 " " 56 "

* Anyone who has botanized on our mountains must have been struck with the number and brilliancy of the flowers, mostly white (*Celmisias*, *Raoulias*, *Ranunculi*, *Veronicas*, etc.), which grow in such localities. Many fine insects are also confined to the mountains, however.

† Includes all the (conspicuous) Compositæ.

‡ Includes most of the lower Monocotyledons (Juncæ, Cyperaceæ, Gramineæ, etc.)

(5). Always hermaphrodite, were noted .. 235 species; or 54 per cent.
,, more or less uniscxual* .. 198 ,, nearly 46 ,,
(6). Apparently self-fertile .. .. .. 208 ,, ,, 48 ,,
(This is a very doubtful approximation.)
Certainly entomophilous .. .. 102 species; or over 23 ,,
,, anemophilous† .. .. 123 ,, nearly 29 ,,
(7). Of the 235 hermaphrodite species, 87 sp., or 37 per cent., are proterandrous;* 18 sp., or nearly 8 per cent., are proterogynous; while 130 sp., or 55 per cent., are not decidedly one or other.

If we take out the most prominent of these figures we shall see that a very large proportion of our plants are dependent on insect aid, more or less. While 23 and 29 per cent. respectively are solely dependent on insects and wind, the remaining 48 per cent. are put down as more or less self-fertile. But even of these it is probable that a large proportion have their fertilization aided if not exclusively effected by insects. Again, no less than 51 per cent. have conspicuous flowers, while had I excluded from these results the large, inconspicuously-flowered orders of Graminea, Cyperaceæ, etc., the average of this class would have stood very much higher. Of course it is a good deal a matter of private judgment and opinion as to how large a flower or flower-cluster must be before it merits the term conspicuous. I have included under this head such flowers as *Cardamine*, *Oxalis*, *Geranium*, etc., because, though small, they are very readily seen; but I have excluded the large solitary *Pterostylis*, and the dull clusters of *Fagus*, *Griselinia*, etc., which are of too green a hue to be readily distinguished. But again it must be remembered that a flower may be conspicuous enough to an insect, even if not so to us. The fragrant-flowered plants only amount to 22 per cent., and the honey-producing to 43 per cent. of the whole, but here it is to be said that flowers do not produce honey and are not fragrant *at all stages of their development*. It is probable that the secretions which serve to attract insects are only produced under contain conditions of weather, temperature, etc., which we are at present ignorant of; and when the various sexual whorls are at a proper condition to receive or benefit by the visits of insects. My numbers, therefore, in these two last items are probably considerably under the mark. Here, again, it may be noted that a flower may be possessed of a kind or an amount of fragrance which is not appreciable to our olfactory nerves, though it may be to those of an insect. This remark applies particularly to the Diptera, which, as an order, have probably attained the greatest perfection in this respect. Everyone must

* Includes all the (conspicuous) Compositæ.

† Includes most of the lower Monocotyledons (Juncea, Cyperaceæ, Gramineæ, etc.)

be aware of the marvellous power of scent possessed by the ordinary blue-flies, for example, and the faculty is, no doubt, fairly well-developed in the flower-visiting species also.

It may also be pointed out that with regard to the two hundred and thirty-five species of hermaphrodite flowers examined, there are several (*Oxalis magellanica* being a good example) which appear quite capable of self-fertilization, but are in reality self-sterile.

Having now considered the flowering plants, I would shortly draw attention to what is known as to the relations of our insects to them. As far as I can make out, this amounts to very little. One thing is clear, however, viz., that the prevalent impression as to the poverty of insect life here (as it is expressed in Wallace's work), is not quite correct. Certain prominent classes of insects are very poorly represented, both in species and individuals, but others almost make up for them. Mr. Wallace's figures are in this respect misleading, not from error on his part, but owing to the immense number of new forms which have been described since his work was published. I give shortly the approximate number of species of the various orders of insects, as far as they are known at present. I am indebted for this part of my subject—and I would thankfully acknowledge it here—to Capt. Broun, Prof. Hutton, and Messrs. W. Colenso and R. Fereday, who have given me valuable information regarding those orders which they have respectively examined. Mr. Wallace's figures are subjoined for comparison.

Of butterflies, Lepidoptera, only 18 species (A. R. W., 11 sp.) are known, but of moths (not mentioned by Wallace) several hundreds are described in numerous publications, while probably half as many more are undescribed. These latter insects are also extremely numerous in individuals, and many of our flowers (as *Leucopogon*, etc.) appear to be exclusively fertilized by them. Of Coleoptera about 1300 species are now described (A.R.W., 800). Of these a great number are not flower-visitants, but others again are greatly concerned in this work of flower-fertilization. I quote with pleasure here some extracts from a memorandum on the subject which Captain Broun kindly furnished me with:—"Of the family Palpicornes, two genera—*Hydrobius* and *Philhydrus*—consist of water-loving species as is usual in other countries; but one peculiar New Zealand genus, *Rygmodus*, of six species, is of quite abnormal habits. One, *R. modestus*, which is commonly found on the inflorescence of *Brachyglottis repanda*, *Cordyline banksii*, etc., has finely spinous legs, and, though somewhat metallic above, is hairy underneath. It undoubtedly plays an important

part in the fertilization of flowers, a remarkable trait in the case of an insect belonging to that family—I think the only instance known to science. Most of the others are rare, and though described by me were found by other collectors, so that I cannot speak authoritatively as to their habits; I suspect, however, that all frequent plants. * * * Of the Melolonthidæ, the pretty *Pyronota festiva*, metallic above, hairy below, is found in profusion on the inflorescence of *Leptospermums*. * * * The Buprestidæ (A.R.W., 1 sp.) and Elateridæ (A.R.W., about 12 species) about 80 species, are wood-feeders in the larval state, but when perfect insects occasionally visit flowers. Nearly all the Dascillidæ do so too, and must, being hairy, render important services. * * * All the Melandryadæ and Mordelliæ frequent flowering shrubs; one insect—*Selenopalpus cyaneus*—is never found away from them, chiefly ti-tree (*Cordyline australis*); but I once noticed numbers of this species on grass when in blossom. The Curculionidæ, an extensive family, in most cases having scaly or hairy clothing, to a great extent aid the seeding of flowers. The species of *Eugnomus* are very partial to the lawyer (*Rubus australis*) when in bloom. Altogether about 40 species of the Erirhinidæ may be found on most of the indigenous flowering shrubs. *Apion metrosideros* confines itself almost exclusively to the pohutukawa (*Metrosideros tomentosa*). *Oropterus coniger* lives entirely on the native fuchsia (*F. excorticata*). The Longicornia are wood-feeders, but often visit flowers. *Zorion minutum* confines itself almost exclusively to flowers. Some, but not all the Phytophaga, are found on flowering plants. *Arnomus brouni*, though very rare, is generally found on *Leptospermum*; 11 species of the genus *Colaspis* (A.R.W., 2 sp.), usually found in abundance, frequent the inflorescence of many shrubs." It will be noticed from these quotations that Captain Broun's observations are made on North Island plants. Had we similar observations continuously made on the flora of other parts, and particularly of mountain districts, we should soon be able to solve many problems which are very obscure at present. Hymenoptera (A.R.W., only a score of species) are very poorly represented, the only flower-visitants being 10 species of bees. The Orthoptera probably do not visit flowers; but many of the Hemiptera-Heteroptera do, only as no attempt has been systematically made to catalogue them yet, I am in utter ignorance as to the number of species. Prof. Hutton informs me that the following flower-visiting species are very abundant in individuals, viz., *Anubis vittatus*, *Rhopalimorpha obscura*, *Nysius huttoni*, and *N. zealandicus*. The most important flower-visiting order in New Zealand is probably, however, the Diptera (not noticed by Wallace). Only about 100 species have been

described, but this, Prof. Hutton informs me, is probably only about one-tenth of the whole number. As far as I can make out, the Diptera depend chiefly on scent in their search for food, and certainly this would explain the fact of their being the sole fertilizers of many inconspicuous or green flowers, as *Tupeia antarctica* and various species of *Pterostylis*, etc. I was formerly of opinion that the part apparently taken by the New Zealand Diptera in this work of fertilization was quite an exceptional case, and that here they performed the work done by bees and butterflies in other countries; but a short and suggestive letter by H. Müller in "Nature" (Vol. XXI., p. 275) shows that among alpine (European) flowers generally Diptera come next in importance to Lepidoptera as flower-visitants, while among lowland flowers they are only exceeded by the Hymenoptera. In the absence of any more definite information on the subject, I would only advance it as a suggestion that here Diptera will be found to be by far the most numerous class of flower-fertilizers. In concluding this introductory portion of my paper, I would point out that my observations do not extend to many of our purely mountain forms, among which are to be found some of the finest flowers in New Zealand.

I now give in detail the results of my investigations on a number of our flowering plants. These deal chiefly with their mode of fertilization, but include some other points which have been noted as well.

Monocotyledons.

In this class, as has been pointed out by Sir J. Lubbock in his work already quoted, the contrivances and means of adaptation to secure the visits of insects are not so numerous nor so complicated as in Dicotyledons, if we except the remarkable order of Orchideæ. Still we have some interesting modes of fertilization, even outside of this order, as perfect as any yet detailed.

Nat. Ord. Orchideæ.

The modes of fertilization of many of the species of this order have been described already by Mr. T. F. Cheeseman and myself.*

Earina mucronata, though differing considerably in appearance from *E. autumnalis*, is similar in structure, and only fitted for cross-fertilization. The flowers are very fragrant and produce a large amount of honey.

Dendrobium cunninghamii. The mode of fertilization I have already described.† This last summer, 1879–80, I found it in great quantity and

* "Trans. N.Z. Inst.," Vol. V., p. 352; Vol. VII., p. 349; and Vol. XI., p. 418.

† "Trans. N. Z. Inst.," Vol. XI., p. 419.

flowering in magnificent profusion in Stewart Island. In nearly every plant examined the flowers contained a large amount of honey. In one lot of eighty examined ten had their pollinia removed.

Sarcochilus adversus. I obtained a few flowers of this rare little species from dry rocks close to the edge of the harbour near Port Chalmers. Though one of the smallest and most inconspicuous Orchids in New Zealand it is absolutely incapable of self-fertilization, but is dependent on insects, and the mechanism by which cross-fertilization is effected is the most perfect of its kind. The flowers are produced in few-flowered racemes seldom exceeding an inch in length, and more or less hidden by the leaves. They are much more regular than the majority of Orchid flowers, are greenish in colour, with a few purple lines on the labellum, and do not exceed one-tenth of an inch in diameter.

At first sight I thought that owing to their inconspicuous appearance they must certainly be self-fertilized, but besides being slightly fragrant, I noticed that they secreted a considerable amount of honey between the base of the column and the fleshy, ridged labellum, and this caused me to look more narrowly into their structure. The four pollinia are united into two almost globular masses, which are attached by a caudicle to a broad flat disc fixed to the rostellum. If this be removed from the anther, which is at the top of the column, it at once commences to contract, and thus causes the pollinia to be depressed to a nearly horizontal position. This depression is almost identical with that which occurs in the British *Orchis mascula*, as described by Darwin,* but there is a somewhat different action in our species, in that the two masses of pollinia separate slightly at the same time. The time taken by this contraction and depression of the caudicles, was about ten seconds. If these were attached to the proboscis of a small insect, they would on their first withdrawal from the anther be in such a position as to strike the rostellum of the next flower they visited, but this is obviated by the depression of the caudicle, so that, in the short interval of time mentioned, they are so placed as to project into the deep and somewhat two-lobed stigmatic cavity under the rostellum.

In my former paper† I stated that *Chiloglottis cornuta* seemed exclusively adapted for self-fertilization. This I am now enabled to verify, for a number cultivated indoors, and covered by a hand-glass during the flowering season, produced a fine full capsule from each flower.

* "Fertilization of Orchids," p. 6. † "Trans. N.Z. Inst.," Vol. XI., p. 424.

Of the *Thelymitras*, *T. longifolia* is very frequently self-fertile, but prominent forms are no doubt crossed by insects. *T. uniflora*, on the contrary, which produces very brilliant blue flowers, is chiefly dependent on insect aid, and is a great honey-producing species.

From Petrie D. A Visit to Stewart Island, with Notes on its Flora. 1880. XIII: 323-334.

ORCHIDEÆ.

Earina mucronata, *Lindl.*
autumnalis, *Hook. f.*
Dendrobium cunninghamii, *Lindl.*
Gastrodia cunninghamii, *Hook. f.*
Corysanthes triloba, *Hook. f.*
rivularis, *Hook. f.*
Microtis porrifolia, *Sprengel.*
Caladenia lyalli, *Hook. f.*
Pterostylis graminea, *Hook. f.*
Chiloglottis cornuta, *Hook. f.*
bifolia, *Hook. f.*
Thelymitra longifolia, *Forst.*
uniflora, *Hook. f.*
Prasophyllum colensoi, *Hook. f.*

From Buchanan J. On some Plants new to New Zealand, and Description of a new Species. 1881. XIV: 356-357.

On a Genus of Orchidaceæ *new to New Zealand.*

The following short description of a new Orchid, which proves to belong to an Australian genus not previously represented in New Zealand, is taken from Bentham's "Flora Australiensis," vol. vi., p. 324. The plant was collected by W. T. L. Travers, Esq., near the Mungaroa Swamp, and was sent by him to the Museum for examination.

Epiblema grandiflorum, R. Br.

Stem erect, 1–15 inches high, with one long narrow leaf and two short sheathing leaves. Flowers 3–4, pedicillate in a short raceme, dark purple, bracts shorter than the ovary. Sepals and petals alike, ½ inch long, narrow-linear, acute, finely veined. Labellum as long as the sepals. Anther erect, or slightly bent forward, the cells distinct, with a short recurved point.

Epiblema grandiflorum is *Thelymitra cyanea.*

From Kirk T. Notes on Plants from Campbell Island. 1881. XIV: 387-389.

Caladenia bifolia, Hook. f.

From Buchanan J. Additions to the Flora of New Zealand. 1882. XV: 339-340.

Calochilus paludosus, R. Br.

The present plant adds yet another genus of *Orchideæ* to the flora of New Zealand.

It was collected by Mr. H. H. Travers in the Collingwood District, South Island, in December last. Baron F. von Müeller, to whom specimens were sent, says: "I took immediate notice that this *Calochilus* might be identical with *C. paludosus*, as you suggest, but the inner segments of the calyx are shorter, and the anther is less blunt; still, that may be ascribed to variation, and I must confess I am not clear about positive distinction between *C. campestris*, *C. robertsoni*, and *C. paludosus*, perhaps because only one form seems to have come under my notice in Victoria in the fresh state, and the others I know only from dried and not very instructive New South Wales specimens. It would be well if a little more material of the New Zealand congeners could be procured, and best of all if several flowers were put fresh into alcohol."

From Adams J. On the Botany of the Thames Goldfields. 1883. XVI: 385-393.

Dendrobium cunninghamii, Lindl. Look-out Rocks.
Gastrodia cunninghamii, Hook. f. Kaueranga.
Cyrtostylis oblonga, Hook. f. Kerikeri Ranges.
Corysanthes oblonga, Hook. f. Tararu Creek.
" *rotundifolia*, Hook. f. Tararu Creek.
Caladenia minor, Hook. f. Kerikeri.
Chiloglottis cornuta, Hook. f. Kerikeri Ranges.
Pterostylis graminea, Hook. f. Wooded ranges.
" *puberula*, Hook. f. Kerikeri.
" *squamata*, Brown. Kerikeri.
Thelymitra imberbis, Hook. f. Kerikeri.
" *pulchella*, Hook. f. Pakirarahi.
Prasophyllum pumilum, Hook. f. Kerikeri.

Pterostylis squamata is *P.plumosa*.

From Buchanan J. Botanical Notes. 1883. XVI: 397.

Bolbophyllum exiguum, F. Muell.

Specimens of this Australian Orchid have been collected in the Collingwood District, Nelson, during the last season by Mr. Dahl, and forwarded to the Colonial Museum, Wellington.

This genus has previously been represented in New Zealand by only one species, *B. pygmæum*, Lindl., a small tufted epiphyte, found on trees and rocks with solitary flowers. The present species may be distinguished by its larger size, and by the peduncles carrying 2–4 flowers.

Calochilus paludosus, R. Brown.

Another Australian orchid discovered by Mr. H. H. Travers in the Collingwood District, Nelson, may also be noticed for the information of botanical visitors to that district.

The present species is a tall slender plant with a long leaf, and two, three, or four dark purple flowers. Sepals 7–8 lines long. Petals not half so long, strongly veined. Labellum covered with long cilia. Column wing produced behind the anther to about its length. Anther as broad as long, very obtuse. Benth. Flora Australiensis, vol. vi.

Dendrobium biflorum, A. Rich.

Mr. Travers sends specimens of a large 2-flowered *Dendrobium* for examination. This is no doubt *D. biflorum*, A. Rich., noticed in the Handbook N.Z. Flora, as a var. of *D. cunninghamii*, Lindl. It is a rare plant in many parts of New Zealand and differs from the latter in its larger size and constant 2-flowers. It would be more satisfactory to treat such distinct forms as species than as varieties in future publications.

Bulbophyllum exiguum is *B.tuberculatum. Dendrobium biflorum* is identified with *D.cunninghamii.*

From Kirk T. On the Flowering Plants of Stewart Island. 1884. XVII: 213-228.

Amongst the shrubs the soil is often carpeted with a compact growth of the charming liliaceous plant, *Callixene parviflora*, with its elegant drooping flowers, mixed with numerous ferns, orchids, and mosses. The orchids form a marked feature in some parts of the forest. *Corysanthes oblonga*, *C. rivularis*, and others produce their attractive flowers literally by thousands; in no other locality have I seen these interesting plants in such vast profusion. *Gastrodia cunninghamii* is rare, having been observed only on the small island of Ulva. *Caladenia bifolia* is frequent, one of its forms making a close approach to *C. lyallii*. *Chiloglottis cornuta* occurs on Ulva, the glands on the labellum vary considerably in their shape and arrangement. In the majority of cases there are five depressed coloured glands arranged in a symmetrical manner, in a few specimens they were reduced to three, and in a solitary plant numerous stalked glands were arranged in a double row down the middle of the labellum exactly as in the Tasmanian *C. gunnii*, which is probably a state of the New Zealand plant. The dwarf variety of *Pterostylis banksii*, with abbreviated sepals, is common in open places in the forest.

In addition to the terrestrial forms, the epiphytic forms are well represented, with the exception of *Sarcochilus*, which appears to be rare, and *Bolbophyllum*, which has not been observed on the island.

It is interesting that Kirk found the Stewart Island forms of *Chiloglottis cornuta* similar to *C.gunnii*. The latter has now been found in two localities in New Zealand - near Taupo and near Hanmer - and is likely to be found elsewhere.

From Adams J. On the Botany of Te Aroha Mountain. 1884. XVII: 275-287.

Earina mucronata, Lindl. High elevations.
E. autumnalis, Hook. f. High elevations.
Dendrobium cunninghamii, Lindl. High elevations.
Bolbophyllum pygmæum, Lindl. High elevations.
Sarcochilus adversus, Hook f. High elevations.
Corysanthes triloba, Hook. f. Near the summit.
C. oblonga, Hook. f. Near the summit.
C. rotundifolia, Hook. f. Near the summit.
C. rivularis, Hook. f. Mountain side.
Chiloglottis cornuta, Hook. f. Mountain side.
Pterostylis banksii, Brown. Mountain side.
Thelymitra longifolia, Forst. On the flat.
Orthoceras solandri, Lindl. Outskirts of the forest.

From Hamilton WS. Notes on the Occurence and Habits of some of our New Zealand Plants. 1884. XVII: 290-293.

Corysanthes macrantha, Br.

This fine orchid occurs plentifully, but always in one kind of situation, where water is oozing out of a bed of gravel on a slope. It likes a *burn-brae*, and is there only found on the shady side. It is particularly luxuriant and large in Southland; its leaves as large as a florin, bright green and succulent. It folds its large *apron* (*labellum*) so closely around the short style and the pollen masses that it must be a very small insect indeed that is able to find its way to them. It not only seems independent of the services of insects, but takes good care that they do not get at its treasures.

From Kirk T. Additional Contributions to the Flora of the Nelson Provincial District. 1885. XVIII: 318-324.

ORCHIDEÆ.

Earina autumnalis, Hook. Lower part of the Valley of the Buller.
Dendrobium cunninghamii, Linde. Aorere Valley; Mokihinui; Westport.
Bolbophyllum exiguum, F. Müell. Collingwood; "Trans. N.Z. Inst.," vol. xvi., p. 397.
Acianthus sinclairii, Hook. f. Nelson, *H. B. Kirk!*
Adenochilus gracilis, Hook. f. Nelson, *P. Lawson*, 1869.
Caladenia minor, Hook. f. Port Hills, Nelson, etc.
Pterostylis micromega, Hook. f. Lake Guyon.
Prasophyllum nudum, Hook. f. Dun Mountain, *H. H. Travers!* in Colonial Museum.
Calochilus paludosus, Br. Collingwood; "Trans. N.Z. Inst.," vol. xvi., p. 397.

From Buchanan J. On some New Native Plants. 1886. XIX: 213-216.

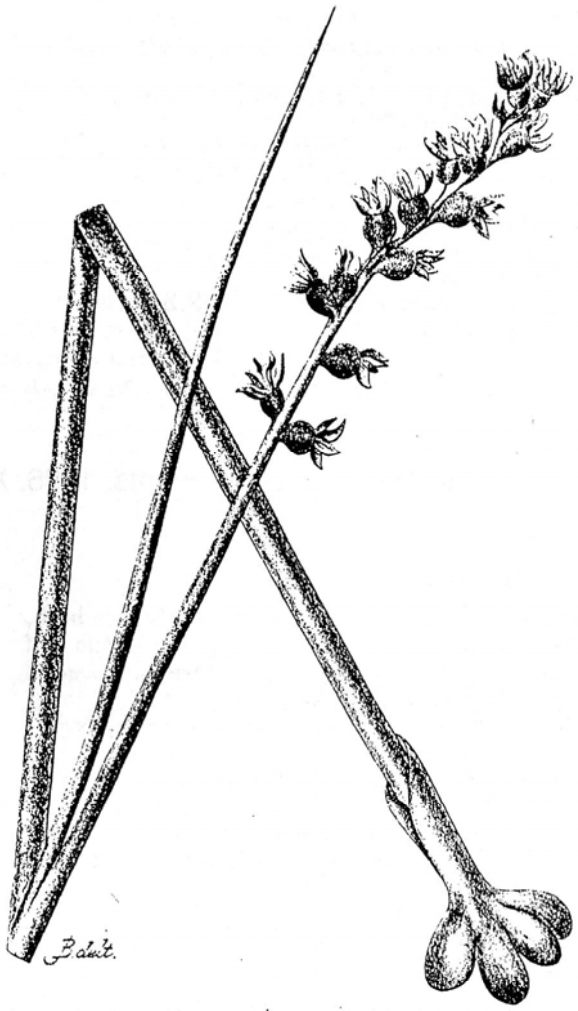
Gastrodia hectori, Buch.

Root tuberous, stem and spike of flowers 18 inches high, closely sheathed for $\frac{2}{3}$ of its length by a long leaf, $\frac{1}{3}$ of the leaf being free, a short outer sheath at bottom encloses the base of the sheathing leaf. Scales none. Racemes $3\frac{1}{4}$ inches long. Flowers 13, close-set, brownish-yellow, $\frac{3}{10}$ of an inch in length, seed-vessel black, or dark brown, orbicular.

The present species was collected several years ago in Marlborough district, near Picton, and has also been seen on the Conway River. The species of *Gastrodia* are probably abundant, but their dark habitats, in dense bush country, prevent them from being easily seen.

Cheeseman identified Buchanan's *Gastrodia hectori* as *Prasophyllum patens*.

Transactions New Zealand Institute, Vol. XIX., Pl XV.



GASTRODIA HECTORI. Buch.

From Adams J. On the Botany of Te Moehau Mountain, Cape Colville. 1888. XXI: 32-41.

Dendrobium cunninghami, *Thelymitra longifolia*,

From Kirk T. On the Botany of Antipodes Island. 1890. XXIII: 436-441.

ORCHIDEÆ.

1. Corysanthes (?).
1. Chiloglottis bifolia.
1. „ cornuta, *Hook. f.*
1. Prasophyllum colensoi, *Hook. f.*

Kirk T. Notice of the Occurrence of Australian Orchids in New Zealand. 1891. XXIV: 425-428.

Caleana minor, R. Brown.

This remarkable plant was detected near Rotorua in 1890 by my friend the Rev. F. H. Spencer, who after protracted search succeeded in obtaining four or five specimens, which he generously presented to me. It is one of the most interesting additions to the New Zealand flora that have been made during recent years, and is, moreover, extremely rare outside the colony, having been observed only in two localities in New South Wales and another in Tasmania, occurring very sparingly in all its habitats. It was originally described by R. Brown in 1810. On account of the interest attending its discovery here, and for the convenience of New Zealand botanists, I append a somewhat detailed description.

Root of two or three short fibres and two small oblong tubers, which are irregularly narrowed towards their extremities. Stem and leaf glabrous, reddish; the former almost filiform, 4in.–6in. high: the leaf extremely narrow-linear, flat, from one-third to one-half the length of the stem. Flowers 1 to 3, on slender pedicels ¾in. long, with a small acute bract at the base, inverted: sepals and petals almost equal, about

⅜in. long, linear, sometimes with infolded margins; the dorsal sepal narrow linear-spathulate, 3-nerved. The lateral sepals spring from either side of a strap-shaped process or hinge which carries the labellum, and is about $\frac{1}{12}$in. long, and unequally waved or wrinkled at the margin. The labellum itself is broadly pear-shaped, but, owing to a constriction at the middle, is unequally 2-lobed: it is peltately attached by its broad end to the process just described, and is margined with rather large purplish-red tubercles, the largest being situate at the free extremity: the exterior surface is green. The column is nearly as long as the sepals, and is furnished with a large dilated wing on each side, the whole forming a cup-shaped cavity, which is capable of being closed by the labellum. Owing to the inversion of the flower, the anther occupies the lowest part. The entire flower presents a strange resemblance to a spider, the body of which is formed by the expanded and dilated column, the legs by the narrow-linear sepals and petals, and the cephalothorax by the labellum: the resemblance is increased by the dull-red or reddish-brown coloration of the column and the tips of both sepals and petals. The pollen-masses are four in number.

The position of the labellum when not closed is nearly horizontal, the free extremity being more or less ascending at first. One of my specimens has an apparently ripe capsule, with perfect seeds.

The following instructive and interesting remarks on the hinge of the labellum and on the probable mode of fertilisation in *Caleana major*, R. Br., are copied from the splendid work on "Australian Orchids" by R. D. Fitzgerald, F.L.S., and will be welcomed by all students of New Zealand plants: although the hinge is shorter in *C. minor*, there is no other difference:—

"The labellum is not sensitive, but when raised remains in unstable equilibrium, subject to be closed by a slight touch. The mechanism of the hinge by which this end is obtained is curious and simple. Imagine a thin strap of indiarubber having its edges slightly contracted: the result would be that the centre would bulge to one side or the other, and according to the side on which the convexity or concavity lay the strap would be bent. It is evident that a lid so supported would be ready to fall on a slight pressure from behind; but in this flower the column has taken the position usually occupied by the labellum, and an insect alighting on it would not bring down the lid, a touch or even a push from the front having no effect, while the falling of the lid from a touch on the back would be but to exclude the insect. . . . It struck me that the weight of the insect might here act to bring down the labellum, which in other cases springs up by elasticity against the weight. My first experiment was with a blow-fly, hung by a thread and let swing against the labellum. But the blow-flies were either too restive, or, by grasping the cup as well as the lid, prevented their weight from being felt by the labellum. I therefore had recourse to ladybirds as more tractable. One of the ladybirds which attack the Solanums was induced to climb up a match till it reached the end, when it readily left the wood for the labellum, and immediately the labellum descended and the insect was fairly caught in the cup. It remained imprisoned for about two minutes, when it forced itself out, but did not fertilise the flower or remove the pollen. Other ladybirds similarly entrapped escaped in from one to twenty minutes, but none of them fertilised the flower, the obvious reason being that they were caught with their backs to the column, and the breadth and smoothness of the back prevented the pollen or stigma from being touched. I had frequently placed *Caleanas* where house-flies would be likely to alight upon them, and had occasionally observed that they had closed the flowers, but the flies were never caught, and I believe the labellums were *sprung* by being struck from the back. To help nature and make the flowers more attractive in the proper part, I now placed a little honey on the front of the labellums of a dozen flowers, and was soon rewarded by the capture of several flies, only two of which, however, fertilised plants, and one perished in so doing—it was so firmly united to the stigma that it could not help itself. Six hours was the longest time noted as the imprisonment of a fly, but the labellum never rose until the insect escaped or (as in the one instance) died. The usual time for the flowers to remain shut when no insect is enclosed is from a quarter of an hour to an hour."

Mr. Fitzgerald states that in all probability the right insects were not experimented with; and, whatever may be the cause, ripe capsules are very rarely produced.

It may be added that four species of *Caleana* have been described, all except *C. minor* being restricted to Australia.

Calochilus campestris, R. Brown.

Calochilus is a small genus comprising only three species, which until a few years back were supposed to be absolutely restricted to Australia. In 1882 Mr. J. Buchanan, F.L.S.,

reported the occurrence of *C. paludosus* in the Collingwood district;* and in 1887 Mr. T. Ball showed me a single flower of another species collected by the late Mr. E. B. Dickson, B.A., in the Rotorua district; but it was not until 1890 that I was able to obtain good specimens, through the kind exertions of my old friend the Rev. F. H. Spencer, who, although on the eve of leaving for England, gave himself considerable trouble in searching for the plant, and was rewarded with success. I am indebted solely to him for the opportunity of examining good specimens, which, although differing in one or two points from the Australian plant, must be identified with *O. campestris*, R. Br.

The specimens of this plant figured on t. 106A in Hooker's "Flora Tasmaniæ" represent a somewhat robust plant with a very short leaf, little more than a sheathing bract, several cauline bracts, and a short broad labellum, clothed with a red fringe on the margins and surface, except at the short beak-like point, which is naked. The Rotorua plant differs in having a long broad basal leaf, and one or two sheathing cauline bracts, and especially in the longer labellum, with its long naked flexuous tip, and the upper portion of the labellum clothed with large red calli. Mr. Fitzgerald's fine drawing in "Australian Orchids" represents the habit and structure of the New Zealand plant exactly, but differs in the coloration, the calli and fringes in all the Rotorua specimens seen by me being of a deep velvety red throughout, and showing no trace of blue or even of purple.

The Rotorua plant is usually robust, 9in. to 18in. high, with a leaf from one-third to two-thirds the length of the stem, $\frac{3}{8}$in. to $\frac{5}{8}$in. broad, and one or, less frequently, two sheathing cauline bracts. Flowers 3–6; pedicels, exceeded by the acuminate sheathing bracts, $\frac{1}{2}$in.–$1\frac{1}{2}$in. long. Sepals 4–5 lines long, upper broadly ovate, almost galeate, lateral narrower, rather strongly veined; lateral petals shorter; labellum $\frac{5}{8}$in.–$\frac{3}{4}$in. long, terminating in a narrow flexuose naked tip, strongly fimbriate on the margins and upper surface for two-thirds of its length above, most of the upper portion being covered with rather large naked calli, which gradually pass into hairs on the expanded portion of the labellum; above the calli is a small naked bar which is slightly thickened. The column is furnished with two short broad wings reaching to slightly above the stigma, and broadly rounded in front, with a large

* Trans. N. Z. Inst., vol. xv., 340.

intramarginal gland at the base of each wing; anther bent forward and projecting, so that the base of the pollen-masses projects beyond the rostrum, and comes in close contact with the stigma even before the flower is fully expanded, thus insuring self-fertilisation. Pollen-masses 2, clavate.

As Hatch has noted, RD FitzGerald illustrated *Calochilus robertsonii* in his *Australian orchids,* but labelled it *C.campestris*. The Rotorua plants described here are *C.robertsonii*.

From Petrie D. Description of a New Genus and of New Species of Native Plants, &c. 1892. XXV: 269-275.

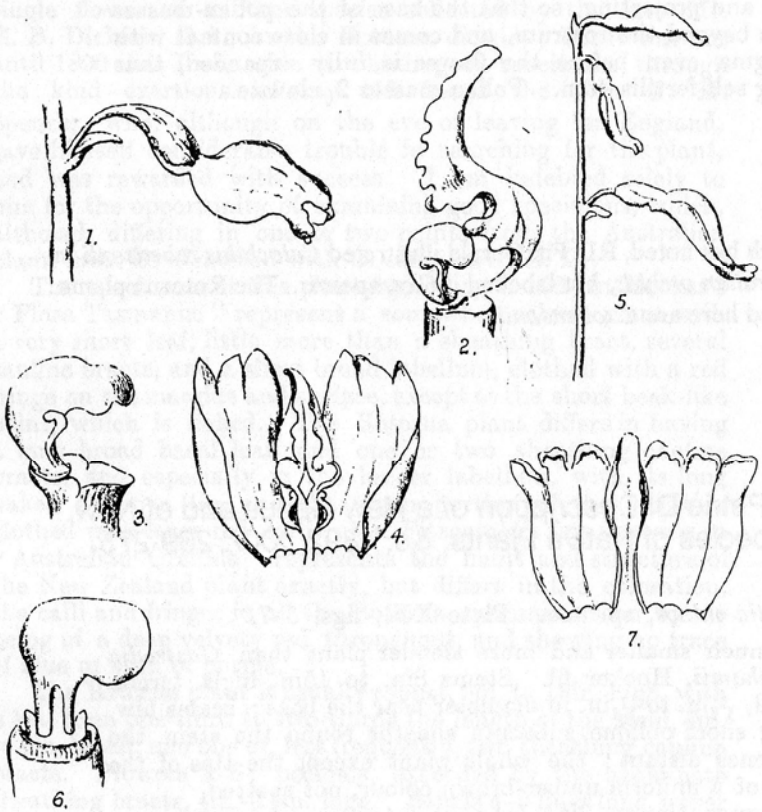
Gastrodia minor, sp. nov. Plate XX., figs. 5–7.

A much smaller and more slender plant than *Gastrodia cunninghamii*, Hooker fil. Stems 8in. to 15in. high, terete, polished, $\frac{1}{12}$in. to $\frac{1}{16}$in. in diameter near the base; scales few, forming short oblique subacute sheaths round the stem, the upper ones distant; the whole plant except the tips of the flowers of a uniform umber-brown colour, not spotted.

Racemes 1in. to 3in. long, of 1 to 9 pendulous flowers (usually 3 to 5). Bracts short, rather broad, scarious. Pedicels slender, 2 lines long; ovary as long as the pedicel, ribbed, slightly tuberculate. Perianth 5 lines long, ventricose, 5-fid, the very narrow division behind the labellum extending to about one-third the length of the tube, the others very shallow (less than 1 line deep); the sepals and two inferior petals rounded, undulate, crumpled and incurved along the thickened margin; tips and inner surface of the perianth-lobes dirty-white.

Labellum, included, oblong, dull-yellow, sometimes slightly expanded at the base, with two subpapillose narrow more or less confluent medial ridges, incurved and thickened at the undulating and crumpled margin; the upper third free, the

To illustrate paper by D. Petrie.



EXPLANATION OF PLATE XX.

1. Flower of *Gastrodia cunninghamii*, Hook. fil.
2. Column and labellum of ditto.
3. Column and appendages of ditto (enlarged).
4. Perianth of ditto laid open.
5. Part of spike of *Gastrodia minor*.
6. Column of ditto.
7. Perianth of ditto laid open.

lower half adnate to the tube and with or without obscure ridge-like wings at the sides.

Column short, with straight very short lateral appendages that are either acute or obtuse.

Hab. Town Belt, Dunedin, in shady manuka bush. Flowers first weeks of January.

The present species differs from *G. cunninghamii*, H. f., in its small size, short racemes, smaller flowers, and umber-brown colour, but most of all in the structure and attachment of the labellum. Mr. A. Hamilton has kindly drawn for me the flowers of both species, and his drawings show the points of difference plainly enough. In *G. cunninghamii* (Plate XX., figs. 1–4) the free part of the labellum is trowel-shaped and much thinner at the sides than in my plant, and it has a distinct claw which is wanting in *G. minor*. The curiously-twisted wing of the lower part of the labellum of the former is wholly absent in the present species, in which, moreover, all the divisions of the flower except the labellum are of equal length. The lateral appendages of the column in *G. cunninghamii* are slender, curved, and horn-like; in *G. minor* they are short, erect, and straight. I had the good fortune to find both plants in flower in the neighbourhood of Dunedin at the same time, so that a very complete comparison of the two species was practicable. The flowers of the present species open but very slightly, and the groove behind the labellum cannot be seen without pushing apart the sepals which the latter separates.

From Petrie D. Descriptions of New Native Plants, &c. 1893. XXVI: 266-274.

7. **Pterostylis oliveri**, sp. nov.

A rather stout leafy species 6in. to 12in. high. Leaves reticulately veined, bright glossy-green, amplexicaul or shortly sheathing; radical several, narrow-ovate, acute, narrowed into a rather broad petiole, 2½in. to 3½in. long, ¾in. to ⅞in. wide; cauline several, amplexicaul, sessile, almost acuminate, the upper gradually diminishing in size.

Flowers usually solitary and terminal, a second flower occurring but rarely in the axil of the uppermost cauline leaf, about 2in. long, curved forward and downward in front almost to the level of the ovary. Upper sepal boat-shaped, broad, tapering gradually to an acute point, the free lobes of the lower sepals broadly obcuneate and produced into very slender erect filaments 1¼in. in length. Petals falcate, 1¼in. long, ¼in. broad, acuminate. Claw broadly linear, brown, of nearly uniform width to the base; appendage much narrower than the claw, terminating in numerous very narrow filaments. Column ¾in. long.

Hab. Open scrub and low bush on the banks of Kelly's Creek, Otira River (1,100ft.). In flower in the early part of January.

I have much pleasure in dedicating this plant to Professor D. Oliver, F.R.S., of Kew, in acknowledgment of valued assistance in my botanical studies.

11. **Gastrodia sesamoides**, R. Br.

This Australian orchid has not hitherto been recorded from New Zealand, but I am now able to add it to the species truly native to our Islands. I found it growing in considerable abundance in sparse scrub, at Kelly's Creek, Otira River (1,100ft.), in January of the present year. *G. cunninghamii*, Hook. f., grows pretty plentifully in the same district, but it flowers some weeks earlier. It was this difference in the time of flowering that led me to examine critically the flowers of the present plant, and recognise its independence. Unfortunately but one or two spikes had come into flower when I had to leave Kelly's Creek, but these exactly match the excellent figure given in Sir Joseph Hooker's "Flora Tasmaniæ."

G. sesamoides is very similar to *G. cunninghamii*, but an observer is at once struck by its stouter stems, and their paler mottled-grey colour. It is not so tall as Hooker's plant, and does not seem to affect such deep shade.

The undoubted species of *Gastrodia* occurring in New Zealand are thus raised to three, for Mr. Buchanan's *G. hectori* clearly does not belong to this genus, and it seems doubtful if the species described by Mr. Colenso, F.R.S., are really different from *G. cunninghamii* and the present plant.

15. **Gastrodia minor**, D. Petrie.

In the fruiting state of this species, the flowers, which are at first almost pendulous, become erect and parallel with the axis of the spike. It seems to be parasitic on the roots of *Leptospermum cricoides*, A. Rich., but I have not been able to satisfy myself on this point. It has flowered very sparingly this season.

From Petrie D. List of the Flowering Plants indigenous to Otago, with Indications of their Distribution and Range in Altitude. 1895. XXVIII: 540-591.

EARINA MUCRONATA, Lindley.—Common on tree-stems in forests of E., S., and W. Dunedin; Catlin's; Bluff; Te Anau; &c.

EARINA AUTUMNALIS, Hook. f.—Rather rare near the E. coast. Dunedin; Nugget Point.

DENDROBIUM CUNNINGHAMII, Lindley.—Rather rare on trees and rocks in forests of E. and S. Port Chalmers; Leith Valley; Catlin's.

SARCOCHILUS ADVERSUS, Hook. f. — Very rare on rocks and trees in bush in vicinity of Dunedin. Sawyer's Bay; Pine Hill (on *Griselinia littoralis*, Raoul).

MICROTIS PORRIFOLIA, Sprengel.—Common in dry, open stations, and very variable in size and robustness.

CALADENIA MINOR, Hook. f.—Not uncommon in scrub and heath in the E. and S. Dunedin; Manuka Creek; Catlin's; Bluff; &c.

CALADENIA LYALLII, Hook. f.—Swampy Hill, Dunedin; Maungatua; Blue Mountains. Ascends to 3,000ft.

CHILOGLOTTIS CORNUTA, Hook. f.—Bluff; Maungatua. Ascends to 3,000ft.

CHILOGLOTTIS BIFOLIA, Hook. f.—Not uncommon in moist heathy stations of E. and S. Swampy Hill; Maungatua; Catlin's; Invercargill; Bluff. Ranges from 3,000ft. to near sea-level.

GASTRODIA CUNNINGHAMII, Hook. f.—Not rare in forests of E., S., and W. Dunedin; Pine Hill; Maungatua; Lake Te Anau; Lake Wakatipu; Bluff; Stewart Island. This seems much more plentiful in the mossy forests of the W. Elsewhere it is more easily overlooked.

GASTRODIA MINOR, Petrie.—Scrub at Opoho Creek, near Dunedin. Not at all easy to detect, and not very plentiful.

ADENOCHILUS GRACILIS, Hook. f.—Moss-carpeted forests of far W. Lakes Wakatipu and Te Anau. The long, stout rootstocks usually lie in moss, and have no connection with the soil. The way in which they absorb food is well worth investigating.

CORYSANTHES TRILOBA, Hook. f.—Sparingly found in the forests of the E. and S. Dunedin; Bluff Hill.

CORYSANTHES OBLONGA, Hook. Forests of Catlin's district. Apparently a very rare plant in Otago.

CORYSANTHES ROTUNDIFOLIA, Hook. f.—Not rare in the forests of the E. and S. North-east Valley; Waitati Creek; Catlin's; Heriot (in boggy ground); Bluff.

CORYSANTHES RIVULARIS, Hook. f.—Rare in deep shady valleys in bush. Head valleys of Water of Leith; Bluff.

CORYSANTHES MACRANTHA, Hook. f.—Not uncommon in moist stations in bush and scrub. Dunedin; Kaitangata; Bluff; Lawrence; Pembroke; &c.

PTEROSTYLIS BANKSII, Br.—Not rare in bush near the E. and S. coasts. Dunedin; Port Molyneux; Catlin's; Bluff.

PTEROSTYLIS GRAMINEA, Hook. f.—Not rare in moist open stations in C., E., and S. Dunedin; Kaitangata; Owaka Valley; Naseby.

PTEROSTYLIS FOLIATA, Hook. f.—Rather rare on the uplands of the E. Dunedin (Signal Hill); Milburn; Tuapeka West.

PTEROSTYLIS MUTICA, Br.—Not uncommon on dry uplands of C. and E. Horse Range; Lee Flat; Naseby; Cambrian; St. Bathan's.

LYPERANTHUS ANTARCTICUS, Hook. f.—Swampy Hill; Maungatua (2,500ft.), in peaty stations. A rare and local plant.

THELYMITRA LONGIFOLIA, Forst.—Common in moist stations, especially in the E. and S. Dunedin; Port Molyneux; Milton; Lawrence; Maniototo Plain; &c.

THELYMITRA PULCHELLA, Hook. f.—Not rare in the S.; much more uncommon in the E. Dunedin (Signal Hill); Invercargill; Bluff.

THELYMITRA UNIFLORA, Hook. f.—Not rare in wet lowlands of E. and S. Swampy Hill; Maungatua; Port Molyneux; Catlin's; Invercargill.

PRASOPHYLLUM NUDUM, Hook. f.—Common in open lands. Dunedin; Naseby; Kaitangata; Catlin's; Naseby; &c.

Sarcochilus adversus mentioned here is almost certainly the unnamed *Drymoanthus* currently tagged "spotted leaf", rather than *Drymoanthus adversus*, which does not appear to exist in Eastern Otago. *Pterostylis mutica* is an Australian endemic - Molloy recognised that the NZ plant differs, and the Colenso name, *P.tristis* now stands.

From Kirk T. Notes on the Botany of the East Cape District. 1896. XXIX: 509-532.

ORCHIDEÆ.

Earina mucronata, *Lindl.* W. L. W.
„ suaveolens, *Lindl.*
Dendrobium cunninghamii, *Lindl.*
Bulbophyllum pygmæum, *Lindl.* W. L. W. !
„ tuberculatum, *Col.* L. Wall !
Sarcochilus adversus, *Hook. f.* J. B. Lee !
Acianthus sinclairii, *Hook. f.* J. B. Lee !
Adenochilus gracilis, *Hook. f.* Colenso.
Corysanthes triloba, *Hook. f.* W. L. W !
Microtis porrifolia, *Spreng.* Banks and Sol. !
Pterostylis banksii, *R. Br.* Banks and Sol. !
„ trullifolia, *Hook. f.* J. B. Lee !
Thelymitra longifolia, *Forst.*
„ colensoi, *Hook. f.* Tolago: H. B. Kirk ! A single imperfect specimen only.

Earina suavolens is now included in *E.autumnalis*.

From Adams J. On the Botany of Hikurangi Mountain. 1897. XXX: 414-433.

ORCHIDEÆ.

Earina autumnalis, *Hook. f.* Common.
„ mucronata, *Lindl.* Mokoiwi.
Dendrobium cunninghamii, *Lindl.* Maraehara.
*Gastrodia sesamoides, *Br.* Awatere River.
Acianthus sinclairii, *Hook. f.* Puhunga.
*Cyrtostylis oblonga, *Hook. f.* Puhunga.
Corysanthes triloba, *Hook. f.* Puhunga.
* „ rotundifolia, *Hook. f.* Awatere River.
* „ macrantha, *Hook. f.* Hikurangi.
Microtis porrifolia, *Spreng.* Puhunga.
Pterostylis banksii, *R. Br.* River-banks to summit.
„ trullifolia, *Hook. f.* Mata River.
Thelymitra longifolia, *Forst.* River-banks to summit.
*Prasophyllum nudum, *Hook. f.* Summit.
*Orthoceras solandri, *Lindl.* Puhunga.

From Proceedings of the Otago Institute. 1898. XXXI: 747.

New Habitats for some Rare Otago Plants.

Sarcochilus adversus, *Hook. f.*; St. Leonards, Blanket Bay.

From Carse H. On the Flora of the Mauku District. 1901. XXXIV: 362-386.

Prasophyllum colensoi is very rare in the district; in fact, I have only found one plant of this beautiful and interesting orchid. The recently named *Schœnus carsei* occurs sparingly in two localities. *Bulbophyllum tuberculatum*, another very interesting orchid, originally discovered in the Hawke's Bay District by Mr. Colenso in 1883, is plentiful on the upper branches of trees in the swampy bush bordering the Waikato River. I understand that this plant was not seen after its discovery by Colenso until rather more than a year ago, when it was rediscovered almost simultaneously by my friend Mr. R. H. Matthews at Kaitaia, in the Mongonui County, and by myself in this district.

Of plants growing as epiphytes those most frequently met with are various species of *Astelia*, among which grow *Pittosporum cornifolium* and the beautiful *Senecio kirkii*, with its large daisy-like flowers. *Griselinia lucida*, with its large shining leaves, is a conspicuous feature on many of the forest trees. The trunks and branches of the trees are more or less clothed with a luxuriant growth of smaller orchids, ferns, lycopods, and mosses.

In many places in the more shady parts of the bush the ground is fairly carpeted with *Hydrocotyle dissecta*, *Galium umbrosum*, *Dichondra repens*, *Corysanthes macrantha*, *C. triloba*, *Oplismenus undulatifolius*, and other plants. *Pterostylis banksii* is plentiful, *P. trullifolia* not uncommon, while *P. graminea* is rare. The lower parts of the trunks of trees and rocks are frequently clothed with a luxuriant growth of *Peperomia endlicheri*. *Acianthus sinclairii* is fairly plentiful, and in damp spots *Corysanthes oblonga* and *Chiloglottis cornuta* are frequently met with.

Among *Leptospermum* scrub, near the edge of the bush, *Clematis indivisa*, the only species of this genus I have found in the district, is not uncommon. Here also are to be found *Gaultheria antipoda*, *Luzula campestris*, *Caladenia minor*, *Lycopodium volubile*, *L. densum*, and only one solitary specimen of the usually plentiful *Adiantum hispidulum*, while *A. æthiopicum* and *A. affine* are not uncommon.

Ascending the first hill, we follow a track through a piece of bush in which the more interesting plants are *Melicope ternata* and its variety *mantellii*, *Gahnia lacera*, *Uncinia banksii*, *Pterostylis trullifolia*, *Bulbophyllum turberculatum*, *Botrychium ternatum*, and *Piper excelsum*.

In many places,

especially in the more open parts, *Thelymitra longifolia* is especially plentiful, and here and there *Prasophyllum pumilum* is to be found.

In the frequently occurring swampy patches the most interesting plants are *Drosera spathulata*, *D. binata*, *Utricularia colensoi*, *U. novæ-zelandiæ*, *Gratiola peruviana*, *G. nana*, *Thelymitra pulchella*, *Cladium capillaceum*, *Schœnus tenax*, and *S. carsei*.

At the mouths of some of the tidal creeks opening into the Manukau Harbour the mangrove, *Avicennia officinalis*, occurs, and here and there are a few trees of *Metrosideros tomentosa*. On the bank of a small stream flowing into the Waiau Creek I found, among *Leptospermum* scrub, *Caladenia minor*, *Cotula minor*, *Hydrocotyle moschata* (a dwarf form), and fine specimens of *Botrychium ternatum*.

Perhaps the most interesting plant in the Lower Waikato, or, in fact, in any part of the district, is the dainty little orchid *Bulbophyllum tuberculatum*. In December, 1900, I discovered large quantities of it in the upper branches of trees that had been felled. It was then in fruit, having flowered evidently in November. While I write — May, 1901 — I have this species flowering on an apple-tree. Probably it flowers right through the warm season, and even into the winter. Unfortunately, the plants I discovered in 1900 have all been destroyed in the burning of the felled trees, but I think it is probable that the species is plentiful in the upper branches of trees all along the river-side.

Orchideæ.

Earina mucronata, *Lindl.* Plentiful in woods.
" suaveolens, *Lindl.* In woods; not common.
Dendrobium cunninghamii, *Lindl.* Not uncommon.
Bulbophyllum pygmæum, *Lindl.* Upper branches of trees; common.
Bulbophyllum tuberculatum, *Col.* Upper branches of trees, Lower Waikato, not uncommon; Mauku, rare.
Sarcochilus adversus, *Hook. f.* Branches of trees; not uncommon.
Acianthus sinclairii, *Hook. f.* In woods; common.
Microtis porrifolia, *Br.* Generally distributed.

Pterostylis banksii, *R. Br.* In woods; plentiful.
" trullifolia, *Hook.* In woods; not uncommon.
" graminea, *Hook. f.* Wet place, Mauku Fall, rare.
Thelymitra longifolia, *Forst.* Common in open land.
" pulchella, *Hook. f.* Te Karaka Flat.
Corysanthes triloba, *Hook. f.* In woods; plentiful.
" macrantha, *Hook. f.* In woods; plentiful.
" oblonga, *Hook. f.* Wet places; not uncommon.
Spiranthes australis, *Lindl.* Swamps; not uncommon.
Prasophyllum colensoi, *Hook.* One plant seen in a swamp between Mauku and Puni.
Prasophyllum pumilum, *Hook. f.* Te Karaka Flat.
Orthoceras solandri, *Lindl.* Not uncommon in open places.

From Cockayne L. A Botanical Excursion during Midwinter to the Southern Islands of New Zealand. 1903. XXXVI: 225-333.

—	Snares.	Auckland.	Campbell.	Antipodes.	Macquarie.
ORCHIDACEÆ.					
The time of the year being quite unfavourable for obtaining these plants, none were seen by me. This list is merely compiled from Hooker, Kirk, &c.					
Corysanthes rotundifolia, Hook. f. B	..	1	1	1?	..
C. macrantha, Hook. f. B	..	1	..	..	..
Caladenia lyallii, Hook. f. B	..	1	..	..	..
C. bifolia, Hook. f. B	..	1	1	..	..
Chiloglottis cornuta, Hook. f. B	..	1	1	1	..
Lyperanthus antarcticus, Hook. f. B	..	1	..	..	..
Thelymitra longifolia, Forst. B	..	1	..	..	..
T. uniflora, Hook. f. B	..	1	..	..	..
Prasophyllum colensoi, Hook. f. B	..	..	..	1	..

From Townson W. On the Vegetation of the Westport District. 1906. XXXIX: 380-433.

Again, in a small patch of pakihi forest I discovered *Corysanthes cheesemanii* growing amongst the *Fagus* roots, and on the margin of the same forest *Pterostylis puberula* flourished under shelter of the fern; and, search as I would, I never found them elsewhere. Many plants are so local in their distribution, and others so easily missed, that I consider it safer to say that I have not found them than that they do not grow in the district.

On the mountain pakihis numerous orchids are to be found, the most noticeable being *Thelymitra pachyphylla*, with its flowers variously coloured from a beautiful dark-blue to purple, and again shading from delicate pink to a pale creamy-white; the curious *Calochilus paludosus*; *Pterostylis banksii*; and here and there under shelter of the mountain-flax the rare *Pterostylis venosa*; whilst in the higher regions *Prasophyllum colensoi*, *Lyperanthus antarcticus*, *Caladenia minor*, and *C. bifolia* are plentiful. *Gastrodia cunninghamii* and *Microtis porrifolia* are also fairly abundant.

I had the good fortune to discover in the same situation a little orchis which forms a new genus, and which Mr. Cheeseman has honoured me by naming *Townsonia*.

I must take this opportunity of thanking him for the compliment which he has paid me in thus associating my name with the science of botany in New Zealand, and giving me such liberal rewards for my work, which has always proved to be to me a labour of love. This delicate little plant *Townsonia deflexa* is only found at about the same elevation as the *Drimys* just described, growing in the shelter of the manuka and *Olearia colensoi*, on the bosses of moss and prostrate tree-trunks. It blooms in November and December, but is easily overlooked, as it is very slender, averages from 4 in. to 5 in. in height, and its colour much the same as the cushions of moss on which it grows. When fully matured the flowers show a purplish tint. I have also found it growing on Mount Frederic, and across the Buller on Mount Buckland, at the same elevation.

Drimys traversii, *Metrosideros parkinsoni*, *Townsonia deflexa*, and *Pterostylis venosa* are amongst the rarest of the plants which grow on Mount Frederic, and *Drosera arcturi* is quite common in the moss-covered bogs.

Passing in a northerly direction along the range you reach Millerton, at an elevation of nearly 2,000 ft., where the Westport Coal Company has workings, and from the township a track leads down to Granity Creek, where the coal-bins are situated. *Pterostylis banksii* is abundant on the sides of the track, and

At a point known as Big Hill the track takes to the bush, through which you climb up several hundred feet on the cliff-face; and I noticed that in places where the water ran across the track it left a deposit on all that it touched, coating over grass, moss-leaves, and ferns with a crust of lime, with which the water is highly impregnated. *Corysanthes macrantha* is very abundant on this bluff,

We got on our way by starlight in the morning, passing the ruined huts and batteries, and by sunrise were well up the lower spurs of the mountain. My attention was first arrested by the curious little orchis, *Adenochilus gracilis*, which grows amongst the cushions of moss between the *Fagus* roots, at an elevation of about 1,000 ft.

In the low bush around the lighthouse I gathered *Acianthus sinclairii;* and at Tauranga Bay, a mile or two further down the coast, *Corysanthes triloba* is abundant under the shelter of the nikaus and tree-ferns.

Thelymitra pachyphylla helps to vary the monotony of the brown surface; whilst here and there *Orthoceras solandri*, *Pterostylis graminea*, *P. banksii*, and *Prasophyllum colensoi* may be found.

In the same locality, growing on the banks at the side of the road, and also on dry elevations amongst the pakihis, I collected *Prasophyllum rufum*, in reference to which Mr. Cheeseman remarks, "I suspect that the New Zealand plant will prove to be a different species to the Australian, and it is probable that the North Island plant described in the Handbook under the name of *P. nudum* is distinct from McMahon's and Townson's South Island specimens. Mr. Townson's have a broad obtuse lip, but in Fitzgerald's 'Australian Orchids' (vol. ii, part iv) the lip of *P. rufum* is represented as lanceolate and acute."

On the other hand, many northern species find their southern limit in the vicinity of the Buller, amongst which are *Lepidium flexicaule*, *Notothlaspi australe* var. *stellatum*, *Myriophyllum robustum*, *Nertera cunninghamii*, *Olearia cunninghamii*, *Celmisia dallii*, *Astelia banksii*, *Orthoceras solandri*, *Calochilus paludosus*, *Pterostylis venosa* and *P. puberula*, *Corysanthes cheesemanii*,

Some few make their appearance for the first time in the South Island—viz., *Lepidium flexicaule*, *Gnaphalium subrigidum*, *Pterostylis venosa* and *P. puberula*, and *Corysanthes cheesemanii;* and it yet remains to be proved by future observers whether the new species, such as *Aciphylla townsoni*, *Celmisia dubia*, *Wahlenbergia saxicola* var. *congesta*, *Dracophyllum townsoni* and *D. pubescens*, *Myosotis townsoni*, *Veronica macrocarpa* var. *crassifolia* and *V. divergens*, *Townsonia deflexa*, and *Prasophyllum rufum*, are confined to the district or have a more extended range.

Orchideæ.

Dendrobium cunninghamii, Lindl. Common; sea-level to 2,000 ft.
Bulbophyllum pygmæum, Lindl. Not uncommon throughout.
Earina mucronata, Lindl. Abundant.
Earina suaveolens, Lindl. Abundant.
Sarcochilus adversus, Hook. f. Rather a rare plant, growing mostly on *Aristotelia racemosa* in Buller Valley.
Thelymitra longifolia, Forst. Abundant from sea-level to 3,000 ft.
" *pachyphylla*, Cheesem., n. sp. An abundant species on both lowland and mountain pakihis; sea-level to between 2,000 ft. and 3,000 ft.
" *uniflora*, Hook. f. Abundant from sea-level to 3,000 ft.
Orthoceras strictum, R. Br. On stony elevations on the pakihis, at sea-level; not common.
Microtis porrifolia, R. Br. Common from sea-level to 2,000 ft.
Prasophyllum colensoi, Hook. f. Abundant from sea-level to 4,000 ft.
" *rufum*, R. Br. Not uncommon on sides of roads, and on dry elevations on the pakihis.
Pterostylis banksii, R. Br. Abundant; ascending to an elevation of 2,000 ft.
" *graminea*, Hook. f. Less abundant than the preceding. Grows on pakihis under shelter of low

bushes, and on margins of the patches of *Fagus* forest.

„ *venosa*, Col. Mount Rochfort and Mount Frederic, amongst mountain-flax, at an elevation of from 2,000–3,500 ft.

„ *puberula*, Hook. f. On margin of pakihi forest, and amongst *Pteris aquilina* on elevated ground on "Waite's pakihi"; not common.

Acianthus sinclairii, Hook. f. In forest around Cape Foulwind, but not common.

Calochilus paludosus, R. Br. Not uncommon on the pakihis from sea-level to 2,000 ft.

Lyperanthus antarcticus, Hook. f. On coastal mountains from an elevation of 2,000–4,000 ft. or more; fairly abundant.

Caladenia minor, Hook. f. Not uncommon from sea-level to 2,000 ft.

„ *bifolia*, Hook. f. Mount Rochfort, Mount Frederic; from 2,000–3,000 ft.

Chiloglottis cornuta, Hook. f. Not uncommon from sea-level to 2,000 ft.

Adenochilus gracilis, Hook. f. Mount Owen, in *Fagus* forest; altitude, 1,000 ft.

Townsonia deflexa, Cheesem. Mount Rochfort, Mount Frederic, and the Paparoas, at an elevation of from 1,500–2,500 ft., growing in low forests on mossy surface of logs and rocks; not uncommon.

Corysanthes cheesemanii, Hook. f. Amongst *Fagus roots* in pakihi forest on "Waite's pakihi"; far from common.

„ *oblonga*, Hook. f. Abundant in shady woods.

„ *rivularis*, Hook. f. In damp forests; not uncommon.

„ *rotundifolia*, Hook. f. Not uncommon on the rock-faces where the tributaries of the Buller run through narrow gorges.

„ *triloba*, Hook. f. On the sea-slopes near to Cape Foulwind, under shelter of tree-ferns and nikau palms.

„ *macrantha*, Hook. f. Abundant between Mokihinui and Karamea on the road by the beach and in Fox's River.

Gastrodia cunninghamii, Hook. f. Not uncommon from sea-level to 1,000 ft.

Cheeseman included *Prasophyllum rufum* in *P.nudum*. *Townsonia deflexa* is now known as *Acianthus viridis*.

From Petrie D. Account of a Visit to Mount Hector, a High Peak of the Tararuas, with a List of Flowering Plants. 1907. XXXX: 289-304.

Dendrobium Cunninghamii, *Lindl.* 2,000 ft.
Earina mucronata, *Lindl.* 1,500 ft.
Thelymitra uniflora, *Hk. f.*
Prasophyllum Colensoi, *Hk. f.* 3,500–4,500 ft.
Lyperanthus antarcticus, *Hk. f.* 3,200 ft.
Caladenia bifolia, *Hk. f.* 3,500 ft.
Corysanthes triloba, *Hk. f.*
Gastrodia Cunninghamii, *Hk. f.*

From Proceedings of the Otago Institute. 1907. XXXX: 579-80.

Mr. G. M. Thomson read a note in reference to the orchid *Gastrodia*, as follows:—

The genus *Gastrodia* belongs to a tribe of *Orchideæ* (*Arethusæ*) which contains several leafless species, some of which have rather fleshy rhizomes or tubers, and are evidently saprophytic in growth, while the species of *Gastrodia* itself are said to be parasitic on roots. Three species occur in New Zealand—viz., *G. sesamoides*, R. Br., which is found in the North Island and in the botanically allied west-coast region of the South Island, and is also found along the eastern side of Australia from Queensland to Tasmania (it is the only Australian species); *G. Cunninghamii*, Hook. f., which is common in the bush throughout New Zealand, and is endemic; and the closely allied *G. minor*, Petrie, which has been found in only one locality, near Dunedin. *G. Cunninghamii* was formerly abundant in all bush-covered parts of Otago, and some twenty years ago was still to be met with in the Town Belt of Dunedin, but it has disappeared from many localities with the spread of cultivation, the inroads of cattle, and the competition of cocksfoot-grass and other aggressive introduced species of plants. It is now some years since any specimens have been found in the neighbourhood of this city.

In September last, Mr. F. Challis, of North-east Harbour, brought me a quantity of the rhizomes, which he had dug up in the bush at Catlin's, where the species is common. The starchy nature of the rhizome has long been known, and, according to Cheeseman, these thick rhizomes were formerly collected and eaten by the Maoris, especially in the Urewera country. I was curious to examine the starchy substance, and accordingly squeezed the cut end of a rhizome in a minute drop of water on the microscope-slide. I found the liquid was full of minute white granules, which were only about 0·0025 mm. in diameter. These were so abundant as to make the juice, when squeezed out, quite milky. Among them were a few larger rounded and usually oblong masses. On adding

solution of iodine the larger masses stained a brown colour, showing the presence of proteids, but they very quickly disintegrated into amorphous brownish flocculent masses. The small granules remained uncoloured. On heating the semi-fluid material on the slide these small granules dissolved completely, but on addition of iodine-solution they were reprecipitated in a loosely flocculent form, and were stained a reddish-violet or port-wine colour. These reactions appear to show that the granules are probably erythro-dextrin, one of the cellulose-starch isomers ($C_6H_{10}O_5$). On heating a small quantity of the clear solution with Fehling's solution considerable reduction and deposition of cuprous oxide took place, showing the presence of dextrose. I estimated the amount of this dextrose in a portion of a rhizome which was shred down and completely extracted with hot water, and found it amounted to 1·38 per cent. of the whole. Unfortunately, the whole amount of erythro-dextrin and dextrose together was not estimated. I am inclined to think it will be found that the material stored up in these rhizomes in autumn is erythro-dextrin, but that as the spring growth starts this is converted into the soluble dextrose, and thus is immediately utilisable in the formation of stem-tissue. These rhizomes also contain a considerable amount of raphides, especially in the cells near the surface, and the amount of calcium-oxalate found amounted to 0·26 per cent. of the whole weight.

It is desirable that the parasitic habit of these orchids should be more closely investigated. I have no record of the roots on which they grow, nor can I find that any careful examination of these has been made. The casual collector has usually little time and few means to undertake such an investigation, but any one dwelling in a bush district where these plants are common could readily find out. This note is a preliminary one, as I hope to be able to look into the matter again.

P.S.—I placed a few portions of the rhizomes in damp moss in September last, covering them with leaves and humus, and keeping the whole mass moist. Now (16th December) they are throwing up stems with scale leaves and rudimentary flower-buds. But the growth is thin and stunted, and is evidently the product of the conversion of the material stored up, not the assimilation of new food-material. No roots are being developed, and presumably the specimens will die without coming to any full development.

From Cockayne L. Some Hitherto-unrecorded Plant-habitats. 1908. XXXXI: 399-403.

ORCHIDACEÆ.

Thelymitra uniflora, Hook. f.

Mount Grey, Canterbury. T. Keir!

From Cockayne L. On a Collection of Plants from the Solanders. 1908. XXXXI: 404-405.

Orchidaceæ.

Thelymitra uniflora, *Hook. f.*

From Aston BC. Botanical Notes made on a Journey across the Tararuas. 1909. XXXXII: 13-25.

A list of plants seen from the junction of the Pakuratahi and Hutt Rivers to the camp is given below:

Cory-

santhes, Dendrobium Cunninghamii, Thelymitra sp., *Earina autumnalis,*

The epiphytic orchids *Earina mucronata* and *E. suaveolens* are still plentiful, and *Gastrodia Cunninghamii*, the tall black-and-white flowered terrestrial orchid, with the large tuberous roots beloved of pigs, is met with.

Earina autumnalis, *Hook. f.*
Orthoceras strictum, *R. Br.*, Kaitoke.
Pterostylis Banksii, *R. Br.*
,, graminea, *Hook. f.*, Kaitoke.
,, foliata, *Hook. f.*, Kaitoke.
,, trullifolia, *Hook. f.*, Kaitoke.
,, barbata, *Lindl.*, Kaitoke.
Cyrtostylis oblonga, *Hook. f.*, Kaitoke.
Chiloglottis cornuta, *Hook. f.*, Kaitoke.
Gastrodia sesamoides, *R. Br.*, Tauherinikau Valley.

From Aston BC. Unrecorded Habitats for New Zealand Plants. 1909. XXXXII: 26-28.

Corysanthes oblonga, *Hook. f.*
Port Ross, Auckland Island.

Corysanthes rivularis, *Hook. f.*
Norman's Inlet, Laurie Harbour, Auckland Island.

Thelymitra, nov. sp.
Bluff Hill, Southland.

Thelymitra pachyphylla, *Cheesem.*
Bluff Hill, Southland.

Pterostylis foliata, *Hook. f.*
Kaitoke.

Pterostylis barbata, *Lindl.*
Kaitoke.

Adenochilus gracilis, *Hook. f.*
Under *Fagus* at 1,000 ft. on Maungtaua, Otago. (This habitat was attributed to Mr. Petrie in the "Manual.")

Gastrodia sesamoides, *R. Br.*
Tauherinikau Valley.

Thelymitra pachyphylla is *T.pulchella. Pterostylis barbata* is *P.plumosa.*

From Oliver RB. The Vegetation of the Kermadec Islands. 1909. XXXXII: 118-175.

ORCHIDACEÆ.

Microtis unifolia (Forst. f.), Rohb.
Open ground in tutu scrub (crater), Sunday Island.
Norfolk Island, Lord Howe Island, New Zealand, Australia.

Acianthus Sinclairi, Hook. f.
Forest, Sunday Island.
New Zealand.

Lancaster TL. Preliminary Note on the Fungi of the New Zealand Epiphytic Orchids. 1910. XXXXIII: 186-191.

THE epiphytic orchids found in New Zealand comprise six species, all of which are endemic. The four genera to which they belong are typically tropical, two (*Sarcochilus* R. Br. and *Bulbophyllum* Thouars) being widely distributed in tropical regions. *Dendrobium* Swartz has its headquarters in the Malay Archipelago, while *Earina* Lindl. extends to the islands of the tropical Pacific. The species specially referred to in this paper are *Dendrobium Cunninghamii* Lindl., *Earina mucronata* Lindl., and *Earina suaveolens* Lindl.

If transverse sections of the roots of *Earina* or *Dendrobium* be examined with the microscope it will generally be found that some of the cortical cells contain each a yellowish-brown mass. Sometimes these masses are few in number and small in size, but often they are present in abundance and are conspicuous objects in the section. They are most plentiful in the outer layers of cortical cells, and are seldom found in close proximity to the stele. Close examination of these masses shows that they vary greatly in size, in shape, and in the materials composing them. In colour and denseness, too, they show variation, so that no two are alike, even in the same cross-section. It will be of assistance in description to refer all these masses to one or another of three chief classes, into which they may be divided, the first class containing masses which consist almost wholly of a more or less dense coil of well-defined fungal hyphae; the second comprising those which are dense and yellowish in colour, and in which no traces of hyphae are observable; and a third class consisting of masses which are intermediate in structure between those of the first two classes. The bodies belonging to the last class are usually composed partly of numerous granular bodies and partly of what are evidently degenerating fungal hyphae.

In the bodies of the first type the hyphae are thin-walled, almost colourless, often swollen slightly in places, and are usually coiled up in a more or less dense mass. They are septate, the division walls being sometimes very numerous, and they often branch freely. A vacuolated appearance is nearly always observable, and sometimes the hyphae are seen to have collapsed in places.

The masses of the second class, although varying greatly in shape, generally have their edges well defined. They are usually of a yellowish colour, and the substance of the mass appears homogeneous, no signs of fungal hyphae being observable. Each of these masses is usually connected with the walls of the cell in which it occurs by one or more narrow strands, which often appear to consist of protoplasm, but which are sometimes fungal hyphae in a state of degeneracy. Sometimes the strands belonging to the masses in adjacent cells appear to be continuous through the dividing cell-walls, so that the strands would seem to connect the yellowish bodies with

one another.

The masses of the third class contain numerous degenerating hyphae, the outlines of which are often difficult to distinguish, and mingled with these are often large numbers of tiny granular bodies. Sometimes small starch-grains are present among these, but they are never abundant. Often the central portion of these masses is of a yellowish colour, and more dense than the outer portions, which consist largely of degenerate hyphae; in fact, if it were not for the presence of this outer hyphal layer the mass could be correctly referred to class 2. It should have been stated at the outset that it is not possible absolutely to delimit these classes from one another, as they are connected by masses of intermediate structure.

In the cortical cells containing the bodies just described the nucleus is frequently much swollen, and it is generally observed to be in close contact with the mass in the cell to which it belongs—sometimes, indeed, it appears to be partly included in the mass. Usually bodies belonging to all three of the above types will be seen in any one section, but one class of mass invariably predominates. In most cases the bodies coming under the second head will be found to be most numerous.

An examination of the velamen tissue of these orchid-roots shows that it almost invariably contains many colourless or brownish hyphae, which branch freely and wander through its cells, forming a loose network of mycelial threads. The hyphae are septate, and it would sometimes appear from their great variation in thickness that more than one species of fungus was present. This is undoubtedly often the case. At maturity the velamen is a dead tissue, and no coils of hyphae or yellowish masses such are seen in the cortical cells are present in it. Where the hyphae are present in abundance in the velamen that tissue is sometimes observed to be in a state of decay; indeed, in the older portions of some roots it has entirely disappeared, and the exodermis is then the outermost layer.

The passage-cells of the exodermis are often occupied by a scanty coil of hyphae formed by threads which have entered from the velamen. Sometimes a mass of granular bodies occupies each of these cells, which, unlike those of the velamen, contain living contents. Where extensive thickening has taken place in the exodermal cells it is not always easy to demonstrate the connection existing between the hyphae of the transfusion-cells and those of the velamen, owing to the presence of a felty mass which often guards these cells on their outer sides. The transfusion-cells of the exodermis are the ones which admit the fungal hyphae to the cortical tissues. Having entered one of these passage-cells, a hypha usually forms a loose coil, and then extends out into the cortex, where it may branch, and each branch is generally seen to end in one of the yellowish masses above described. Sometimes after forming a coil in one cell a hypha enters an adjacent cell, where it forms another coil, and it may do this in several cells in succession. The hyphae which are found in the cortex are seldom

normal, and they generally present an unhealthy and impoverished appearance. This ill-nourished condition is indicated by the presence of vacuoles, and often by the collapse of the hyphal walls. The hyphae of the velamen never have this unhealthy appearance.

Where the roots of these orchids come into contact with humus, as they usually do in the crevices of the bark of the supporting tree, or in the black material formed by the decay of lichens, mosses, &c., it is noticed that numbers of hairs, much resembling the root-hairs of ordinary terrestrial plants, are frequently developed. Sometimes among the other normal hairs some will be seen which have become flattened, and then twisted in a regular spiral fashion. The cavity of each hair usually contains one or more fungal hyphae, which are continuous with those in the velamen.

The foregoing description applies in all essential respects to both species of *Earina* and to *Dendrobium Cunninghamii*, in which the velamen is usually a well-marked tissue, and the roots of which are structurally very similar. In the New Zealand species of *Bulbophyllum* and in *Sarcochilus adversus* the velamen is poorly developed, being seldom more than two cells deep. In *Sarcochilus* the hyphae of the velamen are very scanty, but the yellowish masses in the cortical cells are often large and abundant.

It is by no means easy to discover the exact physiological significance of structures such as those briefly described, although such problems are of supreme interest. It is well known that the roots of many plants growing in soils rich in humus often live in intimate connection with the mycelia of fungi inhabiting the soil. These associations are believed to be beneficial to both organisms, and to such an alliance between the roots of one of the higher plants and a fungal mycelium the name "mycorhiza" is given. Mycorhizae are of two kinds—those in which the fungal elements do not penetrate the root, but merely form a dense mat round it, and those in which the hyphae enter the root and form coils within its cells. There can be no doubt that the relationship existing between the roots of our epiphytic orchids and the fungal filaments comes under the head of mycorhizic associations. It is evident, moreover, that the mycorhizae in their case are endotrophic. Orchids seem to be particularly prone to the formation of such alliances, and it is therefore not surprising to find that some New Zealand orchids possess mycorhizae. Among mycorhizae hitherto described is that of a British saprophytic orchid, *Corallorhiza innata*, which was dealt with by Messrs. Hanna and Jennings in a paper published in the "Proceedings of the Royal Dublin Society" (1898).

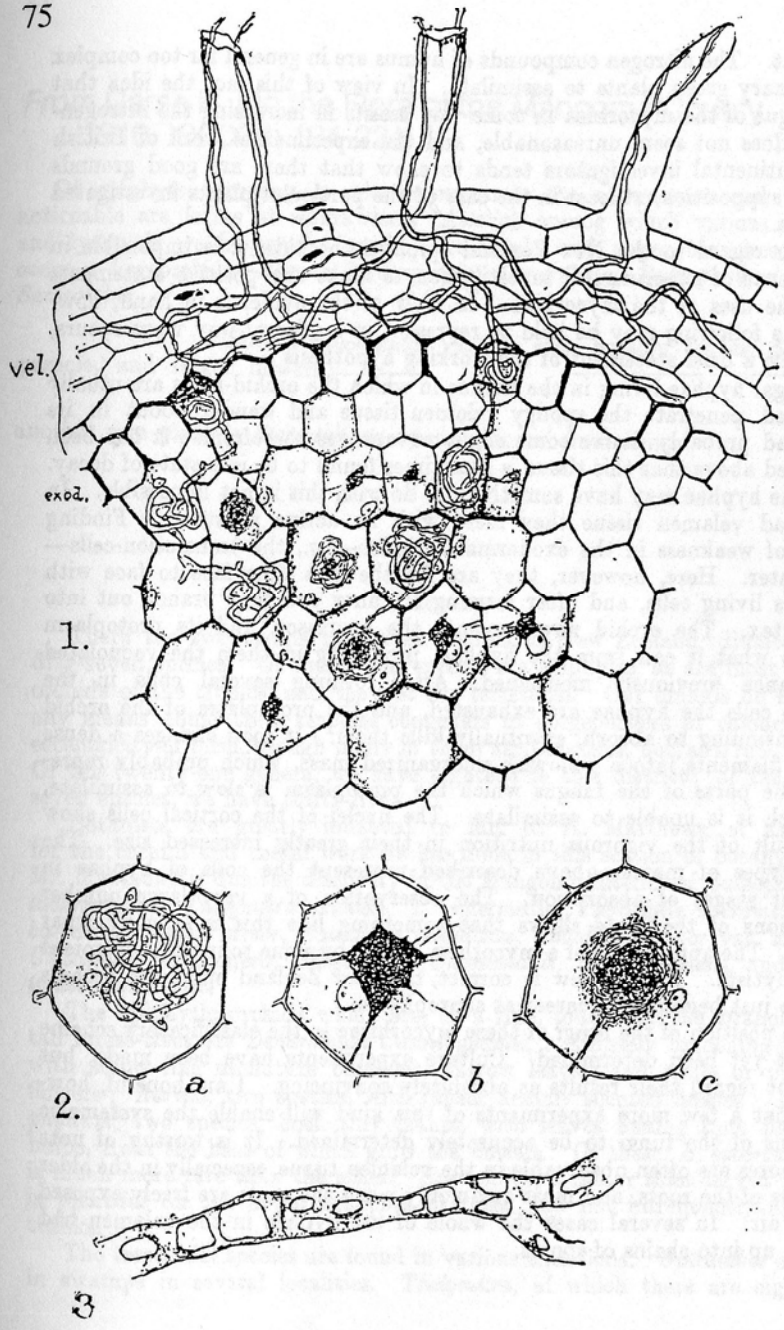
There is little fixity of opinion as to the exact nature of the benefits accruing to the partners in these mycorhizic associations. The view of Hanna and Jennings with regard to *Corallorhiza* is that the hairs found on the rhizome of the plant are produced with the object of attracting the fungal hyphae into the rhizome, so that the orchid can use them to augment its supply of food-materials. According to these authorities, the coils of hyphae in the orchid's cells are gradually absorbed as food by the proto-

plasm, starch-grains appearing in abundance as the hyphae disappear. A view held by Groom and Janse with regard to endotrophic mycorhizae in general is that the fungus is digested by the root, thereby supplying combined nitrogen. Other investigators — *e.g.*, Hiltner and Magnus — hold similar views.

In the case of the New Zealand orchids it is not probable that the hairs on their roots are produced as fungus-trapping organs. In some cases it is certain from the manner in which the hyphae branch that they are leaving, and not entering, the root. In many instances spores have been seen in the hairs, and in more than one case the cavity of a hair at its extremity was observed to be densely packed with spores. What seems more probable is that the hairs perform, for a time at least, the functions which root-hairs perform in ordinary terrestrial plants—viz., absorption of water and mineral food. As above mentioned, the velamen at maturity is a dead tissue : its cells after having thickened their walls in a curiously intricate fashion lose their living contents, so that the hairs springing from them must also die, and presumably become functionless. It seems probable that no special significance is to be attached to the presence of the hyphae in the hairs. That the fungi sometimes use them as a means of entering the root cannot be doubted, but it is very likely that the hyphae are capable of penetrating the velamen at almost any point, and that their chief mode of entrance is by direct penetration of the outer cells of that tissue.

It is well known that humus is invariably penetrated in all directions by the hyphae of many species of fungi, and these are believed to assist in breaking down the complex organic compounds of the humus, thereby bringing a large amount of plant-food into an available condition. The humus, from which these epiphytic orchids must obtain practically all their food-materials except carbon, is formed, as before stated, largely by the decay of lower plants, chiefly lichens and mosses. It is unlikely that the carbon of the humus is utilized by the orchids, as they are all well supplied with chlorophyll, and it would therefore seem that their supply of carbon from atmospheric sources would be adequate to their needs. It cannot be said that their supply of available nitrogen is by any means

1. Portion of a transverse section of the root of *Earina mucronata*, showing the hyphae in the velamen and the masses in the cortical cells. The thickenings of the walls of the velamen cells have been omitted to secure clearness.
2. Cells from the cortex, showing the hyphae in various stages of absorption—*a*, first stage; *c*, intermediate stage; *b*, third stage.
3. Portion of a hypha from the cortex, showing vacuolated appearance (much enlarged).



sufficient. The nitrogen compounds of humus are in general far too complex for ordinary green plants to assimilate. In view of this fact the idea that the fungus of the mycorhiza in some way assists in increasing the nitrogen-supply does not seem unreasonable, and the experimental work of British and Continental investigators tends to show that there are good grounds for this supposition, at least in the case of the particular plants investigated by them.

With regard to the New Zealand epiphytic orchids, it is impossible in the absence of experimental investigation to make any positive statements as to the uses of the mycorhiza. In view of the evidence in hand, however, the following may be held to represent in a general way what occurs, and to be a brief statement of the working hypothesis :—

Fungal hyphae living in the humus in which the orchid-roots are usually imbedded penetrate the spongy velamen tissue and wander about in its cells, and probably derive some slight advantages therefrom. It has been remarked above that this tissue is sometimes found to be in a state of decay. That the hyphae may have something to do with this is not impossible. In this dead velamen tissue they meet with no active resistance. Finding points of weakness in the exodermal cylinder—*e.g.*, the transfusion-cells—they enter. Here, however, they are for the first time face to face with vigorous living cells, and after forming a scanty coil they branch out into the cortex. The orchid now becomes the aggressor, and its protoplasm absorbs what it can from the hyphae, producing in them the vacuolated appearance previously mentioned. After forming several coils in the cortical cells the hyphae are exhausted, and the protoplasm of the orchid still continuing to absorb, eventually kills them. It soon changes a dense coil of filaments into a yellowish unorganized mass, which probably represents the parts of the fungus which the protoplasm is slow to assimilate, or which it is unable to assimilate. The nuclei of the cortical cells show the result of the vigorous nutrition in their greatly increased size. The three types of masses above described represent the coils of hyphae in different stages of absorption. The observation of a very large number of sections of the roots shows that something like this is actually what occurs. The appearance of a mycorhiza is held by some to indicate incipient saprophytism. If this view is correct, the New Zealand epiphytic orchids may be just beginning a career as saprophytes.

The position of the fungi of these mycorhizae in the classificatory scheme has not yet been determined. Culture experiments have been made, but I do not regard their results as absolutely convincing. I am hopeful, however, that a few more experiments of this kind will enable the systematic positions of the fungi to be accurately determined. It is worthy of note that spores are often observable in the velamen tissue, especially in the older portions of the roots, and most commonly when the roots are freely exposed to the air. In several cases the whole of the hyphae in the velamen had broken up into chains of spores.

From Carse H. On the Flora of the Mangonui County. 1910. XXXXIII: 194-224.

Of epiphytes growing on the forest-trees the commonest and most noticeable are forms of wharawhara (*Astelia*), among which various ferns and lycopods are frequently found. On trunks and upper branches, too, occur a few orchids—*Earina* (two species), *Dendrobium*, *Bulbophyllum*, and *Sarcochilus*.

Earina mucronata, variety with broader leaves, denser panicle, and larger flowers;

another rare plant is *Pterostylis micromega*, found in swamps

Orchids.

There are twenty-one genera of orchids in New Zealand, divided into fifty-seven species. Of these, four species are epiphytic, as are most of the orchids of the tropics, and the rest are terrestrial. Our orchids do not by any means equal their tropical congeners in gorgeousness of colouring or eccentricity of form, though many of them are beautiful, but, as a rule, small. Of the twenty-one genera, we have eighteen in this district; of the fifty-seven species, we have thirty-five.

Botanists are greatly indebted to Mr. R. H. Matthews, of Kaitaia, for the careful and useful work he has done in this section of botany. To Mr. Matthews is due the discovery in the Mangonui district of *Bulbophyllum tuberculatum*, *Thelymitra ixioides*, *T. intermedia*, *Pterostylis micromega*, *P. barbata*, *Caleana minor*, *Calochilus paludosus*, *Caladenia minor* var. *exigua*, *Chiloglottis formicifera*, *Corysanthes Cheesemanii*, *C. Matthewsii*, and *Gastrodia sesamoides*.

The epiphytic orchids which are, as a rule, found on the branches of tall forest-trees are *Dendrobium Cunninghamii*, a diffusely branching plant, with stems like miniature bamboos, narrow leaves, and white or pinkish flowers; *Earina*, two species, with rather heavily scented flowers; *Bulbophyllum*, two species, both tiny plants, with leaves issuing from pseudo-bulbs, from the base of which grow the flowers. Of these, *B. tuberculatum* is much more rare than the other. *Sarcochilus*, a rather thick-leaved plant, is plentiful on the upper branches of trees, and not infrequently on the trunks.

The terrestrial species are found in various situations. *Spiranthes* occurs in swamps in several localities. *Thelymitra*, of which there are eight or

nine species in New Zealand, is represented in this district by five or six species (I understand a new species was discovered by Mr. Matthews this year). Most of these are moorland-plants. The flowers of this genus are less like the generally accepted idea of orchids than any other. The genus "is remarkable from the lip being quite free from the column and resembling the petals and sepals, so that the perianth has little of the irregular appearance of an orchid, but rather resembles that of an *Ixia* or a *Sisyrinchium*."* Of the *Thelymitrae* the most showy and one of the most common is *T. pulchella*, easily distinguished by the large blue-purple flowers. *T. ixioides* and *T.* sp. nov. are the rarest of the genus. What I take to be Berggren's *T. intermedia* is not uncommon on old clay landslips and hillsides.

Orthoceras, which is not uncommon on dry banks, is rather a curious-looking plant. The flowers, which grow in the form of a spike, bear a general resemblance to a number of grasshoppers climbing up a stick. *Microtis porrifolia*, a common orchid in almost all situations, bears a close resemblance to the next genus, *Prasophyllum*, of which there are two species in the district. Both are moorland-plants, and not uncommon. I think the one now included under *P. Colensoi*, will prove to be a different species. Mr. Cheeseman, referring to it in a letter, says, "Your plant is not quite identical with the southern plant, but until a very careful comparison can be made of the structure of the flowers . . . they are best kept together."

Caleana minor, a rare plant, is found on barren-looking moorland near Kaitaia. "A most remarkable little plant. The column is horizontally placed, forming a broad pouch; the lamina of the lip, when at rest, is elevated by the slender elastic claw, and swings directly above it. When an insect alights on the lamina it overbalances, shutting up the insect within the concavity of the column."†

The flowers of *Pterostylis*, of which we have five out of the eleven species found in the Dominion, are also insect-traps; they are in form like boat-shaped hoods. *P. Banksii* and *P. graminea* are common in forests, and *P. trullifolia* plentiful on moorlands and dry open ridges in the bush. *P. micromega* is a rare swamp-orchid; *P. barbata*, another rare plant. So far the latter two are only known in this district near Kaitaia. *Acianthus*, a very small plant, is one of the commonest orchids we have; it is usually found in humus in the bush. *Cyrtostylis*, a small delicate orchid, is not uncommon; usually on dry ridges. *Calochilus paludosus* is another rather rare orchid; Kaitaia is one of the six places in the Dominion from which it has been reported. On clay hills from Kaitaia to Fairburn occurs a slender form of *Caladenia minor*, which Mr. Cheeseman has distinguished as var. *exigua*. Another of Mr. Matthews's discoveries was *Chiloglottis formicifera*, previously only known from eastern Australia. *C. cornuta* also occurs, but is not common.

* "Manual of New Zealand Flora," p. 668.
† *Ibid.*, p. 677.

Of *Corysanthes*, six of the seven species occur. The flower resembles a helmet in shape, and is, as a rule, of a deep-purple colour. They are all shade-loving plants. In the Manual *C. Cheesemanii* is reported from "Kaitaia; vicinity of Auckland; Westport." This is a small plant, easily overlooked, and probably not uncommon in open bush and scrub throughout. I found a few specimens at Mauku, in Manukau County; it occurs also in Fairburn, but is rare. Of *C. Matthewsii*, originally found at Kaitaia, I have specimens gathered by Mr. A. Thompson at Aponga; it is not uncommon on mossy slopes near Fairburn. *C. oblonga* is not uncommon on clay banks and slopes. *C. rivularis*, in my opinion the handsomest of the genus, is very local; so far I have only seen it in one spot in Mangonui County, between Fairburn and Peria. *C. rotundifolia* is plentiful, though rather local; its favourite habitat is on banks of bush-creeks, or on rocks in the bed of the creek. *C. triloba*, which in many places in common, is rare in this district; Mr. Matthews found two or three specimens, young plants only, near Kaitaia.

Gastrodia sesamoides was found by Mr. Matthews near Kaitaia and Tauroa, the only places in Mangonui County from which it has been reported.

Orchidaceae.

Dendrobium Cunninghamii Lindl. On upper branches of trees; common.
Bulbophyllum tuberculatum Col. On upper branches of trees, Kaitaia and Fairburn; probably not uncommon throughout.
Bulbophyllum pygmaeum Lindl. On branches and stems of trees; common.
Earina mucronata Lindl. A common epiphyte.
,, *suaveolens* Lindl. Less common than above.
Sarchochilus adversus Hook. f. On trunks and branches of trees; common.
Spiranthes australis Lindl. In swamps, Kaitaia; Waipapakauri; Rangaunu Heads.
Thelymitra ixioides Swz. Kaitaia, common; near Victoria Valley, rare.
,, *longifolia* Forst. Moorlands; common.
,, *intermedia* Bergg. Kaitaia; Fairburn; not uncommon.
,, *pulchella* Hook. f. Moorlands; common.
,, *imberbis* Hook. f. Moorlands; not uncommon.
Orthoceras strictum R. Br. Not uncommon throughout.
Microtis porrifolia R. Br. Plentiful.
Prasophyllum Colensoi Hook. f. On clay hills; not uncommon.
,, *pumilum* Hook. f. On clay hills; not uncommon.
Caleana minor R. Br. On clay hill, Kaitaia; rare.
Pterostylis Banksii R. Br. Abundant in forests.
Pterostylis graminea Hook. f. Fairburn; vicinity of Kaitaia; not uncommon.
Pterostylis micromega Hook. f. Kaitaia; rare.

Pterostylis trullifolia Hook. f. Dry ridges in forest, and on moorland; common.
Pterostylis barbata Lindl. In damp soil among *Leptospermum*, near Kaitaia; rare.
Acianthus Sinclairii Hook. f. Abundant in forests.
Cyrtostylis oblonga Hook. f. Scattered throughout the district.
Calochilus paludosus R. Br. Kaitaia; rare.
Caladenia minor Hook. f. Moorlands and open scrub; common.
„ „ var. *exigua* Cheesem. Kaitaia; Fairburn.
Chiloglottis cornuta Hook. f. Kaitaia; Fairburn; not common.
„ *formicifera* Fitzg. Kaitaia; rare.
Corysanthes Cheesemanii Hook. f. Kaitaia; Fairburn.
„ *Matthewsii* Cheesem. Kaitaia; Fairburn.
Corysanthes oblonga Hook. f. On damp clay banks throughout.
Corysanthes rivularis Hook. f. Fairburn, in wet part of open forest; not common.
Corysanthes rotundifolia Hook. f. On rocks and creek-banks; not uncommon.
Corysanthes triloba Hook. f. Kaitaia; rare.
Gastrodia sesamoides R. Br. In shaded gully near Kaitaia, rare; edge of swamp, Tauroa.

Carse's *Earina mucronata* with the broader leaves, etc, was named *E.aestivalis* by Cheeseman. The *Thelymitra ixioides* referred to here is an as yet unnamed plant having an affinity with the Australian *T.ixioides*. *Caladenia minor* var. *exigua* is now recognised as *C.alata*. *Chiloglottis formicifera* is now regarded as extinct in New Zealand. *Corysanthes Matthewsii* is now included in *C.carsei*.

From Aston BC. List of Phanerogamic Plants Indigenous in the Wellington Province. 1910. XXXXIII: 225-247.

79. Orchidaceae.

Dendrobium Cunninghamii Lindl. Dec.–Feb. Ascends from sea-shore to 2,000 ft.
Bulbophyllum tuberculatum Col. April–May. Palmerston North (Hamilton).
pygmaeum Lindl. Nov.–Feb. Happy Valley Bay. Ascends to 1,500 ft.
Earina mucronata Lindl. Oct.–Dec. Ascends to 2,000 ft.
suaveolens Lindl. Mar.–June. Ascends to 2,000 ft.
Sarcochilus adversus Hook. f. Oct.–Nov.
Spiranthes australis Lindl. Jan.–Feb. Bog near Erua, 2,600 ft. (P. Turner).
Thelymitra longifolia Forst. Nov.–Dec. Ascends to 4,000 ft.
decora Cheesem. Jan. Volcanoes; Taumarunui (T. F. C.); Kaimanawas. 2,500–3,700 ft.
venosa R. Br. Mungaroa Swamp (T. K., Petrie).
uniflora Hook. f. Dec.–Jan. Volcanoes (T. F. C.). Ascends to 3,500 ft.
Orthoceras strictum R. Br. Dec.–Feb. Ascends to 2,500 ft.
Microtis porrifolia R. Br. Oct.–Dec. Ascends to 2,500 ft.
Prasophyllum Colensoi Hook. f. Nov.–Jan. Ascends to 5,000 ft. on Kaimanawas.
rufum R. Br. Feb. Day's Bay; Kaitoke; Waimarino, at 2,900 ft. (Turner).
Pterostylis Banksii R. Br. Oct.–Nov. Ascends to 3,500 ft.
graminea Hook. f. Sept.–Nov.
micromega Hook. f. Dec.–Jan. Murimotu (Petrie); Wairarapa (Col.).
foliata Hook. f. Dec.–Jan. Ruahine Mountains and Cape Palliser (Col.); Kaitoke. Ascends to 2,500 ft.
venosa Col. Ruahine Mountains (Olsen). 2,000–3,500 ft.
trullifolia Hook. f. Kaitoke (V. Phillips, B. C. A.).
barbata Lindl. Oct.–Nov. Kaitoke (V. Phillips, B. C. A.); Day's Bay (Atkinson, Morrison).
Acianthus Sinclairii Hook. f. May–Aug. Kapiti Island (Cock.). Ascends to 2,500 ft.
Cyrtostylis oblonga Hook. f. Aug.–Oct. Kaitoke (V. Phillips). Ascends to 2,500 ft.
Calochilus paludosus R. Br. Upper Hutt (E. H. Atkinson).
Lyperanthus antarcticus Hook. f. Dec.–Feb. Tararua Mountains. 3,000–4,000 ft.
Caladenia minor Hook. f. Sept.–Dec. Kaitoke. Ascends to 2,000 ft.
bifolia Hook. f. Dec.–Jan. Tararua Mountains; volcanoes (T. F. C.). Ascends to 4,500 ft.
Chiloglottis cornuta Hook. f. Oct.–Dec. Kaitoke; Kaimanawa Mountains. Ascends to 3,000 ft.

Adenochilus gracilis Hook. f. Nov.–Jan. Between Ohakune and Ruapehu (Turner). 500–2,500 ft.
Corysanthes rotundifolia Hook. f. Sept.–Dec. Ascends to 2,500 ft.
triloba Hook. f. July–Sept. Ascends to 4,000 ft. on Kaimanawa Mountains.
macrantha Hook. f. Oct.–Dec. Ascends to 3,500 ft. on Kaimanawa Mountains.
Gastrodia sesamoides R. Br. Dec.–Jan. Tauherenikau Valley. Ascends to 1,500 ft.
Cunninghamii Hook. f. Nov.–Jan. Ascends to 2,000 ft.

From Crosby Smith J. Notes on the Botany of Lake Hauroko District. 1910. XXXXIII: 248-253.

Orchidaceae.

Dendrobium Cunninghamii. Common.
Earina suaveolens. Common.
mucronata. Common.
Corysanthes rotundifolia. End Peak bush.
rivularis. End Peak bush.
Caladenia Lyallii. Hump.
Lyperanthus antarcticus. Hump.
Gastrodia Cunninghamii. Hump.

From Speight R, Cockayne L, Laing RM. The Mount Arrowsmith District: a Study in Physiography and Plant Ecology. 1910. XXXXIII: 315-378.

ORCHIDACEAE.

Microtis unifolia (Forst. f.) Reichenb.	.. Steppe.
Prasophyllum Colensoi Hook. f.	.. Steppe.
Pterostylis mutica R. Br.	.. Steppe.
Corysanthes (*macrantha* Hook. f.) ? ..	.. Totara forest.

From Laing RM. Some Notes on the Botany of the Spenser Mountains, with a List of the Species collected. 1911. XXXXIV: 60-75.

Orchidaceae.

Thelymitra longifolia Forst. f.
Microtis unifolia (Forst. f.) Reichenb.
Prasophyllum Colensoi Hook. f.
Pterostylis Banksii R. Br.
Caladenia Lyallii Hook. f.
bifolia Hook. f.
Chiloglottis cornuta Hook. f.
Adenochilus gracilis Hook. f.
Corysanthes triloba Hook. f.
Gastrodia Cunninghamii Hook. f.

From Abstracts. 1911. XXXXIV: 32.

1. Die Gattung Townsonia *Cheesem.* By R. Schlechter. (Abstract from Fedde, Repertorium ix, pp. 249–250; 1911).

The genus *Townsonia* was originally published by T. F. Cheeseman in 1906 in the "Manual of the New Zealand Flora" (p. 691), and was placed in the vicinity of *Adenochilus* Hook. f. When Dr. Schlechter undertook a new arrangement of the *Polychondreae* (equivalent to the *Neottieae* of other authors) he was unable, through the absence of specimens, to decide on the exact relationships of the genus. Having received a copious suite from its describer, he has now been able to study it in detail. He has arrived at the conclusion that it is best placed between *Acianthus* R. Br., which is found in Australia and New Caledonia as well as in New Zealand, and *Stigmatodactylus* Maxim., which has three species in Japan, India, and Java respectively. At the same time, there is an undoubtedly strong resemblance to the subfamily *Caladeniinae* in the broadly winged column, a character which is not found in *Acianthus* and allied genera. On the other hand, the smooth labellum, devoid of any projections or protuberances beyond two obscure ridges at the base, and the habit of the plant, point towards the *Acianthineae*. A remarkable character, which is not shown by any *Acianthus*, is that the flowering-stems often produce offshoots which bear solitary radical leaves. The petals are much reduced in size, but this peculiarity is approached by some of the New Caledonian species of *Acianthus*, although not carried to the same extent. The elongated finger-like rostellum much resembles that of *Stigmatodactylus*.

As soon as specimens of *Townsonia* were examined, it was noticed that it was closely allied to *Acianthus viridis* Hook. f. from Tasmania. This led to a careful examination of the Tasmanian plant, which resulted in proving that it also was a genuine *Townsonia*, closely allied to but clearly distinct from the original *T. deflexa*. *Townsonia* will therefore rank as a typical austral-antarctic genus, with one species—*T. deflexa* Cheesem.—confined to the South Island of New Zealand, the other—*T. viridis* (Hook. f.) Schlechter—endemic in Tasmania.

T. F. C.

From Carse H. On some Additions to the Flora of the Mangonui County. XXXXV: 276-277. (1912)

Thelymitra Matthewsii Cheeseman sp. nov.

A dainty and apparently rare species, known only from a very restricted area between Lake Tangonge and the west coast. The small size and the curious spiral twist of the leaf distinguish it from its congeners. It was named in honour of the late Mr. R. H. Matthews, to whose painstaking investigation we owe so much of our increased knowledge of the orchids of the far north.

Thelymitra imberbis Hook. f.

Mr. H. B. Matthews, who is following in his late father's footsteps as an orchidologist, has recently discovered a variety of this orchid with pale cream-coloured flowers.

Caladenia minor Hook. f.

Mr. Matthews has also dropped on a *Caladenia* with greenish-yellow flowers, pink being the usual colour.

Corysanthes Carsei Cheeseman sp. nov.

This is a very tiny plant, ½–⅔ in. high, rather difficult to find. It occurs in wet peat associated with *Lycopodium Drummondii*, *Drosera spathulata*, *Utricularia delicatula*, &c. It was discovered by Mr. H. B. Matthews and myself in a morass adjoining Lake Tangonge.

From Poppelwell DL. Notes of the Botany of the Ruggedy Mountains and the Upper Fresh-water Valley, Stewart Island. 1912. XXXXV: 278-287.

the ixia-like orchid *Thelymitra uniflorum* (in full bloom).

Less common, but still tolerably plentiful, will be found *Gaultheria perplexa*, *G. erecta*, *Coprosma acerosa*, and *Caladenia Lyallii*. Here and there are stretches of drier ground covered with *Danthonia Raoulii*, the tussocks fairly tall, and the ground between them filled up with *Pratia angulata*, *Thelymitra longifolia*, and *Microtis unifolia*, with occasional specimens of *Prasophyllum Colensoi*.

From Poppelwell DL. Notes of a Botanical Excursion to Northern Portion of the Eyre Mountains. 1912. XXXXV: 288-293.

Orchidaceae.

Pterostylis Banksii R. Br. In beech forest.

From Poppelwell DL. Notes on the Botany of Routeburn Valley and Lake Harris Saddle. 1913. XXXXVI: 22-29.

Orchidaceae.

Thelymitra uniflora Hook. f. Subalpine bog.
Gastrodia Cunninghamii Hook. f. Beech forest.

From Aston BC. Notes on the Phanerogamic Flora of the Ruahine Mountain-chain, with a List of the Plants observed thereon. 1913. XXXXVI: 40-54.

Dendrobium Cunninghamii Lindl. In lower forest.
Earina mucronata Lindl. Ascending in forest to 2,600 ft.†
Thelymitra longifolia Forst. Ascending to 3,600 ft. in tussock meadow.
Prasophyllum Colensoi Hook. f. In tussock meadow, 3,600–4,450 ft.
Pterostylis Banksii R. Br. Ascending to 3,600 ft. on Mokai Ridge, in subalpine gullies.†
—— *australis* Hook. f. Ascending through higher forest from 2,700–3,700 ft.†
—— *foliata** Hook. f.
—— *venosa** Col.
Caladenia bifolia Hook. f. In tussock meadow and bog, 4,250–4,500 ft.
Chiloglottis cornuta Hook. f. On ridge in forest, 3,150 ft.
Corysanthes oblonga Hook. f.
—— *triloba* Hook. f. On wet banks, ascending to 4,200 ft.†
—— *macrantha* Hook. f. Ascending to 3,600 ft. on Mokai Ridge, in alpine gullies.†
Gastrodia Cunninghamii Hook. f. In lower forest at 1,900 ft.

Thelymitra longifolia Forst. At 3,500 ft.
Prasophyllum Colensoi Hook. f. Ascends to 5,300 ft.†
Pterostylis Banksii R. Br. At 3,500 ft.
Chiloglottis cornuta Hook. f. Ascends to 3,000 ft.
Corysanthes triloba Hook. f. Ascends to 4,200 ft.†
—— *macrantha* Hook. f. Ascends to 3,500 ft.†
—— *oblonga* Hook. f.

From Crosby Smith J. List of Phanerogamic Plants Indigenous in the Southland District. 1913. XXXXVI: 220-246.

ORCHIDACEAE.

Dendrobium Cunninghamii Lindl. Greenhills; common, Stewart Island.
Earina mucronata Lindl. Nov.–Feb. Common throughout virgin forests.
—— *suaveolens* Lindl. Feb.–Mar. Common throughout virgin forests.
Sarchochilus adversus Hook. f. Nov.–Dec. Tokonui, Stewart Island.
Thelymitra longifolia Forst. Dec.–Jan. Bluff (Kirk).
—— *pachyphylla* Cheeseman. Dec.–Jan. Abundant on damp ground.
—— *uniflora* Hook. f. Dec.–Jan. Abundant on damp ground.
Microtis porrifolia R. Br. Nov.–Jan. Abundant throughout fields.
Prasophyllum Colensoi Hook. f. Dec.–Feb. Common up to 4,000 ft.
Pterostylis Banksii R. Br. Nov.–Jan. Common in all shady forests.
—— *australis* Hook. f. Nov.–Jan. Common in all shady forests.
—— *graminea* Hook. f. Oct.–Nov. Hump forest, Stewart Island.
Lyperanthus antarcticus Hook. f. Dec.–Feb. Lower peak of The Hump, Longwoods, Stewart Island.
Caladenia minor Hook. f. Dec.–Jan. Golden Bay Track, Stewart Island.
—— *Lyallii* Hook. f. Dec.–Jan. Greenhills, Woodend, Stewart Island.
—— *bifolia* Hook. f. Dec.–Jan. Bluff, Woodend, Stewart Island.
Chiloglottis cornuta Hook. f. Nov.–Jan. Rather rare.
Adenochilus gracilis Hook. f. Nov.–Jan. Lake Hauroko forests, west of Lake Te Anau.
Corysanthes rivularis Hook. f. Oct.–Dec. Lake Hauroko forest, Stewart Island.
—— *rotundifolia* Hook. f. Oct.–Dec. Common in shady places.
—— *triloba* Hook. f. Sept. Bluff Hill, Longwood forest, Stewart Island.
—— *macrantha* Hook. f. Nov.–Feb. Lake Hauroko forest, Stewart Island.
—— *oblonga* Hook. f. Oct.–Nov. Stewart Island.
Gastrodia Cunninghamii Hook. f. Nov.–Jan. East and west sides of Longwoods, Greenhills, Lochy River valley, Stewart Island; rare.

From Aston BC. Plant-habitats Hitherto Unrecorded. 1914. XXXXVII: 67-70.

Dendrobium Cunninghamii Lindl. On forest-trees, Kapiti Island.
Earina mucronata Lindl. Waterfall Creek, Kapiti Island.
Thelymitra uniflora Hook. f. Kapiti Island.
Pterostylis australis Hook. f. Wharekahu Bay, Kapiti Island.
Caladenia minor Hook. f. On high spurs, Kapiti Island.
Chiloglottis cornuta Hook. f. In high forest, Kapiti Island.
Gastrodia Cunninghamii Hook. f. In forest, Kapiti Island.

Earina autumnalis Hook. f. Tukutuki River, Ruahine Mountains.
Microtis porrifolia R. Br. Ruahine Mountains, Kaimanawa Mountains.

From Poppelwell DL. Notes on the Plant Covering of the Garvie Mountains, with a List of Species. 1914. XXXXVII: 120-142.

the orchids *Pterostylis australis*, *P. Banksii*, *Corysanthes triloba*, and *Chiloglottis cornuta*.

On the decaying logs and among the humus of the forest floor there is a wealth of the orchids *Caledenia bifolia*, *Gastrodia Cunninghamii*, and *Adenochilus gracilis*.

Orchidaceae.

Thelymitra longifolia Forst. Common in open forest.
—— *uniflora* Hook. f. Common in open forest.
Microtis unifolia (Forst. f.) Rchl. Common in steppe meadow.
Prasophyllum Colensoi Hook. f. Common in steppe meadow.
Pterostylis Banksii R. Br. Not common; in damp forest
—— *australis* Hook. f. Not common; in damp forest.
Caladenia bifolia Hook. f. Abundant in Waikaia Valley forest.
Chiloglottis cornuta Hook. f. In forest; not plentiful.
Corysanthes rotundifolia Hook. f. Common in forest.
—— *triloba* Hook. f. Common in forest.
Gastrodia Cunninghamii Hook. f. Fairly common in forest.
Adenochilus gracilis Hook. f. Fairly common in forest.

From Cockayne L, Foweraker CE. Notes from the Canterbury College Mountain Biological Station No.4: The Principal Plant Associations in the Immediate Vicinity of the Station. 1915. XXXXVIII: 166-186.

ORCHIDACEAE.

Microtis unifolia (Forst. f.) Reichenb. (= *M. porrifolia* R. Br.)	Small summer-green tuberous herb	Tussock grassland; river-bed.
Pterostylis mutica R. Br. ..	Small tuberous herb ..	Tussock grassland.
Corysanthes macrantha Hook. f.	,, ..	Forest.

From Cockayne L. Some Hitherto-unrecorded Plant-habitats. 1915. XXXXVIII: 203-209.

Orthoceras strictum R. Br.

South Island: Marlborough—Open ground on dry hillside near Kenepuru Sound. L. C.

Pterostylis graminea Hook. f.

Salt's Gully, near Lyttelton. R. M. Laing.

Pterostylis foliata Hook. f.

Heathcote Valley. Miss Holdsworth.

From Carse H. Some Further Additions to the Flora of Mangonui County. 1915. XXXXVIII: 237-243.

17. Earina sp. nov.

This new orchid will be described shortly by Mr. Cheeseman. It occurs in several places in the district, but is by no means common, and elsewhere has been found sporadically as far south as Wellington.

18. Pterostylis barbata Lindl.

In open moorland, Peria. H. B. Matthews! Very rare. Previously reported from Kaitaia.

19. Pterostylis trullifolia Hook f. var. gracilis Cheesem.

Not uncommon in open woods and moorlands.

20. Calochilus paludosus R. Br.

Moorland, Kaimaumau. H. B. Matthews!
This orchid, which is very rare here, was also reported from Kaitaia.

From Poppelwell DL. Notes on the Plant-covering of the Breaksea Islands, Stewart Island. 1915. XXXXVIII: 246-52.

Orchidaceae.

Thelymitra longifolia Forst.
—— *uniflora* Hook. f.
Microtis unifolia (Forst. f.) Rchb.
Prasophyllum Colensoi Hook. f.
Pterostylis Banksii R. Br.
—— *australis* Hook. f.
Caladenia bifolia Hook. f.

From Poppelwell DL. Botanical Results of an Excursion to the Upper Makarora Valley and the Haast Pass, supported by a List of the Species observed. 1916. XXXXIX: 161-166.

ORCHIDACEAE.

Thelymitra longifolia Forst.
Microtis unifolia (Forst. f.) Reichb.
Prasophyllum Colensoi Hook. f.
Caladenia bifolia Hook. f.
—— *Lyallii* Hook. f.
Chiloglottis cornuta Hook. f.
Corysanthes rotundifolia Hook. f.
—— *triloba* Hook. f.
—— *macrantha* Hook. f.
Adenochilus gracilis Hook. f.
Gastrodia Cunninghamii Hook. f.
Pterostylus Banksii R. Br.
—— *australis* Hook. f.

From Poppelwell DL, Thomson WA. Notes of a Botanical Visit to Hollyford Valley and Martin's Bay, with a List of Indigenous Plants. 1917. L: 146-154.

ORCHIDACEAE.

Dendrobium Cunninghamii Lindl. Tolerably common.
Earina mucronata Lindl. Epiphytic on tree-trunks.
—— *autumnalis* (Forst. f.) Hook. Epiphytic; not common.
Pterostylis Banksii R. Br. In damp forest.
Thelymitra longifolia Forst. Martin's Bay.
Corysanthes macrantha Hook. f. Damp banks, &c.
—— *oblonga* Hook. f. Forest-floor.
Gastrodia Cunninghamii Hook. f. Beech forest.
Bulbophyllum pygmaeum Lindl. Rocks, Martin's Bay.

From Poppelwell DL. Notes of a Botanical Excursion to Bunkers Island (Stewart Island). 1917. L: 154-157.

ORCHIDACEAE.

Earina mucronata Lindl.
—— *autumnalis* (Forst. f.) Hook.
Thelymitra longifolia Forst.
Prasophyllum Colensoi Hook. f.

From Poppelwell DL. Notes on a Botanical Visit to Coll or Bench Island (Stewart Island). 1917. L: 158-159.

ORCHIDACEAE.

Earina mucronata Lindl.

From Petrie D. Descriptions of New Native Flowering-plants. 1917. L: 207-211.

6. Pterostylis areolata sp. nov.

Gracilis glabra ± 15 cm. alta. Folia pauca, caulina, sessilia, culmum amplectentia; inferiora scariosa squamiformia; superiora (plerumque 3) valde tenuia, in siccitate pellucida, lanceolata v. oblongo-lanceolata, acuta v. subacuta, plurinervia manifeste areolata, 3·5–4 cm. longa 1 cm. lata; culmo folium summum longe excedente. Flores solitarii 3·5 cm. longi ± 1·5 cm. lati. Galea pro parte majore erecta, pro parte tertia recurva; sepalum superius in apicem brevem acutum haud filiformem desinens, petalis acutis paulo longius; labii inferioris divisurae anguste obcuneatae, in apices subulato-filiformes summam galeam haud excedentes desinentes; labium subcrassum lanceolato-oblongum subacutum; columna gracilis elongata galeae partem erectam aequans.

Slender, glabrous, ± 15 cm. (6 in.) high. Leaves 4 or 5 (in the specimens seen), rather distant, sessile and sheathing the stem; the lower reduced to scarious sheathing scales; the upper very thin, pellucid when dried, 3·5–4 cm. (± 1½ in.) long, 1 cm. (± ⅜ in.) broad, lanceolate or oblong-lanceolate, acute or subacute, entire, narrowed towards the base, with conspicuous veins running nearly straight along their whole length and connected by delicate more or less oblique veinlets into an open network; the uppermost leaf placed about half-way up the stem and reaching about half-way up to the flower. Flowers solitary, 3·5 cm. (± 1½ in.) long, ± 1·5 cm. (⅝ in.) broad, green more or less streaked with reddish-brown; galea erect for two-thirds its length, then sharply bent forwards; upper sepal ending in a short more or less acute non-filiform tip, a little longer than the acute petals; lower lip narrow-cuneate for nearly half its length, forking widely into narrow obcuneate subulate-filiform-tipped lobes that do not exceed the top of the galea; lip brownish when dried, rather thick and firm, lanceolate-oblong, subacute with exserted tip; column slender, as long as the erect part of the galea, the lower lobe of its wings large long obtuse.

Hab.—Base of Shingle Peak, Awatere Valley, Marlborough; 3,000 ft.; in shade: L. Cockayne! Bealey, Waimakariri Valley, Canterbury: T. Kirk!

This appears to be a well-marked species. The late Mr. Kirk referred his specimens, which are in fruit and are rather stouter than Dr. Cockayne's, to *P. micromega* Hook. f., but they are destitute of radical leaves, while the cauline leaves are much larger and broader than those of *P. micromega*, and do not extend above the middle of the stem. As I have seen only dried specimens, the details of the structure of the column may be imperfectly sketched here.

From Petrie D. Descriptions of New Native Flowering-plants. 1919. LI: 106-107.

4. Thelymitra caesia sp. nov.

T. pulchellae Hk. f. affinis; differt floribus subcoeruleis, sepalis petalisque acutis, columnae lobo posteriore bifido ac apice subcrenulate incrassato, lobis lateralibus latis valde complanatis brevioribus insuper a marginibus subpectinate fimbriatis.

Stems moderately slender, 65 cm. high or less. Leaves shorter than the stem, variable in length, long-sheathing at the base, linear, fleshy, concave above, shining light green, midrib obscure. Cauline bracts usually two, thin, short, sheathing for most of their length, rather abruptly acuminate; floral thin, lanceolate-acuminate, slightly exceeding the peduncles. Flowers about five, laxly racemose, shortly pedunculate, large (± 2½ cm. across); sepals and petals ovate or ovate-lanceolate, acute (sepals slightly the longer), lavender-coloured but closely streaked with deep blue; lip broader, paler, sharply narrowed above and less acute. Column stout, broadly winged, much shorter than the perianth, 3-lobed; posterior lobe bifid, shorter than the anther, its divisions truncately obtuse, thickened and slightly incurved along their somewhat wavy brownish-yellow tops; lateral lobes short but equalling the anther, forming broad thin flattened plates, subpectinately fimbriate along the upper margins, the fimbriate processes more or less cut into very short hair-like subdivisions; anther broad, connective produced into a short slightly grooved tip.

Hab.—Birkdale-Glenfield Reserve, Waitemata County. Flowers late November and early December.

This species was collected recently by Mr. H. B. Matthews, who has for several years devoted much time and attention to hunting up the native orchids, with quite remarkable enthusiasm, acuteness, and success. To him I am indebted for the specimens examined and for a note of the tint of the leaves and the colour of the perianth. When the species is better known the range in stem-height and in the number of flowers may be greater than the present description discloses. The species is clearly a fairly close ally of *T. pulchella* Hk. f.

From Laing RM. The Vegetation of Banks Peninsula, with a List of Species (Flowering Plants and Ferns). 1919. LI: 355-408.

Spiranthes australis.—Not known elsewhere on the east coast of this Island.

Family Orchidaceae.

Earina mucronata Lindl. [J. F. A.; J. B. A.; L. C.]
I am not certain that I have seen this species. It is certainly less common than the following.

Earina suaveolens Lindl. [J. B. A.]
Not uncommon in rocky clefts.

J. B. A. records also (1)*Dendrobium Cunninghamii*, but I have not seen it.

**Spiranthes australis* Lindl.
Banks Peninsula: J. B. A.!
Several specimens labelled as from Banks Peninsula are in the Canterbury Museum. In the *Lyttelton Times* of the 6th April, 1918, in the column "From Nature's Book"† appears the following: "Mr. J. B. Armstrong . . . reports that *Spiranthes australis* was very common on the Lake Ellesmere flats before they were drained. Both the red and white variety may be found there still."

Thelymitra longifolia Forst. [J. F. A.; L. C.]
Castle Rock; Sugarloaf, &c.; but becoming less common.

J. B. A. includes (2)*T. uniflora*, which I have not seen.

Microtis unifolia Reichenb. [J. B. A.; L. C.]
Not uncommon.

Prasophyllum Colensoi Hook. f. [J. F. A.]
Castle Rock, above 2,500 ft.; Lyttelton (?): R. M. L.

Pterostylis Banksii R. Br.
Not uncommon in the forest and heath.

**Pterostylis australis* Hook. f.
Waikerikikeri; Checkley's Bush, Akaroa; and probably elsewhere.

Pterostylis graminea Hook. f.
Waikerikikeri; Castle Rock; Lyttelton.

(1)*Pterostylis foliata* Hook. f. (?).
Heathcote Valley. One specimen only seen, collected by Miss E. Holdsworth, and thus identified by Cheeseman: "I believe, however, that it is *P. foliata*, of which it has the sheathing bracts and short lateral sepals."

(²)*Cyrtostylis oblonga* is recorded by J. B. A.

**Caladenia minor* Hook. f. [J. B. A.]
Akaroa: Miss M. Fyfe!

Corysanthes triloba Hook. f. [J. F. A.; J. B. A.; L. C.]
Not uncommon in damp shady spots.

**Corysanthes macrantha* Hook. f. [J. F. A.; J. B. A.]
Castle Rock.

Gastrodia Cunninghamii Hook. f. [J. B. A.]
Okute Valley, and probably elsewhere. It has been reported to me from Akaroa, and near Tai Tapu, but I have not seen specimens.

Other orchids reported by J. B. A. are (²)*Dendrobium pygmaeum*, (¹)*Corysanthes rotundifolia*, (²)*C. rivularis*, (²)*Lyperanthus antarcticus*, (²)*Caladenia Lyallii*; and by J. F. A., (²)*Corysanthes oblonga*.

From Herriott EM. A History of Hagley Park, Christchurch, with Special Reference to its Botany. 1919. LI: 427-447.

Microtis porrifolia R. Br.	..	..	.. Common in Domain.
Pterostylis Banksii R. Br.	..	..	.. Swamp only.
Thelymitra longifolia Forst.	..	..	.. Common in dry places.

New Zealand Plants found now in Hagley Park.

Orchidaceae:
(*Microtis porrifolia.*)

From Poppelwell DL. Notes on the Indigenous Vegetation of the North-eastern Portion of the Hokonui Hills, with a List of Species. 1920. LII: 239-247.

ORCHIDACEAE.

Earina mucronata Lindl. Not plentiful.
Thelymitra longifolia Forst. Common.
—— *uniflora* Hook. f. Common on banks, &c.
Microtis uniflora (Forst. f.) Rochb. Common in steppe meadow.
Prasophyllum Colensoi Hook. f. Common in steppe meadow.
Pterostylis Banksii R. Br. Not common.
—— *australis* Hook. f. Fairly abundant in damp meadow.
Caladenia bifolia Hook. f. In manuka heath.
—— *Lyallii* Hook. f. In manuka heath at 1,000 ft.
Corysanthes rotundifolia Hook. f. Common on creek-banks.
—— *macrantha* Hook. f. Damp places in forest.
—— *triloba* Hook. f. Damp places in forest.

From Poppelwell DL. Notes on the Indigenous Vegetation of Ben Lomond, with a List of Species. 1920. LII: 248-252.

ORCHIDACEAE.

Corysanthes macrantha Hook. f. Creek-banks.
Gastrodia Cunninghami, Hook. f. Rare.

Rogers RS. *Petalochilus* - a New Genus of New Zealand Orchids. 1926. 56: 16-18.

PETALOCHILUS nov. gen.

Herbae terrestres, hirsutae, tuberibus globulosis parvis, caule simplici 1-foliato. Folium ad basin, lineare. Flores pedicellati, 1 vel 2. Segmenta perianthii subaequilonga, fere similia, angustiuscula; posticum erectum vel leviter incurvum, cetera plana et patentia. *Labellum ceteris segmentis simile* sed breviusculum. Columna elongata, leviter incurva; in parte superiore late alata; inferiore anguste alata. Anthera suberecta, bilocularis, mucronata; pollinia pulverea; caudiculae nullae. Stigma sub antheram, concavum.

Species nobis notae 2, Novae Zelandiae incolae.

Leaf basal, linear. Flowers pedicellated, 1 or 2. Segments of perianth subequal, similar, rather narrow; the dorsal one erect or slightly incurved over the column, the others flat and spreading; labellum similar to the other segments but slightly shorter. Column elongated, slightly incurved, widely winged above, narrowly below. Anther suberect, 2-celled, mucronate; pollinia powdery; caudicles absent. Stigma concave, just below the anther.

Terrestrial hairy herbs, with small globular tubers.

The outstanding feature of the new genus is, of course, the ancestral form of the labellum.

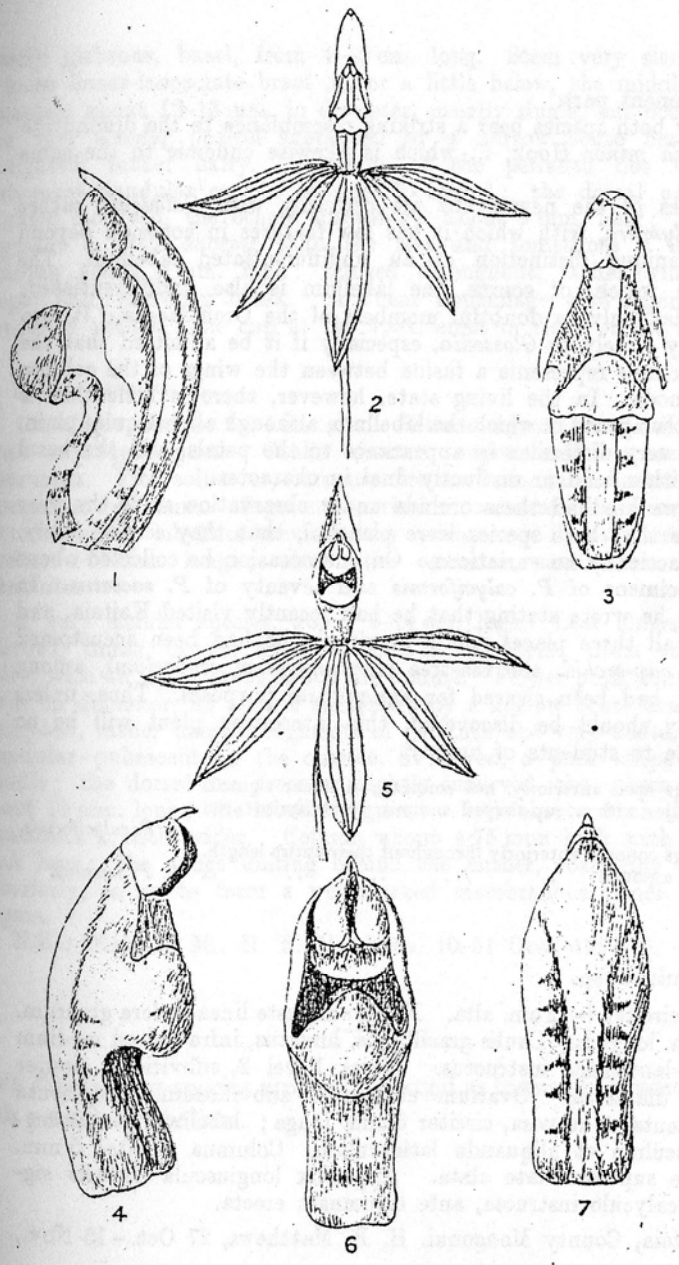
The excellent vernacular names, *cup* and *pouch orchid*, originally applied by the discoverer, Mr. H. B. Matthews, have been latinized and retained as specific designations for its two representatives.

The plants are endemic to New Zealand, and, so far as is known, are restricted to the neighbourhood of the little town of Kaitaia, situated in the extreme north-east of the Dominion.

The peculiar appendage in the first species is probably staminodial in origin, and occupies the position of stamen a_3 of the inner whorl. In *P. saccatus* the size and shape of the capacious pouch suggest that the wings of the column are not its sole constituents, but that the staminode

FIGS. 1–3.—*P. calyciformis.* FIGS. 4–7.—*P. saccatus.*

1. Column from the side, showing appendage; 2, front view of the flower (the artist has represented the labellar segment too long); 3, column from the front, showing appendage; 4, column from side, showing anterior union of the columnar wings; 5, front view of flower (the artist has shown the labellar segment too long); 6, column from the front, showing the union of the wings to form a pouch; 7, column from the back. All details much enlarged.



is also a component part.

Superficially both species bear a striking resemblance to the diminutive orchid *Caladenia minor* Hook. f., which is likewise endemic to the same islands.

The affinities of the new genus are certainly with *Caladenia* rather than with *Thelymitra*, with which it has few features in common beyond the hitherto unique distinction of an undifferentiated labellum. The Apostasieae, in which, of course, the labellum is also undifferentiated, must be regarded only as doubtful members of the Orchidaceae. It also approaches very closely to *Glossodia*, especially if it be admitted that the pouch in *P. saccatus* represents a fusion between the wings of the column and the staminode. In the living state, however, there is little that is reminiscent of that genus in which the labellum, although almost quite plain, is nevertheless very dissimilar in appearance to the petals, and the basal appendage is either bifid or distinctly dual in character.

Mr. Matthews has had these orchids under observation since the year 1912. He says that both species were plentiful, that they seeded freely, and showed practically no variations. On one occasion he collected about a hundred specimens of *P. calyciformis* and seventy of *P. saccatus*. In January, 1919, he wrote stating that he had recently visited Kaitaia, and found that in all three places where previously he had been accustomed to collect the *cup-orchid*, the tea-tree (*Leptospermum scoparium*), among which it grew, had been cleared for agricultural purposes. Thus, unless a fresh locality should be discovered, this interesting plant will be no longer available to students of botany.

Column-wings open anteriorly, not connate; a linear sigmoid appendage, with a cup-shaped summit, erect against the column	1. *P. calyciformis.*
Column-wings connate anteriorly throughout their entire length, forming a pouch	2. *P. saccatus.*

1. P. calyciformis n. sp.

Gracillima, circiter 7–22 cm. alta. Folium anguste lineare, fere glabrum, circiter 4–15 cm. longum. Caulis gracillimus, hirsutus, infra vel ad medium bractea lineari-lanceolata instructus. Flores 1 vel 2, subvirides, circiter 12–13 mm. in diametro. Ovarium elongatum subvillosum. Segmenta perianthii subacuta, 5-nervosa, circiter 6 mm. longa; labellum ceteris segmentis breviusculum et aliquando latiusculum. Columna circiter 5 mm. longa, in parte superiore late alata. Appendix longiuscula linearis sigmoidea, apice calyculo instructa, ante columnam erecta.

N.Z.: Kaitaia, County Mongonui, H. B. Matthews, 27 Oct.–15 Nov., 1916.

A very slender plant, about 7–22 cm. high. Leaf very narrow linear, nearly glabrous, basal, from 4–15 cm. long. Stem very slender, hairy, a loose linear-lanceolate bract at, or a little below, the middle. Flowers greenish, about 12–13 mm. in diameter, usually single, but occasionally 2, the very slender pedicel subtended by a narrow acute bract. Ovary elongated, rather hairy. Segments of the perianth not very acute, pubescent-glandular on the outside, 5-nerved; the dorsal one erect or slightly incurved, the others spreading; about 6 mm. long; the labellar segment a little shorter than the rest and sometimes a little wider. Column about 5 mm. high; winged throughout, rather widely in the upper half, narrowly below. A linear appendage with sigmoid flexure, furnished with a little cup at the apex, erect in front of the column.

2. P. saccatus n. sp.

Gracillima, circiter 7–14 cm. alta. Folium anguste lineare, fere glabrum, cauli subaequilongum. Caulis hirsutus, supra medium bractea acuta instructus. Flos solitarius, carneus, circiter 2 cm. in diametro. Ovarium elongatum, villosum. Segmenta perianthii subacuta, 5-nervosa, circiter 10 mm. longa; labellum breviusculum et aliquando latiusculum. Columna circiter 4·75 mm. longa; alae antice connatae, saccum membranaceum formantes.

A very slender species, about 7–14 cm. high. Leaf almost glabrous, narrowly linear, usually about as long as the stem. Stem very slender, hairy, with an acute bract above the middle. Flower pink, solitary, about 2 cm. in diameter, its pedicel subtended by a narrow acute bract. Ovary elongated, rather hairy. Segments of perianth not very acute, the sepals glandular-pubescent on the outside, 5-nerved, a pink stripe down the middle; the dorsal one erect or slightly incurved, the others spreading; about 10 mm. long; the labellar segment a little shorter than the rest and sometimes a little wider. Column about 4·75 mm. high with transverse pink bars; the wings uniting behind the anther, coalescing throughout anteriorly, so as to form a well-marked membranous pouch below the stigma.

N.Z.: Kaitaia, Mr. H. B. Matthews, 10–31 Oct., 1917.

Both *Petalochilus* species are now regarded as forms of *Caladenia minor* with a petaloid labellum.

From Cockayne L and Allan HH. Notes on New Zealand Floristic Botany, including Descriptions of New Species. 1926. 56: 21-33.

64. Pterostylis confertifolia Allan sp. nov.

Herba terrestris glabra, ± 7 cm. alta; erecto caule e tubere pisiforme ± 7 mm. diam. Folia conferta caulem amplectantia, inferiora scariosa squamiforma, obtusa, superiora plerumque 3, erecto-patentes, pallide viridia, paulo crassa, in siccitate tenuiora; laminae 3–5 cm. longae, 1·5–2 cm. latae, elliptico-ovatae, obtusae, venis per vitam obscuris, marginibus paulo incurvatis, basim versus in vaginas latas albas angustatae. Flores solitarii, virides, venis rubris, vix folia excedentes, aliquanto in fructu increscentes, ± 2 cm. longi, ovario obovoideo ± 1·5 cm. longo excepto. Galeae erectae usque ad ± 12 mm., deinde arcuatae, apicibus acutis. Petala lateralia in inferioribus dimidiis linearo-oblonga, in superioribus falcata, acuta. Sepala lateralia linearia, usque ad ± 8 mm. connata, deinde in lobos 2, ± 1·2 cm. longos, erectos, acuminatos producta. Labellum subcrassum, latericium, linearo-oblongum, marginibus minute serrulatis; in canaliculatum, minute retusum, paulo exsertum apicem angustatum. Unguis curvatus, apice 2 longis et aliquis brevibus satis latis filamentis ornatus. Columna gracilis, galeam partem erectam aequans; auriculae decurrentes, superioribus lobis late triangularis, apice breviter acuminatis; inferioribus lobis late oblongis, obtusis, apice mollibus pilis vestitis.

North Island: Wellington Botanical District—On margins of subalpine scrub, and in lower subalpine herb-field, about 1,200 m. altitude, Ruahine Mountains, near Apiti: H. H. A.

Though coming into the group containing *P. Banksii*, *P. australis*, *P. graminea*, that have cauline leaves only, this species is very distinct. So crowded are the broadly elliptic-ovate, obtuse leaves that superficially the species more closely resembles the *P. foliata* group. The plant grows in small colonies, and when growing through moss cushions the stems may be much elongated.

Pterostylis confertifolia is now identified with *P.venosa.*

From Andersen JC. Popular Names of New Zealand Plants. 1926. 56: 659-714.

Bolbophyllum pygmaeum:
pygmy bolbophyllum

Bulbophyllum pygmaeum:
piripiri

Caladenia Lyallii:
Lyall's caladenia

Caladenia minor:
lesser caladenia

Corysanthes macrantha:
large-flowered corysanthes
large-flowered spider-orchid
*silverback

Corysanthes rotundifolia:
round-leaved spider-orchid

Dendrobium Cunninghamii:
common dendrobe
Cunningham's dendrobium

Earina autumnalis:[1]
*raupeka
*fragrant earina
sweet-scented earina

Earina mucronata:
*pekaawaka
pointed-leaved earina
sharp-pointed earina
*(sharp-leaved earina)

Earina suaveolens. See *E. autumnalis.*

Gastrodia Cunninghamii:
*huperei
maukuuku
para (= tuber used as food)
perei
uhiperei
Cunningham's gastrodia

Microtis porrifolia:
onion-leaved microtis
*onion-leaved orchid

Microtis unifolia:
maikaika
onion-leaved orchid

Orthoceras Solandri:
*ikaika
Solander's orthoceras

Orthoceras strictum:
maikaika
*mamaika
para (=tuber used as food)
paratawhiti

Pterostylis Banksii:
*tutukiwi
Banks' pterostylis
common hooded orchid
hooded orchid
*(elfs-hood)

Pterostylis graminea:
grass-like hooded orchid
narrow-leaved hooded orchid

Thelymitra longifolia:
*maikuku
common thelymitra
long-leaved thelymitra

Thelymitra pulchella:
*maikaika

Thelymitra uniflora:
blue thelymitra
*(blue maikuku)