

6. Dichotomous branching from node. Sections of basal internode and the next two above, as seen by the naked eye. (Three times nat. size.)
 - a. Limiting tissue.
 - b. Cortical tissue.
 - c. Inner tissues.
 - d. Cavity containing saline solution.
7. Dichotomous branching from node.
- 8a. Polychotomous branching from node. Front view.
 - a, b, etc., mark the same branches as in fig. 8b.
- 8b. Ditto. View from above.
 - a, b, etc., mark the same branches as in fig. 8a.
9. Lateral branching from node and internode.

ART. XL.—*A Visit to Stewart Island, with Notes on its Flora.*

By D. PETRIE, M.A.

[Read before the Otago Institute, 29th June, 1880.]

IN the month of January of this year Mr. G. M. Thomson and I made a short excursion to Stewart Island for the purpose of dredging in the inlets, and examining, as far as we could, the flora of that little-known part of New Zealand. Our examination of the flora was confined to the country around Paterson's Inlet, and that in the neighbourhood of Port Pegasus.

Paterson's Inlet is for the most part comparatively shallow, and extends more than half-way across the greatest breadth of the island. It is surrounded on nearly all sides by hills of moderate elevation, with rather steep slopes that are clothed with "bush" to the water's edge. At the head or north-western extremity of the inlet however, it is bordered by a low tract some three miles in width, which is difficult of access except near high water, in consequence of extensive shoals. From this part of the inlet there extends for a good many miles to the westward a flat swampy area, some three miles or less in average width, and raised but little above sea-level. It is drained by a forked creek, which is tidal in its northern branch for at least six miles. About six miles from the inlet this flat area is connected by a rather narrow, low, boggy valley bending to the south, with a similar area of low swampy land abutting on Mason Bay and the west coast of the island. The distance from sea to sea is probably about thirteen miles. Sand-hills occur at intervals throughout the flat areas at the head of the inlet and Mason Bay respectively, but they do not extend into the connecting valley. It is evident that at no remote date a strait here ran across Stewart Island, separating the high land in the north, of which Mount Anglem is the culmi-

nating point, from the southern portion. I believe that a depression of fifty or sixty feet would suffice to restore this strait, and part Stewart Island once more into two. At the head of the inlet the sand-hills present a very remarkable appearance, forming parallel chains that run for two or three miles in straight or nearly straight lines at considerable distances from one another. Their singular arrangement is not easy to explain, but it may be due to the fact that the direction of the prevailing winds, and of the tidal flow through the former strait, would be east and west. Though the sand-hills are evidently of recent origin, they are everywhere covered by about six inches of sandy mould, and overgrown by fern, heath, gravels, rushes, and manuka.

With the exception of the already-mentioned flat areas, there is no grass-covered land in the neighbourhood of Paterson's Inlet. Even in these the grass is very sparse, except in a few patches of no great extent, and it is mixed with a very copious growth of manuka, ferns, (*Pteris*, *Gleichenia*, *Lindsaea*, and *Schizea*), *Carpha*, *Calorophus*, *Cladium*, and *Lepidosperma*. In the boggy parts, which occupy by far the largest portion of the low land, a curious assemblage of alpine plants is found, comprising *Alepyrum*, *Oreobolus*, *Donatia*, *Helophyllum*, *Liparophyllum*, and *Actinotus* (*Hemiphues*).

The *Liparophyllum*, probably *L. gunnii* (hitherto known only from Tasmania), is extremely abundant in the wettest parts, and forms a strong turf, held together by its matted and branched root-stocks. It bore abundant fruit, though the latter was scarcely ripe at the time of our visit.

The plant which I have named *Actinotus* (*Hemiphues*) *novæ-zealandiæ* belongs to a genus hitherto found only in the alpine parts of Tasmania and Australia. It grows abundantly side by side with *Liparophyllum*, but affects somewhat drier situations. The genus *Actinotus* (*Hemiphues*), which includes this new addition to the flora of New Zealand, belongs to a section of the great natural order of the Umbelliferæ. It differs very widely from every other genus of that order, and occupies a singularly isolated position. Instead of having two similar mericarps, like the rest of the Umbelliferæ, Dr. Hooker tells us that one of the mericarps appears as if wholly suppressed, but his dissections have satisfied him that it is not really suppressed, but "is entirely incorporated with the others, and its cavity obliterated."

I had the good fortune some three years ago to discover on Stewart Island both *Liparophyllum* and *Actinotus* (*Hemiphues*), but I was not at the time able to identify them. Some months before this excursion was undertaken, Mr. Kirk, F.L.S., of Wellington, pointed out to me the close resemblance *the one* bore to the *Liparophyllum* of Tasmania. The *Actinotus* (*Hemiphues*) we are able to identify from the structure of the fruit, and of a withered flower found at Port Pegasus. It seems to me probable that

another species of *Actinotus* (*Hemiphues*) occurs in the same localities, but by no means in such abundance as *A. (H.) novæ-zealandiæ*. The plant in question was found only in fruit, the structure of which presented all the characteristics of the genus, and it will, I have little doubt, prove to be another species of this anomalous genus, probably new to science, and certainly new to the flora of New Zealand. It is worthy of remark that in Tasmania both *Liparophyllum* and *Actinotus* (*Hemiphues*) grow in alpine bogs and moist places, while in Stewart Island they flourish almost at sea level.

The occurrence of *Donatia novæ-zealandiæ* at the same low elevation is certainly surprising. It has not been found either in the bogs of Southland or on the Bluff Hill, which offers many situations favourable for its growth. The lowest elevation at which I have elsewhere met with it is 3000 feet, on the summit of Maungatua, near the Taieri Plain. Lyall found it on mountains near Preservation Inlet, but the height is not stated. It is extremely remarkable that a plant which does not descend below 3000 feet in the latitude of Dunedin should flourish at sea-level in that of Paterson's Inlet, and the fact bears emphatic testimony to the severity of the climate of Stewart Island.

Of the interesting plants found in this locality, I may next mention *Utricularia monanthos*, and *Eleocharis sphacelata*. The latter grew in two or three deep pools in peaty soil, and specimens were procured with considerable difficulty. It is singular that this species, which ranges from the extreme north of New Zealand to Stewart Island, should have been found in the South Island only in one or two spots in Westland and at Bluff Island, a locality at one time held to be very doubtful. *Utricularia monanthos* grows almost exclusively in pools, at the time of our visit for the most part dried to the consistency of sticky mud. Its rhizomes are abundantly provided with bladders similar to those of the European species, whose structure and functions have been investigated with great care and skill by Darwin. (See his "Insectivorous Plants.") This eminent naturalist was led to the conclusion that the bladders serve as traps for minute aquatic animals such as the Entomostraca, whose protoplasm is in some obscure manner made available for the nourishment of the plant. Mr. Thomson has examined roughly the structure and contents of the bladders attached to specimens gathered by us, and he informs me that remains of Entomostracans and other minute aquatic animals were present in all, sometimes in considerable quantity. Two other insectivorous plants were common here, viz., *Drosera binata* and *D. rotundifolia*. Insects are so frequently caught in the glandular hairs of their leaves that these herbs are known among the observant Southland settlers as "fly-catchers."

Some years ago an attempt was made to utilize the flat tracts between Mason Bay and Paterson's Inlet as a sheep run, and portions of the lower slopes of the hills were cleared, by burning, to extend the area of grass-bearing land. About six hundred sheep were placed on the ground, but they did not thrive, and few now survive the hardships of a life in this inhospitable locality. The country appears to be wholly unsuitable for depasturing sheep, unless considerable portions of the higher ground were cleared and sown with grass, an improvement that would involve a heavy outlay. A few spots of the low land grow grass luxuriantly, but much of it must be under water a great part of the year, and a very large proportion of the remainder is always inaccessible bog. Drifted grass and twigs caught in the branches of the manuka bushes indicated that floods, sufficient to inundate the greater part of the low country, are not unknown.

The grasses found here are of little value for pasturage. *Danthonia raoulii* (brown snow-grass) and *D. semi-annularis* were the most abundant, and the latter was by far the most widely spread. *Poa australis* (silver or white tussock) is by no means plentiful, and is dwarfed in size, and inclined to form a loose sward. The only other fodder grass of any consequence was *Danthonia quadriseta*. In general, the grass is extremely sparse, and is almost choked by the abundant growth of rush-like and Cyperaceous plants. There can, I think, be no doubt that this, the only open part of Stewart Island, is in its present condition wholly unsuitable for either agricultural or pastoral occupation. No doubt draining would make some improvement, but the fall is so slight, and the soil so saturated with frequent heavy rains, that general drainage would probably do but little good. However this may be, it will be a very long time before this part of Stewart Island will have any other resources than timber and the produce of its fisheries.

At the mouth of the inlet lies an island of considerable size called the Neck. It is connected by a sand-bank with the southern mainland, has a very fertile soil, and is occupied by a number of Maori and half-caste families. The sand-bank joining this island to the southern mainland has evidently filled up a former eastern outlet of Paterson's Inlet, and has encroached on it from the south. We may account for the change by the gradual drifting of the sand before the southerly winds, which are the prevailing ones here, and the transportation of material in the same direction by the tides flowing from the southward. The condition and situation of the Neck are strikingly analogous to those of Otago Peninsula. Both have been islands at a recent date; both are now connected with the southern mainland by a narrow sandy isthmus; both are fertile and largely composed of volcanic rocks; and both have been recently converted from islands into peninsulas by the gradual encroachment of sand blown from the south. I

think I am justified in saying so much about the direction from which the sand-hills at the Ocean Beach, Dunedin, encroached on the former channel connecting Otago Harbour and the ocean, from the well-known accumulation of sand from the south-east between Black Head and Green Island, and on Sawyer's Head between Tomahawk and the Ocean Beach, while there are no corresponding accumulations at the eastern or south-eastern end of these beaches.

On the Neck we found a very handsome species of *Olearia* (*angustifolia*) growing abundantly near the beach. It is a species so far as is at present known peculiar to Stewart Island, and was met with also at Port Pegasus. Side-by-side with it grew *Olearia colensoi*, which attains to the dimensions of a tree, and has a stem often as much as a foot in diameter. It is a species that has a very wide range, and in Stewart Island ascends from sea-level, where it attains its maximum size, to 1,500 feet at Port Pegasus. Elsewhere in New Zealand it is an alpine plant.

From Paterson's Inlet we made our way to Port Pegasus. The country here has every appearance of recent glaciation, and the rounded outlines of the hills recall vividly the roches moutonnées so well marked to the south and west of Lake Wanaka. The district around this harbour is composed entirely of a granite-like rock composed of large crystalline masses of albite, felspar, quartz, and mica.

The harbour is very picturesque, and breaks up into several branches, one of which penetrates to within a few miles of the west coast. To the west are two very striking conical hills, known as the Frazer Peaks, the larger of which has a very elegant and regular outline. Both are composed of the granite so plentiful in the district, and they glitter in the sunshine as if covered with a thin coating of snow. We were not favoured with good weather during this part of our cruise, and were consequently prevented from examining the district so fully as we had hoped to do. For two days the weather was so stormy that we could dredge only in the most sheltered parts of the anchorage, and for the most part with very meagre results. In the bush, which surrounds the port on all sides, we found a species of *Coprosma*, apparently new but allied to *C. colensoi*, and also in great abundance *Gahnia procera*. The tidal flats at the head of the various branches of the harbour are covered with *Zostera nana*. At the lower levels *Actinotus* (*Hemiphys*) *novae-zealandiae* was abundant, and also *Astelia linearis*, elsewhere in New Zealand an alpine plant. At the intermediate levels *Drosera stenopetala* and *Senecio lyalli* were met with. The latter is very common in this part of the island, but we did not see it anywhere around Paterson's Inlet. The specimens were, however, small and poorly grown as compared with those to be met with on the mountains of the interior of Otago. The

flowers on Stewart Island were all yellow, while in the Otago alpine localities they are often white. The occurrence of this alpine plant at so low a level in Stewart Island, as well as its dwarfed proportions, give additional proof of the severity of the climate in this part of the colony. Near the summit of the more northerly of the Frazer Peaks, we gathered a robust form of *Forstera sedifolia*, which constitutes a very distinct, large-flowered variety, and may prove a distinct species. We also found here a robust form of what may prove to be *Celmisia hectori*, though I am inclined to rank this also as a distinct species. At all levels we found a new species of *Ehrharta*, which I have described under the name of *E. thomsoni*, in honour of my fellow-worker on the expedition. The description and drawings appear in the Transactions of the Institute for the past year. *Ligusticum intermedium*, which occurs along the south coast of Otago from Nugget Point to the western sounds, grew plentifully along the shore of the upper reaches of the port. In one or two sheltered spots in deep shade, we found excellent specimens of what appears to be *Stilbocarpa polaris*. The specimens were a little past flowering, but had not the fruit mature, so that we could not determine with accuracy whether it is identical with the plant found on Campbell Island and the Lord Auckland group. I may add here that on a former excursion Mr. G. M. Thomson collected *Myrsine chathamica* a little to the south of Port Pegasus.

For the purposes of settlement the country around Port Pegasus is of no value whatever. The lower hills are clad with manuka, which has been partly burned off; but there is no grass land, and very few grasses of any kind are to be met with. *Ehrharta thomsoni*, though widely spread, is very small and of no economic value. A time may come when the granitic rock, so abundant here, may prove valuable; but its distance from any market, and the great facilities for working the inexhaustible stores of excellent building-stone found at Port Chalmers, will render the time at which it may be utilized very remote.

On returning from Port Pegasus we proceeded to the Bluff. We had intended to visit Mount Anglem and explore the alpine flora likely to be found on it, but unfavourable weather prevented us from carrying out this part of our programme.

Appended is a list of the flowering plants gathered by us. For the identification of the Coniferæ Mr. Thomson is responsible; the others have been examined by myself as well as by him. The list, which cannot be considered as by any means exhaustive, especially as regards the alpine plants, will be of considerable interest to botanists as extending the limits of distribution of some well-known forms.

LIST OF PLANTS GATHERED ON STEWART ISLAND.

- RANUNCULACEÆ.
- Ranunculus plebeius, *Br.* | Ranunculus lappaceus, *Sm.*, var. multiscapus
Ranunculus acaulis, *Banks and Sol.*
- MAGNOLIACEÆ.
- Drimys colorata, *Raoul.*
- CRUCIFERÆ.
- Cardamine hirsuta, *L.*
- VIOLARIÆÆ.
- Viola filicaulis, *Hook. f.* | Melicytus ramiflorus, *Forst.*
cunninghamii, *Hook. f.* | lanceolatus, *Hook. f.*
- PITTOSPOREÆ.
- Pittosporum tenuifolium, *Banks and Sol.*
- CARYOPHYLLÆÆ.
- Stellaria parviflora, *Banks and Sol.*
- TILIACEÆ.
- Aristotelia racemosa, *Hook. f.*
- LINEÆ.
- Linum monogynum, *Forst.*
- GERANIACEÆ.
- Geranium microphyllum, *Hook. f.* | Geranium molle, *Cav.*
- CORIARIÆÆ.
- Coriaria ruscifolia, *L.*
- ROSACEÆ.
- Rubus australis, *Forst.* | Geum parviflorum, *Commerson* (a very small
var.)
- Acæna sanguisorbæ, *Vahl.*
- SAXIFRAGÆÆ.
- Donatia novæ-zealandiæ, *Hook. f.* | Carpodetus serratus, *Forst.*
Weinmannia racemosa, *Forst.*
- CRASSULACEÆ.
- Tillæa moschata, *DC.*
- DROSERACEÆ.
- Drosera stenopetala, *Hook. f.* | Drosera spathulata, *Labill.*
Drosera binata, *Labill.*
- HALORAGÆÆ.
- Haloragis uniflora, *Kirk.* | Haloragis micrantha, *Br.*
Callitriche verna, *L.*
- MYRTACEÆ.
- Leptospermum scoparium, *Forst.* | Metrosideros hypericifolia, *A. Cunn.*
Metrosideros lucida, *Menzies.* | Myrtus pedunculata, *Hook. f.*
- ONAGRARIÆÆ.
- Fuchsia excorticata, *Linn. f.* | Epilobium alsinoides, *A. Cunn.*
Epilobium nummularifolium, *A. Cunn.* | rotundifolium, *Forst.*
linnæoides, *Hook. f.* | tetragonum, *L.*
Epilobium pubens, *A. Rich.*
- FICOIDEÆ.
- Mesembryanthemum australe, *Soland.* | Tetragonia expansa, *Murray.*

UMBELLIFERÆ.

Hydrocotyle americana, Linn.
asiatica, Linn.
mucosa, Br.

Hydrocotyle novæ-zealandiæ, Kirk.
Apium australe, Thourars.
filiforme, Hook.
Ligusticum intermedium, Hook. f.

ARALIACEÆ.

Stilbocarpa polaris, Dcne. and Planch.
Panax simplex, Forst.
edgerleyi, Hook. f.
anomalum, Hook.

Panax crassifolium, Dcne. and Planch.
longissimum, Hook. f.
colensoi, Hook. f.
Schefflera digitata, Forst.

CORNEÆ.

Griselinia littoralis, Raoul.

RUBIACEÆ.

Coprosma lucida, Forst.
tenuicaulis, Hook. f.
rhamnoides, A. Cunn.
parviflora, Hook. f.
propinqua, A. Cunn.

Coprosma fetidissima, Forst.
species (undetermined)
acerosa, A. Cunn.
Nertera depressa, Banks and Sol.
dichondræfolia, Hook. f.

COMPOSITÆ.

Olearia angustifolia, Hook. f.
colensoi, Hook. f.
nitida, Hook. f., forming large bushes
ilicifolia, Hook. f.
avicenniæfolia, Hook. f.
Celmisia longifolia, Cass.
Lagenophora forsteri, DC.
Brachycome odorata, Hook. f.
Cotula perpusilla, Hook. f.
squalida, Hook. f.
Cassinia fulvida, Hook. f.
Gnaphalium bellidioides, Hook. f.
trinerve, Forst.

Gnaphalium filicaule, Hook. f.
luteo-album, Linn.
involutum, Forst.
collinum, Labill.
Erechtites prenanthoides, DC.
arguta, DC.
glabrescens, Kirk.
Senecio bellidioides, Hook. f., var. B.
lautus, Forst.
lyallii, Hook. f.
rotundifolius, Hook. f.
elæagnifolius, Hook. f.
Taraxacum dens-leonis, Desf.

Sonchus oleraceus, Linn.

STYLIDIEÆ.

Forstera sedifolia, Linn. f., var.

Phyllachne subulata, Müller.

CAMPANULACEÆ.

Wahlenbergia saxicola, A. DC.

Pratia angulata, Hook. f.
Selliera radicans, Cav.

ERICÆÆ.

Gaultheria antipoda, Forst.
Cyathodes acerosa, Br.
empetrifolia, Hook. f.
Leucopogon frazeri, A. Rich.

Pentachondra pumila, Br.
Dracophyllum longifolium, Br.
rosmarinifolium, Forst
muscoïdes, Hook. f.

MYRSINÆÆ.

Myrsine urvillei, A. DC.

Myrsine chathamica, Müller.

PRIMULACEÆ.

Samolus littoralis, Br.

GENTIANÆÆ.

Gentiana montana, Forst. Sub-erect var. | *Gentiana saxosa*, Forst.

BORAGINÆÆ.

Myosotis capitata, Hook. f.

CONVOLVULACEÆ.

Convolvulus soldanella, Linn.

SCROPHULARINEÆ.

Veronica salicifolia, Forst.
elliptica, Forst.
buxifolia, Benth.

Ourisia macrophylla, Hook.
colensoi, Hook. f.
Euphrasia, species undetermined.

LENTIBULARIÆ.

Utricularia monanthos, Hook. f.

PLANTAGINEÆ.

Plantago raoulii, Decaisne.

Plantago brownii, Rapin. Form with sepals subacute.

CHENOPODIACEÆ.

Chenopodium glaucum, Linn., var. *ambiguum*.

Atriplex billardieri, Hook. f.

POLYGONEÆ.

Muhlenbeckia adpressa, Lab.

Rumex neglectus, Kirk.

THYMELEÆ.

Drapetes dieffenbachii, Hook.

CONIFERÆ.

Podocarpus ferruginea, Don.
totara, A. Cunn.

Podocarpus dacrydioides, A. Rich.
Dacrydium cupressinum, Soland.

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.

IRIDEÆ.

Libertia ixioides, Sprengel.

NAIADÆ.

Zostera nana.

Triglochin triandrum, Michaux.

Potamogeton natans, Linn.

LILIACEÆ.

Rhipogonum scandens, Forst.
Callixene parviflora, Hook. f.
Astelia nervosa, Banks and Sol.

Astelia linearis, Hook. f.
Anthericum hookeri, Hook. f., var.
Phormium tenax, Forst.

Herpolirion novæ-zealandiæ, Hook. f.

JUNCEÆ.

Juncus communis, E. Meyer.
planifolius, Br.

Juncus bufonius, Linn.
Luzula campestris, De Cand.

Luzula oldfieldii, Hook. f.

RESTIACEÆ.

Leptocarpus simplex, A. Rich.

Calorophus elongata, Lab.

Alepyrum pallidum, Hook. f.

CYPERACEÆ.

Schoenus brownii, Hook. f.
Carpha alpina, Br.
Eleocharis sphacelata, Br.
Isolepis riparia, Br.
cartilaginea, Br.
nodosa, Br.
Cladium glomeratum, Br.
gunnii, Hook. f.
Gahnia procera, Forst.

Lepidosperma tetragona, Labill.
Oreobolus pumilio, Br.
Uncinia ferruginea, Boott.
filiformis, Boott.
rupestris, Raoul.
Carex lambertiana, Boott.
neesiana, Endl.
trifida, Cavanilles.
stellulata, Goodenough.

Carex testacea, Solander.

GRAMINEÆ.

Ehrharta thomsoni, Petrie.
Microlæna stipoides, Br.
 avenacea, Hook. f.
Hierochloë redolens, Br.
 alpina, Rœm. & Schultes.
Agrostis æmula, Br.
 billardieri.
 avenoides, Hook. f.
 quadrisseta, Br.

Arundo conspicua, Forst.
Danthonia cunninghamii, Hook. f.
 raoulii, Steud.
 semiannularis, Br.
Trisetum antarcticum, Trinius.
Poa imbecilla, Forst.
 australis, Br., var. *lævis*.
 colensoi, Hook. f.
Gymnostichum gracile, Hook. f.

ART. XLII.—Description of new Species of *Carex*.

By D. PETRIE, M.A.

[Read before the Otago Institute, 1st February, 1881.]

Carex parkeri, n.s.

A SMALL slender species; culms 3–5 inches; leafy at and above the base, smooth, grooved; leaves flat, smooth, striate, shorter than the culm, sheathing at the base; sheaths more membranous and strongly striate; spikelets two or three, forming a compact head; bract glume-like, with a short awn; male flowers below, female above; glumes ovate, obtuse or subacute, one-nerved, dark-purplish, paler at and near the nerve; utricle subequal with or longer than the glume, ovate oblong, rather compressed, with entire beak and numerous faint nerves; stigmas two.

This species stands near *C. colensoi*.

Hab. A hill near Mount Aspiring, 5,000 feet.

Carex kaloides, n.s.

A tall, slender, cæspitose species; culms drooping, two feet or more, sparingly leafy at the base, rounded, smooth; leaves shorter than culm, narrow, flat or involute, deeply grooved, slightly scabrid at the edges, most tenacious; spikelets 9–12, lower compound distant, upper approximate, arranged on alternate sides of the long (3–5 inches) scabrid rachis; lowest bract setaceous, very long; male flowers at the top few, sometimes wanting, female flowers below; glumes linear-lanceolate, scarious, 1–3-nerved, the nerves produced into a slender awn; utricle linear-lanceolate, plano-convex, ending in a tapering two-winged bifid beak, the wings finely serrate; stigmas two, short.

A very distinct species. The leaves have an exceedingly strong fibre.

Hab. Carrick range, Otago, 4,000 feet; Deep Stream, Otago, 1,000 feet.

Carex viridis, n.s.

A slender tufted species; culms erect, 6–12 inches, grooved, smooth; leaves sheathing at the base, narrow, concave, smooth, shorter than the