

the development of the flowers, or, which is more probable, the pollen must be shed early into the pendulous flowers, and, being caught in the sac made by the closed petals, is thus brought into contact with the stigmas. In all the flowers examined by me the ovaries stood always too high to receive pollen directly on their stigmas, unless it reached them in the manner suggested.

No definite cause has been assigned for the occurrence of cleistogamic flowers in plants. The Rev. George Henslow, in "The Origin of Floral Structures" (p. 262), gives several examples of species which produce normal flowers in one district or country and cleistogamic flowers in another, showing that the change appears to be due to variations in climate or soil, &c.; but no law can be adduced from the examples given. That the occurrence of this phenomenon depends largely on the supply of moisture is suggested by the following fact: Some plants of violet (cultivated forms of *Viola odorata*) growing in my garden, in a border against a wall—a position in which they were subjected to great heat and where they got very little moisture—were found covered with cleistogamic flowers, and bore very numerous seed-capsules, although they produced no conspicuous flowers. Other violets of the same variety, growing only a few feet away, but in a border where they were exposed to the weather and got abundance of moisture, had abundance of normal but no cleistogamic flowers.

I can give no explanation of the specimens of *Melicope* from Lake Wanaka, as I have no record of the soil or climatic conditions of Pigeon Island; but the profusion of flowers, not one of which was open, and of maturing fruit, arrested my attention at once, and I noticed that all the plants seen by me were so covered with these peculiar self-fertilised closed flowers.

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ART. XLII.—*Remarks on the Genus Abrotanella, Cassini, with Descriptions of New Species.*

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[Read before the Wellington Philosophical Society, 24th February, 1892.]

Plate XXXVI.

*Abrotanella* was founded by Cassini in 1825 on a plant from the Falkland Islands, which for some years was considered to be the only species. In 1845 Sir Joseph Hooker constituted

the genera *Trineuron* and *Ceratella* for the reception of two plants from the Auckland and Campbell Islands, and pointed out their close relationship to the original *Abrotanella emarginata* of Cassini, in Hooker's *London Journal of Botany*, v., 437: he also formed the genus *Scleroleima* for the reception of another closely-related plant from the summit of Table Mountain, Tasmania. A few years later Professor Asa Gray, in *Proceedings of the American Academy*, v., 137, showed the propriety of reducing all these genera to *Abrotanella*: his views were adopted by Hooker in the "Handbook of the New Zealand Flora," 139, and by Bentham in "Flora Australiensis," iii., 553. As now constituted the genus comprises about a dozen species, of which one, or possibly two, are found in South Chili, the Magellan Straits and Falkland Islands, &c.; one in the mountains of Victoria; two in Tasmania; and six or seven in New Zealand and the Antarctic Islands.

Most of these plants are inconspicuous moss-like herbs, forming small patches, with stems from  $\frac{1}{4}$  in. to  $\frac{1}{2}$  in. high, resembling a large-leaved *Tortula*, or a *Bryum*. *A. spathulata*, Hook. f., however, sometimes attains the height of 3 in., with an erect stem and crowded flower-heads, so that the moss-like appearance is completely lost. *A. linearis*, Bergg., occasionally develops leaves upwards of 2 in. in length, but even under the most favourable conditions they are neither conspicuous nor attractive; the flower-heads are terminal, and are usually more or less concealed by the apical leaves, but *A. spathulata* and *A. linearis* are marked exceptions in this particular. The flower-heads may be solitary or numerous. The involucre is cylindrical or cup-shaped, and consists of from 5 to 12 linear-oblong scales, arranged in 2 series: usually they exhibit 3-5 translucent veins, and are broadly obtuse: the receptacle is very small, naked, slightly convex, and papillose: the florets vary in number from 5 to 20, those of the disc being  $\sigma$  with a truncate style and 4 stamens, and those of the ray, which are more numerous, being female with a shortly bifid style: the corolla is always tubular, and very slender; in the disc-florets rather deeply 4-cleft, with incurved apices; in the ray-florets 4-toothed, the teeth usually spreading. Anthers partially coherent. Achenes either somewhat compressed, or tetragonous, narrowed below, with 4, rarely 3 or 2, prominent ridges, glabrous or rarely setose; pappus reduced to a slightly-raised annulus. In one species the ridge is produced into a short horn-like process at each angle, in another into a spine as long as the achene.

It is hoped that the following descriptions of the known New Zealand species will be found useful to students of the genus.

## ABROTANELLA, Cassini.

1. *A. linearis*, Berggren, Physiograph. Saltskaps, Mineskrift Lund, 1878, p. 14, t. 3, f. 28-38.

A tufted scapigerous herb, rarely exceeding 2in. in height. Leaves radical, spreading, equalling or slightly exceeding the scapes,  $\frac{1}{2}$ in.— $1\frac{1}{2}$ in. long, linear, obtuse or apiculate, with sheathing bases which are slightly hairy. Scapes  $\frac{1}{2}$ in.— $1\frac{1}{2}$ in. high, with 1 or 2 or several linear obtuse bracts. Head solitary: involucre scales 8-12, subacute, obscurely 3-nerved; ovary of ray-florets 4-angled; achenes clavate, with 4 ribs.

*Hab.* South Island: Mountains of Nelson, Westland, Canterbury, and Otago, but often local; 2,000ft.—3,000ft. Stewart Island; sea-level to 2,000ft.

Diminutive specimens are sometimes less than  $\frac{3}{8}$ in. in height; on the other hand the leaves occasionally exceed 2in. in length, and the rootstock is sometimes largely developed, the decaying bases of the old leaves being more or less persistent. The lateral nerves of the involucre leaves are sometimes very faint, and disappear in drying, while the median nerve becomes more prominent.

2. *A. cæspitosa*, D. Petrie, MS.

Tufted. Stems  $\frac{3}{8}$ in.— $\frac{1}{2}$ in. high. Radical leaves recurved,  $\frac{3}{8}$ in. long, linear, obtuse, concave above, with a scarious margin when young, coriaceous. Scapes naked or with 1 or 2 short bracts. Head solitary: involucre scales 7 or 8, 3-nerved, with broad scarious margins, broadly rounded at the apices, often erose. Florets about 6. Corollas not seen. Achenes (immature) ovoid, compressed, with broad margins.

*Hab.* South Island: Otago, Mount Kyeburn, D. Petrie!

A curious little plant, with the leaves of *A. spathulata*, and the solitary head of *A. linearis*, but smaller in all its parts than either. The achenes appear to differ widely from both; they are not at all tetragonous. Better specimens must be obtained before a good description can be drawn.

3. *A. spathulata*, Hook. f., Handbk. N.Z. Fl., 139. *Trineuron spathulatum*, Hook. f., Fl. Antarct., i., 23, t. 17.

Tufted; 1in.—3in. high. Leaves rather close-set, spreading,  $\frac{1}{2}$ in.—1in. long, coriaceous, obtuse or acute. Scapes sparingly leafy or with 1, 2, or more leafy bracts near the apex. Heads pedunculate, crowded near the top of the scape. Involucre scales 8-10, oblong, with 3 translucent nerves. Florets 8-12; those of the disc with short patent teeth. Achenes ovoid compressed with 3 cellular ribs, abortive; or tetragonous compressed with 4 ribs, perfect.

*Hab.* Auckland Islands; 1,000ft.—2,000ft. Campbell Island; 500ft.—800ft.

The largest species. The achenes with 4 ribs do not appear to have been noticed by Sir Joseph Hooker, probably owing to his visit having been made at an early period of the season. The cellular structure of the ribs of the achenes, and of the veins of the involucreal scales, becomes greatly obscured after maturation.

4. *A. rosulata*, Hook. f., Handbk. N.Z. Fl., 139. *Ceratella rosulata*, Hook. f., Fl. Antarct., i., 25, t. 18.

A small tufted herb, with prostrate or suberect stems,  $\frac{1}{2}$  in.— $1\frac{1}{2}$  in. high. Leaves  $\frac{1}{4}$  in.— $\frac{1}{3}$  in. long, narrow-ovate or lanceolate, acute or subacute, patent, tips recurved, concave above, very coriaceous, 5-nerved beneath, dense. Heads 3–6; terminal partially hidden by the apical leaves. Involucreal leaves 8–10, linear-oblong, 3-nerved; disc-florets about 4, corolla 4-angled, swollen at the base; ray-florets, corolla tubular, with 4 spreading teeth. Achene tetragonous, 4-ribbed, narrowed below; each rib produced upwards into a short horn.

*Hab.* Campbell Island; rare and local; 1,000ft.

A harsh, rigid plant, easily distinguished from all other species by its peculiar habit, and by the 4-horned achenes.

5. *A. inconspicua*, Hook. f., Handbk. N.Z. Fl., 140.

A moss-like plant with naked stems  $\frac{1}{2}$  in.—2 in. high, densely leafy. Leaves  $\frac{1}{4}$  in.— $\frac{1}{3}$  in. long, spreading or ascending, subulate or linear-oblong, concave at the base, subacute, rigid and rather flat when dry. Head solitary, almost hidden by the upper leaves; involucreal scales linear-oblong, 3-nerved, obtuse. Florets 15–20, crowded; of the disc, tubular, deeply 4-cleft; of the ray, with 4 spreading narrow lobes. Achenes linear-clavate, with 4 prominent ribs.

*Hab.* South Island: Otago, Mount Alta, *J. Buchanan!* Ben Lomond, Dunstan Range, Mount Pisa, *D. Petrie!* 5,000ft.—6,000ft.

Mr. Petrie's specimens from Mount Pisa are very robust, and contrast strongly with the original specimens collected by Mr. Buchanan, which are less than  $\frac{1}{2}$  in. high. When dry the leaves appear to be partially flattened, with a strong marginal nerve which is scarcely observable in fresh specimens.

6. *A. pusilla*, Hook. f., Handbk. N.Z. Fl., 139. *Trineuron pusillum*, Hook. f., Fl. N.Z., i., 130.

A slender wiry species. Stems 1 in. long, puberulous, emitting long fibrous roots. Leaves  $\frac{1}{3}$  in.— $\frac{1}{2}$  in. long, narrow-linear, acute, flat above with a prominent midrib below. Heads solitary, shortly pedunculate, sunk amongst the upper

leaves; involucreal leaves linear, obtuse, ribbed. Achenes linear-clavate, 4-angled.

*Hab.* North Island: Snowy places amongst the Ruahine Mountains, *Rev. W. Colenso, F.R.S.*

I copy the above description from Hooker, as this species has not been found since its original discovery, more than forty years ago.

7. *A. muscosa*, n.s.

A minute herb; stems  $\frac{1}{2}$  in.— $\frac{1}{4}$  in. high; solitary or forming matted patches  $\frac{1}{2}$  in.—1 in. in greatest diameter. Leaves dense, imbricating,  $\frac{1}{8}$  in.— $\frac{1}{7}$  in. long, erect, linear, concave above, excessively coriaceous, truncate or retuse, with a stout marginal nerve, rarely obtuse. Heads hidden amongst the apical leaves, shortly pedunculate. Involucreal scales 5, oblong acuminate, obtuse or acute; nerves indistinct. Florets 4 or 5; of the disc, with 4 bristles from the base of the narrow tubular corolla, which is indistinctly 4-lobed; of the ray, ovary 4-angled. Achene tetragonous, shortly clavate, 4-angled, with a bristle as long as the achene at each angle; setose.

*Hab.* Stewart Island: Summit of Rakiahua; 2,300ft.

This singular little plant is allied to *A. rosulata* in the spreading horn-like bristles, which, however, are much longer than the short stout horns of that species. In general appearance it resembles a *Tortula* or *Bryum*, and may easily pass unnoticed. At present it has only been observed in the locality stated above, where it occurs in very small quantity. It closely approaches the original *A. emarginata*, Cass., from the Falkland Islands, and, with the exception of *Lemna*, is the smallest flowering-plant in the colony. It is the only species with setose achenes.

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EXPLANATION OF PLATE XXXVI.

Fig. 1. *Abrotanella muscosa*, natural size.

Fig. 2. The same magnified.

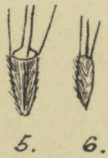
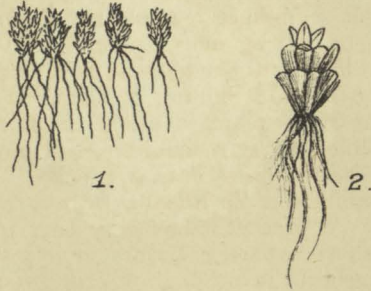
Fig. 3. Leaves, magnified.

Fig. 4. Capitulum, magnified.

Fig. 5. Achene of the ray, magnified.

Fig. 6. Achene of the disc, magnified.

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L.M.K. del.

*ABROTANELLA MUSCOSA. n.s.*