EXPLANATION OF PLATE XXXVIII.

Phascum (Pleuridium) lanceolatum.

Fig.
1. Stem leaves.
2. Perichætial leaf.
3. Capsule.

Phascum (Pleuridium) longifolium.

1. Stem leaf.
2. Perichætial leaf and capsule.
3. Calyptra.

Phascum (Cycnæa) arnoldii.

1. Lower stem leaves.
2. Middle stem leaves.
3. Upper stem leaf.
4. Perichætial leaf and capsule.
5. Calyptra.

Art. XXXI.—*On* Lessonia variegata, *J. Ag., Mscr.*

By Robert M. Laing, B.Sc.

[*Read before the Canterbury Philosophical Institute, 1st November, 1893.*]

Plates XXXIX., XL.

In the "Flora Novæ-Zelandiæ," vol. ii., p. 217, *Lessonia fuscescens* (Bory, Voy. Coq., p. 75) is put down as indigenous to New Zealand; and on the authority of Lyall its habitat is given as Lyall's Bay, Cook Strait. In the Handbook, vol. ii., p. 656, it is stated also to occur on the east coast—*i.e.*, of the North Island—Colenso being the authority. Unfortunately I have not access to the original description of the plant in the Voyage of the "Coquille," and no synopsis of the species is given in the "Flora Novæ-Zelandiæ" or in the "Flora Antarctica." In the latter work, however, it is figured, vol. ii., 167, 168, and 171d; and in the "Handbook of the New Zealand Flora" there is a short account of the species. It is more fully described in Agardh's "Species Algarum," vol. i., p. 151.

The specific description in the Handbook, which agrees well with the figures in the "Flora Antarctica," is as follows:—"*L. fuscescens:* Gregarious, forming submarine miniature forests, trunks sometimes 10ft. long, cylindric, as thick as the thigh, bearing towards the top short branches with

pendulous foliage. Leaves 2ft. to 3ft. long, 1in. to 2in. broad, linear-lanceolate, toothed, older sinuate."

Now, the only well-defined habitat given for this plant in New Zealand is Cook Strait; and a search along the northern shores of the Strait, in the neighbourhood of Wellington, reveals a *Lessonia* certainly, but one quite different in form from this. It has no massive trunk, but in the older plants from twenty to thirty stems about the thickness of a man's thumb spring from the rhizoid, and the fronds when in the water are not pendulous, but approximately vertical. Moreover, it occurs immediately below low-water mark, and not, as described in the "Flora Antarctica," vol. ii., p. 457, "always far below low-water mark." The leaves, in general shape and external characters, correspond well with those of the South American forms of *L. fuscescens*, as described in the "Flora Antarctica" (*loc. cit.*); but the other characters are certainly sufficient to differentiate it, though in all probability Hooker and Harvey have confused it with *L. fuscescens*. As our New Zealand form is bulky, it is likely that Harvey did not see a complete specimen, but identified the species from the leaves and a few pieces of the stem alone.

J. G. Agardh, on the other hand, in his list of New Zealand seaweeds ("De Algis Novæ-Zealandiæ Marinis," p. 6), includes only one species of *Lessonia*—viz., *L. variegata*, J. Ag., Mscr.—and gives, on the authority of Berggren, Lyall's Bay and Hokianga as its habitats. He adds, as synonyms, *Lessonia nigrescens* (*partim*), Bory, and *Lessonia fuscescens*, Fl. Nov. Zel., p. 217. To the latter synonym he attaches a (?). Unfortunately, however, he gives no synopsis of his new species, but simply shows that it is to be readily distinguished from others of the genus by the structure of the fronds. He states that he has only seen a few specimens, and it is probably on this account that he refrains from giving a specific description. What he says, however, is sufficient to identify his *Lessonia variegata* with the plant so common on the Strait in the neighbourhood of Wellington, and to which Hooker erroneously refers as *L. fuscescens*. Our plant must therefore be regarded as undescribed—at least, as far as New Zealand is concerned. Agardh states (*loc. cit.*) that it is also found on the Chilian coast, but how far it has been confounded with, or is distinct from, the several species of the genus found there, I must leave for others to decide. As we have already seen, it is not *L. fuscescens*, and apparently it can only be partially included, if at all, under any of the remaining species. I therefore propose to give a description of it here that will suffice for systematical purposes, and to refer to one or two points in its structure which will show that it is worthy of a further histological examination.

Lessonia variegata, J. Ag., Mscr.

Hab. Plentiful in rock-pools 6ft. to 10ft. or more in depth in the neighbourhood of Wellington (Cook Strait); Hokianga: *Berggren.* Mr. H. B. Kirk informs me that the plant is also to be seen among the drift-weed on the beaches at Stewart Island.

General Appearance.—A bushy plant, 3ft. to 5ft. high, bearing at the top of its numerous stems a subglobose mass of fronds a foot or two in diameter. It grows below low-water mark, so that the tops of the leaves just reach the surface at low tide. Small specimens may occasionally be obtained which are completely uncovered at ebb.

The Rhizoid.—In the young plant the root consists of a number of short, dichotomous branches, the tips of which are closely appressed to the rock-surface (Pl. XXXIX., fig. 1, *a*). When the plant is torn off it generally brings with it a more or less complete disc of rock-chips, corallines, and other incrustations attached to the root-tips. In the mature plants, owing to the coalescence of adjacent roots, the expansion of the lower branches, and the growth of numerous adventitious rootlets from the lower ends of the stem, the main rhizoid tends to form a ribbed columnar mass (Pl. XL., fig. 1, *a*). This forms a favourite resort for numerous epiphytic and parasitic growths of sponges, zoophytes, sertularians, corallines, florideæ, &c.

The Branch System.—Immediately above the root, even in young plants, a number of branches are given off, which are more or less compressed or oval in transverse section, and from 1in. to 1½in. in width in the direction of the longer diameter. Each branch divides three or four times dichotomously at an acute angle, broadening out a little below each fork, and finally each branchlet terminates in a frond. The pseudo-petioles are twisted several times below each frond, and the twisting is continued for some distance towards the base. The total length of the branching system is from 2ft. to 3ft. New branches are formed thus: A small fissure appears just where the frond joins the top of the stipe. This gradually extends through the lamina until bisection is completed. Occasionally a secondary fission commences before the primary one is completed (Pl. XL., fig. 2).

The Fronds.—These are from 1ft. to 2ft. in length, and 1in. or 2in. in breadth, linear or linear-oblong, sometimes falcate owing to unilateral growth, and with a few teeth scattered along the margin. In the young plant they are generally much longer than in the mature plant, with acuminate apices, as may be seen by a reference to the plates. The probable explanation of this will be given presently. They are olive-

yellow in colour, closely covered with linear markings from $\frac{1}{8}$in. to $\frac{1}{4}$in. in length of a darker colour. Hence the specific name.*

Fructification.—The sori are of the usual type, and of irregular size and shape, generally several inches in length, and situated in varying positions on the fronds, more often, perhaps, immediately above the middle than elsewhere. I have, however, found them within an inch of the base. According to Harvey, in the "Flora Antarctica," the sori in *L. fuscescens* are situated beyond the middle of the leaf; and Agardh ("Species, Genera, et Ordines Algarum," vol. i., p. 150) makes their situation at the middle of the frond a generic character. Harvey also states that the cuticle covers the sori. This is certainly not the case in *L. variegata*, in which the sori are on the surface of the frond; and, as Agardh points out in the case of the other species, it is probably also a mistake due to the coherence of the parts in dried specimens.

Growth.—In the youngest specimens seen the plant consists of a single stem surmounted by a leaf, and at this stage is scarcely distinguishable from young plants of *Macrocystis*. In the latter, however, the first fission of the frond is scarcely median, and this character at present serves to distinguish it from *Lessonia*, in which the division passes through the centre of the lamina, and in which all leaves subsequently formed apparently result schizogenetically from the first leaf, so that if the growth were regular the plant ought to consist of a single stem presenting a perfectly dichotomous symmetry in one plane; but, owing to the twisting of the stem already referred to, the branches are thrown out of the original plane; and, owing to the thickening and coalescence of their lower portions, there appears to be a number of stems in place of one arising from the root. This, at any rate, seems to me the most feasible explanation of the large number of stems apparently growing from the rhizoid in the mature plant. As there is no proliferous growth or adventitious branching, it cannot be accounted for by these means; and the only other possible explanation that occurs to me is that the mature plant represents a cluster of plants growing together. Against this idea is the fact that young plants are not seen growing from the rhizoid, and that all the stems are apparently of similar age. In favour of the explanation first given is the great lateral thickening by secondary growth that is clearly shown at the base of the stems, and the fact that sometimes two masses of central tissue are found in one stem, and this

* If the fronds are steeped in fresh water for an hour or two they blister badly, probably owing to osmosis.

near the base of the plant and not immediately below a fork. (Pl. XXXIX., fig. 2, *a*.)

The growth in length, as in other Laminarians, takes place at the junction of the stipe and the frond, and consequently, the tip of the frond being once worn off by the action of the waves, or eaten by molluscs, it cannot be replaced, and, as all fronds subsequently formed have no apices, a complete leaf is rarely to be found except in young specimens, in which, as has already been stated, they are much longer than in the mature forms. Harvey (*loc. cit.*) explains the absence of the tip in *L. fuscescens* thus: "In the present species the sori are situated beyond the middle of the leaf; they are oblong and nearly as broad as the lamina, of which they carry away the upper part when decaying, causing the apices to be two-horned. In none of the specimens is the point perfect, all the spores we have seen being situated on the sorus, which has itself fallen away from the edge of the frond." I have not noticed that the sorus in *L. variegata* falls away in the manner described. It is certainly frequently attacked by a green filamentous alga which grows on its upper surface, on the tops of the paraphyses, and causes decay; but this green alga, though chiefly found forming a velvety nap on the sorus, grows elsewhere on the surface of the frond.

Notes on the Histology.

The Frond.—A transverse section through the frond shows it to consist of an epidermal and several cortical layers gradually merging into a parenchymatous tissue. In the centre is the hyphal layer, in which, however, the hyphæ preserve a general longitudinal direction. Like the stem, it contains "trumpet hyphæ." Immediately under the epidermis are a number of large lacunæ (Plate XL., fig. 3, *a*). It is on these that Agardh apparently chiefly relies to distinguish this species from others. Under a Browning's platyscopic lens I have counted as many as twenty-five of these in a transverse section of a single frond. They open into ostioles on the surface. The structure of the frond is the same on both sides. I have not seen any "air-cells," as figured by Hooker and Harvey in the centre of the frond.—("Flora Antarctica," vol. ii., pl. 167c.)

The Stem.—Harvey, in speaking of *L. fuscescens*, says ("Flora Ant.," vol. ii., p. 458), "The trunks, which contract to a quarter of their original dimensions when dry, and become deeply furrowed, are perfectly smooth and cartilaginous when fresh. On being cut across, the curious appearance of concentric elliptical rings, in many respects very similar to, though very different from, those of an exogenous trunk, is very evident." Harvey again refers to this appearance in

speaking of *L. nigrescens*, in which, no doubt, is partly included *L. variegata*. However, such a series of rings can only with difficulty be made out in our New Zealand specimens. On a stem of one of these being cut across there is to be seen—(1) The thin brown epidermal and cortical layer; (2) a lighter tissue (almost white in spent specimens), which constitutes the great bulk of the stem; (3) a darker tissue, oval in transverse section, and scarcely to be distinguished by the naked eye from (4), a linear more or less central layer, containing brown colouring-matter. It is in No. 2, particularly in dried specimens, that faint concentric rings are to be seen; but I have not been able by microscopical examination to ascertain that they are rings of growth, as Hooker thought they were, or even to differentiate them at all under the microscope. In a hard-dried specimen they remind one of the appearance of the grain in ivory.

Under the microscope the different tissues present the following characteristics: No. 1 is an epidermal and cortical layer of the usual type; under this is No. 2, consisting on the outside of a meristem divided by periclinal walls. By means of this the stem increases in thickness. Owing to unequilateral growth of this layer, tissues (3) and (4) are rarely central. Pitting is common in this part of the stem. The meristem passes into a parenchyma, which constitutes the greater bulk of the stem. Tissue (3) consists of cells which are oblong in transverse section, but in longitudinal section are seen to be many times longer than broad. They anastomose occasionally. This tissue is penetrated by a number of ducts—(?) mucilage-canals—about $\frac{1}{100}$in. in diameter, and perhaps similar to those found in *Macrocystis*. The innermost tissue is hyphal in character, and, like the hyphæ of fungi, it does not stain with iodine and sulphuric acid. (I am not aware if this is a common characteristic amongst seaweeds). It contains "trumpet-hyphæ," which give the usual reactions for callus with chlor-zinc-iodine, Russow's callus reagent, and corallin-soda. The last-mentioned stain, though very distinctive, is, however, transient. With eosin the callus stains rather more deeply than the rest of the tissue, but the result is not very satisfactory. As will be seen, this is only the fourth seaweed in which callus has been found. Oliver says* that "in the *Nereocystis*, as in *Macrocystis*, callus is formed in the true sieve-tubes, as well as in the 'trumpet-hyphæ.' In the 'trumpet-hyphæ' of other *Laminariæ* I have so far (with one exception) been unable to discover any callus." The explanation of the figures illustrating Oliver's

* "On the Obliteration of Sieve-tubes in *Laminariæ*."—"Annals of Botany," vol. i., p. 95.

paper shows that the exception referred to is an unnamed species of *Laminaria* from Vancouver Island. As Oliver mentions that he has found "trumpet-hyphæ" in *Lessonia* (*loc. cit.*), but does not state in what species, it seems probable that in the species he examined callus is wanting, as he is not likely to have overlooked it. He also refers to Grabendörfer as having figured "trumpet-hyphæ" for *L. ovata* in a paper in the Bot. Ztg., 1885, entitled "Beitrage zur Kentniss d. Tange." I regret that I have not access to this magazine, as it would have been interesting to compare the structure of the stem in the two species *ovata* and *variegata;* and Grabendörfer's paper, no doubt, would have assisted me much in the preparation of this.

EXPLANATION OF PLATES XXXIX., XL.

PLATE XXXIX.

Fig. 1. Young specimen of *Lessonia variegata*, showing the immature forms of the rhizoid and fronds. (About one-sixth natural size.)

Fig. 2. Group of stems, showing transverse sections. In two of them the central tissue is divided, probably showing coalescence of two separate stems.

PLATE XL.

Fig. 1. Fragment of mature specimen of *Lessonia variegata*. (About one-seventh natural size.)

Fig. 2. A perfect frond, showing acuminate apex, and the method of branch-formation by fission. A secondary fission is commencing before the first one is completed. (About one-quarter natural size.)

Fig. 3. Transverse section from the epidermis to the centre of a frond, showing intercellular spaces. (× 200 diam.)

ART. XXXII.—*On the Occurrence of* Xanthium strumarium, *Linn., in New Zealand.*

By T. W. KIRK, F.L.S.

[*Read before the Wellington Philosophical Society, 26th July, 1893.*]

I HAVE on previous occasions drawn the attention of members of this Society, and also of the Field Naturalists' Club, to some very undesirable importations—notably, centipedes and millipedes arriving in bananas, the English mole-cricket, and others.

The most recent of these arrivals is a plant which, if acclimatised, will probably prove harmful to both the cattle- and sheep-farmer.