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Notes on Some New Zealand Species of *Cladonia* With Descriptions of Two New Species and One New Form

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Summary

Two new species of the lichen genus *Cladonia*—*C. murrayi* and *C. southlandica*—are described, also a new form (*f. fiordense*) of *C. aggregata*. Previously unrecorded forms of other species are listed and new localities for several of the rarer species. It is suggested that plants formerly ascribed to *C. impexa* be merged in *C. leptoclada*, and that Nylander's genus *Cladia* be recognised for plants formerly comprising the section Clathrinae of the genus *Cladonia*.

CLADONIA—Subsection COCCIFERAE

Cladonia bacillaris (Ach.) Nyl.

Three forms occur in New Zealand: f. *clavata* (slender, obtuse, and rarely branched); f. *elegantior* (longer, stouter, and sometimes branched above); and f. *reagens* (with orange patches on podetia turning violet with KOH). Unrecorded areas include:

— f. **clavata** (Ach.) Vain.

Coromandel (8259); Wellington (4281); Pelorus Bridge, Nelson (8158); Wairau Valley (4048); Greymouth (2158); Awatuna, Westland (6868); Blue Mountains, Otago (8142); Catlins, Otago (7027).

— f. **elegantior Vain.**

Molesworth (7603); Longwood Range (4466a); Mt Pisgah (J.S.T. 1490); Saddle Hill, Dunedin (5111); Cass, Canterbury (6790); Greenhills (7092); Awarua Bay, Southland (8157); Arthurs Pass (9001).

— f. **reagens** Evans.

Wairau Valley (3012); Taupo (L. 202).

Cladonia hypoxantha Tuck.

Typical plants of this uncommon species were recently obtained by me on *Nothofagus* at Black Gully, Blue Mountains, Otago.

Cladonia metalepta Nyl.

No plants of this species occur in any New Zealand herbaria from New Zealand sources. The Mt Hauhangatahi record is erroneous and, pending fuller information, the species should be deleted from the N.Z. flora.

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Cladonia polydactyla (Floerke) Spreng. (Synonym *C. flabelliformis* (Flk.) Vain.)

This species is more common than existing records indicate:

— f. **tubaeformis** Flk.

Longwood Range (6903); Cobb R., Nelson (7271); Cascade Creek (4490); Awarua Bay (8160); Tophouse (3028); Ruahine Range (4593).

— f. **scabriuscula** (Del.).

Kuriwao, Southland (8015); Tophouse (4723); Mihiwaka, Dunedin (553a); Rotorua (K2, D.S.I.R.); Homer Tunnel (4425).

— f. **intertexta** Vain.

Wairau Valley (4290); Cascade Creek (4431).

Cladonia murrayi sp nov.

TYPE. New Zealand; lodged in herbarium Botany Division D.S.I.R., Lincoln, N.Z.

DESCRIPTION. Plantae dense caespitosae. Thallus primarius persistens, squamis caespitosis majusculis, 2–3cm longis, 1–1.5cm latis, basi emoriente, multo palmate pinnateque ramosis, summis laciniis rigidus, ad 1cm longis, lobatis, aliquando tuberculosis, apicis saepe reflexis, subtus albis ad vasi aureis, superne pallido-glaucescentibus, esorediosis, K + flavescens; P + flavescens dein rubra.

Pseudo-podetia 3–20mm longa, simplicia aut irregulariter ramosa, cortica vel ecorticata, apotheciis terminata, cortice areolato vel isidivideo-squamuloso. Apothecia coccinea, ± globosa, .5–1mm diam., solitaria vel aggregata, sporis oblongis (10.5–12μ × 3μ). Spermagonia non visa.

Primary thalli 2–3cm long, 1–1.5cm wide, erect, palmately and pinnately divided, and aggregated into dense cushions 4–10cm in diameter, dying at base, only the upper laciniae remaining alive. Terminal laciniae .5–1cm long, narrow, lobulate, somewhat tuberculate, thick, with ultimate lobes ± reflexed, white below merging into orange-brown at the base; grey-green, glaucescent, or whitish above. Medulla white, also turning golden at base. Algal layer disintegrating with age into close or distant areoles or into isidioid squamules; cortex hyaline, uneven, ± 25μ thick; algae 8–12μ diam., probably *Trebouxia*. Spermagonia not seen. Apothecia globular or sub-globular, scarlet above, often brown at the base, .5–1mm diam., sometimes single, more often in aggregates at tips of pseudo-podetia formed by podetia-like extensions of the primary thallus, lacking a central canal, but dividing into separate or agglutinate slender fibres, each terminated by the apothecia. The hypothecium is very thin or almost absent; hymenium about 45μ high, ± interspersed with red granules (K + crimson), paraphyses conglutinate, simple, 2μ diam., with inflated tips; asci about 40μ x 8μ.

DISTRIBUTION. Secretary Island, in Doubtful Sound, West Otago, in moss at an altitude of 1,000 metres.

This distinct species is distinguished from all other members of the *Cocciferae* in New Zealand in its formation of dense cushions and in bearing the apothecia on podetia-like extensions of the ultimate laciniae. The cushions are so compact as to exclude light, causing the death of the lower portions of the thalli, which thus form an amorphous mass from which it is difficult to isolate the individual squamae. This species was discovered by the late Dr James Murray, of Otago University, for whom it is named.

Cladonia cocciferae (L.) Willd.

Though not a common species, the following forms have been noted:

— var. **stemmatina** Ach.

Near Taupo (L.209a); Kaiangaroa Plains (L.210).

— f. **grandis** Kremp.

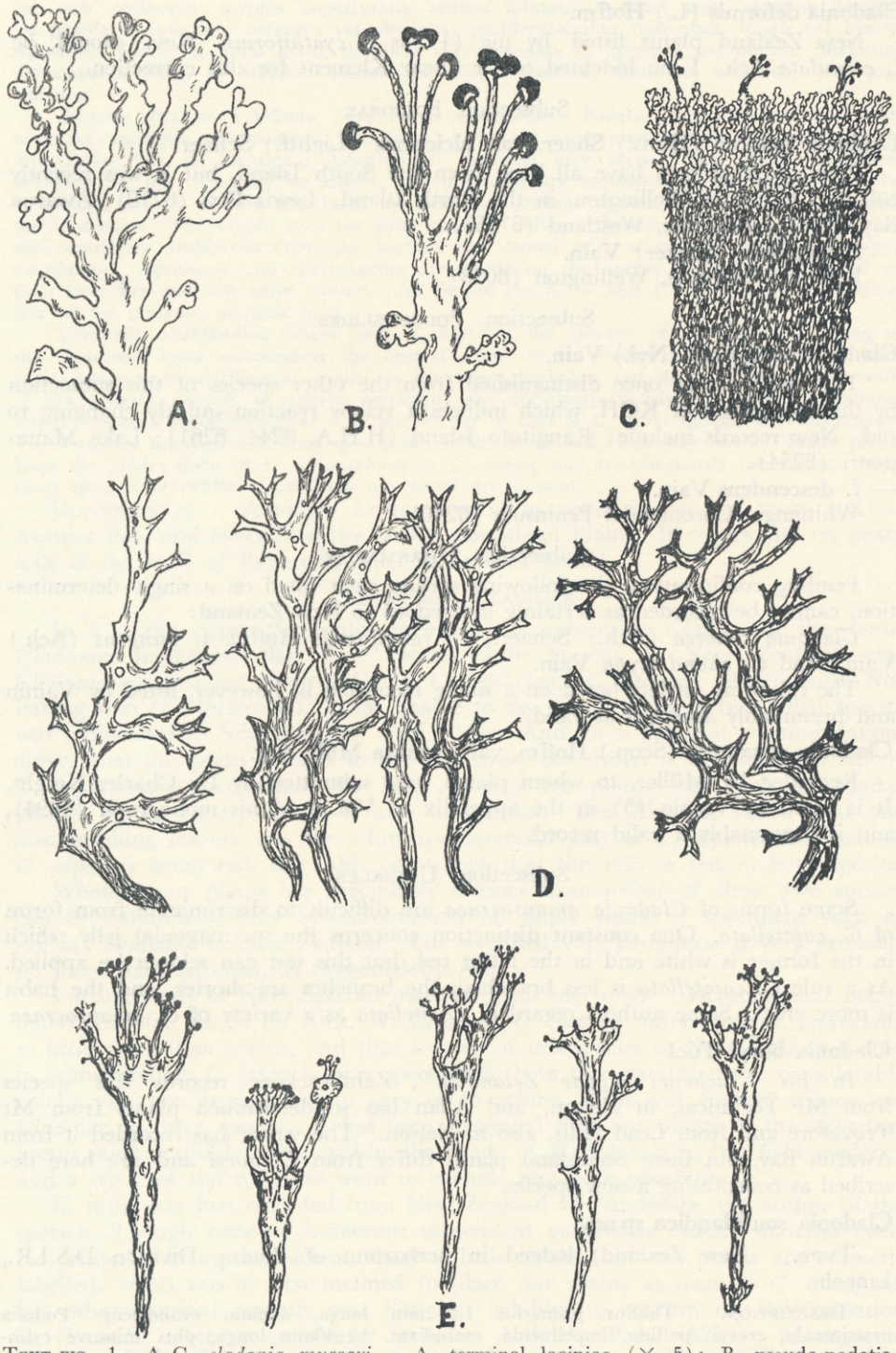
Ohakune (J.E.A. A.504); Taupo (K.W.A. L.209).

— f. **phyllocoma** Flk.

Awarua Bay (8087); Black Gully, Blue Mts, Otago (9000).

— f. **asotea** Ach.

Awarua Bay (8164).



TEXT-FIG. 1.—A–C, *cladonia murrayi.* A, terminal laciniae (× 5); B, pseudo-podetia (× 5); C, portion of plant showing habit (× 1); D, *Cladia aggregata* f. *fiordense* (× 1¼); E, *Cladonia southlandica.* Podetia (× 1).

Cladonia deformis (L.) Hoffm.

New Zealand plants listed by me (4) as f. *cyathiformis* Kov. should be f. *crenulata* Ach. I am indebted to Dr Oscar Klement for this correction.

Subsection FOLIOSAE

Cladonia foliacea (Huds.) Shaer. var. **alcicornis** (Lightf.) Schaer.

Previous recordings have all been from the South Island, but it was recently collected by me at Wellington, in the North Island. Lewis Pass (6710); Awarua Bay (7213); Kaimate, Westland (6765).

— f. **epiphylla** (Schaer) Vain.

Botanical Gardens, Wellington (8038).

Subsection PODOSTELIDES

Cladonia subcariosa (Nyl.) Vain.

This species is at once distinguished from the other species of this subsection by the application of KOH, which induces a yellow reaction quickly changing to red. New records include: Rangitoto Island (H.H.A. 8244, 8261); Lake Manapouri (8254).

— f. **descendens** Vain.

Whitianga, Coromandel Peninsula (8240).

Subsection CHASMARIAE

Pending confirmation, the following species each listed on a single determination, cannot be recorded as certainly indigenous to New Zealand:

Cladonia cenotea (Ach.) Schaer.; *C. rangiformis* Hoffm. f. *pungens* (Ach.) Vain.; and *C. chondrotypa* Vain.

The following variety based on a single recording is, however, listed by Vainio and presumably accepted as valid.

Cladonia squamosa (Scop.) Hoffm. var. **cornuta** Müll. Arg.

Recorded by Müller, to whom plants were submitted by Dr Charles Knight. It is listed by Vainio (5) in the appendix to Vol. 2 of his monograph (1894), and is presumably a valid record.

Subsection UNCIALES

Some forms of *Cladonia amaurocraea* are difficult to discriminate from forms of *C. capitellata*. One constant distinction concerns the spermagonial jelly which in the former is white and in the latter red, but this test can seldom be applied. As a rule *C. capitellata* is less branched, the branches are shorter, and the habit is more erect. Some authors regard *C. capitellata* as a variety of *C. amaurocraea.*

Cladonia boryi Tuck

In his "*Lichenes Novae Zelandiae*", Zahlbruckner records this species from Mt Technical, in Nelson, and Allan has so determined plants from Mt Trovatore and from Lead Hills, also in Nelson. The writer has recorded it from Awarua Bay, but these Southland plants differ from *C. boryi* and are here described as constituting a new species.

Cladonia southlandica sp nov.

TYPE. New Zealand; lodged in herbarium of Botany Division D.S.I.R., Lincoln.

DESCRIPTION. Thallus primarius 1.5–2mm longa, demum evanescens. Podetia crassiuscula, erecta, pallida, impellucida, esorediata, 12–40mm longa, plus minusve cylindrica, scyphifera, prolifera, squamarum destituta aut rarissima parcissime basi squamulosa, simplicia vel irregulariter dichotome ramosa, ecorticata, axillis imperforatis aut interdum perforatis; stratum chondroideum bene evolutum, nec reticulatum, vulgo lateribus integris

vel raro perforatis; scyphis imperforatis, sensim dilatatis, 3–6mm latis, margine dentatis vel proliferis, interdum deformis vel obsoletis; proliferationibus numerosis, longis vel brevis. Apothecia parva, .2–.4mm diam, simplicia vel aggregata in apicibus ramulorum, fuscentia; spermagonia etiam in apicibus ramulorum sita, cylindrica; materiam hyalinam (?) continentia.

Primary thallus 1.5–2mm long, soon evanescent. Podetia 1–1.5mm at the base, widening upwards, subcylindric, ecorticate but not tomentose, surface uneven, usually imperforate but an occasional longitudinal foramen may occur. The axils are closed, branches are few, irregular, or absent, and the walls are esquamulose and esorediate. The chondroid layer is smooth and lacks the reticulate surface present in *C. boryi*. The habit too is distinct. The scyphi may be quite regular, oblique, deformed, or even absent; they are commonly proliferous from the margin and closed with a concave or funnel-shaped membrane. Apothecia and spermagonia are borne on the apices of the proliferations or their branches and are quite minute. All plants are K — and P —, but KC + indicative of the presence of usnic acid.

Cladonia southlandica differs from *C. boryi* in the absence of the reticulate lining of the chondroid layer surrounding the central canal, in its smaller stature and almost constant presence of well-formed scyphi, in the fewer branches and distinct habit. The walls of the podetia, though of uneven thickness, are not conspicuously perforate or lacunose, but the exterior medullary layer is rather similar to that of *C. boryi* though less tuberculate. The terminal branchlets in both species are short, erect, and commonly fertile. Many plants have the goblet form of *C. chlorophaea* or *C. major* but are constantly proliferate. Very short spinous branchlets 1mm long sometimes are present.

DISTRIBUTION. Amongst *Leptospermum* in open spaces on peaty soil at Awarua Bay, and other localities on the Southland Plains. It occurs also on peaty soils at the head of Paterson's Inlet in Stewart Island.

Subsection CLADINAE

In a recent paper the writer reviewed the subsection *Cladina* of the genus *Cladonia*, indicating that four species were present in New Zealand—viz., *Cladonia alpestris* (or *alpestroides* ?), *C. leptoclada, C. impexa,* and *C. mitis*. Not having seen *C. alpestroides,* I was unable to say which of these two allied species was indigenous to New Zealand. Prof. Teuvo Ahti, in a personal communication, agrees that our plant belongs to the *Alpestrae,* but thinks it distinct from either. *C. alpestroides* was named by Des Abbayes for plants met with in Madagascar, where *C. leptoclada* is also indigenous. Des Abbayes stated that one distinguishing feature was the white spermagonial jelly of *C. alpestroides,* that of *C. alpestris* being red; but Ahti points out that the jelly is red in both species.

Whether our plants are specifically distinct from either of these two species can be determined only by examination of ample suites of specimens such as are not available in New Zealand. The so-called var. *portentosa* is very probably no more than an ecad, as suggested by Ahti.

Further study of New Zealand material leads me to the conclusion that plants determined for me by Dr Alex. W. Evans as *C. impexa* differ from *C. leptoclada* in little more than colour, and that records of this species in New Zealand should be transferred to *C. leptoclada,* a species which in this country shows considerable colour variation from white to grey or to yellow. This will further reduce our *Cladinae* to three species. It has been suggested that our plants of the *Alpestrae* group might possibly come within the range of *C. leptoclada,* but field evidence and a study of the structure seem to exclude any such possibility.

C. mitis was first recorded from New Zealand by Sandstede, the author of the species. Though none of numerous subsequent gatherings exactly matches overseas material in my herbarium, there is little doubt that our plants are correctly labelled. Ahti was at first inclined to place our plants as near to *C. laevigata,* but other material recently sent him has led him to confirm my determination as *C. mitis*. Recent gatherings include: Arthur's Pass (8259); Maungatua, Dunedin (T.1332 and M.8260); Cass (W. R. Philipson B.23), (6796); Rotoiti, Nelson (8190); Rimutaka Mts (8195); near Taupo (K. W. Allison L.236).

Subsection CLATHRINAE

The writer is convinced that Carroll W. Dodge (1929-31) was correct in placing plants of this subsection in Nylander's genus *Cladia.* Nylander included in this genus *Cladonia aggregata* and *C. retipora,* the then known species of *Clathrinae.* To these *C. sullivanii* should be added. What was believed to be the primary thallus has been observed only in *C. retipora,* this being crustose or papillose in character. All plants belonging to *Cladia* have the chondroid layer external to the algal layer, and not lining the central canal as in *Cladonia.* The walls of the podetia have a very thin medulla and are conspicuously porose, save in some forms of *C. aggregata,* where perforations may be few. All lack soredia, squamules, isidia, and scyphi. The apothecia are minute, black, peltate, and clustered in small cymes.

Cladia aggregata is a very polymorphic and widely distributed species with at least a dozen named forms, several of doubtful validity, with numerous connecting forms. The species is predominantly K —, but some gatherings are K +. What appears to be a distinct but unnamed form is described below.

Cladia aggregata (Sev.) Nyl. f. **fiordense** forma nova

TYPE. New Zealand; lodged in herbarium of the Botany Division of the D.S.I.R. at Lincoln, Canterbury.

DESCRIPTION. Podetia adscandentia, robusta, rigida, superne pallida vel albido-viridia, ad basi spadicia vel testacea, ad nodis 3–4mm lata, ad internodis ± 2mm lata, foraminibus paucis, apicibus bi- (raro ter-) furcatis, subulatis; ramulis 1–15mm longis, numerosis, sterilis.

This form has short stems (3–5cm) and numerous branches, many little more than spines, while others may be 1–3cm long. The podetia are light coloured above, dark or light brown below, wider at the nodes, ± ascending, forming open clusters; the tips of the stems are mainly bifid, ending in short, subulate spines. The foramamina vary from small to large and from oblong to circular, but are not numerous. The surface is dull, not nitidous. Fertile plants were not seen. K —, P —. It is allied to f. *inflata* F. Wilson from Australia.

DISTRIBUTION. Secretary Island, Doubtful Sound, West Otago, amongst mosses and low shrubs at 1,000 metres in Cladonia Gut. Collected by the late Dr James Murray, February, 1959.

Cladia sullivanii (Müll. Arg.) Martin comb. nov.

Syn. *Cladonia sullivanii* Müll. Arg. in Monogr. Clad. Univ. Vol. 1 (1887) p. 230.

Nylander transferred *Cladonia aggregata* and *C. retipora* to a new genus *Cladia. C. sullivanii* is somewhat intermediate in form between these two species, and indeed was regarded by Vainio as a form of *C. aggregata.* It therefore becomes necessary to transfer *Cladonia sullivanii* to the genus *Cladia.*

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