Studies of New Zealand Lichens. I—The Coniocarpineae

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Summary

KEYS, descriptions and distributional data are given for the New Zealand species of *Calicium, Sphinctrina, Coniocybe, Cyphelium, Pyrgillus* and *Sphaerophorus.* Nine new taxa are described in *Calicium, Coniocybe, Pyrgillus* and *Sphaerophorus,* together with a number of new combinations and new records. The monotypic genus *Calycidium* is reduced to synonymy with *Sphaerophorus.*

THIS is the first of a series of papers on the lichens of New Zealand and adjacent islands, at present based largely on collections from the South Island. Because of the present paucity of North Island material discussions of geographical distribution within New Zealand have not usually been given.

The first lichen collections from New Zealand were made on Cook's voyages, but these were apparently specimens picked up more or less accidentally; one species was described by Swartz in 1781 and two others collected by the Forsters were described by Acharius in 1810. The first large collection of New Zealand lichens was reported on by Richard in 1832, and between then and the present time about 190 papers and books dealing with New Zealand specimens have appeared. Among these are monographs dealing with all groups by Babington in Hooker (1855), Hooker (1867), Nylander (1888), Müller (1894), Hellbom (1896) and Zahlbruckner (1941), while series of papers have been published by Lindsay, Stirton and Knight in particular between 1860 and 1890. Although a number of papers published in the last 50 years have included New Zealand species, there has been but little activity in this field in the country with the result that almost all genera are in need of revision. Such revision is made difficult by the fact that no type specimens except Knight's and a handful of Stirton's remain in the country. Important reference collections of New Zealand lichens are at Kew, the British Museum, Paris, Helsinki and Vienna, while type specimens are located in nearly twenty places and some have been destroyed. However, cotypes of a number of species collected by Colenso are in the Dominion Museum, Wellington, and cotypes of nearly all the species described by Zahlbruckner (1941) are in the Herbarium of Botany Division, D.S.I.R., and in the Thomson collection at Otago.

In this paper and succeeding ones reference is made to specimens in the following collections:—

CHR: Specimens (usually unnumbered but sometimes carrying several letters and numbers) in the Botany Division Herbarium, D.S.I.R., Christchurch, collected by Dr. H. H. Allan and other members of the Division, principally V. D. Zotov, L. B. Moore, E. Chamberlain and H. Attwood. Duplicates of species seen by Zahlbruckner usually carry a number prefixed by Z, A, or ZA, and duplicates sent to other lichenologists also have identifying letters.

Mr: Mr. W. Martin, Dunedin.

T: J. S. Thomson collection in the Botany Department, University of Otago, and also specimens in the Botany Division Herbarium.

WELT: Dominion Museum Herbarium, Wellington; comprising mainly collections by Knight and Colenso.

Sc: D. Scott, University of Otago.

Others are named in full, and my own specimens carry a number only.

The collector's name is given where not otherwise obvious. I have not quoted all relevant specimens of common species, particularly in the Knight collection, since the latter do not usually carry locality or date. It is thought that most of Knight's New Zealand specimens were collected near Auckland or Wellington by Knight himself, but a fair number of specimens in this collection seem to belong to Australian or tropical species.

Descriptions of species are based on my own examination of the specimens cited, unless otherwise stated. In most cases the literature descriptions are very inadequate by modern standards or are inaccessible, and I have felt obliged to give more extended ones. Many species have an extensive synonymy which I am not in a position to examine—details will mostly be found in the appropriate volumes of Zahlbruckner's "Catalogus Lichenum Universalis", although this has some mistakes—consequently I have listed only the original citations together with references dealing with New Zealand material of the species concerned. Probably several of the earlier identifications are incorrect but I have not been able to check them.

The Coniocarpineae includes rather a heterogenous collection of genera, comprising those species where the asci disintegrate early, leaving the spores to ripen in a loose mass or mazedium. The spores are mostly rather small, dark and simple. A number of the species have little or no thallus, are parasitic on other lichens or are doubtfully in association with the algae and are often classed as fungi proper. Two of the New Zealand *Calicium* species are not certainly lichens but I have not thought it convenient to place them in fungus genera.

The genera are usually distributed among three families, the Caliciaceae, comprising crustose species with small stalked apothecia, the Cypheliaceae crustose species with sessile apothecia, and the Sphaerophoraceae foliose or fruticose species. Most of the genera are best developed in the Northern Hemisphere and the Tropics, but one monotypic genus is confined to the Southern Hemisphere (Madagascar) and another—*Sphaerophorus*—is most prominent there. Judging by present collections the crustose genera are relatively poorly represented both in species and numbers in Australasia and presumably are northern in origin.

Key to Genera

1.	Thallus crustose or obsolete or wanting	2
	Thallus fruticose or erect foliose	*Sphaerophorus*
2.	Apothecia sessile, spores brown, septate	3
	Apothecia very shortly stalked, spores simple	*Sphinctrina*
	Apothecia relatively long stalked	4
3.	Excipulum raised, apothecia subcylindrical	*Pyrgillus*
	Excipulum not well developed	*Cyphelium*
4.	Spores more or less globose, hyaline or pale	*Coniocybe*
	Spores elongated, pale or dark, 1- to 2-celled	*Calicium*

Genus Calicium (Pers) D. Notrs

Thallus crustose, obsolete or wanting, apothecia of cylindrical to lens-shaped capitula on relatively long stalks without algal cells; asci cylindrical, 8-spored; spores brownish or dark grey to very dark brown, ellipsoid to fusiform, 1- or 2-celled; paraphyses slender, unbranched; pycnidia minute, black, usually shortly stalked. The species are largely confined to dead wood, bark or other lichens.

As here defined *Calicium* has perhaps 80 species mostly found in the Northern Hemisphere and the Tropics; some 10 are described from temperate Australia and about a dozen from South America, while only one cosmopolitan species has been hitherto reported from New Zealand. The genus has been variously delimited in the past, and has been split into six by Vainio (1927), according to presence or

absence of algal cells in the thallus, the septation of the spores and whether parasitic or not on other lichens. Some of Vainio's genera are classed as fungi, but it seems that in a few species some specimens have algal cells and others not. The division between species with simple and with 1-septate spores is also not clearly marked, although the majority fall readily into one group or the other. I have included all these variations within the genus, but divided the New Zealand species among three subgenera, one of which is new. All the New Zealand species have whitish evanescent or obsolete thalli.

KEY TO NEW ZEALAND *Calicia*

1.	Apothecia broadly funnel-shaped, stipe hardly delimited from capitulum. Subgenus *Crassistipitum*	*martinii*
	Stipe thin, clearly delimited from capitulum	2
2.	Spores all simple. Subgenus *Mycocalicium*	*subnigricans**
	Spores mostly or all 1-septate. Subgenus *Calicium*	3
3.	Capitula reddish pruinose	*sphaerocephalum*
	Capitula whitish or epruinose	4
4.	Spores more than 4μ wide	*abietinum*
	Spores less than 4μ wide	*floerkei*

C. abietinum varieties

Capitula white pruinose or glabrous; spores less than 12μ long	var. *abietinum*
Capitula glabrous; spores more than 12μ long	var. *australe*

Calicium abietinum Pers. var. **abietinum**

Calicium abietinum Pers., Dispos. Meth. Fungor., 59 (1797).
Calicium curtum Borr., Bab. in Hook. Fl. N.Z. Vol. II, 304 (1855).
Nyl. Synops. Lich. I, 156 (1860).
Hook. Handb. N.Z. Fl., 558 (1867).
Kirk, Trans. N.Z. Inst., *4*, 235 (1871).
Hellbom, Bihang Kgl. Sv. Vetensk. Akad. Handl., *21*, 111, 130 (1896).
Calicium abietinum var. *denigratum* (Vain) Zahlbr. apud Szatala, Borbasia, *1*, 55 (1939).

Thallus whitish, very thin or evanescent, more or less homoiomerous with scattered bright green algal cells; apothecia (including stipe) up to 2 mm high but usually 0.8 to 1 mm, stipe 0.1–0.2 mm thick, black with hyaline outer layer; capitulum more or less turbinate (top-shaped), 0.2–0.5 mm wide, white pruinose beneath or marginally only, or epruinose; spores dark, ellipsoid, 2-celled, distinctly constricted at septum, 7–12 x 5–6μ with roundish loculae. (Description adapted from Vainio, 1927, p. 41.)

HABITAT. On old wood.

DISTRIBUTION. More or less cosmopolitan. Otago: Flagstaff, 4,600; Merton, 4649.

This is apparently the only species previously found in New Zealand, having been reported from the North Island by Babington, Szatala and Kirk, and from Otago by Hellbom. The species is evidently a variable one in Europe, and several varieties and forms have been reported from there. I am not quite certain which should be regarded as the typical variety, but have taken it to be Vainio's var. *glaucellum* (*C. glaucellum Ach.*) since this is apparently much the commonest form in the Northern Hemisphere. According to Vainio (1927), *C. abietinum* f. *denigratum* is an inconstant form differing from the typical variety in the less developed thallus and total absence of pruina on the apothecia; actually it is ranked as a form also by Zahlbruckner.

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* Added in Proof: Since the manuscript was submitted, the Australian species *Calicium oceanicum* Räs. has been collected in Otago: Merton, 4650. It differs principally from *subnigricans* in the brown, simple, ellipsoid spores, 5–6 x 3μ.

Calicium abietinum var. **australe** Murray, var. nov.

A C. *abietino* Pers. var. *abietino* differt stipite tenuiore, capitulo parviore et nudo, et sporis majoribus. Thallus evanescens.

Thallus whitish or greyish, very thin or obsolete, containing a few trebouxioid algae among the hyphae; apothecia about 0.8 mm high, stipe tapering upwards from about 0.18 mm at base to 0.07–0.09 below capitulum; capitulum subcylindrical to rather turbinate, black and somewhat shining, epruinose, K + pale brown, about 0.2 mm dia. and 0.18 mm high with mazedium forming a nearly flat top to 0.3 mm dia. Apothecia dark brown in section with hyaline outer layer of ill-defined structure 8–9μ thick; paraphyses few, very slender, simple and aseptate; asci cylindrical, *ca.* 55 x 5μ; spores in one series, dark brownish or smoky grey, oblong to ovate, 1-septate, definitely constricted at septum, (7$\frac{1}{2}$–) 12–15 (–18) x (5–) 6–7$\frac{1}{2}$ (–8)μ, wall and septum 1$\frac{1}{2}\mu$ thick (spores still in the ascus are hyaline, 1-septate, 7$\frac{1}{2}$ x 4$\frac{1}{2}\mu$). Pycnidia not seen.

HABITAT. Old wood.

DISTRIBUTION. Otago: Taieri Beach, 3718; Akatore Gorge, 3725. Southland: Forest Hill, 3474 (Type).

The variety differs from typical *abietinum* principally in the larger spores and total absence of pruina. Var. *meizopus* Vain. has similar large spores but the apothecia are 1·5–2 mm high and the capitulum is broader and more turbinate; only the type specimen of this variety seems to have been reported.

Calicium sphaerocephalum (L) Ach.

Mucor sphaerocephalus L., Sp. Pl. 1185 (1753).

Calicium sphaerocephalum Ach., Method. Lich. 91 (1803).

Thallus white to pale cream, very thin or evanescent, penetrating within the substrate and containing scattered trebouxioid algal cells (and occasional *Nostoc* cells which are probably chance contaminants); apothecia about 2 mm high, stipe black, epruinose, tapering from 150μ at base to 100μ at top, capitula dark brown or nearly black, cup-shaped, 300–350μ diameter and 300μ high; excipulum without hyaline layer but reddish pruinose and K + reddish-brown; mazedium convex, spores dark brown, all 1-septate, rather strongly constricted at septum, oblong to ovoid with nearly spherical cells, 6$\frac{1}{2}$–9 x 5μ.

HABITAT. On old wood.

DISTRIBUTION. Northern Hemisphere, (?) South America, Australia (as varieties). Southland: Forest Hill, 0265a (pr.p. with *Calicium subnigricans*).

The single small specimen seen (consisting of six apothecia) has slightly smaller capitula and spores than usual for European material (Vainio, 1927, gives the capitula as 350–800μ dia. and the spores (6–) 10–13 x (3–) 5–7μ for Finnish specimens), but in other respects it agrees closely. There are pycnidia on the specimen, but I am uncertain with which species they are associated. The Australian *C. trachelinum* var. *elattosporum* Wilson is similar but is said to have still smaller spores (3–8 x 2–4μ), although Wilson's microscopic measurements on other lichens are often rather small, presumably due to a calibration error. I have not used this variety name without seeing material of it; in any case the name could well be dropped because of possible confusion with *Calicium elassosporum* Nyl.

Calicium floerkei Zahlbr.

Calicium floerkei Zahlbruckner, Cat. Lich. Universalis I, 598 (1923–40) (nom. nov. for *Calicium pusillum* Hepp., non Flk.)

Thallus very thin, up to 30μ thick on surface of substrate and penetrating beneath, whitish to pale creamy-white or partly evanescent, green globose algal cells scattered in surface layer; apothecia about 350μ high, stipe light brown, 75–100μ thick at base tapering to 35–60μ at top, without any hyaline layer; capitula top-shaped, 100–200μ dia. and same in height, dark brown, epruinose, K+ pale brownish; hymenium 75–80μ thick, hypothecium pale brown, conical; paraphyses more or less conglutinate, 1μ thick; asci cylindrical, 45–60 x 3μ, 8-spored; spores smoky grey (turning brown with K), oblong to almost cylindrical, 1-septate with some simple thin-walled, 6–8 (–12) x 2.5–2.8μ, not constricted at septum. Pycnidia not seen.

HABITAT. On old bark.

DISTRIBUTION. Europe. Otago: Mt. Cargill, 1,500ft, T 2165 (on *Libocedrus bidwillii*).

The specimens consist of several pieces of bark with an unrecognisable lichen of which little remains but disintegrating lecideine apothecia, and which is covered with the minute fruits. It agrees very closely with Vainio's description (1927) of *Calicium subpusillum* Vain. and *Embolidium italicum* Sacc. (= *Calicium pusillum* Hepp), which apparently differ significantly only in that the former has algal cells in the thallus and the latter not. In the New Zealand specimen some of the apothecia seem to have no gonidia within 100μ of their bases, while others are clearly associated with a lichen thallus, although the visible thallus, particularly the white portions, may in part belong to the decomposing lichen. In some parts of the thallus the lichen hyphae were observed to produce thin-walled globose (?) chlamydospores, 5–8μ dia.

Calicium subnigricans Murray, sp. nov.

Thallus tenuissimus aut vix ullus, subalbidus, laevigatus, K-, parcibus gonidiis viridibus; apothecia altitudine 0.5–0.7 mm, stipite 60–80μ crasso, dilute fuscescente, pellucido, intus distincte pallidiore; capitulo turbinato, major minusve albido-pruinoso, 200μ diametro et 100μ altitudine, K-; asci cylindrici, 8-sporae; sporae monostichae, pallidae vel griseae, semper simplices, oblongae, 4½ x 2.2μ; mazedium bene evolutum, nigricans, hemisphaericum; paraphyses 1½μ crassi, subsimplici, irregulares; pycnidia non certe visa.

Thallus marked by a whitish area containing a relatively small proportion of ? trebouxioid cells 8μ dia. scattered singly and in groups among the thin hyphae and decomposing substrate cells; stipes 80μ dia. at base tapering to 60μ below capitula, structure not clearly seen but outer 15μ a slightly deeper brown than the centre, which is a pale straw colour. The whole capitulum is nearly globular, the upper two-thirds of which is the dark grey mazedium; the excipulum in young apothecia is white pruinose, the pruina disappearing in older fruits; the spores are all simple, oblong to somewhat ellipsoid, hyaline but darkening in the mazedium to a smoky grey.

HABITAT. Old wood.

DISTRIBUTION. Southland: Forest Hill, 0265b (pr.p. with *Calicium sphaerocephalum*) on dead *Griselinia littoralis* (Type).

This species with its simple spores falls in *Mycocalicium*, a group which has been variously interpreted in the past as including *Calicium* species without algae, in the thalli (i.e., fungi), lignicolous non-lichenized species with brown simple spores, and *Calicium* species with all simple spores whether lichenized or not. I have preferred to follow the last of these interpretations (Santesson, 1943) since it is not always possible to be sure whether algae are truly associated with the fungus hyphae in certain species, or indeed whether the apothecia are certainly derived from the thallus on which they are growing. *C. subnigricans* resembles in the nearly colourless spores *C. arenarium* Hampe (*Coniocybopsis arenarium* (Hampe) Vainio), a species of fungus parasitic on lecideine lichens, and differs from it principally in the smaller capitula with more developed mazedia and smaller spores, as well as in the habitat. The white pruina may not be a constant character.

There is evidently another New Zealand species in the Mycocalicium subgenus, judging by a North Island specimen from Hawke's Bay (Colenso, 3596, WELT). It is not complete, the capitula being reduced to the narrow excipula on dark brown stipes of uniform structure, K + purplish; thallus none remaining; spores still clinging to the stipes are brown, simple, broadly ellipsoid, 7½ x 3–5½μ. It is no longer completely identifiable, but is not referable to any European or South American species. The Australian *Mycocalicium australicum* Räsänen appears very similar but for slightly longer spores.

Crassistipitum Murray, subgenus **Calicii** novum

Thallus tenuis vel obsoletus; stipites apotheciorum magis crassi, a capitulis non bene distincti, totum apothecium subcylindricum vel infundabiliforme; sporae pro majore parte nigricantes, uniseptatae.

The new subgenus is separated from *Calicium* proper by the relatively broad stipes which are not clearly delimited from the capitula. The apothecial margin and

upper part of the stipe form a broad conical structure containing the hymenium and hypothecium. The type species is *Calicium infundabiliforme* Sant. and the only other species so far referable to the subgenus is *C. martinii* below.

Calicium martinii Murray, sp. nov.

Thallus albidus, circa 30μ crassus aut partim obsoletus, K-, gonidia viridia, pauca, 8–10μ dia.; apothecia ad 1 mm alta, infundabiliformia, circa 0.6 mm dia., nigra (macroscopaliter), K + flavescenti-aurantiacea, structurae uniformis, mazedium bene evolutum, applanatum, nigrum; asci non certe visi, sporae oblongae, obscure fuscae, uniseptatae, non constrictae, membrana septoque hyalinibus, 15–18 x 5–7½μ; paraphyses simplices, aseptate, circa 2μ crassi. Pycnidia non visa.

Thallus white or whitish, mostly 30μ thick but very variable and partly obsolete, K-, structure more or less disorganised, of mixed slender hyphae and collapsed cells (? from substrate), with hyphae penetrating below the surface; relatively few algal cells associated with the hyphae and considerable areas without gonidia; apothecia broadly funnel-shaped, 0.6–1 mm high, 0.65–0.75 mm wide at top and 0.6–0.65 at base, K + orange-yellow; excipulum 120μ wide, of dark reddish-brown material without appreciable hyaline layer; no asci seen. Mazedium forming a flat or convex black mass up to 1 mm wide; spores dusky greyish brown, all 1-septate, not constricted, nearly oblong although sometimes apiculate at one end, 15–18 x 5–7½μ, wall and septum hyaline or nearly so, 1½μ thick; paraphyses simple, aseptate, 2μ thick. Pycnidia not seen.

HABITAT. On bark.

DISTRIBUTION. Westland: Greymouth, Mr 1222, on *Nothofagus fusca.*

This species is unusual among the *Calicia* in the form of the fruit, and seems to justify the separation of a separate subgenus. So far as I know the only other species with such funnel-shaped apothecia is *C. infundabiliforme* Santesson (1943) from Argentina, which differs principally in the narrower fruits and smaller (10–13 x 4–6μ) oval spores. In the conical bases of one of the apothecia examined a few immature hyaline 1-septate spores appear to be formed by budding from the ends of slender filaments otherwise indistinguishable from paraphyses. All the fruits on the type specimen appear to be fully mature and no asci were definitely seen. The subhymenial structure is somewhat atypical, and it is possible that the plant is not a true ascolichen, although a definite thallus is present wherever apothecia appear and they seem continuous with it. The apothecia apparently originate just below the surface of the thallus and may seem to be emerging from the bark beneath.

Genus CONIOCYBE Ach.

Thallus crustose; apothecia small, stipitate; spores more or less globose, simple, hyaline or very pale yellowish or greyish, forming a well-developed mazedium.

Coniocybe otagoënse Murray, sp. nov.

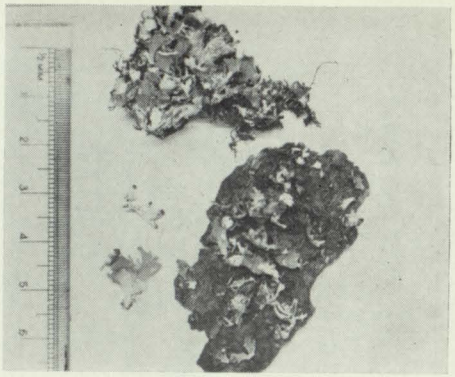
Thallus albidus vel griseus, obsoletus aut partim nullus, K-, gonidia non certe includans; apothecia circa 1.5 mm alta, stipite fusco, moderate crasso, hyphibus longitudine dispositibus, K + purpurascens, capitulo parvissimo, epruinoso, strato hyalino nullo; asci haud visi; mazedium pallidum subobscurumve, globosum capitem formans; sporae hyalinae, globosae aut pro parte ellipsoidae, 4–6 x 3–4μ; paraphyses tenuissimi, simplices. Pycnidia nigra, globosa, substipitata, 50 (–100)μ dia., pycnidiosporae non visae.

Thallus very thin, mostly 10μ thick with scattered green cells 10μ dia. (perhaps not truly associated with thallus) but penetrating 10–20μ below wood surface, white or greyish, K-, or obsolete; apothecia about 1.5 mm high, stipe about 250μ thick at base tapering to about 180μ upwards, K + purple; capitula brown, epruinose, little wider than stem and funnel-shaped with grey spore mass forming a nearly spherical head; asci none remaining; paraphyses slender, aseptate; spores simple, hyaline or nearly so, globose to rather oblong, 4–6 x 3–4μ with wall 0.8μ thick. Pycnidia black, elevated, 50μ dia. or sometimes larger, pycnidiospores not clearly seen.

HABITAT. On old wood.

DISTRIBUTION. Otago: Maungatua, 2,500ft, 0585.

The type specimen is not in good condition, nearly all the spore heads having disappeared, leaving the resistant stems with a few spores remaining in the indented



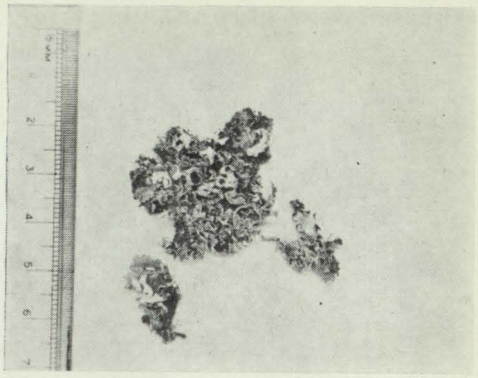


FIG. 1.—*Sphaerophorus cuneatus* (Stirt.) Murray. No. 3980.

FIG. 2.—*Sphaerophorus melanocarpus* var. *australis* (Laur.) Murray. No. Mr. 7095. An unusually small specimen.

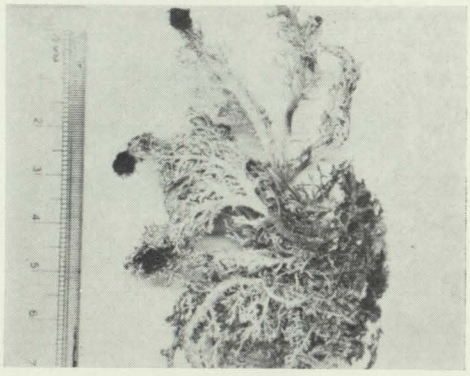
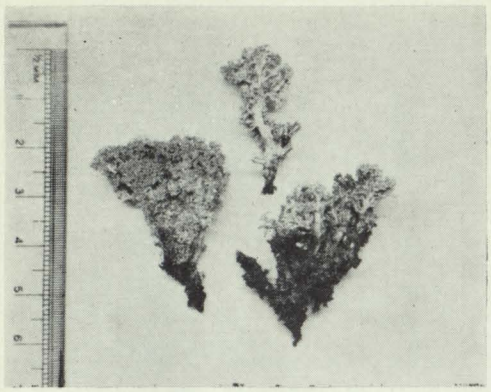


FIG. 3.—*Sphaerophorus melanocarpus* var. *australis* f. *angustior* (Reinke) Murray. No. T 2915.

FIG. 4.—*Sphaerophorus melanocarpus* var. *australis* f. *delicatus* Murray. No. 4295.

FIG. 5.—*Sphaerophorus melanocarpus* var. *australis* f. *insignis* (Laur.) Murray. No. Mr. 6870.

FIG. 6.—*Sphaerophorus melanocarpus* var. *australis* f. *palmatus* Murray. (Thomson & Simpson) CHR.



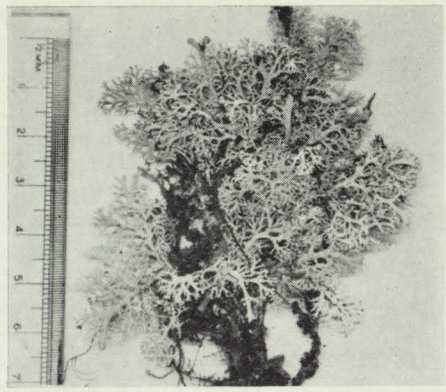
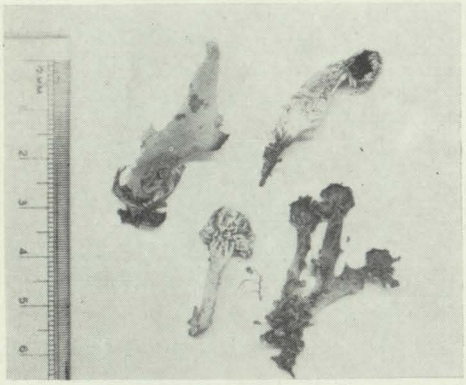


FIG. 7.—*Sphaerophorus melanocarpus* var. *australis* f. *subteres* (Zahlbr.) Murray. No. 1170.

FIG. 8.—*Sphaerophorus melanocarpus* var. *australis* f. *vividulus* (Col.) Murray. (Thomson & Simpson) CHR.



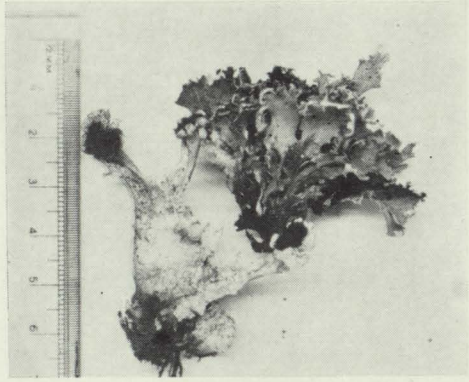


FIG. 9.—*Sphaerophorus melanocarpus* var. *scrobiculatus* (Bab.) Murray. No. Sc 135.

FIG. 10.—*Sphaerophorus melanocarpus* var. *scrobiculatus* f. *macrophyllus* (Zahlbr.) Murray. No. 4051.

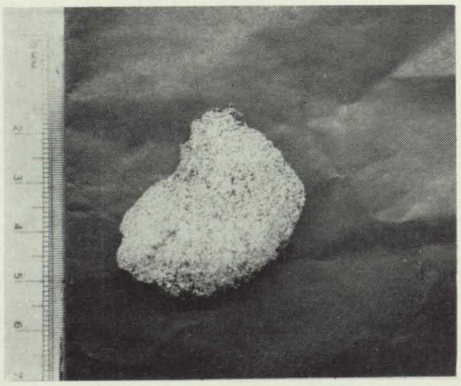


FIG. 11.—*Sphaerophorus tener* Laur. No. T 2251. Caespitose form on soil, corresponding to *Sph. curtum* Hook. f. & Tayl.

FIG. 12.—*Sphaerophorus tener* f. *globosoides* Murray. No. 4288.

tips. Among European species with similar scant thalli and moderately large spores are *C. obscuripes* Nyl. and *Roesleria onygenoides* Karst.; the former has Trentepohloid gonidia and reddish pruinose apothecia, while the latter, with no algal symbiont, is apparently a true fungus which has not recently been reported.

Genus SPHINCTRINA Fries

Algal thallus none, parasitic on other lichens; apothecia small, shortly and broadly stipitate; spores dark, simple.

Sphinctrina leucopodoides Nyl.

Sphinctrina leucopodoides Nylander, Lich. N.Z., 12 (1888).

Parasitic on *Pertusaria* species, stipe short, whitish, apothecia 0.5 mm dia., dark; spores blackish, simple, ellipsoid-fusiform, 11–20 x 6–8μ (description from Nylander).

Nylander, who described this species from one of Knight's specimens (locality unstated), remarks that it is hardly more than a variety of the European *S. microcephala* (Tul.) Nyl. (*Sph. tubaeformis* Mass.). It has not been found since, except for a somewhat doubtful report from Hawaii (Magnusson, 1944), and I was unable to find a specimen in the Knight collection.

Vainio (1927) restricts the genus *Sphinctrina* to parasitic species with globose spores, and the New Zealand species would perhaps fall in his genus *Strongyleuma* with ellipsoid to fusiform spores.

Genus CYPHELIUM Ach.

Thallus crustose; apothecia small, sessile to immersed, asci cylindrical, sometimes persisting till late; spores dark, two-celled, more or less ellipsoid.

KEY TO NEW ZEALAND *Cyphelia*

On stone; thallus thick, mazedium poorly developed	*polycarpum*
On wood; thallus thin, mazedium well developed	*emergens*

Cyphelium polycarpum Zahlbr.

Cyphelium polycarpum Zahlbr., Lich. nov. Zel., 10, 1941 (reprint).

Thallus ash-grey, up to 2 mm thick, mostly determinate, continuous, rimose centrally, K- or faintly brown; cortex fastigiate, 25–40μ thick, of faintly brownish tipped thick-walled hyphae 2½μ dia.; algal layer 25–50μ thick, cells trebouxioid, up to 10½μ dia.; medulla white, nubilated, of irregularly arranged 2½μ dia. hyphae; thin brown hypothallus visible in places is K + brown; apothecia black, adnate to almost immersed, saucer-shaped, excipulum rudimentary; hypothecium hyaline, 75–140μ thick; hymenium 100–120μ high; paraphyses conglutinate (distinct in KOH), 1½μ thick, mostly simple with 3μ dia. brownish tips, level with and hardly distinguished from cortical hyphae; asci clavate-cylindrical, about 55 × 15μ, 8-spored; mazedium thin or absent, spores reddish-brown, oblong, 1-septate, 15–18½ × 7½–10½μ, sometimes slightly constricted at septum.

HABITAT. On exposed rock.

DISTRIBUTION. New Zealand. Otago: Silver Peak, 2,400ft, T 1157, and in CHR as ZA 3880 (isotypes), Swampy Spur, 2,200ft, 4188.

This species, at present known only from two collections, is a doubtful member of the genus. The thallus is much thicker than usual, and the well developed fastigiate cortex seems to make it unique in *Cyphelium*; in addition, although the asci apparently do disintegrate early (when the spores are dusky-bluish), the apothecia have at most only a few loose spores on the hymenial surface rather than a definite mazedium. The abundant stout paraphyses are also unusual in the genus. I believe the species may belong to a separate new genus, but hesitate to erect one for it in the absence of other specimens and without examining other *Cyphelium* species. Possibly it does not belong to the *Coniocarpineae*, but the structure of the cortex and hymenium seem to exclude it from *Rhizocarpon* or *Buellia* in the *Cyclocarpineae*, which it otherwise resembles.

Cyphelium emergens (Wils.) Zahlbr.

Trachylia emergens Wilson, J. Linn. Soc. Lond. Bot. *28*, 369 (1891) and Tabl.
Cyphelium emergens Zahlbr, Cat. Lich. Univ. *1*, 664 (1922).

Thallus epi- and endolignous, whitish, up to 40μ thick above substrate surface, K-, algae green, *Trebouxia*, globose, 10–18μ dia. or more or less oblong, 10½–13 (–18) x 7½–10½ (–13)μ, colonies usually enclosed in capsules about 150 x 75μ containing 25 or more algal cells and with a boundary wall of fungus hyphae; apothecia up to ½ mm dia. round or somewhat ellipsoid, convex, mostly with a small annulus of white cortical tissue at the base and seeming to emerge from the wood fibres; hypothecium indistinct, pale; paraphyses few and degenerate; asci not seen; mazedium prominent, K + greenish-brown; spores dark grey with surface coating of black pigment granules (spores turning brown in KOH) mostly 2-celled with round loculae and well constricted at the septum, 8–10½ x 5.2μ, but apparently sometimes 3-septate and 12μ long. The spores in the mazedium usually form conglutinate masses in which individual spores are difficult or impossible to distinguish, and only the round loculae are visible.

HABITAT. On old wood.

DISTRIBUTION. Australia. Marlborough: Onamalutu, Mr 4240a. Canterbury: Lake Ohau, 1,700ft, Mason 96. Otago: Flagstaff, 1,700ft, 3681, on old posts. Southland: Kaiwera, Mr 908 (pr.p.).

The algal cells are mostly beneath the top layer of wood fibres, 50–120μ below the surface, and are not always enclosed in "capsules". The restriction of the gonidia to capsules with a fastigiate cortex of lichen hyphae is not unknown in other lichen families but does not seem to have been recorded for any of the *Coniocarpineae* previously. In Mason, 96, the outer thalline layer is very thin, the apothecia appear subglobose and the spores less coherent than usual. In this specimen there are frequent zoosporangia among the algal cells. Probably other wood inhabiting species of *Cyphelium* are present in New Zealand but have been overlooked or are very local.

Genus PYRGILLUS Nyl.

Thallus crustose, ecorticate, algae *Trentepohlia*, apothecia with dark more or less cylindrical raised excipulum, asci cylindrical, 8-spored, spores brown, ellipsoid or fusiform, 1- or 3-septate, forming well-developed mazedium.

Pyrgillus crassus Murray, sp. nov.

Thallus lignicolus, crustosus, crassus, rimosus, albidus vel cinerescenti-albidus, ecorticatus, major minusve homoeomerus, hypothallo nullo, K-, P-, gonidiis Trentepohlioidis irregulariter subglobosis ad 13 x 9μ, in coloniis. Apothecia elevata, subcylindrica, nigra, epruinosa (vel apothecia juventia subglobosa, albido-pruinosa ad ostiolem), excipulo obscure fusco, subtendente hypothecium et K + brunneus; sporae fuscae, biloculares, oblongae, ad septo constrictae, 11½–18½ x 8–8½μ. Pycnidia non visa.

Thallus crustose, subeffigurate, to 10 cm dia., white to greyish-white, without distinct hypothallus, rimose (in dry state) forming irregular areolae 200–800μ across, 300–400μ thick, apparently ecorticate but with outer hyaline decomposed layer 5–15μ thick; algae green or yellowish-green, *Trentepohlia*, subglobose 10–13μ dia. to oblong 13 x 9μ with thin sheath and forming clumps embedded in the nubilated "decomposed" tissues of upper part of the thallus; medulla mostly of disorganised structure but some 2½μ dia. hyphae visible in KOH; K-, P-. Mature apothecia black, 500–700μ dia., raised about 300μ above thallus, slightly conic; excipulum matt or faintly shining, 35–40μ thick at sides increasing to over 100μ beneath hypothecium, very dark brown in section with outer part lighter and a surface hyaline coating 5μ thick, K + brownish; hypothecium indistinct, 60μ thick including bases of old asci; asci cylindrical, 8-spored, evanescent; spores smoky brown, 1-septate, distinctly constricted at septum, oblong, 11½–15½ x 8–8½μ with wall and septum 1½–2μ thick, contents grumose (spores clearing and turning dark brown, swelling to 18 x 10½μ in KOH); mazedium at least 250μ thick, black, K + faint brown.

HABITAT. On dead wood.

DISTRIBUTION. Otago: Green Hill (Silver Peaks), 2,000ft, 4203.

Although this new species has been collected only once, it is moderately common on a line of old fence posts in the type locality. There are only two other species in the genus with 2-celled spores, both from near Brisbane, Australia; the Northern

Hemisphere species have 3-septate spores but are otherwise similar. This species differs from the Australian ones principally in the well-developed thallus, and much larger spores.

Genus SPHAEROPHORUS Pers.

Thallus fruticose, terete or flattened, or erect foliose, mostly entirely corticate, cortex usually of thick-walled vertical hyphae; algae green (one species with cephalodia containing blue-green algae); medulla of longitudinally arranged close-packed hyphae without distinct strengthening layer. Apothecia terminal or nearly so, with thalline margin (sometimes dehiscent); paraphyses slender, sparse; asci clavate to cylindrical, 8-spored; spores forming a well-developed mazedium, simple, globose, hyaline or brown, with or without encrusting black granules. Pycnidia brown, globose, with simple oblong hyaline pycnidiospores.

The genus has probably less than a dozen species, mostly in the Southern Hemisphere, although some are poorly defined or of uncertain status. Most of the species are rather variable, but undoubtedly the most protean is the *Sph. melanocarpus-Sph. australis* complex. Although the extreme forms in this group are very different in appearance, there seems to be a nearly complete series of intermediates, so that I have thought it most convenient to place all the New Zealand variants as varieties and forms of *Sph. melanocarpus* pending examination of specimens from other parts of the world.

Sphaerophorus melanocarpus (sensu latiore)

This species appears to be of nearly world-wide distribution, but with the greatest development of forms in Australasia, where it is also particularly abundant. Despite the very different appearance of the various varieties and forms, the morphological and chemical differences between them are hardly significant. A moderate proportion of the specimens examined are K + faint yellow, but this does not seem to be correlated with any other feature, and since the reaction is often doubtful I have not taken it into account in separating the subspecific taxa. It is largely a matter of convenience how many varieties and forms should be recognised, and it is unlikely that any two lichenologists would agree completely about their number and exact status, so the present scheme cannot be regarded as final. It might be equally satisfactory to treat the three varieties as separate species, particularly since they have different geographical ranges. Some of the forms are probably ecotypes, and this could probably be confirmed by experiment, but others must be more constant since two forms can sometimes be found growing together but easily separable into different populations. The most distinct taxa seem to be var. *australis* f. *subteres* and var. *scrobiculatus*. The former sometimes looks like *Sph. fragilis* but flattened stems can usually be found near the periphery of the clump. The average spore diameter for var. *scrobiculatus* is a little greater than for the others, although the ranges overlap almost completely.

A curious feature of several specimens is the presence of fruiting structures additional to apothecia and the normal pycnidia; these are not visible macroscopically and sections showing them have been obtained only by chance. They are apparently randomly distributed over the upper surface and consist of irregular spaces in the algal layer and lower part of the cortex, without definite wall but lined with hyphae producing hyaline ellipsoid spores. I have not clearly seen either the opening of these structures to the outside or the mode of attachment of the spores.

KEY TO NEW ZEALAND *Sphaerophorus* SPECIES

1. Thallus more or less compressed, dorsiventral 2
   Thallus terete 3
2. Apothecia subterminal on ventral surface, over 1 mm dia., with thalline margin ..... *melanocarpus*
   Apothecia terminal on lobules, up to 1 mm dia., thalline margin absent in mature fruits ..... *cuneatus*

3. Thallus stout, with bluish cephalodia ..... *stereocauloides*
   Thallus not over 2 mm dia., without cephalodia 4
4. Apothecia in irregularly dehiscent globose receptacles ..... *globosus*
   Apothecia hemispherical, thalline margin lost in mature fruits *tener*

Sphaerophorus melanocarpus varieties and forms.

1. Main stems and branches up to 1.5 times as broad as thick, branchlets mostly subterete ..... var. *melanocarpus* 2
   Main stems at least twice as broad as thick, branchlets compressed or subterete 3
2. Stems to 2 mm dia., with small sympodial branches or several times di- or trichotomously divided ..... normal form
   Sympodial axis to 1 mm dia., almost terete, branches not much narrower than axis and repeatedly di- or trichotomously divided in more than one plane ..... f. *ramosissimus*
3. Fruiting stems up to 3.5 mm broad, more or less branched or dissected, backs of apothecia smooth or nearly so, apothecial margin narrow ..... var. *australis* 4
   Stems more than 3 mm wide, subentire to marginally laciniate, backs of apothecia strongly rugose-scrobiculate, margins usually broad ..... var. *scrobiculatus* 7
4. Thallus several times dichotomously divided into branches 2–3 mm wide, without main stem ..... f. *palmatus*
   Thallus with evident main stem and final branches less than 2 mm wide 5
5. Margin of fruiting fronds laciniate ..... f. *proliferus*
   Margins entire or nearly so 6
6. Upper branches closely clustered, subterete ..... f. *subteres*
   Small, repeatedly branched with final branches 0.05–0.3 mm wide ..... f. *delicatus*
   More or less sympodially branched, final branches 0.2–0.8 mm wide ..... f. *angustior*
   Repeatedly sympodially and di- or trichotomously divided, branches widely spreading, final branchlets mostly 1 mm wide f. *vividulus*
   Branches linear, sparingly subdivided, 5–15 x 0.5–1.2 mm, main stems rather wide ..... f. *insignis*
   Stems usually strongly flattened, with relatively few small branches ..... "normal" form
7. Fruiting stems 3–8 mm wide ..... normal form
   Fruiting stems 8–25 mm wide, thin ..... f. *macrophyllus*

Sphaerophorus tener forms.

Branching mainly dichotomous except for fruiting stems; plant usually on bark ..... normal form
Sympodial axis clearly evident; plant usually on soil among debris ..... f. *globosoides*

Sphaerophorus cuneatus (Stirt.) Murray, comb. nov. Pl. 13, Fig. 1.

Calycidium cuneatum Stirton, Proc. Philos. Soc. Glasgow *10*, 292 (1877).
Coniophyllum colensoi Müll. Arg., Bull. Soc. Bot. Belg., *31*, 23 (1892).
(?) *Sphaerophoron polycarpum* Colenso, Trans. N.Z. Inst., *16*, 361, 1883 (1884).

Thallus of erect fronds 5–10 mm long by 3–6 mm wide, entire, K-; upper surface smooth, brownish (originally grey-green) lower surface pale brownish (originally white) smooth to somewhat longitudinally ribbed and wrinkled; upper cortex 50μ thick, hyaline, of vertical septate hyphae sometimes appearing almost pseudoparenchymatous with cells up to 20μ long; algal layer 25–40μ thick, with light green thinly halonate gonidia 7–13μ dia.; medulla at least 150μ thick, of moderately loosely woven anastomosing hyphae about 2$\frac{1}{2}\mu$ dia.; lower cortex discontinuous, brownish, up to 25μ thick, similar to upper cortex. Apothecia on marginal lobules about 1 mm long, 1 to 15 per frond, mostly slightly displaced to ventral surface, hemispherical, 0.5 mm dia., with thin thalline margin at base (like mature *Sph. tener* fruits), K + brownish, hymenium up to 100μ high, more or less hyaline except for brown epithecium and mazedium; hypothecium dark brown, mostly 200–250μ high; faintly brownish proper margin 12–15μ thick continuous beneath hypothecium; paraphyses very thin, rather numerous, entangled, apparently simple, asci cylindrical, 8-spored; spores monostichous,

globose, brown, without pigment granules (4–) 5 (–5½)μ dia., thin walled, forming a well-developed mazedium. Pycnidia not seen. (Description from isotype specimens.)

HABITAT. On bark.

DISTRIBUTION. Chatham Islands. Southland: Secretary Island, 3980, 3997. Chatham Island: (Colenso 7), (Colenso 30), WELT (apparently isotype specimens from a single collection).

This species was till very recently known only from the type specimens acquired by Colenso (probably collected by Travers) about 90 years ago. The Secretary Island plants are rather larger (to 15 x 8 mm) with less entire margins than the isotypes, have mostly longer fertile lobules with dark brown fruits, a more continuous lower cortex and a less cellular upper cortex 65μ thick, but are clearly conspecific. The structure of sterile fronds is very similar to that of *Sph. melanocarpus* var. *scrobiculatus* and indeed the plant would be taken for this in the absence of fruits. There is no justification, then, for retaining the genus *Calycidium* and I have reduced it accordingly. The apothecia are similar to, and develop in the same manner as, those of *Sphaerophorus tener*. The present discontinuous distribution suggests that the species will be found elsewhere in New Zealand, although it is almost certainly not present on the East side of the Southern Alps.

Sphaerophorus globosus (Huds.) Vainio

Lichen globosus Huds., Fl. Angl. 460 (1762).
Sphaerophorus globosus Vainio, Lich. Ant. 35 (1903)
Sphaerophorus coralloides Pers., Usteri N. Ann. Bot. 1st, 23 (1794).
? Hook., Handb. N.Z. Fl., 559 (1867)
? Hook., Fl. N.Z., 304 (1855).
? Buchanan, Trans. N.Z. Inst., *6*, 231 (1873) (1874).

Thallus up to 10 cm high, forming loose clumps, primary axes to 2 mm dia., sparingly branched, smooth or slightly impressed, terete or sometimes slightly compressed, with short terete phyllocladial branches 0.2–0.3 mm thick, whitish or greenish-white or brownish, cortex 90–110μ thick, hyaline, of conglutinate more or less vertical branched hyphae, not clearly delimited from medulla; algae *Cystococcus*; medulla of longitudinal 4–5μ dia. hyphae, I + blue. Apothecia rather rare, in tips of thicker branches, globose, irregularly dehiscent above; hypothecium globular-columnar, brownish above, hymenium nearly hyaline, paraphyses few, thin, simple, asci cylindrical, spores globose or subglobose, becoming bluish then black, 7–11μ dia. with papillate wall. Pycnidia immersed in tips of phyllocladia. (Description from Vainio. 1927.)

HABITAT. On mossy rocks, soil, etc.

DISTRIBUTION. Northern Hemisphere, South America and adjacent Islands, ? Australia and ? New Zealand.

Exsiccata seen: Fl. Suecica 19 (Henriksson).

Although this species has been reported several times from New Zealand and the Subantarctic Islands, I have seen no undoubted specimens. Possibly the plant referred to is *Sphaerophorus tener* f. *globosoides*, a form which is hardly distinguishable from *Sph. globosus* when sterile, as it usually is. Hooker records the species as being collected by Colenso, but there are no specimens of it in the portion now in the Dominion Museum. A short, caespitose form of the species in Europe is known under the name *Sph. globosus* f. *curtus* (Hook.) Zahlbr. based on *Sphaerophoron curtum* Hook. from Campbell Island. This is evidently a misidentification, as the Hooker species is conspecific with *Sph. tener*. Although the records of *Sph. globosus* for New Zealand are probably incorrect, I have included a description of it as the species may well be present. Two specimens identified as "*Sph. coraloides*" in the Knight collection are a small form of *Sph. melanocarpus* and a very isidiose specimen of *Menegazzia nothofagi* Zahlbr.

Sphaerophorus melanocarpus D.C. var. **melanocarpus**

Sphaerophoron melanocarpon D.C., Fl. Fr. *6*, 178 (1805).
Sphaerophoron compressum (pr.p.) Hook., Fl. Antarctica, *1*, 196 (1844).
Fl. N.Z., 305 (1855).
Handb. N.Z. Fl., 559 (1867).
Lindsay, Trans. Linn. Soc., *25*, 530 (1866).
Kirk, Trans. N.Z. Inst., *4*, 235 (1871).
Buchanan, Trans. N.Z. Inst., *6*, 231 (1873).
Nyl., Compt. rend. Paris., *83*, 87 (1876).
Lich, N.Z., 13 (1888).
Müll Arg., J. Linn. Soc. Bot., *32*, 198 (1896).
Hellb., Bihang Kgl. Svensk Vetensk. Handl., *21*, III (13), 129 (1896).
(?) *Sphaerophoron compressum* var. *candidum* Müll. Arg., J. Linn. Soc. Bot., *32*, 198 (1896).

Thallus fruticose, more or less erect, sometimes forming clumps up to 15 cm across, 2–10 cm high, either with evident sympodial axis or several times di- or trichotomously branched; main axis up to 2 mm broad and 1.2 mm thick, sometimes impressed or foveolate on ventral surface and with cortex up to 220μ thick but usually about 90μ, of vertical conglutinate thick-walled hyphae 12–20μ dia., thinner on lower surfaces and on branches; algal layer 40–65μ thick but not clearly distinct and thinner and less continuous on lower surface, algae green, 5–10μ dia.; medulla of longitudinal thick-walled hyphae up to 7μ dia., often encrusted with colourless crystals, K- or f. yellow, P-, I-. Phyllocladial branches down to 50μ dia. with 10μ thick cortex but usually considerably larger, terete or flattened. Apothecia subterminal with narrow margin or on ventral surface near tip of main stem and larger branches; irregularly lentiform and finally hemispherical, 1–3 mm dia., hypothecium hyaline, hemispherical, not clearly distinct from medulla; asci cylindrical, paraphyses few, simple, slender; spores globose, 6–7½ (–12) μ, smoky-grey and encrusted with black pigment granules which are weakly K + purplish. Pycnidia black, globose, 100–300μ dia., pycnidiospores hyaline, ellipsoid-oblong, 3 x 1μ.

HABITAT. On soil and debris, rarely on trees.

DISTRIBUTION. More or less cosmopolitan. North Island: Herekino (Poole) CHR; Ruahines (Colenso) WELT. Marlborough: Mt. Stokes, CHR. Canterbury: Poulter Valley, Sc 70, Sc 71. Otago: Haast Pass, 3902; Mt. Watkins, T 2064. Southland: Doubtful Sound, T 2839, T 2840; Lake Hauroko, Mr 7304. Campbell Island: (Oliver) WELT 18.

Exsiccata seen: Arnold 873 (WELT), Gyelnik's Lich. (CHR).

Sphaerophorus melanocarpus var. **melanocarpus** f. **ramosissimus** Murray f. nov.

Axis ramesque subteretes, repetito ramosi ramulis teretibus.

Thallus erect, greenish, usually forming a loose hemispherical clump to 10 cm high, main axis and branches about 1 mm dia., terete or nearly so, repeatedly branched, sometimes in more than one plane, final branches almost terete with continuous, even algal layer. Fruiting stems rare, distinctly flattened, apothecia as for the variety but somewhat scrobiculate on backs. Spores 10 (–13) μ dia.

HABITAT. Usually on branches.

DISTRIBUTION. North Island: Little Barrier Island (Hamilton) CHR; Hawke's Bay (Colenso) WELT, Ramahanga R. (Colenso 2171), Tarawera, (Colenso 3843), Ruahines summit (Colenso 2711, sub "*Sph. album*" W.C. nom. nud.) WELT. Southland: Secretary Island, 2,800ft, 4052, 4053, 4054 (Type).

This seems a distinct form with something of the appearance of a stout *Sph. tener*, but the fruit clearly demonstrates its affinity to *Sph. melanocarpus*. The apparently discontinuous distribution is probably due to insufficient collecting, although it does seem to be rare.

Sphaerophorus melanocarpus var. **australis** (Laur.) Murray comb. nov. Pl. 13, Fig. 2.

Sphaerophoron compressum (pr.p.) Hook., Handb. N.Z. Fl. 559, 1867, *et. auct. al.*
Sphaerophoron australe Laurrer, Linnaea II, 44 (1827).
Hook, Fl. Antarctica *1*, 195 (1844).
Fl. N.Z., 304 (1855).

Nyl., Synops. Lich., I, 170 (1860).
Compt. Rend. Paris *83*, 87 (1876).
Krmph., Reise der Novara, Bot. I., 127 (1870)
Chilton, Subant. Islands N.Z., *2*, 530 (1909).
Cockayne, Trans. N.Z. Inst., *42*, 320 (1909).
Müll. Arg., J. Linn. Soc. Bot., *32*, 198 (1896).
Hellb., Bihang Kgl. Svensk Vetensk. Akad. Handl., *21*, III (13), 129 (1896).

Sphaerophoron compressum var. *australe*, Linds., Trans. Linn. Soc., *25*, 530 (1866).

Thallus fruticose (often growing horizontally from tree trunks), strongly compressed, (5–) 30–50 (–100) mm high, main axis ½–3 mm wide, 0.2–1 mm thick, at least in part more than 1.5 times as broad as thick, sparingly to considerably branched in one plane, branchlets more or less flattened (except in f. *subteres*). Cortex of main stems hyaline, 50–150μ thick, of conglutinate very thick-walled hyphae, similar on ventral surface but thinner; algal layer continuous above, 15–35μ thick, mostly absent below, algae green or sometimes yellowish-green, mostly 5–10μ dia.; medulla of densely packed more or less longitudinally arranged thick-walled hyaline hyphae; K- or f. y, P-, I-. Tips of fertile branches expanded, apothecia on ventral surface, subterminal or with narrow margin, initially usually lentiform becoming round when mature, smooth to weakly scrobiculate on back, 1–4 mm dia.; traces of brown excipulum sometimes present; hypothecium hemispherical or flattened, to 0.8 mm thick, brown, in saucer-shaped depression; hymenium hyaline in lower parts, paraphyses very few, sparingly branched, to 1μ thick with small swellings; asci 40 x 5μ cylindrical to irregularly clavate, spores mostly in one series, globose, 8–10½ (–13)μ, faintly brownish with encrusting black granules (K + purplish or brownish), forming thick mazedium. Pycnidia black, globose, 100–300μ dia., partly immersed in tips of final branches and less commonly on ventral surface, pycniospores hyaline, oblong, 3½ x 1μ. In some specimens ellipsoid spores, 5 x 2½μ are present in hyaline irregular (?) pycnidia.

HABITAT. On bark, less commonly on soil or mosses.

DISTRIBUTION. Australia, New Zealand, South America, Philippines, Hawaii, Pacific Islands. North Island: Ruamahanga R. (Colenso 2617, 2621 and 2714), Te Hawera (Colenso 2718), Toruarau (Colenso 4721), Te Kotukutuku (Colenso 5094), Ruahines (Colenso 1509) WELT; Taupo, Allison 264. Westland: Rununga, Mr 6879; Toaroha River, 3,200ft, Sc 150; Greymouth, Mr 7095. Otago: Haast Pass (Smith) 0953; Mt. Cargill, T 556; Mihiwaka, T 659; Dunedin, 3548; Kaka Point, 0390. Southland: Purakanui Falls, 0648; Wilmot Pass, 3930, 3932. Doubtful Sound, T 2841; Secretary Island, 4055. Stewart Island: T 3009; T 3013; T 3014; T 3015; T 3016. Chatham Island: (Colenso 23) WELT; (Colenso 5) WELT. Campbell Island: (Oliver) WELT 29.

The specimens left under the variety name only are not very uniform; apart from immature material they include mostly smaller specimens with a few irregular branches. It is doubtful whether many of the forms have real taxonomic significance, but it is convenient to use them with a species so variable as *Sph. melanocarpus*. Several attempts were made to arrange the specimens in natural groups, and the one given here seems the most successful, although the scheme would doubtless require modification to accommodate non-New Zealand specimens satisfactorily. It is interesting that some of the forms appear to be restricted to certain parts of the country, often to one side or the other of the 60in isohyet.

The apothecia develop initially beneath the lower cortex, and break through it as they mature, the cortical covering splitting and eventually disappearing. The black pigment granules which coat the mature spores are present in a thick layer in the immature fruits before any spores are discharged from the asci; the spores while still in the asci are smooth and hyaline, and when mature are only very faintly coloured.

The entities to which Colenso applied the names *vividulum* and *polycarpum* must remain in some doubt, since a careful search of his specimens in the Dominion Museum failed to disclose any bearing these names, although three carried other apparently unpublished names. It is possible that *Sph. polycarpum* Col. is actually *Sph. cuneatus* but this cannot be determined in the absence of the type specimen.

Sphaerophorus melanocarpus var. **australis** f. **angustior** (Reinke) Murray comb. nov. Pl. 13, Fig. 3.

Sphaerophoron australe f. *angustior* Reinke, Pringsheim's Jahrb. f. wiss. Bot., *28*, 85 (1895) and Figs. 20, 21.

Sphaerophorus australis var. *angustior* Zahlbr., Lich. nov. Zel., 11 (1941) (reprint).

Plant to 8 cm high, main axis 1–2 mm wide to ½ mm thick, more or less sympodially and repeatedly branched with final branches 0.2–0.8 mm wide; apothecia usually nearly terminal and rather small, 1–2 mm dia.

HABITAT. On bark.

DISTRIBUTION. Australia and New Zealand. North Island: Makakahi R. (Colenso 2713, sub. *Sph. umbilicatum* W.C. nom. herb), Cape Kidnapper (Colenso 3570) WELT; Puketitiri (M. Clark) 4500. Otago: Huxley River 1835; Mt. Cargill T 524, T 568; Silver Peaks T 1185, T 1197; Saddle Hill T 184; Routeburn Valley 0787; Dunedin 3547. Southland: Milford Track T 2887, T 2915; Tautuku T 1163; Wilmot Pass 3937; Doubtful Sound T 2822; Secretary Island 3978, 3995. Stewart Island: Freshwater River T 3065.

Sphaerophorus melanocarpus var. **australis** f. **delicatus** Murray, f. nov. Pl. 13, Fig. 4.

Thallus parvus, delicatus, flabelliformis, ramibus ultimis parvissimis; apothecia parva.

Plant 1–3 cm high, fan-shaped, with stems up to 2 mm wide at the base, but mostly 0.8 mm, repeatedly sympodially branched with final branchlets 0.05–0.2 mm wide, distinctly flattened, cortex 20μ thick. Fruiting stems 1 mm wide, apothecia 1 mm dia. with very narrow margin; spores hyaline, 8μ dia. heavily encrusted with black pigment granules.

HABITAT. Probably on wood.

DISTRIBUTION. North Island: Puketitiri (M. Clark) 4295 (Type). Otago: Matukituki Valley, 3,000ft (R. F. Smith) 0958; Saddle Hill T 178.

Although this form is unusually delicate for the species and only the broadening at the very base of a few fronds in the type specimen places it in var. *australis*, it is approached by a few specimens of f. *angustior*.

Sphaerophorus melanocarpus var. **australis** f. **insignis** (Laur.) Murray, comb. nov. Pl. 13, Fig. 5.

Sphaerophoron insigne Laur., Linnaea, II, 45 (1827).

Sphaerophorus australis f. *insignis* Müll. Arg. Flora, *66*, 17 (1883).

Sphaerophorus australis var. *insignis* Zahlbr., Lich. Nov. Zel., 11 (1941) (reprint).

Main stems short, up to 3 mm wide, sparingly branched, branches more or less linear, 5–15 mm long by 0.5–1.2 mm wide; apothecia as in the variety.

HABITAT. Mostly on soil among mosses, etc.

Distribution. South America, New Zealand. Nelson: Lead Hills T 1975. Canterbury: Lewis Pass, Mr., 6870. Otago: Routeburn Valley, 0815. Southland: Secretary Island, 3994; Lake Hauroko, Mr 7303. Stewart Island: Freshwater River, T 3034.

One of these specimens, Mr 7303, has hyaline irregular ? pycnidia scattered beneath the upper surface, with ellipsoid spores 5 x 2½μ.

Sphaerophorus melanocarpus var. **australis** f. **palmatus** Murray, f, nov. Pl. 13, Fig. 6.

Thallus ad 2 cm latitudine et altitudine, bis terve dichotome divisus, laciniis (1–) 2–3 mm latis.

Thallus 2 cm high, several times dichotomously divided into branches of nearly uniform width, 2–3 mm wide and 0.3–0.5 mm thick, ends rounded or with terminal laciniae 1 mm long and 1 mm wide, lower surface weakly impressed, white pruinose near the ends of branches; upper cortex hyaline, of thick-walled vertical highly gelified hyphae, 75μ thick, lower cortex 30–70μ thick, of more or less vertical thick-walled hyphae appearing distinct in KOH (resembling lower cortex of *Sph. cuneatus*); algal layer 25–30μ thick, of numerous closely packed cells 5–8μ dia.; medulla looser than usual for the species, hyphae 5–8μ dia., not regularly longitudinally arranged, K-, P-, I-. The pruinose appearance of most of the lacinae is due to irregular proliferations of the lower cortex and some medullary hyphae protruding. Pycnidia immersed, brown, globose with wide ostiole, 300μ dia.; pycnidiospores oblong 3 x 1μ.

HABITAT. On bark.

DISTRIBUTION. Otago: Dunedin, T 2132 (a doubtful juvenile specimen). Southland: Doubtful Sound (Thomson & Simpson), CHR (Type).

Although there is only one good collection of several individual plants, they are readily separable from any other specimens of the variety I have seen; they resemble in shape f. *vividulus*, which is, however, considerably narrower and more branched. There are no apothecia on the specimens.

Sphaerophorus melanocarpus var. **australis** f. **proliferus** (Wilson) Murray, comb. nov.

Sphaerophoron australe var. *proliferus* Wilson, J. Linn. Soc. Bot., *28*, 370 (1891).

A small form of var. *australis* in which the margin of the apothecium is fimbriate with branches linear and several mm long, and rarely carrying small apothecia at their tips.

HABITAT. On bark.

DISTRIBUTION. Tasmania. North Island: Orongorongo River (Healy) CHR. Otago: Mt. Cargill, T 540.

Specimens of var. *australis* rarely have apothecial margins with one or two short processes, but these carry a regular corona of 4 to 10 branchlets.

Sphaerophorus melanocarpus var. **australis** f. **subteres** (Zahlbr.) Murray, comb. nov. Pl. 14, Fig. 7.

Sphaerophorus australis f. *subteres* Zahlbr. apud Magn., Arkh. f. Bot., *31* A, (1), 24 (1944).

? *Sphaerophoron fragilis*, Chilton, "Subant. Ids. N.Z.", *2*, 530 (1909).

Forming dense mats or clumps, 5–25 mm high, main stems short, commonly subterete, with short vertical closely-clustered subterete often simple branches 0.5–0.8 mm dia., flattened stems and branchlets commonly only present near periphery of clumps; cortex nearly even round main stems and 100μ thick, algal layer thin and discontinuous; cortex and algal layer of uniform thickness round upper branchlets. Apothecia rare, appearing terminal in globose receptacles like those of *Sph. globosus* and opening irregularly circular. Structure of apothecia and pycnidia as for the variety. Thallus K-, P-, I-.

HABITAT. On soil in rock crevices in subalpine situations.

DISTRIBUTION. Australia, South America, Hawaii. North Island: Napier (Colenso, 1510) WELT. Canterbury: Arthur's Pass (D. Billings, NZL 46) 4499. Otago: Trotter's Gorge, T 1934, 3849; Mt. Watkin, T 1766, T 2010; Silver Peaks, T 248, T 249, T 250, T 280, T 232, T 1196, 4285, 4286; Maungatua, 2,000ft, 1170, T 2600, T 370; Akatore Gorge, 3724. Campbell Island: Mt. Beeman (1958 party), 3652.

This form has much the appearance of *Sph. fragilis*, from which it is distinguished by fruit characters and chemical reactions, or a stunted *Sph. melanocarpus* var. *melanocarpus* from which the few clearly flattened stems present in most specimens separate it. Sections of an immature apothecium show it to develop slightly to one side of a thickened stem, and to resemble that of *melanocarpus* rather than *fragilis* or *globosus*.

Sphaerophorus melanocarpus var. **australis** f. **vividulus** (Colenso) Murray, comb. nov. Pl. 14, Fig. 8.

Sphaerophoron vividulum Colenso, Trans. N.Z. Inst. *17*, 263 (1884 iss. 1885).

Thallus to 10 cm high, main axis not strongly marked above, branching regularly sympodial then di- and trichotomous, forming fan-shaped branches; branchlets mostly 1 mm wide and 0.5 mm thick, smooth or impressed beneath; apothecia usually small and obliquely inserted in tips of slightly expanded branchlets.

HABITAT. Usually on moist soil among bryophytes.

DISTRIBUTION. New Zealand. North Island: (Colenso) WELT; (Attwood V2) CHR; Otara (Colenso 2712, sub. *Sph. lacunosum* W.C. nom. nud.) WELT (doubtful), Tararuas, (Zotov) CHR. Otago: Mt. Cargill, T 528, T 530. Southland: Hokanui, 0390; Doubtful Sound (Simpson & Thomson) CHR; Secretary Island, 3996.

Colenso's type specimen was collected at Norsewood, but no collection from there in the Dominion Museum material matches his description which, however, fairly clearly indicates this form. The specimen Colenso 2712, from the Rangitikei River, has prominent apothecia with rugose receptacles, and may be a distinct form.

Sphaerophorus melanocarpus var. **scrobiculatus** (Bab.) Murray, comb. nov. Pl. 14, Fig. 9.

Sphaerophoron australe var. *scrobiculatum* Bab. apud Hook. Fl. Nov. Zel., II, 304 and Tab. CXXX, c (1855).
Zahlbr., Lich. nov. Zel., II (1941) (reprint).

Thallus of erect, sometimes imbricating foliose fronds (0.2–) 0.4–0.8 mm thick and 3–8 mm wide by 1–3 cm (sterile) or 2–9 cm (fruiting) long, subentire or once or twice divided or divided at margin into laciniae about 1 mm wide and up to 10 mm long; cortex as for var. *australis* but mostly 60–70μ thick above and 40–50μ thick below (sometimes much thinner); medullary hyphae mostly near 5½μ dia. Apothecia on narrower lobules, large, 3–8 mm dia., round or broadly lentiform, margin very variable in width, (1–) 2–3 (–8) mm wide, backs of apothecia deeply rugose-scrobiculate; spores globose, 8–11 (–14) μ dia., nearly hyaline with black pigment granules which are K + dark purplish. Pycnidia as in var. *australis*.

HABITAT. On tree-trunks and branches among bryophytes.

DISTRIBUTION. New Zealand. North Island: Pirongia CHR; Tararuas, 3,000ft (Zotov) CHR. Marlborough: Pelorus Bridge, Mr 1221. Westland: Tokaroha River, Sc 146; Styx River, Sc 135. Otago: Mt. Cargill, T 537. Southland: Doubtful Sound, T 2819-21, T 2880; Wilmot Pass, 3931; Manapouri, 3918; Secretary Island, 3991; Orepuke (Sorensen) CHR. Stewart Island: Freshwater River, T 3064.

Sphaerophorus melanocarpus var. **scrobiculatus** f. **macrophyllus** (Zahlbr.) Murray, comb. nov. Pl. 14, Fig. 10.

Sphaerophorus australis var. *macrophyllus* Zahlbr., Lich. Nov. Zel., 11 (1941) (reprint)

Thallus as for the variety but with fronds (particularly fruiting ones) up to 25 mm broad and 0.25–0.45 mm thick, mostly entire or coarsely crenate. The margin of the apothecia may be very broad and with secondary apothecia on proliferations or only 1 mm wide, even in the same specimens. Frequently there are narrow fronds like those of var. *australis* f. *insignis* mixed with the broad ones. Structural details of thallus and apothecia are as for the variety.

HABITAT. As for the variety.

DISTRIBUTION. New Zealand. North Island: Tararuas, Mt. Dora (Chamberlain) CHR (? isotype), Mt. Dennan (Zotov) CHR; Tiritea (Allan) CHR. Canterbury: Cass (Allan) CHR. Southland: Secretary Island, 3979, 3990, 3993, 4051. Stewart Island: Table Hill, T 3005, T 3122.

The specimens listed under this form are not particularly homogenous, and non-fruiting specimens may be difficult to separate from the typical form of the variety. However, field studies in the Doubtful Sound area where most taxa in *Sphaerophorus* are very common indicate that at least 80% of specimens can be assigned to one form or the other without difficulty.

Sphaerophorus stereocauloides Nyl.

Sphaerophoron stereocauloides Nyl., Flora, 69 (1869).
Lich. Nov. Zel., 12 (1888).
Hellb., Bihang Kgl. Svensk Vetensk. Aka. Handl., *21* III (13), 129 (1896).
Colenso, Trans. N.Z. Inst., *17*, 264 (1884).
(?) Chilton, "Subant. Ids. of N.Z." 2, 530 (1909).
Sphaerophorus nobilis Zahlbr., Lich. Nov. Zel., 10 (1941).
Thysanophoron Pinkertonii Stirt., Trans. Bot. Soc. Edinb., *14*, 359 (1882).

Thallus white or grey (greenish-grey when fresh), 7–15 cm high, fastened to substratum with brown branching rhizoids, sometimes polytomously branched at base and usually several times dichotomously divided with many clustered phyllocladial branchlets. Main stems and branches terete, 2–3 mm dia., usually with annular cracks, cortex of vertical gelified thick-

walled hyphae, algal layer discontinuous, medulla of longitudinal very thick-walled hyaline hyphae; phyllocladial branchlets mostly 1–5 mm x 0.2 mm dia., terete or compressed near tips, simple or branched with cortex 12–15μ thick, algal pale greenish, 5–8μ dia., medullary hyphae 5½–8½μ dia.; cephalodia rare to frequent among phyllocladia, pale blue to greenish-blue, mostly irregularly clavate, 500μ long by 150–400μ dia., cortex like that of phyllocladia, smooth, containing both discrete hyphae and structureless hyaline material with scattered coiled chains (up to at least 80μ long and 5–7μ wide) of *Scytonema,* cells bright greenish-blue and about 3μ long. Apothecial terminal on branches, in globose receptacles 1½–3 mm dia., usually stellate dehiscent; hypothecium brown, columnar-globose; mazedium black, thick, spores finally dark brown, more or less globose, 9–12μ dia., without encrusting granules; pycnidia not seen.

HABITAT. On trees and logs.

DISTRIBUTION. New Zealand. North Island: Summit of Ruahines (Colenso, 2202 WELT. Canterbury: Lewis Pass, T 2430; Andrew River, Sc 47; Sc 51; Waimakariri River (Allan, L9) CHR; Arthur's Pass (Martin, 13) CHR; Cass (Philipson 35 and 77), Canterbury Univ. Bot. Dept. Otago: Howden, 0800, 0841. Southland: Stuart Range (W. A. Thomson, ZA 424) CHR (isotype of *Sph. nobilis* Zahlbr.); Lake Manapouri (Billings, NZL 8) Duke Univ. Bot. Dept.; Lake Monowai (D. Hamilton), 089. Stewart Island: (J. D. Smith) CHR.

This handsome species is the largest in the genus, and the only one to have cephalodia. In fresh material these cephalodia are almost indistinguishable from phyllocladia, but are readily seen in herbarium material after a few years when the rest of the plant bleaches to white. Evidently Zahlbruckner had fresh material when he erected *Sph. nobilis* as the cephalodia are now clearly visible on the isotype specimens; these are also unusually large and stout for the species. In one of the above specimens the cephalodia seem to be absent. Like *Sph. melanocarpus* var. *scrobiculatus, Sph. stereocauloides* is apparently confined to parts of New Zealand with high rainfall—i.e., to the western side of the South Island and some parts of the North Island.

Sphaerophorus tener Laur.

Sphaerophoron tenerum Laur., Linnaea II, 45 (1827).
Hook., Fl. Antarct., I, 195 (1844).
II, 530 (1847).
Fl. N.Z., II, 304 (1855).
Handb. N.Z. Fl., 559 (1867).
Mont., Voy. Astrolobe Pôle sud, Bot. I, 170 (1845).
Nyl., Synops. Lich., I, 171 (1860).
J. Linn. Soc. Bot., *9,* 244 (1865).
Lich. N.Z., 13 (1888).
Linds., Trans. Linn. Soc., *25,* 530 (1866).
Krmph., Reise der Novara, Bot. I, 127 (1870).
Kirk, Trans. N.Z. Inst., *4,* 235 (1871).
Buch., Trans. N.Z. Inst., *6,* 231 (1873).
Nyl., Comptes rend. Paris, *83,* 87 (1876).
Hellb., Bihang Kgl. Svensk Vetensk. Akad. Handl., *21,* III (13), 129 (1896).
Müller, J. Linn. Soc. Bot., *32,* 198 (1896).
Chilton, "Subant. Ids. N.Z.", II, 530 (1909).
Szat., Borbasia, *1,* 55 (1939).
Zahlbr., Lich. N.Z., 12 (1941).
Sphaerophoron australe Tayl. & Hook., London J. Bot., *3,* 654 (1844).
Sphaerophoron tener var. *stereocauloides* Nyl., Synops. Lich., I, 171 (1860).
Sphaerophoron curtum Hook. & Tayl., London J. Bot., *3,* 654 (1844).
Sphaerophoron tenerum var. *curtum* Tayl. & Hook., Fl. Antarct. I, 195 (1844).

Thallus terete, fruticose, white or pale greenish, smooth to somewhat shining, forming clumps (0.2–) 2–10 (–50) cm high by repeated dichotomous branching; lower stems mostly 1 mm dia., final branches 0.15 mm dia., K-, P-, I-. Cortex of primary stems hyaline, even, 25–30μ thick (down to 12μ in final branches), of gelified vertical thick-walled hyphae; algal layer usually discontinuous, 20–30μ thick, algae pale green, 8μ dia.; medulla of closely packed

longitudinally arranged very thick-walled hyphae (4–) 7 (–10)μ dia., with rough surface (clearing in KOH). Fruiting stems thicker and longer than sterile, sometimes scrobiculate below apothecia; apothecia more or less globose, without thalline or proper margin at maturity, 0.8–1.2 mm dia.; hypothecium dark brown, cushion-shaped to hemispherical, about 400μ wide, K-, composed of small entangled hyphae; hymenium hyaline below; asci cylindrical, 8-spored; spores smoky-grey with few or no pigment granules, globose, (6–) 7–8μ dia.

HABITAT. On trees or moss cushions on soil.

DISTRIBUTION. Australia, New Zealand, South America. North Island: Rangitoto (Allan L 7) CHR; Tongariro (Allan) CHR; Maungapohatu (Cranwell & Moore) CHR; Pirongia CHR; Raetihi (Attwood) CHR; Moehau (Moore) CHR; Tararuas (Allan, Chamberlain) CHR; Waikaremoana, Auckland Univ. Bot. Dept.; Ruahines (Colenso, 2715, sub *Sph. excelsum*) WELT; Te Hawera (Colenso 2716, 2717 and 2822) WELT; Ruamahanga R. (Colenso, 2124) WELT; Tararuas (Colenso, 2183) WELT; Mt. Holdsworth (Zotov) CHR. Nelson: Lead Hills, T 1978. Westland: Greymouth (Mackay) CHR; Styx River, Sc 148, Sc 149. Canterbury: Andrew River, Sc 74; Arthur's Pass (Allan, 21) CHR. Otago: Huxley River, 1854; Mt. Cargill, T 531, T 536, T 539, T 564; Mihiwaka, T 660, T 661, T 669, T 670; Silver Peaks, T 1191, 4287; Cave Hill, T 236; Leith Valley, T 2134; Flagstaff, T 81, 1167; Saddle Hill, T 154; Howden, 0835; Key Summit (R. E. Corbett) 3641; Maungatua, T 2898. Southland: Pahia Point, T 2251; Tautuku, T 1161; Doubtful Sound, T 2842; Secretary Island, 4056, 4057; Ben Bolt, 1074; Bluff Hill, T 831; Riverton, T 795; Orepuke (Sorensen) CHR. Stewart Island: T 3018, T 3109; Freshwater River, T 3063; Port Pegasus, 077, 0416. Auckland Island: Adam's Is. (Turbott & Easton) CHR. Campbell Island: (Bayley) 1630, (Rae) 3653.

Sphaerophorus tener is probably universally distributed in New Zealand but is commoner in the wetter areas; in the Fiordland subalpine beech forest it is the commonest epiphytic lichen. It varies greatly in size, the smallest fruiting plant I have seen being only 4 mm high, and the largest being a clump 120 x 50 cm and up to 40 cm thick; nevertheless the structure is very uniform throughout. The fruiting stems are extended and usually simple, but sometimes furcate or with several fertile branches. As in other species of the genus the apothecia develop under the cortex, which is later thrown off or remains as a thin flat rim at the base of the fruit.

Sphaerophoron curtum Hook. & Tayl. is a small, rather densely caespitose form not uncommon in exposed situations. Some specimens from Campbell Island form a turf a few mm high and 30 cm or more in diameter. Pl. 14, Fig. 11.

Sphaerophorus tener f. **globosoides** Murray f. nov. Pl. 14, Fig. 12.

? *Sphaerophoron coralloides* Hook., Fl. Nov. Zel., 304 (1855).
Handb. N.Z. Fl. 559 (1867).

A forma typicale differt axilibus sympodialibus, ramulis brevibus tenuibusque et KOH reactione normaliter flavescente.

Thallus caespitose, white or brownish, often shining, 1–6 cm high, branching mostly sympodial from terete main stems (which may be dichotomously divided) 0.7–0.8 (–1.6) mm dia., branchlets mostly short and often clustered, (100–) 150–300 μ dia., sometimes breaking up into soredia at tips. Cortex completely gelified even in KOH, 15–30μ thick on main stems and 10–15μ on branches; algae in scattered or contiguous colonies about 50μ dia., beneath cortex, algal cells pale yellowish-green, *Trebouxia*, about 8μ dia.; medullary hyphae thick-walled, rough (clearing in KOH), 4½–8μ dia., algal layer near tips of branchlets is usually K + yellow, P-, I-; apothecia as in typical form but very rare, spores pale greyish, 7–8μ dia. Pycnidia not seen.

HABITAT. Subalpine grass and scrubland.

DISTRIBUTION. North Island: Ruahines (Colenso 2730) WELT; Tongariro (Allan) CHR. Otago: Mt. Watkins, T 1570; Silver Peaks, T 1190, T 1192, 4288 (Type); Cave Hill, T 233; Maungatua, 3,000ft, T 1804; Key Summit, T 2927; Southland: Tautuku, T 1662; Secretary Island, 3,400ft, 4058. Stewart Island:

Table Hill, T 3010, T 3017; Mt. Anglem, 3,200ft, Mr 30, Mr 42. Campbell Island: (Bayley) 1631, (A. F. Rae) 4326, (Oliver) WELT 23 and 31.

Extreme examples of this form have a very distinct appearance, but they are connected with the typical form of the species by intermediates, and the taxon is probably an ecotype. It usually differs from the normal form of the species in the positive reaction with KOH, although this is absent in shaded specimens. It is hardly distinguished macroscopically from *Sph. globosus*, but has a thinner cortex and a different reaction with iodine. The Stewart and Campbell Island specimens have very stout main stems with relatively few phyllocladial branchlets, and may possibly prove to be separable as another form; they also have a more matt surface than usual for f. *globosoides*.

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