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ANTARCTIC LICHENS

II. THE GENERA *Buellia* and *Rinodina*

*By*

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*Farlow Herbarium, Harvard University,  
Cambridge, Mass., U.S.A.*

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ONTOGENETIC SECTION

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### ABSTRACT

THIS report deals with the species of two genera of crustose lichens, *Buellia* and *Rinodina*, known to occur on the Antarctic Peninsula, South Orkney and South Shetland Islands. These two genera constitute a seemingly natural family, the Buelliaceae. *Buellia*, as far as our present knowledge goes, is represented in the region by twenty-two species, and *Rinodina* by six. Keys and descriptions of these species are given. In addition to studies on living populations in Graham Land (the northern part of the Antarctic Peninsula) and the South Shetlands in 1944-45 and 1965, an examination was made of all available type specimens and general collections from the area. Particularly in the genus *Buellia* a number of previously described species are shown to be non-taxonomic modifications induced by environmental factors, and as such are reduced to synonymy. Three species, one variety and three forms of *Buellia*, and two species of *Rinodina* are here described as new. A relatively small but significant bipolar element (species occurring also in the colder Northern Hemisphere) is present, and the following species belonging to this category are recorded for the first time from the Antarctic: *Buellia punctata*, *B. papillata*, *B. coniops*, *Rinodina archaeoides*, *R. diplocheila* (with some doubt), and *R. nimbosea*. Rather surprisingly, a floristic relationship with southernmost South America is almost completely lacking, as far as these two genera are concerned. The type specimens of certain possibly related species from Tierra del Fuego, the Falkland Islands, South Georgia, Ile St. Paul (in the southern Indian Ocean), New Zealand, Uruguay, Europe, Greenland and Novaya Zemlya were restudied for purposes of comparison and are described and discussed in Appendix I. An ontogenetic study of the different types of apothecial development in the genus *Buellia* was made in order to clarify the taxonomic relationships of the Antarctic species, and in particular to establish the position of the genus *Melanaspicilia* described by Vainio. A previously undescribed type of spore structure was found in the new species *Rinodina endophragmia*, and in a specimen of *Buellia coniops* a heterosporous condition of the asci was observed which may indicate meiotic segregation of a genetic factor for spore-pigmentation.

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## I. INTRODUCTION

THIS is the second of a series of reports on the taxonomy of the lichens of the northern part of the British Antarctic Territory (Graham Land,\* the South Shetland Islands and the South Orkney Islands). It deals with two of the crustose genera—*Buellia* and *Rinodina*. The first of this series (Lamb, 1964) treated the fruticose genera *Usnea*, *Ramalina*, *Himantormia*, *Alectoria* and *Cornicularia*.

Most of the material on which this series of reports is based is preserved in the Cryptogamic Herbarium of the British Museum (Natural History), London, and smaller collections exist in other institutions. The following list gives the locations of the collections studied, with the abbreviations used in this report for the herbaria and the expeditions concerned.

Herbarium	Abbreviation used in text	Expedition	Abbreviation used in text	Publication of results
Cryptogamic Herbarium, British Museum (Natural History), London, England	BM	British National Antarctic ( <i>Discovery</i> ) Expedition, 1901–04	BNAE	Darbishire (1910)
		British Antarctic ( <i>Terra Nova</i> ) Expedition, 1910	BATNE	Darbishire (1923a)
		Discovery Investigations (voyages of R.R.S. <i>Discovery II</i> ), 1931–33, 1934–35, 1936–37	DI	Partly published by Lamb (1948a, 1964).
		British Graham Land Expedition, 1934–37	BGLE	
Falkland Islands Dependencies Survey, 1944 onwards†	FIDS			
Naturhistoriska Riksmuseet, Botaniska Avdelningen, Stockholm, Sweden.	S	Swedish South Polar Expedition, 1902–04	SAE	Darbishire (1912)
Herb. E. A. Vainio,‡ Botanical Institute, Turku University, Finland, and Jardin Botanique de l'Etat, Bruxelles, Belgium	TUR BR	Belgian Antarctic Expedition, 1897–99	BAE	Vainio (1903)
Laboratoire de Cryptogamie, Muséum National d'Histoire Naturelle, Paris, France	PC	French Antarctic Expedition, 1903–05	FAE 1903–05	Hue (1908)
		French Antarctic Expedition, 1908–10	FAE 1908–10	Hue (1915)
Farlow Herbarium, Harvard University, Cambridge, Mass., U.S.A.	FH	Botanical Survey in West Antarctica, 1964–65	BSWA	Partly published in this report
Facultad de Ciencias Exactas y Naturales, Universidad de Buenos Aires, Buenos Aires, Argentina	BASB	Several Argentine expeditions from 1948 onwards	AE	Partly published by Lamb (1964)
Museo de Botánica, Universidad de Córdoba, Córdoba, Argentina	CORD	Argentine expedition of 1953. Material collected by Dr. A. Hunziker	AE	Partly published in this report
Facultad de Ciencias Naturales y Museo de la Plata, La Plata, Argentina	LP	Argentine expeditions of 1951 and 1957–58. Material collected by Dr. A. Corte and Dr. A. Martínez	AE	Partly published in this report

\* The part of the Antarctic Peninsula which lies north of the line joining Cape Agassiz (lat. 68°30'S., long. 62°58'W.) and Cape Jeremy (lat. 69°24'S., long. 68°51'W.). The area south of this line is now known as Palmer Land. Formerly, "Graham Land" and "Palmer Land" were alternative names for the whole of the Antarctic Peninsula.

† Known as "Operation Tabarin" prior to 1946 and renamed British Antarctic Survey on 1 January 1962.

‡ Name spelt as "Wainio" in the report cited, subsequently altered to "Vainio" which is the form used in the present report.

One of the present authors (Lamb) had the privilege of collecting and making field studies in west and east Graham Land and the South Shetland Islands during the years 1944–45, while a member of “Operation Tabarin”,\* and of revisiting the area in 1964–65, as Principal Investigator of the project “Botanical Survey in West Antarctica” financed by the National Science Foundation† and supported logistically by the Argentine Navy. A summary of previous publications dealing with the lichens of this region is given in the first report in this series (Lamb, 1964, p. 3).

The two genera, *Buellia* and *Rinodina*, treated in this report, constitute the family Buelliaceae in the sense of Zahlbruckner (1926a), which, together with the family Physciaceae, is placed by Klement (in Grumann, 1963, p. 17) in an order Buelliales, characterized by brown, one-septate, three-septate, submuriform or placodiomorphic spores with often characteristically thickened walls, and a thallus either crustose (in the Buelliaceae) or foliose (in the Physciaceae).

The genus *Buellia* is well represented in the Antarctic regions, 65 species having been described in the literature from the continent and adjacent islands south of lat. 60°S., and is one of the most important crustose genera there ecologically and sociologically. The saxicolous species present a high degree of endemism, although this impression has been exaggerated by the description of a number of superfluous taxa. This in turn has been largely due to the extreme polymorphism of some of the species, and only by prolonged and careful field studies and re-examination of existing type materials has it been possible to elucidate their approximately correct taxonomic relationships.

Poelt (1965a) has pointed out the fundamental importance and great difficulty, in the taxonomy of crustose lichens generally, of distinguishing between phenotypes which are constitutionally (genetically) conditioned and modifications due to external environmental conditions, and has emphasized that this task is made even more difficult by the fact that the genetic characteristics themselves may often be strongly altered by the influence of outside factors. Lichen taxonomy up to recent times has tended to be statically descriptive, minimizing or totally ignoring variability due to environmental and growth conditions, with the result that many unnecessary synonyms have been created, and there has been a regrettable tendency freely to apply taxonomic epithets to entities which are quite obviously nothing more than mere environmental modifications.‡ Future systematic studies must be orientated in large measure towards the evaluation of these taxa, largely by field studies, and the major impetus in this direction may prove to have been the publication of an important paper by Weber (1962) in which the above-mentioned facts are convincingly emphasized and analytically illustrated by a number of examples.

Environmental factors noted by Weber as having a profound effect on the morphology of crustose lichens include available moisture, composition and texture of the substratum, degree of exposure to sunlight, amount of nitrogenous substances present, mechanical erosion by wind-blown rock and ice particles, and change of orientation by frost action. Among the Antarctic crustose lichens the last three factors are particularly important, and in the following treatment of the *Buellia* species we have been able to add some instructive examples further illustrating Weber's statements. Morphological modification of lichens due to richly nitrogenous substrata (ornithocoprophily) has also been dealt with in papers by Du Rietz (1932), Grønlie (1948) and Hakulinen (1962). Other environmental factors which we have found to be significant for an understanding of polymorphic variation in Antarctic populations of crustose lichens are

- i. The degree and duration of seasonal snow cover (see Du Rietz, 1930; Riehmer, E., 1935; Merxmüller and Poelt, 1954; Gjaerevoll, 1956) and,
- ii. Damage by mites (Acarinidae) with subsequent abnormalities in regeneration (see Schade, 1933, 1957).

Apart from such modifications directly due to environmental influences, the relative age of lichen thalli may also affect their morphological characteristics to a considerable degree. The cases of *Buellia anisomera* Vain., *B. granulosa* (Darb.) Dodge, and *B. augusta* Vain., discussed at some length in the following taxonomic treatment, supply instructive illustrations of changes taking place in the life-span of the same species and giving rise to appearances so diverse that, without careful studies of living populations in the field, they would unhesitatingly be classed as distinct species. Such field studies must, however, be made

\* The precursor of the Falkland Islands Dependencies Survey which was renamed British Antarctic Survey on 1 January 1962.

† Grant No. GA-119.

‡ A classic case of this tendency was the description by Bouly de Lesdain (1947, p. 71) of a “variety” *sabulicola* of the foliose-frutescent lichen *Evernia prunastri* with the remark: “Il s'agit simplement . . . de thalles d'*Evernia prunastri* tombés des buissons de *Salix dunensis* et d'*Hippophae rhamnoides* sur lesquels ils sont communs. Sur le sable où ils trouvent une large surface plus étendue que celle que leur offrirait l'exiguïté des rameaux de ces arbustes, ils acquièrent un développement souvent beaucoup plus considérable.” Such observations are of ecological interest, but afford no basis for taxonomic operations.

with a degree of caution, for apparent transitional states between distinct types do not, in themselves, always afford reliable evidence for assuming genetic identity, unless they are demonstrably portions of one and the same thallus. Cases of convergent mimicry ("Verähnlichung") may be found in related species growing under similar conditions, as has been pointed out by Sandstede (1931) in connection with the genus *Cladonia*. By our field studies in the Antarctic Peninsula region we have been able to elucidate many of the previously described taxa of crustose lichens and reduce a number of them to synonymy, but in some cases the necessary observations are still lacking and the status of certain species, e.g. those of the *anisomera*—*granulosa*—*subpedicellata* complex, must remain somewhat uncertain pending further investigation of living populations. Where field evidence has been inconclusive, we have adopted a conservative taxonomic standpoint.

To facilitate the correct interpretation of the technical terms—many of them peculiar to crustose lichens—employed in the keys and descriptions of the Systematic Account, a glossary is provided in Appendix II.

## II. SYSTEMATIC ACCOUNT

ABBREVIATIONS and symbols used in the text for chemical reagents are as follows: PD, paraphenylenediamine ( $C_6H_4(NH_2)_2$ ), 5 per cent solution in 95 per cent alcohol, freshly made up for each occasion; I, iodine dissolved in an aqueous solution of potassium iodide and diluted to a light brown colour; K, a mixture of equal parts of 5 per cent potassium hydroxide (KOH) and 20 per cent potassium carbonate ( $K_2CO_3$ ), both in aqueous solution; C, a fresh saturated aqueous solution of calcium hypochlorite ( $Ca(OCl)_2$ );  $HNO_3$ , concentrated nitric acid. A plus sign indicates positive reaction and a minus sign negative reaction. See glossary of terms on p. 85.

### 1. Genus *Buellia* De Notaris, 1846, p. 195

De Notaris (1846) cited the following 5 species: *B. canescens* (Ach.) De Not., *B. major* De Not. (as n. sp.), *B. parasema* (Ach.) De Not., *B. miryocarpa* (sic) De Not.,\* and *B. Schaereri* De Not. (as n. sp). Clements and Shear (1931, p. 323) selected *B. parasema* as the type species of the genus, and in this have been followed by Dodge (1948, p. 240). Fink (1910, p. 92) had considered *B. canescens* as the type of the genus, but in view of the fact that Massalongo in 1852 had used this species as the type of a separate genus, *Diploicia* Mass. (now regarded as a section of *Buellia*), this selection, which was followed by Tomaselli and Ciferri (1952), is ill-advised and should be rejected in favour of that of *B. parasema* by Clements and Shear. Although, as Th. Fries has shown (1874, p. 593), Acharius based his "Lichen parasemus" on heterogeneous material comprising species of *Buellia*, *Lecidea* and *Arthonia*, and the epithet *parasema* has been widely used for a *Lecidea* species (*L. limitata* (Scop.) Röhl.; cf. Laundon, 1960, p. 163), Th. Fries nevertheless, as well as De Notaris (1846), emended the species to apply only to the *Buellia*-component, and therefore *Buellia parasema* (Ach., emend.) De Not. stands as a valid epithet, and there is no reason to challenge its selection as the type species of the genus *Buellia*.

Zahlbruckner (1926a, p. 254; 1930-31, p. 330-457) recognized three sections in the genus: sect. *Eubuellia* Körb. (now correctly called sect. *Buellia*), sect. *Diploctomma* (Mass.) Th. Fr. (with 3-septate or submuriform spores) and sect. *Diploicia* (Mass.) Stizenb. (with marginally effigurate thallus). Other later segregates from *Buellia* have been: *Amandinea* Choisy (1950, p. 16; with filiform conidia); *Samboa* Tomaselli & Ciferri (1952, p. 7; with 4-spored asci); and *Mattickiolichen* Tomaselli & Ciferri (1952, p. 6; equivalent to sect. *Diploctomma*). Some additional sections have also been established: sect. *Catalechiopsis* Oxner (1933, p. 170; with squamose, corticate thallus) and sect. *Moriopsis* by Räsänen (1939, p. 108) to accommodate the species *B. moriopsis* (Mass.) Th. Fr. (syn. *B. atrata* (Sm.) Anzi), which is peculiar in its spores and ascus development (see Sheard, 1964).

Vainio (1909, p. 76) described a new genus, *Melanaspicilia*, from north-eastern Siberia, differing from *Buellia* in having immersed (aspicilioid) apothecia. In Zahlbruckner's catalogue (1930-31) this genus is treated as a synonym of *Rinodina* (Ach.) S. Gray. Vainio cited no type species for the new genus, and divided it into three sections based on the coloration of the hypothecium: sect. *Semibuellia* (hypothecium pale or pale brownish, or pale above and brownish below; 5 Siberian species described as new and 6 other species mentioned); sect. *Buelliopsis* (hypothecium brown-blackish; 1 Siberian species described as new and

\* The only synonym cited by De Notaris for this species is "*Lecidea milliaria lignaria* Fr., Lich. Europ. p. 343", which corresponds, at least nomenclaturally, to *Bacidia lignaria* (Ach.) Lett. There is no indication that De Notaris intended to base it on *Patellaria myriocarpa* DC., and Th. Fries (1874, p. 595) attributes the combination *Buellia myriocarpa* (DC.) to Mudd, not to De Notaris.

7 other species mentioned); and sect. *Rinodinopsis* (hypotheorium colourless; no Siberian representatives, but 10 other species mentioned). Subsequently he added several new Japanese species to the genus (Vainio, 1918, 1921). Oxner (1933, p. 170) treated *Melanaspicilia* as a section of *Buellia*, and Dodge and Baker (1938, p. 657) as a section of *Rinodina*. Some of the species listed by Vainio, e.g. *aethalea* (Ach.) and *sororia* (Th. Fr.), can certainly not be placed under *Rinodina*, and the same probably applies to most of the species with pigmented hypotheorium (sections *Semibuellia* and *Buelliopsis*). Malme (1932) made the transfer of some of them to the genus *Buellia*. In view of the fact that at least one of the Antarctic species dealt with here (*B. russa*) sometimes has immersed, aspicilioid apothecia, it became desirable to review the taxonomic status of the genus *Melanaspicilia*. Through the courtesy of the Curator of the Vainio Herbarium at Turku University, Finland, we were able to receive material of the Siberian species for examination: *M. microplaca*, *M. ectolechioides*, *M. injucunda*, *M. dubia* (with vars. *paraleuca* and *paraphaea*), *M. crystallifera* and *M. tschuctschorum*. Most of the specimens are rather scanty and poorly developed, with the exception of *M. crystallifera*, which would probably be a good choice for the lectotype of the genus; a final decision in this regard, however, is best postponed until a comparative monographic study can be made also of all the non-Siberian species listed by Vainio (1909), and the taxonomic significance of the three sections *Semibuellia*, *Buelliopsis* and *Rinodinopsis* clarified. Malme (1932, p. 39) expressed doubt as to the autonomy of the Siberian taxa, and our examination of the type materials left us with the same impression. It is possible that they may all be states of the same species; further collections and field studies in the Pitlekai area of north-eastern Siberia would probably be necessary to decide this. The type specimen of *M. crystallifera* (No. 9117 in Herb. Vainio) is shown in Plate VIa, and Fig. 1 represents an enlarged portion of the same with several areolae on the dark protothallus and the aspect of the immersed to very slightly emergent apothecia. The thallus consists of scattered single verrucose areolae, occasionally a few aggregated together, on a black, effuse protothallus.



FIGURE 1

*Melanaspicilia crystallifera* Vain. Part of the holotype specimen (No. 9117 in Herb. Vainio), showing fertile areolae on black protothallus.

If the genus *Melanaspicilia* is to be delimited from *Buellia* merely by its immersed, aspicilioid apothecia, we are confronted with a difficulty in the generic disposition of some of our Antarctic species, notably *B. russa* (Hue) Darb., in which, as mentioned above, the apothecia may in some states remain a long time or even persistently immersed; such states were described by Hue under the names *Aspicilia erythroda* and *Aspicilia ditissima*. It therefore became necessary to make a comparative study of the ontogeny of apothecial development in various species of *Buellia* (*sens. lat.*) in order to find out whether fundamental differences exist which would call for the separation of distinct genera. Such a study was carried out by one of the present authors (Henssen) on some of Vainio's Siberian material as well as on several

Northern Hemisphere and Antarctic *Buellia* species, and it was found that four types of ontogenetic development may be distinguished within the complex, exemplified by (1) *B. disciformis* (Fr.) Mudd and *B. punctata* (Hoffm.) Mass., (2) *B. Wahlenbergii* (Ach.) Sheard (syn. *B. pulchella* (Schaer.) Tuck.), (3) *B. canescens* (Dicks.) De Not., and (4) species placed in *Melanaspicilia* and some of the Antarctic species in which the apothecia become emergent to sessile.

Type 1. *Buellia disciformis* and *B. punctata*.

*Material studied*

*B. disciformis*: Sweden, Ångermanland, Hemörsundet, HENSSEN, 1954, No. 6241 (herb. Henssen); U.S.A. Louisiana, St. Martin Parish, Bayou Benoit, HENSSEN, 1963, No. 15102p (herb. Henssen).

*B. punctata*: Germany, Rheinland, Jülich, HENSSEN, 1953, No. 6243 (herb. Henssen); Finland, Nylandia, Strömfors, FAGERSTRÖM, 1949 (herb. Henssen, No. 6244).

In certain parts of the thallus vegetative hyphae divide actively without inclusion of algal cells and form a generative tissue,\* the primordium of the ascocarp. Several ascogonia differentiate in each separate welt of generative tissue. They are straight in *B. punctata*, spirally coiled in *B. disciformis*, and provided with a trichogyne which emerges at the upper surface of the thallus (Plates Ia and IIa). The generative tissue protrudes above thallus-level and usually becomes strongly pigmented in its marginal part (Plate Ib). More rarely the generative tissue is developed submerged within the thallus, and is covered by residues of thallus tissue (Plate IIb). Active division of the generative hyphae continues, and they differentiate into paraphyses in the centre and the excipulum at the margin. Plate IIc shows a young stage with the initial orientation of the paraphyses and progressive pigmentation of the excipulum, which consists of enlarged cells. The tips of the paraphyses also become swollen and pigmented. Ascogenous hyphae and a young ascus are visible between the paraphyses in Plate IIc. In Plate IIc a young apothecium is seen with a less pigmented but more strongly developed cellular excipulum, still immersed in the thallus. Subsequently the apothecium develops vertically and protrudes well above the surface of the thallus (Plates Ic and IIe). The subhymenial layer, composed of the hypothecium and the base of the generative tissue, soon becomes pigmented (dark brown), with a progressive dying-off of the cells. In old apothecia this pigmentation and degradation extends to the basal or even upper parts of the hymenium, enclosing spores which have not already been ejaculated (Plates Id and IIh).

Type 2. *Buellia Wahlenbergii* (syn. *B. pulchella*).

*Material studied*

Finland, Lapponia enontekiensis, Toskalharji, HENSSEN, 1955, No. Le 1042, and Pihtsusputous, HENSSEN, 1955, No. Le 1040 (herb. Henssen).

The generative tissue is very strongly developed, and usually arises between two thallus-lobes (Plates Ii and IIIi), where it forms a small dark outgrowth, since its outermost part is dark-pigmented from the beginning (Plate IIg). A number of coiled or spiral ascogonia arise within the primordium (Plate IIg), each of them provided with a trichogyne. In one preparation a swelling was seen on the end cell of a trichogyne (Fig. 2d), probably indicating fusion with a conidium. The vegetative hyphae of the generative tissue differentiate into the paraphyses and the excipulum, and the apothecium grows considerably in a vertical direction (Plates II and IIIi). The subhymenial layer becomes dark pigmented, and in late stages the pigmentation extends to the hymenium, so that degenerated spores, often in the original groups of 8, are finally enclosed in the subhymenial layer (Plate IIIj).

Type 3. *Buellia canescens*

*Material studied*

Netherlands, Zeeland (herb. Univ. Marburg, ex herb. van den Bosch, No. 63.1); France, Bayeux, LENORMAND, 1840 (Farlow Herb.).

\* The term *generative tissue* may be defined as a vegetative tissue, analogous to a stroma, different in structure from the rest of the thallus, produced by ordinary medullary hyphae in connection with the formation of the ascogonia. Either the ascogonia are produced initially, and then become surrounded by the generative tissue, or the latter is formed first and the ascogonia arise subsequently from hyphae of this tissue. The hyphae of the generative tissue differentiate to form the paraphyses and the excipulum proprium, while the ascogonia give rise to the ascogenous hyphae.



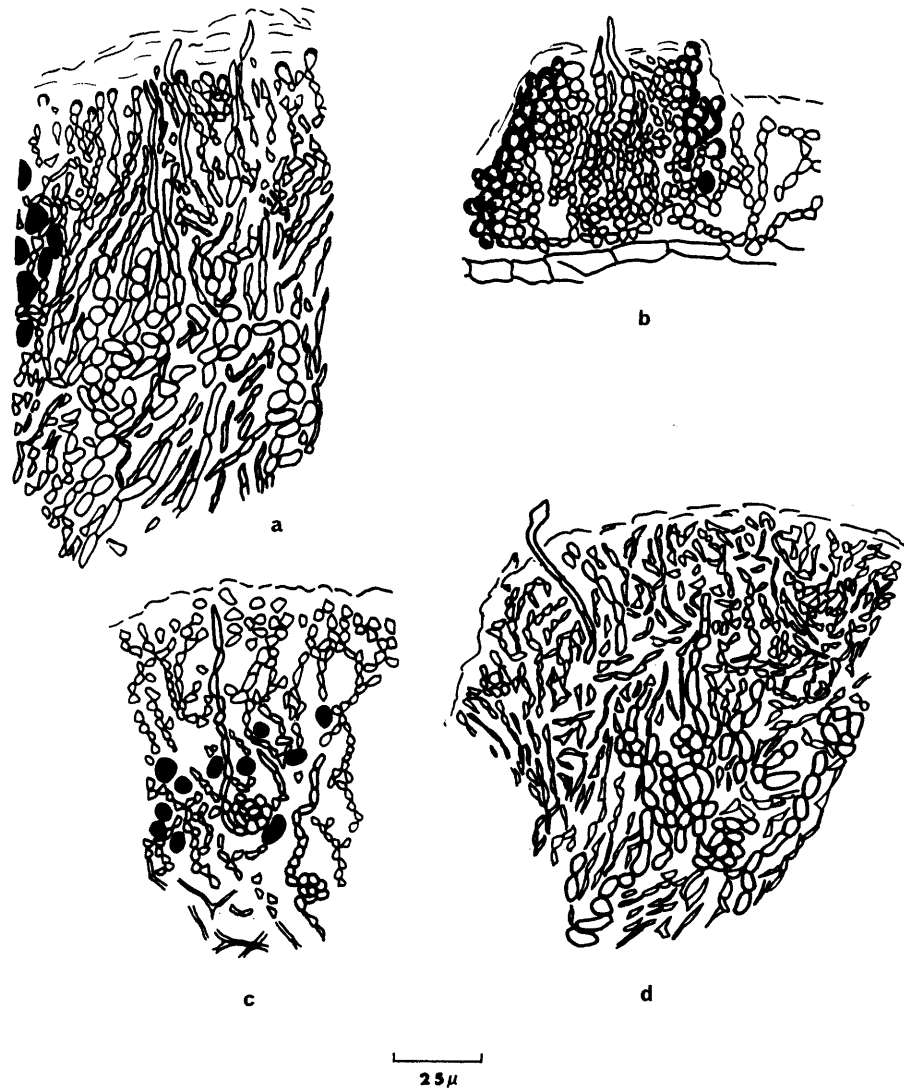


FIGURE 2

Development of ascogonia in the genus *Buellia* (camera lucida drawings).

- a. *Buellia anisomera* (FIDS A1827); several ascogonia with protruding trichogynes differentiated in generative tissue.
- b. *Buellia punctata* (Henssen 6243); several ascogonia with protruding trichogynes in generative tissue; ascocarp primordium rising above thallus-level.
- c. *Buellia canescens* (Lenormand, FH); ascogonia differentiated among thallus hyphae and symbiotic algal cells.
- d. *Buellia Wahlenbergii* (Henssen Le 1042); ascogonia in generative tissue formed as an outgrowth from the thallus; one trichogyne protruding and with swollen tip.

The development of the apothecium in this species has already been described by Letrouit-Galinou (1961). Our observations confirm hers in all important respects. In contrast to Types 1 and 2, the ascogonia in *B. canescens* do not arise inside a generative tissue, but between undifferentiated thallus-hyphae (Plates Im and IIIa). According to Letrouit-Galinou a few cells of the generative tissue (ascostroma of the author) are already developed at this early stage. Later on, a compact generative tissue is produced by the medullary hyphae surrounding the swollen ascogenous cells (Plates In, IIIc and III d). The upper part of the thallus forms a veil above the ascocarp primordium, and this veil, at an early stage, ruptures from the centre (Plate IIIc). The hyphae of the generative tissue differentiate to form paraphyses and excipulum. Young apothecia are still partly covered by the veil (Plates Io and IIIe). Later, the veil becomes restricted to the basal part of the excipulum (Plate IIIf). The apothecium enlarges considerably in a horizontal

direction (Plate Ip), and the subhymenial layer becomes dark pigmented (Plate IIIf). Vertical growth of the apothecium, with accompanying degeneration of the basal hymenium and enclosure of spores, was not observed in this type.

#### Type 4. *Melanaspicilia*-type

##### *Material studied*

*Melanaspicilia crystallifera*: Siberia, Pitlekai, ALMQUIST (herb. Vainio, holotype).

*Melanaspicilia tschuctschorum*: Siberia, Pitlekai, ALMQUIST (herb. Vainio, holotype).

*Buellia aethalea*: Sweden, Västergötland, Floby, STENHOLM, 1897 (Farlow Herb.).

*Buellia russa*: Antarctica, Port Lockroy, Goudier Island, FIDS, 1944, Nos. A1202b, A1207, A1807b, A1810; 1945, No. A2241; Hope Bay, FIDS, 1945, No. D2494; South Orkneys, Laurie Island, FIDS, 1946, No. C20-1007h (Herb. Mus. Brit.).

*Buellia anisomera*: Antarctica, Port Lockroy, Goudier Island, FIDS, 1944, Nos. A1202a, A1208a, A1807a, A1827; South Orkneys, Laurie Island, FIDS, 1946, No. C20-10071 (Herb. Mus. Brit.).

*Buellia augusta*: Antarctica, Port Lockroy, Goudier Island, FIDS, 1944, No. A1202c (Herb. Mus. Brit.).

*Buellia coniops*: Antarctica, Port Lockroy, Goudier Island, FIDS, 1944, No. A1208b; Marguerite Bay, FIDS, 1947, No. E1064 (Herb. Mus. Brit.); Finland, Lapponia petsamoënsis, RÄSÄNEN, 1938, Lich. Fenn. Exs. No. 611 (herb. Henssen).

*Buellia isabellina*: Antarctica, Port Lockroy, Goudier Island, FIDS, 1944, Nos. A1145, A1148; 1945, No. A2242 (Herb. Mus. Brit.).

Here the generative tissue is formed between the symbiotic algae (Plates Ie and IIIh) or above the algal layer (Plate IIIb). Several  $\pm$  straight or spirally coiled ascogonia, depending on the species, arise in each weft of generative tissue (Plate IIIb, g, h; Plate IVa, b). In *B. isabellina* the ascogonia are produced between the medullary hyphae and symbiotic algal cells (Plate IIIg) as in *B. canescens*, and the generative tissue is produced later. The ends of the trichogynes protrude from the upper surface of the thallus (Plates Ie and IIIh). The tips of the hyphae at the upper margin of the generative tissue soon form enlarged and dark pigmented cells (Plate IVa). Later on, the central hyphae differentiate into paraphyses and the marginal hyphae produce the excipulum. Plate IVg shows a young stage in the development of the apothecia, with formation of the excipulum. In *Melanaspicilia crystallifera* and *Buellia aethalea* the apothecia remain permanently immersed in the thallus, and the excipulum consists only of a few rows of dark pigmented hyphae (Plate IVc, f). In *Buellia russa*, *B. anisomera*, *B. coniops*, *B. augusta* and *B. isabellina* the apothecia soon develop considerably in a vertical direction, and the excipulum therefore becomes prominent above the level of the thallus (Fig. 3a, b; Plates Ig, h and IVh). The subhymenial layer soon becomes dark pigmented and this darkening as well as a dying off of the tissues extends downwards to the basal part of the thallus finally (Plate IVd, e) and upwards progressively into the hymenium, as the latter continues to grow in a vertical direction. In this way unejaculated spores frequently become enclosed in the dark pigmented subhymenial tissue (Plate IVi). The production of the excipulum, in the form of enlarged and dark pigmented cells, commences at the margin (Plate Ve, g). In old apothecia the excipulum may be strongly developed (Plate IVe) or may remain thin (Plate Vf).

The development of the pycnidia in the four ontogenetic types described above closely parallels that of the apothecia. In the *Melanaspicilia*-type they remain immersed in the thallus (Plate Va, d); in *Buellia disciformis* and *B. punctata* their upper part protrudes above the level of the thallus (Plate Vb), and in *B. Wahlenbergii* they are produced in a special outgrowth of the thallus of the same origin and structure as the generative tissue (Plate Vc). The cavity of the pycnidium is at first simple, but later it often becomes incompletely divided into chambers (Plate Vc, d). The conidia are produced either laterally and terminally on short-celled, stout conidiophores ("endobasidial") or terminally on long-celled, thin conidiophores ("exobasidial"); they are straight and shortly rod-shaped in some species, e.g. *Buellia russa* and *anisomera*, long needle-shaped in *B. punctata*, thread-like and curved in others, e.g. *Buellia coniops*, *isabellina* and *augusta*. With regard to the anatomy of the thallus, *Buellia canescens* shows a greater degree of differentiation than the other *Buellia* species studied, having the symbiotic algae restricted to a distinct layer in the upper part of the thallus between the upper cortex and the loosely interwoven medulla (Plate IIIc).

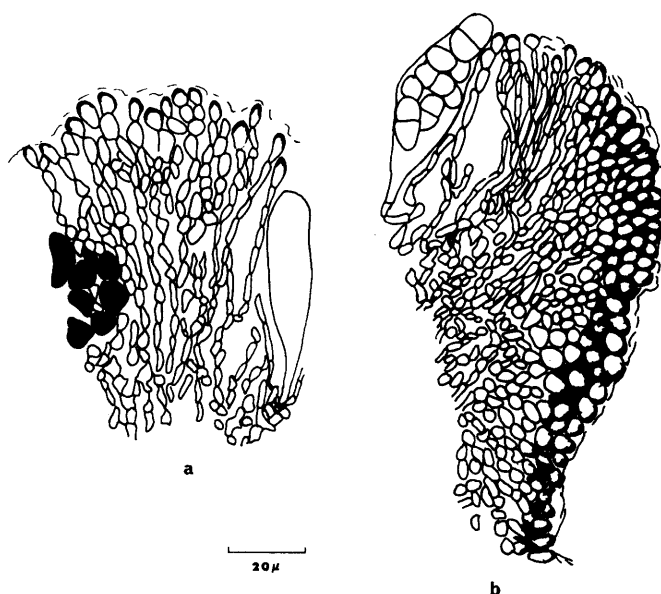


FIGURE 3

- Development of the excipulum in *Buellia russa* (camera lucida drawings).
- a. Margin of a young apothecium with formation of first cells of excipulum (FIDS D2494); symbiotic algal cells drawn black.
  - b. Margin of an old apothecium with well developed, partly pigmented excipulum (FIDS C20-1007h).

The taxonomic conclusions which may be drawn from the foregoing comparative ontogenetic study are the following:

- i. In ascocarp ontogeny and anatomy, as well as habitus, *Buellia canescens* stands closer to *Pyxine* sect. *Dirinaria* Tuck. than to the other *Buellia* species examined.
- ii. *Buellia Wahlenbergii* (syn. *pulchella*) also shows a distinct type of ascocarp ontogeny.
- iii. *Buellia disciformis* and *B. punctata*, in this respect, show a greater similarity than the foregoing to the *Melanaspicilia*-type. Both these types agree in having the generative tissue only diffusely separated from the adjacent thallus tissue, whereas in the *B. canescens* and *B. Wahlenbergii* types it is sharply differentiated.
- iv. From the phylogenetic point of view the ascocarp ontogeny of the *Melanaspicilia*-type may be regarded as the most primitive. Here the generative tissue remains immersed in the thallus; in the *B. disciformis*—*B. punctata*-type it becomes somewhat elevated above thallus-level, and in the *B. Wahlenbergii*-type this tendency proceeds so far that the generative tissue is exogenous in its development. The apothecia of the *B. canescens* type, long remaining enclosed, and initially covered by a thalline veil, seem to represent an evolutionary trend in the opposite direction. The apothecium extends horizontally in *Buellia canescens*, while in the three other types a considerable vertical growth is noticeable, during which unejaculated spores become enclosed within the emorient sub-hymenial layer.
- v. Ontogenetic development of the *Melanaspicilia*-type is found not only in species with persistently immersed (aspicilioid) apothecia, e.g. Vainio's Siberian species and *Buellia aethalea*, but also in those with apothecia becoming emergent and sessile in varying degree, e.g. the Antarctic species mentioned above. The Siberian species and the *Buellia aethalea* complex present, in this respect, a condition of arrested development in a juvenile state (neoteny). In the Antarctic species there is no sharp distinction between aspicilioid and sessile ascocarps; states of *B. russa*, as mentioned previously were classified by Hue under *Aspicilia* on account of their more persistently immersed apothecia. Permanently immersed apothecia furnish, therefore, no fixed criterion of the *Melanaspicilia*-type of development; in other words, sessile apothecia may be developed by the *Melanaspicilia*-type as well as by the *Buellia punctata*—*disciformis*-type. To decide which of the several hundred described *Buellia* species should be placed in *Melanaspicilia*, an ontogenetic study along the above lines would have to be made of all of them. For the meantime at least, for these reasons, we consider it more practicable not to maintain the *Melanaspicilia*-type as taxonomically distinct from *Buellia*.

Booth (1966, p. 140) has recently suggested a relationship to exist between *Buellia disciformis* and the non-lichenized Ascomycete *Bagnisiella mirabilis*, and places *Buellia* in the order Dothideales of the ascolular Ascomycetes. In his words, "the basis of the Dothideales fructification is . . . a vegetative stroma containing one or more ascogonia. These give rise to ascogenous hyphae and asci which break down the overlying cells by mechanical growth processes to form a locule". In fig. 4 on the same page (139) Booth illustrates the typical structure of a stroma of the Dothideales: a pseudoparenchyma in which the asci develop inside cavities. In our investigations on *Buellia disciformis* and other *Buellia* species we could not find any resemblance to the Dothideales. Neither the thallus nor the generative tissue is pseudoparenchymatous, nor was any breaking down of cells observed around the developing asci. The ontogeny of the ascocarp resembles rather that of other genera of the order Lecanorales, a fact which will be fully demonstrated in another paper.\*

Ascogonia which are produced by the medullary thallus hyphae and later become surrounded by a generative tissue are frequently found in species of the family Lichinaceae (Henssen, 1963, in which the generative tissue is termed "Hyphenknäuel", = weft of hyphae). The formation of  $\pm$  straight ascogonia within a generative tissue of vertically parallel hyphae, as found in *Buellia punctata* and *Buellia*-species of the *Melanaspicilia*-type, resembles in most respects the ascocarp ontogeny in *Pertusaria* and related genera. Already Letrouit-Galinou (1961) had observed a similarity in ascocarp development between *Buellia canescens* and *Pertusaria*.

#### Classification†

The main features here used for the classification of the species are:

- i. The morphology and colour of the thallus, and the lichen acids or isolichenin (if any) which it contains, as indicated by chemical reactions;
- ii. The internal morphology of the apothecia, colour of hypothecium, height of hymenium, type of epithelial pigmentation, and size, shape and septation of the spores; and
- iii. The type of pycnoconidia (rod-shaped or thread-like).

Pycnidia are abundantly produced by most of the Antarctic species treated here, and so the form of the conidia, undoubtedly an important character in classification, may feasibly be used as a practical criterion; the two types are illustrated in Fig. 4.

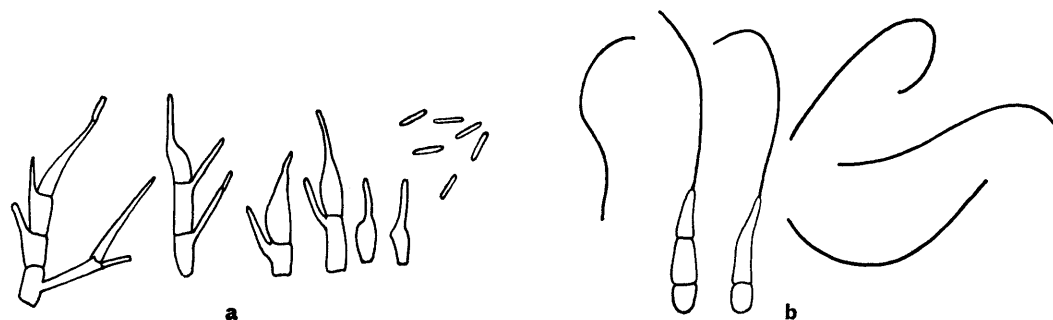


FIGURE 4

Conidiophores and conidia.

a. *Buellia anisomera* Vain.

b. *Buellia augusta* Vain.

The spores, while not showing in the Antarctic *Buelliae* the same degree of structural diversity found in the genus *Rinodina*, exhibit several distinctive forms (Fig. 5). Among these, an interesting variation is the placodiomorphic or orcularioid type, in which the two locules are separated, in the immature spore, by an endosporial thickening of the transverse septum, and are connected by a narrow canal (Fig. 5c). The primary median septum is always visible as a thin dark line, concolorous with the spore wall, and the internal thickenings are paler in colour. The canal connecting the two locules appears to be interrupted

\* By A. Henssen.

† This and ensuing text by I. Mackenzie Lamb.

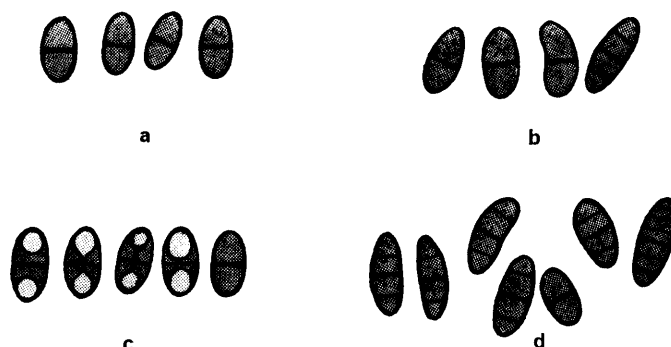


FIGURE 5

Spore types in Antarctic *Buellia* species.

- a. *B. russa* (Hue) Darb.
- b. *B. anisomera* Vain.
- c. *B. perlata* (Hue) Darb.
- d. *B. granulosa* (Darb.) Dodge  
(the two spores at right are abnormal).

by the dark septum, but there is reason to suppose that the latter is perforated, as in the cross-walls of Ascomycetous fungi generally. The gelatinous nature of the endosporial thickening is indicated by its gradual resorption as the spores approach maturity; fully ripe spores usually appear thinly 1-septate. Hillmann (1935, p. 3-4) has shown that this thickening in spores of the polarilocular type may often be increased or made more evident by the application of potassium hydroxide. Electron microscope studies of septum-formation in spores of some Fungi Imperfecti (*Phoma* and *Ascochyta*) have been made by Brewer and Boerema (1965), who found that in these genera the spores may become septate either by an annular ingrowth from the lateral wall (*euseptation*) or by a doubling of the spore wall with invagination of the inner layer to form a bistratose septum (*distoseptation*). While the formation of the placodiomorphic spore type in lichens appears to fall into the former category, further studies are desirable, especially with the electron microscope.\* Bouly de Lesdain (1906, p. 676) proposed a new genus, *Pseudobuellia*, segregated from *Buellia* by the placodiomorphic spores, but this single character does not seem to warrant distinction at the generic level, and according to Sheard (1964, p. 235) *Buellia biloculata* (Nyl.) Oliv., the species on which the genus *Pseudobuellia* was based, should be transferred to *Rinodina*. Imshaug (1955, p. 512, fig. 2) has illustrated some other spore types found in tropical *Buellia*-species.

The epithelial pigmentation on the tips of the paraphyses is of two kinds: a more or less blue-greenish or aeruginose-olivaceous substance which turns rose-red or crimson on the addition of nitric acid ( $\text{HNO}_3$ ) under the microscope, and a pure dark brown pigment which is unaltered by  $\text{HNO}_3$ . Both these substances are of unknown chemical composition, but the former, first described by Nylander (1872, p. 355), has been named "Lecidea-green" (see Lamb, 1940, p. 134). Anderson (1963, p. 252) has reported apparent transitions between blue-green and brown pigments in the epithecium of *Lecidea*-species, but in *Buellia*, as well as in *Rhizocarpon*, their distinction by the  $\text{HNO}_3$  reaction is easy, and they afford a valuable taxonomic criterion (Lamb, 1940; Sheard, 1964).

Species of the genus *Rhizocarpon* (sect. *Catocarpon*) resemble *Buellia* in many respects, but may be distinguished by the gelatinized hymenium with completely conglutinated paraphyses and the usually larger spores typically surrounded by a halo of hyaline mucilage.

The *Buelliae* of western Antarctica show three assemblages of closely related species:

- i. The *coniops*-assemblage (*B. coniops*, *B. isabellina*, *B. augusta*, *B. latemarginata*, *B. Babingtonii*, *B. fulvonitescens*), characterized by arcuate-filiform pycnoconidia and thallus tending to shades of tawny brown and with pure brown epithelial pigments not reacting with  $\text{HNO}_3$ ;

\* A recent electron microscope study of the lichen *Phyiscia aipolia* by Rudolph and Giesy (1966) has shown the spores (brown-pigmented and 1-septate, similar to those of *Buellia*) to have a wall consisting of two layers, the inner of which develops a laminated structure with sheaths of granular, electron-dense material probably corresponding to dark pigmentation. The septum is developed from the inner secondary wall-layer and is continuous with the latter. No perforating pore was detected in the septum. Durrell (1964), examining dark spores of several genera of Fungi Imperfecti by electron microscopy, found that in all cases there is present both an inner, lighter, chitinous wall, sometimes laminated and often of considerable thickness, and an outer wall heavily impregnated with dark pigment (melanin). Ultramicroscopic studies of lichen spores of the polarilocular type, in particular, are greatly needed.

- ii. The *russea*-assemblage (*B. russea*, *B. melanostola*, *B. perlata*, *B. illaetabilis*), with straight rod-shaped pycnoconidia, greyish (rarely brownish) thallus, and epithecium and excipulum containing "Lecidea-green", more or less blue-green or aeruginose, turning crimson-red with HNO<sub>3</sub>;
- iii. The *anisomera*-assemblage (*B. anisomera*, *B. inordinata*, *B. Nelsonii*, *B. granulosa*, *B. subpedicellata*, *B. Darbishirei*, *B. cladocarpiza*), with medullary hyphae of thallus producing isolichenin (violet-blue with iodine), thallus yellow to cream-coloured or whitish, and spores with a tendency to become 3-septate or rarely submuriform. It is not impossible that field studies carried out over long periods of time may prove some of these to be developmental stages of one species; see discussion under *B. granulosa*, p. 21. The customary segregation of a distinct section *Diplotomma* characterized by 3-septate to submuriform spores, already shown to be untenable by Imshaug (1951, p. 9), breaks down completely in this Antarctic species-complex.\*

*Buellia frigida* is the sole known representative of the genus in the Antarctic regions with the thallus truly lobate-effigurate at the periphery. The remaining species here dealt with (*B. evanescens*, *B. papillata*, *B. punctata*, *B. pycnogonoides*) are of uncertain systematic affinity.

#### Key to the species of Graham Land and adjacent islands

- 1a. Thallus some shade of yellow (lemon-yellow, sulphur-yellow or stramineous yellow), usually C+ orange-yellow to orange-red.
- 2a. Epithecium pure brown or brown-blackish without aeruginose tinge, HNO<sub>3</sub>—; spores sometimes with two weakly developed accessory septa; medulla I+ violet-blue . . . . . *B. anisomera* (p. 15)
- 2b. Epithecium aeruginose or blue-green-blackish, HNO<sub>3</sub>+ crimson-red; spores always 1-septate.
- 3a. Thallus thick (up to 2 mm.), verrucose or verruculose; medulla I+ violet-blue; protothallus absent or little developed . . . . . *B. inordinata* (p. 17)
- 3b. Thallus thin (up to 0.2 mm.), of plane areolae; (I reaction of medulla fluctuating); protothallus well developed, black . . . . . *B. Nelsonii* (p. 19)
- 1b. Thallus not yellow.
- 4a. Thallus brown or brownish (fuscous, tawny, pale brownish, fulvous or alutaceous).
- 5a. Thallus of mostly isolated, round, convex, minute, fuscous areolae not over 0.25 mm. diameter on a conspicuous, radiating-dendritic, black protothallus; hymenium not over 60μ high; spores 11–12 (–13) × 6.0–7.5 (–8.0)μ . . . . . *B. pycnogonoides* (p. 26)
- 5b. Thallus of crowded or conrescent areolae or verrucae over 0.25 mm. diameter; marginal protothallus not or less distinctly dendritic; hymenium over 60μ high; spores over 13μ long.
- 6a. Thallus of tawny or fuscous verrucae with minutely granulate-scabrid or whitish-punctate surface . . . . . *B. augusta* (p. 47)
- 6b. Thallus not granulate-scabrid or whitish-punctate.
- 7a. Thallus tawny-brown (cervino-rufescent).
- 8a. Thallus-verrucae hemispherical to subglobose, up to 0.35 mm. diameter, subdiscrete, on a well-developed, thickish, effuse, jet-black hypo- and protothallus . . . . . *B. augusta* (juvenile or "brabantica" phase) (p. 47)
- 8b. Thallus-verruculae smaller (about 0.2 mm. diameter), ± conrescent or fused to form squamulose areolae; hypothallus and protothallus thin, dark brown to brown-black (or lacking) . . . . . *B. coniops* (ff. *coniops* and *cervinogranulata*) (p. 43)
- 7b. Thallus fuscous (not tawny), grey-brownish, pale brownish, fulvous or alutaceous.
- 9a. Epithecium ± aeruginose (HNO<sub>3</sub>+ crimson-red); spores in young condition orcularioid; pycnoconidia bacillar, straight . . . . . *B. melanostola* (p. 40)
- 9b. Epithecium pure dark brown (HNO<sub>3</sub>—); spores thinly 1-septate also in young condition; pycnoconidia filiform, arcuate.
- 10a. Thallus areolate, with plane to slightly convex areolae.

\* Sheard (1964, p. 232–33) has suggested that sect. *Diplotomma* may be maintained on the basis of the structure of the spore-septa rather than their number. He finds the transverse and longitudinal septa in *Buellia alboatra*, *B. chlorophaea* and *griseovirens* to be indistinct, and refers to such spores as "pseudomuriform". It is questionable whether the sectional name *Diplotomma* can be used for these species, for as Imshaug has pointed out (1951, p. 8, footnote), the original diagnosis of *Diplotomma* by Flotow (1849) was based on *Buellia canescens* (Dicks.) De Not., which is also the type-species of the section *Diploicia* (Mass.) Stizenb. Imshaug (1951) indicates the name *Abacina* Norm. as a correct alternative if a separate genus should prove necessary for species with 3-septate or muriform (i.e. "pseudomuriform") spores.

- 11a. Thallus grey-brownish, matt; marginal areolae radially elongated to give a subeffigurate appearance; apothecia small (0·2–0·4 mm. diameter), for a long time or persistently plane and marginate  
*B. Babingtonii* (p. 53)
- 11b. Thallus alutaceous or fulvous (not greyish), slightly lustrous; marginal areolae not or only slightly radially elongated; apothecia larger, finally becoming convex and immarginate.. ..  
*B. fulvonitescens* (p. 54)
- 10b. Thallus verrucose or verruculose.
- 12a. Thallus of small verruculae about 0·2 mm. diameter .. ..  
*B. coniois* (pale coloured states) (p. 43)
- 12b. Thallus of larger verrucae up to 0·4 (–0·5) mm. diameter .. ..  
*B. isabellina* (p. 45)
- 4b. Thallus not brown or brownish.
- 13a. Medulla I+ violet-blue; thallus white, sordid whitish or cream-coloured.
- 14a. Spores mostly 3-septate (rarely submuriform); thallus sometimes giving a yellow or orange reaction with C .. ..  
*B. granulosa* (p. 20)
- 14b. Spores all, or nearly all, 1-septate (rarely with 2 weakly developed accessory septa); thallus C—.
- 15a. Thallus forming a flat crust, not over 3 mm. in thickness.
- 16a. Epithecium aeruginose (HNO<sub>3</sub>+ crimson-red) .. ..  
*B. inordinata* (pale coloured states) (p. 17)
- 16b. Epithecium pure dark brown (HNO<sub>3</sub>—).
- 17a. Spores 18–28 (–30) × 8–11 (–12) μ .. ..  
*B. subpedicellata* (p. 22)
- 17b. Spores 15–21 × 8–10 μ .. ..  
*B. Darbishirei* (p. 23)
- 15b. Thallus forming small cushion-like clumps 5–15 mm. thick made up of branching, cariose, brownish, hypothalline stipes covered with a superficial crust of small metathalline granules .. ..  
*B. cladocarpiza* (p. 24)
- 13b. Medulla I—; thallus of various colours (white, whitish, grey, blackish-grey, alutaceous or pinkish-grey).
- 18a. Epithecium and excipular tissue pure dark brown, without aeruginose tinge (HNO<sub>3</sub>—).
- 19a. Growing over mosses, soil or lignum; pycnoconidia (so far as known) not filiform-arcuate.
- 20a. Apothecia minute, 0·15–0·30 mm. diameter; thallus very thin or obsolete, whitish or cinerous, continuous or patchy; spores 13–15 × 6–7 μ .. ..  
*B. punctata* (p. 25)
- 20b. Apothecia larger, 0·8–1·2 mm. diameter; thallus thick, nodulose-verrucose, white; spores 15–25 × 7·5–10·0 μ .. ..  
*B. papillata* (p. 30)
- 19b. Growing on rock; pycnoconidia filiform, arcuate.
- 21a. Thallus (when well developed) with a subeffigurate appearance at the margin due to the radial elongation of the peripheral areolae, which have darkened tips.
- 22a. Protothallus black (rarely brown); thallus ash-grey or whitish; apothecia soon becoming convex and immarginate, 0·5–1·0 mm. diameter .. ..  
*B. latemarginata* (p. 50)
- 22b. Protothallus brown; thallus sordid grey, often with a dingy brownish tinge (obvious on moistening); apothecia a long time or persistently plane and marginate, smaller, 0·3–0·5 mm. diameter .. ..  
*B. Babingtonii* (p. 53)
- 21b. Thallus not of subeffigurate appearance at periphery, the marginal areolae or verrucae not radially elongated; sordid grey, often with a dingy brownish tinge  
*B. coniois* (ff. *areolata*, *verrucosa*, *incrassata*) (p. 43)
- 18b. Epithecium and excipular tissue aeruginose, aeruginose-brown or aeruginose-blackish (HNO<sub>3</sub>+ crimson-red). (*Note*: occasionally, in aged or weathered conditions, the epithecium may become ± pure brown by alteration, giving no distinct reaction with HNO<sub>3</sub>, but the characteristic colour and reaction is usually retained in the excipular tissue.)

- 23a. Thallus effigurate at periphery, with radiating marginal thallus-lobes.  
 24a. Marginal lobes entirely metathalline (although usually blackened); no protothallus developed . . . . . *B. frigida* (p. 55)  
 24b. Marginal lobes partly metathalline, partly (at periphery) transitional into a blackish, radiate-fimbriate protothallus. . . . . *B. russa* var. *cycloplaca* (p. 39)  
 23b. Thallus not effigurate at periphery (may, however, be bounded by a dark, radiate-fimbriate or zonate protothallus).  
 25a. Apothecia minute, not exceeding 0.5 mm. in diameter; hymenium not over 60 $\mu$  high; spores small, not over 12 (-13) $\mu$  long.  
 26a. Thallus-areolae hemispherical to subglobose, scattered (not contiguous); hypothecium  $\pm$  colourless . . . . . *B. evanescens* (p. 28)  
 26b. Thallus-areolae plane to convex, at least partly contiguous and separated by cracks; hypothecium brown to dark brown . . . . . *B. illaetabilis* (p. 29)  
 25b. Apothecia at maturity larger; hymenium higher; spores larger.  
 27a. Thallus bounded at periphery by a very conspicuous, dark grey or blackish, sometimes concentrically whitish-zonate protothallus up to 7 mm. wide with  $\pm$  even margin . . . . . *B. russa* var. *Liouvillei* (p. 38)  
 27b. Marginal protothallus narrower, not over approximately 2 mm. wide (or absent).  
 28a. Spores in young condition polarilocular (orcularioid); thallus ash-grey (rarely partly somewhat alutaceous-rufescent) . . . . . *B. perlata* (p. 41)  
 28b. Spores thinly 1-septate also in young condition; thallus varying greatly in colour (grey, alutaceous or coppery-pinkish, sometimes reddish from decomposition of depsidone-content). . . . . *B. russa* (p. 31)

***Buellia anisomera*** Vainio, 1903, p. 26

- Syn.** *Lecidea anisomera* (Vainio) Hue, 1915, p. 120.  
*Lecidea citrella* Hue, 1915, p. 127; *Buellia citrella* (Hue) Darbishire, 1923a, p. 62.  
*Lecidea festivissima* Hue, 1915, p. 124; *Buellia festivissima* (Hue) Darbishire, 1923a, p. 62.
- Icon.** Plate IIIb, h: ontogeny of ascocarps.  
 Plate IVa, e, i: ontogeny of ascocarps, and old apothecia in section.  
 Plate Va: young immersed pycnidium in section.  
 Plate Vd: old pycnidium in section, showing division into chambers.  
 Plate VIb: young growth phase, epiphytic on *Buellia russa*, from east Graham Land, Hope Bay, FIDS No. D2492a, BM,  $\times 4$ .  
 Plate VIc: thallus with apothecia and pycnidia, epiphytic on *Buellia russa*, from west Graham Land, Alpha Island, BSWA No. 7890a, FH,  $\times 4$ .  
 Plate VIId: older thallus, growing directly on rock, from east Graham Land, Hope Bay, FIDS No. D2488, BM,  $\times 4$ .  
 Plate VIIa: thallus, growing directly on rock, and worn down by environmental agencies, from west Graham Land, Goudier Island, FIDS No. A1832, BM,  $\times 4$ .  
 Figs. 2a, 4a, 5b.  
 Vainio, 1903, pl. IV, fig. 35: thallus on rock (the holotype specimen), BR,  $\times 1$ .  
 Hue, 1915, fig. 3, p. 121: spores (as *Lecidea anisomera*).  
 fig. 5, p. 126: spores (as *Lecidea festivissima*).  
 fig. 6, 6 bis, p. 128: spores (as *Lecidea citrella*).

**Morphological description.** Thallus lemon- to sulphur-yellow, matt, effuse, crustose, of moderate thickness (0.3-1.0 mm., rarely up to 2 mm.), in young condition rimose-areolate with  $\pm$  tumid areolae, then becoming thicker and congested-verrucose, finally with the verrucae conerescent in areola-like portions separated by gaping cracks. Protothallus normally absent, rarely present as an inconspicuous narrow black margin. No soredia.

Apothecia usually present and often abundant, 0.5-1.3 mm. diameter, formed in thallus-verrucae, sessile at maturity, round, slightly constricted at base, black, matt, not pruinose, at first plane and



indistinctly marginate, soon becoming convex and immarginate. Excipulum 60–90 $\mu$  thick at sides, densely dark brown, pseudoparenchymatous. Hypothecium up to 250 $\mu$  deep, dark brown. Hymenium 75–100 (–110) $\mu$  high, with pure dark brown epithecium without any aeruginose tinge (HNO<sub>3</sub>–). Paraphyses involved in mucilage but separable under pressure in water, not anastomosing, capitate to 5 $\mu$ , the brown pigment often forming a cap on the swollen tips. Asci clavate, 75–90  $\times$  16–20 $\mu$ . Spores normally 8 in ascus, irregularly biseriata, olivaceous then dark brown, ellipsoid to elongate-ellipsoid, straight or occasionally slightly curved, either all 1-septate or with an intermixture in various proportions of 3-septate spores (the two additional cross-walls usually thin and weakly developed), 16–24  $\times$  6–9 $\mu$ , the septum thin also in the young condition (Fig. 5b).

Pycnidia commonly present, indicated by small black-edged punctures in thallus-verrucae (Plate VIc); immersed (Plate Va), finally divided into chambers or saccate compartments (Plate Vd), with colourless or faintly sordid perifulcril wall; conidia bacillar, straight, 5–6  $\times$  0.8–1.0 $\mu$ , borne on simple or branched sterigmata (Fig. 4a).

Thallus externally K–, C+ (usually) orange-yellow or orange, PD–; in sections cortex C+ orange or orange-red, or intense yellow, medulla always I+ violet-blue; no reactions with K or PD.

**Discussion.** The holotype material was collected on granodioritic rock on Wiencke Island, west Graham Land (BAE No. 447 *pr. p.*) and divided into two isotypes, one of which (that figured by Vainio in his report) went to BR, and the other retained in his own herbarium at TUR (Herb. Vainio No. 9413 *pr. p.*). Both these portions have been studied by the author. The BR specimen is associated with *Buellia augusta* Vainio, that in TUR with *Buellia russa* (Hue) Darbishire (called "*Buellia protohallina* var. *indissimilis*" by Vainio).

*B. anisomera* is a common species in the Antarctic Peninsula sector, and I have collected and studied it repeatedly in 1944–45 and 1964–65. It appears always to start its growth epiphytically on the thallus of *Buellia russa* (Plate VIb, c), and later, spreading over and obliterating its host, becomes directly attached to the rock (Plate VI d), attaining sometimes considerable dimensions (patches up to 8 cm. diameter occasionally seen).

The type material in BR and TUR is a well-developed specimen with lemon-yellow thallus (C+ orange-pink) and numerous apothecia; it represents the transitional growth-stage between the early epiphytic and the later independent conditions. Its spores are all 1-septate. A section of the thallus in the TUR isotype shows the cortex overlaid by a colourless, hyaline, almost amorphous, necrotic stratum 15–70 $\mu$  thick; the cortex 30–60 $\mu$  thick, opaque from a dense deposit of minute dull yellowish granules which turn orange-red in C and dissolve in K with a pale yellow colour, pseudoparenchymatous with thin-walled,  $\pm$  isodiametric cells 4–6 $\mu$  diameter. Algal stratum irregular, interrupted, 75–240 $\mu$  deep, with isolated groups of algae also occurring lower down in the medulla. Algae trebouxoid, 10–18 (–21) $\mu$  diameter. Medulla colourless, hyaline, becoming gradually brown in lower part, compact, formed of closely interwoven, thin-walled hyphae about 3 $\mu$  thick which stain intensely violet-blue with I; the lower part gradually more pseudoparenchymatous, with  $\pm$  rounded cells 4.5–7.0 $\mu$  diameter with brown walls.

The holotype specimen of *Lecidea citrella* Hue, from west Graham Land, Goudier Island (FAE 1908–10, No. 92 *pr. p.*, in PC) consists of small,  $\pm$  orbicular rosettes growing directly on the rock; the cortex is C+ intense yellow, the medulla I+ violet-blue, and the spores are all 1-septate. It was separated from *B. anisomera* by Hue on account of an imagined difference in the structure of the thallus-cortex, which is not, however, in any way different from that found in other specimens of this species.

*Lecidea festivissima* Hue was based on a very small, depauperate specimen of *B. anisomera* with an unusually pale thallus of a whitish-yellow colour (perhaps due to having grown in a shaded cleft) from west Graham Land, Petermann Island (FAE 1908–10, No. 142 *pr. p.*, in PC); the cortex is C+ orange-yellow, the medulla I+ violet-blue, and the spores all 1-septate.

Tested macroscopically with a drop of reagent, the thallus of *B. anisomera* is C+ orange, orange-yellow, or occasionally C–; in sections the cortical layer turns intense yellow or orange-yellow with C. The substance causing this reaction (and presumably giving the yellow colour to the thallus) is unknown; fragments of several specimens were submitted to Dr. Mason Hale (Smithsonian Institution, Washington, D.C.) for microchemical testing, and he reported (personal communication, 1960): "An unknown C+ brilliant orange-red substance; it was proved by chromatography that this substance is neither lecanoric nor olivetoric acids; crystals were not formed in any of the common reagents." In addition to this substance, the thallus contains also the  $\beta$ -orcinol derivative atranorine.

The spores of this species are subject to variation in septation, from simply 1-septate to 3-septate. Some specimens, such as the holotype, have the spores entirely 1-septate; others show 1-septate spores with an admixture of 3-septate (the additional accessory septa often being thin and weakly developed; see Fig. 5b). Both types may occur in the same hymenium and even in the same ascus, and the septation shows no correlation with the external appearance or developmental phase of the lichen. This criterion, formerly used in an attempt to distinguish sections of the genus, or even separate genera (*Buellia*, "*Diplotomma*", *Abacina*, "*Mattickiolichen*"; see p. 13), but shown to be arbitrary and unnatural by Malme (1928, p. 4) and Imshaug (1951, p. 13), thus proves once more to be of doubtful taxonomic value. The same transitions are also found in another closely related Antarctic species, *B. granulosa* (p. 20).

Thalli of *B. anisomera* growing in very exposed situations sometimes become gradually worn down by windborne ice or dust particles; in such circumstances the cortical layer, by continued growth, keeps pace with the abrasion, but the aspect of the thallus is greatly altered, presenting a smooth surface of plane areolae (Plate VIIa), similar to states found in crustose lichens of temperate regions as a result of damage by snails (see Schade, 1933).

Vainio, in his original description, compared *Buellia anisomera* with *B. semitensis* Tuck. (N. America), *B. flavoareolata* (Nyl.) Müll. Arg. (Chile) and *B. agelaeoides* Müll. Arg. (Chile). According to the revisions of Magnusson (1955), *B. flavoareolata* differs in having the medulla I—, the cortex K+, the thallus ochraceous brown to dark yellow, lustrous, and a granular black epithecium, and *B. agelaeoides* in having medulla I—, hymenium dark green above, and shorter spores. *B. semitensis* is, however, undoubtedly very closely related to *B. anisomera*, and examination of the type material in the Tuckerman herbarium (FH) from California, Bolander Nos. 128, 329, did not reveal any definite distinguishing characters; the general appearance and colour are similar, the reactions are the same (thallus-cortex C+ yellow or orange-yellow, medulla I+ violet-blue), the internal structure and colours of the apothecia the same, the spores (all 1-septate) of about the same size, and the pycnoconidia likewise rod-shaped. All the available material of *B. semitensis* was assembled for comparative study; it consisted of six specimens from California and one from South Dakota (Herb. Univ. Colorado, furnished by courtesy of Dr. W. A. Weber). To judge from these specimens, it seems that *B. semitensis* differs from *B. anisomera* in its biology, in that it grows interspersed among other crustose lichens without being at any stage epiphytic on them. The only reliable microscopic features found to distinguish *B. semitensis* are the apparently constant lack of 3-septate spores and the lower hymenium (75 $\mu$  high, with asci 50–60 $\mu$  long). Other distinguishing characters may be found with the study of more material, and further North American collections giving a more complete picture of the distribution of *B. semitensis* may help to explain the close affinity between these geographically now completely disjunct species.

Another taxonomic problem is the relationship of *B. anisomera* to *B. granulosa*; see discussion under the latter (p. 21).

**Geographical distribution.** Apparently endemic to the Peninsula sector of Antarctica, where it occurs in the South Orkney and South Shetland Islands and on the west side of Graham Land at least as far south as Marguerite Bay, but not seen from the Weddell Sea side further south than Hope Bay and Paulet Island (Fig. 6).

The specimens examined are listed in Appendix III, Table I.

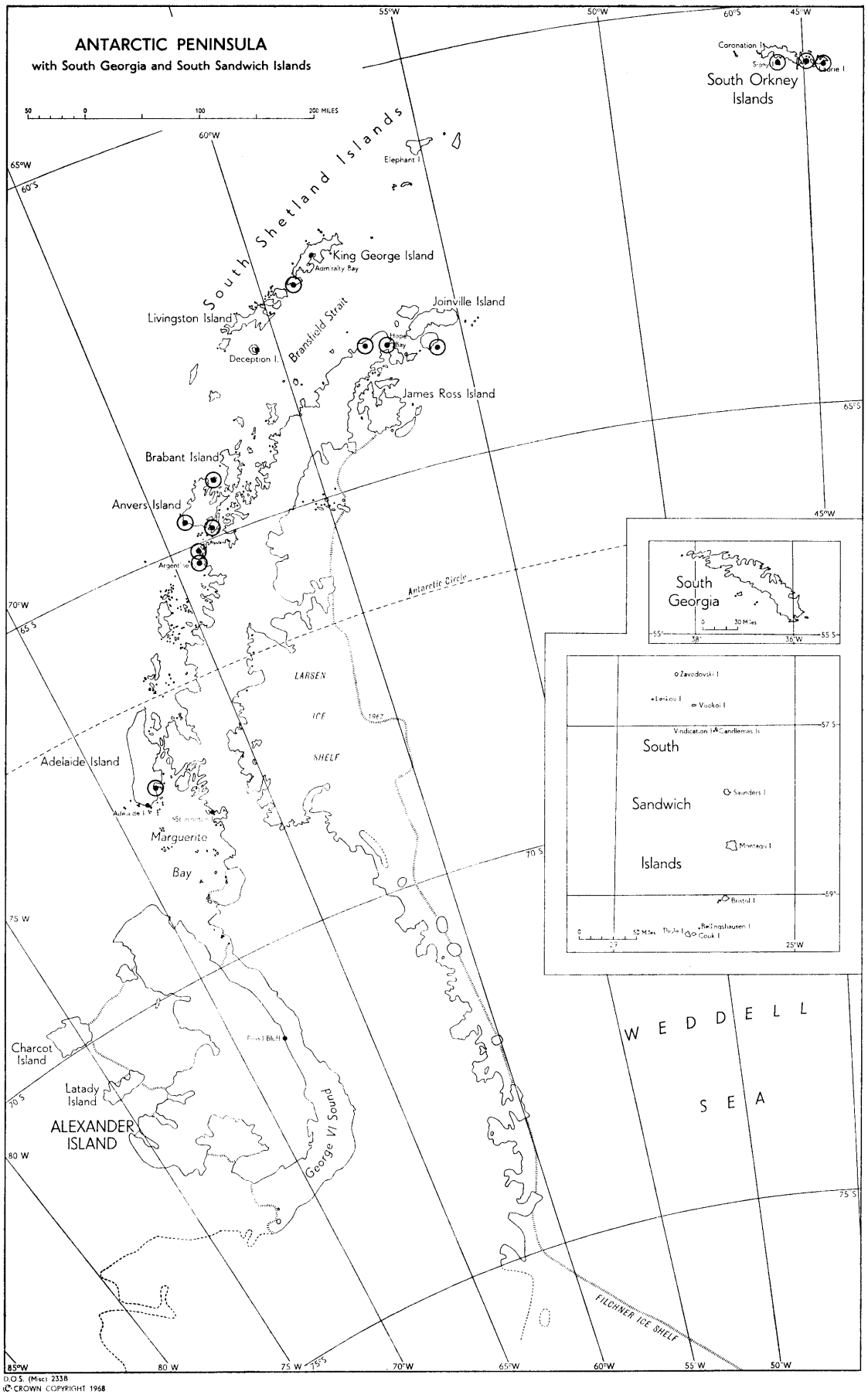
### *Buellia inordinata* (Hue) Darbishire, 1923a, p. 63

**Syn.** *Lecidea inordinata* Hue, 1915, p. 122.

**Icon.** Hue, 1915, fig. 4, p. 123: spores (as *Lecidea inordinata*).

**Morphological description.** Thallus sulphur-yellow, stramineous or cream-coloured, matt, effuse, crustose, of moderate thickness (up to 2 mm.), granulate-verruculose with uneven surface, not areolate, continuous or with a few irregular gaping cracks, the verruculae unequal in shape and size, 0.15–0.30 mm. diameter. No prothallus developed in the specimens seen. No soredia.

Apothecia abundant, sessile on thallus, 0.4–0.8 (–1.0) mm. diameter, round, black, matt or subnitid, not pruinose, for some time remaining plane with a distinct, moderate,  $\pm$  prominent proper margin, at length immarginate and slightly convex. Excipulum 30–50 $\mu$  thick at sides, black or green-blackish in section, more brown in lower part, composed of flabellately arranged, short cells. Hypothecium up to 230 $\mu$  deep, brown to dark brown. Hymenium 75–100 $\mu$  high, in uppermost part (epithecium) dark sordid blue-green or aeruginose-blackish (HNO<sub>3</sub>+ crimson-red). Paraphyses  $\pm$  concrete in mucilage, separable



**FIGURE 6**  
The known distribution of *Buellia anisomera* Vain.

with difficulty in water, capitate to  $4\mu$  at the pigmented tips. Asci clavate, about  $90\mu$  long. Spores 8 in ascus, irregularly biseriolate, olivaceous then dark brown, ellipsoid, straight or rarely slightly curved, thinly 1-septate (also in young condition), rarely with 1 or 2 weakly developed accessory septa,  $14-22 \times 6-9\mu$ . (Pycnidia not found.)

Thallus macroscopically K—, C—, in sections K—, C—, PD— in the material seen; medulla I+ violet-blue (sometimes in places only).

**Discussion.** Hue (1915) based this species on three specimens of the FAE 1908–10 expedition: No. 115 *pr. p.* from Booth Island, No. 142 *pr. p.* from Petermann Island and No. 86 *pr. p.* from Goudier Island. The latter specimen could not be found in Hue's herbarium (PC), but the other two were seen and examined. No. 142 *pr. p.* proved to be referable to *B. anisomera* Vainio, and No. 115 *pr. p.* was chosen by me as the lectotype of the species.

*B. inordinata* is very similar, and obviously closely related, to *B. anisomera*, but differs principally in the aeruginose, not brown, epithelial pigment ("Lecidea-green") which turns crimson-red on the addition of  $\text{HNO}_3$ . This difference was not mentioned by Hue, who usually failed to distinguish between the various types of epithelial pigments, describing any dark colour as "fuliginous" or "niger". In addition, the species is distinguished by its often paler, straw-yellow or cream-coloured thallus, and—a biological difference—its tendency to grow over or in contact with *Huea grisea* (Vainio) M. Lamb\* instead of on *Buellia russa*.

The lectotype specimen from Booth Island (FAE 1908–10, No. 115 *pr. p.*, in PC) forms a  $\pm$  orbicular, stramineous-yellowish patch 2.5 cm. diameter mostly surrounded by the minutely isidiate thallus of *Huea grisea*, into which it effusely interpenetrates at its periphery, without formation of any black line. The thallus-cortex is poorly developed, 8– $12\mu$  deep, colourless, not nubilated, less distinctly pseudoparenchymatous than in *B. anisomera*, in places covered by a colourless, almost amorphous necrotic layer 10– $18\mu$  in thickness. No reactions could be obtained on thallus-sections with K, C or PD, but the medulla stained distinctly violet-blue with I. Algal stratum  $\pm$  interrupted, 90– $130\mu$  deep; algae trebouxoid, up to  $20\mu$  diameter, showing multiplication by autospores. Medulla hyphose, somewhat lax, colourless or greyish, the hyphae rather thick-walled, 3– $5\mu$  diameter, interwoven, at base of thallus becoming gradually brown-pigmented by degeneration.

In one specimen from the Melchior Islands (BSWA No. 7988b) a blue reaction of the medulla with iodine could be obtained only in places, probably on account of the thinness of the thallus in this sample, with very little development of true medullary tissue below the algal layer.

All specimens seen were associated with *Huea grisea* (Vainio) M. Lamb.

**Geographical distribution.** Not a common species; seen from one locality in the South Orkney Islands and four in the islands off the west coast of Graham Land; these specimens and localities are listed in Appendix III, Table II.

### *Buellia Nelsonii* Darbishire, 1912, p. 15

**Icon.** Plate VIIb: the holotype specimen in S from the South Shetland Islands, Nelson Island,  $\times 4$ .

Darbishire, 1912, pl. 3, fig. 28: the same holotype specimen,  $\times 6$ .

**Morphological description.** Thallus sordid stramineous-yellow, matt, crustose, thin (0.1–0.2 mm.), forming small,  $\pm$  orbicular, non-effigurate thalli up to 1 cm. diameter, bounded at periphery by a conspicuous, black, in places radiating-dendritic prothallus up to 1 mm. wide; even, rimose-areolate with plane areolae 0.3–0.5 mm. diameter separated by narrow cracks, not sorediate.

Apothecia numerous, arising in thallus-areolae and soon becoming adpressed-sessile and slightly constricted at base, round (or difform by mutual pressure when crowded), 0.3–0.5 mm. diameter, black, matt, not pruinose, mostly persistently plane and marginate with a moderate, entire, slightly prominent proper margin, rarely finally slightly convex with the margin disappearing. Excipulum densely dark brown in section, developed at sides and running down for some distance below apothecium, pseudoparenchymatous. Hypothecium dark brown, gradually paler brown in upper subhymenial part. Hymenium 90– $110\mu$  high, in uppermost epithelial part aeruginose-blackish ( $\text{HNO}_3$  + crimson-red). Paraphyses involved in some mucilage but discrete under pressure in water, at the pigmented tips clavate-capitate to 4– $5\mu$ .

\* *Huea grisea* (Vainio) M. Lamb, n. comb.; syn. *Pertusaria grisea* Vainio, 1903, p. 22 (basionym); *Lecidea coralligera* Hue, 1915, p. 102, *Blastenia coralligera* (Hue) Darbishire, 1923a, p. 54, *Huea coralligera* (Hue) Dodge and Baker, 1938, p. 618.

Asci clavate,  $75-90 \times 12-15 \mu$ . Spores 6-8 in ascus, biseriate or subsiseriate, soon brown to dark brown, somewhat variable in size and shape, broadly or narrowly ellipsoid, straight or sometimes curved, 1-septate with thin septum (also in young condition),  $(13.5-16-20) \times 6-8 \mu$ .

Pycnidia immersed in thallus, globose,  $75-100 \mu$  diameter, with pale brown perifulcral wall, brown-blackish round the ostiole; pycnoconidia rod-shaped, straight,  $5 \times$  approx.  $0.7 \mu$ .

Thallus-sections K—, C+ more or less distinctly yellow (not orange), PD—, I+ violet-blue or I—.

**Discussion.** Only two specimens have been seen, and hence little can be said at present concerning the variability of this species or the constancy of the differences which appear to separate it from *B. inordinata* (Hue) Darbishire, namely the plane-areolate (not verruculose) thallus and the development of a black fringing prothallus.

The type specimen is associated with a species of *Huea* described by Zahlbruckner (1917, p. 47) as *Blastenia austroshetlandica*, and consists of three isolated, orbicular thalli 5-8 mm. in diameter, in section with a thin, outer, colourless, faintly stratified necrotic layer  $5-6 \mu$  thick; cortex  $15-25 \mu$  thick, of indistinctly cellular structure (not fastigiate-capitate), not pigmented but  $\pm$  densely impersed with minute, sordid-yellowish granules which do not disappear in K but turn more or less distinctly yellow with C. Algal stratum irregular,  $120-170 \mu$  deep; algae trebouxoid,  $9-18 \mu$  diameter. Medulla isabelline-cloudy with minute granules, I—, at the base transitional into a dark brown, obscurely pseudoparenchymatous hypothalline tissue containing substratum-particles. Darbishire reported the occurrence of some 4-celled spores in the type-specimen, but none were seen by me in the apothecium examined.

The other specimen, from Robert Island, South Shetland Islands (DI 1934-35, No. 1485-2), is quite similar in appearance and structure, but gives a distinct violet-blue reaction of the medulla with iodine.

**Geographical distribution.** Known only from the South Shetland Islands; the two specimens seen are listed in Appendix III, Table III.

#### *Buellia granulosa* (Darbishire) Dodge, 1948, p. 244

**Syn.** *Bacidia granulosa* Darbishire, 1912, p. 6.

*Lecidea cremea* Hue, 1915, p. 129; *Buellia cremea* (Hue) Darbishire, 1923a, p. 62.

*Lecidea cremea* f. *incrassata* Hue, 1915, p. 130; *Buellia cremea* f. *incrassata* (Hue) Zahlbruckner, 1930-31, p. 346.

**Icon.** Plate VIIc: the lectotype specimen of *Lecidea cremea* Hue (FAE 1908-10 No. 119 *pr. p.*) in PC,  $\times 4$ .

Plate VIIId: the holotype specimen of *Lecidea cremea* f. *incrassata* Hue (FAE 1908-10 No. 140 *pr. p.*) in PC,  $\times 4$ .

Fig. 5d.

Hue, 1915, fig. 7, p. 130: spores (as *Lecidea cremea*).

**Morphological description.** Thallus cream-coloured or sordid whitish, sometimes with a faint yellowish tinge, matt, effuse, crustose, moderately to very thick (1-3 mm.), verrucose, irregularly cracked but not areolate, the verrucose portions  $0.5-1.0$  ( $-2.0$ ) mm. diameter and themselves indistinctly divided into smaller verruculae  $0.15-0.30$  mm. diameter. Prothallus absent or occasionally weakly developed as a thin, narrow, black, marginal line, not dendritic or radiating. No soredia.

Apothecia moderately numerous to abundant and crowded, arising in the thallus-verrucae and becoming sessile, slightly to moderately constricted at the base, round,  $0.4-0.9$  mm. diameter, black, matt, not pruinose, plane to slightly convex, with a thin, entire, hardly prominent, sometimes evanescent proper margin. Excipulum massive, up to  $150 \mu$  thick at sides, confluent with basal part of hypothecium, dark brown (without any aeruginose tinge), pseudoparenchymatous or partly with radiate-flabellately elongated cells. Hypothecium  $120-250 \mu$  deep, dark brown. Hymenium  $80-110 \mu$  high, with pure dark brown epithecium ( $\text{HNO}_3$ —). Paraphyses embedded in mucilage but subdiscrete under pressure, capitate to  $3-5 \mu$  at the pigmented tips. Asci clavate,  $65-90 \times 15-18 \mu$ . Spores 8 in ascus (or sometimes fewer, 3-6), subsiseriate, soon brown, ellipsoid to oblong- or fusiform-ellipsoid, straight or sometimes curved, rarely (in very old spores) constricted at the septa; at first with one thin cross-septum, and some spores remaining thus, others becoming 3-septate with weak or strong accessory septa, rarely 4-6-septate and occasionally submuriform with a single longitudinal septum in one or two of the median cells (Fig. 5d). Mature spores  $17-28 \times 8-10 \mu$ .

Pycnidia immersed in thallus, protuberant, black, 0.1–0.2 mm. diameter, becoming convex-immarginate with impressed ostiole; in section 350–480 $\mu$  diameter and globose to chambered-lobate, with brown, pseudoparenchymatous perifulcral wall. Pycnoconidia rod-shaped, straight, 4–5 $\times$ 1 $\mu$ , borne terminally and subterminally on septate conidiophores as in *B. anisomera* (cf. Fig. 4a).

Thallus externally K– or + indistinctly yellow, C– or sometimes + yellow or orange-yellow, PD–; cortex in section K–, C– or sometimes + yellow to orange, PD–; medullary hyphae I+ violet-blue.

**Discussion.** Darbishire described this species for the first time, as a *Bacidia*, on very poor material from east Graham Land, Hope Bay. The type specimen in S is partially eroded or damaged by abrasion or decay, which accounts for some of its aberrant characteristics, such as the absence of any distinct coloration of the medulla with iodine and the spurious reaction “K rubescens” stated by Darbishire in his description. In addition, the specimen is covered in many places by a fungus, which was described by Darbishire (1912, p. 18) as a new species of *Chaetomium*, *Ch. Bacidiae* Darb. It is strongly to be suspected, however, that this Ascomycete was not originally present on the lichen, but made its appearance after collection as a contaminant on the perhaps imperfectly dried sample, which gives the impression of one that has been spoiled by moisture and mould. Apart from these post-mortem changes, the specimen shows most of the diagnostic characteristics of the species. The thallus is sordid cream-coloured, up to 1 mm. thick, verruculose and cracked, not areolate; the apothecia numerous, 0.5–0.8 mm. diameter, mostly plane and thinly marginate, a few finally slightly convex with the margin disappearing. The hymenium is morbose and more or less disintegrated, but shows a dark brown epithecium and contains some well-developed spores, which are dark brown, 3-septate, 21–24 $\times$ 8–10 $\mu$ . A very similar specimen of this species, also in poor condition, is that recorded by Darbishire (1912, p. 23) from Hope Bay as “*Diplotomma alboatrum*”; the other specimen from the South Shetland Islands recorded under that name by Darbishire (loc. cit.) could not be found in the collections of the Stockholm Museum. A third specimen from Hope Bay collected by the Swedish expedition was misidentified by Darbishire as “*Buellia frigida*”.

*Lecidea cremea* Hue was founded on two specimens from west Graham Land, Booth Island, FAE 1908–10 Nos. 119 *pr. p.* and 179 *pr. p.*; the former has been chosen by me as the lectotype,\* and is shown in Plate VIIc. Its thallus is cream-coloured with a yellowish tinge, up to 1 mm. in thickness, consisting of concrescent verrucose portions separated in places by gaping cracks, and with their surface further subdivided into smaller, indistinct verruculae. Traces of a slight black proto- and hypothallus are visible in places. The thallus in section is corticate and without any distinct outer necrotic layer; the cortex 15–25 $\mu$  thick, densely brown-yellowish-inspersed and opaque from small isabelline granules which dissolve in K and are not coloured by C or PD. The algal stratum is partly interrupted, 75–120 $\mu$  deep, and the algae trebouxoid, 11–17 $\mu$  diameter. The medulla is colourless, clear, compact or slightly lax in places, with hyphae 3–4 $\mu$  thick, I+ violet-blue. The spores, according to Hue, are 8 in the ascus, which is probably usually the case, but in the apothecium sectioned by me they were fewer (3–5); 3-septate with septa of equal thickness, a few 1-septate or 4-septate, very rarely up to 6-septate or submuriform with a single longitudinal septum in one of the median cells; 21–28 $\times$ 8–9 (–10) $\mu$ .

The holotype specimen of f. *incrassata*, from west Graham Land, Petermann Island (FAE 1908–10, No. 140 *pr. p.*) has a very thick thallus, up to 3 mm., glebose-verrucose and verruculose, cream-coloured (Plate VIIId). The thallus has the same structure and reactions as in the lectotype of the species, differing only in the presence of an outermost, thin, hyaline necrotic layer 5–6 $\mu$  thick. The spores are 6–8 in the ascus, mostly 1-septate, the remainder 3-septate with the 2 accessory septa thinner than the median one; they measure 17–24 $\times$ 8–9 $\mu$ .

Particular interest attaches to the structure of the cortical layer in this species. It is sometimes fairly distinctly pseudoparenchymatous, isabelline-cloudy (not granulose), but more usually is of indistinct, more or less gelatinized structure, with outlines of interwoven hyphae more or less obscured by the small sordid isabelline granules with which it is inspersed. It has in fact the same hyphal structure as the medullary and algal-medullary layers. In the former case it is obviously a true cortex similar to that of *B. anisomera*, but in the latter a secondarily derived *pseudocortex*† originating by the upward proliferation of the medullary layer of the thallus. This was proved in several specimens by the fact that it stained violet-blue with iodine, thus demonstrating its medullary origin. In one sample examined, not only the pseudocortex, but

\* The other specimen listed by Hue could not be found under No. 179, which came from Petermann, not Booth Island. This is probably an error in Hue's listing.

† The term *pseudocortex* was introduced by Degelius (1954) to designate a type of cortical layer composed of compacted, indistinct, more or less gelatinized, branching hyphae.

also the overlying necrotic layer, gave this characteristic reaction. I interpret this observation in the following way: in certain natural circumstances, and with increasing age, plants of this species have their original pseudoparenchymatous cortical layer removed by the abrading effect of atmospheric agencies, and it then becomes replaced by a pseudocortex, of medullary origin, growing up through the algal stratum. Plants with a true primary cortex have the latter isabelline-cloudy (not granulose) and C+ yellow, orange-yellow or orange, probably due to the same undescribed lichen acid which occurs in *B. anisomera*. Plants in which the primary cortex has been replaced by a medullary pseudocortex have this layer usually isabelline-grnulose and C—, but sometimes (in one specimen seen, BSWA No. 8015x) cloudy and C+ orange. This means, if my interpretation be correct, that the loss of the primary cortex usually entails loss of the ability to produce the C+ red substance, but that occasionally the latter may be produced by the pseudocortex also. The type specimens of "*Lecidea cremea*" and "*Lecidea cremea* f. *incrassata*" both have a pseudocortex which is C—; that of "*Bacidia granulosa*", as far as can be made out in its poor condition, is the same in this respect. In one specimen from west Graham Land, Goudier Island (FIDS No. A1831a), with C— negative pseudocortex, the presence of atranorine was demonstrated by Dr. Mason Hale, who remarked (personal communication, 1960): "The continued production of atranorine in the pseudocortex is particularly interesting . . . since this acid is so characteristically a product of cortical layers."

The characters by which this species is separated from *B. anisomera* are fluctuating and I have long suspected that *B. granulosa* may in fact represent very old individuals of *B. anisomera* with the original cortical layer entirely replaced by a pseudocortex, with a corresponding alteration of thallus-colour. This is, however, purely speculative at present, and experimental proof, by the observation of marked thalli in the field, could probably not be obtained in much less than a century, the growth rates of crustose lichens being exceedingly slow.\*

**Geographical distribution.** Endemic to the South Orkney and South Shetland Islands, and the west coast of Graham Land to somewhat south of lat. 65°S., apparently not extending far to the eastern side of the peninsula.

The specimens examined are listed in Appendix III, Table IV.

***Buellia subpedicellata*** (Hue) Darbishire, 1923a, p. 64

**Syn.** *Lecidea subpedicellata* Hue, 1915, p. 140.

? *Lecidea Goudieri* Hue, 1915, p. 130; *Buellia Goudieri* (Hue) Darbishire, 1923a, p. 63 (cf. below).

**Icon.** Plate VIIe: part of syntype specimen in PC from west Graham Land, Petermann Island (FAE 1908-10 No. 304 *pr. p.*), ×4.

Plate VIIf: part of a specimen from west Graham Land, Galindez Island (BGLE No. 1253-10) with fringing brown funoid protothallus, ×4.

Plate VIIg: part of a well fertile specimen from west Graham Land, Goudier Island (FIDS No. A1169), ×4.

**Morphological description.** Thallus whitish, grey-whitish or (in old herbarium specimens) whitish cream-coloured, without yellow tinge, occasionally partly pale ash-grey, matt, effuse, forming patches up to 6 or 7 cm. diameter, crustose but in the thicker central parts with a formation of underlying short stipes produced by the medullary layer and up to 2 mm. high, congested, ecorticate, cariose, branched, pale sordid cream-coloured or pale brownish, bearing at their summits the assimilative verrucae of the thallus which form an irregularly cracked crust. Thallus congestedly verrucose, uneven, very thick in central parts (up to 2.5 or 3.0 mm.), the verrucae smoothly globose or subglobose, 0.2-0.5 (-0.7) mm. diameter, crowded and ± confluent into a crust. Basal hypothalline layer attaching thallus to rock pale brown, felted, mycelial; marginal protothallus brown to blackish, matt, radiately fibrose, sometimes forming distinct, rope-like fibrils and often bearing small isolated outlying metathalline verrucae. No soredia.

Apothecia sparsely developed to abundant, originating in thallus-verrucae, 0.4-1.0 mm. diameter, round, adpressed-sessile, constricted at base, black, matt, not pruinose, plane and thinly marginate, finally becoming moderately convex with the proper margin excluded. Excipulum laterally developed and confluent with hypothecium below, up to 170μ thick at sides, dark brown, pseudoparenchymatous with a flabellate-radiating arrangement of the cells. Hypothecium up to 270μ deep in centre, dark brown.

\* Some Arctic and alpine crustose lichens have been shown to increase by a mere fraction of a millimetre in diameter annually, and remain growing for a period of up to several thousand years if the substratum does not weather too rapidly. Their slow growth and long persistence allows them to be used for dating rock surfaces in glaciology and physiography; for a summary of investigations in this respect, see Beschel (1961).

Hymenium 80–100 $\mu$  high, dark brown in uppermost part without any aeruginose tinge (HNO<sub>3</sub>—). Paraphyses lying in mucilage but separable in water, with brown-capitate tips up to 4–5 $\mu$  diameter, often with the pigment forming an apical cap. Asci clavate, 70–85 $\times$ 18–23 $\mu$ . Spores 8 or sometimes fewer in ascus, irregularly biseriata, at first pale olive, soon becoming brown to dark brown, ellipsoid to fusiform-ellipsoid, straight or curved, 1-septate with thin septum (also in young condition), very rarely with 2 quite faintly indicated accessory septa, large: 16–28 (–30) $\times$ 8–11 (–12) $\mu$ .

Pycnidia usually numerous, immersed singly or 2 to 3 together in thalline verrucae, with prominent black ostiole 0.10–0.15 mm. diameter, which is often greyish-pruinose; in section globose, or irregular, up to 180 $\mu$  diameter, with colourless perifulcral wall, brown at the ostiole; pycnoconidia rod-shaped, straight, 3.0–4.5 $\times$ c. 0.8 $\mu$ .

Thallus macroscopically K+ distinct persistent yellow, C—, PD— or + faint sulphur-yellow appearing slowly; in sections, cortex cleared by K with yellow mist, no coloration with C or PD; medulla I+ intense violet-blue.

**Discussion.** This species is easily recognizable by its thick, whitish thallus of  $\pm$  globose verrucae with development of short, cariose, pale sordid or brownish, irregularly branched, stipe-like, medullary or hypothalline extensions beneath them in its thicker parts. The thallus is sometimes faintly caesious-pruinose, especially around the pycnidia. The spores were almost exclusively 1-septate in all the specimens examined. Very characteristic, when developed, is the radiating, fibrillose-fimbriate, blackish, brown or pale brown protothallus surrounding the thallus and sometimes forming rope-like (funoid) strands somewhat loosely attached to the substratum (Plate VIII f). The thallus always gives a distinct K+ yellow reaction, due to the presence of atranorine in the cortical layer. The original description by Hue (1915) mentioned an orange-red coloration with K followed by C, but I was unable to obtain any such reaction in our material.

Hue based his description of the species on three specimens from west Graham Land—two from Goudier Island and one from Petermann Island. Only the latter specimen (FAE 1908–10 No. 304 *pr. p.*) could be found in his herbarium at the Paris Museum, and although it cannot justifiably be chosen as a lectotype (Hue (1915), states that his diagnosis was drawn up from one of the other specimens) it agrees well with the description and can be regarded as an identical syntype. It has abundant pycnidia but very few apothecia. The thallus in section is covered by an outermost, hyaline necrotic stratum up to 15 $\mu$  thick with faint outlines of disintegrated cells; the underlying cortical layer 20–25 $\mu$  thick, nubilated with minute, sordid yellowish-grey granules which dissolve in K with emission of a yellow solution, composed of intricately short-celled, not fastigiate, somewhat indistinct hyphae. Algal stratum irregular, the algae (trebouxioid, 9–18 $\mu$  diameter) dispersed in masses 60–200 $\mu$  diameter. Medulla in assimilative verrucae composed of interwoven, short-celled, thin-walled hyphae 2.0–3.5 $\mu$  thick, colourless, I+ violet-blue. Underlying hypothalline stipes solid or somewhat lacunose, not containing algae, ecorticate, granulose-inspersed in section, of indistinct, conglutinated hyphae, gradually brown-pigmented towards the base.

*Lecidea Goudieri* Hue may probably be referred to this species, but the type specimen could not be found in the PC collections, and from Hue's description it cannot be distinguished with certainty from *B. granulosa*.

**Geographical distribution.** Endemic to the west coast and northern tip of Graham Land, and also seen from the South Orkney Islands.

The specimens examined are listed in Appendix III, Table V.

### *Buellia Darbishirei* M. Lamb, n. nom.

**Syn.** *Rinodina crassa* Darbishire, 1912, p. 13.

**Icon** Plate VIIIh: part of the holotype specimen in S,  $\times$ 4. Darbishire, 1912, pl. 2, fig. 24: the same type specimen,  $\times$ 4.

**Morphological description.** In general appearance, anatomical structure and reactions similar to the foregoing species (*B. subpedicellata*), from which it differs in the smaller spores: 15–21 $\times$ 8–9 $\mu$ .

**Discussion.** Darbishire (1912) erroneously stated the hypothecium to be hyaline, and on account of the immature and more or less immersed condition of the apothecia considered these to be lecanorine and interpreted the species as a *Rinodina*. The thalline and apothecial anatomy is, however, exactly as in *Buellia subpedicellata*, and it is possible that this may be only a variety of that species, but the different spore-size, found also in another specimen from a distant locality, seems to be significant. There also appears to be a distributional difference (see below).



The type specimen in S, from Hope Bay, east Graham Land (SAE No. 170) forms a  $\pm$  continuous, orbicular patch 2.8 cm. diameter, very thick (up to 2.5 mm.), compound-verruculose, not areolate, fissured in places by irregular gaping cracks, now cream-coloured (not yellowish, "flavescens", as stated by Darbishire), matt, not pruinose. The concrescent verruculae, 0.25–0.50 mm. diameter, form a crust raised up on the summits of crowded, confused and confluent, closely branched, cariose, stipe-like processes emanating from the hypothallus, which is felted and pale (sordid cream-coloured to pale brownish). The thallus terminates thickly and abruptly at the margin, without any dark prothallus, and is not effigurate. Apothecia, mixed with pycnidia, are very abundant but small, up to 0.3 mm. diameter, mostly immature and  $\pm$  immersed; the more mature ones distinctly lecideine with black proper margin, plane, with black, matt or subnitid, non-pruinose disc. The pycnidia originate as dark spots in the thallus-verrucae and become hemispherical-emergent, black, up to 0.15 mm. diameter; they are globose to vertically ellipsoid in section, with colourless perifulcrum but brown-pigmented around the ostiole, and produce rod-shaped, straight conidia  $3-4 \times c. 0.7\mu$ .

The following data were obtained from one of the less immature apothecia,  $150\mu$  in diameter and  $70\mu$  deep: excipulum dark brown in section, not clothed by thallus, of flabellate-radiate, pseudoparenchymatous structure. Hypothecium lentiform,  $50\mu$  deep, dark brown. Hymenium (immature) about  $75\mu$  high, dark brown in uppermost  $10-15\mu$  without any aeruginose tinge. Paraphyses discrete under pressure in water, capitate to  $3\mu$  and dark brown at tips. Spores olive to dark brown, straight, 1-septate, not constricted at septum which is  $0.8-1.0\mu$  thick;  $15-21 \times 8-9\mu$ .

The thallus of the type specimen has the same structure as in *B. subpedicellata*, with cortical layer  $10-15\mu$  deep of indistinct, gelatinized, shortly cellular structure, nubilated with minute, isabelline granules which dissolve in K with emission of yellow solution, and covered by an outer, hyaline,  $\pm$  amorphous necrotic layer of about the same thickness. Thallus-sections C—; medulla I+ intense violet-blue.

The only other specimen seen to date, from east Graham Land, James Ross Island (FIDS No. D2682r) is very similar in all respects, but bears mature apothecia 0.5–0.8 mm. diameter, at first plane with thin, slightly prominent, black proper margin, then becoming convex and immarginate. Its hymenium is  $90-100\mu$  high and its spores 1-septate,  $15-18 (-20) \times 8-9\mu$ . It bears numerous pycnidia with rod-shaped, straight conidia  $5-6 \times 0.8\mu$ .

A new name is necessary for this species on transfer to *Buellia* on account of *Buellia crassa* Riehmer (1932, p. 392), a corticolous species from Africa.

**Geographical distribution.** Known only from the northernmost end of the Antarctic Peninsula and the coast of James Ross Island on its eastern side. This is a more eastern distribution than has been observed in *B. subpedicellata*.

The specimens examined are listed in Appendix III, Table VI.

### *Buellia cladocarpiza* M. Lamb, n.sp.

**Icon.** Plate VIIIa: portions of the holotype specimen in BM,  $\times 4$ .

**Diagnosis.** *Thallus crassus, pulvinulos compactos ad 15 mm. altos formans, crusta superficiali granulosa, sordide albicante vel flori lactis concolori, stipitibus radiciformibus superposita anastomoso-confluentibus, cariosis, fuscescentibus, algis destitutis, substrato enatis et ad 7 (-10) mm. altis. Apothecia crusta adpressa vel sessilia, 0.8-1.5 mm. lata, nigra, epruinosa, primum plana et margine proprio integro nigro praedita, dein convexa et immarginata, interdum botryoso-composita. Excipulum et hypothecium obscure fusca, hymenium  $90-100\mu$  altum et superne nigrofuscum,  $HNO_3$ —. Sporae normaliter 8nae, ellipsoideae, fere omnino 1-septatae (rarius nonnullae immixtae 3-septatae, septis accessoriis tenuioribus), majusculae:  $18-25 \times 8-11\mu$ —Crusta metathallina atranorinum continet (K+ bene lutescens, C—, PD+ pallide sulphureo-flavescens); medulla I+ violaceo-caerulescens. (Pycnidia non visa.)—Ad stirpem Buelliae subpedicellatae adscribenda et ei speciei proxime affinis, stipitibus hypothallinis magis evolutis et habitu crasse pulvinato, quasi fruticuloso distincta.*

**Morphological description.** Thallus forming  $\pm$  scattered pulvinate clumps 1.0–2.5 cm. diameter, 0.5–1.5 cm. thick, with irregularly convex-glebose,  $\pm$  continuous surface consisting of crowded or concrescent granules 0.1–0.3 mm. diameter. Crust sordid whitish or cream-coloured, matt, not sorediate, borne over brownish, cariose, irregular, anatomosing, hypothalline stipes up to 7 (–10) mm. long concealed inside the clumps and attached to the rock at their base. No dark prothallus present.

Apothecia moderately numerous, adpressed-sessile on the thalline crust, round, 0.8–1.5 mm. diameter, black, matt or subnitid, not pruinose, at first plane with moderate, slightly prominent, entire proper margin, then slightly to strongly convex and immarginate; occasionally composite, forming  $\pm$  botryose masses up to 6 mm. diameter of convex-immarginate secondary discs. Excipulum densely dark brown, 45–70 $\mu$  thick, pseudoparenchymatous. Hypothecium dark brown, up to 210 $\mu$  deep. Hymenium 90–100 $\mu$  high, in uppermost part pure dark brown without aeruginose tinge, HNO<sub>3</sub>—. Paraphyses separable under pressure in water, not anastomosing, capitate to 4–5 $\mu$  and brown-pigmented at the tips. Asci clavate, 75–90 $\times$ 15–20 $\mu$ . Spores 8 in ascus (or fewer by abortion), irregularly biseriolate, ellipsoid, nearly all 1-septate (rarely a few 3-septate with weaker accessory septa), the septum and wall of equal thickness, 1.0–1.5 $\mu$ ; 18–25 $\times$ 8–11 $\mu$ .

(No pycnidia found.)

Thallus-crust externally K+ yellow, C—, PD+ faint sulphur-yellow (atranorine proved by micro-chemical test); medulla I+ intense violet-blue.

**Discussion.** The type specimen was collected on Wiencke Island, west Graham Land, at an altitude of approximately 450 ft. above sea-level, on a south-facing, slightly overhanging face of granodioritic rock, where it formed small colonies of pale-coloured, pulvinate, firmly attached clumps. Subsequently an exactly similar specimen was seen from King George Island in the South Shetlands.

The thallus of the type specimen has a cortical layer 15–20 $\mu$  thick, sordid isabelline-inspersed and almost opaque, clearing in K with emission of yellow solution, C—, PD—, composed of indistinct, compacted, gelatinized hyphae; the outermost necrotic layer is vestigial or absent. Symbiotic algae trebouxoid, forming an irregular, diffuse, interrupted stratum 60–100 $\mu$  deep below the cortical layer. Medulla colourless,  $\pm$  clear, lax to compact, hyphose, with gelatinous and somewhat indistinct hyphae 3–4 $\mu$  diameter, passing gradually downwards into the stipes, which are ecorticate, without algae, brownish or brown in section and of degenerated, indistinct, gelatinized-confluent, hyphal structure.

*B. cladocarpiza* is obviously closely related to *B. subpedicellata*, having similar apothecial anatomy, spores and chemical constitution, but its habitus is entirely different. The subfruticulose thallus appears to be unique in the genus, although *B. subpedicellata* shows a transitional condition in this direction. *Buellia papillosa* Müll. Arg., from Brazil, has a thallus of erect, cylindrical papillae, but they are of meta-thalline, not hypothalline construction and are probably to be interpreted as isidioid outgrowths. “*Thamnolecania*” *macquariensis* Dodge & Rudolph (1955, p. 141), to judge from the description, may be a fruticulose *Buellia* or *Rinodina* species; no material has been seen by the present author. Fruticulose or subfruticulose development in species of normally crustose genera is not uncommon among the ornithocrophilous lichens of the Antarctic Peninsula sector of Antarctica; other examples are *Caloplaca* sect. *Thamnoma* (Tuck.) Zahlbruckner (1926a, p. 251, as “*Thamnonoma*”), *Lecania* sect. *Thamnolecania* (Vain.) Zahlbruckner (1926a, p. 226), *Catillaria* sect. *Hypocaulon* M. Lamb (1954, p. 116) and *Bacidia* sect. *Thamnopsis* M. Lamb (1954, p. 125). Sheard (1964, p. 244) has pointed out that lichen species characteristic of strongly nitrogenous habitats, such as birds’ perching stones, tend to have exaggeratedly verrucose thalli, and it seems not unreasonable to suppose that this frutescent tendency may have been further developed by certain of the endemic Antarctic lichens simultaneously with their physiological adaptation to conditions of extreme ornithocrophily.

**Geographical distribution.** Known from the west coast of Graham Land and the South Shetland Islands. The specimens examined are listed in Appendix III, Table VII.

*Buellia punctata* (Hoffmann) Massalongo, 1852, p. 81

Syn.† *Verrucaria punctata* Hoffmann, 1796, p. 192.

*Verrucaria punctata* [subsp.]\* *V. punctiformis* Hoffmann, 1796, p. 193; *Buellia punctiformis* (Hoffmann) Massalongo, 1852, p. 82.

*Lecidea praecavenda* Nylander ex Crombie, 1869, p. 232; *Buellia praecavenda* (Nylander) Arnold, 1870, p. 479.‡

† We have not listed the extensive complete synonymy of this species; reference may be made to Zahlbruckner, 1930–31, p. 392–402. Synonyms derived from later authorities (Butler, Imshaug, Sheard) and not found under this species in Zahlbruckner’s catalogue are listed here.

\* This asterisk appears in the original citation and denotes a subspecies.

‡ Synonymy on the authority of Sheard, 1964, p. 243.

*Buellia pullata* Tuckerman, 1866, p. 26.\*

*Buellia lepidastrae* f. *lignicola* Hasse, 1915, p. 78 (misprinted 94).\*

*Buellia saxicola* Bouly de Lesdain, 1932, p. 127.\*

*Patellaria patinelloides* Saccardo & Roumeguère in Debeaux, Trabut, Therry and others, 1880, p. 189; *Karschia patinelloides* (Saccardo & Roumeguère) Saccardo, 1889, p. 780.†

*Karschia occidentalis* Earle in Greene, 1901, p. 8.†

*Karschia crassa* Fairman, 1904, p. 229.†

**Icon.** Lorrain Smith, 1911, pl. 13; 1926, pl. 12 (as *Buellia myriocarpa*).

Migula, 1929, pl. 4, figs. 13, 14; pl. 5, fig. 3 (as *Buellia myriocarpa*).

**Morphological description.** Thallus effuse, patchy or obsolete, usually very thin, whitish or cinereous to dark grey, continuous (or sometimes rimose in rare thicker states), smooth or uneven. No soredia. A blackish delimiting protothalline line occasionally present at periphery.

Apothecia numerous, minute, 0.15–0.30 mm. diameter, adpressed-sessile, round, black, at first plane and indistinctly thinly marginate, later slightly convex and immarginate, not pruinose. Excipulum 40–45 $\mu$  thick at sides, dark brown or brown-blackish without greenish tinge (HNO<sub>3</sub> —) in outer part, paler inwards, pseudoparenchymatous. Hypothecium light brown to dark brown, 60–80 $\mu$  deep. Hymenium (40–) 50–75 $\mu$  high, without oil-droplets, epithecium dark brown without aeruginose tinge, HNO<sub>3</sub> —. Paraphyses distinct, manifestly capitate to 4 or 5 $\mu$  at the pigmented tips. Asci clavate, (35–) 40–50 (–70)  $\times$  (11–) 12–15 (–18) $\mu$ . Spores 6–8 in ascus,  $\pm$  biserially arranged, ellipsoid, thinly 1-septate (also in young condition), (8.5–) 13–15 (–19)  $\times$  (4.5–) 6–7 (–10) $\mu$ .

Pycnidia rare (not seen in our material); pycnoconidia rod-shaped, straight, *c.* 7  $\times$  1 $\mu$  (according to Magnusson, 1952, p. 240, as *B. punctiformis*).

Thallus externally and in sections unaffected by K, C, PD and I; an indistinct sordid yellowish colour is sometimes obtained with K, but is a spurious reaction.

**Discussion.** The thallus of this species is of simple, relatively undifferentiated structure, entirely filled with trebouxioid algae, no separate lower medullary layer being present. The upper surface may be covered in places by a thin, hyaline, necrotic stratum. No distinct cortex is developed, but some of the outermost end-cells of the hyphae are faintly brown-capitate, and the structure may therefore be considered as a reduced condition of the capitate-fastigiate type.

*Buellia punctata* occurs in temperate regions usually on the bark of trees, also on bare wood, plant-remains, and rarely on rocks. The Antarctic specimens seen were growing over stunted mosses or, in one instance, on weathered lignum (the decayed deck of an old whaling boat). Muscicolous specimens of this species have been segregated as a distinct form, f. *muscicola* (Hepp) Körber, but there seems to be no good reason for this, as they show no distinguishing features apart from the different substratum (Hepp, Flecht. Europ. No. 318, *s.n.* *Lecidea punctiformis*  $\gamma$ . *muscicola* Hepp, examined in FH).

The record by Darbishire (1910, p. 8) of "*Buellia parasema*" from south Victoria Land (Winter Harbour near Cape Armitage on Ross Island) refers to this species; I have studied the material (BNAE No. 49b) preserved in BM.

**Geographical distribution.** A very widely distributed species in the Northern Hemisphere, including the Arctic and alpine zones, and probably circumpolar. A map of its distribution in North America is given by Imshaug (1951, p. 185). It was not previously known from the Antarctic regions, but has been recorded from Argentine Patagonia (Chubut), on bones and trees, by Cengia Sambo (1930, p. 63, as *Buellia myriocarpa*). It occurs in both western and eastern Antarctica, but is rare.

The specimens examined are listed in Appendix III, Table VIII.

### *Buellia pycnogonoides* Darbishire, 1923a, p. 41

**Syn.** ? *Buellia brunnescens* Dodge & Baker, 1938, p. 646.

? *Buellia dendritica* Dodge & Baker, 1938, p. 651 (cf. below).

**Icon.** Plate VIIIb: plant on rock from north-east Graham Land, Tabarin Peninsula, FIDS No. D2555,  $\times 4$ .

Darbishire, 1923a, p. 41, fig. 10: sketch of single areole with dendritic protothallus; pl. I, fig. 4: habitus-photograph,  $\times 5$ .

\* Synonymy on the authority of Imshaug, 1951, p. 45.

† Synonymy on the authority of Butler, 1940, p. 819–20.

**Morphological description.** Thallus effuse, scanty, consisting of few, usually scattered, metathalline areolae surrounded by a conspicuous, extensive, black, thin, fimbriate-radiating, dendritic protothallus; protothalline strands up to 3 mm. long, fine, branching and anastomosing. Metathalline areolae usually singly isolated, sometimes a few crowded together, rarely (as in part of the lectotype specimen) numerous and  $\pm$  contiguous; minute, 0.1–0.2 (–0.25) mm. diameter, rounded, strongly convex, fuscous, olive-brown or brown-blackish, matt, not pruinose, not or only slightly lighter when moistened. No soredia.

Apothecia not abundant, sessile on thallus areolae, minute, 0.20–0.25 (–0.40) mm. diameter, round, plane and indistinctly marginate or finally convex with evanescent margin, black, matt, not pruinose. Excipulum developed at sides only, 25–45 $\mu$  thick, olivaceous-blackish or aeruginose-blackish in section, pseudoparenchymatous. Hypothecium bowl-shaped, shallow, 40–50 $\mu$  deep, entirely colourless and hyaline or faintly brownish in lower part, sometimes faintly aeruginose in upper subhymenial part. Hymenium 45–60 $\mu$ , gradually aeruginose- or olivaceous-blackish (HNO<sub>3</sub> + crimson-purple) in uppermost part, without oil-droplets. Paraphyses conglutinated in mucilage but  $\pm$  distinct, frequently somewhat branched but not anastomosing, clavate-capitate to 3–4 $\mu$  at the pigmented tips. Asci clavate or saccate-clavate, 35–45 (–48)  $\times$  10–16 (–21) $\mu$ . Spores 8 in ascus,  $\pm$  biseriolate or irregularly arranged, soon brown, ellipsoid, thinly 1-septate (also in young condition), sometimes  $\pm$  constricted at the septum, minute, 9–12 (–13)  $\times$  5.0–7.5 (–8.0) $\mu$ .

(Pycnidia not observed.)

Thallus in sections under microscope K—, C—, PD—, I—, or sometimes with cortical and upper algal-medullary layers PD+ yellow.

**Discussion.** Darbishire (1923a) drew up his description from several specimens collected by the BATNE expedition. As lectotype specimen I chose the one illustrated in his report (1923a, pl. I, fig. 4), BATNE No. 8a, in BM, from eastern Antarctica, Evans Cove, Cape Sastrugi; this specimen is on light greyish, quartzitic rock, associated with the type specimen of *Buellia tristis* Darbishire (syn. *Rhizocarpon adarensis* (Darbishire) M. Lamb, 1948b, p. 221). The other, paratype, specimens seen were BATNE No. 11 from Evans Cove, Cape Sastrugi (in BM drawer collection), and BATNE Nos. 18 and 19 from Cape Adare; they are more scanty and depauperate than the lectotype specimen, but otherwise similar.

Sections of the thallus in the lectotype specimen show a rudimentary brown cortex 5–8 $\mu$  thick, consisting of rather indistinct, rounded cells 3–4 $\mu$  diameter with thin, pigmented walls; the structure appears to be referable to the capitate-fastigiolate type. In places a thin, outermost, colourless, necrotic layer is present. Algal layer diffuse and  $\pm$  continuous; algae trebouxoid, 8–15 $\mu$  diameter. Medullary tissue between algae hyaline,  $\pm$  compact, of interwoven, shortly septate, thin-walled hyphae with swollen, compacted cells 3–5 $\mu$  diameter. At the base the medullary tissue grades into a dark brown (hypothalline) tissue of similar but more compact and cellular texture. Thallus-sections are K—, C—, PD—, I—. These negative reactions are typical for the species, but in one specimen seen (FIDS No. D2555) a distinct yellow colour was obtained with PD in the cortical and upper algal-medullary layers of the thallus; this may indicate a very low concentration of norstictic acid, too weak to form spicular red crystals with K.

Darbishire described the spores in this species as measuring 12–14  $\times$  8–10 $\mu$ , but in the lectotype specimen I found them to be 11–12 (–13)  $\times$  6.0–7.5 (–8.0) $\mu$ , and in some of the other specimens studied, e.g. FIDS No. D2555, they were somewhat smaller, 9.0–10.5  $\times$  5.0–5.5 $\mu$ . This size agrees with that given by Dodge and Baker for their species *Buellia brunnescens* and *B. dendritica*, which from the descriptions given, are obviously very similar to *B. pycnogonoides*. Murray (1963, p. 61) considered *B. dendritica* Dodge & Baker as “probably not specifically distinct” from *B. pycnogonoides*. Through the courtesy of Prof. C. W. Dodge (University of Vermont) I was able to examine the type materials of the two species in question. Both were too scanty to allow of any microscopic or chemical examination, but the following macroscopic features were noted:

*B. brunnescens* Dodge & Baker: type specimen from Byrd Land, Ford Ranges, Mount Rea–Mount Cooper area, collected by Siple, Wade, Corey and Stancliff, 1934 (No. R–7\*). On coarsely crystalline, quartzitic rock together with *Usnea* (*Neuropogon*) *sulphurea*, *Alectoria minuscula* and *Buellia chrysea* Dodge & Baker (type specimen). A few very small thalli present at one end of the stone, consisting of some branched and dendritically radiating black protothalli up to 2 mm. diameter, each bearing at the centre one to several pustular-convex assimilative areolae; these are minute, about 0.1 mm. diameter, greyish to sordid dull brown (fuscous). No apothecia now present.

\* Given as R–1 in the original citation (Dodge and Baker, 1938, p. 647) probably through an error in proof-reading.

*B. dendritica* Dodge & Baker: type specimen from King Edward VII Land, Rockefeller Mountains, Washington, Ridge collected by Siple, Wade, Corey and Stancliff, 1934 (No. HW-18). On coarsely crystalline, quartzitic rock, around the holdfasts of *Umbilicaria*-sp. (detached). Several small patches, the largest  $9 \times 5$  mm., consisting of a predominant, very thin, black or in places brown-blackish hypothallus, at the margin forming a radiate-fimbriate to minutely dendritic protothallus. Sparsely scattered on this hypothallus are minute, round, hemispherical-convex assimilative areolae  $0.15-0.20$  mm. diameter; they are dark brown (fuscous) and matt. No mature apothecia now present.

On account of the scanty nature of the material studied and the impossibility of making a microscopic examination and chemical tests, I prefer to leave the question of the synonymy of *B. brunnescens*, *B. dendritica* and *B. pycnogonoides* undecided for the present. Further, more ample and fertile collections from Byrd Land and King Edward VII Land attributed to the former two species should be carefully compared with *B. pycnogonoides*, from which they could differ only in internal structure or chemical constituents, their outward appearance being exactly similar.

Murray (1963, p. 61) recorded *B. pycnogonoides* from the Cape Hallett region of eastern Antarctica, and furnished a description, in which the spore-size is given as  $10-11 \times 5-8 \mu$ . Some features in his description, such as the indication of a dark reddish-brown epithecium, suggest that his material was not correctly determined.

Depauperate conditions of *Buellia coniops* (p. 43), with scattered, brown verruculae on a dendritic protothallus, may have an outward resemblance to *B. pycnogonoides*, but can be distinguished by the higher hymenium with pure brown epithecium ( $\text{HNO}_3$ —) and larger spores.

It is possible that *B. pycnogonoides* may be a very reduced condition of some other species, but no extra-Antarctic species known to the present author corresponds to it. It appears to be most closely related to *B. punctata* (p. 25) and *B. stigmatea* (Schaerer) Körber *sensu* Lyngé, which occurs in the Arctic regions.

**Geographical distribution.** Known only from the Antarctic continent, where it is probably circumpolar. The two known occurrences in the Antarctic Peninsula sector are from the east (Weddell Sea) side of the peninsula.

The specimens examined are listed in Appendix III, Table IX.

***Buellia evanescens* Darbishire, 1923a, p. 36**

**Icon.** Darbishire, 1923a, p. 37, figs. 3-5 (sketches of metathallus, apothecium and pycnidium in section).

**Morphological description.** Thallus scanty and reduced, effuse, consisting of widely scattered, rounded assimilative areolae, which are solitary or occasionally a few contiguous, minute,  $0.15-0.25$  ( $-0.40$ ) mm. diameter, hemispherical to subglobose, whitish to sordid cream-coloured, not changing colour when moistened, matt, smooth, without soredia. Hypothallus dark, effuse, not fimbriate or dendritic, extremely thin, visible only in places as a blackish stain on the rock.

Apothecia fairly numerous, scattered, arising on or at the sides of the areolae, often finally covering and concealing the areola; black, round,  $0.25-0.35$  ( $-0.45$ ) mm. diameter, at first plane with a thin, non-prominent, inconspicuous proper margin, then becoming  $\pm$  convex and immarginate; matt, not pruinose. Excipulum developed at sides only,  $25-45 \mu$  thick, brown-blackish or subaeruginose-blackish in section, compactly cellular or  $\pm$  pseudoparenchymatous. Hypothecium colourless and hyaline, or in thicker sections with a very faint brownish tinge,  $35-45 \mu$  deep, subtended by lax thalline medullary tissue intruded upwards into the apothecium. Hymenium  $55-60 \mu$  high, with brown to olivaceous-blackish epithecium ( $\text{HNO}_3$  + sordid purple-reddish). Paraphyses concrete, embedded in mucilage, occasionally branched but not anastomosing, at the pigmented tips capitate to  $3-4 \mu$ . Asci clavate,  $40-45 \times 12-20 \mu$ . Spores 8 in ascus and  $\pm$  biserially or irregularly arranged, ellipsoid to shortly ellipsoid, soon brown, thinly 1-septate (also when young), often distinctly constricted at the septum,  $11-12 \times 6.0-8.5 \mu$ .

Pycnidia immersed in assimilative areolae and indicated externally by minute black spots;  $\pm$  spherical in section,  $60-80 \mu$  diameter, with brownish perifulcrical wall (pycnocidia not seen; according to Darbishire (1923a), straight, *c.*  $2 \times 0.25 \mu$ ).

Sections of assimilative areolae K—, C—, KC—, PD—; medulla I—.

**Discussion.** The species was founded by Darbishire on specimens from Cape Adare and Cape Sastrugi ("Sustruzi"), eastern Antarctica, collected by the BATNE expedition in 1910. In BM (drawer collection) there are two specimens from the former locality, numbered 57 and 58, but I could not find any from the

latter. No. 58 has been chosen as the lectotype; it is on a piece of reddish, vesicular, lava-like rock, around the base of *Usnea* (*Neuropogon*) sp. No. 57 appeared to be identical, but several apothecia examined were degenerated and carbonized, for which reason no comparative data could be obtained from it.

In a section of an assimilative areola in the lectotype specimen, no cortex could be distinguished, the fungal tissue being throughout a homogeneous, close web of indistinct and gelatinized, colourless, thin-walled hyphae about  $3\mu$  diameter, in the outermost  $15\text{--}30\mu$  becoming even more gelatinous and indistinct and grading into an amorphous, hyaline necrotic layer containing numerous small foreign particles and minute, dull yellowish granules. The areola sectioned may have been morbose and atypical, for Darbishire (1923a) describes and figures a distinct cortical layer of "light brown hyphae". Algal stratum  $\pm$  continuous,  $45\text{--}65\mu$  deep; algae trebouxoid,  $6\text{--}12$  ( $\text{--}14$ ) $\mu$  diameter. Algal-medullary tissue hyaline, towards the base increasingly filled with substratum-particles. The hypothallus consists of compacted, gelatinized, rather indistinct, dark aeruginose hyphae  $3\text{--}4\mu$  diameter, much conspurcated with quartz crystals.

Note that Darbishire, as in the case of *B. pycnogonoides*, overestimated the size of the spores, describing them as  $13\text{--}15 \times 8\text{--}9\mu$ .

In my opinion this is a somewhat doubtful species, showing evidence of depauperation by severe environmental factors and therefore possibly a state of some other species in an underdeveloped condition. Two specimens from Alexander Island collected by the BGLE show quite good agreement with the type material and have been identified as this species.

Murray (1963, p. 61) described a new species, *B. subtegens*, from the Cape Hallett area of eastern Antarctica, stating it to be related to *B. evanescens* and "perhaps not specifically different". According to his description, the thallus of the new species consists of small, scattered, brown, convex areolae, and no protothallus is present; the hypothecium is pale brown, the hymenium about  $100\mu$  high and dark brown in its upper part; the spores  $10.5\text{--}11.5 \times 5.5\text{--}8.0\mu$ . The colour of the thallus and the height of the hymenium seem to distinguish it specifically from *B. evanescens*.

**Geographical distribution.** Known only from south Victoria Land, eastern Antarctica, and from one southern station in the Antarctic Peninsula sector, on the east side of Alexander Island.

The specimens examined are listed in Appendix III, Table X.

### *Buellia illaetabilis* M. Lamb, n.sp.

**Icon.** Plate IXf, g: portions of the holotype specimen in BM,  $\times 4$ .

**Diagnosis.** *Thallus crustaceus, effusus vel plus minusve orbicularis, ambitu haud effiguratus sed margine protothallino atro saepe dendritice radiante cinctus, areolis minutis, plerumque verrucoso-convexis, contiguis vel dispersis, obscure cinereis aut nigricanti-cinereis, hypothallo atro impositis. Apothecia areolis enata, mox emergentia et sessilia, 0.2–0.4 (–0.5) mm. lata, nigra, epruinosa, diu plana et tenuiter marginata, aetate interdum immarginato-convexa. Excipulum nigricans aut fusconigricans, dimidiatum. Hypothecium fuscum vel rufofuscum. Hymenium 50–60 $\mu$  altum, superne aeruginosum vel aeruginoso-nigricans ( $\text{HNO}_3$  + purpureo-rubescens). Sporae 5–8nae, ellipsoideae, fuscae, tenuiter 1-septatae, halone nullo, minutae, (9–) 10–12(–13) $\mu$  longae, 5–7 $\mu$  latae. Pycnidia immersa, globosa; pycnoconidia fusiformi-cylindrica, recta, 3–4 $\mu$  longa, 0.7–0.8 $\mu$  crassa. Thallus reagentibus solitis (K, C, PD) vulgo non mutatur, interdum (microscopio visus) K lutescit et PD flavescit; medulla I–. Species inconspicua, ad stirpem *B. russae* forsan pertinens.*

**Morphological description.** Thallus crustose, effuse or  $\pm$  orbicular, not effigurate, forming irregular patches or rosettes 1–4 cm. diameter, blackish in general colour, consisting of minute, ash-grey, rounded or angulose, usually  $\pm$  convex or verrucose areolae  $0.10\text{--}0.25$  ( $\text{--}0.30$ ) mm. diameter aggregated together or more often dispersed on a well developed, black hypothallus which is either effuse at the periphery or forms a radiating and  $\pm$  dendritic protothallus.

Apothecia arising in the thallus-areolae, soon emergent and sessile, round,  $0.2\text{--}0.4$  ( $\text{--}0.5$ ) mm. diameter, black, not pruinose, either persistently plane with thin, slightly prominent proper margin, or becoming convex-immarginate. Excipulum densely blackish, aeruginose-blackish or brown-blackish in outer part, gradually colourless inwards; its structure indistinct on account of heavy pigmentation. Hypothecium brown to dark reddish-brown (paler in upper subhymenial part), often prolonged downwards in centre to join the basal hypothalline tissue. Hymenium  $50\text{--}60\mu$  high, aeruginose to blue-green-blackish in upper epithelial part, where  $\text{HNO}_3$  + crimson-red, otherwise colourless, without oil-droplets. Paraphyses embedded in mucilage but  $\pm$  discrete under pressure, simple or sometimes branched, not anastomosing,

at tips aeruginose-capitate up to  $3\mu$ . Asci clavate,  $40-50 \times 11-22\mu$ . Spores 5-8 in ascus, irregularly biseriata, soon brown, ellipsoid, thinly 1-septate (also in young condition), with equal cells, not halonate, not constricted at septum, small, (9-)  $10-12$  (-13)  $\times 5-7\mu$ .

Pycnidia immersed in thalline areolae, indicated externally by very minute black spots; in section  $70-90\mu$  diameter, with colourless to brownish perifulcril wall, aeruginose-blackish round the ostiole; pycniconidia fusiform-bacillar, straight,  $3-4 \times 0.7-0.8\mu$ , borne on simple or once-branched, dactylaeform conidiophores  $9-12\mu$  long.

Thallus-sections K-, C-, PD-, I-, or in thicker sections K+ yellow solution (without formation of red crystals), PD+ yellow (chemical constitution unknown at present).

**Discussion.** Three specimens of this species have been seen, all from north-east Graham Land, and two of them from high elevations (1,000-1,900 ft.); they correspond closely in all essential features. The plants, which occurred on fine-grained or crystalline metamorphic rock not effervescing with HCl, are small, dark and inconspicuous, and resemble a very depauperated condition of *B. russa* (p. 31), to which the species appears indeed to be related, but distinguished chiefly by the smaller areolae and apothecia, lower hymenium and smaller spores. It may be related to *B. stellulata* (Tayl.) Mudd, from which it differs in the darker grey, dispersedly verrucose-areolate thallus, elevated apothecia and somewhat shorter spores. No other extra-Antarctic species shows any close correspondence. One of the specimens (FIDS No. D2420c) occurred together with *Umbilicaria decussata* (Vill.) Zahlbr., *Acarospora chlorophana* (Wahlenb.) Mass. and *Lecanora* and *Lecidea* species not yet determined, while the holotype specimen (FIDS No. D2722) was associated with broken fragments of *Usnea* (*Neuropogon*) sp.

The thallus-cortex in the type specimen is capitate-fastigiata, consisting of a single layer of rounded, heavily pigmented (aeruginose-brown-blackish) cells  $4-5\mu$  diameter, and is covered by an outermost, hyaline, decomposed-cellular necrotic layer. No distinct medulla is developed; the symbiotic algae fill the whole of the interior of the thallus, with the fungal tissue between them hyaline, compact, intricately-hyphose. Basal hypothalline layer dark brown in section, up to  $60\mu$  thick, of decomposed-cellular structure. Algae trebouxoid,  $10-15\mu$  diameter. The other specimens have similar thalline structure, differing only in partial lack of an outer necrotic layer and somewhat larger symbiotic algae (up to  $22\mu$  diameter).

**Geographical distribution.** North-east Graham Land.

The specimens examined are listed in Appendix III, Table XI.

### *Buellia papillata* (Sommerfelt) Tuckerman, 1866, p. 26

**Syn.** *Lecidea papillata* Sommerfelt, 1826, p. 154; *Abacina papillata* (Sommerfelt) Norman, 1853, p. 236; *Buellia insignis* [f.] *a. papillata* (Sommerfelt) Th. Fries, 1861, p. 327; *Buellia parasema* var. *papillata* (Sommerfelt) Th. Fries, 1874, p. 591; *Buellia disciformis* var. *papillata* (Sommerfelt) Vainio, 1909, p. 83; *Buelliopsis papillata* (Sommerfelt) Fink, 1935, p. 374.

*Lecidea geophila* Floerke ex Sommerfelt, 1826, p. 157; *Buellia insignis* [var.] *γ. geophila* (Floerke) Th. Fries, 1861, p. 328.\*

*Lecidea insignis* Naegeli ex Hepp, 1853, pl. VI, no. 39; *Buellia insignis* (Naegeli) Körber, 1855, p. 230; *Buellia parasema* [var.] *ε. insignis* (Naegeli) Hazslinszky, 1884, p. 185; *Buellia disciformis* var. *insignis* (Naegeli) Flagey, 1893, p. 111.\*

*Lecidea insignis* *β. muscorum* Hepp, 1853, pl. VI, no. 40; *Buellia insignis* [var.] *β. muscorum* (Hepp) Körber, 1855, p. 231; *Buellia parasema* var. *muscorum* (Hepp) Th. Fries, 1874, p. 590; *Buellia disciformis* var. *insignis* f. *muscorum* (Hepp) Vainio, 1909, p. 83; *Buellia disciformis* var. *muscorum* (Hepp) "Vain.", Lynge, 1937, p. 180.\*

*Buellia bryophila* Körber, 1865, p. 190.\*

**Icon.** Hepp, 1853, pl. VI, no. 39, 40 (as *Lecidea insignis* and *L. insignis* *β. muscorum*): spores. Lynge, 1928, pl. IV, figs. 15-17 (as *Buellia disciformis* f. *muscorum*): spores.

**Morphological description.** Thallus crustaceous, white or whitish, thick, effuse, nodulose-verrucose, matt, not sorediate, without visible hypo- or protothallus.

Apothecia sessile,  $0.8-1.2$  mm. diameter, round, black, matt, not pruinose, at first plane with prominent, entire, moderate proper margin, then soon becoming convex and immarginate. Excipulum brown-blackish or olive-blackish in section,  $50-75\mu$  thick at sides, continuous with the hypothecium, of radiating cellular structure. Hypothecium up to  $250\mu$  deep, varying in colour from olive to dark brown

\* Synonymy on the authority of Imshaug, 1951, p. 76-78.

or brownish-red (more olive above, often distinctly red at base). Hymenium 70–110 $\mu$  high, without oil-droplets; epithecium pure dark brown (HNO<sub>3</sub>—). Paraphyses involved in some mucilage but distinct, at tips capitate up to 4–5 $\mu$  and there brown-pigmented. Asci clavate, 60–90  $\times$  10–18 $\mu$ . Spores 6–8 in ascus, irregularly biseriate, soon dark brown or olive-brown, ellipsoid or pip-shaped, straight or curved, not halonate, 1-septate with walls and septum of equal thickness (1.0–1.5 $\mu$ ; young spores not polarilocular), rarely 3-septate with the accessory septa often weakly developed; 15–25 (–35)  $\times$  7.5–10.0 (–13) $\mu$ .

(Pycnidia not observed.)

Thallus externally K— or + sordid yellowish, C—, PD—; thallus-sections K— or + yellow solution (not turning red, no crystals formed), C—, PD—, I—. No information is available on the chemical constituents.

**Discussion.** *B. papillata* grows over more or less decayed mosses. According to Poelt (1960, p. 571), in the Alps of central Europe it grows over mosses on moderately calcareous substrata only; unfortunately we have no recorded observations in this respect from our Antarctic locality. Sowter (1960, p. 122) notes that in the Canadian Arctic (Cornwallis Island) it occurs on mossy mounds manured by birds or lemmings; it does not appear, however, to be markedly nitrophile.

The internal organization of the thallus is primitive, with the cortical layer of indistinct, “decomposed” structure, 25–35 $\mu$  thick, colourless or faintly isabelline-cloudy in section without granules but sometimes with colourless crystals. Symbiotic algae forming a somewhat diffuse stratum 75–120 $\mu$  deep. Medulla compact or  $\pm$  lax, sometimes filled with colourless crystals, hyphose, the hyphae gelatinous and rather indistinct, about 3 $\mu$  diameter, moderately thick-walled.

Our single specimen, from James Ross Island, off the north-east coast of Graham Land, is small but well-developed and quite typical of the species.

**Geographical distribution.** A bipolar species, widely distributed in the Northern Hemisphere, where it is Arctic-montane (central and northern Europe, Arctic Asia, alpine and Arctic North America), and also recently recorded from the Himalayan region by Awasthi (1963, p. 35). Our Antarctic find seems to be the first record from the Southern Hemisphere.

The single specimen seen is listed in Appendix III, Table XII.

### *Buellia russa* (Hue) Darbishire, 1923a, p. 64

**Syn.** *Lecidea russa* Hue, 1915, p. 136.

*Lecidea acarosporoides* Hue, 1915, p. 135; *Buellia acarosporoides* (Hue) Darbishire, 1923a, p. 61.

*Lecidea caesiocinerescens* Hue, 1915, p. 151; *Buellia caesiocinerescens* (Hue) Darbishire, 1923a, p. 62.\*

*Lecidea Joannae* Hue, 1915, p. 160; *Buellia Joannae* (Hue) Darbishire, 1923a, p. 63.

*Lecidea Petermannii* Hue, 1915, p. 159; *Buellia Petermannii* (Hue) Darbishire, 1923a, p. 64.

*Lecidea polychora* Hue, 1915, p. 148; *Buellia polychora* (Hue) Darbishire, 1923a, p. 64.

*Lecidea Tuxenii* Hue, 1915, p. 155; *Buellia Tuxenii* (Hue) Darbishire, 1923a, p. 65.

*Aspicilia ditissima* Hue, 1915, p. 175; *Rinodina ditissima* (Hue) Zahlbr., 1930–31, p. 513.

*Aspicilia erythroda* Hue, 1915, p. 178; † *Rinodina erythroda* (Hue) Zahlbr., 1930–31, p. 514.

*Buellia protohallina* var. *Gerlachei* Vain., 1903, p. 25.

*Buellia protohallina* var. *indissimilis* (Nyl.) Vain., 1903, p. 25 (*nomen, non planta*; cf. below).

*Rinodina hypopoichila* Vain., 1903, p. 25 (*pr. p.*; cf. below).

? *Lecidea modesta* Hue, 1915, p. 132; ‡ *Buellia modesta* (Hue) Darbishire, 1923a, p. 63, § *Buellia modestula* Zahlbr., 1930–31, p. 382 (*ut nom. nov.*) (cf. below).

? *Lecidea imperfecta* Hue, 1915, p. 133; *Buellia imperfecta* (Hue) Darbishire, 1923a, p. 63 (cf. below).

**Icon.** Plate VIIIc: part of the lectotype specimen (FAE 1908–10 No. 83 *pr. p.*) in PC,  $\times 4$ .

Plate VIII d: specimen from west Graham Land, near Rasmussen Island, BGLE No. 1479–1a, in BM, showing effect of damage by mites,  $\times 4$ .

\* Cited by typographical error as “*caesiocinerascens*” in Zahlbruckner, 1930–31, p. 340.

† Erroneously listed as “*Aspicilia erythropoda*” in the index-volume of Zahlbruckner’s *Catalogus* (1933–34).

‡ *Nom. illegit.*; non *Lecidea modesta* Krempelhuber ex anno 1874, nec Hegetschweiler ex anno 1882.

§ *Nom. illegit.*; non *Buellia modesta* (Krempelhuber) Müll. Arg. ex anno 1881.



- Plate VIIIe: the lectotype specimen of *Lecidea polychora* Hue (FAE 1908–10 No. 154-I *pr. p.*) in PC,  $\times 4$ .
- Plate VIII f: a well developed and typical specimen from west Graham Land, Goudier Island, FIDS No. A1138 *pr. p.*, in BM, with abundant apothecia and pycnidia,  $\times 4$ .
- Plate VIII g: the type specimen of *Lecidea caesiocinerescens* Hue (FAE 1908–10 No. 228 *pr. p.*) in PC,  $\times 4$ . (Thalli at top and left are *Lecidea placodiformis* Hue.)
- Plate VIII h: part of the lectotype specimen of *Aspicilia erythroda* Hue (FAE 1908–10 No. 89 *pr. p.*) in PC,  $\times 2$ .
- Plate IX b: a reduced state induced by severe environmental conditions, with assimilative thallus consisting of small, scattered, verrucose areolae, and the dendritic protothallus predominating, from west Graham Land, Lagotellerie Island, BGLE No. 1487–5, in BM,  $\times 4$ .
- Plate XV a, b: field-photographs of population on face of granodioritic rock, west Graham Land, Goudier Island (photo: I. M. Lamb, 1944–45); the specimen FIDS No. A1807b was collected from this population. Also seen in the photographs are *Buellia anisomera* Vain. (epiphytic on the thalli) and *Lecanora* aff. *polytropa* (Ehrh.) Rabenh. ("*L. aspidophora* f. *errabunda*" Hue).

Figs. 3, 5a, 7, 8.

Hue, 1915, fig. 11, p. 136: spores (as *Lecidea acarosporoides*); fig. 12, p. 137: spores (as *Lecidea russa*); fig. 16, p. 152: spores (as *Lecidea caesiocinerescens*); fig. 18, p. 156: spores (as *Lecidea Tuxenii*); fig. 20, p. 160: spores (as *Lecidea Petermannii*); fig. 21, p. 161: spores (as *Lecidea Joannae*); fig. 25, p. 176: spores (as *Aspicilia ditissima*); fig. 26, p. 179: spores (as *Aspicilia erythroda*).

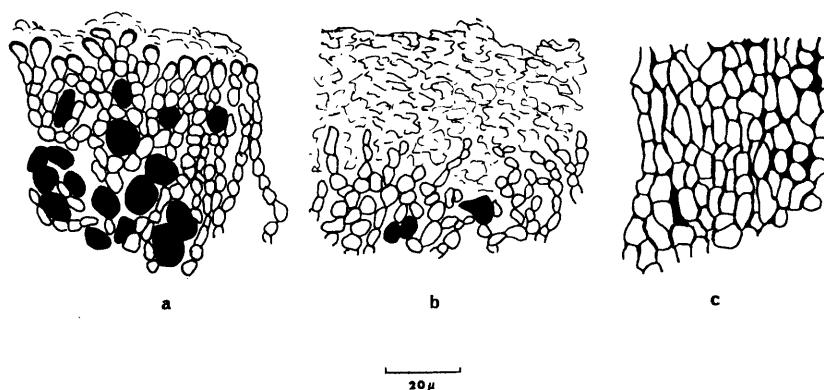
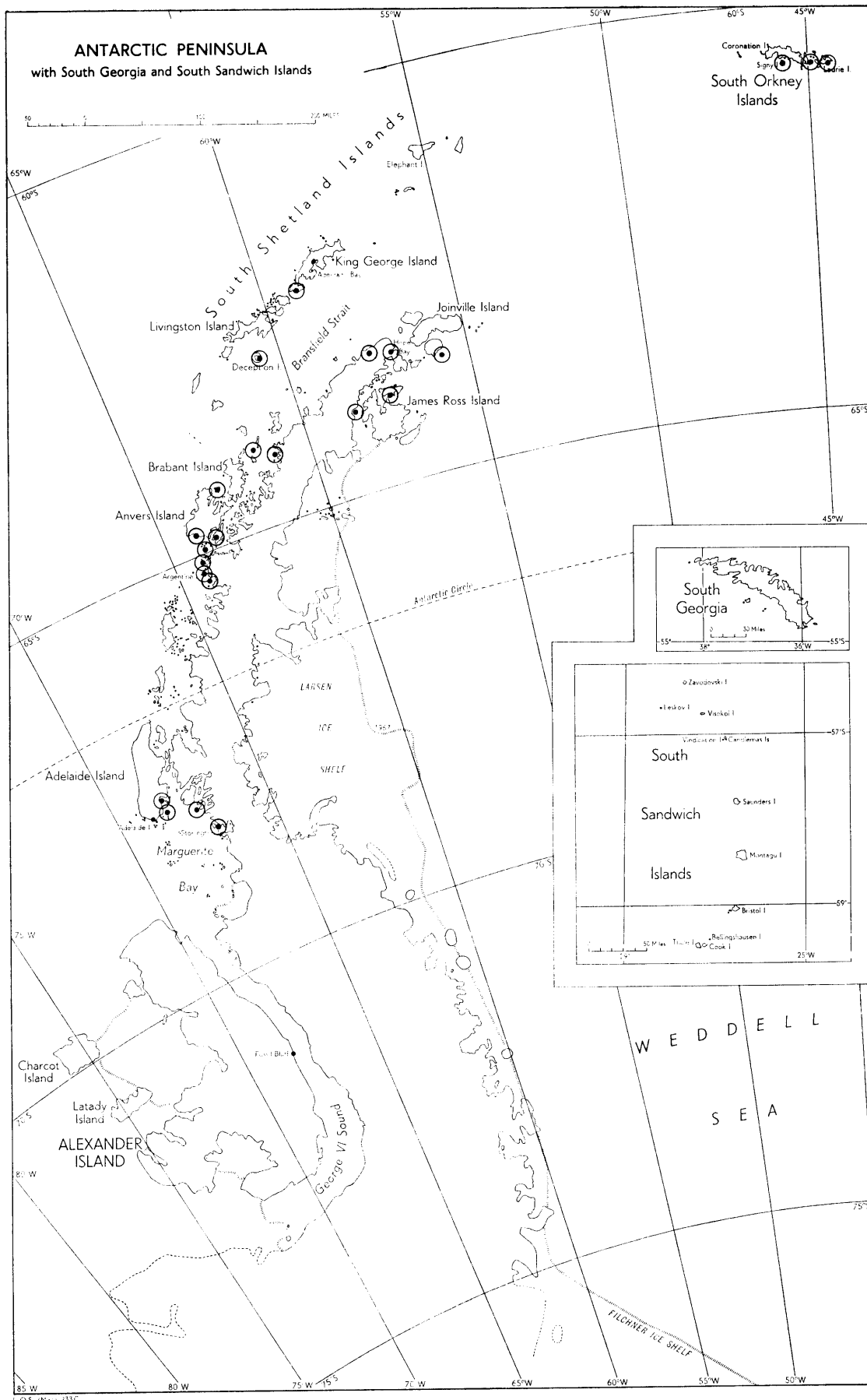


FIGURE 7

Thallus structure in *Buellia russa* (camera lucida drawings).

- Upper surface of a young thallus with capitata-fastigiata cortex covered by a thin necrotic layer (FIDS D2494).
- Upper surface of an old thallus in which the original capitata-fastigiata cortex has been eroded away, covered by a thick necrotic layer (FIDS A2241).
- Pseudoparenchymatous basal hypothalline tissue with heavy pigmentation of the cell walls (FIDS D2494).

**Morphological description.** Thallus cream-coloured to pale buff, often with a faint coppery or rufescent tinge, or light to dark ash-grey, or (by decomposition of depsidone-content) red or reddish, matt, effuse, crustose, forming  $\pm$  orbicular or irregular patches (conspicuously orbicular in var. *cycloplaca*), the patches often confluent and sometimes covering extensive areas, of moderate thickness (0.2–1.0, rarely 1.5 mm.), areolate to verrucose-areolate, the areolae 0.3–0.8 (–1.0) mm. diameter, angulose, plane to convex,  $\pm$  isodiametric (in var. *cycloplaca*  $\pm$  elongated at periphery of thallus to give a subeffigurate appearance), separated by narrow or gaping cracks, at periphery sometimes discrete and rounded on the dark hypothallus. Protothallus usually well developed, black, aeruginose-blackish or (rarely) dark brown to brown-blackish, 0.5–1.0 (–2.0) mm. wide (wider in var. *Liouvillei*), amorphous or  $\pm$  fimbriate-radiate, ending abruptly at edge or minutely dendritic-fimbriate; continuous with a dark hypothallus underlying the thallus-areolae. No soredia. Medulla (when exposed by cutting) white, pinkish-white or reddish-pink.



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**FIGURE 8**  
The known distribution of *Buellia russa* (Hue) Darb.

Apothecia usually present, often abundant, arising in thallus-areolae, immersed when young, then usually becoming emergent and adpressed-sessile, round, 0.4–0.7 (–1.0) mm. diameter, not or hardly constricted at base, black, matt, not pruinose, plane or finally convex, immarginate or in young condition with a thin, entire, indistinct, hardly prominent proper margin. Excipulum developed at sides only, (20–) 30–50 $\mu$  thick, sordid olive-greenish, dark olive-brown or blue-green-blackish in section (HNO<sub>3</sub>+ purple-red), of radiating-cellular structure; occasionally rudimentary or completely absent. Hypothecium of variable depth (50–180 $\mu$ ), pale brown to reddish-brown or dark brown, often finally connecting downwards with the dark-pigmented hypothalline tissue. Hymenium (70–) 75–85 (–100) $\mu$  high, without oil-droplets, in upper part (epithecium) sordid olivaceous, greenish-brown, dark aeruginose-brown or sometimes dark blue-green (HNO<sub>3</sub>+ purple-red); rarely (by alteration)  $\pm$  pure brown and HNO<sub>3</sub>–. Paraphyses concrete in hyaline mucilage but  $\pm$  separable under pressure in water, frequently somewhat branched but not anastomosing, at tips conglutinated by epithelial pigment and capitate to 3–4 $\mu$ . Asci clavate, 60–75 (–80)  $\times$  12–18 (–20) $\mu$ . Spores 6–8 in ascus, irregularly biseriate, smoky-brown when young, dark brown when mature, ellipsoid to broadly ellipsoid, straight, 1-septate with thin septum (also in young condition, i.e. not polarilocular), not constricted at septum, (12–) 13–18 (–20)  $\times$  (6–) 7–9 (–10) $\mu$  (Fig. 5a).

Pycnidia usually present, often numerous, forming round or rarely slightly elongated (sublirelliform), slightly prominent, black spots up to 0.2 mm. diameter in thallus-areolae; immersed, flask-shaped to subglobose or irregularly saccate, simple or  $\pm$  chambered, 130–180 (–250) $\mu$  diameter, with colourless perifurcated wall but dark-pigmented round the ostiole; pycnoconidia rod-shaped, straight, 3–4  $\times$  0.5–0.7 $\mu$ .

Thallus externally K– or + brownish-yellow slowly turning dark red, C–, PD– or + yellow; thallus-sections K– or + yellow solution with formation of spicular red crystals (due to presence of norstictic acid), C–, PD– or + yellow (often in cortical layer only). Medulla I–.

**Discussion.** This is the commonest and most polymorphic species of *Buellia* in Graham Land and the adjacent islands; the extensive synonymy bears witness to its great variability. It was first recorded by Vainio (1903), who, however, misidentified it as “*Buellia protothallina* var. *indissimilis*” (syn. *Lecidea indissimilis* Nyl., *Buellia indissimilis* (Nyl.) B. de Lesd.), a European species to which it has some resemblance but is not closely related, as was shown by Lamb (1953, p. 431–37). In that study it was also pointed out that Vainio’s combination “*Buellia protothallina* var. *indissimilis*” was illegitimate, since *indissimilis* (Nyl.) as a specific epithet antedates *protothallina* (Krempelh.) in the same category, the latter having existed only as the name of a form until raised to species-rank by Vainio in 1903 (loc. cit.); in addition, the combination *Buellia protothallina* (Krempelh.) Vainio, 1903, is antedated by an earlier homonym, *Buellia protothallina* (Anzi) Jatta, 1900, which is a synonym of *Abrothallus protothallinus* Anzi, syn. *Karschia protothallina* (Anzi) Körber, a different species belonging to the biological group known as parasymbionts or “lichen-parasites”. Vainio (1903, p. 25) also stated that the Antarctic species is identical with *Buellia stellulata* var. *minutula* Vainio, based on *Lecidea spuria*  $\beta$ . *minutula* Hepp, Flecht. Europ. No. 313. This statement is incorrect; the variety *minutula* represents a condition of *Buellia stellulata* (Taylor) Mudd, which is quite distinct from the Antarctic species. (A description and discussion of *B. stellulata* and its synonyms are given in Appendix I, p. 81).

Hue (1915) described various states of this polymorphic species under no less than 9 (or possibly 12) specific names. This was not necessarily an indication of taxonomic ineptitude on his part, but the only procedure to follow in the circumstances, without the possibility of field studies. After extensive observation of living populations in the field, I consider that the state described by Hue as *Lecidea russa* represents the species in its biologically typical state, and have therefore selected this epithet for it from among the others, all having been published simultaneously.

The specimen selected by me as lectotype of *B. russa* is from west Graham Land, Goudier Island, collected by Gain on 28 December 1908 (FAE 1908–10 No. 83 *pr. p.*), in PC; it is shown on Plate VIIIc. The extensive population shown in our field-photograph (Plate XVa, b) is from the same locality, 37 years later. It occurs abundantly on the smoothly rounded, granodioritic rocks of that small island. The lectotype material has an areolate to verrucose-areolate thallus of sordid cream colour with a faint coppery or rufescent tinge (“Tilleul-*Buff*” to “*Vinaceous-Buff*” in Ridgway, 1912, pl. XL), 0.2–0.7 mm. in thickness, surrounded for the most part of the periphery by a black marginal protothallus up to 0.6 mm. wide which either ends abruptly or thins out  $\pm$  dendritically at the edge. The thallus turns yellow then rusty-red with K, and persistently yellow with PD. The apothecia are numerous, adpressed-sessile (immersed only in youngest stages), plane and indistinctly marginate to convex-immarginate. The

hymenium is sordid olivaceous or green-brown in its uppermost part ( $\text{HNO}_3$ + purple-red); the spores (12–) 14–15 (–18)  $\times$  7–8 (–10)  $\mu$ . The thallus in section has an outermost, transparent, almost structureless necrotic layer up to 15  $\mu$  thick; cortex 15–25  $\mu$  thick,  $\pm$  heavily inspersed with sordid isabelline granules of depsidone-substance, of “fastigate” structure, i.e. composed of concrescent, vertical, short-celled hyphae with rounded lumina 1.5–3.0  $\mu$  diameter. Algal stratum irregular, diffuse, up to 300  $\mu$  deep; algae trebouxoid, 9–14  $\mu$  diameter. Medulla  $\pm$  compact, patchily inspersed with sordid yellowish granules (depsidone) which are dissolved in K with effusion of a yellow liquid in which masses of red spicular crystals of potassium norstictate are formed; PD+ intense yellow. The lower medulla is gradually transformed into a reddish-brown or olive-brown, cellular hypothalline tissue with rounded, heavily pigmented cells 4–7  $\mu$  in diameter.

In some specimens the outermost cells of the cortex are distinctly pigmented (Fig. 7a); in others, as a result of erosion, little remains of the original cortex (Fig. 7b). The basal hypothalline layer may be quite thick (about 200  $\mu$ ) and forms a distinct pseudoparenchyma (Fig. 7c), but is never so massively developed as in *B. melanostola* (p. 40, Fig. 9).

Of the other two specimens mentioned by Hue in his original description of *Lecidea russa*, the one from Goudier Island (FAE 1908–10 No. 88) could not be found in the PC collections; that from Booth Island (FAE 1908–10 No. 115 *pr. p.*) was seen, and belongs to the same species, being of similar appearance but somewhat morbose, rufescent from decomposition of the depsidone-content and with the apothecia partly  $\pm$  persistently immersed in the thallus.

Norstictic acid was proved by microchemical test in a specimen from Goudier Island (FIDS No. A1207). The amount of this substance present in the thallus varies greatly in different specimens; some, although giving a macroscopic K+ red reaction of the medulla, are K– in thin sections under the microscope, although intense yellow with the more sensitive reagent PD, and others, especially states with ash-grey thallus, may be K– both macro- and microscopically, but usually PD+ yellow in sections, at least in the cortical layer.

Since this species belongs to the *Melanaspicilia*-type in its apothecial ontogeny (see p. 9), it may under certain conditions have the apothecia  $\pm$  persistently immersed in the thallus. Such states were described by Hue under the names *Aspicilia ditissima* and *A. erythroda* (see below).

The epithelial colour (“*Lecidea*-green”) is typically brownish-green, green-blackish or dark olivaceous, less frequently pure blue-green, turning vividly purple-red on treatment with  $\text{HNO}_3$ . Occasionally, however, it may be more or less pure brown without obvious greenish tinge, and the  $\text{HNO}_3$  reaction indistinct. The tissues of the excipulum retain the pigment more strongly, and give a positive  $\text{HNO}_3$  reaction even when none can be obtained in the epithecium.

Unusually severe environmental conditions can bring about extreme reduction in the development of the thallus, culminating in a condition such as that shown on Plate IXb, in which the small, isolated, convex assimilative areolae are scattered over a dendritic or confervoid-anastomosing, black hypothallus. Such reduced states may resemble *B. pycnogonoides* Darb., but can be distinguished from that species by the brown hypothecium, higher hymenium and larger spores. The depredations of mites also bring about some very striking modifications: the thallus-areolae become swollen and bullate and partly hollowed out where the mites have eaten away the medullary tissue or the contents of the pycnidia. Such a specimen is shown in Plate VIIIId.

*Aspicilia ditissima* Hue was based on a very copiously fertile specimen from west Graham Land, Petermann Island (FAE 1908–10 No. 686 *pr. p.*), with the apothecia for a long time  $\pm$  immersed (aspicilioid), but many of them finally becoming emergent to adpressed-sessile. The thallus is cream-coloured to isabelline, poor in depsidone (PD– in our sections) and, where a free periphery is shown, bounded by a conspicuous, radiating-fimbriate, black or blue-green-blackish protothallus up to 1 mm. wide. Hue’s statement (1915) that the lower parts of the thallus are I+ blue, is erroneous. A specimen very similar in habitus, but rich in depsidone and with somewhat more emergent apothecia, was collected by me at Hope Bay, east Graham Land (FIDS No. D2494).

*Aspicilia erythroda* Hue refers to a growth-state of *B. russa* with thick, depsidone-rich thallus and  $\pm$  immersed and aspicilioid apothecia. In the lectotype specimen from west Graham Land, Goudier Island, (FAE 1908–10 No. 89 *pr. p.*), however, some of the apothecia are slightly emergent or even adpressed-sessile (Plate VIIIh). The thallus, which is pinkish-buff or light reddish ochraceous, apparently contains some decomposed norstictic acid, resulting in a blackish-brown coloration of the protothallus and a pinkish

colour of the protoplasm in the asci. A somewhat paler (buff-cream-coloured) but otherwise closely similar specimen was collected by me on Goudier Island (FIDS No. A1207) in a hollow in rocks where snow melt water collected (the lichen itself not submerged, however). The occurrence of *Verrucaria elaeoplaca* Vain. (Lamb, 1948a, p. 15) associated with the lectotype specimen indicates a similar habitat, and it seems that this growth-condition is characteristic of intermittently moist or submerged rocks in richly nitrogenous situations.

The type material of *Lecidea acarosporoides* Hue from west Graham Land, Goudier Island (FAE 1908-10 Nos. 87 *pr. p.*, 88 *pr. p.*) could not be found in the PC collections, but there can be no doubt from the original description that it refers to a state of *B. russa* with the thallus stained entirely reddish by decomposition of its depsidone-content, a phenomenon referred to previously in connection with *Usnea* sect. *Neuropogon* (Lamb, 1964, p. 11). A specimen agreeing with the description was collected in 1945 in the same locality (Goudier Island) on loose stones between granodioritic rocks (FIDS No. A2241). The decomposition of the norstictic acid in the thallus results in a pinkish coloration of the medulla when freshly cut open; on surfaces exposed for a longer time, this colour deepens to pinkish-red.

The type specimen of *Lecidea Tuxenii* Hue from west Graham Land, Cape Tuxen (FAE 1908-10 No. 210 *pr. p.*) is also a state partly reddish-stained for the same reason; the original colour of the thallus is ash-grey. The medulla, when exposed by cutting, is orange to brick-red, and the macroscopic reactions of the thallus are K+ dark purple-reddish, PD+ yellow. Even the hymenium is infiltrated by the orange-reddish colour of the decomposed depsidone. Like the foregoing and the "*Aspicilia erythroda*" state, this condition is most probably induced by prolonged inundation in highly nitrogenous snow melt water seeping down from bird-rocks higher up.

*Lecidea polychora* Hue, described from west Graham Land, Petermann Island, is, according to the lectotype specimen (FAE 1908-10 No. 154-I *pr. p.*), shown on Plate VIIIe, a rather poorly developed and unhealthy condition of *B. russa* on a granodioritic stone around the base of a large tuft of *Usnea* (*Neuropogon*); the thallus is dark ash-grey where fully exposed, coppery-fuscescent where shaded on the underside of the stone and in among the bases of the *Usnea*. It is moderately rich in norstictic acid (K+ red crystals in thick sections under the microscope).

*Lecidea Joannae* Hue was founded on three specimens from west Graham Land: one (which I have selected as lectotype), FAE 1908-10 No. 119 *pr. p.* from Booth Island, the others from Petermann Island, Nos. 284 *pr. p.*, 285 *pr. p.* The lectotype has an ash-grey to slightly rufescent thallus moderately rich in depsidone (K+ red crystals, at least in thicker sections, PD+ yellow).

*Lecidea caesiocinerescens* Hue (west Graham Land, Marguerite Bay, Jenny Island, FAE 1908-10 No. 228 *pr. p.*, holotype) is a very smooth and evenly areolate, dark ash-grey state of the species apparently completely lacking in depsidone-substance (thallus sections K-, PD-). It is shown in Plate VIIIg. The forma *rufescens* Hue, described from west Graham Land, Cape Pérez (FAE 1908-10 No. 274 *pr. p.*) was not studied by me, as it could not be found in the PC collections.

*Lecidea Petermannii* Hue, as lectotypified by me on the specimen FAE 1908-10 No. 179/II *pr. p.* from west Graham Land, Petermann Island, refers to a depsidone-rich state of *B. russa* with pale reddish-fuscescent thallus giving red crystals with K; it is somewhat peculiar in having the epithecium dark blue-green without any brown tinge, turning vivid crimson-red on application of HNO<sub>3</sub>. A similar epithecial colour has been noted in some other specimens, e.g. from Goudier Island (FIDS No. A1201k) and Jenny Island, Marguerite Bay (FIDS No. E466-1u). The other (paratype) specimen from Cape Pérez, west Graham Land, FAE 1908-10 No. 274 *pr. p.*, could not be found in the PC collections.

The holotype specimen of *Buellia protothallina* var. *Gerlachei* Vain. from west Graham Land, Auguste Island (BAE No. 257 *pr. p.*, in TUR), as well as the specimens from Auguste and Wiencke Islands erroneously attributed by Vainio to var. *indissimilis* (syn. *Lecidea indissimilis* Nyl., *Buellia indissimilis* (Nyl.) B. de Lesd.), represent *B. russa* in a quite typical condition; the marginal protothallus in var. *Gerlachei* is brown or brown-blackish, not pure black.

*Rinodina hypopoichila* Vainio, described from west Graham Land, Wiencke Island (BAE No. 447 *pr. p.*), could not, at first, be satisfactorily elucidated from the very scanty fragment, with only one fully developed apothecium, preserved in the TUR herbarium, but it was noted that the thallus present strongly resembled that of *Buellia russa*. The single apothecium could not be sacrificed for sectioning, and Vainio in his original description had unfortunately omitted to state the size of the spores. It was particularly desirable to establish the identity of this taxon, because if it were referable to the present species, the epithet *hypo-*

*poichila* would have to be used for it instead of *russea* in accordance with the International Code of Botanical Nomenclature (Lanjouw and others, 1961). In 1964 I was able to see a somewhat more ample isotype specimen in BR, from the study of which it became clear that Vainio had based his description of *Rinodina hypopoichila* on a mixture of two different species, *Buellia russea* (Hue) Darb. and *Rinodina Petermannii* (Hue) Darb. (of which a few poorly developed apothecia, but very little thallus, were present). Some of the features in his description were obviously drawn from the *Buellia*, others from the *Rinodina*. Accordingly, the species-epithet *hypopoichila* is to be rejected as based on a mixture of discordant elements (International Code, Lanjouw and others, 1961, Art. 70).

In addition to the states of *B. russea* enumerated above, there are two *Buellia* species described by Hue (1915) which may possibly belong here, but cannot be identified with certainty. These are *Lecidea imperfecta* Hue and *Lecidea modesta* Hue.

*Lecidea imperfecta*, described from west Graham Land, Goudier Island, could not be found in the PC collections. The features mentioned in Hue's (1915) description seem to indicate that it may be a state of *B. russea* with dark aeruginose epitecium more or less corresponding to "*Lecidea Petermannii*" Hue (see p. 36).

The holotype specimen of *Lecidea modesta* Hue (*nom. illegit., non* Krempelh., *nec* Hegetschw.), syn. *Buellia modesta* (Hue) Darbishire (*nom. illegit., non* (Krempelh.) Müll. Arg.), *Buellia modestula* Zahlbr., from west Graham Land, Petermann Island (FAE 1908-10 No. 142 *pr. p.*), is a very small thallus 8 × 5 mm. in diameter, associated with *Buellia anisomera* Vain. (the holotype of *Lecidea festivissima* Hue). The thallus is verruculose-areolate, sordid cream-coloured, containing a slight amount of depsidone-substance (thallus-sections K— but PD+ yellow in the cortical layer). Pycnidia are present, and have straight, rod-shaped conidia 3-4 × 0.5 μ. The single apothecium (not taken for sectioning) is black, immarginate, slightly convex, 0.4 mm. diameter. Most probably it is a very young growth state of *B. russea*, but in the absence of reliable data on the apothecial structure and spores this cannot be stated with certainty, although the close association with *B. anisomera* lends support to this view. (See also p. 16.)

The following key serves to characterize the non-taxonomic growth-states or modifications of *B. russea* enumerated above.

*Key to the non-taxonomic growth-states or modifications of Buellia russea (Hue) Darb. described in the literature*

- 1a. Apothecia for a long time or persistently immersed in thallus-level (± aspicilioid).
  - 2a. Thallus pinkish-alutaceous or pale reddish-ochraceous (from decomposition of depsidone-content) . . . . . "*Aspicilia erythroda*" Hue
  - 2b. Thallus cream-coloured, isabelline or grey.
    - 3a. Thallus-sections K+ red with formation of crystals, PD+ yellow; apothecia usually finally becoming emergent to adpressed-sessile . . . . . "*Lecidea polychora*" Hue
    - 3b. Thallus-sections K—, PD—; apothecia ± persistently immersed in thallus-level . . . . . "*Aspicilia ditissima*" Hue
- 1b. Apothecia sessile.
  - 4a. Thallus-sections K+ red with formation of crystals, PD+ yellow; thallus grey or cream-coloured with a faint coppery tinge.
    - 5a. Epithecium dark blue-green . . . . . "*Lecidea Petermannii*" Hue
    - 5b. Epithecium olive-brown, aeruginose-brownish or aeruginose-olivaceous.
      - 6a. Thallus light or dark grey, variegated reddish; medulla pink or red (from decomposition of depsidone-content) . . . . . "*Lecidea Tuxenii*" Hue
      - 6b. Thallus sordid cream-coloured with a faint coppery tinge, not grey; medulla white to pale pinkish.
        - 7a. Marginal protothallus black or greenish-black. . . . . *B. russea* (typical), syn. "*Lecidea acarosporoides*" Hue, "*Buellia protothallina* var. *indissimilis*" *sensu* Vain.
        - 7b. Marginal protothallus brown or brown-blackish . . . . . "*Buellia protothallina* var. *Gerlachei*" Vain.
  - 4b. Thallus-sections K— or + yellow, without formation of crystals; thallus grey. . . . .
    - 8a. Thallus-sections PD+ yellow . . . . . "*Lecidea Joannae*" Hue
    - 8b. Thallus-sections PD— . . . . . "*Lecidea caesiocinereascens*" Hue

Two other species described by Hue (1915), *Lecidea Liouvillei* and *Lecidea Margaritae*, also belong to the present species, but represent a morphologically very distinct condition which appears to be more than a mere environmental modification; I therefore distinguish it as a variety, var. *Liouvillei*, and for the same reasons have described a new variety, *cycloplaca* (cf. below).

"*Buellia protohallina*" recorded from east Graham Land, Paulet Island, by Darbishire (1912, p. 35) does not refer to this species, but is *B. anisomera* Vain. (specimen seen in S).

*Buellia russa*, within its distributional range, is a ubiquitous species in nitrophilous lichen associations around penguin rookeries and on rocks frequented by gulls, skuas and other birds. In places it forms, with its common epiphyte *B. anisomera*, almost pure associations of wide extent on large rock faces (Plate XVa, b). Rufescent conditions with a high depsidone-content, e.g. "*Aspicilia erythroda*" and "*Lecidea Tuxenii*" are characteristic of extremely nitrogenous situations with abundant moisture, as around snow melt water pools near penguin rookeries; plants of more or less pure ash-grey colour and low depsidone-content, e.g. "*Lecidea caesiocinereascens*", are usually found in localities less frequented by birds and poorer in organic nitrogen and phosphates. The type of stone on which it grows seems to be unimportant; it has been observed on granodioritic, basaltic, tufaceous, and various metamorphic rocks. Its nitrogenous requirements limit it mainly to localities not far above sea-level; but it has been seen by me on rocky escarpments surrounded by snow fields at an altitude of 235 m., on Wiencke Island, west Graham Land, and as high as 330 m. on rock faces of The Steeple near Hope Bay, east Graham Land, irrigated by trickles of snow melt water.

Considering the fact that *B. russa* is the commonest *Buellia*-species in the Antarctic Peninsula sector, it would not be surprising to find that it had been previously described from Tierra del Fuego or even from the Arctic. This does not, however, appear to be the case; I have been unable to identify it with any described extra-Antarctic species. Räsänen (1932, p. 31) described a variety *pygmaea* of *Buellia protohallina* from Fuegia, but this has obviously nothing to do with the present species, as the apothecia are described as only 0.1 mm. diameter and the spores as minute ( $6-8 \times 2.5-3.5 \mu$ ). Among the Northern Hemisphere species, the closest relationship to *B. russa* is perhaps to be sought in the northern Siberian species which Vainio (1909) described under the genus *Melanaspicilia*, which we have discussed previously (p. 9). Of the other species occurring in the Antarctic Peninsula sector, the nearest affinity is undoubtedly with *B. melanostola* (p. 40) and *B. perlata* (p. 41), both similarly endemic to the region.

**Geographical distribution.** This species is common and widespread in the South Orkney and South Shetland Islands and all down the west coast of Graham Land and offshore islands as far south as collections have been made and studied (Marguerite Bay, lat.  $68^{\circ}13'S$ ). In east Graham Land it is common in the northernmost localities (Hope Bay area) but has not been seen from much further southwards on the east side of the peninsula; there the southernmost collection known is from Vega Island in the Erebus and Terror Gulf (lat.  $63^{\circ}55'S$ ). Possibly it occurs also further south on the east side, where few or no collections have been made to date, but it is certainly less common in east Graham Land than is *B. latemarginata* (p. 50). Its known distribution is shown in Fig. 8.

The specimens examined are listed in Appendix III, Table XIII.

var. *Liouvillei* (Hue) M. Lamb, n. comb.

**Syn.** *Lecidea Liouvillei* Hue, 1915, p. 162; *Buellia Liouvillei* (Hue) Darbishire, 1923a, p. 63.\*

*Lecidea Margaritae* Hue, 1915, p. 163; *Buellia Margaritae* (Hue) Darbishire, 1923a, p. 63.

**Icon.** Plate IXa: part of the holotype specimen of *Lecidea Liouvillei* Hue (FAE 1908-10 No. 141) in PC, showing periphery,  $\times 4$ .

Hue, 1915, fig. 22, p. 163: spores (as *Lecidea Liouvillei*); fig. 23, p. 164: spores (as *Lecidea Margaritae*).

**Morphological description.** Differs from the typical species (var. *russa*) in the very well-developed marginal protothallus, which is 3 mm. or more in width, sometimes showing concentric zonation, either blackish or partially covered by a whitish-grey, radially cracked epinecral layer, and bearing dispersed peripheral thallus-areolae which are sometimes of large size and are isolated from the continuously verrucose-areolate main central thallus.

**Discussion.** The holotype specimen from west Graham Land, Petermann Island (FAE 1908-10 No. 141) was growing on a flat slab of rusty-coloured, fine-grained dioritic rock without accompanying species.

\* Erroneously listed as "*Lionvillei*" in Zahlbruckner, 1930-31, p. 378.

Several orbicular thalli are present, from 0.8 to 7.0 cm. in diameter, isolated or partly confluent. The prothalline zone is 3–7 mm. wide and is blackish, greenish-black or olivaceous-blackish, thin, continuously filmy or partly  $\pm$  distinctly radiately fibrose, in places with concentric, alternating lighter and darker zones; very thin at the margin, but terminating abruptly, not dendritic. About 3 mm. in from the margin, isolated verrucae of the assimilative thallus occur, widely scattered; they have a faintly rufescent-brownish tinge, contrasting with the inner main part of the thallus, which is sordid cream-coloured or whitish-cinereous. Between the outlying isolated thallus-warts, the prothallus is covered with a thin, whitish-grey, radially cracked epinecral layer; this is not a thallus-mantle, and does not contain algae. The outermost, scattered thallus-verrucae are 0.15–0.40 mm. diameter; further inwards they become larger and more crowded. The central part of the thallus is verrucose-areolate with uneven areolae 0.5–1.0 mm. diameter, the larger ones often subglobose and slightly constricted at the base. Apothecia numerous in central part, single or 2–3 in one verruca, becoming adpressed-sessile, 0.3–0.8 mm. diameter. Hypothecium dark reddish-brown. Epithecium dark greenish-brown or olive-brown ( $\text{HNO}_3$ + red). Spores  $15\text{--}18 \times (6.5\text{--}) 7.5\text{--}8.0\mu$ .

*Lecidea Margaritae* Hue, from Jenny Island in Marguerite Bay, west Graham Land (FAE 1908–10 Nos. 227 *pr. p.*, 230) is very similar in appearance. No. 230, which is without accompanying species and is fertile, has been selected as the lectotype; No. 227 *pr. p.* is associated with *Usnea* (*Neuropogon*), *Umbilicaria*, *Rhizocarpon* and *Lecanora* spp., and is sterile.

The above type materials are poor in norstictic acid, and I could obtain no red crystals in thin sections under the microscope; but Hue, in his description of *Lecidea Margaritae*, reported a K+ red reaction with formation of spicular crystals. Some of our FIDS specimens are very rich in depsidone, with abundant red crystals produced by K, the thallus being of an alutaceous or buff-brownish colour.

**Geographical distribution.** (See Appendix III, Table XIV.)

**var. *cycloplaca* M. Lamb, n. var.**

**Icon.** Plate IXc: part of isotype specimen in FH (FIDS No. D2398),  $\times 5$ .

Plate IXe: specimen from west Graham Land, Anvers Island, Norsel Point (BSWA 8021a) in FH,  $\times 4$ .

**Diagnosis.** *Thallus eximie orbicularis, rosulas formans, cinereus, margine prothallino bene evoluto, fimbriato et fibrilloso, nigricanti, intrinsecus (i.e. centrum versus) saepe pallio metathallino tenuissimo radiatimque fisso tenuiter velato et aspectu quasi effigurato. Ceterum sicut in specie typica, nisi quod sporae saepe leviter minores inveniuntur.*

**Morphological description.** Thallus forming confluent, orbicular rosettes 2.0–3.5 cm. diameter bounded by a very distinct, even, radiate-fibrillose, dark prothallus 1–2 mm. wide, ending  $\pm$  abruptly at periphery. Inner part of thallus even, thin, areolate, dark ash-grey (may be brownish on moistening), with plane to convex areolae 0.25–0.50 mm. diameter, separated by narrow or  $\pm$  gaping cracks. Marginal prothallus thin (up to 0.2 mm.), black or brown-blackish, matt or subnitid, radiately fimbriate, inwards becoming invested with a grey cortical layer and passing gradually into the areolate metathallus.

Apothecia usually abundant in inner part of thallus, soon becoming emergent and adpressed-sessile, 0.4–0.7 mm. diameter.

Anatomical structure of thallus and apothecia as in grey states of the typical species; thallus-cortex capitate-fastigiate with dark brown-pigmented outer end-cells. Upper part of hymenium sordid aeruginose-blackish or olivaceous-blackish ( $\text{HNO}_3$ + red). Spores often somewhat smaller than in var. *rusa*:  $11\text{--}14 \times 5\text{--}7\mu$ , thinly 1-septate. Pycnoconidia typical of the species.

Thallus with varying amounts of depsidone (norstictic acid); K–, PD–, or K+ red crystals, PD+ yellow.

**Discussion.** This variety is to be found growing on smooth rock faces without much competition from other lichens. On account of the subeffigurate appearance of the margin, the thalli have some resemblance to *Buellia frigida* Darb. (p. 55), but the peripheral lobation is different: in *B. frigida* the marginal lobes, although blackened, are metathalline, well rounded-off at the tips, and no prothallus is evident; whereas in the present variety, although they may be partly metathalline (due to the radial elongation of some of the marginal areolae), the marginal lobes are converted at the outer edge into a thin, blackish, radiately fibrillose prothallus which is very thin and closely adpressed to the substratum.



One of our specimens from east Graham Land, Hope Bay (FIDS No. D2381d) is associated on the same stone side by side with a thallus of typical *B. russa*, a circumstance which indicates a genetic, and not merely a modificational difference.

**Geographical distribution.** (See Appendix III, Table XV.)

***Buellia melanostola*** (Hue) Darbshire, 1923a, p. 63

**Syn.** *Lecidea melanostola* Hue, 1915, p. 166.

*Lecidea endomelaena* Hue, 1915, p. 149; *Buellia endomelaena* (Hue) Darbshire, 1923a, p. 62.

**Icon.** Plate IXd: the holotype specimen of *Lecidea endomelaena* Hue (FAE 1908-10 No. 142 *pr. p.*) in PC,  $\times 4$ .

**Fig. 9.**

Hue, 1915, fig. 15, p. 150: spores (as *Lecidea endomelaena*; incorrectly represented as thinly 1-septate).

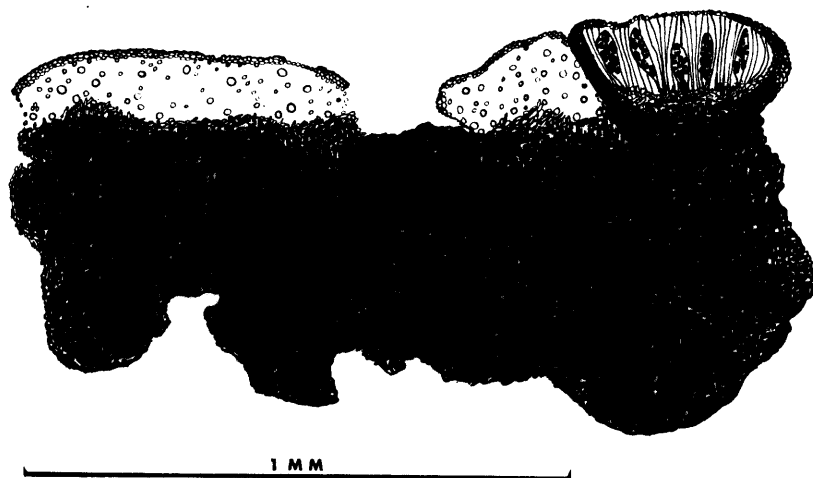


FIGURE 9

*Buellia melanostola* (Hue) Darb. (BSWA 8016y). Vertical section of thallus showing relative thickness of basal hypothalline layer.

**Morphological description.** Thallus as a whole of very dark appearance, grey-brown-blackish, crustose, effuse, 0.3-0.7 (-1.0) mm. thick, forming either small islands among other crustose lichens or patches up to 5 cm. across, bounded at free margins by a distinct, black, thin to thickish, amorphous or dendritic-radiating protothallus 0.5-2.0 (-2.5) mm. wide; rimose-areolate with convex-verrucose, dark brownish-grey or partly buff-brown or coppery-brown areolae with often minutely lumpy or verruculose surface, sometimes con crescent into larger portions separated by gaping cracks. Hypothallus well developed, very thick, black. No soredia.

Apothecia numerous, arising in the thallus-areolae, semi-immersed to adpressed-sessile, round, black, matt, not pruinose, plane to slightly convex, up to approximately 0.5 mm. diameter, immarginate or with thin, indistinct proper margin. Excipulum developed at sides only, 30-45 $\mu$  thick, densely aeruginose-blackish on outside, gradually reddish-brown inwards, pseudoparenchymatous. Hypothecium brown to dark brown, soon merging with the underlying hypothallus tissue. Hymenium 75-80 $\mu$  high, in uppermost part olivaceous-brown to aeruginose-blackish (HNO<sub>3</sub>+ purple-red). Paraphyses  $\pm$  concrete in hyaline mucilage but distinct, sometimes branched, at tips pigmented and capitate to 3.5-4.0 $\mu$ . Asci clavate, 60-75  $\times$  12-17 $\mu$ . Spores 6-8 in ascus, irregularly biseriolate, soon dark brown, ellipsoid, in young condition polarilocular with thickened septum (septum-thickening up to 7 $\mu$  thick and often traversed by a narrow canal), at maturity becoming thinly 1-septate, 14-21  $\times$  7-9 (-11) $\mu$ .

Pycnidia immersed in thallus,  $\pm$  globose, up to 150 $\mu$  diameter, forming slightly prominent, blackish spots; perifulcral wall colourless or brownish, dark brown to olive-blackish at the ostiole; conidia bacillar or fusiform-bacillar, straight, 3-4  $\times$  c. 0.5 $\mu$ .

Thallus-sections K—, C—, PD+ yellow (in the cortical layer only); medulla I—.

**Discussion.** This species resembles *B. perlata* (Hue) Darb. (below) in the polarilocular development of the spores (cf. Fig. 5c), but differs in the colour and form of the thallus, which is usually not pure grey, but some shade of greyish-brown or blackish-brown and verrucose-areolate to compound-verruculose. The very strong development of the basal hypothalline layer, which greatly exceeds the assimilative tissues in thickness (Fig. 9) is also characteristic of the species.

As lectotype of *B. melanostola* I have designated one of the two specimens of FAE 1908–10 collected on Booth Island, west Graham Land (No. 121–I *pr. p.*). It forms small elongated patches between thalli of the type specimen of *Lecanora gainiana* Hue. (The other—syntype—specimen, No. 120 *pr. p.*, mentioned in the original description, could not be found in the PC collections.) The areolar portions are somewhat variegated in colour, partly blackish, partly drab buff-brownish; seen with the naked eye, the thallus appears almost black. The shallow assimilative tissue or thallus-mantle, borne on the extremely massive, dark hypothalline layer, is bounded by an upper cortex, 15–25 $\mu$  thick, of manifestly capitate-fastigiate structure, with brown-pigmented, swollen outer cells resembling heads of paraphyses; the pigment often has a greenish or olivaceous tinge, and then gives a distinct reddish-purple reaction with HNO<sub>3</sub>. In places a superficial, colourless, indistinctly stratified necrotic layer up to 10 $\mu$  in thickness is present. The algal-medullary layer is 75–100 $\mu$  deep, colourless and hyaline, compact, with scattered, trebouxoid algae 8–15 $\mu$  diameter, and merges gradually or  $\pm$  abruptly downwards into the underlying dark hypothallus tissue, which is pseudoparenchymatous, dark reddish-brown in section, with rounded, moderately thick-walled cells 5–8 $\mu$  diameter.

The holotype specimen of *Lecidea endomelaena* Hue, from west Graham Land, Petermann Island, FAE 1908–10 No. 142 *pr. p.*, shown in Plate IXd, has a larger thallus, up to 5 cm. in diameter, with the same generally dark colour and composite-verruculose thallus which is somewhat rufescent in the outlying peripheral areolae, dark cinereous in the inner part, and in general shows good agreement with the lectotype specimen in both external and internal features. The dark basal hypothalline tissue is very thick, the superficial assimilative thallus-mantle occupying only one-eighth to one-sixth of the total thickness. Hue (1915) reported and figured the spores as thinly 1-septate, but they are distinctly and in some cases persistently polarilocular. (The structure and taxonomic significance of polarilocular spores in *Buellia* is discussed under the following species, *B. perlata*.) The FIDS and BSWA specimens are also quite conformable and have the same characteristic appearance, but an extensive development of the thallus, as seen in the type of *Lecidea endomelaena*, appears to be unusual in this species; the normal type of development seems to be the formation of small patches or islands between other crustose lichens. Specimens studied by me in the field at Norsel Point, Anvers Island, west Graham Land, were associated and contiguous with *Buellia russa*.

**Geographical distribution.** This species has been seen to date only from the South Orkney Islands, the northernmost tip of Graham Land, and the islands of the Palmer Archipelago off the west coast of the peninsula.

The specimens examined are listed in Appendix III, Table XVI.

### *Buellia perlata* (Hue) Darbishire, 1923a, p. 64

**Syn.** *Lecidea perlata* Hue, 1915, p. 153.

*Lecidea dimorphota* Hue, 1915, p. 147; *Buellia dimorphota* (Hue) Darbishire, 1923a, p. 62.

**Icon.** Plate Xa: portion of the holotype specimen of *Lecidea perlata* Hue (FAE 1908–10 No. 140 *pr. p.*) in PC,  $\times 4$ .

Plate Xb: the holotype specimen of *Lecidea dimorphota* Hue (FAE 1908–10 No. 304 *pr. p.*) in PC,  $\times 1$ .

Plate Xc: portion of the foregoing holotype specimen of *Lecidea dimorphota* Hue,  $\times 4$ .  
Fig. 5c (spores).

Hue, 1915, fig. 17, p. 153: spores (as *Lecidea perlata*).

Hue, 1915, fig. 14, p. 148: spores (as *Lecidea dimorphota*; incorrectly represented as all thinly 1-septate).

**Morphological description.** Thallus light to dark ash-grey, matt, effuse, crustose, of moderate thickness (0.25–1.0 mm., rarely up to 1.2 mm.), even or in places with abrupt changes in thickness, rimose-areolate

with plane to slightly convex, angulose areolae separated by narrow to somewhat gaping cracks. Protothallus distinct, black, thin, amorphous or radiately fibrillose, or somewhat dendritic. No soredia.

Apothecia usually numerous, arising in the areolae and soon emergent and adpressed-sessile, 0.4–0.7 mm. diameter, round, not or hardly constricted at base, black, matt, not pruinose, mostly plane, sometimes finally slightly convex, with thin, entire, slightly prominent proper margin which may be evanescent. Excipulum lateral, 25–45 $\mu$  thick, dark brown to aeruginose-blackish, pseudoparenchymatous. Hypothecium 50–135 $\mu$  deep, pale brown to dark red-brown. Hymenium 75–80 $\mu$  high, olive-blackish to aeruginose-blackish in uppermost part (HNO<sub>3</sub>+ purple-red). Paraphyses concrete in hyaline mucilage but distinct, the tips thickened up to 4 $\mu$  and heavily pigmented. Asci clavate, 60–70 $\times$ 12–15 $\mu$ . Spores 6–8 and irregularly biseriata in ascus, soon dark brown, ellipsoid, straight, 14–18 $\times$ 6–9 $\mu$ , at maturity thinly 1-septate, but in young condition polarilocular with the septum thickened and traversed by a narrow canal (Fig. 5c).

Pycnidia immersed in thallus, forming small black spots in the areolae, in section globose, pyriform or vertically ellipsoid, 100–125 $\mu$  diameter, with colourless perifulcral wall, dark-pigmented around the ostiole; conidia shortly rod-shaped, straight, 4–5 $\times$ 0.7 $\mu$ .

Thallus-sections K–, C–, but PD+ partly intense yellow (usually in the cortical layer). Medulla I–.

**Discussion.** The holotype of *Lecidea perlata* Hue is from west Graham Land, Petermann Island (FAE 1908–10 No. 140 *pr. p.*) and according to the label was collected by Gain (not Liouville as stated in Hue's report). In the apothecium sectioned by me nearly all the spores were fully mature and thinly 1-septate, and only a few young ones, distinctly polarilocular, were seen; Hue, however, described and figured most of the spores as polarilocular. On the other hand, in the holotype specimen of *Lecidea dimorphota* (Petermann Island, FAE 1908–10 No. 304 *pr. p.*), Hue saw only thinly 1-septate spores, while I, in another apothecium from the same thallus, found many showing polarilocular development. The distinctive structure is developed only in rather young spores, in the form of a paler endospore layer produced from the inner side of the spore-wall and septum; this layer must be of a gelatinous nature, since it becomes resorbed as the spores approach full maturity. The thin canal which traverses the septal thickening (cf. Fig. 5c, p. 12) apparently corresponds to, and is an extension of, the perforation known to exist in spore-septa and hyphal cross-walls of Ascomycetes generally (Moore and McAlear, 1962).\* The primary median septum is visible as a thin dark line continuous with the exospore wall. Polarilocular spore structure in the genera *Buellia* and *Rinodina* has generally been regarded as a feature of considerable taxonomic importance (Imshaug, 1955; Poelt, 1965b) and Bouly de Lesdain (1906, p. 677) proposed the segregation of a distinct genus, *Pseudobuellia*, on this character.† In the present instance the character is an ephemeral one and may not have much taxonomic significance, for *B. perlata*, apart from its spores, is indistinguishable from certain states of *B. russa* (Hue) Darb.

The anatomy of the thallus, as studied in the type-specimen of *Lecidea perlata*, is similar to that of cinereous conditions of *B. russa*, with a capitate-fastigiata cortical layer 15–25 $\mu$  thick, the outer end-cells of which are rounded and brown-pigmented; an outermost, colourless, obscurely stratified necrotic layer 5–18 $\mu$  thick is present. The algal-medullary layer is very variable in thickness (120–450 $\mu$  in our sections), compact, composed of interwoven, shortly septate hyphae, in places of almost pseudoparenchymatous appearance. The algae, which are dispersed irregularly all through this layer, are trebouxoid, 9–15 $\mu$  diameter. The basal hypothalline tissue is dark brown, manifestly pseudoparenchymatous, of round cells 5–6 $\mu$  diameter, with pigmented walls of moderate thickness.

The type specimen of *Lecidea dimorphota* Hue represents a growth-condition in which the thallus is of very uneven thickness, with a thin, peripheral, finely areolate part going over abruptly into much thicker, coarser areolae in the central part. A very similar specimen was collected on Wiencke Island, west Graham Land, by me in 1944 (FIDS No. A1297a), and is richer in norstictic acid than the FAE 1908–10 material, producing red crystals with KOH.

**Geographical distribution.** This species has been collected from islands off the west coast of Graham Land south to Marguerite Bay, and from one station on the mainland at Hope Bay. It has not been seen from the South Orkney and South Shetland Islands.

The specimens examined are listed in Appendix III, Table XVII.

\* But see footnote on p. 12.

† According to Sheard (1964, p. 235) *Buellia biloculata* (Nyl.) Oliv., the type-species of Bouly de Lesdain's proposed genus, is referable to *Rinodina*.

***Buellia coniops*** (Wahlenberg ex Acharius) Th. Fries, 1861, p. 331

**Syn.** *Lecidea coniops* Wahlenberg ex Acharius, 1803, suppl., p. 8.

*Lecidea disciformis* var. *coniops* (Wahlenberg ex Acharius) Nylander, 1861, p. 237.

*Buellia coracina* [var.] *coniops* (Wahlenberg ex Acharius) Boistel, 1902, p. 239.

*Amandinea coniops* (Wahlenberg ex Acharius) Choisy, 1950, p. 16 (40 of reprint).

*Buellia coniops* f. *subsquamulosa* Vainio, 1909, p. 89.

*Lecidea intercalans* Nylander, 1865, p. 7; *Buellia coniops* f. *intercalans* (Nylander) Vainio, 1909, p. 89.

? *Lecidea conspicua* Hue, 1915, p. 143; *Buellia conspicua* (Hue) Darbishire, 1923a, p. 62 (cf. below).

**Icon.** Plate Xd: part of the holotype specimen of *Buellia coniops* f. *subsquamulosa* Vainio (= f. *coniops*), No. 9417 in Herb. Vainio,  $\times 4$ .

Plate Vh: heterosporous ascus in specimen of f. *verrucosa* (BSWA No. 7945j),  $\times 560$ .

Lyngé, 1928, pl. IV, figs. 10–13: pycnoconidia and spores; pl. XII, fig. 2: thallus on rock.

**Morphological description.** Thallus variable in colour: grey to dark grey, brownish-grey, buff-coloured, brown or tawny-rufescent; matt, effuse, crustose, rather thin, up to 0.6 mm. in thickness (thicker in certain of the forms described below), rimose-areolate, diffract-areolate, verrucose-areolate or subsquamulose with incised and verruculose, squamulose portions (in f. *cervinogranulata* minutely granulate-verruculose). Protothallus brown to brown-black, fibrillose-fimbriate or effusely amorphous and filmy, sometimes indistinct or absent. No soredia.

Apothecia often present, 0.4–1.0 mm. diameter, formed on the metathallus, adnate and adpressed-sessile, slightly constricted at base, black, matt, not pruinose, plane or finally convex, with thin, entire, subpersistent proper margin. Excipulum dark brown or reddish-brown in outer part (without olivaceous or greenish tinge,  $\text{HNO}_3$  —) gradually  $\pm$  colourless in inner part. Hypothecium brown to dark brown, sometimes produced downwards to merge with the dark hypothalline tissue. Hymenium (60–) 70–75 (–95) $\mu$  high,\* with pure dark brown epithecium ( $\text{HNO}_3$  —). Paraphyses somewhat concrete but separable under pressure, simple or hardly branched, not anastomosing, the pigmented tips capitate-swollen up to 4–5 $\mu$ . Asci clavate, 45–70 (–75)  $\times$  15–25 $\mu$ . Spores 8, irregularly biserial in ascus, soon brown, ellipsoid, thinly 1-septate, (12–) 14–17 (–20)  $\times$  7–9 (–11) $\mu$  (see note on abnormal development below).

Pycnidia frequent, forming slightly prominent, minute, dark spots in thallus, with colourless or brownish perifulcral wall, dark brown around the ostiole; conidia filiform, arcuate, 20–25 $\mu$  long, 0.6–0.7 $\mu$  thick, borne terminally on subulate conidiophores (cf. Fig. 4b).

Thallus K — or dull brownish (a spurious reaction), C —, PD —; medulla I —.

**Discussion.** A widely distributed, maritime-nitrophilous species, hitherto known with certainty only from the colder Northern Hemisphere, and extremely variable with regard to thallus-morphology and colour. Vainio (1909, p. 88–89) distinguished three forms: f. *areolata* Vain., f. *intercalans* (Nyl.) Vain. and f. *subsquamulosa* Vain. My examination of type materials has shown that the two latter forms represent the typical condition of the species (f. *coniops*). I have found it necessary to distinguish three additional forms in the Antarctic material (see below).

The typical form of *B. coniops*, as originally described from northern Norway, has a “*crusta granulata . . . granulis laevigatis passim sublobatis s. crenatis*” (Acharius, 1803, Suppl.). Vainio’s f. *subsquamulosa* was based on a specimen collected from the same region by Th. Fries in 1864 (Herb. Vainio No. 9417); this specimen, already identified as *Buellia coniops* by Th. Fries, corresponds exactly to the original description by Acharius, having a thallus of scattered or conrescent, verruculose,  $\pm$  lobate squamules up to 0.6 mm. diameter, distinctly constricted below and somewhat loosely attached to the rock, surrounded by an irregular, thin, brown to brown-blackish, effuse,  $\pm$  filmy protothallus. The colour of the metathallus is alutaceous to tawny-rufescent. An isotype specimen of *Lecidea intercalans* Nyl. from east Lapland, Kola (Fellman, Lich. Arctici No. 195, in FH) is very similar in appearance to the foregoing, although somewhat less distinctly lobate-squamulose. The material from Spitzbergen distributed in Krypt. Exs. Vindob. No. 2286 as *B. coniops* represents the typical state of the species.

Plants which can be classed as typical are not uncommon in the South Orkneys, South Shetlands and down the west coast of Graham Land, but are much less frequent than the very similar endemic species *B. isabellina* (Hue) Darb. (p. 45). They can usually be distinguished macroscopically from the latter

\* Up to 120 $\mu$  high according to Sheard (1964, p. 241).

without difficulty by the thinner, less extensive thallus of smaller, usually tawny-rufescent granules, which tend to become concrescent into flattened squamules; this latter condition, when strongly developed and deeply coloured, has some resemblance to *Acarospora fuscata* (Schrad.) Arn.

*Lecidea conspicua* Hue, recorded from west Graham Land, Goudier Island (FAE 1908–10 No. 88 *pr. p.*) may possibly refer to the present species, to judge from the description; the type material could not be found in the PC collections. (See p. 58.)

An interesting case of what appears to be genetic segregation of the factor for spore-pigmentation in the meiotic division of the ascus fusion-nucleus was observed in a specimen collected by Zimmermann on Deception Island, South Shetlands (f. *verrucosa*, BSWA No. 7945j); the asci contained 4 normally pigmented and 4 completely hyaline spores, as shown on Plate Vh. This may be an indication of heterozygosity for a spore-colour gene. The random disposition of the spores in the ascus in this species makes it impossible to tell whether segregation, if any, took place in the first or the second meiotic division. In the case of the Ascomycete *Sordaria fimicola*, in which a similar phenomenon has been demonstrated, the strictly uniseriate arrangement of the spores made possible a more accurate assessment of the nature of the segregation or translocation involved (Olive, 1956).

Attention has been drawn repeatedly by Lyngé (1928, p. 243; 1937, p. 179; 1939, p. 43; 1940, p. 123) to the fact that *B. coniops* is a very nitrophilous species, characteristic of bird-cliffs and rookeries in the Arctic regions. This was also emphasized by Du Rietz (1932, p. 77), who stated it to be a species of maritime rocks irrigated by nitrogenous seepage. This is the case also in the Antarctic regions, but there this ecological feature is less strikingly apparent because many of the other species of crustose lichens share the same edaphic requirements.

**Geographical distribution.** An addition to the bipolar element in the Antarctic lichen flora. *B. coniops* is widely distributed in the Arctic regions (Greenland, Jan Mayen, Spitzbergen, Novaya Zemlya, northern Siberia) and in northern Scandinavia and Scotland, but was not known previously with certainty from the Southern Hemisphere. In the Antarctic Peninsula sector, where it seems to exhibit greater morphological variability than in the Arctic regions, it is known to occur in the South Orkney and Shetland Islands and along the west coast of Graham Land southwards to the Marguerite Bay area. Only one station in east Graham Land is known at present—Devil Island off Vega Island in the Erebus and Terror Gulf (f. *coniops*).

The forms of this polymorphic species may be discriminated by the following key:

- 1a. Thallus thin (not exceeding c. 0.6 mm. in thickness).
  - 2a. Thallus ± distinctly areolate, with plane or convex areolae, brownish-grey, bounded by a distinct, fimbriate-dendritic protothallus .. .. . f. *areolata*
  - 2b. Thallus not areolate, but verruculose or verrucose or finally lobate-subsquamulose, alutaceous to brownish-grey or tawny-rufescent; protothallus effuse, filmy or sometimes fibrillose-fimbriate.
    - 3a. Thallus of simple verrucae up to 0.3 mm. diameter, brownish-grey .. f. *verrucosa*
    - 3b. Thallus verruculose, often becoming subsquamulose with incised-lobate, verruculose squamules, alutaceous to grey-brown or tawny-rufescent .. .. . f. *coniops*
- 1b. Thallus thick (1 mm. or more in thickness).
  - 4a. Thallus grossly verrucose or verrucose-areolate, with irregular portions 0.7–1.5 mm. diameter, brownish-grey .. .. . f. *incrassata*
  - 4b. Thallus composed of a continuous or diffract-rimose crust with minutely granulate surface, tawny-rufescent .. .. . f. *cervinogranulata*

#### f. *coniops*

The specimens examined are listed in Appendix III, Table XVIII.

f. *areolata* Vainio, 1909, p. 88

**Icon.** Plate Xe: lectotype specimen from north-eastern Siberia, Pitlekai (No. 9418 in Herb. Vainio, TUR), ×4.

**Morphological description and discussion.** The lectotype specimen from U.S.S.R., north-eastern Siberia, Pitlekai, Jinretlen, collected by Almquist on the Vega Expedition of 1878–79 (Herb. Vainio No. 9418) has

the thallus in small rosettes becoming confluent to form patches up to 2 cm. diameter, bounded at the periphery by a distinct, black or brown-blackish, fimbriate protothallus up to 0.5 mm. wide. The inner part of this protothalline margin is grey and matt, the total width of the margin (blackish + grey zones) being up to 1 mm. Assimilative thallus (metathallus) dark brownish-grey, matt, up to 0.3 mm. thick, areolate or verrucose-areolate with areolae up to 0.3 mm. diameter, rounded in outline, not squamulose or crenulate. Closely corresponding specimens have been seen from the South Shetland Islands and the west coast of Graham Land. Some of these specimens were obviously somewhat planed down by erosion due to mechanical or biological agencies.

**Geographical distribution.** (See Appendix III, Table XIX.)

**f. *verrucosa*** M. Lamb. n.f.

**Icon.** Plate Xg: isotype specimen from the South Shetland Islands, Deception Island (FIDS No. B1113) in FH,  $\times 4$ .

**Diagnosis.** *Thallus sat tenuis, verrucosus, verrucis contiguus aut dispersis, fuscocinerascentibus, hypo- et protothallo fuligineofusco tenuissimo effuso aut interdum fimbriato impositis.*

**Morphological description.** Thallus up to 0.5 (–0.8) mm. thick, consisting of dispersed or contiguous, hemispherical to subglobose, simple verrucae 0.15–0.30 mm. diameter, brownish-grey, on a thin, dark brown, effuse, filmy or sometimes fibrillose-fimbriate protothallus.

**Geographical distribution.** (See Appendix III, Table XX.)

**f. *incrassata*** M. Lamb, n.f.

**Icon.** Plate Xh: holotype specimen from Penguin Island, off the coast of King George Island, South Shetland Islands (DI 1936–37 No. 1951p *pr. p.*) in BM,  $\times 4$ .

**Diagnosis.** *Thallus valde incrassatus (ad 1.3 mm. crassus), grosse rimoso-verrucosus, alutaceus vel cinereo-fuscescens. Apothecia demum majora, convexa.*

**Morphological description.** Thallus up to 1.3 mm. thick, irregularly and coarsely verrucose and cracked with portions 0.7–1.5 mm. diameter, sordid brownish cream-coloured or brownish-grey, matt. (No distinct protothallus seen.) Apothecia finally somewhat over 1 mm. diameter, convex.

**Discussion.** Perhaps merely an extremely overnourished state from richly nitrogenous situations; the type specimen from Penguin Island was associated with *Xanthoria elegans* (Link) Th. Fr. and that from Deception Island with *Caloplaca (Thamnoma) regalis* (Vain.) Zahlbr., both strongly nitrophilous species.

**f. *cervinogranulata*** M. Lamb, n.f.

**Icon.** Plate Xf: part of isotype specimen from the South Shetland Islands, Deception Island (FIDS No. B2302a) in FH,  $\times 4$ .

**Diagnosis.** *Thallus crustam crassam formans continuam vel rimoso-diffractam, cervinorufescens, superficie minute granulatus.*

**Morphological description.** Thallus forming a continuous or rimose-diffract crust about 1 mm. thick, tawny-rufescent, with the surface composed of crowded, minute granules up to 0.1 mm. diameter. Hypo- and protothallus poorly developed, indistinct.

**Discussion.** This form of *B. coniops* strongly resembles the Fuegian species *B. subcervina* (Nyl.) Vain.; see description of the latter in Appendix I (p. 82).

**Geographical distribution.** (See Appendix III, Table XXII.)

***Buellia isabellina*** (Hue) Darbishire, 1923a, p. 63

**Syn.** *Lecidea isabellina* Hue, 1915, p. 157.

**Icon.** Plate XIa: part of a specimen from west Graham Land, Goudier Island (FIDS No. A2242) in BM,  $\times 4$ .

Plate XIb: part of a specimen from west Graham Land, Melchior Islands (BSWA No. 7902) in FH,  $\times 4$ .

Plate XVIa: field photograph of association of *B. isabellina* with *Mastodia tessellata* Hook. f. & Harv. on a vertical granodioritic face on Goudier Island, west Graham Land (photo: I. M. Lamb, 20 January 1945).

Hue, 1915, fig. 19, p. 158: spores (as *Lecidea isabellina*).

**Morphological description.** Thallus buff-coloured to pale brownish or yellow-brown, matt, effuse, crustose, uneven, (0.5–) 1–2 (–2.5) mm. thick, composed of congested, finally piled-up, subglobose verruculae 0.2–0.4 (–0.5) mm. diameter, the verruculose surface sometimes irregularly cracked but not areolate. Underlying hypothalline stratum thick, brown-blackish, at the periphery forming in places a thin, brown or brown-blackish, fimbriate-radiating prothallus closely adnate to the rock. No soredia.

Apothecia often numerous, arising on or between the thalline verruculae in thicker central parts of thallus, adpressed-sessile, flattened, discoid, slightly constricted at base, 0.4–0.8 mm. diameter, black or brown-blackish, matt, not pruinose, initially slightly concave, soon becoming plane with a subpersistent, thin, entire, proper margin, finally sometimes slightly convex. Excipulum 30–50 $\mu$  thick at sides, in outer part dark brown (without any greenish or olive tinge), inwards  $\pm$  colourless, of radiating structure, the cells of the outer pigmented part rounded and thick-walled. Hypothecium up to 150 $\mu$  deep, pale brown to dark reddish-brown. Hymenium (70–) 75–90 (–100) $\mu$  high, in uppermost epithelial part yellow-brown to dark brown (never with any greenish tinge, HNO<sub>3</sub>–). Paraphyses  $\pm$  discrete, rarely branched, not anastomosing, distinctly capitate-swollen to 4 $\mu$  at the pigmented tips. Asci clavate, c. 60–70  $\times$  15 $\mu$ . Spores 6–8 and irregularly biserial in ascus, brown to dark brown, ellipsoid, thinly 1-septate with equal cells, (12–) 14–18 (–20)  $\times$  7.0–8.5 (–10) $\mu$ .

Pycnidia often numerous, immersed in thallus-verruculae, with minute, punctiform, pale or dark ostioles;  $\pm$  globose in section, with hyaline to brownish perifulcral wall; conidia filiform, arcuate, about 0.5 $\mu$  thick, measuring 10–22 $\mu$  in a straight line between the ends.

Thallus (macroscopically and in sections) K–, C–, PD–; medulla I–.

**Discussion.** The species was based by Hue on seven specimens from west Graham Land, five from Goudier Island and two from Petermann Island. Of these I have seen, in the PC collections, only three, all from the former locality: Nos. 90 *pr. p.*, 92 *pr. p.* and 95 *pr. p.* I have selected No. 95 *pr. p.* as lectotype of the species, and No. 92 *pr. p.*, collected at the same time, is identical with it; but No. 90 *pr. p.* is a different species, *B. augusta* Vain. (see p. 47). It is common and widespread on Goudier Island, and I have observed and collected it repeatedly there. It may form very large, continuous patches, as shown in Plate XVIa. There is no doubt that it is specifically distinct from *B. coniops*, although similar and closely related and having the same preference for highly nitrogenous situations.

The thalline verruculae in section have a capitate-fastigiate cortex with the outer end-cells pure brown, rounded, 3–4 $\mu$  diameter; a superficial, hyaline, indistinctly stratified, necral layer is often present. The algae, which are trebouxoid, 8–18 $\mu$  diameter, are dispersed in an algal-medullary layer of colourless, transparent,  $\pm$  cellular, fungal tissue with rounded or slightly angulose, thin-walled cells 3–6 $\mu$  diameter. Sections through the thicker central parts of the thallus show remains of old assimilative verruculae buried beneath the surface, sometimes with dead algal cells still visible, and with their tissues strongly brown-pigmented and more distinctly pseudoparenchymatous. It is obvious that growth in thickness of the thallus occurs by formation of new assimilative verruculae over pre-existing ones, which become deeply buried and morbose and finally converted into dark basal hypothalline tissue with heavily brown-pigmented, rounded cells of about 5 $\mu$  diameter.

To judge from the description given, *Buellia barrilensis* Zahlbr., described from the islands of Juan Fernandez (off Chile), on rock (Zahlbruckner, 1926b, p. 459), has a considerable resemblance to *B. isabellina*; unfortunately I was unable to obtain any type material for comparison, as no specimens could be found in the herbaria of the Vienna and Stockholm Natural History Museums. The description of *Buellia alutacea* Zahlbr., a New Zealand species (Zahlbruckner, 1941, p. 374), also indicated many features resembling those of the present species, so that a reinvestigation of the type specimen seemed desirable, and it was received on loan from the Vienna Natural History Museum. It was found, however, to be unrelated to *B. isabellina* or to any other species of the *B. coniops* group (see description in Appendix I, p. 79).

**Geographical distribution.** Endemic, as far as known, to the Antarctic Peninsula sector where it has been found in the South Orkney and South Shetland Islands and on the west coast of the peninsula to somewhat south of lat. 65°S.

The specimens examined are listed in Appendix III, Table XXIII.

*Buellia augusta* Vainio, 1903, p. 26

**Syn.** *Buellia brabantica* Vainio, 1903, p. 26; *Lecidea brabantica* (Vainio) Hue, 1908, p. 15.

**Icon.** Plate XI d: portion of a specimen in the typical condition from west Graham Land, Goudier Island (FIDS No. A1203 *pr. p.*) in BM,  $\times 4$ .

Figs. 10, 11.

Vainio, 1903, pl. II, fig. 10, pl. IV, fig. 36: parts of the type material of *B. augusta*,  $\times 1$ .

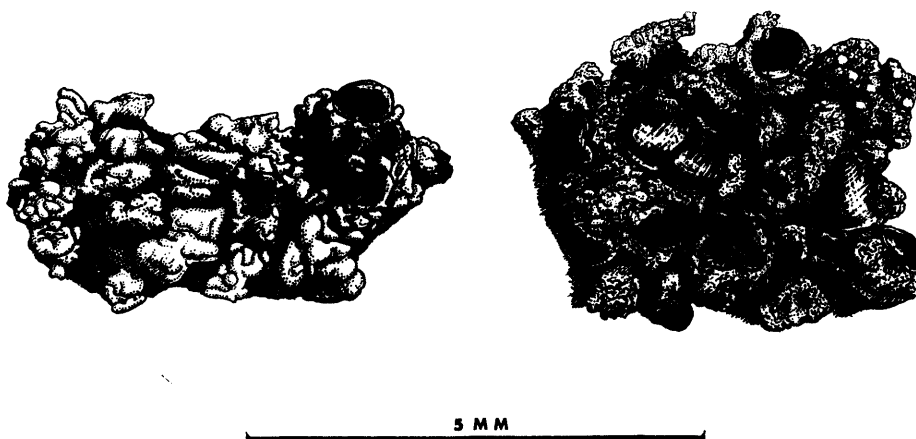


FIGURE 10

*Buellia augusta* Vain. (FIDS A1203). Two portions of the same specimen. At left, the juvenile or "brabantica" growth-phase; at right, the adult typical growth-phase.

**Morphological description.** Thallus reddish-brown or tawny-castaneous to dark fuscous, matt, effuse, crustose, up to 1.5 mm. thick, at maturity verrucose-areolate with irregularly angulose, convex areolar portions 0.5–1.0 mm. diameter, with minutely granulate-scabrid surface; where the scabrosities are abraded the surface appears minutely whitish-punctate; in young condition, ("brabantica"-phase) the strongly convex thalline verrucae are smooth (no scabrosities present), 0.2–0.5 mm. diameter, up to 0.3 mm. thick, with rounded outline or slightly lobate at the edges. Protothallus and hypothallus well developed, black or sometimes brown-blackish, thickish (up to 0.2 or even 0.3 mm. thick), the former often radiately rugose or cracked, 0.7–1.5 (–2.5) mm. wide, with abrupt, even outer margin, the latter visible between the thalline verrucae, often with slightly roughened surface. No soredia.

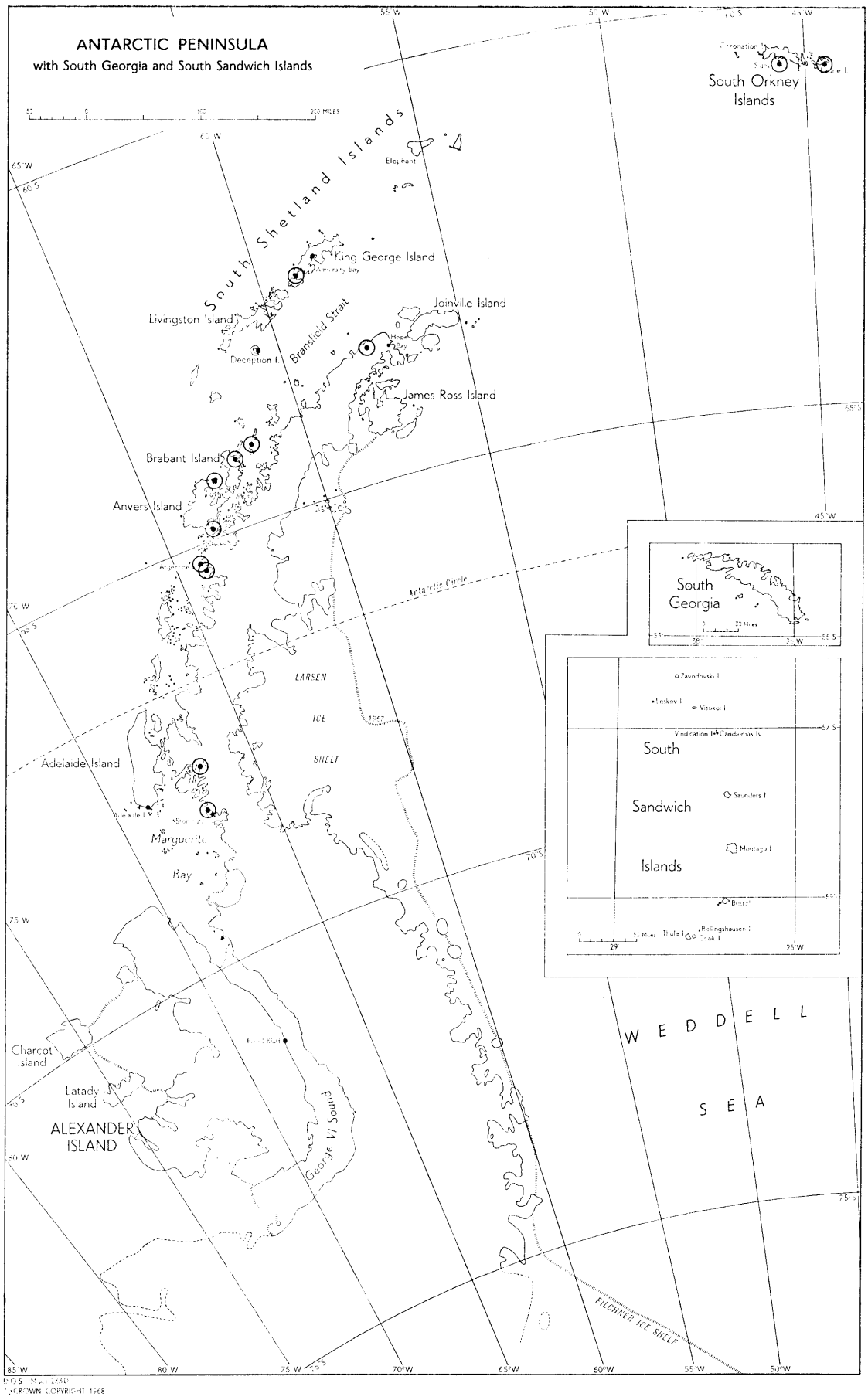
Apothecia not constantly present, scattered or crowded, 0.4–0.7 mm. diameter, adpressed-sessile on or between the thallus-areolae, round, slightly constricted at base, black, matt, not pruinose, plane or slightly convex, thinly marginate, the margin sometimes finally evanescent. Excipulum developed at sides, brown-blackish in outer part, gradually paler to almost colourless inwards, pseudoparenchymatous with flabellate-radiating arrangement of the cells. Hypothecium up to 150  $\mu$  deep, brown to dark brown, sometimes produced downwards through underlying thallus-tissue. Hymenium 70–90  $\mu$  high; epithecium dark brown without olivaceous or aeruginose tinge ( $\text{HNO}_3$ —). Paraphyses involved in some mucilage but discrete under pressure, occasionally branched, not anastomosing, capitate up to 4  $\mu$  at the brown-pigmented tips. Asci clavate, 40–65  $\times$  15–23  $\mu$ . Spores 8 in ascus,  $\pm$  biseriolate or irregularly arranged, dark brown, ellipsoid, thinly 1-sepate from the first, not constricted at septum, (12–) 14–16 (–18)  $\times$  6–8 (–9)  $\mu$ .

Pycnidia immersed in thallus-verrucae, with inconspicuous, non-prominent, dark, punctiform ostiole; perifulcral wall  $\pm$  colourless; conidia filiform, arcuate, 20–25  $\mu$  long (15–18  $\mu$  in a straight line between the ends), 0.6  $\mu$  thick, borne terminally on simple, subulate-digitate conidiophores.

Thallus externally K—, C—, PD—, internally K— or sometimes + yellow then red with formation of red crystals under microscope, C—, PD+ yellow (sometimes indistinct); medulla I—.

**Discussion.** This species, when fully developed, is easily recognizable by the scabrid-granulate surface of the thallus-verrucae. These minute granulations, concolorous with the thallus, resemble very small isidia, but do not appear to become naturally detached. When they become abraded by mechanical agencies, or through grazing by mites, they leave the minute whitish spots mentioned by Vainio in his original diagnosis. Younger thalli show this scabrosity only in places, or not at all, having smooth, strongly convex, tawny





**FIGURE 11**  
The known distribution of *Buellia augusta* Vain.

brown or castaneous areolae with sometimes  $\pm$  lobulate outline. It was on a juvenile condition of this kind that Vainio based his description of *Buellia brabantica* from Brabant Island, west Graham Land, BAE No. 251 *pr. p.* in TUR, (9553 in herb. Vainio). The type specimen is on a very small chip of rock, and may be the younger peripheral part of a fully developed thallus of *B. augusta*, with which it agrees in the chemical reaction (algal-medullary layer PD+ yellow). Specimens have been seen in which the transition from the “*brabantica*” condition to the normal scabrid adult condition occur on the same thallus (Fig. 10).

*B. augusta* was originally described from two localities in west Graham Land, Auguste Island in the Gerlache Strait (BAE Nos. 209 *pr. p.*, 213 *pr. p.*) and Wiencke Island (BAE No. 447 *pr. p.*). I have chosen No. 213 *pr. p.* (9414 in herb. Vainio) as the lectotype specimen; it appears to be a portion of the specimen illustrated on pl. II, fig. 10 of Vainio's (1903) report. No. 447 *pr. p.* was not seen in TUR, but is present in BR, associated with *Buellia anisomera* Vain., and is obviously the specimen shown in Vainio's other illustration (1903, pl. IV, fig. 35/36).

A section of the thallus in the lectotype specimen of *B. augusta* shows a very uneven surface overlaid by a colourless, hyaline, amorphous necrotic layer 5–13 $\mu$  deep. The cortex is 9–16 $\mu$  deep, capitate-fastigiate with the outermost cells reddish-brown, rounded, 3–4 $\mu$  diameter. Algal stratum diffuse, interrupted, concentrated beneath the cortex in a zone 90–120 $\mu$  deep, but sporadic groups of algae also present lower down in the medulla to a depth of 200 $\mu$ . Algal-medullary hyphal layer colourless, hyaline, pseudoparenchymatous, with thin-walled,  $\pm$  isodiametric cells 4–6 $\mu$  diameter, in lower parts gradually necrosed and brown-pigmented and converted at the base into hypothalline tissue with thickened, heavily brown-pigmented cell-walls.

The depsidone compound (probably norstictic acid) fluctuates considerably in amount. When abundantly present, it gives a K+ red reaction of the medulla with spicular or granular red crystals under the microscope, but in lesser quantities no coloration with K can be obtained, and only the yellow reaction with PD persists; even this may be in some cases weak or indistinct.

*B. augusta* is a highly nitrophilous species occurring around bird rocks and rookeries, and is particularly subject to damage by mites, which are often to be seen on thalli in nature; a field-note on one of our specimens collected on Wiencke Island in 1944 (FIDS No. A1246a) states: “Severely damaged by mites, of which two kinds were present: one a small, actively running, red mite, the other a large, glistening, smooth brown mite, now dead or dormant.” Such grazing finally results in destruction of the cortical layer and transformation of the thallus into a pale-coloured, eroded, furfuraceous crust. One cannot in fact altogether exclude the possibility that the characteristic scabrosity of the adult thallus may be due to punctures by the mouth parts of mites stimulating the formation of minute isidioid outgrowths.

An Arctic species, *Buellia avium*, described from Novaya Zemlya by Lynge (1928, p. 243), to judge from the description given, resembles *B. augusta* very closely, and the type specimen was therefore obtained for comparison from the Oslo Botanical Museum. Although very similar in appearance, it proved to be a different species, distinguished from *B. augusta* mainly by the absence of a distinct black proto- and hypothallus and in the younger parts of the metathallus being dull fuscous and minutely verruculose (not tawny-brown, smooth and  $\pm$  sublobulate as in the early “*brabantica*” growth-phase of *B. augusta*); see description and further remarks in Appendix I, p. 79. *B. avium* Lynge is also a strongly ornithocoprophilous species, having been found in a bird rookery in Novaya Zemlya.

The records of *B. augusta* by Darbishire (1912, p. 35, 45) from the South Shetlands, Nelson Island, and east Graham Land, Paulet Island, are erroneous, according to the material preserved in S. The former is *B. russa* (Hue) Darb. (a cinereous, depsidone-poor state  $\pm$  corresponding to “*Lecidea Joannae*” Hue) and the latter is a very poor, quite indeterminable specimen, certainly not *B. augusta*. Hue (1908, p. 15) recorded *Lecidea brabantica* (Vain.) Hue from west Graham Land, Wiencke Island; the specimen could not be found by me in the PC collections, and is probably not this species, as the colour of the thallus was described as grey or brownish-grey. One of the syntype specimens of *Buellia isabellina* (Hue) Darb. from west Graham Land, Goudier Island, FAE 1908–10 No. 90 *pr. p.*, in PC, is *B. augusta*, a typically developed specimen rich in depsidone.

What may be an undescribed *Buellia*-species with a scabrid brownish thallus very like that of *B. augusta* was present in a sample from the Debenham Islands, west Graham Land, collected by B. Stonehouse in 1947 (FIDS No. E1121 *pr. p.*, associated with *B. russa*, *Umbilicaria decussata* (Vill.) Zahlbr. and a *Lecidea* sp.). The few apothecia present are minute, about 0.2 mm. diameter, black, plane, thinly marginate, the epithecium and hypothecium dark brown, and the spores minute, brown, fusiform-ellipsoid, 10–12 $\times$

4.5–5.0 $\mu$ , 1-septate and occasionally with one or two weakly developed accessory septa. The material is too scanty for conclusive investigation, and the apothecia may even belong to a parasymbiont on an alien thallus. Attention is drawn to it in this place because of the resemblance of the thallus to that of *B. augusta*.

**Geographical distribution.** Known from the South Orkney Islands (where it appears to be rather common), the South Shetland Islands and the west coast of Graham Land south to the northern side of Marguerite Bay. It has not been seen from east Graham Land, and would appear to be representative of the extreme type of western-oceanic distribution among the Antarctic Peninsula *Buellia*-species (Fig. 11).

The specimens examined are listed in Appendix III, Table XXIV.

*Buellia latemarginata* Darbishire, 1912, p. 15

**Syn.** *Lecidea actinobola* Hue, 1915, p. 118; *Buellia actinobola* (Hue) Darbishire, 1923a, p. 61 (*lapsu* "actinoloba").

*Lecidea Charcotii* Hue, 1915, p. 145; *Buellia Charcotii* (Hue) Darbishire, 1923a, p. 62.

*Lecidea Gainii* Hue, 1915, p. 138; *Buellia Gainii* (Hue) Darbishire, 1923a, p. 63.

*Lecidea radians* Hue, 1915, p. 117 (*nom. illegit.*; *non Lecidea radians* Harmand, 1898, p. 422);

*Buellia radians* (Hue) Darbishire, 1923a, p. 64 (*nom. illegit.*; *non Buellia radians* (Harmand) Lettau, 1912, p. 247).

*Buellia Huei* Dodge, 1948, p. 248 (*nom. nov.* for *B. radians* (Hue) Darbishire, *non* (Harmand) Lettau).

**Icon.** Plate XIe: part of the lectotype specimen of *B. latemarginata* from east Graham Land, Paulet Island (SAE No. 112) in S,  $\times 4$ .

Plate XI f: part of the lectotype specimen of *Lecidea Gainii* Hue from west Graham Land, Petermann Island (FAE 1908–10 No. 284 *pr. p.*) in PC,  $\times 4$ .

Plate XVI b: field photograph of orbicular thalli of various ages on granodioritic rock on Goudier Island, west Graham Land (photo: I. M. Lamb, January 1945). (FIDS A1825 was collected from this population. The dark patches are *Mastodia tessellata*.)

Fig. 12.

Darbishire, 1912, pl. 3, fig. 29: type specimen of *B. latemarginata*,  $\times 7$ –8 (*vide* Darbishire, but appears to be *c.*  $\times 4$ ).

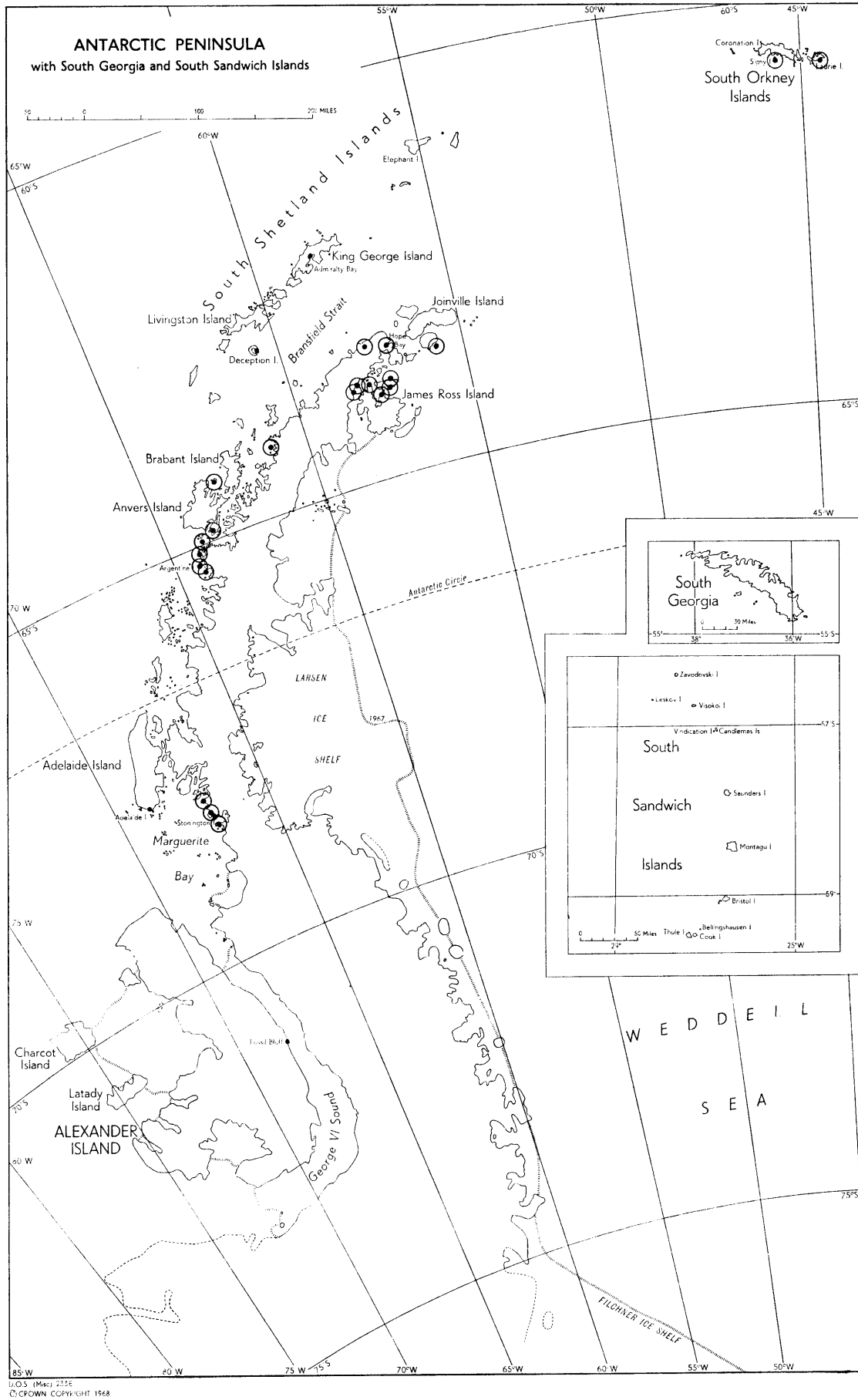
Hue, 1915, fig. 13, p. 146: spores (as *Lecidea Charcotii*).

**Morphological description.** Thallus light to dark ash-grey (in old or preserved specimens often with a creamy, alutaceous or subfuscous tinge), matt, crustose, effuse or subeffigurate at margin, 0.5–1.2 mm. thick in central parts, 0.2–0.4 mm. thick at periphery, areolate or verrucose-areolate with areolae of irregular size and form, obtusely angulose, separated by thin to gaping cracks, sometimes  $\pm$  fused into irregular portions; marginal areolae often  $\pm$  radially elongated (subeffigurate), blackened at the tips and sometimes bounded by a thin, white,  $\pm$  radiately fibrose prothalline zone. No soredia.

Apothecia normally numerous, adpressed-sessile on areolae of central parts of thallus, (0.3–) 0.5–0.8 (–1.0) mm. diameter, only slightly constricted at base, black, matt or slightly nitid, not pruinose, in early stages plane with thin to moderate, entire, black margin, soon becoming convex and immarginate. Excipulum laterally developed, 30–70 $\mu$  thick, densely pure dark brown or reddish-brown and pseudoparenchymatous in outer part, inwards faintly brown to  $\pm$  colourless and composed of conglutinated, flabellate radiating hyphae. Hypothecium 150–200 $\mu$  deep, brown to dark brown, often finally produced downwards into subjacent thallus-tissue. Hymenium 70–75 (–90) $\mu$  high; epithecium dark brown without any olivaceous or aeruginose tinge (HNO<sub>3</sub>–). Paraphyses somewhat mucilaginously conglutinated but discrete under pressure, simple or sparingly branched, not anastomosing, at tips very distinctly capitate to 5 (–6) $\mu$  and there dark brown-pigmented, the pigment often forming an apical cap. Asci clavate, 50–60  $\times$  14–18 $\mu$ . Spores (4–) 6–8 and irregularly biseriolate in ascus, soon dark brown, ellipsoid, occasionally slightly curved, thinly 1-septate (also in young condition), (12–) 13–17  $\times$  6–8 (–9) $\mu$ .

Pycnidia immersed in thallus-areolae, indicated by small, slightly prominent, dark spots, vertically ellipsoid in section, with colourless perifulcral wall pigmented brown around the ostiole; conidia filiform, arcuate, 10–15  $\times$  0.5–0.6 $\mu$ .

Thallus externally K– or + slowly reddish, C–, PD+ yellow or –, internally and in sections K– or + red with formation of red spicular crystals, C–, PD+ yellow or –. Medulla I–.



**FIGURE 12**  
The known distribution of *Buellia latemarginata* Darb.

**Discussion.** This species is characterized by its whitish-grey or cinereous thallus which often exhibits a  $\pm$  distinct subeffigurate margin with the extremities of the lengthened marginal areolae blackened (by merging into dark protothalline tissue) and sometimes surrounded by an outermost, thin, white fringe of fine, fibrous hyphae. Thalli which do not show this feature have some outward resemblance to *B. russa* (Hue) Darb., but *B. latemarginata* is not closely related to that species and belongs to the *coniops*-group with pure brown epithecium (unchanged in colour by  $\text{HNO}_3$ ) and filiform pycnoconidia. The paraphyses are also more distinctly capitate than in *B. russa*. The production of the characteristic depsidone substance (norstictic acid) is very variable, as indicated by the fluctuating reactions with K and PD.

Zahlbruckner (1917, p. 52; 1930–31, p. 363) wrongly placed this species into synonymy with *Buellia frigida* Darbishire.

The type material of *B. latemarginata* in S, collected from east Graham Land, Paulet Island, by C. Skottsberg in 1903, consists of two specimens, both bearing the same number, 112. One of them is obviously that shown in Darbishire's illustration (1912, pl. 3, fig. 29), and is regarded as the lectotype; it is on dark basaltic rock, without accompanying species. The margin is distinctly subeffigurate, with radially elongated marginal areolae up to 1.2 mm. long and 0.25–0.40 mm. wide, gradually blackened towards the tips and surrounded at the periphery by a narrow white zone, as described above. Norstictic acid is either lacking or present only in very low concentration (thallus-sections K—, PD—). The spores measure 13–16  $\times$  6–8  $\mu$ . The thallus in section is covered by a colourless, hyaline necrotic layer 30–50  $\mu$  thick showing stratification or indistinct outlines of dead collapsed cells. Cortex 15–22  $\mu$  thick, capitate-fastigiate, with the upper end cells rounded, 4–5  $\mu$  diameter, and dark brown-pigmented. Algal stratum irregular, somewhat interrupted, (60–) 80–120  $\mu$  deep, the hyphae compactly interwoven, thin-walled, about 3  $\mu$  diameter. Algae trebouxoid, 9–13  $\mu$  diameter. Lower medulla up to 600  $\mu$  deep, colourless and clear or in places brownish, compact, hyphose, of thin-walled, interwoven, somewhat gelatinized hyphae 2–3  $\mu$  diameter, passing downwards into brown hypothalline tissue of indistinct,  $\pm$  degenerated structure, heavily obscured by pigment, in places almost pseudoparenchymatous with cells of 3–5  $\mu$  diameter.

The holotype specimen of *Lecidea actinobola* Hue from west Graham Land, Petermann Island (FAE 1908–10 No. 179 *pr. p.*, in PC) resembles that of *B. latemarginata* very closely, but lacks the outermost white zone and contains more depsidone-substance (thallus-sections K— but PD+ intense yellow in places). Spores (11–) 13–15  $\times$  6–7 (–7.5)  $\mu$ . I can match it almost exactly with one of my own specimens from east Graham Land, Vega Island (FIDS No. D2715).

*Lecidea Charcotii* Hue was based on three specimens from different localities (Petermann Island, Booth Island, and a small unnamed island in Marguerite Bay). The first of these, FAE 1908–10 No. 284 *pr. p.*, has been selected by me as lectotype, and consists of a small thallus with the margin in places distinctly subeffigurate. Depsidone substance is abundantly present (thallus-sections K+ red with crystals). Spores 13–15  $\times$  6.5–8.0  $\mu$ . The syntype from Marguerite Bay, FAE 1908–10 No. 266 *pr. p.*, is in poor, morbose condition, and does not show any marginal lobation or PD reaction; its spores measure (13–) 15–18  $\times$  6–8  $\mu$ . The other syntype specimen from Booth Island, FAE 1908–10 No. 119 *pr. p.*, was not examined microscopically by me, and appeared to be a state of *B. russa* (Hue) Darb.

Of *Lecidea Gainii* Hue only one of the two specimens mentioned in the original description was seen; it is from Petermann Island (FAE 1908–10 No. 284 *pr. p.*), and has a scattered and patchy thallus without distinct marginal effiguration (Plate XI f) and spores measuring 12.0–16.5 (–18.0)  $\times$  7.0–8.5  $\mu$ . Depsidone-substance is present in low concentration (thallus-sections K—, PD+ yellow). It may be considered as the lectotype. The other (syntype) specimen, from Goudier Island, FAE 1908–10 No. 86 *pr. p.*, could not be found in the PC collections.

The holotype specimen of *Lecidea radians* Hue, from Booth Island, FAE 1908–10 No. 116 *pr. p.*, shows the subeffigurate periphery fairly well, but not so noticeably as in the type specimens of *Buellia latemarginata* and *Lecidea actinobola*. The specimen is rich in depsidone, abundant red acicular crystals being formed in thallus-sections on addition of K. Spores (12–) 13.0–17.5  $\times$  7–9  $\mu$ . A specimen collected by Dr. A. Hunziker at Hope Bay (AE No. 10158) closely resembles it.

Occasionally the fimbriate marginal protothallus may be dark brown rather than black, e.g. in FIDS Nos. D2443 and D367–8d. In this respect such specimens resemble *Buellia Babingtonii* (Hook. & Tayl.) M. Lamb, which is undoubtedly very closely related (see p. 53).

I have found *B. latemarginata* to be a highly nitrophilous species, more so than *B. russa*, which it often outwardly resembles. It occurs preferentially high up or even on the zenith surfaces of bird rocks, and may

form an extensive, diffuse cover one square metre or more in area, often associated with other characteristically nitrophilous species such as *Xanthoria elegans*, *X. candelaria*, *Rinodina Petermanni* and *Mastodia tessellata*. In the living condition the colour of the thallus is whitish to pale grey, without the coppery-rufescent tinge often observed in *B. russa*, but aged specimens, and those preserved a long time in the herbarium, may acquire a creamy or slightly brownish colour. Early growth-stages consist of orbicular, black-edged rosettes of various size which eventually become confluent to form more or less continuous patches (Plate XVIb).

**Geographical distribution.** The only record of this species from outside the Graham Land sector of Antarctica is that of "*Buellia Charcotii*" by Darbishire (1923b, p. 106) from eastern Antarctica, Ross Island, Mount Erebus. I have not been able to obtain the specimen for revision. *B. latemarginata*, in addition to its occurrence in the South Orkney Islands, from where I have seen several specimens, extends along both sides of the Antarctic Peninsula to about as far south as collections have been made (Fig. 12). It is much more common on the east side of the peninsula than is *B. russa* (p. 33).

The specimens examined are listed in Appendix III, Table XXV.

***Buellia Babingtonii*** (Hooker f. & Taylor) M. Lamb ex Dodge, 1948, p. 248

**Syn.** *Lecanora Babingtoni* [sic] Hooker f. & Taylor in Hooker, 1844-47, p. 535 (1847);\* *Rinodina Babingtoni* (Hooker f. & Taylor) Dodge, 1965, p. 525 (*comb. inval.*, basionym not given).

*Lecidea australissima* Nylander, 1857, p. 123 (*nomen nudum*) et ex Hue, 1891, p. 139 (*cum descript.*); *Buellia australissima* (Nylander) Zahlbruckner, 1930-31, p. 458.

**Icon.** Plate XIg: part of a specimen from west Graham Land, Melchior Islands, Omega Island (BSWA No. 7939k) in FH,  $\times 4$ .

Hooker, 1844-47, pl. CXCVIII, fig. III (1847):\* representation of plant on rock with structural details (not good).

**Morphological description.** Thallus sordid brownish-grey (dark fuscous when moistened), matt, crustose, subeffigurate, thin (0.2-0.3 mm. in thickness), rimose-areolate with the peripheral areolae radially elongated, brownish-grey or whitish, forming contiguous, flattened, branching lobes transformed at the margin into a  $\pm$  conspicuous, very thin, dark brown, dendritic-fibrillose or fimbriate, limiting prothallus. No soredia.

Apothecia adpressed-sessile on thallus-areolae, minute (0.3-0.4 mm. diameter), round, slightly constricted at base, matt, black, not pruinose,  $\pm$  persistently plane, with thin proper margin or rarely finally immarginate. Excipulum up to  $60\mu$  thick at sides, dark brown in outer part,  $\pm$  colourless internally, pseudoparenchymatous. Hypothecium brown to dark reddish-brown, lentiform and about  $60\mu$  deep, or produced downwards to join the hypothalline layer. Hymenium about  $75\mu$  high, pure dark brown in uppermost part (no olive or aeruginose tinge,  $\text{HNO}_3$ -). Paraphyses embedded in some mucilage but discrete under pressure, simple or occasionally branched, not anastomosing, clavate-capitate to  $3-4\mu$  at the brown-pigmented tips. Spores 8 in ascus (or fewer by abortion), irregularly biserial, brown, ellipsoid or sometimes curved (fabaceous), thinly 1-septate at all stages of development,  $15-18 \times 7.5-9.0\mu$ .

Pycnidia occasional, immersed in thallus-areolae, indicated externally by minute, dark spots; conidia filiform, arcuate,  $10-18\mu$  long,  $0.5-0.6\mu$  thick.

Thallus K- or dull brown (a spurious reaction), C-, PD-, also internally and in sections. Medulla I-.

**Discussion.** I am not entirely convinced of the autonomy of this species, as in many respects it greatly resembles *B. latemarginata* Darb.; the main differences are the distinctly brownish-tinged thallus (manifestly so on moistening), the dark brown (not black), fimbriate prothallus, and the smaller,  $\pm$  persistently plane and marginate apothecia.

The type material was collected by J. D. Hooker at Cockburn Island, east Graham Land, on the *Erebus* and *Terror* Expedition of 1839-43, and was first published under the name "*Lecidea atro-alba* Ach." by Hooker and Taylor in their preliminary report (1844; p. 636). Neither the diagnosis nor the illustration of *Lecanora Babingtoni*, published three years later, give a clear idea of its appearance and morphology. A duplicate portion of the same gathering came into the possession of W. Nylander, who named it *Lecidea australissima*, a *nomen nudum* when first published in 1857, included in a sub-section of the genus

\* This work was published in 25 instalments between 1844 and 1847. For the dates of publication of these parts and their pagination, see Wiltshire, 1913, p. 355.

designated "*Thallus radios. vel laciniato-radiosus*". Not until over thirty years later was a validating diagnosis supplied (Hue, 1891).

An isotype specimen of *Lecanora Babingtoni* seen in BM (ex herb. Churchill Babington) is very small, scanty and incomplete, and very little information could be gained from it except that it was a *Buellia*-species. According to Dodge (1965, p. 525) part of the same collection is preserved in the Kew Herbarium under the name "*Buellia australissima* Nyl.", but I have not seen this. The portion constituting the type of *Lecidea australissima* Nyl. in Herb. Mus. Bot. Helsingfors (Herb. Nylander No. 10650), although small, is more adequate, and a detailed revision could be made from it. It is on a chip of dark basaltic rock and is associated with a *Caloplaca*-species.\* The central, rimose-areolate part of the thallus is of a sordid grey-brownish colour, and the subeffigurate marginal part inside the brown, limiting protothallus is whitish, due to the development of a superficial necral stratum. In sections of the thallus this necral layer is 12–15 $\mu$  thick, colourless, with indistinct outlines of disintegrated cells; the underlying cortex is capitate-fastigiate with very distinct, brown-pigmented, round cells 4–6 $\mu$  diameter, resembling the heads of paraphyses. The dark fuscous coloration produced by moistening the thallus with water or KOH is due to this pigmented layer showing through the necral stratum. Algae trebouxoid, 10–15 $\mu$  diameter, diffusely and interruptedly distributed, the medullary tissue between them colourless, compact, without granules, composed of interwoven hyphae and transitional downwards into a brown hypothalline layer up to 30 $\mu$  deep of indistinctly pseudoparenchymatous structure.

Other Antarctic collections studied by me are very similar in appearance and seem distinct from *B. latemarginata* Darb. Some from stations further south (Debenham Islands, west Graham Land, e.g. FIDS No. E1114x) are very depauperate, with scanty, small and  $\pm$  scattered thallus-areolae.

**Geographical distribution.** Known only from the mainland and off-lying islands on both the west and east coasts of Graham Land, where it is apparently of rather rare occurrence.

The specimens examined are listed in Appendix III, Table XXVI.

### *Buellia fulvonitescens*, M. Lamb, n. sp.

**Icon.** Plate XIc: isotype specimen in FH,  $\times 4$ .

**Diagnosis.** *Thallus crustaceus, plagulas orbiculares vel confluentes formans, ambitu effusus vel subeffiguratus et protothallo lato, fimbriato, radiatim fisso et fibrilloso, obscure fusco circumdatus; in parte centrali rimoso-areolatus, fulvo-alutaceus, subnitidus, areolis planis aut convexiusculis, peripheriam versus super protothallo sparsis et magis verrucosis; interdum protothallo minus evoluto et margine tantum zona angusta, sat crassa, obscure fusca cinctus. Apothecia numerosa, sparsa aut confluentia, in areolis oriunda et adpresso-sessilia, 0.4–0.8 mm. lata, nigra, epruinosa, primo plana et marginata, dein convexa, margine tandem evanescenti. Excipulum lateribus evolutum, extrinsecus obscure fuscum. Hypothecium fuscum. Hymenium 70–75 (–90) $\mu$  altum, epithecio fusco, HNO<sub>3</sub>–, paraphysibus bene capitatis. Sporae (4–) 6–8 nae, fuscae, ellipsoideae, tenuiter uniseptatae, halone nullo, 12–17 $\mu$  longae, 7–8 $\mu$  latae. Pycnidia nigra, globoso-ampullacea, extus punctiformia et leviter prominentia, conidiis filiformibus, arcuatis, 15–21 $\mu$  longis, 0.4–0.5 $\mu$  crassis. Thallus saltem intus K e flavo sanguineo-rubens (rhapidibus productis), C–, PD aureo-flavens; medulla I–.* —A *B. latemarginata* Darb., quacum maximam affinitatem habet, thallo fulvo-alutaceo, nitidiusculo et protothallo fusco bene distincta videtur; B. *Babingtonii* (Hook. f. & Tayl.), colore protothalli cum *B. fulvonitescenti* congruens, praesertim apotheciis minoribus discrepat.

**Morphological description.** Thallus pale buff-coloured (fulvous-alutaceous), with smooth and subnitid surface, forming isolated or confluent,  $\pm$  orbicular patches, at least in places distinctly subeffigurate at periphery, crustose, up to c. 0.5 mm. thick, rimose-areolate with plane or convex areolae, those at the periphery often  $\pm$  isolated on a wide, brown, radiating, fissured and fibrillose-fimbriate protothallus (or in places conrescent, bounded by a narrow, amorphous or indistinctly radiating, dark brown protothalline zone). No soredia.

Apothecia numerous in central part of thallus, isolated or contiguous, arising in thallus-areolae and soon becoming adpressed-sessile, slightly constricted at base, small (0.4–0.8 mm. diameter), round, black, matt or subnitid, not pruinose, at first plane with moderate, entire, slightly prominent proper margin, then becoming slightly to strongly convex, the margin finally disappearing. Excipulum 60–70 (–80) $\mu$  thick at

\* A duplicate of this *Caloplaca* in FH (Herb. Thomas Taylor) was recently described by Dodge (1965, p. 525) as a new species, *Gasparrinia Hookeri* Dodge.

sides, dark reddish-brown in outer part, pale brown to  $\pm$  colourless inwards, of flabellate-radiating structure with the outer darkly pigmented part pseudoparenchymatous. Hypothecium truncate-obconical, up to  $270\mu$  deep, brown or dark reddish-brown. Hymenium  $70-75 (-90)\mu$  high; epithecium pure dark brown without olivaceous or aeruginose tinge ( $\text{HNO}_3-$ ). Paraphyses involved in some hyaline mucilage but discrete under pressure, not anastomosing, very distinctly capitate to  $4.5 (-6.0)\mu$  at tips and there brown-pigmented, the pigment often forming an apical cap. Asci clavate,  $50-60 (-70) \times 12-14 (-20)\mu$ . Spores (4-) 6-8 in ascus, irregularly biseriate, soon brown to dark brown, not halonate, ellipsoid, straight or rarely slightly bent, thinly 1-septate at all stages of development,  $12-17 \times 7-8\mu$ .

Pycnidia numerous in central thallus-areolae, forming minute, slightly protuberant, ostiolate spots; perifulcril wall colourless in lower part, dark brown towards ostiole; conidia filiform, arcuate,  $15-21\mu$  long (length computed as if straightened out),  $0.4-0.5\mu$  thick, borne terminally on subulate conidiophores.

Thallus externally K+ yellow then slowly dull reddish, C-, PD+ yellowish, internally K+ yellow then red with formation of spicular red crystals under microscope (norstictic acid present), C-, PD+ golden yellow; medullary hyphae I-.

**Discussion.** This species shows the same variability as *B. latemarginata* (p. 50) with regard to the development of the subeffigurate margin. In the holotype (FIDS No. A1245a) this is conspicuously radiating, passing gradually from a thin, dark brown, minutely fibrillose fringe 1-2 mm. wide at the outer edge to an inner zone thinly clothed with an indistinct metathalline cortical layer, from which  $\pm$  isolated, isodiametric (not radially elongated) assimilative verrucae up to 0.5 mm. diameter are developed; further in the verrucae or areoles become crowded, separated by cracks, to form the rimose-areolate crust. In another specimen collected on the same rock-face (FIDS No. A1242b) the margin is not subeffigurate, the verrucose-areolate crust being uniform up to the periphery, where it is bounded by a narrow (0.3-0.5 mm. wide), dark brown,  $\pm$  amorphous or indistinctly radiate-lobulate protothallus.

The thallus in the holotype is covered by an outermost, colourless, stratified necral stratum about  $25\mu$  thick. Cortex capitate-fastigiate,  $12-16\mu$  thick, with the outermost cells brown-pigmented, round,  $3-4\mu$  diameter. Algal stratum  $\pm$  diffuse and interrupted,  $60-100\mu$  deep; algae trebouxoid, globose,  $9-20 (-22)\mu$  diameter. Medulla colourless and clear or slightly isabelline-cloudy, without granules, in and near the algal layer pseudoparenchymatous with cells *c.*  $3\mu$  diameter, further down gradually more hyphose with compacted, short-celled hyphae, and at the base, where mixed with substratum-particles, patchily dark brown-pigmented (hypothalline tissue).

In the colour of its protothallus *B. fulvonitescens* resembles *B. Babingtonii* (p. 53), from which it differs in the larger and finally convex apothecia, the alutaceous (rather than grey-brownish), slightly lustrous thallus, and the isodiametric (not radially elongated) peripheral metathallus-areolae, as well as in the (perhaps not constant) presence of depsidone (norstictic acid). The colour and appearance of the meta- and protothallus distinguish it from *B. latemarginata*, to which it is otherwise very similar.

The type population occurred on the sloping face of a large granodioritic block near the shore at Besnard Point, Port Lockroy, west Graham Land, in association with *Buellia russa* var. *Liouvillei*.

**Geographical distribution.** West Graham Land.

The specimens examined are listed in Appendix III, Table XXVII.

### *Buellia frigida* Darbishire, 1910, p. 7

**Syn.** *Rinodina frigida* (Darbishire) Dodge, 1948, p. 259.

*Buellia quercina* Darbishire, 1910, p. 8.

**Icon.** Plate XIIb: portion of a specimen from Australian Antarctic Territory, Kemp Coast, Mawson Base, collected by A. M. Gwynn, 1954 (No. AB/54/L 133), in Herb. Missouri Bot. Gard.,  $\times 4$ .

Fig 13.

Darbishire, 1910, pl. I, fig. 3 (as *B. quercina*), fig. 4 (as *B. frigida*): habit photographs (not good). Darbishire, 1923a, pl. I, figs. 5, 6: habit photographs (good); figs. 7-9, p. 40-41: sections of thallus, apothecium and pycnidium.

Dodge and Baker, 1938, pl. 57, figs. 327-32, 335: anatomical details and spores, habit-sketch; pl. 65, fig. 427: section of thallus and apothecium.

Rudolph, 1965, fig. 1, p. 286: field-photograph taken in Victoria Land (as *Rinodina frigida*).



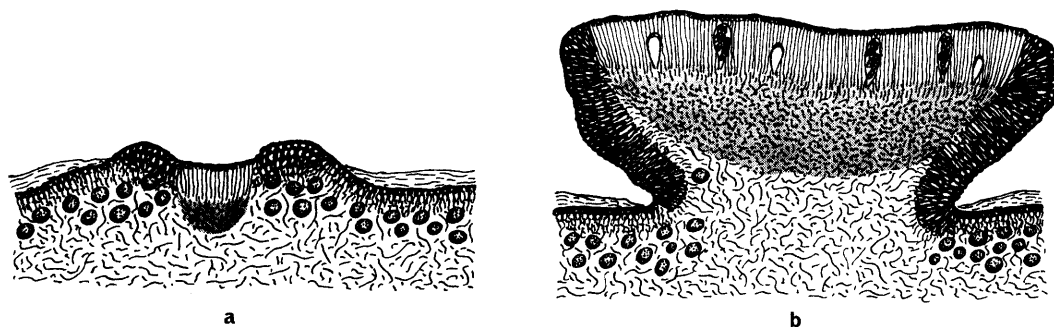


FIGURE 13

*Buellia frigida* Darb. (Mac.Robertson Land, Mawson Base; FILSON 4060). Vertical sections showing development of apothecia.

- a. Initial stage.  
b. Mature stage.

**Morphological description.** Thallus usually bicolorous (black and whitish-grey or ash-grey and whitish), matt, crustose, lobate-effigurate at periphery, forming  $\pm$  orbicular patches up to 8–10 cm. diameter, of moderate thickness (up to *c.* 0.5, rarely 0.8 mm.); effigurate margin black or whitish (or partly black and partly whitish), consisting of contiguous, often branching, flattened or tumid, smooth or minutely rugulose lobes 0.8–2.0 mm. long and 0.3–0.8 mm. wide, rounded at the tips, separated by rounded-off cracks. Inner part of thallus rimose-areolate with contiguous or scattered, plane or convex, bicolorous (black and whitish) or unicolorous (black or whitish) or sometimes ash-grey areolae separated by narrow cracks or rarely  $\pm$  coalescent. No protothallus developed; no visible hypothallus. No soredia.

Apothecia usually not numerous, irregularly scattered on central part of thallus, soon sessile, slightly to well constricted at base, 0.4–1.0 mm. diameter, round, black, matt or slightly nitid, not pruinose, at first  $\pm$  plane with thin, hardly prominent, black proper margin, then soon becoming hemispherical-convex and immarginate. Excipulum present at sides, reflexed at maturity, 30–50 $\mu$  thick, dark aeruginose or olivaceous brown-blackish, pseudoparenchymatous with cells in  $\pm$  radiating arrangement. Hypothecium obconic-lentiform, pale brownish to brown. Hymenium (50–) 60–75 (–80) $\mu$  high, gradually blue-green-blackish or sordid aeruginose (HNO<sub>3</sub>+ purple-red) in uppermost part. Paraphyses embedded in some mucilage but distinct and usually discrete under pressure, rarely branched, not anastomosing, stout (up to 3 $\mu$ ), capitate to 4–5 $\mu$  at the pigmented tips. Asci clavate, 50–60 $\times$ 14–20 $\mu$ . Spores 8 in ascus,  $\pm$  biseriate or partly uniseriate, brown, ellipsoid, not halonate, thinly 1-septate (also in young stages) with equal cells, small, (9–) 10–14 (–15) $\times$ (4.5–) 5.0–6.5 (–8.0) $\mu$ .

Pycnidia frequent, indicated by minute black spots in central areolae, immersed, globose or flask-shaped, often divided into several chambers, with colourless perifulcrical wall; conidia elongate-fusiform to sub-bacillar, straight, 4–6 $\times$ 1 $\mu$ , on simple, digitate-subulate conidiophores.

Thallus externally K–, C–, PD–, internally usually also thus, rarely K+ slowly red, PD+ yellow (probably due to norstictic acid); medulla I–.

**Discussion.** A conspicuous species of characteristic appearance, easily recognizable by the distinctly lobate-effigurate periphery and the often bicolorous (black and whitish) thallus, with no development of any protothallus.

By virtue of its effigurate thallus this species would seem to have a claim to inclusion in the section *Diploicia* (Mass.) Stizenb., although not so placed by Zahlbruckner (1930–31, p. 362). However, its apothecial ontogeny is quite different from that of *Buellia canescens* (Dicks.) De Not., the type-species of the section (see p. 7), and there is certainly no close relationship. Accordingly the character of peripheral lobation (effiguration) must be polyphyletic, and in itself not an adequate criterion for natural taxonomic

categorization above the species-level. Apothecial ontogeny in *B. frigida* appears in fact to be in no way different from that of the *Melanaspicilia*-type (see p. 9). The apothecia in early stages of development are completely immersed in the thallus, with enlarged and dark pigmented cells at the sides of the differentiating hymenium (Fig. 13a). At this stage the small, obconical hypothecium is already distinctly pigmented (pale brown). Some algal cells are present at the sides of the hymenium immediately below the developing excipulum, but already at this stage those in the upper part are dying off and disappearing. In mature apothecia (Fig. 13b) the pigmented excipulum is well developed at the sides; the hypothecium is either confluent with the excipulum or separated from it by a narrow, hyaline band, in which a few sporadic algal cells may occasionally be present. The hypothecium usually does not occupy the whole depth of the lower apothecium, the basal part being filled with loosely interwoven, intrusive hyphae from the medulla of the thallus. Sections treated with chlor-zinc-iodine solution often show the collapsed remains of cellulosic algal walls inside the marginal excipular tissue. In this respect there is, therefore, undoubtedly some transition towards the apothecial type found in certain *Rinodina* species, notably those of the section *Mischoblastia* (Mass.) Malme, in which the algae in the apothecial margin tend to die off and disappear (Malme, 1902, p. 20, 39). However, the structure of the mature apothecium is so essentially lecideine that it seems more natural to retain it in *Buellia* as originally proposed by Darbishire rather than transfer it to *Rinodina*.

The thallus has an upper cortex of capitate-fastigiata structure with the outermost cells rounded, up to  $6\mu$  diameter, and aeruginose or olivaceous-blackish ( $\text{HNO}_3$ + purple-red). This cortex is covered by a hyaline, almost amorphous necrotic layer  $8\text{--}24\mu$  deep, as pictured by Darbishire (1923a, fig. 8, p. 40). In addition to this, the cortex is in some places covered by an intermediate stratum of interwoven hyphae derived from the medulla; these hyphae are extruded upwards from the medullary layer through gaps in the algal and cortical layers. The variegation of black, whitish and grey colours observed in this species is correlated with these anatomical features:

<i>Anatomical structure</i>	<i>Colour of thallus</i>
Necral stratum absent or nearly so, pigmented cortex $\pm$ exposed	Black
Necral stratum well developed, superimposed directly on pigmented cortex	Grey
Necral stratum present; layer of loosely interwoven, extruded medullary hyphae present between necral stratum and pigmented cortex	White or whitish

The algal layer is irregular, interrupted,  $50\text{--}140\mu$  deep; algae trebouxoid, (9–)  $10\text{--}20$  ( $\text{--}23$ ) $\mu$  diameter. Medulla colourless, clear, lax, consisting of loosely interwoven hyphae  $3\text{--}5\mu$  thick, with walls of moderate thickness, running in various directions. The underside of the thallus has a few aeruginose-blackish, rhizoidal attachment-hyphae, but no true hypothalline tissue is developed.

*Buellia frigida* was described on the basis of 8 specimens from eastern Antarctica, McMurdo Sound, Granite Harbour, collected by BNAE, 1901–4, and preserved in BM (drawer collection). The specimens are of various sizes, on pieces of rock and pebbles of different nature; one of them is labelled as from Granite Harbour, the others are without indication of locality. One of the latter specimens, better developed than the others, is that shown in Darbishire's photograph (1910, pl. I, fig. 4), and it seems appropriate to designate it as lectotype of the species; it bears the number 19, and is on pinkish granitic rock, without accompanying species. It consists of several separate, orbicular thalli  $2\cdot5\text{--}7\cdot5$  cm. diameter, the effigurate margin even and complete, but the central parts in places patchy or deficient (tendency to ring-formation). The peripheral lobes are either entirely black, or black in the outer one-half to two-thirds and  $\pm$  abruptly grey-whitish inwards; their surface smooth or slightly rugulose. The areolae of the central part are contiguous or scattered,  $0\cdot2\text{--}0\cdot5$  ( $\text{--}0\cdot8$ ) mm. diameter, up to  $0\cdot3$  ( $\text{--}0\cdot5$ ) mm. thick,  $\pm$  isodiametric, rounded or angulose, plane or convex; some entirely black, a few entirely whitish, most of them variegated black and whitish.

*Buellia quercina* Darb. was collected in 1902 by BNAE, "probably from Granite Harbour"; the holotype, bearing the number 6, is in BM and is on a piece of lava, without accompanying lichens except for a few scattered apothecia of a *Caloplaca* species. It is quite similar in morphology and anatomy to *B. frigida*, differing only in having the marginal lobate zone lighter in colour, whitish or pale ash-grey. No taxonomic importance seems to attach to the distribution of the black, grey and whitish colours in *B. frigida*, due to the variations in anatomical structure described above, and I have no hesitation in reducing *B. quercina* to synonymy. Its thallus is negative to the usual reagents.

Zahlbruckner (1917, p. 52) treated *Buellia latemarginata* Darb. as a synonym of *B. frigida*, but this is incorrect; his description refers to *B. latemarginata* only. Darbishire's records (1912, p. 35, 45) from Graham Land, based on specimens collected by C. Skottsberg, are also erroneous; that from Hope Bay (SAE No. 165/166) is a small orbicular thallus of *Buellia granulosa* (Darb.) Dodge with  $\pm$  radiating cracks which give it a pseudoeffigurate appearance, while one of the specimens from Paulet Island (SAE No. 113 *pr. p.*) is *B. russa* (Hue) Darb., a cinereous condition with semi-immersed apothecia. Another specimen from Paulet Island in S, SAE No. 65, bears a small, sterile, orbicular thallus which could not be determined with certainty.\*

Good material of *B. frigida* collected by BATNE, 1910 from Victoria Land, Cape Adare and Evans Cove, and reported on by Darbishire (1923*a*, p. 39, 62) is also present in BM (sheet collection). It was in one of the specimens from Evans Cove (No. 32) that I obtained a positive reaction of the medulla—K+ slowly red, PD+ yellow—probably due to the presence of norstictic acid. A similar but weaker positive reaction was obtained in one of the specimens from west Graham Land, Debenham Islands (BGLE No. 1542-5). Other specimens seen were consistently negative in their reactions.

I am indebted to Dr. Carroll W. Dodge and Dr. Rex Filson for the opportunity of studying further material of this species from the Australian Antarctic Territory (Mawson Base, Kemp and Mac.Robertson Coasts). It is very uniform in gross morphology and in the anatomy of the apothecia. The usually blackened peripheral lobes may sometimes have a minutely granulated surface. The apothecia appear entirely black and lecidine from the first; they may remain for some time flat and thinly marginate, but finally become convex and immarginate. The hymenium is normally about  $75\mu$  high, and the paraphyses are noticeably stout.

The few specimens seen from the Antarctic Peninsula sector are small but typical.

Murray (1963, p. 62) recorded *Buellia frigida* from several localities in the Cape Hallett area of eastern Antarctica, and gave a description. He also considered the species best left in the genus *Buellia*.

**Geographical distribution.** *B. frigida* is a rather common endemic Antarctic species of circumpolar distribution, having been found in Victoria Land, Terre Adélie, and George V Land the Queen Mary, Ingrid Christensen, Mac.Robertson and Kemp Coasts, south-west Graham Land and Byrd Land. All collections so far have been made in coastal areas, and it is not known how far the species penetrates into the interior of the continent. Darbishire's record from Mount Erebus on Ross Island (1923*b*, p. 106) lacks confirmation. In the Antarctic Peninsula sector it has been found only on the west side of the peninsula south of lat.  $67^{\circ}$ S., and does not appear to be frequent.

The specimens examined from the Antarctic Peninsula sector are listed in Appendix III, Table XXVIII.

#### DOUBTFUL SPECIES

Four of the five following *Buellia* species described by Hue under *Lecidea* could not be found in the collection preserved at PC, and their identity cannot be established with certainty. Hue's descriptions, although lengthy, are often far from accurate, and seldom give an adequate conception of the gross morphology and general appearance. His failure to notice habitual resemblances, and his tendency to base new taxa on minutiae of anatomical structure, often quite variable and taxonomically insignificant, has already been commented upon by Magnusson (1944).

**L. conspicua** Hue, 1915, p. 143. Syn. *Buellia conspicua* (Hue) Darbishire, 1923*a*, p. 62.

Described from west Graham Land, Goudier Island (FAE 1908-10 No. 88 *pr. p.*). It has the following main features according to the description: thallus sordid reddish, areolate, up to 1 mm. thick, of areolae 1.0-1.5 mm. diameter with granulose surface, separated by rather wide cracks. No marginal prothallus

\* A SAE specimen from Paulet Island said to have been determined as *Buellia frigida* by Darbishire was recently described by Dodge (1965, p. 512) as a new species, *Bacidia Skottsbergii*. Unfortunately the number of the specimen is not quoted. No *Bacidia* was present on any of the Paulet Island specimens seen by me in S.

present. Thallus internally K+C slightly red\* (the individual reactions not given). Thallus-cortex fastigiate but not capitate, interspersed with reddish granules, 10–20 $\mu$  thick, covered by an outermost necrotic layer 20 $\mu$  thick. (Iodine reaction not mentioned.) Apothecia black, sessile, constricted at base, up to 0.5 mm. diameter, persistently plane, the margin finally  $\pm$  evanescent. Excipulum “black” on outside, reddish internally, 60 $\mu$  thick at sides, separated from the hypothecium by a  $\pm$  colourless layer. Hypothecium reddish-brown. Hymenium 75–80 $\mu$  high, with “black” epithecium. Spores 8, brown, thinly 1-septate, 13–20 $\times$ (6.0–) 7.5–9.0 $\mu$ . Pycnoconidia filiform, arcuate. Obviously one of the *B. coniops* group, and perhaps synonymous with either *B. coniops* (Wahlenberg) Th. Fries or *B. augusta* Vainio.

**L. dichromatina** Hue, 1915, p. 126. Syn. *Buellia dichromatina* (Hue) Darbishire, 1923a, p. 62.

Described from west Graham Land, Goudier Island (FAE 1908–10 No. 86 *pr. p.*). From the description given, the salient features are as follows: thallus generally glaucescent-whitish, but actually bicolorous (the same areolae partly whitish and partly cinereous), granulate-areolate, up to *c.* 1 mm. thick, of areolae with granulate surface, the granules 0.2–0.3 mm. diameter, hemispherical. No marginal protothallus developed. Thallus internally K+ yellow. Thallus-cortex of intricately hyphae (not capitate-fastigiate), interspersed with granules, 20–40 $\mu$  thick, covered by an outer necrotic layer 10 $\mu$  thick. Medulla I—. Apothecia black, sessile, constricted at base, 0.3–1.0 mm. diameter, persistently plane and marginate. Excipulum “black”, 120 $\mu$  thick at sides. Hypothecium “black”. Hymenium “black” above (height not indicated). Spores 8, brown, 1-septate, (15–) 26–28 $\times$ (8–) 12–13 $\mu$ . (Pycnidia not observed.) The large spores suggest *B. subpedicellata* (Hue) Darbishire, but the alleged iodine reaction of the medulla is not in agreement.

**L. imperfecta** Hue, 1915, p. 133. Syn. *Buellia imperfecta* (Hue) Darbishire, 1923a, p. 63.

Described from west Graham Land, Goudier Island (FAE 1908–10 No. 88 *pr. p.*). Compilation from Hue’s diagnosis indicates the following characters: thallus whitish or in places with a pale rufescent tinge, areolate, up to 0.6 mm. thick, of plane or convex, smooth or rugulose-granulose areolae 0.5–1.5 mm. diameter separated by narrow cracks or sometimes contiguous or piled-up (acervate). No marginal protothallus present. Thallus internally K+C slightly red (individual reactions not mentioned). Thallus-cortex fastigiate but not capitate, interspersed with granules, thin, 5–10 (–20) $\mu$  thick, covered by an outermost necrotic layer 10–40 $\mu$  thick. (Iodine reaction not given.) Apothecia black, sessile, constricted at base, 0.5–1.0 mm. diameter, thinly marginate, with plane or rarely convex disc. Excipulum “black”, 40 $\mu$  thick at sides. Hypothecium “black”, grading into brown in upper part, up to 400 $\mu$  deep. Hymenium blue-blackish above (height not indicated). Spores 8, dark brown, thinly 1-septate, 15–18 $\times$ 8–10 $\mu$ . (Pycnoconidia not seen.) These characters seem to indicate a state of *B. russa* (Hue) Darbishire, corresponding to “*Lecidea Petermannii*” Hue in the aeruginose epithecium, and it may be considered as a doubtful synonym of that species.

**L. melampoia** Hue, 1915, p. 142. Syn. *Buellia melampoia* (Hue) Darbishire, 1923a, p. 63.

Described from west Graham Land, Goudier Island (FAE 1908–10 No. 88 *pr. p.*). The following characters are indicated by the diagnosis: thallus mostly caesious-cinereous (in places reddish), areolate, up to 0.6 mm. thick, of rounded or variously angulose areolae 0.2–0.5 (–1.0) mm. diameter which are contiguous or separated by narrow cracks, with smooth or rugulose surface. No marginal protothallus developed. Thallus internally K—, C—. Thallus-cortex fastigiate but not capitate, interspersed with granules, 20–30 $\mu$  thick, with an outermost necrotic layer of the same thickness. Basal part of thallus in section brown-black. (Iodine reaction not mentioned.) Apothecia black, sessile, constricted at base, 0.5–1.0 mm. diameter, thinly marginate; disc plane, later becoming convex. Excipulum “black”, 40–80 $\mu$  thick at sides. Hypothecium “black”, grading to brown upwards, up to 240 $\mu$  deep. Hymenium “black” above (height not indicated). Spores 8, brown, 1-septate (the septum  $\pm$  thick), (13–) 16–19 $\times$ 8–9 (–10) $\mu$ . (Pycnoconidia not seen.) Impossible to recognize with certainty from the description; either *B. russa* (Hue) Darbishire or *B. latemarginata* Darbishire might come in question, and the description of a thickish spore-septum might also indicate *B. perlata* (Hue) Darbishire.

**L. modesta** Hue, 1915, p. 132 (*nom. illegit., non Lecidea modesta* Krempelhuber *ex anno* 1874). Syn. *Buellia modesta* (Hue) Darbishire, 1923a, p. 63 (*nom. illegit., non Buellia modesta* (Krempelhuber) Müller Arg. *ex anno* 1881); *Buellia modestula* Zahlbruckner, 1930–31, p. 382 (*ut nom. nov.*).

\* The following lichen acids are known to give this type of reaction: alectoronic, barbatic, collatolic, divaricatic, lobaric, microphyllinic, perlatolic and physodic. None of them has ever been demonstrated in any of the Antarctic *Buellia* species.

As mentioned on p. 37, I have examined the very small holotype specimen from west Graham Land, Petermann Island (FAE 1908-10 No. 142 *pr. p.*†), but did not sacrifice the single remaining apothecium for sectioning and hence have no first-hand knowledge of its microscopic characters. Data obtained (additional to those mentioned on p. 37) are: thallus thin, up to 0.3 mm. thick, composed of small, crowded, hemispherical to subglobose verruculae 0.15-0.30 mm. diameter  $\pm$  conrescent to form irregular areolar portions separated by irregular, black, gaping cracks. There is a thin, black, hypothalline layer which forms at the margin an indistinctly radiate-fibrose black protothallus 0.5 mm. wide. The outermost assimilative verruculae are  $\pm$  discretely scattered on the protothallus. Pycnidia are fairly numerous in the verruculae, black, lustrous, about 0.05 mm. diameter, hemispherical-emergent, with very fine, hardly visible ostiole; perifulcral wall in section at first colourless, at maturity pigmented (brown), pseudoparenchymatous with small cells, more heavily pigmented around the ostiole. Thallus-cortex  $\pm$  isabelline-inspersed, of fastigiate-cellular structure (not capitate), with cells 3-4 $\mu$  diameter. Algae dispersed throughout whole depth of the colourless medulla. Hypothalline tissue brown,  $\pm$  pseudoparenchymatous. Thallus-sections C-, I-. (The spores according to Hue are 14.0-18.5 (-20.0)  $\times$  7-10 $\mu$ .) If not a young growth-state of *B. russa*, as suggested on p. 37, it may represent a distinct species.

## 2. Genus *Rinodina* (Acharius) S. Gray, 1821, p. 448, *emend.* Massalongo, 1852, p. 14

**Syn.** *Lecanora*\* *Rinodina* Acharius, 1810, p. 344, 687.

*R. siphodes* (Acharius) Massalongo, the only species common to all three treatments cited above, is the lectotype of the genus (Dodge and Baker, 1938, p. 656).‡ The main taxonomic character which distinguishes *Rinodina* from *Buellia* is the presence of a thalline margin on the apothecia or at least the presence of symbiotic algae in the excipular margin. Several subgeneric groupings have been distinguished, partly on the thalline, partly on spore characters, and some if not all of these appear to represent natural assemblages. The taxonomy and phylogeny of the genus is discussed by Sheard in his recent treatment of the British species (1967).§

Particular use has been made of the form of the spores in this genus as a criterion for distinguishing subgenera and sections. They show a greater degree of variation than is found in the genus *Buellia*. Massalongo (1852, p. 40) erected the genus *Mischoblastia* (now treated as a section of *Rinodina*), comprising species with triangular or cordate spore-lumina. Arnold (1872) made use of spore form in classifying the European *Rinodina* species. Further discussion of spore types was given by Malme (1902), Poelt (1965b), and Sheard (1967).

Section *Rinodina* (syn. [subgen.]  $\alpha$ . *Eurinodina* Stizenberger, 1862, p. 169, sect. *Eurinodina* (Stizenberger) Malme, 1902, p. 18) is characterized by a uniform, non-effigurate thallus and unevenly to more or less evenly|| thickened spore wall with round or rounded-angulose cell lumina—two in subsection *Rinodina* (syn. subsect. *Pachysporaria* Malme, 1902, p. 18), four or more in subsection *Conradia* Malme, loc. cit. See Fig. 14b, and figs. 1a, b and 2f, g, h, i in Malme 1902, p. 12-13.

Section *Orcularia* Malme (1902, p. 20, 44) has a uniform, non-effigurate thallus, an often brown-pigmented hypothecium, and spores of the polarilocular type (Fig. 14c; Malme, 1902, fig. 1e on p. 12).

Section *Mischoblastia* (Massalongo) Malme (1902, p. 20, 39; syn. *Mischoblastia* Massalongo, 1852, p. 40) has a uniform, non-effigurate thallus, a poorly-developed thalline margin to the apothecia (sometimes darkened and with the symbiotic algae contained in it tending to die off, therefore simulating a lecideine condition), and two-celled spores with unevenly thickened wall and locules of triangular, cordate or bifurcate form (see Malme, 1902, fig. 2j on p. 13).

Section *Placothallia* (Trevisan) Vainio (1909, p. 69; syn. *Berengeria* sect. *Placothallia* Trevisan, 1853, p. 265) comprises species with lobate-effigurate thallus and two-celled spores with thin walls and septum (Fig. 14a). The apothecial thallus margin is well developed.¶

† It is called "*modica*" on the handwritten label.

\* This asterisk appears in the original citation.

‡ The type species of "*Rinodinomyces*" Thomas (a name applied to the fungal component in isolation) is, however, *R. archaea* Thomas (syn. *Rinodina archaea* (Acharius) Arnold), according to Ciferri and Tomaselli (1953, p. 72).

§ It should be noted that Sheard's terminology of spore forms differs somewhat from that used in the present report, e.g. the use of the terms *polarilocular* and *placodiomorphic*.

|| When unevenly thickened, the incrassation is developed around the septum and at the ends of the spore, as shown in our Fig. 14b.

¶ For this reason *Buellia frigida* Darbishire (p. 55), if transferred to *Rinodina* as suggested by Dodge, would not well fit into this section nor any of the others.

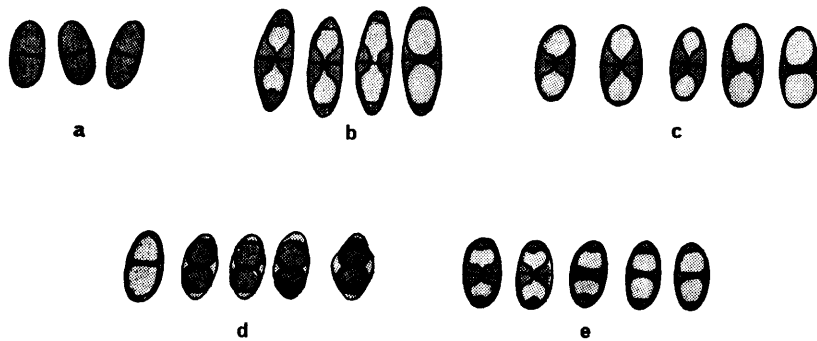


FIGURE 14

Spore types in Antarctic *Rinodina* species.

- a. *R. Petermannii* (Hue) Darb. (Beltraminia-type).
- b. *R. turfacea* (Wnbg.) Körb. (Pachysporaria-type).
- c. *R. deceptionis* M. Lamb (Orcularia-type).
- d. *R. endophragmia* M. Lamb (Endophragmia-type).
- e. *R. cf. diplocheila* Vain. ex H. Magn., BSWA 7948a (approaching Mischoblastia-type).

In addition, the genus *Melanaspicilia* Vainio (1909, p. 76) has been transferred as a section to *Rinodina* by Dodge and Baker (1938, p. 657). We have shown it to belong to *Buellia* (see p. 10).

Poelt (1965b, p. 22) has emphasized the fact that the internal thickening characteristic of the various spore types is due to the swelling of the inner cell wall, and that this swelling tends to be resorbed at maturity, so that old spores of all types may appear evenly thin-walled. I have found this to be the case also with the polarilocular spores of some of the Antarctic *Buellia* species (p. 12).

One of the Antarctic *Rinodina* species described below (*R. endophragmia*) has a distinct type of spore not hitherto described in the genus. These spores when young are ellipsoid and thinly 1-septate, but at maturity become bilocular with rounded, contiguous locules bounded by a dark-pigmented endosporial wall resembling the figure 8; the outer wall (exosporium) is paler and developed equatorially and at the ends, the overall shape of the spore being broadly ellipsoid to almost lemon-shaped (Fig. 14d). Such spores may be designated as the "endophragmia-type".

It is obvious that also other distinctive spore types exist in the genus *Rinodina*; Magnusson, for instance (1947, p. 202, fig. 8 on p. 201), describes and depicts spores with bluntly truncate apical protuberances, found in *R. mucronatula* H. Magn. In the circumstances, it would seem unwise to multiply further formal subgeneric categories based solely on spore characters.

The *Rinodina* species known from the Antarctic Peninsula sector belong to several of the above-mentioned groups and to some not yet formally classified, as follows:

1. Section *Rinodina* (subsect. *Rinodina*): *R. turfacea*, *R. archaeoides*, *R. cf. diplocheila*.
2. Section *Orcularia*: *R. deceptionis*.
3. Section *Placothallia*: *R. Petermannii*.
4. "Endophragmia-type" (see above): *R. endophragmia*.
5. Of uncertain subgeneric position (see discussion on p. 73); *R. nimbosea*.

## Key to the species of Graham Land and adjacent islands

- 1a. Growing on decayed mosses, detritus or "soil".
  - 2a. Thallus squamulose; spores thinly 1-septate .. .. . *R. nimbosea* (p. 73)
  - 2b. Thallus granulose or verruculose or evanescent (usually hardly visible on account of dense covering of apothecia); spores (at least in younger condition) with thickened septum and end-walls.
    - 3a. Spores large, c.  $25-30 \times 10-11 \mu$  .. .. . *R. turfacea* (p. 62)
    - 3b. Spores smaller, c.  $16-21 \times 8-9 \mu$  .. .. . *R. archaeoides* (p. 63)
- 1b. Growing directly on rock (*R. Petermannii* rarely and atypically extending over mosses).
  - 4a. Thallus lobate-effigurate at periphery: margin of apothecia always concolorous with the thallus; spores thinly 1-septate (also in younger condition) .. .. . *R. Petermannii* (p. 68)

- 4b. Thallus effuse, indeterminate; margin of apothecia often darkened and appearing lecideine; spores (in younger condition) with variously thickened walls and septum.
- 5a. Immature spores with darker and constricted endosporium and paler exosporium (Fig. 14d)  
*R. endophragma* (p. 71)
- 5b. Spores not as described above.
- 6a. Immature spores polarilocular (Fig. 14c) .. .. . *R. deceptionis* (p. 65)
- 6b. Immature spores not polarilocular, but with thickened septum and apices and rounded to slightly cordate lumina (Fig 14e) .. .. . *R. cf. diplocheila* (p. 64)

***Rinodina turfacea*** (Wahlenberg) Körber, 1855, p. 123

- Syn.** *Lichen turfaceus* Wahlenberg, 1812, p. 408; *Pachysporaria turfacea* (Wahlenberg) Choisy, 1949, p. 111 (7 of reprint).\*
- Lecanora sophodes* var. *orbata* Acharius, 1810, p. 678; *Rinodina orbata* (Acharius) Vainio, 1909, p. 71.\*
- Rinodina egentissima* Hue, 1915, p. 97; *Rinodina egentissima* (Hue) Darbishire, 1923a, p. 61.
- Icon.** Plate XIIe: specimen from west Graham Land, Moss Islands, SAE (without number),  $\times 4$ . Figs. 14b and 15.
- Lynge, 1928, pl. V, figs. 4-6; spores.

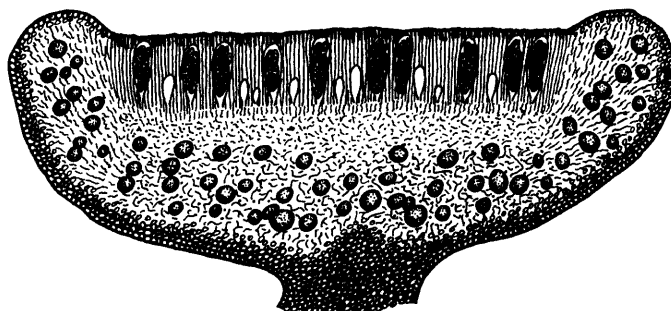


FIGURE 15

*Rinodina turfacea* (Wnbg.) Körb. (BSWA 8072a).  
Vertical section of apothecium.

**Morphological description.** Thallus encrusting dead stems and leaves of mosses, brownish or occasionally grey or whitish, effuse, crustose, matt, not pruinose; granulate or verruculose, usually not or hardly visible on account of the dense covering of apothecia. No protothallus developed. No soredia.

Apothecia extremely abundant and crowded, sessile, scutelliform, constricted at base, round or deformed by mutual pressure, 1.0-1.5 (-2.0) mm. diameter (sometimes smaller, 0.5-0.8 mm.), persistently plane or concave, with moderate, prominent, entire or  $\pm$  crenulate thalline margin concolorous with the thallus, usually pale reddish-brown, sometimes paler (alutaceous). Disc brownish-black, matt, not pruinose. Thalline margin containing symbiotic algae, bounded by an outer cortical layer 30-60 (-100) $\mu$  thick, reddish-brown in outer part or entirely colourless, of conglutinated structure with thick-walled,  $\pm$  gelatinized hyphae in predominantly parallel or palisadic-radiating arrangement. Algal-medullary tissue colourless, clear, of loosely intricated, thick-walled, gelatinous hyphae. Hypothecium shallow, 15-40 (-50) $\mu$  deep, colourless, resting on algal-medullary tissue. Hymenium commonly 100 $\mu$  high (80-115 $\mu$ ), reddish-brown in uppermost part. Paraphyses embedded in hyaline mucilage but distinct, at tips reddish-brown and clavate-capitate to 3-4 $\mu$ . Asci clavate, 70-90 $\mu$  long. Spores (3-) 5-8 in ascus, biseriate, soon dark brown, ellipsoid or fusiform-ellipsoid, straight or occasionally bean-shaped, rounded or bluntly acuminate at ends, transversely 1-septate with thickened septum and ends, (23-) 25-30 (-35)  $\times$  (8-) 10-11 (-14) $\mu$ .

(Pycnidia not observed in our material; according to Th. Fries, 1867, p. 25, straight, cylindrical, 4-5 $\mu$  long.)

\* Other synonyms on this basionym are to be found in Zahlbruckner, 1930-31, p. 537-39.

Thallus macroscopically and microscopically K—, C—, PD—, I—.

**Discussion.** Specimens of this species from western Antarctica tend on the whole to be more amply and luxuriantly developed than those from the Northern Hemisphere. In thickness and general appearance the Antarctic specimens correspond most closely to the state described as var. *pachnea* (Acharius) Anzi, as exemplified by No. 84 of Hepp's *Flechten Europas* ("*Psora turfacea*  $\beta$ . *pachnea*"). Central European specimens often have the thalline margin of the apothecia pale, whitish, as in e.g. No. 1668 of *Krypt. Exs. Vindob.*, from Tirol; Arctic and Scandinavian material has a more coppery-rufescent tinge, but are still paler than the majority of Antarctic samples, which are distinctly tawny-rufescent (pale only where growing in shaded crevices).

The spores, when treated with KOH, often swell considerably. The original cross-septum, visible as a thin line, is secondarily thickened (endosporium) up to 3–6 (–8) $\mu$ , and this thickened part is traversed by a rather wide connecting canal interrupted by the septum; the spore-wall is similarly thickened at the apices, to 4–7 $\mu$ . In older spores the incrustation of septum and end-walls becomes gradually resorbed, and completely mature spores appear thinly 1-septate with an even wall equal to the septum in thickness, about 1 $\mu$ .

According to Magnusson (1947, p. 203, 263) the outer cortex of the apothecia of *R. turfacea* is coloured pale blue by iodine. I was able to obtain a very faint and fugaceous reaction of this type in some of our Antarctic specimens, but it seems to be inconstant even in Northern Hemisphere material cited by Magnusson, e.g. the above-mentioned Hepp exsiccata. It should be noted also that Vainio (1909, p. 73) stated of the f. *ecrustacea* (Vainio) Magnusson: "*Stratum corticale excipuli . . . iodo non reagens.*" The shallow hypothecial tissue, however, usually stains violet-blue with iodine.

Sections of the thallus, where it is visible between the congested apothecia, show an outermost, colourless, stratified necrotic layer up to 18 $\mu$  in thickness, below which occurs an upper cortex, 12–18 $\mu$  thick, of capitate-subfastigiate structure, consisting of gelatinously conglutinated and somewhat randomly intricately hyphae of which the outermost end-cells are pale brown, 3–5 $\mu$  diameter and moderately thick-walled. No lower cortex is developed; the thallus is attached to moss-remains by the lower medullary tissue.

Although Hue's type specimen of *Lecanora egentissima* in PC (FAE 1908–10 No. 158) is extremely scanty, it seems obviously to be a state of *R. turfacea* with apothecia smaller than usual, 0.4–0.6 mm. diameter. Numerous old spores were seen in a squash preparation, and were 24–33  $\times$  12–14 $\mu$ , mostly thinly 1-septate but a few with the septum still thickened up to 2.5 $\mu$  and in some cases with indication of a connecting tube. Some of the material of *R. turfacea* which I collected at Hope Bay, east Graham Land, e.g. FIDS No. D2495, and on Anvers Island, west Graham Land (BSWA No. 8001b) has many or most of the apothecia small, 0.6–0.8 mm. diameter, with only some attaining normal size, up to 1.5 mm. Murray (1963, p. 63) has recorded *Rinodina egentissima* from the Cape Hallett area of eastern Antarctica. I have not seen this material, but believe, in view of the spore-measurements given (18–25  $\times$  10.0–11.5 $\mu$ ), that it is probably referable to *R. turfacea* rather than *R. archaeoides* (p. 63).

The record of "*Rinodina turfacea*" in Darbshire, 1910, p. 7 from eastern Antarctica, south Victoria Land, refers to *R. archaeoides* H. Magn., according to the present author's revision of the corresponding BNAE material in BM. Subsequent records by Darbshire from the Graham Land area (SAE) are correct.

**Geographical distribution.** *R. turfacea* is a bipolar, circumpolar-alpine species, rather common in northern Scandinavia and in the Alps of central Europe; for a list of Northern Hemisphere localities, see Magnusson, 1947, p. 264–66. It has recently been recorded also from the Himalayan region (Awasthi, 1963, p. 36). In the Southern Hemisphere it appears to be rare in eastern Antarctica (cf. Murray's record of "*R. egentissima*" discussed above) but is common in western Antarctica (Graham Land, South Shetland and South Orkney Islands). It occurs off both the west and east coasts of Graham Land, but has not been seen by me from further south than about lat. 65°S.

The specimens examined are listed in Appendix III, Table XXIX.

### *Rinodina archaeoides* H. Magnusson, 1947, p. 278

**Syn.** *Rinodina archaea* f. *minuta* Arnold, 1887, p. 116.

**Morphological description.** Thallus very thin or evanescent, effuse, whitish-grey, over living or dead mosses.



Apothecia abundant and usually crowded, adpressed, round, constricted at base, small (0.3–0.6 mm. diameter), with thin, smooth, slightly prominent, pale brownish or greyish margin; disc plane to slightly convex, black or brown-blackish, matt, not pruinose. Algae present in margin and extending below hypothecium. Cortex of margin attenuated above, below 25–50 $\mu$  thick, colourless or in places faint brown in section, composed of gelatinized, conglutinated, flabellate-radiating, rather thick-walled hyphae. Hypothecium colourless, very shallow. Hymenium about 75 $\mu$  high, gradually red-brown in uppermost part. Paraphyses conglutinated, but  $\pm$  discrete under pressure, swollen to 3–4 $\mu$  at the pigmented apices. Spores 8 in ascus, irregularly biseriate, olivaceous then dark brown, similar to those of *R. turfacea* but smaller, 16–21 (–25)  $\times$  8–9 (–10) $\mu$ .

Thalline reactions negative, as in *R. turfacea*.

**Discussion.** This species, previously unreported from the Southern Hemisphere, has not yet been found in the Antarctic Peninsula sector, but occurs in eastern Antarctica and may eventually be found in our area, for which reason I have included it in the present treatment. Externally it has the appearance of a small condition (“*egentissima*”-type) of *R. turfacea*, but is distinguishable microscopically by the smaller spores. The following two Antarctic specimens have been seen:

South Victoria Land: “land close about Winter Quarters”, over pulvinate clumps of moss (*Tortula* sp. *vide* W. R. Sherrin), collected by BNAE, 15 December 1903, no number, in BM, determined by Darbishire as “*Rinodina turfacea*” and published as such by him (1910, p. 7). (A *Lecanora* of the *Hageni*-group is also present as intermixture.)

Mac.Robertson Land: Cape Bruce, over decaying moss, collected by R. Filson, 8 October 1962, No. 4334, in herb. R. Filson (South Yarra, Australia), and duplicate fragment in FH.

Comparison was made with six authentic Swedish and Norwegian specimens of *R. archaeoides* in the Magnusson herbarium, lent through the courtesy of Dr. R. Santesson, Institute for Systematic Botany, University of Uppsala, Sweden. Prior to the description of *R. archaeoides* in 1947 I had determined the BNAE specimen as *Rinodina laevigata* (Acharius) Malme, but that is a corticolous species shown to be different by Magnusson in the monographic study cited.

*R. archaeoides* was previously known from the Arctic regions (Greenland, Jan Mayen, Bear Island, Novaya Zemlya, Bering Straits region), Scandinavia and the Alps of central Europe. Recently it has also been recorded from North America (Wetmore, 1967, p. 427).

*Rinodina* cf. *diplocheila* Vainio ex H. Magnusson, 1924, p. 387\*

Icon. Fig. 14e.

**Morphological description.**† Thallus dark grey, greyish brown to dark brown, effuse, uniform, very thin (up to 0.2 mm. thick), continuous or areolate with slightly verrucose-convex areolae 0.2–0.4 mm. diameter, matt. A blackish proto- and hypothallus often visible at margin and between areolae.

Apothecia at first immersed, then becoming adpressed-sessile, round, 0.2–0.4 mm. diameter, when young with a smooth thalline margin, this soon becoming reflexed and excluded, the mature apothecia then appearing lecideine. Disc brown-blackish to black, smooth, matt, finally  $\pm$  convex. Hypothecium colourless or faintly isabelline, 30–65 $\mu$  deep. Algae present below hypothecium and extending into margin. Hymenium 65–85 $\mu$  high, dark brown in uppermost part. Paraphyses  $\pm$  coherent, at tips brown-capitate to 3–5 $\mu$ . Asci broadly clavate, 35–50 $\mu$  long. Spores 8 in ascus, ellipsoid, greenish-brown to dark brown, 1-septate, (13–) 15–17  $\times$  7.0–8.5 $\mu$ , in younger condition with thickened walls and septum and rounded to subcordate lumina.

Thallus externally and internally K—, C—, PD—, I—; hymenium I+ deep blue.

**Discussion.** I have seen a single Antarctic specimen, scanty and apparently ill-developed, but showing rather good agreement, both morphologically and anatomically, with European material of this species. However, until more Antarctic material becomes available for study, the identification cannot be regarded as completely certain. Nevertheless the resemblance is very close, and my own observations in this respect, based on comparison with specimens from Sweden, are supported by Dr. G. N. Degelius (University of Göteborg), who has seen our Antarctic specimen and is well acquainted with *R. diplocheila* in nature.

Our specimen from Deception Island, South Shetland Islands (BSWA No. 7948a) has a very thin, effuse, greyish-alutaceous, matt thallus in small disrupted patches between other lichens (*Buellia coniops*,

\* First published as a *nomen nudum* ex Havaas, 1910, p. 16.

† Based on European material.

*Caloplaca* sp.); it is mostly continuous, but here and there in indentations of the rock is slightly thicker and has irregular cracks or rarely a few distinct, flattened areolae up to 0.3 mm. diameter. Apothecia 0.2–0.4 mm. diameter, at first semi-immersed, then becoming adpressed-sessile, plane, black or brownish-black, in young stages with the outer side paler (concolorous with the thallus), finally appearing entirely black and lecideine with a thin, indistinct, black margin. In section they are seen to have a layer of algae below the hypothecium and extending into the margin. Hypothecium colourless to faintly isabelline, 35–75 $\mu$  deep. Hymenium about 80 $\mu$  high, dark brown above. Spores 8 in ascus, from pale smoky greenish becoming olivaceous then dark brown, 16.5–18.0 (–21)  $\times$  8–9 $\mu$ , when young with the septum and apices thickened and the lumina rounded to slightly cordate; the thickening gradually resorbed as the spores mature, so that they finally appear thinly 1-septate. Pycnidia (not previously recorded in *R. diplocheila*) forming minute black spots on the thallus; conidia ellipsoid-bacillar, 3.0–3.5  $\times$  c. 0.7 $\mu$ , borne on short, tapered conidiophore-cells 5–6 $\mu$  long, 3–4 $\mu$  broad.

The thinness of the thallus in the Antarctic specimen prevented exact observation of its microscopic structure. In Scandinavian material the thallus-cortex is capitate-fastigiate with the outermost cells of the  $\pm$  perpendicular hyphae brownish, 5–7 $\mu$  diameter, sometimes covered by a colourless necrotic layer about 5 $\mu$  thick. Trebouxoid symbiotic algae are  $\pm$  effusely distributed in the thallus. Medullary hyphae thick-walled, 3–4 $\mu$  diameter, closely intricated and connected.

The spores of *R. diplocheila* approach the so-called “mischoblastiomorphic” condition in their often subcordate lumina, and the finally lecideine appearance of the apothecia is also similar (although perhaps only superficially) to that seen in species of the section *Mischoblastia*; it occupies a somewhat anomalous position between the latter and section *Rinodina*.

As was pointed out by Degelius (1939, p. 194), there are four *Rinodina* species of this assemblage closely resembling each other and distinguished mainly by the size and form of their spores: *R. salina* Degel. (= *R. demissa* auctt.), *R. milvina* (Wnbg.) Th. Fr., *R. diplocheila* Vain. ex H. Magn. and *R. cacuminum* (Th. Fr.) Malme. Malme (1927, p. 252) denied the specific distinction between *R. diplocheila* and *R. demissa* (= *salina*), but this view was refuted by both Magnusson (1930, p. 474) and Degelius (1939, p. 191).

In Europe, *R. diplocheila* is reported to grow on damp overhung or perpendicular, gneissic-schistose rocks (Degelius, 1939, p. 191; Magnusson, 1935, p. 15–16). The Antarctic specimen was found on basaltic stones on a volcanic slope.

**Geographical distribution.** Norway (Hardanger) and western Sweden (Bohuslän, Västergötland, Halland and Småland).

The specimen here tentatively referred to this species is listed in Appendix III, Table XXX.

### *Rinodina deceptionis* M. Lamb, n. sp.

**Icon.** Plate XIIc, d: portions of the holotype specimen (BSWA No. 7883a) in FH from the South Shetland Islands, Deception Island,  $\times 4$ .

Fig. 14c, 16a-d.

**Diagnosis.** *Thallus crassitudine varians* (0.2–1.5 mm.), *effusus, indeterminatus, cinereus (madefactus leviter fuscescens) aut flori lactis concolor, areolatus, areolis irregularibus, angulosis*, (0.3–) 0.6–2.0 mm. *latis, interdum compositis; proto- et hypothallus obscurus deest. Apothecia crebra, primum in thalli areolis innata, alia persistenter aspicilioidea, alia dein emergentia et adpresso-sessilia; sunt rotunda, saepe contigua et mutua pressione angulosa*, 0.4–0.8 mm. *lata, persistenter plana, disco nigro, opaco, epruinoso praedita et margine thalino cincta tenui, integro, leviter prominenti, pallido (thallo concolori) aut interdum nigrescenti vel etiam excipulo proprio obscuro evoluto facie lecideina. Margo apotheciorum saltem juventute algas continens, extrinsecus cortice fuscocapitato vestitus. Hypothecium incolor vel subisabellinus, glomerulis algarum increbrioribus superpositum. Hymenium 90–110 $\mu$  altum, superne fuscum. Sporae 8nae, ex olivaceo fusciscentes, ellipsoideae, 1-septatae, juniores polariloculares, tandem loculis approximatis rotundatisque et septo leviter constrictae*, 17–24  $\times$  (9–) 10–11 $\mu$ . *Thallus extus intusque reagentibus solitis non mutatur. Pycnidia numerosa, maculis minutis nigris indicata; conidia recta, ellipsoideo-bacillaria, 3–4  $\times$  0.8 $\mu$ . Affinis ut videtur R. antarcticae Müll. Arg., a qua praecipue apotheciis majoribus, magis prominentibus et obscurius coloratis differt; primo intuitu R. milvinam (Wnbg.) Th. Fr. fere in memoriam recovat, sed thallo multoties crassiore, aliter colorato, hypothallo obscuro nullo mox distinguitur.*

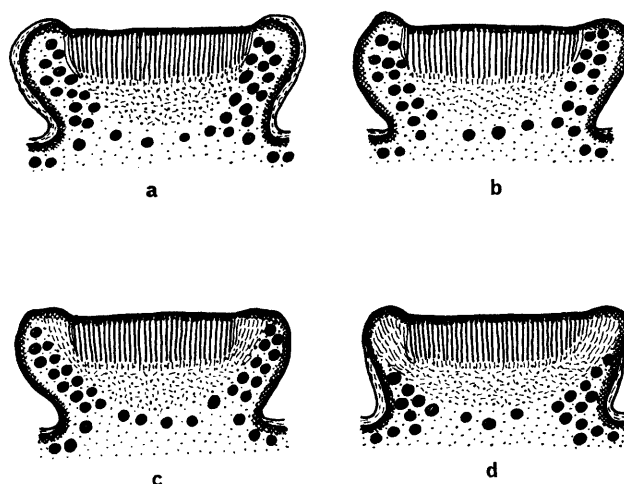


FIGURE 16

Anatomical types of apothecia in *Rinodina deceptionis* M. Lamb (in semi-diagrammatic vertical section).

- a. Apothecium of normal lecanorine appearance; excipulum proprium not or hardly developed; necrotic layer present on thalline margin.
- b. Apothecium of lecideine appearance due to absence of necrotic layer on thalline margin.
- c. Apothecium of lecideine appearance due to combination of well developed excipulum proprium and thalline margin without necrotic layer.
- d. Apothecium of lecideine appearance due to strong development of excipulum proprium.

**Morphological description.** Thallus of variable thickness, 0.2–1.5 mm., effuse, indeterminate, ash-grey (pale brownish-grey on moistening) or cream-coloured, areolate; areolae irregular, angulose, (0.3–) 0.6–2.0 mm. diameter, sometimes composed of verruculae or smaller areolate portions; no dark hypo- or protothallus present. No soredia.

Apothecia numerous, at first innate in areolae (aspicilioid), sometimes remaining so, or then becoming  $\pm$  emergent and adpressed-sessile, round, often contiguous and angulose from mutual pressure, 0.4–0.8 mm. diameter, persistently plane, with black, matt, non-pruinose disc and thin, entire, slightly prominent, pale thalline margin (concolorous with thallus) occasionally blackening or excluded by the dark proper margin which is sometimes developed, then appearing  $\pm$  lecideine. Margin outwardly dark brown, internally colourless, in young condition containing algae, later often without algae. Hypothecium colourless or faintly isabelline, sparsely subtended by algae. Hymenium 90–110 $\mu$  high, brown above. Paraphyses involved in mucilage but distinct and separable under pressure, at tips capitate to 3–4 $\mu$  and there brown (the pigment often forming an apical cap). Asci clavate, about 90 $\mu$  long and 22 $\mu$  broad. Spores 8 in ascus, irregularly biserial, olivaceous then brown, ellipsoid, 1-septate, in young condition polarilocular with the septal thickening traversed by a rather wide canal, finally with approximated, rounded locules and slightly constricted at the septum (Fig. 14c); 17–24  $\times$  (9–) 10–11 $\mu$ .

Pycnidia abundant, indicated by minute black spots in thallus-areolae; perifulcrical wall colourless; conidia ellipsoid-bacillar, straight, 3–4  $\times$  0.8 $\mu$ , borne on simple, tapered-digitate sterigmata about 12 $\mu$  long.

Thallus externally and internally K—, C—, PD—, I—.

**Discussion.** The two specimens seen differ somewhat in thickness and colour of the thallus and appearance of the apothecia.

In the type specimen (BSWA No. 7883a) the thallus is thick, 1.0–1.5 mm., fissured into irregular angulose areolae 0.8–2.0 mm. diameter, the larger of which are obviously compound, made up of conrescent verruculae or small plane portions; its colour is uniformly ash-grey (pale brownish-grey on moistening). The apothecia mostly have a thin, entire, slightly prominent thalline margin concolorous with the thallus; some apothecia show development of a  $\pm$  distinct, blackish proper margin (*excipulum proprium*) inside the thalline margin, and occasionally the latter may disappear entirely, giving some apothecia a lecideine appearance.

In the other specimen, collected twenty years previously, the thallus is cream-coloured to pale alutaceous, probably due to conservation in the herbarium; it is thinner (0.2–0.5 mm.), with smaller areolae 0.3–0.8 mm. diameter which show no tendency to become confluent and form composite portions. The pale thalline margin of the apothecia is soon evanescent and replaced by a black, entire, slightly prominent margin which has the appearance of a lecidine proper margin and in certain cases is actually so (see further discussion below).

In other respects the two specimens are quite similar, also in microscopic structure. The thallus has an outermost, colourless necrotic layer up to  $40\mu$  thick showing the faint, stratified outlines of degenerated hyphae. Cortex 15–22 $\mu$  thick, capitate-fastigiate, colourless except for a single outer layer of rounded, brown-pigmented cells 3–4 $\mu$  diameter. Algal layer diffuse and somewhat irregular, 60–100 $\mu$  deep; algae trebouxoid, 7–15 $\mu$  diameter; medulla compact, colourless or faintly isabelline, composed of compacted and intricately hyphae poorly visible on account of heavy and dense inclusions of foreign substance (sordid greyish granules and substratum-particles). The medulla is directly adnate to the rock, no dark basal hypothalline tissue being developed.

The thalline margin of the apothecia in the type specimen has a cortex of capitate-fastigiate structure, dark brown in its outermost 8–12 $\mu$ , colourless internally, of cellular structure with thin-walled,  $\pm$  isodiametric cells 3–4 (–6) $\mu$  diameter. Young apothecia have abundant algae inside the margin; in older apothecia there are usually no algae visible, although dead, discoloured remains of algal cells are often present. The hypothecium is compact and  $\pm$  clear in section, up to 120 $\mu$  deep in the centre (deeper in young, still immersed apothecia); it has rounded cell-lumina 3–4 $\mu$  diameter. A scanty and diffuse layer of algae is usually present below the hypothecium.

Sections of several apothecia at various stages of development in both specimens show that the lecidine appearance assumed by some of the older apothecia (especially in FIDS No. B 1111d) may be produced either by the thalline margin or by the proper margin, or by a combination of both. The fastigiate-capitate cortex of the thalline margin is more densely brown-pigmented than that of the thallus, and when no outer necrotic layer is present, as is frequently the case, it appears blackish macroscopically, like a proper margin (Fig. 16b). If the necrotic layer is present, the margin appears pale like the thallus (Fig. 16a). A genuine proper margin (excipulum proprium) is also usually present, in varying degrees of development, inside the thalline margin. The dark margin which surrounds some apothecia, and gives them a lecidine appearance, may be formed by (i) a darkened thalline margin (Fig. 16b), (ii) a well-developed proper excipulum excluding the thalline margin (Fig. 16d), or (iii) a combination of both (Fig. 16c). These three anatomical types are indistinguishable in macroscopic surface view.

Both specimens occurred on somewhat weathered agglomerate rock on volcanic slopes. The population from which the type specimen was taken formed a diffuse cover over an area of approximately half a square metre, interspersed with thalli of a species of *Caloplaca*, on an outcrop frequented by gulls and skuas, indicating that the species is either obligately or facultatively nitrophilous.

*R. deceptionis* has some resemblance to a thick and over-nourished *R. milvina* (Wnbg.) Th. Fr., but differs in the ash-grey (not brownish) thallus, absence of dark hypothallus, etc. From *R. atrocinerea* (Dicks.) Körb. it is distinguished by its thicker, less regularly areolate thallus without dark hypothallus, and its more immersed apothecia. Of all the species of the *milvina-demissa* group, it resembles *R. arenaria* (Hepp) Th. Fr. most closely in external appearance, but differs greatly in microscopic characters (lower hymenium, smaller, not "mischoblastiomorphic" spores, etc.). Among Southern Hemisphere species its closest relationship seems to be with *R. philomelensis* Zahlbr. (Falkland Islands) and *R. antarctica* Müll. Arg. (Tierra del Fuego). The former is distinct in its much thinner and less coarsely diffract-areolate thallus, shorter pycnoconidia, etc. The resemblance to the latter, however, is much closer, and the rather inadequate diagnosis given by Müller Arg. (1889, p. 163) does not bring to light any obvious differentiating characters. It was, therefore, necessary to reinvestigate the type specimen of *R. antarctica*, and it was obtained through the courtesy of the Institut de Botanique Systématique (Herbier Boissier), Genève, Switzerland. Study of it showed it to be a distinct though closely related species; see revised description in Appendix I, p. 84. The main differences can be tabulated as follows:

*R. deceptionis*

Thallus up to 1.5 mm. thick, its cortex capitate-fastigiate with brown-pigmented outer cells, not granulose-inspersed.

*R. antarctica*

Thallus up to 0.3 mm. thick, its cortex inspersed with minute granules, not pigmented, not capitate-fastigiate.

No dark prothallus present.	A dark prothalline line present in places.
Apothecia 0·4–0·8 mm. diameter, often finally appearing lecideine with a blackish margin.	Apothecia 0·1–0·4 mm. diameter, never appearing lecideine or with blackish margin.
Apothecial disc black.	Apothecial disc brown to brown-blackish.
Outer part of excipulum proprium dark brown in section.	Outer part of excipulum proprium yellow to golden-brown in section.
Epithecium brown.	Epithecium golden-yellow to pale golden-brown.
Spores 17–24 × (9–) 10–11 $\mu$ .	Spores somewhat shorter and broader, 14–21 × 10–12 $\mu$ .

**Geographical distribution.** Known only from Deception Island, South Shetland Islands. The specimens examined are listed in Appendix III, Table XXXI.

*Rinodina Petermannii* (Hue) Darbishire, 1923a, p. 61

**Syn.** *Lecanora Petermannii* Hue, 1915, p. 96.

**Icon.** Plate XIIa: portion of a specimen from west Graham Land, Melchior Islands, BSWA No. 7982, ×4.

Plate XIVb: specimen from west Graham Land, Anvers Island, BSWA No. 8096, ×2.

Plate XIVa: field photograph showing extensive growth on basalt dyke at Goudier Island, west Graham Land.

Figs. 14a, 17.

**Morphological description.** Thallus forming circular or confluent patches, crustose, lobate-effigurate at periphery, in central part unevenly verrucose and rimose-diffract, pale brown to reddish-brown or sometimes paler (alutaceous), matt, often partly whitish-pruinose, usually 1–3 mm. thick in central parts (rarely up to 5 mm.). No prothallus, but dark brown or blackish hypothallus present; undersides of marginal lobes pallid to blackish. No soredia.

Apothecia usually present but not abundant, 0·6–1·5 mm. diameter, sessile, round, constricted at base, with persistent, prominent or finally  $\pm$  reflexed, moderate, entire or slightly crenulate thalline margin concolorous with the thallus; no proper margin visible. Disc plane to slightly convex, black or brown-blackish, matt, naked or occasionally white-pruinose. Margin with a brown cortex similar to that of thallus, internally colourless, containing symbiotic algae. Hypothecium 70–240 $\mu$  deep, colourless to faintly isabelline, subtended by scattered groups of algae. Hymenium (70–) 90–100 (–110) $\mu$  high, dark reddish-brown in upper part. Paraphyses discrete, at apices pigmented and capitate to 5–6 $\mu$ . Asci clavate, 70–85 × 14–20 $\mu$ . Spores 8 in ascus,  $\pm$  biseriata, brown, ellipsoid, thinly 1-septate (also in young condition) with even, thin wall, not constricted at septum, (13–)14–17(–18) × 7–9 $\mu$  (Fig. 14a).

Pycnidia frequently present, immersed in slight swellings of thallus, with minute, punctiform, reddish-brown to blackish ostiole; perifulcral wall  $\pm$  convoluted, colourless to faintly isabelline in section; conidia filiform, arcuate, 15–24 $\mu$  long, about 0·6 $\mu$  thick, borne terminally on simple or dichotomously branched, subulate sterigmata.

Thallus externally K–, C–, PD–, internally usually K–, C–, PD–, rarely K+ slowly dull red (with formation of red spicular crystals under microscope) and PD+ yellow. Medulla I–.

**Discussion.** The type material consists of four specimens from west Graham Land, three from Petermann Island and one from Goudier Island. Two of these were found in PC and studied; as lectotype I have chosen FAE 1908–10 No. 304 *pr. p.* from Petermann Island, on granodioritic rock associated with *Lecanora charcotiana* Hue, *Buellia perlata* (Hue) Darb. (syn. *B. dimorphota* (Hue) Darb.) and *Buellia subpedicellata* (Hue) Darb. The other cited specimen seen was also from Petermann Island (FAE 1908–10 No. 179 *pr. p.*), a very small thallus with immature apothecia, associated with species of *Xanthoria*, *Caloplaca*, *Buellia* and *Physcia*. A third specimen identified by Hue, but not mentioned in his report, is FAE 1908–10 No. 81 *pr. p.*

from Goudier Island, a minute and poorly-developed specimen with pycnidia and apothecial initials, occurring as intermixture with *Caloplaca* and *Lecanora* spp. None of these authentic specimens is well developed; that chosen as lectotype had only one mature apothecium.

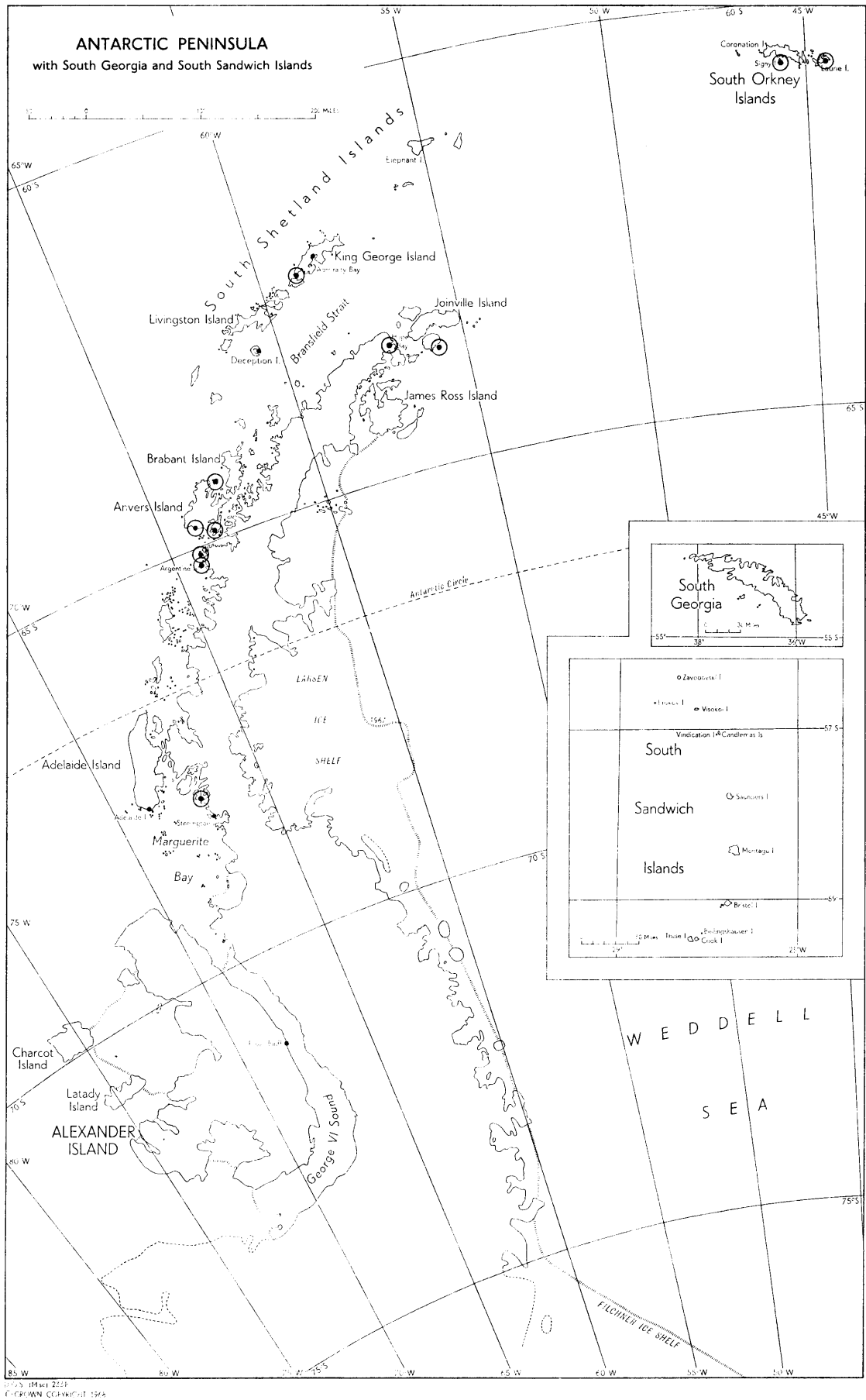
The thallus of *R. Petermannii* varies rather widely in colour, from buff or alutaceous to coppery brown or dark brown; when pale, it sometimes turns reddish-brown on moistening. A whitish pruina is often present, derived from disintegration of the superficial necrotic layer; it is sometimes quite coarse, scabrid to minutely granulate. The thallus surface is always matt. Anatomically (as studied in the lectotype specimen) the thallus is provided with an upper cortex 12–20 $\mu$  thick, reddish-brown in its outer part, colourless within, of capitate-fastigiate or almost pseudoparenchymatous structure with the outer pigmented cells up to 6 $\mu$  diameter, the inner cells 4–5 $\mu$  diameter. It is overlaid by a colourless necrotic layer up to 15 $\mu$  thick (thicker in some other specimens studied), with outlines of collapsed, disintegrated cells and often disrupted into small fragments (pruina). Algal layer diffuse, up to 100 $\mu$  deep; algae trebouxioid, 9–12 (–15) $\mu$  diameter. Medulla colourless and clear or faintly greyish-cloudy, compact, composed of  $\pm$  coalescent, thin-walled hyphae 2–3 $\mu$  diameter compactly intricately in various directions; in other specimens considerable structural variation was noted, ranging from the intertexted hyphose condition to formation of a fairly distinct pseudoparenchyma. No lower cortex is present, but the basal part of the medullary tissue is gradually converted into a dark brown hypothalline tissue, at least 20–30 $\mu$  thick, of pseudoparenchymatous structure with rounded cells 4–5 (–6) $\mu$  diameter, their walls heavily obscured with pigment. In places on the lower side, near the periphery, occasional compact clusters of dark brown rhizoidal hyphae occur, 3–4 $\mu$  diameter, emanating from the hypothalline tissue and attaching the thallus to the substratum.

The peripheral lobes are crowded, richly branched, turgid and convex, lying side by side or (more usually)  $\pm$  imbricated, nodulose, attaining a length of 2–3 mm.; in some parts of the margin they may be only indistinctly developed. They are concolorous with the rest of the thallus, only at the extreme tips often somewhat darker. At least at their extremities they are not attached to the rock, and are alutaceous to brown on the underside; a short distance further in blackish patches are visible (fascicles of rhizoidal hyphae), and in their innermost parts, adjoining the central thallus, their underside is uniformly blackish. The central part of the thallus is crowdedly nodulose-verrucose, and may reach a considerable thickness (3–5 mm.), becoming subfruticulose, with crowded stipes bearing assimilative verrucae 0.3–0.8 mm. diameter at their apices and becoming brown-blackish towards their bases. In exposed positions the thallus may become abraded by environmental agencies (wind-blown detritus and ice-particles) to form a more or less even surface, which in the course of time regenerates to form flat, areola-like portions with verrucose surface, separated by gaping cracks.

The chemical reactions of the thallus are almost constantly negative, but in two specimens seen red spicular crystals were obtained with K in sections of the thallus, which also stained yellow in the medulla with PD, indicating the presence of norstictic acid.

Hue (1915) compared *Rinodina Petermannii* with *R. balanina* (Wnbg.) Vain., *R. radiata* (Tuck.) Tuck. and *R. thysanota* Tuck. Superficial examination of the type specimens of the latter two species in herb. Tuckerman (FH) showed them to be unlike *R. Petermannii* and probably not closely related to it. *R. radiata* has a glaucescent-greyish thallus and apothecia of lecideine appearance, and its hypothecium is described by Tuckerman as brownish-black. *R. thysanota* is a species resembling a brown *Acarospora* in general appearance, with flattened peripheral lobes and the central part of the thallus regularly verrucose-areolate. The resemblance of *R. Petermannii* to the Arctic species *R. balanina* is, however, very close. For comparison I have studied specimens of *R. balanina* from Norway (Nordland, Röst, Vedöy, collected by G. E. Du Rietz, 1922, and Finmark, Varanger Peninsula, collected by R. Santesson, 1966).<sup>\*</sup> These specimens are macroscopically hardly distinguishable from *R. Petermannii*, only somewhat thinner and with more delicate lobes. I was at first inclined to regard the two species as synonymous, having found that certain characters attributed to *R. balanina* in the literature, and seemingly distinguishing it from *R. Petermannii*, had been wrongly or inadequately described. Vainio (1909, p. 70), for instance, stated that the peripheral laciniae in *R. balanina* are pale beneath, without rhizinae; in the Norwegian material studied, however, I found the undersides of the lobes to be partly dark (brown-blackish) with patches of microscopic rhizinae, as in *R. Petermannii*. I was unable to find any reliable anatomical difference in the thallus and apothecia between the two species. But an essential distinction is afforded by the pycnoconidia; in *R. Petermannii* these are thread-like and arcuate, similar to those of *Buellia augusta* Vain. (see Fig. 4b, p. 11), whereas in

<sup>\*</sup> The latter material has been distributed in A. Vězda, *Lichenes Selecti Exsiccati*, Fasc. xxi, No. 525 (1966).



**FIGURE 17**  
The known distribution of *Rinodina Petermannii* (Hue) Darb.

*R. balanina*, as already stated by Vainio (1909) they are short, straight and oblong-bacillar; in the Norwegian material cited above they are  $3-4 \times 0.8 \mu$ , borne on sterigmata issuing terminally and laterally from the conidiophores (Fig. 18). *R. Petermannii* and *R. balanina* are, therefore, undoubtedly distinct species, in spite of their very close morphological and anatomical resemblance.

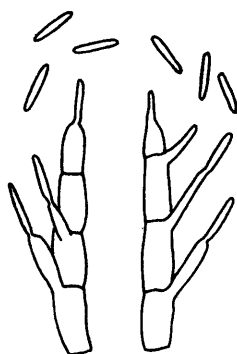


FIGURE 18

Conidiophores and conidia of *Rinodina balanina* (Wnbg.) Vain. (Norway, Vedöy, collector G. E. Du Rietz, 1922).

According to Th. Fries (1874, p. 135) and Vainio (1909, p. 70), *R. balanina* may occasionally have a granulose-sorediate thallus. The Norwegian material studied by me shows in places some finely granulate or eroded efflorescences resembling soredia, but in my opinion these are obviously artefacts following damage by snails, mites or insects; Vainio pointed out that this species is particularly liable to such predation. The absence of similar deformations in *R. Petermannii* is perhaps explainable by the absence of browsing land gastropods in the Antarctic environment.

A specimen of *R. Petermannii* in S from east Graham Land, Paulet Island (SAE No. 113 *pr. p.*) was erroneously determined by Darbishire (1912, p. 35, 45) as "*Buellia frigida*".

*R. Petermannii* is a common and conspicuous species in the Antarctic Peninsula sector, where it occurs on rocks in very nitrogenous situations such as near the summits of outcrops frequented by gulls and skuas, often associated with similarly strongly nitrophilous lichens like *Mastodia tessellata* and *Xanthoria elegans*. It often covers large areas of the rock (Plate XIVa). (Its Arctic vicariant *R. balanina* is similar in its ecology.) Although characteristically saxicolous, *R. Petermannii* may occasionally grow over other substrata. On Doumer Island, west Graham Land, I collected a small specimen growing over moss on a damp rock face (FIDS No. A1929) and on Goudier Island found a small thallus on the weathered wooden deck of a derelict whaling scow drawn up on the beach many years previously (FIDS No. A1215c).

Many specimens, although fertile, have mostly immature apothecia; others may be only sparingly fertile. Apothecia are seldom abundant.

**Geographical distribution.** Apparently endemic to the Antarctic Peninsula sector of Antarctica, where it occurs in the South Orkney and South Shetland Islands and on the west side of the peninsula south to the Marguerite Bay area. On the east side of the peninsula it has not been collected further south than Hope Bay and Paulet Island (Fig. 17, p. 70).

The specimens examined are listed in Appendix III, Table XXXII.

### *Rinodina endophragma* M. Lamb, n. sp.

**Icon.** Plate XIIIa: the holotype specimen in BM,  $\times 4$ .

Fig. 14d.

**Diagnosis.** *Thallus effusus, indeterminatus, areolatus, albidus vel albido-cinerascens, crassit. usque ad 0.5 (-1.0) mm., areolis irregularibus, angulosis, planis aut leviter convexis, interdum compositis, rimis saepe obscuris separatis, ambitu linea obscuriori non cinctus, hypothallo nullo. Apothecia numerosa, plerumque crebra, areolis enata, mox emergentia et sessilia, 0.6-1.2 mm. lata, plana subplanave, disco fusconigranti, nudo, margine thallino prominulo, pallido (thallo concolori) vel interdum obscuro (fusco aut fusconigro), algas fovente cincta. Hypothecium incolor vel (lamina crassiore visum) leviter isabellino-subfuscescens, strato algarum superpositum. Hymenium 75-90  $\mu$  altum, superne fuscum. Sporae 8nae, 16-20  $\mu$  longae, 11-12  $\mu$  latae, olivaceae dein fuscescentes, ellipsoideae vel ovoideae, 1-septatae, loculis rotundatis approximatisque*



*et endosporio obscuro constrictoque (figuram numeri 8 referenti) circumdatis, extus exosporio pallidioro medio et apicibus cinctae. Thallus extrinsecus et intrinsecus reagentibus immutatus. Pycnidia thallo immersa, maculas nigricantes efficientia, globosa, perifulcrio incolori, conidiis bacillari-elongatis, rectis, 7–8 $\mu$  longis, 0.8–1.0 $\mu$  crassis. Aspectu R. teichophilae (Nyl.) Arn. haud absimilis, sed revera R. deceptionis supra descriptae magis affinis, omnibus aliis speciebus generis indole sporarum attamen distincta.*

**Morphological description.** Thallus crustose, effuse, indeterminate, areolate, whitish to pale grey (not changing colour on moistening), matt, not pruinose, up to 0.5 (–1.0) mm. thick. Areolae irregular, angulose, 0.4–0.7 (–1.0) mm. diameter, plane or rarely slightly tumid (but not verrucose), sometimes compositely subdivided into microareolae, separated by rather wide, often dark (brown or blackish) cracks. No dark proto- or hypothallus developed.

Apothecia very numerous, isolated or often contiguous, formed in thallus-areolae, soon emergent and sessile, 0.6–1.2 mm. diameter, plane to slightly convex, with brownish-black, naked disc and moderate, slightly prominent thalline margin which is either pale (concolorous with the thallus) or sometimes darkened (dark brown to brown-blackish). Thalline margin structurally similar to thallus, with outer, colourless necrotic layer and brown-capitate cortex, containing symbiotic algae. Hypothecium colourless or in thick sections faintly brownish-isabelline, clear, 100–180 $\mu$  deep, subtended by numerous algal cells. Hymenium 75–90 $\mu$  high, pure dark brown in uppermost part. Paraphyses discrete, c. 2 $\mu$  thick, at tips brown-capitate to 4–5 (–6) $\mu$ . Asci clavate, c. 65 $\times$ 20 $\mu$ . Spores 8 in ascus, 16–20 $\times$ 11–12 $\mu$ , irregularly biserially arranged, olive-greenish then brown, ellipsoid to ovoid, not constricted, thinly 1-septate with wall of even thickness and rounded, contiguous locules; endosporial wall at maturity dark and strongly constricted at septum (like the figure 8); exosporial wall paler, developed equatorially and terminally (Fig. 14d).

Pycnidia immersed in thallus, forming minute, blackish spots; in section globose, about 90 $\mu$  diameter, with colourless perifulcrial wall; conidia elongated-bacillar, straight, 7–8 $\times$ 0.8–1.0 $\mu$ , borne terminally on slightly swollen cells of simple or sparingly branched sterigmata.

Thallus externally and internally K—, C—, PD—, I—.

**Discussion.** The spores of this species appear to belong to a type hitherto undescribed, not corresponding to any of the eight variations of the *Rinodina-Phycia* spore enumerated and illustrated by Poelt (1965b). Usually the exosporium is hardened and dark-pigmented, and the endosporium paler and  $\pm$  gelatinous; here the situation is reversed, and the two globose locules are surrounded by a dark, resistant endosporial wall; the pale exosporium forms a swollen equatorial girdle and caps at each end of the spore, giving it an ovoid to almost lemon-shaped form. The spores are never polarilocular (orcularioid) at any stage in their development, the median septum being thin from the first.

The thalline margin of the apothecia, although sometimes darkened, is never excluded, and always contains algal cells; the darkening is due to a heavier pigmentation of the capitate-fastigiate cortex and a lesser development of the superficial necrotic layer.

The thallus forms confluent or interrupted patches up to 5 cm. across. In section it is covered by a colourless, lax and desquamescent necrotic layer up to 60 (–150) $\mu$  thick, consisting of the degenerated remains of cortical and medullary tissues. The underlying cortex is about 15 $\mu$  thick, distinctly capitate-fastigiate, with the outermost layer of cells each round and swollen to 5–6 $\mu$ , with pure dark brown pigmentation. Algal layer beneath cortex 60–150 $\mu$  deep; algae trebouxoid, 12–22 $\mu$  diameter. Medulla colourless,  $\pm$  clear but containing much extraneous substance (substratum-particles), its hyphae either compact and shortly cellular, giving a pseudoparenchymatous appearance in places, or  $\pm$  loosely intricated. No dark hypothalline tissue is developed; the dark edges of the cracks between the areolae owe their colour, not to true pigmentation, but to decay and discoloration of thallus-tissues, plus inclusion of dark detritus-particles.

Apart from the peculiar spores, *R. endophragma* has much in common, in general appearance and structure, with *R. deceptionis*. It looks rather similar to the European *R. teichophila* (Nyl.) Arn., but the resemblance is purely superficial, the latter species having a well-developed excipulum proprium and spores of the “mischoblastiomorphic” type.

Known only from the holotype specimen, which was found on a piece of limestone (giving strong effervescence with HCl), associated with *Caloplaca elegans* and a *Lecanora* (*Aspicilia*) species.

**Geographical distribution.** East Graham Land, James Ross Island.

The specimen is listed in Appendix III, Table XXXIII.

***Rinodina nimbosa*** (E. Fries) Th. Fries, 1871, p. 193

**Syn.\*** *Parmelia nimbosa* E. Fries, 1831, p. 129; *Pachysporaria nimbosa* (E. Fries) Choisy, 1949, p. 111.  
? *Lecidea phaeocarpa* Sommerfelt, 1826, p. 159; *Rinodina phaeocarpa* (Sommerfelt) Vainio, 1899,  
p. 302 (*saltem planta*).†

*Rinodina Panschiana* Körber, 1874, p. 78.

**Icon.** Plate XIIIb: specimen from James Ross Island, Cape Lachman, FIDS No. D2676,  $\times 4$ .  
Lynge, 1928, pl. V, figs. 9–11: spores.

**Morphological description.** Thallus lobate-squamulose, adpressed to substratum (decayed mosses or soil), forming patches up to about 3 cm. in diameter; squamules crowded, sometimes subimbricate, up to 1 (–2) mm. diameter, distinctly lobate at circumference of thallus, incised or subcrenate; alutaceous, reddish-brown or fuscous, matt, naked or white-pruinose. No externally visible proto- or hypothallus. No soredia.

Apothecia usually numerous, subinnate in thallus-squamules, finally becoming sessile, round, 0.7–1.5 (–2.0) mm. diameter, with thick, tumid, subentire thalline margin (becoming immarginate in the f. *sphaerocarpa*); disc black, naked or sometimes pruinose, persistently plane (or convex in f. *sphaerocarpa*). Thalline margin containing algae, with outer red-brown cortex similar to that of the thallus. No distinct excipulum proprium usually developed. Hypothecium colourless,  $\pm$  clear, up to 100 $\mu$  deep, occasionally subtended by sporadic groups of algae. Hymenium 90–100 $\mu$  high, red-brown in uppermost part. Paraphyses embedded in hyaline mucilage but discrete under pressure, simple or occasionally branched, at tips clavate-capitate to 4–5 $\mu$  and pale reddish-brown (K–, HNO<sub>3</sub>–). Asci clavate, 70–90  $\times$  15–20 $\mu$ . Spores (2–) 6–8 in ascus, irregularly biseriate or partly uniseriate, dark brown at maturity, ellipsoid, straight or slightly curved, thinly 1-septate (also in young condition) with wall of even thickness and equal to the septum (1.0–1.5 $\mu$ ); 17–23 (–25)  $\times$  8–11 $\mu$ .

Pycnidia‡ immersed, globose, with faintly yellow-brown perifulcral wall confluent at base with dark brown hypothalline tissue; conidia rod-shaped, straight, 5–6  $\times$  0.8–1.0 $\mu$ .

Thallus externally and internally K–, C–, PD–; medulla I–.

**Discussion.** This species has been placed by Zahlbruckner (1930–31, p. 564) and other authors, e.g. Magnusson (1947, p. 327) in the section *Placothallia* (Trev.) Vain., but it seems to me that the squamulose thallus is quite different from the radiate-effigurate, crustose type represented by the species of that section (*R. oreina*, *R. balanina*, *R. Petermannii*, etc.). Neither can it be well included in the section *Rinodina* on account of its thinly 1-septate spores. Trevisan (1869, p. 127) suggested that it might be made the type of a new genus, *Diploeciium* (not subsequently mentioned in the literature and not included in Zahlbruckner's Catalogus). Trevisan's characterization of this proposed genus was, however, not based on a distinction in thallus morphology, but on an alleged peculiarity of the apothecial margin which he refers to as "zeorine" (i.e. with a well-developed excipulum proprium). His observation in this respect appears to have been erroneous, as a proper margin is seldom distinctly developed in *R. nimbosa*. *Diploeciium* Trev., in an emended sense, might possibly be taken up as a section of *Rinodina* to accommodate *R. nimbosa*, but further and more detailed studies on the morphology and apothecial ontogeny of the latter in comparison with other species of *Rinodina* should first be undertaken.

The thallus-squamules have an upper and lateral cortex 10–30 $\mu$  thick, pale red-brown in the outer part, capitate-fastigiata or fastigiata-pseudoparenchymatous with isodiametric cells 4–5 (–6) $\mu$  diameter; it is usually covered by an outermost, colourless,  $\pm$  structureless necrotic layer containing small sordid granules. Algal layer continuous, diffuse, 75–135 $\mu$  deep; algae trebouxoid. Medulla colourless, clear, of loosely intricated, thick-walled hyphae 3–5 $\mu$  diameter. A dark hypothalline stratum (perhaps to be regarded as a lower cortex) is in places present, dark brown, 15–20 (–30) $\mu$  thick, laxly pseudoparenchymatous with thick-walled, heavily pigmented, rounded cells 6–8 $\mu$  diameter, giving rise on the underside to numerous, dark brown, rhizoidal hyphae. In places where the dark hypothalline tissue is not developed, rhizoidal hyphae may arise directly from the lower medulla.

Zahlbruckner (1930–31) used the epithet *R. phaeocarpa* for this species, following Vainio (1899). *Lecidea phaeocarpa*, the basionym, was first published by Sommerfelt (1826) divided into two varieties,  $\beta$ . *microcarpa* and  $\gamma$ . *montana*; he mentioned also a variety "a.", which he presumably regarded as the typical species,

\* Further synonyms given in Zahlbruckner, 1930–31, p. 565–66.

† See discussion below.

‡ In FIDS No. D2804.

seen only from Germany. Lyngé found the type material of var. *microcarpa* in Sommerfelt's herbarium, and reported it to be *Psoroma hypnorum* infested by a parasitic fungus (Lyngé, 1928, p. 249; 1937, p. 189). As no other material attributed by Sommerfelt to the species has since come to light, the identity of his *Lecidea phaeocarpa* remains very doubtful. Vainio (1899) considered it to refer to *Rinodina nimbosa*, and introduced the combination *Rinodina phaeocarpa* (Smrft.) on grounds of priority; but he gave no arguments to support this, and did not state that he had examined any authentic specimens. It seems, therefore, that the epithet *nimbosa* should not be supplanted by *phaeocarpa*.

Our Antarctic specimens are completely similar to Arctic material. They were found on humic detritus and decayed mosses from close to sea-level to an altitude of 135 m. (450 ft.), in considerably exposed situations.

**Geographical distribution.** *R. nimbosa* is here recorded for the first time from the Southern Hemisphere. It is an Arctic-circumpolar species penetrating southwards into Scandinavia and the high mountains of central Europe, and to the Rocky Mountains and Colorado in North America. A list of the known localities is given by Magnusson (1947, p. 329–30). It has also been recorded from North Africa by Werner (1946). In Antarctica it has been found to date only in east Graham Land, in a small area around the northern side of James Ross Island.

The specimens examined are listed in Appendix III, Table XXXIV.

**f. *sphaerocarpa*** Th. Fries, 1871, p. 193

**Syn.** *R. phaeocarpa* var. *sphaerocarpa* (Th. Fries) Zahlbruckner, 1930–31, p. 566.

**Morphological description.** Differs from the typical species in the immarginate and subglobose-convex apothecia.

**Geographical distribution.** (See Appendix III, Table XXXV.)

EXCLUDED SPECIES

*R. crassa* Darbshire, 1912, p. 13.

This is a *Buellia* species, *B. Darbshirei* M. Lamb (p. 23).

*R. ditissima* (Hue) Zahlbruckner, 1930–31, p. 513, and

*R. erythroda* (Hue) Zahlbruckner, 1930–31, p. 514, are both states of *Buellia russa* (Hue) Darbshire; see discussion on p. 35.

*R. frigida* (Darbshire) Dodge, 1948, p. 259.

This is best retained in the genus *Buellia* where placed by its original author; see discussion on p. 57.

*R. hypopoichila* Vainio, 1903, p. 25.

This was based on a mixture of *Buellia russa* (Hue) Darbshire and *Rinodina Petermannii* (Hue) Darbshire. Name to be rejected under Art. 70 of the International Code; see discussion on p. 37.

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# APPENDICES

- I. TAXONOMIC NOTES ON SOME RELATED OR LIMITROPHE SPECIES
- II. GLOSSARY OF TECHNICAL TERMS
- III. TABLES OF SPECIMENS EXAMINED
- IV. EQUIVALENT BRITISH AND ARGENTINE PLACE-NAMES



## APPENDIX I

## TAXONOMIC NOTES ON SOME RELATED OR LIMITROPHE SPECIES

*Buellia alutacea* Zahlbruckner, 1941, p. 374. (See discussion of *B. isabellina*, p. 46.) Redescription of the holotype specimen in Herb. Naturhist. Mus. Wien from New Zealand, North Island, Hen Island off the Auckland Coast, on coastal rock, collected by Miss L. B. Moore, 1934, No. A85:

On coarse-grained vesicular crystalline rock not effervescing with HCl.

Thallus effuse, consisting of mostly scattered and isolated or partly contiguous, pustular-verruciform areolae 0.3–0.7 (–1.0) mm. diameter which are circular in outline except when deformed by mutual contact, hemispherical to subglobose, smooth, matt, buff-yellowish or ochraceous-yellow, in places slightly whitish-pruinose. No soredia or isidia; no distinct proto- or hypothallus.

Apothecia moderately abundant, usually developed between or at sides of areolae, round, 0.5–0.8 mm. diameter at maturity, sessile, black, often with a pale aeruginose pruina, at first plane with a thin, entire proper margin, finally becoming slightly to moderately convex and immarginate.

Thallus-areolae corticate; cortex about 30 $\mu$  thick, densely interspersed with sordid isabelline granules and opaque in section; seen (after treatment with KOH) to consist of closely interwoven hyphae with rounded lumina almost forming a pseudoparenchyma (not capitate-fastigiate). An outermost, colourless, necrotic layer up to 12 $\mu$  thick present in places. Algae in a definite stratum 40–60 $\mu$  deep below the cortex; trebouxoid, 9–18 $\mu$  diameter. Medulla deep, compact, grey-nubilated with small granules and  $\pm$  opaque in section, composed of moderately thick-walled, interwoven hyphae 3–6 $\mu$  diameter, at its base brownish-conspurcated with substratum-particles, but no dark-pigmented hypothalline tissue present. Thallus-sections C–, PD–, I–; cortex K+ more yellow (but no yellow liquor or crystals formed); medulla K–.

Excipulum 45–70 $\mu$  thick at sides, purplish-brown in section, gradually dark aeruginose in uppermost part, pseudoparenchymatous, confluent with hypothecium below. Hypothecium reddish- or purplish-brown, of pseudoparenchymatous structure with cells 3–5 $\mu$  diameter, resting with flat base on the thallus-medulla, not produced downwards. Hymenium 75–90 $\mu$  high, persistently blue with I (ascus-walls stained); epithecium sordid isabelline, granulose and opaque, in places with a blue-greenish tinge (unchanged by HNO<sub>3</sub>). Paraphyses  $\pm$  discrete under pressure, 1.5–2.0 $\mu$  thick, at tips slightly swollen, up to 3 $\mu$ , and there partly pale aeruginose, partly isabelline-yellowish (the two pigments often superimposed). Asci clavate, 60–70 $\times$ 15–20 $\mu$ . Spores (4–) 8 in ascus, sometimes initially uniseriate, later irregularly biseriate; 1-septate, when young pale brown and with thickened walls and septum (up to 2 $\mu$ ) and rounded locules; later becoming densely dark brown with thin walls and septum; ellipsoid, at maturity 14–16 $\times$ 8–9 $\mu$  (Fig. 19a). Occasional simple (non-septate) spores occur.

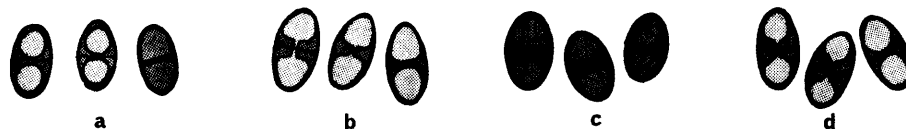


FIGURE 19

Spores (drawn from the type specimens).

- a. *Buellia alutacea* Zahlbr.
- b. *Buellia parasemops* (Nyl.) Zahlbr.
- c. *Buellia subcervina* (Nyl.) Vain.
- d. *Rinodina antarctica* Müll. Arg.

Pycnidia immersed in thallus-areolae, indicated by minute, black, slightly sunken spots; perifulcral wall colourless; conidia rod-shaped, straight, 6 $\times$ 1.0–1.2 $\mu$ , borne terminally on short, crowded sterigmata.

This species does not belong to the *B. coniops* group, and is not closely related to any of the Antarctic species.

*Buellia avium* Lynge, 1928, p. 243. (See discussion of *B. augusta*, p. 49.) The following data on the holotype specimen in Herb. Mus. Oslo, from Novaya Zemlya, collected by Lynge, are given to supplement the short but rather good original description by Lynge:

Thallus pale to dark fuscous-brown, without any tawny or castaneous tinge, matt. No distinct protothallus visible. Thallus effuse, indeterminate, irregularly areolate-rimose, 0.5–0.8 mm. thick, the surface everywhere minutely scabrid-granulate or subfurfuraceous, in places eroded by mites, of which numerous empty carapaces are present. A number of small microthalli are present on the rock surrounding the main thallus; they are in the form of scattered or crowded verruculae 0.1–0.2 mm. diameter, not lobate or subsquamulose, of the same colour as the main thallus, the smaller verruculae with smooth surface, the larger ones scabrid-granulate.

Cortex of thallus thin, 6–10 $\mu$  deep, reddish-brown in section, pseudoparenchymatous with thin-walled, rounded cells 3–4 $\mu$  diameter. Algal-medullary layer colourless,  $\pm$  clear, pseudoparenchymatous with cells like the cortex. Basal hypothalline layer well developed, dark reddish-brown, of pseudoparenchymatous structure with pigmented cells 4–6 $\mu$  diameter. Thallus-sections PD–, I–.

Excipulum reddish-brown in section, pseudoparenchymatous, 40–45 $\mu$  thick at sides, forming a lateral continuation of the hypothecium. Hypothecium dark reddish-brown, in centre produced downwards to join the basal hypothalline layer. Hymenium 60–75 $\mu$  high (lower than stated by Lyngé), pure reddish-brown in uppermost part, without any olivaceous or aeruginose tinge, HNO<sub>3</sub>–. Spores pale brown to medium brown, thinly 1-septate (also in young condition), 15–18 $\times$ 7.5–9.0 $\mu$ .

(No pycnidia found.)

This species, even in the absence of pycnidia, can be confidently assigned to the *B. conioops* group, as suggested by Lyngé. It is similar, but not identical with, the Antarctic *B. augusta* Vain.

*Buellia conioptoides* (Nylander) Zahlbruckner, 1930–31, p. 345; *Lecidea conioptoides* Nylander, 1875, p. 725. Redescription of the isotype specimen in Herb. Nylander (Bot. Mus. Helsingfors) from Ile St. Paul (lat. 38°43'S., long. 77°32'E.), collected by G. de l'Isle, No. 9712 in Herb. Nyl.:

On a small chip of doleritic rock about 1.5 $\times$ 1.0 cm.

Thallus apparently effuse and indeterminate, thin (up to 0.2 mm. thick), sordid isabelline or pale sordid olivaceous, matt, irregularly rimose (not areolate), with  $\pm$  even or minutely rugulose-uneven surface; in places at the periphery there seem to be indications of a dark brown, narrow, protothalline zone, but this is uncertain. No isidia or soredia; no whitish punctations or scabrosities.

Apothecia fairly numerous, sessile or adpressed-sessile, round, only slightly constricted at base, 0.3–0.5 mm. diameter, persistently plane with a distinct, thin to moderate, entire proper margin; black, matt, not pruinose.

Thallus with a poorly developed, colourless cortical layer 9–12 $\mu$  thick of  $\pm$  distinctly cellular (pseudoparenchymatous) structure, with  $\pm$  isodiametric cells about 3 $\mu$  diameter. Algal stratum 60 $\mu$  deep,  $\pm$  continuous; algae apparently trebouxoid, 6–11 $\mu$  diameter. Medulla colourless, clear, compact, of shortly septate, fairly thin-walled hyphae intricately in various directions. Medulla grading downwards into a thickish, dark brown hypothalline layer of brown-pigmented, shortly septate hyphae or pseudoparenchymatous cells 4–5 $\mu$  diameter. Thallus-sections K–, I– (not tested with other reagents).

Excipulum developed at sides and  $\pm$  continuous below apothecium, where in places it is confluent with the dark hypothalline layer; at sides 40–50 $\mu$  thick, in outer half dark brown, inwards gradually pale brown; of indistinctly radiating structure with outwardly-running hyphae 2–4 $\mu$  thick, their walls thickened,  $\pm$  heavily brown-pigmented, the outermost cells rounded, 3–4 $\mu$  diameter. Hypothecium 30–50 $\mu$  deep, faintly brownish to almost colourless in section,  $\pm$  sharply delimited from underlying basal excipulum. Hymenium 70–75 $\mu$  high, with dark brown epithecium (without olivaceous tinge, HNO<sub>3</sub>–). Paraphyses discrete under pressure, simple, at tips brown and capitate to 3–4 $\mu$ . Asci clavate, 65–70 $\times$ 9–12 $\mu$ . Spores 8 in ascus, brown, ellipsoid, thinly 1-septate, not constricted at the septum, not polarilocular at any stage, 13.5–15.0 $\times$ 7.5–8.5 $\mu$ , biseriolate or partly uniseriate in ascus. All brown tissues of apothecium HNO<sub>3</sub>–. Upper part of hymenium I+ persistently blue.

(Pycnoconidia not found; stated by Nylander (1875) to be arcuate.)

This species, very inadequately described by Nylander, proves to be distinct from any of the known Antarctic species.

*Buellia groenlandica* Vainio, 1905, p. 133. This Arctic species was reinvestigated because it was stated to have polarilocular spores and might, therefore, have some relationship to the Antarctic species *B. perlata* and *B. melanostola*. The following revision was made from the holotype specimen in Herb. Vainio (TUR; No. 9552) from Greenland, Turner Sound, collected by the Amdrup Expedition, 1898–1902:

On a few small chips of basaltic rock.

Thallus very thin and inconspicuous, not over 0.1 mm. thick, consisting of minute, sordid greyish, matt, rather indefinite areolae dispersed over a very thin, black, matt, continuous, effuse hypothallus. Areolae not contiguous,  $\pm$  round in outline, 0.15–0.25 mm. diameter, slightly to moderately convex, thinning out at the edges (i.e. not abruptly delimited.) No isidia or soredia.

Apothecia numerous, arising in the areolae, at maturity closely adpressed-sessile, not or hardly constricted at base, round, minute, not over 0.2 mm. diameter, black, matt, not pruinose, persistently plane and usually immarginate (in a few an indistinct, thin, hardly prominent, black proper margin is  $\pm$  developed). The central umbo mentioned by Vainio is not macroscopically obvious, but its presence is confirmed in sections.

Excipulum rudimentary, dimidiate, forming a lateral extension of the hypothecium, 15–28 $\mu$  thick at sides, dark red-brown or purplish-brown, dense and opaque in section, of indistinctly pseudoparenchymatous structure (cells not well visible, 3–5 $\mu$  diameter). Hypothecium shallow, 30–40 $\mu$  deep in centre, pale brown to brown. Hymenium about 60 $\mu$  high, in most places not pigmented above, but with a scanty epithecium of scattered, sordid, isabelline granules; central sterile columella (umbo) pigmented, pale to dark brown in its upper part, not noticeably projecting above hymenium-level. Paraphyses concrete in hyaline mucilage, indistinct, often branched (perhaps also anastomosing), not capitate or pigmented at tips. Spores in the apothecium sectioned all old and  $\pm$  collapsed, brown, 1-septate, c. 15 $\times$ 8 $\mu$  (according to Vainio, *descr. orig.*, 8 in ascus, biseriolate, ellipsoid, distinctly polarilocular with a thick septum traversed by a pore, 12–14 $\times$ 7–8 $\mu$ ). Pigmented tissues of apothecium (brown lateral excipulum and brown central columella) HNO<sub>3</sub>+ dull crimson-purple.

As stated by Vainio, the species much resembles *Buellia punctata* (Hoffm.) Mass. in outward appearance. It is obviously quite distinct from *B. perlata* and related Antarctic species, so much so as to suggest that the presence of polarilocular spores in *Buellia* may not necessarily indicate close taxonomic relationship.

*Buellia Lechleri* Steiner, 1919, p. 147. No material has been seen by me. Type material was distributed in Lechler's exsiccata *Plant. Insul. Maclov.*, No. 55, originally as "*Lecidea disciformis*", from the Falkland Islands.

It is a saxicolous species with filiform pycnoconidia, and seems from Steiner's description to be closely related to *B. late-marginata* Darb. (p. 50). Unfortunately no specimens of this exsiccata number could be located in the major herbaria; the holotype sample, which was in the Berlin Museum, was presumably destroyed during the second world war.

*Buellia argillacea* Müller Arg., 1888a, p. 141; *B. Mülleri* Zahlbruckner, 1890, p. 348, footnote (*ut nom. nov.*)\*. Redescription of the holotype specimen in Herb. Müller Arg. (Herb. Boissier, Genève) from South Georgia, collected by Wilken:

On dark grey, fine-grained, igneous rock not effervescing with HCl.

Thallus effuse, verrucose-areolate; areolae in places close together and separated by cracks, in other places isolated with black hypothallus showing in between. Areolae 0.2–0.4 mm. diameter, rounded or irregular, plane to convex, up to 0.2 mm. thick, yellowish ash-grey to pale brownish, matt, smooth or sometimes  $\pm$  irregularly indented on top; often in the form of hemispherical verruculae. No isidia or soredia.

Apothecia black, arising in or between the areolae, up to 0.4 mm. diameter, at first level with the thallus, then elevated and sessile, round, slightly constricted at base, at maturity plane or concave with  $\pm$  prominent, black proper margin of moderate thickness; disc smooth or minutely scabrid, not pruinose.

Areolae with an upper cortex 30–60 $\mu$  thick, faintly yellowish in section and covered by scattered, yellow-brown granules not dissolving in K; cortex  $\pm$  pseudoparenchymatous with  $\pm$  isodiametric cells 6–14 $\mu$  diameter, which are somewhat crushed and indistinct in outermost part (beginnings of a necrotic layer). Algal stratum 60–120 $\mu$  deep, continuous or slightly interrupted; algae trebouxoid, 9–14 $\mu$  diameter. Medulla colourless but containing substratum particles, consisting of  $\pm$  conglutinated, septate hyphae 4–9 $\mu$  diameter with walls up to 1.5 $\mu$  thick.

Basal hypothalline tissue blue-green or aeruginose-brown from amorphous pigment partly obscuring the cells, which are  $\pm$  isodiametric, 3–5 $\mu$  diameter. Thallus sections K–, C–, I–.

Excipulum well developed, entire below hypothecium, dense and blackish in section,  $\pm$  pseudoparenchymatous, K–. Hypothecium dark brown or reddish-brown, K–, paler brown in upper subhymenial part, 55–70 $\mu$  deep in centre. Hymenium 70–85 $\mu$  high, brownish in lower part; epithecium olivaceous brown-blackish. Paraphyses discrete, occasionally branched, at apices thickened up to 4 $\mu$  and there either colourless or with a cap of brownish-black pigment. This pigment forms in places large, irregular lumps lying on top of the hymenium. Asci oblong-clavate to clavate, 45–60 $\times$ 14–18 $\mu$ . Spores 8 in ascus, uniseriate to irregularly biseriata, brown, ellipsoid, straight or slightly curved, thinly 1-septate (also in young condition), 16–19 (–20) $\times$ c. 9 $\mu$ . Asci I+ dark aeruginose-blue

Distinct from any of the Antarctic species studied.

*Buellia parasemops* (Nylander) Zahlbruckner, 1930–31, p. 386 (*lapsu "parasemopsis"*); *Lecidea parasemops* Nylander, 1875, p. 725. Revision of the inadequately described isotype specimen in Bot. Mus. Helsingfors (Herb. Nylander No. 9715) from Ile St. Paul (lat. 38°43'S., long. 77°32'E.), collected by G. de l'Isle.

Specimen fragmentary, on broken-up crystalline rock (dolerite).

Thallus apparently effuse and indeterminate, sordid whitish or cream-coloured, not changing colour when moistened, matt, very thin, about 0.2 mm. thick, sparingly irregularly rimose (not areolate) or partly continuous. No dark proto- or hypothallus visible. No isidia or soredia.

Apothecia fairly numerous, at first immersed in thallus, then emergent and finally adpressed-sessile, not or hardly constricted at base, round, 0.3–0.5 mm. diameter, entirely black, matt, not pruinose, single or 2–3 aggregated and  $\pm$  confluent; persistently plane with thin to moderate, entire, slightly prominent proper margin.

The thallus has an indistinct, colourless, clear, outer cortical layer of indistinctly cellular structure (cells about 3 $\mu$  diameter). Algal stratum very effuse, penetrating irregularly far down into thallus; algae trebouxoid, 11–14 $\mu$  diameter. Medulla colourless, clear, of compacted, closely interwoven hyphae about 3 $\mu$  diameter, in places  $\pm$  cellular. Thallus K– (according to Nylander); medulla I– (own observation); the material was too scanty to test with other reagents.

Excipulum entire below apothecium, dark brown and opaque in section, resting on medullary tissue, sometimes produced downwards in centre; 30–60 $\mu$  thick at sides, of radiating structure in inner part, in outer part cellular with densely pigmented cells c. 5 $\mu$  diameter. Hypothecium pale brown, up to 75 $\mu$  deep in centre,  $\pm$  sharply delimited from underlying excipulum. Hymenium 90–100 $\mu$  high, with dark brown epithecium (no olivaceous tinge, HNO<sub>3</sub>–). Paraphyses involved in mucilage but discrete under pressure, simple or branched, not anastomosing, capitate to 3 $\mu$  at the brown-pigmented tips. Asci clavate, c. 75 $\times$ 20 $\mu$ . Spores 8 in ascus (or sometimes fewer by abortion), partly uni-, partly biseriata, brown to dark brown, ellipsoid, straight, 2-celled, when young with thickened septum (polarilocular), the septum 3–4 $\mu$  thick and traversed by a narrow canal interrupted by the thin dark primary septum (Fig. 19b); in mature state thinly 1-septate with rounded and approximated locules; (16–)18–23 $\times$ 10–11 $\mu$ . Hymenium I+ persistently blue; all brown tissues of apothecium HNO<sub>3</sub>–.

(Pycnoconidia not seen; stated by Nylander (1875) to be arcuate, and in his annotation on the packet represented as filiform, arcuate, 14–20 $\mu$  long, 0.5 $\mu$  thick.)

A distinctive species, unlike any of the others studied.

*Buellia stellulata* (Taylor) Mudd, 1861, p. 216; *Lecidea stellulata* Taylor in Mackay, 1836, p. 118. (See discussion of *B. russa*, p. 34.)

Some remarks on this species and its subordinate taxa are necessary in order to clarify the confusion introduced by Vainio (1903) in stating the Antarctic *B. russa* (Hue) Darb. to be a variety of *Buellia protohallina* (Krempelh.) Vain. (*nom. illegit.*) and identical with *B. stellulata* var. *minutula* (Hepp) Vain.

\* Zahlbruckner, in the footnote cited, states that Müller's name has to be changed on account of an earlier homonym, *Buellia argillacea* (Bell.) Stein, syn. *Lichen argillaceus* Bellardi. I have tried in vain to trace the publication of this earlier homonym, to which no literary reference is given by Zahlbruckner.

*Lecidea stellulata* f. *protohallina*, on which Vainio founded his illegitimate (and incorrectly applied) combination, was characterized in the original description (Krempelhuber, 1876, p. 267) with the following words: “*areolis minoribus hypothallo atro praedominante intrusis, totius lichenis color typo obscurior, cinereus*”, and is not specifically distinct from *B. stellulata* (Tayl.) Mudd; it may be referred to as *B. stellulata* var. *protohallina* (Krempelhub.) Müll. Arg. (1888b, p. 113). It is represented in Vainio’s exsiccatum *Lich. Bras. Exs.* by No. 1484 (as *Buellia stellulata* var. *protohallina*, in FH), which has the thallus-areolae characteristically quite plane and black-edged, or in Vainio’s own words (1890, p. 174–75), “*areolis vulgo planis aut concaviusculis, hypothallo bene evoluto . . . areolis . . . vulgo angulosis, saepe etiam hypothallo marginatis*”. The typical *B. stellulata*, referred to by Vainio (loc. cit.) as *B. stellulata* var. *minutula* (Hepp) Vain., is described by him as having “*areolis planis aut depresso-convexiusculis, hypothallo nigricante, tenuissimo aut evanescente*”. *Lecidea spuria* β. *minutula* Hepp, *Flecht. Europ.* No. 313 (examined by me in Herb. Tuckerman, FH) is a state of *B. stellulata* agreeing with Vainio’s description.\*

The type material of *Lecidea stellulata* Tayl. from Ireland, Dunkerron (Herb. Taylor, FH), consists of two specimens, one on quartzitic rock, the other on sandstone. The former has plane to slightly convex areolae, not black-marginate, and resembles very closely Hepp’s *Lecidea spuria* β. *minutula*; the latter has quite plane, partly black-edged areolae, and agrees well in appearance with Vainio’s Brazilian specimen of *Buellia stellulata* var. *protohallina* (*Lich. Bras. Exs.* No. 1484). The type material of *Buellia stellulata* therefore comprises both of the variations, and the specimen on quartzitic rock may be regarded as the lectotype.

*B. stellulata* in its optimally developed condition may be characterized as follows (description made from a well developed and typical specimen from Uruguay, Dept. Lavalleja, near Minas, 335 m. altitude, on quartzitic rock in open hillside sheep pasture, collected by I. M. Lamb, 1944, No. 1102, in BM and FH):

Thallus whitish to pale cinereous, thin, not over 0.15 mm. thick, areolate, with plane to slightly convex areolae about 0.3 mm. diameter without black edges. Proto- and hypothallus black, thin, well visible at margin (where filmy or dendritic) and in places between the areolae. Thallus K+ persistent yellow, PD+ faint sulphur-yellow, under microscope K+ yellow mist, not turning red, no crystals formed. Medulla I—.

Apothecia black, minute, 0.3–0.5 mm. diameter, persistently plane and marginate, level with thallus or only slightly prominent, originating in the thallus-areolae but soon becoming marginal and at maturity situated between the areolae. Excipulum dark brown or brown-blackish, confluent with hypothecium. Hypothecium dark brown. Hymenium 50–70 μ high, in uppermost part olivaceous brown-blackish or aeruginose-blackish (HNO<sub>3</sub>+ purple-reddish), not guttulate. Spores 4–8 in ascus, brown, ellipsoid, thinly 1-septate (also in young condition), not constricted at septum, 11–14 × 5.5–7.0 μ.

Pycnoconidia rod-shaped, straight, 4–5 × 0.7 μ, borne terminally on simple sterigmata.

*Buellia indissimilis* (Nyl.) B. de Lesd. is obviously closely related and similar to *B. stellulata*, differing in chemical constitution, more emergent apothecia, pure brown epithecium without olivaceous or aeruginose tinge, and shorter spores; see description by Lamb (1953, p. 432–34).

Both *B. stellulata* and *B. indissimilis* are quite distinct from the Antarctic *B. russa* (Hue) Darb. Vainio’s misidentification of the Antarctic material was probably due to the scantiness of the specimens available to him.

*Buellia subcervina* (Nylander) Vainio, 1903, p. 26; *Lecidea subcervina* Nylander, 1857, p. 126 (*nom. nud.*), 1859, p. 263 (*nom. nud.*), 1888, p. 147 (*cum descript.*). (See discussion of *B. coniois* f. *cervinogranulata*, p. 45.) Redescription of the isotype specimen in Mus. Bot. Helsingfors (No. 9698a in Herb. Nyl.) from Tierra del Fuego, Cape Horn, collector unknown:

On a fragment of granitic rock 2 × 1.2 cm., partly overgrown by a *Caloplaca* species named “*Placodium elegans* f. *lucens*”.

Thallus apparently effuse and indeterminate (margin not clearly shown), even, 0.2–0.4 mm. thick, cracked into irregular, angulose areolae 0.5–1.0 mm. diameter separated by black cracks about 0.1 mm. wide. Areolae plane, composite, with surface consisting of minute verruculae somewhat under 0.1 mm. diameter. Thallus tawny-brown (cervine-rufescent), in some places paler (alutaceous); matt, not pruinose. Lower half to two-thirds of thallus black (hypothallus). No soredia or isidia.

Apothecia fairly numerous, on or between areolae, level with thallus or slightly raised (adpressed-sessile), black or brown-black, round (or rarely angulose by mutual pressure), 0.25–0.50 mm. diameter, persistently plane with distinct, ± prominent proper margin; matt, not pruinose.

The thallus in section appears pseudoparenchymatous-cellular, but on crushing out is seen to consist of erect, closely connected, branching hyphae with swollen, moniliform cells 4–6 μ diameter, thick-walled; those at the surface brown-pigmented and slightly larger, forming a capitate-fastigiate cortex. No outer necrotic layer present. Colourless (assimilative) part of thallus, above hypothalline layer, 100–150 μ deep; algae trebouxoid, 7–12 μ diameter, irregularly dispersed, not forming a definite stratum. Lower hypothalline tissue dark reddish-brown, formed of compacted, pigmented hyphae, partly shortly cellular or pseudoparenchymatous. Thallus unaffected by the usual reagents; medulla I—.

Excipulum dark reddish-brown to brown-blackish, dense, 30–45 μ thick at sides, below joining the hypothecium to form a thick dark stratum confluent with the basal hypothalline layer; of cellular structure, with heavily pigmented cells 4–6 μ diameter. Hypothecium in upper part (subhymenial layer) up to 60 μ deep, reddish-brown, paler than the underlying denser part. Hymenium about 90 μ high, dark reddish-brown above (no aeruginose tinge, HNO<sub>3</sub>—); walls of asci and hymenial mucilage I+ dark blue. Paraphyses in some mucilage but discrete under pressure, at tips brown-pigmented and capitate to 4 or 5 μ. Asci broadly clavate, c. 75 × 25 μ. Spores (4–)6–8 in ascus, irregularly biseriate, at first pale brownish, then dark brown, broadly ellipsoid, 1-septate, somewhat thick-walled and with slightly thickened septum up to 3 μ thick in young spores, becoming thinner at maturity, without any visible connecting canal; 15–18 × 9–11 μ (Fig. 19c). These spores can hardly be termed polarilocular, although the septum is thickened.

\* It should be mentioned, however, that the Brazilian specimen named by Vainio “*Buellia stellulata* var. *minutula*” (Rio de Janeiro, No. 9458 in herb. Vain.) is quite a different species, with peculiar, ± “mischoblastiomorphic” spores, closely related to, if not identical with, *B. posthabita* (Nyl.) Zahlbr. (syn. *B. parachroa* Vain., *B. pachydermatica* Vain., *B. naranjitana* Zahlbr.; see Imshaug, 1955, p. 499).

Pycnidia immersed in thalline verruculae, about  $100\mu$  high and  $70\mu$  wide, with colourless perifulcral wall; conidiophores (sterigmata) crowded, digitate,  $12-15\mu$  long, *c.*  $2\mu$  broad. (In spite of careful search I did not succeed in finding any certain conidia, but saw some filiform-arcuate bodies which may have been conidia. Nylander in his original description reported the conidia to be bacillar,  $4\mu$  long. In view of the fact that this species is undoubtedly related to *B. conioops*, I regard this report as doubtful.)

Vainio (1903, p. 26) stated that *B. subcervina* is related to *B. augusta* Vain., but it is quite different in appearance. It strongly resembles some forms of *B. conioops*, especially the f. *cervinogranulata*, from which it is distinguished by its persistently plane and marginate apothecia and some internal characters, such as the darker hypothecium, the higher hymenium, and the broader spores with thickened septum.

*Buellia subconca* Müller Arg., 1886, p. 127. Redescription of the holotype specimen in Herb. Müller Arg. (Herb. Boissier, Genève) from South Georgia, collected by "Will" (Wilken?), 1885:

On greenish-grey quartzitic rock not effervescing with HCl.

Thallus effuse, rimose-areolate, pale sordid yellowish or pale dirty straw-coloured, in places with a faint brownish tinge; areolae irregularly angulose,  $0.2-0.7$  mm. diameter, up to  $0.4$  mm. thick, separated by narrow cracks. Surface of areolae matt, not pruinose, plane, either smooth or minutely wrinkled and pitted. In some places the areolae are very thin, spaced far apart, and between them is visible a dull brownish hypothallus, which shows faint indications of radiation at the edges. No isidia, soredia, or whitish punctations.

Apothecia black,  $0.3-0.6$  mm. diameter, arising in areolae, at first (or persistently) immersed, at maturity sometimes projecting slightly above thallus-level; numerous, round or often irregularly angulose, persistently concave with prominent, black proper margin of moderate thickness, not crenulate, but margins of several apothecia often coalescent. Disc sunken, matt, smooth or minutely scabrid, not pruinose.

Areolae in section with an outermost, colourless necrotic layer  $10-45\mu$  deep composed of empty, crushed, indistinct cells. Upper cortex  $40-60\mu$  thick, partly pigmented (reddish-brown), partly colourless, composed of rounded cells  $4-8\mu$  diameter with pigmented or colourless walls *c.*  $1\mu$  thick; apparently not capitate-fastigiata. Algal stratum  $60-120\mu$  deep, continuous or  $\pm$  interrupted; algae trebouxoid,  $6-14\mu$  diameter. Medulla of compactly interwoven, colourless hyphae  $5-8\mu$  diameter, closely septate and constricted at septa, forming a tissue of almost pseudoparenchymatous appearance. Thallus externally and internally K—, C—, PD—; medulla I—.

Excipulum entire below hypothecium, in basal part reddish-brown and produced downwards through the underlying thallus-tissue; at sides (proper margin) dense and blackish-brown, of radiating structure, with the hyphal cells heavily obscured by pigment. Hypothecium yellowish-brown, merging gradually into basal excipulum below,  $80-100\mu$  deep in centre. Hymenium  $70-90\mu$  high; epithecium dark reddish-brown (K—). Paraphyses discrete,  $2-3\mu$  thick, occasionally branched, at tips swollen to  $6\mu$  and surmounted by an apical cap of dark pigment. Asci clavate,  $40-65 \times 12-18\mu$ . Spores 8, irregularly arranged in ascus or  $\pm$  biseriata, ellipsoid, straight, brown, thinly 1-septate (also in young condition), not or hardly constricted at septum,  $12.5-15.0 \times 7.5-8.5\mu$ . Walls of asci I+ blue then sordid vinous-reddish. (No conidia seen.)

The persistently concave apothecia distinguish this from all the Antarctic species treated in the present study. It is, however, very closely related to the following species (*B. subviolascens*); see further remarks below.

*Buellia subviolascens* Zahlbruckner, 1917, p. 51. Revision of the holotype specimen in Herb. Mus. Bot. Uppsala from South Georgia, Cumberland Bay, "Maihafen" (Maiviken), collected by C. Skottsberg, 1902:

On fine-grained, schistose rock not effervescing with HCl.

Thallus effuse, forming irregular patches sometimes interspersed with other lichens (*Caloplaca*), the free margin bounded by an indistinct, inconspicuous, filmy, brown-blackish proto-thallus. Thallus thin, mostly *c.*  $0.2$  mm., in places up to  $0.3$  mm. thick, cream-coloured or greyish-isabelline (pale fuscous on moistening), here and there with a faint purplish-rufescent tinge, matt, not pruinose, even, areolate or rimose-areolate with plane, angulose areolae  $0.2-0.8$  mm. diameter separated by narrow, often dark cracks. No isidia or soredia.

Apothecia numerous, arising in thallus-areolae and for a long time immersed and  $\pm$  level with surface, finally emergent and adpressed-sessile, persistently plane and marginate,  $0.3-0.7$  mm. diameter, black, matt, not pruinose, with smooth disc and moderate, entire,  $\pm$  prominent proper margin.

Cortex of thallus colourless or isabelline in section, indistinctly pseudoparenchymatous (not capitate-fastigiata); no superficial necrotic layer seen. Lower third of thallus consisting of dark-brown, dense hypothalline tissue. Algal layer diffuse, not forming a definite stratum. Medullary tissue among algae compact, appearing  $\pm$  cellular, here and there interspersed with small sordid granules. Algae trebouxoid,  $10-18\mu$  diameter. Thallus-sections K—, C—, PD—; medulla I—.

Excipulum well developed at sides, dense, blackish, up to  $80\mu$  thick, continued downwards below apothecium but not entire (interrupted in centre); pseudoparenchymatous with very heavily pigmented cells (HNO<sub>3</sub>—). Hypothecium pale brown to reddish-brown, in central part produced downwards between lateral parts of excipular layer. Hymenium about  $100\mu$  high, in upper part brown to dark brown (no aeruginose tinge; HNO<sub>3</sub>—). Paraphyses distinct, in some mucilage but discrete under pressure,  $1.5-2.0\mu$  thick, capitate to  $3.0-4.5\mu$  at the brown-pigmented tips. Asci clavate,  $75-80 \times 18-21\mu$ . Spores (5-) 8 in ascus, irregularly biseriata, pale olivaceous then brown, ellipsoid, straight or rarely slightly curved, thinly 1-septate (also when young),  $14-18 \times 7.5-9.0\mu$ . Hymenium blue then aeruginose with I (hymenial mucilage persistently blue, asci and paraphyses becoming yellow).

Pycnoconidia filiform, arcuate,  $15-18\mu$  long, *c.*  $0.5\mu$  thick. Zahlbruckner's description is accurate in all respects except for a slight underestimation of the height of the hymenium, and too great length and thickness stated for the pycnoconidia.

This species belongs obviously to the *B. conioops* group and seems to be closely related to *B. latemarginata* Darb. and *B. Babingtonii* (Hook. f. & Tayl.) M. Lamb, from which it differs chiefly in the effuse thallus of different colour and longer

time immersed apothecia. The characters separating it from the preceding (*B. subconca* Müll. Arg.) are slight; more emergent apothecia, excipulum interrupted below, slightly higher hymenium, thinner paraphyses, and somewhat longer spores. Study of more material from South Georgia may show these differences to fall within the limits of variation of a single species.

*Rinodina antarctica* Müller Arg., 1889, p. 163. (See discussion of *R. deceptionis*, p. 67.) Redescription of the holotype specimen in Herb. Müller Arg. (Herb. Boissier, Genève) from Tierra del Fuego ("fretum magellanicum"), collected by Hariot, 1886.

On three small fragments of granitic rock.

Thallus now pale alutaceous or cream-coloured, or in places sordid greyish (whitish or finally grey-brownish, according to Müller Arg.), matt, not pruinose; effuse, areolate, thin, 0.1–0.3 mm. thick, ± even, thinner at periphery and there in some places bounded by a thin, blackish, not distinctly fimbriate or dendritic, protothalline line up to 0.3 mm. wide. Areolae irregular, angulose, of various sizes (0.3–0.8 mm. diameter), usually plane, sometimes slightly convex but not verrucose; separated by narrow or occasionally ± gaping cracks. Areolae at periphery of thallus smaller, 0.15–0.25 mm. diameter, thinner, not radially elongated. In spite of the presence of a dark protothalline line in places, there is no basal dark hypothallus under the central part of the thallus. No isidia or soredia.

Apothecia numerous but not crowded, arising in thallus-areolae and at first immersed, level with thallus or slightly sunken, round, 0.1–0.4 mm. diameter, either remaining in this aspicilioid condition or finally becoming slightly elevated but still closely adpressed and not or hardly constricted at base, surrounded by a fairly distinct but thin and non-prominent, pale thalline margin. Disc dark brown or brown-blackish, persistently plane (slightly tumid and paler on moistening), matt, not pruinose. No distinct dark proper margin developed at any stage.

Thallus in section covered by an uneven, colourless, ± structureless necrotic layer 5–15 $\mu$  thick. Underlying cortex about 30 $\mu$  thick, not pigmented but heavily interspersed with small sordid yellowish granules (dissolving without colour in K), of indistinct, apparently ± pseudoparenchymatous structure (not capitate-fastigiata), with cells 3–5 $\mu$  diameter. Algal layer 90–100 $\mu$  thick, with trebouxoid algae 9–14 $\mu$  diameter. Medulla compact or in places with loosely interwoven hyphae, not pigmented but semi-opaque from abundant, minute, isabelline granules (not dissolved by K) and irregular greyish inclusions (probably substratum-particles), of indistinct, ± gelatinized structure, cells 3–4 $\mu$  diameter. No dark basal hypothalline tissue developed. Thallus K–; medulla I– (not tested with other reagents).

Excipulum proprium little developed, 15–20 $\mu$  thick, yellow to vivid golden-brown in outer 15–50 $\mu$ , colourless internally and confluent with the hypothecium; the outer pigmented part cellular with cells *c.* 3 $\mu$  diameter. Outside the excipulum proprium, and confluent with it, a well developed thalline margin containing numerous algal cells and of the same structure as the thallus (unpigmented). Hypothecium colourless to faintly isabelline, without granules or inclusions, grumose-cellular, somewhat gelatinized. Scattered algal cells present below hypothecium. Hymenium 90–100 $\mu$  high, golden-yellow to pale golden-brown in uppermost part (K+ somewhat brighter yellow). Paraphyses concrete in copious mucilage but distinctly visible, *c.* 1.5 $\mu$  thick, rather abundantly branched but not anastomosing, at apices capitate to 3–4 $\mu$  and there lightly pigmented (dull golden-yellow to golden-brown). Asci clavate, about 75 × 24 $\mu$ . Spores 6–8 in ascus, irregularly biseriate, brown, ellipsoid, polarilocular (orcularioid), with primary thin median septum distinct or indistinct; in older stages darker brown and with the locules larger, rounded and approximated (Fig. 19d). Spores 14–21 × 10–12 $\mu$ .

(No pycnoconidia found.)

The golden-yellow or golden-brown pigmentation in the excipulum and epithecium of this species is peculiar.

Magnusson (1942, p. 39, and in Magnusson and Zahlbruckner, 1945, p. 54) recorded *R. antarctica* Müll. Arg. from the Hawaiian Islands. The descriptions given by him of the material do not, however, agree with the characters of *R. antarctica*, and the Hawaiian specimens certainly belong to some other species, as he himself subsequently suggested (Magnusson, 1956, p. 387). At the time of his writing he had not seen the type specimen of *R. antarctica*.

APPENDIX II  
GLOSSARY OF TECHNICAL TERMS

- Aeruginose* Of a blue-green colour, like verdigris.  
*Alutaceous* The colour of buff leather, or light tan.  
*Apothecium* The shield-shaped fructification (ascocarp) of lichens of the order Lecanorales.  
*Arcuate* Curved or bowed.  
*Areola* Small island-like portion of a crustose lichen thallus (adj. *areolate*).  
*Aspicilioid* Having the apothecial discs sunken and level with the thallus, as in *Lecanora* sect. *Aspicilia*.  
*Bacillar* Rod-shaped.  
*Biseriate* Arranged in two rows.  
*Botryose* Composed of small clustered protuberances, resembling a bunch of grapes.  
*C* Abbreviation used for a fresh, saturated, aqueous solution of calcium hypochlorite, Ca(OCl)<sub>2</sub>.  
*(Note: commercial bleaching liquids may also be used for the same purpose.)*  
*Caesious* Whitish with a bluish tinge.  
*Capitate-fastigiata* A type of thallus-cortex consisting of erect, parallel hyphae terminated by swollen and pigmented apical cells.  
*Cariose* Of a cracked, split, spongy or decayed appearance.  
*Castaneous* Chestnut-coloured (a reddish brown).  
*Cervine* Reddish-brown or tawny.  
*Cervino-rufescent* Brown with a more pronounced reddish tinge.  
*Cinereous* Ash-grey.  
*Clavate* Club-shaped.  
*Concolorous* Of the same colour.  
*Concrete* Closely connected and inseparable, or separable only with difficulty.  
*Confervoid* Composed of loose filaments or threads.  
*Conidia* See *pycnoconidia*.  
*Cortex* Hyphal or cellular tissue forming an outer rind.  
*Crenate* With small marginal lobes.  
*Crustose* Term applied to lichen thalli which form a layer directly applied to the substratum. (As opposed to *foliose* and *fruticose*.)  
*Dactylaeform* Finger-shaped.  
*Dendritic* Repeatedly branched in a tree-like manner.  
*Diffract* Broken up into portions by cracks.  
*Dimidiate* In two lateral parts, interrupted at the base; term applied to the excipulum. (Opposite of *entire*.)  
*Discrete* Separate or easily separable.  
*Effigurate* Term applied to a crustose lichen thallus which is lobed at the periphery.  
*Effuse* Spreading in an indefinite manner, not distinctly limited or structurally specialized at the periphery.  
*Entire* Forming a continuous, uninterrupted stratum at the base; term applied to the excipulum. (Opposite of *dimidiate*.)  
*Epithecium* The upper surface of the hymenial layer of an apothecium, formed by the coloured tips of the paraphyses.  
*Excipulum* (= *exciple*). The border of sterile tissue forming the margin of an apothecium.  
*Fabaceous* Bean-shaped.  
*Fastigiata* Consisting of parallel, clustered branches. (See also *capitate-fastigiata*.)  
*Fibrillose* Having a finely striated appearance, as of radiating fibres.  
*Filiform* Thread-like.  
*Fimbriate* Forming a fringe.  
*Flabellate* Fan-shaped.  
*Foliose* Term applied to lichen thalli which form free, dorsiventral, leaf-like outgrowths. (As opposed to *crustose* and *fruticose*.)  
*Fruticose* Term applied to lichen thalli which form free, erect, stalk-like outgrowths. (As opposed to *crustose* and *foliose*.)  
*Fulvous* Ochraceous yellowish.  
*Funoid* Composed of rope-like strands or fibres.  
*Fuscous* Dusky brownish.  
*Generative tissue* A vegetative tissue, different in structure from the rest of the thallus, produced by ordinary medullary hyphae in connection with the formation of ascogonia. (For further details, refer to p. 7.)  
*Glebose* Forming clod-like lumps.  
*Grumose* Of granular appearance.  
*Holotype* The single specimen on which a taxon was first described. (See also *isotype*.)  
*Hyaline* Clear, colourless, transparent.  
*Hymenium* The upper spore-bearing layer of an ascocarp, made up of asci and paraphyses.  
*Hypothallus* The dark-coloured basal layer, in direct contact with the substratum, extending below the assimilative thallus of a crustose lichen. (See also *protothallus*.)

<i>Hypothecium</i>	The tissue (colourless or pigmented) situated below the hymenium (= "subhymenial layer" of some authors).
<i>I</i>	Abbreviation used for iodine crystals dissolved in an aqueous solution of potassium iodide and diluted to a light brown colour.
<i>Isabelline</i>	Of a drab, dirty yellowish colour, like unwashed linen.
<i>Isotype</i>	A duplicate of the holotype (q.v.).
<i>K</i>	Abbreviation used for a mixture of equal parts of 5 per cent potassium hydroxide, KOH, and 20 per cent potassium carbonate, K <sub>2</sub> CO <sub>3</sub> , in aqueous solution.
<i>Lecanorine</i>	A type of lichen apothecium surrounded by a thalline margin containing symbiotic algae, as in the genus <i>Lecanora</i> .
<i>Lecideine</i>	A type of lichen apothecium without thalline margin, dark-coloured or carbonaceous, as in the genus <i>Lecidea</i> .
<i>Lirelliform</i>	Elongated with a slit-like furrow along the middle.
<i>Matt</i>	Dull, not shining (as opposed to lustrous or <i>nitid</i> ).
<i>Medulla</i>	The thalline tissues below the layer of symbiotic algae.
<i>Metathallus</i>	The assimilative portion of the lichen thallus provided with symbiotic algae (adj. <i>metathalline</i> ).
<i>Muriform</i>	Division of spores by cross walls running in both directions, so as to give the appearance of bricks in a wall.
<i>Mycelial</i>	Composed of fungal threads or hyphae.
<i>Nitid</i> (or <i>nitidous</i> )	Smooth and shining, lustrous (as opposed to <i>matt</i> ).
<i>Nodulose</i>	Forming small knotty or subspherical protuberances.
<i>Nubilated</i>	Cloudy and semi-opaque as viewed by transmitted light.
<i>Ochraceous</i>	Ochre-coloured, dull yellowish.
<i>Orcularioid</i>	Term applied to a brown spore of the polarilocular type (see Fig. 14c, p. 61), as in <i>Rinodina</i> sect. <i>Orcularia</i> .
<i>Ostiole</i>	The aperture through which spores escape from a perithecium or pycnidium.
<i>Paraphyses</i>	Sterile filaments between the asci in the hymenium.
<i>PD</i>	Abbreviation used for a 5 per cent solution of paraphenylenediamine, C <sub>6</sub> H <sub>4</sub> (NH <sub>2</sub> ) <sub>2</sub> , in 95 per cent alcohol, freshly prepared.
<i>Perifulcrum</i>	The wall of a pycnidium.
<i>Placodiomorphic</i>	The polarilocular (q.v.) condition of spores, as found in the genus <i>Placodium</i> (= <i>Caloplaca</i> ).
<i>Polarilocular</i>	Term applied to 2-celled spores with thickened internal wall and the protoplasm-cavities reduced to 2 locules usually connected by a canal. (See also <i>orcularioid</i> .)
<i>Proper margin</i>	An excipulum (q.v.) consisting of ascocarp-tissue only, without any thalline or pseudothalline margin.
<i>Protothallus</i>	That part of the hypothallus (q.v.) which projects as a fringing zone around the periphery of a crustose lichen thallus.
<i>Pruinose</i>	Covered with a fine powder, giving a frosted appearance.
<i>Pseudocortex</i>	Term introduced by Degelius (1954) to designate a type of thalline cortical layer composed of compacted, indistinct, more or less gelatinized, branching hyphae.
<i>Pseudoparenchyma</i>	A fungal tissue of isodiametric cells resembling the parenchyma of higher plants.
<i>Punctate</i>	With small spots or minute, dot-like protuberances.
<i>Pycnidium</i>	A globose or flask-shaped conceptacle in which pycnidiospores are produced.
<i>Pycnoconidia</i>	Conidial spores produced in a pycnidium (in some cases they function as male gametes).
<i>Rimose</i>	Divided by cracks.
<i>Rufescent</i>	Reddish.
<i>Saxicolous</i>	Growing on rock or stone.
<i>Scutelliform</i>	In the form of a small dish or saucer.
<i>Sorediate</i>	See <i>soredium</i> .
<i>Soredium</i> (pl. <i>soredia</i> )	A detachable, powdery, vegetative propagule composed of a few algal cells enveloped in a weft of fungal hyphae.
<i>Squamulose</i>	In the form of small scales.
<i>Sterigma</i>	A hyphal process from which a conidium or pycnidiospore is produced.
<i>Stramineous</i>	Straw-coloured.
<i>Subcrenate</i>	A less accentuated condition of <i>crenate</i> (q.v.).
<i>Subdiscrete</i>	A less accentuated condition of <i>discrete</i> (q.v.).
<i>Subeffigurate</i>	A less accentuated condition of <i>effigurate</i> (q.v.).
<i>Sublirelliform</i>	A less accentuated condition of <i>lirelliform</i> (q.v.).
<i>Submuriform</i>	Similar to <i>muriform</i> (q.v.) but with only a few cells.
<i>Subulate</i>	Awl-shaped, or spindle-shaped with a pointed end.
<i>Tawny</i>	Reddish-brown (= <i>cervine</i> ).
<i>Taxon</i>	A genetically conditioned biological entity meriting a formal name in a system of classification.
<i>Trebouxioid</i>	Similar to the algal genus <i>Trebouxia</i> (Chlorococcales, the commonest algal symbiont of lichens): single spherical cells with an axial, lobed chloroplast, multiplying by internal sporulation.
<i>Verruca</i> (dim. <i>verrucula</i> )	A wart-like, convex outgrowth or subglobose lump (adj. <i>verrucose</i> , dim. <i>verruculose</i> ).



## APPENDIX III

### SPECIMENS EXAMINED

The following points should be noted when comparing the information given in Tables I-XXXV with that appearing on the specimen labels.

*Locality.* The place-names used in the tables are those currently accepted for use in British official publications, as listed in the Gazetteer of the British Antarctic Territory, South Georgia and the South Sandwich Islands, 1962 edition (with Supplement, 1964) published by H.M. Stationery Office. The Argentine equivalents are given after the tables. Unofficial place-names appear on many specimen labels, and if these are quoted in the tables they are given in inverted commas.

*Position.* The latitude and longitude of the locality where each specimen was collected is given in the tables as far as possible to the nearest minute of a degree, but if the precise locality is unknown the figure quoted is the mid-point of the feature named. Some specimen labels still bear provisional figures assigned in the field.

*Specimen number.* In most cases only the actual number will be found on the specimen label, and not the name or date of the expedition (or its abbreviation; see p. 3) which precedes the number. However, specimens collected by FIDS (Falkland Islands Dependencies Survey or its forerunner "Operation Tabarin") also bear prefix letters A, B or BB, C, D, E, G, H and N, which indicate the bases from which the material was collected. A small letter following the number indicates a subdivision of the original specimen.

TABLE I  
*Buellia anisomera*

*South Orkney Islands*

Locality	Position		Altitude		Collecting Notes	Date of Collection	Specimen Number	Herbarium	Fertile or Sterile	Collector or Expedition
	lat. S.	long. W.	ft.	m.						
LAURIE I., Cape Geddes	60°42'	44°35'	150	45	N.W. seaward edge of Cape Geddes: on outcrop on small plateau above general level of snow-covered ground	8 Apr. 1946	FIDS C3-1001s	BM	fert.	FIDS
LAURIE I., Cape Geddes	60°42'	44°35'	40-70	12-21	S.W. Cape Geddes: on loose rocks, recently exposed	27 Nov. 1946	FIDS C20-1007 l	BM	sparingly fert.	FIDS
LAURIE I., Cape Geddes	60°42'	44°35'	100	30	N.W. slope, on recently exposed rocks	28 Nov. 1946	FIDS C24-1008g	BM	fert.	FIDS
LAURIE I., Cape Geddes	60°42'	44°35'	15	4	N.W. coast of Cape Geddes: from exposed rocks	27 Nov. 1946	FIDS C19-1006p	BM	fert.	FIDS
LAURIE I., Cape Geddes	60°42'	44°35'	100-200	30-60	Slope facing N.W., from rocks and crevices	3 Oct. 1946	FIDS C8-1003c	BM	fert.	FIDS
FREDRIKSEN I.	60°45'	45°00'	c.300	c.90	From scree slope	4 Jan. 1933	DI 1931-33/1090-29b	BM	fert.	DI 1931-33
SIGNY I., Borge Bay	60°43'	45°36'	—	—	—	18 Jan. 1933	DI 1931-33/1092-18a	BM	fert.	DI 1931-33
SIGNY I.	60°43'	45°38'	80	24	Near main base hut	26 Apr. 1947	FIDS H53-1j	BM	fert.	G. de Q. Robin
SIGNY I., Jebsen Point	60°43'	45°40'	40	12	—	16 Jan. 1948	FIDS H84-1r	BM	fert.	P.E. Biggs

*South Shetland Islands*

Locality	Position		Altitude		Collecting Notes	Date of Collection	Specimen Number	Herbarium	Fertile or Sterile	Collector or Expedition
	lat. S.	long. W.	ft.	m.						
NELSON I.	62°17'	59°02'	—	—	—	11 Jan. 1902	SAE 55 <i>pr. p.</i>	S	ster.	C. Skottsberg

Locality	Position		Altitude		Collecting Notes	Date of Collection	Specimen Number	Herbarium	Fertile or Sterile	Collector or Expedition
	lat. S.	long. W.	ft.	m.						
2 mi. N.N.W. of MT. JACQUINOT	63°21'	57°53'	50	15	—	18 Oct. 1946	FIDS D367-6e FIDS D367-6f	BM	fert.	A. Reece
MELCHIOR Is., Alpha I.	64°19'	63°00'	16-20	5-6	W. side of island on vertical granodiorite cliff face	21 Dec. 1964	BSWA 7890a BSWA 7893q	FH	fert.	I. M. Lamb
ANVERS I., Arthur Harbour, Norsel Point	64°46'	64°06'	50	15	On a stone on ledge of a rock slope	4 Feb. 1965	BSWA 8023e	FH	fert.	I. M. Lamb
WIENCKE I.	64°50'	63°25'	—	—	“Sur un rocher”	1897-99	BAE 447 <i>pr. p*</i>	TUR, BR	fert.	E. Racovitza
WIENCKE I., Dorian Bay	64°49'	63°31'	c.35	c.11	On small boulder in a rock outcrop	18 Dec. 1944	FIDS A2011b	BM	fert.	I. M. Lamb
WIENCKE I., Goudier I.	64°50'	63°31'	23	7	On granodioritic ridge	25 Feb. 1944	FIDS A1138 <i>pr. p.</i>	BM	fert.	I. M. Lamb
WIENCKE I., Goudier I.	64°50'	63°31'	30	9	On a loose stone	27 Feb. 1944	FIDS A11460	BM	fert.	I. M. Lamb
WIENCKE I., Goudier I.	64°50'	63°31'	26	8	On granodioritic rock	1 Apr. 1944	FIDS A1196a	BM	fert.	I. M. Lamb
WIENCKE I., Goudier I.	64°50'	63°31'	26	8	On rocks	2 Apr. 1944	FIDS A1198 FIDS A1202a	BM	fert.	I. M. Lamb
WIENCKE I., Goudier I.	64°50'	63°31'	26	8	On a piece of loose rock	2 Apr. 1944	FIDS A1208a	BM	fert.	I. M. Lamb
WIENCKE I., Goudier I.	64°50'	63°31'	26	8	On side of basalt dyke	26 Nov. 1944	FIDS A1804	BM	fert.	I. M. Lamb
WIENCKE I., Goudier I.	64°50'	63°31'	26	8	On granodioritic rock	26 Nov. 1944	FIDS A1807a	BM	fert.	I. M. Lamb
WIENCKE I., Goudier I.	64°50'	63°31'	26	8	On basalt dyke	28 Nov. 1944	FIDS A1824b FIDS A1827 FIDS A1828 FIDS A1831b FIDS A1832	BM	fert.	I. M. Lamb
WIENCKE I., Goudier I.	64°50'	63°31'	26	8	On basalt dyke	14 Jan. 1945	FIDS A2232i	BM	fert.	I. M. Lamb
WIENCKE I., Goudier I.	64°50'	63°31'	26	8	On a basaltic stone	18 Jan. 1945	FIDS A2254j	BM	fert.	I. M. Lamb
WIENCKE I., Goudier I.	64°50'	63°31'	—	—	“Sur les rochers (diorites) aux endroits un peu abrités”	28 Dec. 1908	FAE 1908-10/92 <i>pr. p.†</i>	PC	fert.	FAE 1908-10
PETERMANN I.	65°11'	64°11'	—	—	“Sur les rochers au nord de l'île”	1 Jan. 1909	FAE 1908-10/142 <i>pr. p.‡</i>	PC	fert.	Liouville
PETERMANN I.	65°11'	64°11'	—	—	“Sur les rochers (diorites) au nord de l'île”	1 Jan. 1909	FAE 1908-10/142 <i>pr. p.§</i>	PC	fert.	Liouville

\* Type specimen of *Buellia anisomera* Vainio.

† Type specimen of *Lecidea citrella* Hue.

‡ Type specimen of *Lecidea festivissima* Hue.

§ One of the specimens on which *Lecidea inordinata* Hue was based.

TABLE I. *Buellia anisomera* (continued)

## West Graham Land—cont.

Locality	Position		Altitude		Collecting Notes	Date of Collection	Specimen Number	Herbarium	Fertile or Sterile	Collector or Expedition
	lat. S.	long. W.	ft.	m.						
RASMUSSEN I. ("Cape Rasmussen")	65°15'	64°06'	—	—	—	21 Jan. 1936	BGLE 1479-8	BM	fert.	BGLE
ARGENTINE IS., Galindez I.	65°15'	64°15'	10-25	3-8	On nearly vertical low sea cliff	31 Mar. 1935	BGLE 1116-54q BGLE 1116-68 BGLE 1116-71a BGLE 1116-90	BM	fert.	BGLE
ARGENTINE IS., Galindez I.	65°15'	64°15'	—	—	From horizontal rock top exposed by thaw in last few days	14 Dec. 1935	BGLE 1305-3	BM	fert.	BGLE
ARGENTINE IS., Galindez I.	65°15'	64°15'	—	—	From typical boulder area, just uncovered by snow melt	27 Dec. 1935	BGLE 1328-7	BM	fert.	BGLE
BERTHELOT IS., Green I.	65°19'	64°10'	15	4	From N.-facing low sea cliff	18 Mar. 1935	BGLE 1094-3 BGLE 1094-58	BM	fert.	BGLE
MARGUERITE BAY, Léonie Is. (Lagoon I.)	67°36'	68°15'	—	—	—	26 Feb. 1936	BGLE 1449-3a BGLE 1449-4	BM	fert.	BGLE

## East Graham Land

Locality	Position		Altitude		Collecting Notes	Date of Collection	Specimen Number	Herbarium	Fertile or Sterile	Collector or Expedition
	lat. S.	long. W.	ft.	m.						
HOPE BAY, low hill on E. side	63°24'	57°00'	450	137	On loose stone among sward of <i>Usnea antarctica</i>	16 Apr. 1945	FIDS D2407b	BM	fert.	I. M. Lamb
HOPE BAY, above Lake Boeckella	63°24'	57°00'	c.380	c.115	On a large stone	25 Oct. 1945	FIDS D2531b	BM	fert.	I. M. Lamb
HOPE BAY, Scar Hills	63°25'	57°01'	c.330	c.100	On loose stone	25 Sep. 1945	FIDS D2488 FIDS D2492a	BM	fert.	I. M. Lamb
PAULET I.	63°35'	55°47'	—	—	—	Oct. 1903	SAE 62*	S	fert.	C. Skottsberg

\* Specimen determined by Darbishire as "*Buellia protohallina* (Kphbr.) Vainio".

TABLE II  
*Buellia inordinata*

*South Orkney Islands*

Locality	Position		Altitude		Collecting Notes	Date of Collection	Specimen Number	Herbarium	Fertile or Sterile	Collector or Expedition
	lat. S.	long. W.	ft.	m.						
SIGNY I., Borge Bay	60°43'	45°36'	c.56	c.17	On N.-facing hillside	Feb. 1944	FIDS H3038e	BM	fert.	T. Hooley

*West Graham Land*

Locality	Position		Altitude		Collecting Notes	Date of Collection	Specimen Number	Herbarium	Fertile or Sterile	Collector or Expedition
	lat. S.	long. W.	ft.	m.						
MELCHIOR IS., Omega I.	64°20'	62°56'	20	6	N. side of island, on shore escarpment of steep granodioritic rocks beneath a snow slope	31 Jan. 1965	BSWA 7988b	FH	fert.	I. M. Lamb
ANVERS I., Arthur Harbour, Norsel Point	64°46'	64°06'	50	15	On loose stone on stony ground among rocks	4 Feb. 1965	BSWA 8018d	FH	fert.	I. M. Lamb
WIENCKE I., Goudier I.	64°50'	63°31'	25	7.5	On basalt dyke	14 Jan. 1945	FIDS A2232j	BM	fert.	I. M. Lamb
BOOTH I., Jeanne Hill	65°04'	64°02'	100-330	30-100	"Sur les rochers (diorites)"	30 Dec. 1908	FAE 1908-10/115 <i>pr. p.*</i>	PC	fert.	FAE 1908-10

\* Lectotype specimen of *Buellia inordinata* (Hue) Darbshire.

TABLE III

*Buellia Nelsonii*

## South Shetland Islands

Locality	Position		Altitude		Collecting Notes	Date of Collection	Specimen Number	Herbarium	Fertile or Sterile	Collector or Expedition
	lat. S.	long. W.	ft.	m.						
NELSON I.	62°17'	59°02'	—	—	On rock	11 Jan. 1902	SAE 35/37 <i>pr. p.</i> *	S	fert.	C. Skottsberg
ROBERT I., Coppermine Cove	62°22'	59°45'	100	30	On sheltered N.E.-facing slopes	31 Dec. 1934	DI 1934-35/1485-2	BM	fert.	DI 1934-35

\* Type specimen of *Buellia Nelsonii* Darbshire.

TABLE IV

*Buellia granulosa*

## South Orkney Islands

Locality	Position		Altitude		Collecting Notes	Date of Collection	Specimen Number	Herbarium	Fertile or Sterile	Collector or Expedition
	lat. S.	long. W.	ft.	m.						
LAURIE I., Cape Geddes	60°42'	44°35'	40-70	12-21	On loose rocks, recently exposed	27 Nov. 1946	FIDS C20-1007p	BM	fert.	FIDS
SIGNY I., Borge Bay	60°43'	45°36'	25	8	On N.-facing hillside	Feb. 1944	FIDS H3036b	BM	fert.	T. Hooley
SIGNY I., Jebsen Point	60°43'	45°40'	40	12	—	16 Jan. 1948	FIDS H84-1u	BM	fert.	P. E. Biggs

## South Shetland Islands

Locality	Position		Altitude		Collecting Notes	Date of Collection	Specimen Number	Herbarium	Fertile or Sterile	Collector or Expedition
	lat. S.	long. W.	ft.	m.						
KING GEORGE I., Penguin I.	62°05'	57°55'	100	30	From summit of great basalt plug on W. side of island	9 Jan. 1937	DI 1936-37/1951-17b	BM	fert.	DI 1936-37

TABLE IV. *Buellia granulosa* (continued)

## West Graham Land

Locality	Position		Altitude		Collecting Notes	Date of Collection	Specimen Number	Herbarium	Fertile or Sterile	Collector or Expedition
	lat. S.	long. W.	ft.	m.						
ANVERS I., Arthur Harbour, Norsel Point	64°46'	64°06'	33	10	On loose stone on stony ground among rocks	4 Feb. 1965	BSWA 8015x	FH	fert.	I. M. Lamb
WIENCKE I., Goudier I.	64°50'	63°31'	26	8	On rock	2 Apr. 1944	FIDS A1209	BM	fert.	I. M. Lamb
WIENCKE I., Goudier I.	64°50'	63°31'	26	8	On basalt dyke	28 Nov. 1944	FIDS A1829 FIDS A1831a	BM	fert.	I. M. Lamb
WIENCKE I., Goudier I.	64°50'	63°31'	26	8	On granodioritic rock	28 Nov. 1944	FIDS A1830	BM	fert.	I. M. Lamb
WIENCKE I., Goudier I.	64°50'	63°31'	26	8	On basalt dyke	14 Jan. 1945	FIDS A2235	BM	fert.	I. M. Lamb
BOOTH I., Jeanne Hill	65°04'	64°02'	100-330	30-100	"Sur les rochers abrupts (diorites)"	30 Dec. 1908	FAE 1908-10/119 <i>pr. p.*</i>	PC	fert.	FAE 1908-10
PETERMANN I.	65°11'	64°11'	—	—	"Sur les rochers (diorites) au nord de l'île"	1 Jan. 1909	FAE 1908-10/140 <i>pr. p.†</i>	PC	fert.	Liouville
ARGENTINE IS. Galindez I.	65°15'	64°15'	—	—	Summit of island, on rock, only recently free of snow	1 Jan. 1936	BGLE 1340-5	BM	fert.	BGLE
Mainland behind BERTHELOT IS.	65°19'	64°05'	—	—	From cliff exposed to dominant wind	27 Jul. 1935	BGLE 1189-2	BM	fert.	BGLE

\* Lectotype specimen of *Lecidea cremea* Hue.† Type specimen of *Lecidea cremea* f. *incrassata* Hue.

## East Graham Land

Locality	Position		Altitude		Collecting Notes	Date of Collection	Specimen Number	Herbarium	Fertile or Sterile	Collector or Expedition
	lat. S.	long. W.	ft.	m.						
HOPE BAY	63°24'	57°00'	—	—	On rock	11 Nov. 1903	SAE 165/166* SAE 176 <i>pr. p.†</i> SAE 242‡	S	fert.	C. Skottsberg
HOPE BAY, above Lake Boeckella	63°24'	57°00'	350	105	Summit of hillock above lake, on loose stone	25 Oct. 1945	FIDS D2525t	BM	fert.	I. M. Lamb

\* Named "*Buellia frigida*" by Darbishire.† Named "*Diplotomma alboatrum*" by Darbishire.‡ Type specimen of *Bacidia granulosa* Darbishire.

TABLE V

*Buellia subpedicellata**South Orkney Islands*

Locality	Position		Altitude		Collecting Notes	Date of Collection	Specimen Number	Herbarium	Fertile or Sterile	Collector or Expedition
	lat. S.	long. W.	ft.	m.						
LAURIE I., Cape Geddes	60°42'	44°35'	15	4	On exposed rocks	27 Nov. 1946	FIDS C19-1006c	BM	fert.	FIDS
LAURIE I., Cape Geddes	60°42'	44°35'	40-70	12-21	On loose rocks, recently exposed	27 Nov. 1946	FIDS C20-1007j	BM	fert.	FIDS

*West Graham Land*

Locality	Position		Altitude		Collecting Notes	Date of Collection	Specimen Number	Herbarium	Fertile or Sterile	Collector or Expedition
	lat. S.	long. W.	ft.	m.						
MELCHIOR Is., Kappa I.	64°19'	63°00'	33	10	N. side of island on granodioritic stone on ledge of rock face	31 Dec. 1964	BSWA 7930s	FH	fert.	I. M. Lamb
MELCHIOR Is., Kappa I.	64°19'	63°00'	33	10	N. side of island, on vertical granodioritic rock face	31 Dec. 1964	BSWA 7931z	FH	fert.	I. M. Lamb and R. E. Waterhouse
ANVERS I., Arthur Harbour	64°46'	64°04'	30	9	On loose stone on rock outcrop on rocky knoll	4 Feb. 1965	BSWA 8024i BSWA 8027q	FH	fert.	I. M. Lamb
ANVERS I., Arthur Harbour, Norsel Point	64°46'	64°06'	50	15	On a stone on ledge of a rock slope	4 Feb. 1965	BSWA 8023c	FH	fert.	I. M. Lamb
ANVERS I., Arthur Harbour, Norsel Point	64°46'	64°06'	83	25	On upper side of large rock on rocky and mossy slope	7 Feb. 1965	BSWA 8097k	FH	fert.	I. M. Lamb and M. H. Zimmermann



TABLE V. *Buellia subpedicellata* (continued)

## West Graham Land—cont.

Locality	Position		Altitude		Collecting Notes	Date of Collection	Specimen Number	Herbarium	Fertile or Sterile	Collector or Expedition
	lat. S.	long. W.	ft.	m.						
WIENCKE I., Goudier I.	64°50'	63°31'	26	8	On granodioritic rocks	17 Mar. 1944	FIDS A1169	BM	fert.	I. M. Lamb
WIENCKE I., Goudier I.	64°50'	63°31'	26	8	On granodioritic rock	26 Nov. 1944	FIDS A1805a	BM	fert.	I. M. Lamb
PETERMANN I.	65°11'	64°11'	—	—	“Sur les rochers”	14 Mar. 1909	FAE 1908-10/304 <i>pr. p.*</i>	PC	spar- ingly fert.	FAE 1908-10
ARGENTINE IS., Galindez I.	65°15'	64°15'	10-25	3-8	From nearly vertical low sea cliff	31 Mar. 1935	BGLE 1116-64	BM	fert.	BGLE
ARGENTINE IS., Galindez I.	65°15'	64°15'	—	—	From rock slopes facing N.W. a few yards back from the sea	31 Mar. 1935	BGLE 1118-15 BGLE 1118-17b	BM	fert.	BGLE
ARGENTINE IS., Galindez I.	65°15'	64°15'	—	—	From N.-facing cliff on <i>Penola's</i> starboard beam at winter anchorage	1 Nov. 1935	BGLE 1253-10 BGLE 1253-11 BGLE 1253-14 BGLE 1253-15	BM	fert.	BGLE
ARGENTINE IS., Galindez I.	65°15'	64°15'	10-20	3-6	From vertical rock just S.E. of <i>Penola</i> in winter quarters	27 May 1935	BGLE 1163-25	BM	fert.	BGLE
ARGENTINE IS., Galindez I.	65°15'	64°15'	—	—	From outcrop facing N. on <i>Penola's</i> starboard quarter at winter anchorage	24 Oct. 1935	BGLE 1248-3	BM	fert.	BGLE
BERTHELOT IS., Green I.	65°19'	64°10'	—	—	From N.-facing inland cliff	18 Mar. 1935	BGLE 1081-23 BGLE 1081-31 BGLE 1088-1a	BM	fert.	BGLE
BERTHELOT IS., Green I.	65°19'	64°10'	15	4	From N.-facing low sea cliff	18 Mar. 1935	BGLE 1094-17 BGLE 1094-36 BGLE 1094-60 BGLE 1094-68 BGLE 1094-97	BM	fert.	BGLE

\* Syntype specimen of *Lecidea subpedicellata* Hue.

TABLE V. *Buellia subpedicellata* (continued)

## East Graham Land

Locality	Position		Altitude		Collecting Notes	Date of Collection	Specimen Number	Herbarium	Fertile or Sterile	Collector or Expedition
	lat. S.	long. W.	ft.	m.						
HOPE BAY, Lake Boeckella	63°24'	57°00'	155	50	On loose stone, not abundant	11 Oct. 1945	FIDS D2514	BM	fert.	I. M. Lamb

TABLE VI

*Buellia Darbishirei*

## East Graham Land

Locality	Position		Altitude		Collecting Notes	Date of Collection	Specimen Number	Herbarium	Fertile or Sterile	Collector or Expedition
	lat. S.	long. W.	ft.	m.						
HOPE BAY	63°24'	57°00'	—	—	On rocks	11 Nov. 1903	SAE 170*	S	fert.	C. Skottsberg
JAMES ROSS I., Cape Lachman	63°47'	57°47'	70-230	20-70	On isthmus behind the cape, on basaltic rock	21 Nov. 1945	FIDS D2682r	BM	fert.	I. M. Lamb

\* Type specimen (as *Rinodina crassa* Darbishire).

TABLE VII

*Buellia cladocarpiza*

## South Shetland Islands

Locality	Position		Altitude		Collecting Notes	Date of Collection	Specimen Number	Herbarium	Fertile or Sterile	Collector or Expedition
	lat. S.	long. W.	ft.	m.						
KING GEORGE I., Esther Harbour	61°55'	57°56'	0	0	On rocks	6 Jan. 1937	DI 1936-37/1949-3	BM	fert.	DI 1936-37

## West Graham Land

Locality	Position		Altitude		Collecting Notes	Date of Collection	Specimen Number	Herbarium	Fertile or Sterile	Collector or Expedition
	lat. S.	long. W.	ft.	m.						
WIENCKE I., Noble Peak	64°48'	63°25'	445	135	On S.-facing, slightly overhanging face of granodioritic rock in an outcrop	19 Nov. 1944	FIDS A1782*	BM	fert.	I. M. Lamb

\* Type specimen.

TABLE VIII  
*Buellia punctata*

West Graham Land

Locality	Position		Altitude		Collecting Notes	Date of Collection	Specimen Number	Herbarium	Fertile or Sterile	Collector or Expedition
	lat. S.	long. W.	ft.	m.						
WIENCKE I., Goudier I.	64°50'	63°31'	0	0	On weathered wooden deck of old whaling boat drawn up on beach many years previously	1 Apr. 1944	FIDS A1211w	BM	fert.	I. M. Lamb
MARGUERITE BAY, Bourgeois Fjord	67°40'	67°05'	—	—	S.E. corner of fjord*	15 Dec. 1936	BGLE 1515-1	BM	fert.	BGLE

\* Over stunted mosses on sandy detritus.

TABLE IX  
*Buellia pycnogonoides*

East Graham Land

Locality	Position		Altitude		Collecting Notes	Date of Collection	Specimen Number	Herbarium	Fertile or Sterile	Collector or Expedition
	lat. S.	long. W.	ft.	m.						
TABARIN PENINSULA, nunatak 3 mi. S.W. of Summit Pass	63°29'	57°06'	700	215	On rock*	5 Nov. 1945	FIDS D2555	BM	fert.	L. Ashton
DUSE BAY, View Point	63°33'	57°22'	50	15	On scree and rock outcrop, N. exposure	10 Nov. 1945	FIDS D2614w	BM	fert.	I. M. Lamb

\* Around bases of tufts of *Usnea* (*Neuropogon*).

TABLE X  
*Buellia evanescens*

West Graham Land

Locality	Position		Altitude		Collecting Notes	Date of Collection	Specimen Number	Herbarium	Fertile or Sterile	Collector or Expedition
	lat. S.	long. W.	ft.	m.						
ALEXANDER I., Ablation Point	70°48'	68°22'	—	—	—	26 Oct. 1936	BGLE 1497-4 BGLE 1497-6	BM	fert.	BGLE

TABLE XI

*Buellia illaetabilis**East Graham Land*

Locality	Position		Altitude		Collecting Notes	Date of Collection	Specimen Number	Herbarium	Fertile or Sterile	Collector or Expedition
	lat. S.	long. W.	ft.	m.						
HOPE BAY, The Pyramid	63°26'	57°01'	1,900	575	Summit of peak, on rock	30 Apr. 1945	FIDS D2420c	BM	fert.	I. M. Lamb
THE STEEPLE	63°26'	57°03'	c.1,000	c.303	W. side of peak near Depot Glacier	26 Oct. 1945	FIDS D2535x	BM	fert.	E. H. Back
VEGA I., False I. Point	63°55'	57°20'	20-60	6-18	On stony isthmus	5 Dec. 1945	FIDS D2722*	BM	fert.	I. M. Lamb

\* Holotype specimen.

TABLE XII

*Buellia papillata**East Graham Land*

Locality	Position		Altitude		Collecting Notes	Date of Collection	Specimen Number	Herbarium	Fertile or Sterile	Collector or Expedition
	lat. S.	long. W.	ft.	m.						
JAMES ROSS I., Herbert Sound	63°55'	57°45'	50-155	15-50	Over decayed moss on gently sloping stony slope periodically irrigated by snow melt water	8 Dec. 1945	FIDS D2824	BM	fert.	I. M. Lamb

TABLE XIII

*Buellia russa**South Orkney Islands*

Locality	Position		Altitude		Collecting Notes	Date of Collection	Specimen Number	Herbarium	Fertile or Sterile	Collector or Expedition
	lat. S.	long. W.	ft.	m.						
LAURIE I., Cape Geddes	60°42'	44°35'	150	45	From an outcrop above general level of snow-covered ground	8 Apr. 1946	FIDS C3-1001r	BM	fert.	FIDS
LAURIE I., Cape Geddes	60°42'	44°35'	100-200	30-60	From slope to E. of base hut	3 Oct. 1946	FIDS C8-1003h	BM	fert.	FIDS
LAURIE I., Cape Geddes	60°42'	44°35'	15	4	On exposed rocks	27 Nov. 1946	FIDS C19-1006e FIDS C19-1006m	BM	fert.	FIDS

TABLE XIII. *Buellia russa* (continued)

## South Orkney Islands—cont.

Locality	Position		Altitude		Collecting Notes	Date of Collection	Specimen Number	Herbarium	Fertile or Sterile	Collector or Expedition
	lat. S.	long. W.	ft.	m.						
LAURIE I., Cape Geddes	60°42'	44°35'	40-70	12-21	On loose rocks, recently exposed	27 Nov. 1946	FIDS C20-1007h FIDS C20-1007k	BM	fert.	FIDS
LAURIE I., Cape Geddes	60°42'	44°35'	100	30	N.W. slope, on recently exposed rocks	28 Nov. 1946	FIDS C24-1008f	BM	fert.	FIDS
FREDRIKSEN I.	60°45'	45°00'	300	90	From scree slope	4 Jan. 1933	DI 1931-33/1090-23 DI 1931-33/1090-29a	BM	fert.	DI 1931-33
SIGNY I.	60°43'	45°38'	80	24	Near main base hut	26 Apr. 1947	FIDS H53-1i	BM	fert.	G. de Q. Robin
SIGNY I., near Berry Head	60°42'	45°36'	50	15	—	13 Jan. 1948	FIDS H80-1d	BM	fert.	P. E. Biggs
SIGNY I., near Berry Head	60°42'	45°36'	100	30	—	13 Jan. 1948	FIDS H81-1c	BM	fert.	P. E. Biggs
SIGNY I., Borge Bay	60°43'	45°36'	—	—	—	18 Jan. 1933	DI 1931-33/1092-18b	BM	fert.	DI 1931-33
SIGNY I., Borge Bay	60°43'	45°36'	24	7	On N.-facing hillside	Feb. 1944	FIDS H3027n	BM	fert.	T. Hooley
SIGNY I., Borge Bay	60°43'	45°36'	33	11	On N.-facing hillside	Feb. 1944	FIDS H3032b	BM	spar- ingly fert.	T. Hooley
SIGNY I., Jebsen Point	60°43'	45°40'	40	12	—	15 Jan. 1948	FIDS H84-1s	BM	fert.	P. E. Biggs
SIGNY I., Jebsen Point	60°43'	45°40'	600	180	—	16 Jan. 1948	FIDS H85-1c	BM	fert.	P. E. Biggs

## South Shetland Islands

Locality	Position		Altitude		Collecting Notes	Date of Collection	Specimen Number	Herbarium	Fertile or Sterile	Collector or Expedition
	lat. S.	long. W.	ft.	m.						
NELSON I.	62°17'	59°02'	—	—	On stone	11 Jan. 1902	SAE 57*	S	fert.	C. Skottsberg
DECEPTION I.	62°57'	60°38'	—	—	From tuff cliffs about 300 ft. above "chin-strap" penguin rookery	20 Jan. 1936	BGLE 1400-14	BM	fert.	BGLE

\* Erroneously identified as "*Buellia Augusta*" by Darbishire, 1912, p. 35.

TABLE XIII. *Buellia russa* (continued)

## West Graham Land

Locality	Position		Altitude		Collecting Notes	Date of Collection	Specimen Number	Herbarium	Fertile or Sterile	Collector or Expedition
	lat. S.	long. W.	ft.	m.						
2 mi. N.N.W. of MT. JACQUINOT	63°21'	57°53'	50	15	—	18 Oct. 1946	FIDS D367-6i	BM	fert.	A. Reece
AUGUSTE I.	64°03'	61°36'	—	—	"Sur les rochers"	1897-99	BAE 257 <i>pr. p.</i> *	TUR	fert.	BAE
BRIALMONT COVE, Spring Point	64°17'	61°04'	—	—	—	1957-58	AE (no number)	LP	fert.	A. Corte
MELCHIOR IS.	64°19'	62°57'	—	—	—	25 Jan. 1936	BGLE 1428-4	BM	fert.	BGLE
MELCHIOR IS., Alpha I.	64°19'	63°00'	20	6	W. side of island, on granodioritic bird cliff above the shore	21 Dec. 1964	BSWA 7888 BSWA 7890b BSWA 7893p BSWA 7903b	FH	fert.	I. M. Lamb
MELCHIOR IS., Beta I.	64°19'	63°00'	—	—	On granodioritic rock	10 Jan. 1950	AE 13337	FH	spar- ingly fert.	A. Ruiz Leal
MELCHIOR IS., Pi Is.	64°20'	62°53'	50-83	15-25	On steep granodioritic rocks	25 Jan. 1965	BSWA 7965s	FH	fert.	N. Bellisio
ANVERS I., Arthur Harbour	64°46'	64°04'	33-50	10-15	On rocky knoll above the base hut, on loose stones on rocky ground	4 Feb. 1965	BSWA 8024n BSWA 8026l BSWA 8027r	FH	fert.	I. M. Lamb
ANVERS I., Norsel Point	64°46'	64°06'	70	20	On a loose stone between rocks	4 Feb. 1965	BSWA 8011i	FH	fert.	I. M. Lamb
ANVERS I., Norsel Point	64°46'	64°06'	50	15	On rocks and stones around edge of dried-out freshwater pool	4 Feb. 1965	BSWA 8012o	FH	fert.	I. M. Lamb
ANVERS I., Norsel Point	64°46'	64°06'	33-50	10-15	On loose stone on stony ground among rocks	4 Feb. 1965	BSWA 8013a BSWA 8014 BSWA 8015y BSWA 8016z BSWA 8017r	FH	fert.	I. M. Lamb
ANVERS I., Norsel Point	64°46'	64°06'	50	15	On a stone on ledge of a rock slope	4 Feb. 1965	BSWA 8023d	FH	fert.	I. M. Lamb
ANVERS I., Norsel Point	64°46'	64°06'	70	20	On vertical cliff face	6 Feb. 1965	BSWA 8090c	FH	fert.	I. M. Lamb and M. H. Zimmermann
ANVERS I., Norsel Point	64°46'	64°06'	70	20	On upper side of a large rock	7 Feb. 1965	BSWA 8110y	FH	fert.	I. M. Lamb
WIENCKE I., Noble Peak	64°48'	63°25'	770	235	N. buttress, on a rock pro- jecting through snow	15 Oct. 1944	FIDS A1304	BM	fert.	I. M. Lamb
WIENCKE I.	64°50'	63°25'	—	—	"Sur un rocher"	1897-99	BAE 447 <i>pr. p.</i> †	TUR	fert.	BAE

\* Holotype of *Buellia protohallina* var. *Gerlachei* Vain.; erroneously cited as "213 *pr. p.*" in Vainio's report (1903, p. 25).† Erroneously identified as "*B. protohallina* var. *indissimilis*" by Vainio, 1903, p. 25.

TABLE XIII. *Buellia russa* (continued)

West Graham Land—cont.

Locality	Position		Altitude		Collecting Notes	Date of Collection	Specimen Number	Herbarium	Fertile or Sterile	Collector or Expedition
	lat. S.	long. W.	ft.	m.						
WIENCKE I.	64°50'	63°25'	—	—	“Sur un rocher”	1897-99	BAE 447 <i>pr. p.*</i>	TUR, BR	sparingly fert.	BAE
WIENCKE I., Port Lockroy	64°50'	63°31'	60-80	18-24	On rock faces	18 Jan. 1935	DI 1934-35/1489-1	BM	fert.	DI 1934-35
WIENCKE I., Port Lockroy	64°50'	63°31'	50	15	At top of penguin rookery on granodioritic rock	27 Mar. 1944	FIDS A1187f	BM	fert.	I. M. Lamb
WIENCKE I., Goudier I.	64°50'	63°31'	—	—	“Sur les rochers abrités (diorites)”	28 Dec. 1908	FAE 1908-10/83 <i>pr. p.†</i>	PC	fert.	FAE 1908-10
WIENCKE I., Goudier I.	64°50'	63°31'	—	—	“Sur les rochers (diorites) aux endroits un peu abrités”	28 Dec. 1908	FAE 1908-10/89 <i>pr. p.‡</i>	PC	fert.	FAE 1908-10
WIENCKE I., Goudier I.	64°50'	63°31'	25	7.5	This species is extremely abundant on the rounded granodiorite ridges all over the islet, often covering large areas of rock	25 Feb. 1944	FIDS A1138 <i>pr. p.</i>	BM	fert.	I. M. Lamb
WIENCKE I., Goudier I.	64°50'	63°31'	30	9	Near summit of island on rock ridge	27 Feb. 1944	FIDS A1141v	BM	fert.	I. M. Lamb
WIENCKE I., Goudier I.	64°50'	63°31'	26	8	Near summit of island, on granodioritic rock	1 Apr. 1944	FIDS A1196b	BM	fert.	I. M. Lamb
WIENCKE I., Goudier I.	64°50'	63°31'	26	8	Near summit of island on rock	2 Apr. 1944	FIDS A1200m FIDS A1201k FIDS A1202b	BM	fert.	I. M. Lamb
WIENCKE I., Goudier I.	64°50'	63°31'	33	10	Just below summit of island on rocks in a hollow which collects snow melt water, but the lichen itself not submerged	2 Apr. 1944	FIDS A1207	BM	sparingly fert.	I. M. Lamb
WIENCKE I., Goudier I.	64°50'	63°31'	26	8	Upper part of island, on granodioritic rock	26 Nov. 1944	FIDS A1807b FIDS A1808 FIDS A1809 FIDS A1810	BM	fert.	I. M. Lamb
WIENCKE I., Goudier I.	64°50'	63°31'	26	8	Near summit of island, on a basalt dyke	28 Nov. 1944	FIDS A1824a FIDS A1831c	BM	fert.	I. M. Lamb

\* The major component of the mixed holotype of “*Rinodina hypopoichila*” Vain.† Lectotype specimen of *Buellia russa* (Hue) Darb.‡ Lectotype specimen of *Aspicilia erythroda* Hue.

TABLE XIII. *Buellia russa* (continued)

West Graham Land—cont.

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Locality	Position		Altitude		Collecting Notes	Date of Collection	Specimen Number	Herbarium	Fertile or Sterile	Collector or Expedition
	lat. S.	long. W.	ft.	m.						
WIENCKE I., Goudier I.	64°50'	63°31'	15	4	Halfway up the island, on loose stone at base of large granodioritic rocks	4 Dec. 1944	FIDS A1877k	BM	fert.	I. M. Lamb
WIENCKE I., Goudier I.	64°50'	63°31'	10–15	3–4	Near E. side of island, on basalt dyke	12 Mar. 1944	FIDS (no number)	BM	fert.	A. Taylor
WIENCKE I., Goudier I.	64°50'	63°31'	26	8	Upper part of island, on loose stones lying between granodioritic rocks	16 Jan. 1945	FIDS A2241	BM	fert.	I. M. Lamb
WIENCKE I., Bills I.	64°50'	63°31'	10	3	On granodioritic rock	13 Jun. 1944	FIDS A–A–1	BM	fert.	A. Taylor and L. Ashton
DOUMER I.	64°51'	63°55'	100	30	On a loose stone on rocky outcrop on N. side; N. exposure	12 Dec. 1944	FIDS A1905d	BM	fert.	I. M. Lamb
BOOTH I.	65°05'	64°00'	100–330	30–100	“Sur les rochers (diorites)”	30 Dec. 1908	FAE 1908–10/115 <i>pr. p.*</i>	PC	fert.	FAE 1908–10
BOOTH I.	65°05'	64°00'	100–330	30–100	“Sur les rochers abrupts”	30 Dec. 1908	FAE 1908–10/ 119 <i>pr. p.†</i>	PC	fert.	FAE 1908–10
PETERMANN I.	65°11'	64°11'	400	120	“Sur les rochers (diorites) du sommet”	4 Jan. 1909	FAE 1908–10/ 154 <i>pr. p.‡</i>	PC	fert.	FAE 1908–10
PETERMANN I.	65°11'	64°11'	—	—	“Sur les rochers (diorites avec filons d'andesite très altérés)”	5 Jan. 1909	FAE 1908–10/ 179 <i>pr. p.§</i>	PC	fert.	FAE 1908–10
PETERMANN I.	65°11'	64°11'	—	—	“Sur les rochers près de la côte”	14 Mar. 1909	FAE 1908–10/284 <i>pr. p., 285 pr. p.  </i>	PC	fert.	FAE 1908–10
PETERMANN I.	65°11'	64°11'	—	—	“Sur une grosse pierre”	Nov. 1909	FAE 1908–10/ 686 <i>pr. p.§§</i>			
RASMUSSEN I. (“Cape Rasmussen”)	65°15'	64°06'	—	—	—	21 Jan. 1936	BGLE 1479–1a BGLE 1479–7	BM	fert.	BGLE

\* Syntype specimen of *Buellia russa* (Hue) Darb.† Lectotype specimen of *Lecidea Joannae* Hue.‡ Lectotype specimen of *Lecidea polychora* Hue.§ Lectotype specimen of *Lecidea Petermannii* Hue.|| Syntype specimens of *Lecidea Joannae* Hue.¶ Holotype of *Aspicilia ditissima* Hue.



TABLE XIII. *Buellia russa* (continued)

West Graham Land—cont.

Locality	Position		Altitude		Collecting Notes	Date of Collection	Specimen Number	Herbarium	Fertile or Sterile	Collector or Expedition
	lat. S.	long. W.	ft.	m.						
ARGENTINE IS., Galindez I.	65°15'	64°15'	10-25	3-7	From nearly vertical low sea cliff	31 Mar. 1935	BGLE 1116-46 BGLE 1116-68a BGLE 1116-71b BGLE 1116-101c BGLE 1116-109	BM	fert.	BGLE
ARGENTINE IS., Galindez I.	65°15'	64°15'	—	—	From outcrop facing N. on <i>Penola's</i> starboard quarter at winter anchorage	24 Oct. 1935	BGLE 1248-12	BM	fert.	BGLE
ARGENTINE IS., Galindez I.	65°15'	64°15'	—	—	—	10 Dec. 1935	BGLE 1325-13	BM	fert.	BGLE
ARGENTINE IS., Galindez I.	65°15'	64°15'	—	—	From typical boulder area, just uncovered by snow melt	27 Dec. 1935	BGLE 1328-8	BM	fert.	BGLE
BERTHELOT IS., Green I.	65°19'	64°10'	15	4	From N.-facing low sea cliff	18 Mar. 1935	BGLE 1094-12 BGLE 1094-25 BGLE 1094-41a BGLE 1094-41b BGLE 1094-47 BGLE 1094-51a BGLE 1094-66 BGLE 1094-77d	BM	fert.	BGLE
MARGUERITE BAY, Léonie Is. (Lagoon I.)	67°36'	68°15'	—	—	—	25 Feb. 1936	BGLE 1449-49	BM	fert.	BGLE
MARGUERITE BAY, Jenny I.	67°44'	68°25'	545	165	"Sur les pierres des éboulis (diarites avec filons diabasiques)"	15 Jan. 1909	FAE 1908-10/228 <i>pr. p.*</i>	PC	fert.	FAE 1908-10
MARGUERITE BAY, Jenny I.	67°44'	68°25'	30	9	From rock exposure on N.E. side of island	17 Oct. 1948	FIDS E466-1u	BM	fert.	B. Stonehouse and V. E. Fuchs
MARGUERITE BAY, Lagotellerie I.	67°53'	67°24'	—	—	From low point at E. end of island	20 Jul. 1936	BGLE 1487-5	BM	fert.	BGLE
MARGUERITE BAY, Debenham Is.	68°08'	67°07'	50	15	On exposed rock face	7 Dec. 1947	FIDS E1121s	BM	fert.	B. Stonehouse
MARGUERITE BAY, Debenham Is. (Barbara I.)	68°08'	67°07'	—	—	W. end of island	5 Jan. 1937	BGLE 1564-10 BGLE 1564-15	BM	fert.	BGLE
MARGUERITE BAY, Roman Four Promontory	68°13'	66°58'	90	27	On exposed rock, shaded locality	8 Dec. 1947	FIDS E1073c	BM	fert.	B. Stonehouse

\* Holotype of *Lecidea caesiocinerescens* Hue.

TABLE XIII. *Buellia russa* (continued)

## East Graham Land

Locality	Position		Altitude		Collecting Notes	Date of Collection	Specimen Number	Herbarium	Fertile or Sterile	Collector or Expedition
	lat. S.	long. W.	ft.	m.						
HOPE BAY	63°24'	57°00'	25	7.5	On stones in penguin rookery	7 Feb. 1944	FIDS D1130 FIDS D1131b	BM	fert.	I. M. Lamb
HOPE BAY, low hill on E. side	63°24'	57°00'	380	115	On loose stones	16 Apr. 1945	FIDS D2381c FIDS D2402u FIDS D2402v	BM	fert.	I. M. Lamb
HOPE BAY, low hill on E. side	63°24'	57°00'	445	135	On loose stone in sward of <i>Usnea (Neuropogon) antarctica</i>	16 Apr. 1945	FIDS D2407a	BM	fert.	I. M. Lamb
HOPE BAY, Lake Boeckella	63°24'	57°00'	150	45	On loose flat stones on S. shore; very abundant in this place	11 Oct. 1945	FIDS D2511b FIDS D2512	BM	fert.	I. M. Lamb
HOPE BAY, beside Lake Boeckella	63°24'	57°00'	155	50	On loose stone on level stony ground	3 Aug. 1945	FIDS D2438	BM	fert.	A. Taylor
HOPE BAY, above Lake Boeckella	63°24'	57°00'	350	106	On loose stone at summit of hillock	25 Oct. 1945	FIDS D2525s	BM	fert.	I. M. Lamb
HOPE BAY, Scar Hills	63°25'	57°01'	300	90	On loose stones and rocks	25 Sep. 1945	FIDS D2489f FIDS D2492b FIDS D2494	BM	fert.	I. M. Lamb
THE STEEPLE	63°26'	57°03'	1,000	330	On N.-facing vertical cliff irrigated by snow melt water trickles	8 Nov. 1945	FIDS D2576b	BM	fert.	I. M. Lamb
PAULET I.	63°35'	55°47'	—	—	On stone	Oct. 1903	SAE 113 <i>pr. p.</i> *	S	fert.	C. Skottsberg
LONG I.	63°46'	58°12'	70	21	On rock outcrop at S.W. end of island	17 Aug. 1945	FIDS D2439b FIDS D2444	BM	ster. fert.	I. M. Lamb
VEGA I., False I. Point	63°55'	57°20'	24-68	7-20	On loose stone on stony isthmus	5 Dec. 1945	FIDS D2725b	BM	fert.	I. M. Lamb

\* Erroneously identified as "*Buellia frigida*" by Darbishire, 1912, p. 35.

TABLE XIV

*Buellia russa* var. *Liouvillei*

## West Graham Land

Locality	Position		Altitude		Collecting Notes	Date of Collection	Specimen Number	Herbarium	Fertile or Sterile	Collector or Expedition
	lat. S.	long. W.	ft.	m.						
WIENCKE I., Besnard Point	64°49'	63°30'	3-6	1-2	On face of large granodioritic block	23 Aug. 1944	FIDS A1245b	BM	fert.	I. M. Lamb
WIENCKE I., Port Lockroy	64°50'	63°31'	43	13	Near the penguin rookery, on granodioritic rock, without accompanying species	27 Mar. 1944	FIDS A1185	BM	sparingly fert.	I. M. Lamb
WIENCKE I., Goudier I.	64°50'	63°31'	26	8	Upper part of island, on granodioritic rock	26 Nov. 1944	FIDS A1811	BM	fert.	I. M. Lamb
PETERMANN I.	65°11'	64°11'	—	—	"Sur les rochers (diorites) au nord de l'île"	1 Jan. 1909	FAE 1908-10/141*	PC	fert.	Liouville
ARGENTINE IS., Galindez I.	65°15'	64°15'	—	—	Northern part of island	23 Nov. 1935	BGLE 1270	BM	fert.	BGLE
MARGUERITE BAY, Jenny I.	67°44'	68°25'	248	75	"Sur les pierres des éboulis (diorites avec filons diabasiques)"	15 Jan. 1909	FAE 1908-10/227 pr. p.	PC	ster.	FAE 1908-10
MARGUERITE BAY, Jenny I.	67°44'	68°25'	810	245	"Sur les pierres des éboulis (diorites avec filons diabasiques)"	15 Jan. 1909	FAE 1908-10/230†	PC	fert.	FAE 1908-10

\* Type specimen of *Lecidea Liouvillei* Hue.† Lectotype specimen of *Lecidea Margaritae* Hue.

TABLE XV

*Buellia russa* var. *cycloplaca*

## West Graham Land

Locality	Position		Altitude		Collecting Notes	Date of Collection	Specimen Number	Herbarium	Fertile or Sterile	Collector or Expedition
	lat. S.	long. W.	ft.	m.						
ANVERS I., Norsel Point	64°46'	64°06'	70	21	On stone on exposed rock ledge, dry position	4 Feb. 1965	BSWA 8021a	FH	fert.	I. M. Lamb

TABLE XV. *Buellia russa* var. *cycloplaca* (continued)

## East Graham Land

Locality	Position		Altitude		Collecting Notes	Date of Collection	Specimen Number	Herbarium	Fertile or Sterile	Collector or Expedition
	lat. S.	long. W.	ft.	m.						
HOPE BAY, low hill on E. side	63°24'	57°00'	380	115	On loose flat stones	16 Apr. 1945	FIDS D2381d FIDS D2398* FIDS D2403	BM	fert.	I. M. Lamb
HOPE BAY, low hill on E. side	63°24'	57°00'	380	115	On vertical outcrop of solid rock with E. exposure	16 Apr. 1945	FIDS D2399b	BM	fert.	I. M. Lamb
HOPE BAY, Scar Hills	63°25'	57°01'	330	100	On a loose stone	25 Sep. 1945	FIDS D2506f	BM	fert.	I. M. Lamb

\* Holotype specimen of var. *cycloplaca*.TABLE XVI  
*Buellia melanostola*

## South Orkney Islands

Locality	Position		Altitude		Collecting Notes	Date of Collection	Specimen Number	Herbarium	Fertile or Sterile	Collector or Expedition
	lat. S.	long. W.	ft.	m.						
LAURIE I., Cape Geddes	60°42'	44°35'	150	45	On steep slopes	8 Apr. 1946	FIDS C3-1001y	BM	fert.	FIDS
SIGNY I., Borge Bay	60°43'	45°36'	60	18	On N.-facing hillside	Feb. 1944	FIDS H3038d	BM	fert.	T. Hooley

## West Graham Land

Locality	Position		Altitude		Collecting Notes	Date of Collection	Specimen Number	Herbarium	Fertile or Sterile	Collector or Expedition
	lat. S.	long. W.	ft.	m.						
2 mi. N.N.W. of MT. JACQUINOT	63°21'	57°53'	50	15	—	18 Oct. 1946	FIDS D367-6d	BM	fert.	A. Reece
ANVERS I., Norsel Point	64°46'	64°06'	70	21	On a loose stone between rocks	4 Feb. 1965	BSWA 8011h	FH	fert.	I. M. Lamb
ANVERS I., Norsel Point	64°46'	64°06'	70	21	On a stone on a ledge in rock face	4 Feb. 1965	BSWA 8022d	FH	fert.	I. M. Lamb
ANVERS I., Norsel Point	64°46'	64°06'	50	15	On loose stone on stony ground among rocks	4 Feb. 1965	BSWA 8016y	FH	fert.	I. M. Lamb
ANVERS I., Norsel Point	64°46'	64°06'	83	25	On loose stone on ledge under slightly overhanging cliff near summit of bluff, somewhat moist position	7 Feb. 1965	BSWA 8120x	FH	fert.	I. M. Lamb
BOOTH I.	65°05'	64°00'	100-330	30-100	"Sur les rochers (diorites)"	30 Dec. 1908	FAE 1908-10/121-I pr. p.*	PC	fert.	FAE 1908-10
PETERMANN I.	65°11'	64°11'	—	—	"Sur les rochers (diorites) au nord de l'île"	1 Jan. 1909	FAE 1908-10/142 pr. p.†	PC	fert.	Liouville

TABLE XVII

*Buellia perlata*

## West Graham Land

Locality	Position		Altitude		Collecting Notes	Date of Collection	Specimen Number	Herbarium	Fertile or Sterile	Collector or Expedition
	lat. S.	long. W.	ft.	m.						
MELCHIOR Is., Omega I.	64°20'	62°56'	100	30	On horizontal ledge of shore escarpment of steep granodioritic rocks below snow slope	31 Jan. 1965	BSWA 7990t	FH	fert.	R. E. Waterhouse
ANVERS I., Norsel Point	64°46'	64°06'	50	15	On loose stone on stony ground among rocks	4 Feb. 1965	BSWA 8018c	FH	fert.	I. M. Lamb
ANVERS I., Norsel Point	64°46'	64°06'	70	21	On vertical dioritic rock face	6 Feb. 1965	BSWA 8076	FH	fert.	I. M. Lamb
ANVERS I., Norsel Point	64°46'	64°06'	83	25	On upper side of large rock on rocky and mossy slope	7 Feb. 1965	BSWA 80971	FH	fert.	I. M. Lamb and M. H. Zimmermann
WIENCKE I., Noble Peak	64°48'	63°25'	780	235	N. exposure on N. buttress. On rock projecting through snow	15 Oct. 1944	FIDS A1297a FIDS A1302	BM	fert.	I. M. Lamb
WIENCKE I., Noble Peak	64°48'	63°25'	450	135	N.W. buttress, on N.E.-facing rocky outcrop	19 Nov. 1944	FIDS A1775 FIDS A1776 FIDS A1779k FIDS A1780	BM	fert.	I. M. Lamb
WIENCKE I., Port Lockroy	64°50'	63°31'	60	18	On granodioritic rock near penguin rookery	27 Mar. 1944	FIDS A1186a	BM	fert.	I. M. Lamb
PETERMANN I.	65°11'	64°11'	—	—	"Sur les rochers (diorites)"	1 Jan. 1909	FAE 1908-10/140 <i>pr. p.*</i>	PC	fert.	Liouville
PETERMANN I.	65°11'	64°11'	—	—	"Sur les rochers, près de la côte"	14 Mar. 1909	FAE 1908-10/304 <i>pr. p.†</i>	PC	fert.	FAE 1908-10
BERTHELOT Is., Green I.	65°19'	64°10'	15	4	From N.-facing sea cliff	18 Mar. 1935	BGLE 1094-20a BGLE 1094-54 BGLE 1094-77a	BM	fert.	BGLE
MARGUERITE BAY, Léonie Is. (Lagoon I.)	67°36'	68°15'	—	—	—	26 Feb. 1936	BGLE 1449-3b BGLE 1449-18	BM	fert.	BGLE

\* Type specimen of *Lecidea perlata* Hue.† Type specimen of *Lecidea dimorphota* Hue.

## East Graham Land

Locality	Position		Altitude		Collecting Notes	Date of Collection	Specimen Number	Herbarium	Fertile or Sterile	Collector or Expedition
	lat. S.	long. W.	ft.	m.						
HOPE BAY, above Lake Boeckella	63°24'	57°00'	380	115	On a large stone on summit of hillock	25 Oct. 1945	FIDS D2531a	BM	fert.	I. M. Lamb

TABLE XVIII

*Buellia coniops f. coniops**South Orkney Islands*

Locality	Position		Altitude		Collecting Notes	Date of Collection	Specimen Number	Herbarium	Fertile or Sterile	Collector or Expedition
	lat. S.	long. W.	ft.	m.						
SIGNY I., near North Point	60°41'	45°38'	80	24	300 yd. S. of North Point	16 Jan. 1948	FIDS H83-1o	BM	fert.	P. E. Biggs
SIGNY I., Borge Bay	60°43'	45°36'	—	—	—	18 Jan. 1933	DI 1931-33/1092e <i>pr. p.</i>	BM	fert.	DI 1931-33

*South Shetland Islands*

Locality	Position		Altitude		Collecting Notes	Date of Collection	Specimen Number	Herbarium	Fertile or Sterile	Collector or Expedition
	lat. S.	long. W.	ft.	m.						
KING GEORGE I., Martel Inlet (Visca Anchorage)	62°03'	58°23'	9-80	3-24	—	18 Dec. 1934	DI 1934-35/1481-3	BM	fert.	DI 1934-35
KING GEORGE I., Penguin I.	62°05'	57°55'	100	30	From summit of great basalt plug on W. side of island	9 Jan. 1937	DI 1936-37/1951-18	BM	fert.	DI 1936-37
KING GEORGE I., Potter Cove	62°13'	58°42'	—	—	On rocks near the coast	20 Jan. 1953	AE 10148b	CORD	fert.	A. Hunziker
DECEPTION I.	62°57'	60°38'	—	—	From rocks close to nesting "chinstrap" penguins at largest rookery	10 Jan. 1936	BGLE 1364-4	BM	fert.	BGLE
DECEPTION I.	62°57'	60°38'	—	—	From tuff cliffs about 300 ft. above "chinstrap" penguin rookery	20 Jan. 1936	BGLE 1400-21b	BM	fert.	BGLE
DECEPTION I.	62°57'	60°38'	50	15	S.E. side of harbour, N.W. exposure, on agglomerate rocks	6 Feb. 1944	FIDS B1114b	BM	fert.	I. M. Lamb
DECEPTION I.	62°57'	60°38'	—	—	On hillside near the Argentine Naval Station	15 Feb. 1951	AE (no number)	LP	fert.	A. Martínez

TABLE XVIII. *Buellia coniops* f. *coniops* (continued)

## West Graham Land

Locality	Position		Altitude		Collecting Notes	Date of Collection	Specimen Number	Herbarium	Fertile or Sterile	Collector or Expedition
	lat. S.	long. W.	ft.	m.						
WIENCKE I., Goudier I.	64°50'	63°31'	30	9	Near summit of island on a loose stone	27 Feb. 1944	FIDS A1146n	BM	fert.	I. M. Lamb
WIENCKE I., Goudier I.	64°50'	63°31'	26	8	From upper part of island; on rock	2 Apr. 1944	FIDS A1201j FIDS A1208b	BM	fert.	I. M. Lamb
WIENCKE I., Goudier I.	64°50'	63°31'	25	7.5	From upper part of island; on loose stone	28 Dec. 1944	FIDS A2123d	BM	fert.	I. M. Lamb
WIENCKE I., Goudier I.	64°50'	63°31'	25	7.5	From upper part of island; on basalt dyke	14 Jan. 1945	FIDS A2232 1	BM	fert.	I. M. Lamb
DOUMER I.	64°51'	63°55'	118	35	From rocky outcrop on N. side of island; N. exposure on granodioritic rock	12 Dec. 1944	FIDS A1910	BM	fert.	I. M. Lamb
ARGENTINE IS., Galindez I.	65°15'	64°15'	—	—	From N.-facing lower cliff near Colobanthus plants (specially protected situation)	14 Dec. 1935	BGLE 1304-2	BM	fert.	BGLE
BERTHELOT IS., Green I.	65°19'	64°10'	—	—	From N.-facing inland cliff	18 Mar. 1935	BGLE 1081-26b BGLE 1081-29a	BM	fert.	BGLE
MARGUERITE BAY, Léonie Is. (Lagoon I.)	67°36'	68°15'	—	—	—	26 Feb. 1936	BGLE 1449-22	BM	fert.	BGLE
MARGUERITE BAY, Lagotellerie I.	67°53'	67°24'	—	—	From low point at E. end of island	20 Jul. 1936	BGLE 1487-2 BGLE 1487-3	BM	fert.	BGLE
MARGUERITE BAY, Debenham Is.	68°08'	66°07'	40	12	In shaded, damp hollow	7 Dec. 1947	FIDS E1111b	BM	fert.	B. Stonehouse
MARGUERITE BAY, Fitzroy I.	68°11'	67°58'	—	—	—	30 Dec. 1947	FIDS E1064	BM	fert.	B. Stonehouse

## East Graham Land

Locality	Position		Altitude		Collecting Notes	Date of Collection	Specimen Number	Herbarium	Fertile or Sterile	Collector or Expedition
	lat. S.	long. W.	ft.	m.						
DEVIL I.	63°48'	57°17'	680	205	From vesicular basaltic rock on E. peak	13 Nov. 1945	FIDS D2591b	BM	fert.	G. Davies and V. I. Russell

TABLE XIX

*Buellia coniops f. areolata**South Shetland Islands*

Locality	Position		Altitude		Collecting Notes	Date of Collection	Specimen Number	Herbarium	Fertile or Sterile	Collector or Expedition
	lat. S.	long. W.	ft.	m.						
KING GEORGE I., Martel Inlet (Visca Anchorage)	62°03'	58°23'	0-80	0-24	—	18 Dec. 1934	DI 1934-35/1481-2	BM	fert.	DI 1934-35
KING GEORGE I., Keller Peninsula	62°03'	58°26'	700-800	210-240	From flat top of E. peak	20 Feb. 1947	FIDS G24-9w	BM	fert.	D. Nicholson and A. Reece
DECEPTION I.	62°57'	60°38'	—	—	From area of small ash with a few stones	6 Jan. 1936	BGLE 1351b	BM	fert.	BGLE
DECEPTION I.	62°57'	60°38'	—	—	Tuff peninsula on E. coast of "chinstrap" penguin colony	16 Jan. 1936	BGLE 1381b	BM	fert.	BGLE
DECEPTION I.	62°57'	60°38'	500	150	From tuff cliffs above main penguin colony	20 Jan. 1936	BGLE 1400-8	BM	fert.	BGLE
DECEPTION I.	62°57'	60°38'	215	65	Top of E. side of the harbour, on a flat smooth stone	6 Feb. 1944	FIDS B1127	BM	fert.	I. M. Lamb
DECEPTION I.	62°57'	60°38'	—	—	Slope between outer navigation light and top of glacier	19 Mar. 1944	FIDS BB129a	BM	fert.	W. R. Flett
DECEPTION I.	62°59'	60°35'	200	60	From N. side of Ronald Hill near Whalers Bay; on andesitic rock in scree slope	8 Feb. 1945	FIDS B2317b	BM	fert.	I. M. Lamb

*West Graham Land*

Locality	Position		Altitude		Collecting Notes	Date of Collection	Specimen Number	Herbarium	Fertile or Sterile	Collector or Expedition
	lat. S.	long. W.	ft.	m.						
MELCHIOR Is., Omega I.	64°20'	62°56'	90	27	From N. side of island, on shore escarpment of steep granodioritic rocks below snow slope, on stone on ledge	31 Jan. 1965	BSWA 7997a	FH	fert.	R. E. Waterhouse
BERTHELOT Is., Green I.	65°19'	64°10'	15	4	From N.-facing low sea cliff	18 Mar. 1935	BGLE 1094-26	BM	fert.	BGLE



TABLE XX

*Buellia coniops f. verrucosa*

## South Shetland Islands

Locality	Position		Altitude		Collecting Notes	Date of Collection	Specimen Number	Herbarium	Fertile or Sterile	Collector or Expedition
	lat. S.	long. W.	ft.	m.						
DECEPTION I.	62°57'	60°38'	33	10	On a stone embedded in scree near the deserted whaling station; W. exposure	6 Feb. 1944	FIDS B1113*	BM	fert.	I. M. Lamb
DECEPTION I., Port Foster	62°58'	60°39'	16-19	5-6	About 1 km. S.W. of the Argentine Naval Station on stone on hillside	15 Jan. 1965	BSWA 7945j BSWA 7947m	FH	fert.	M. H. Zimmermann

\* Type specimen of *f. verrucosa*.

## West Graham Land

Locality	Position		Altitude		Collecting Notes	Date of Collection	Specimen Number	Herbarium	Fertile or Sterile	Collector or Expedition
	lat. S.	long. W.	ft.	m.						
MARGUERITE BAY, Lagotellerie I.	67°53'	67°24'	—	—	Around Adélie penguin colony	13 Dec. 1936	BGLE 1507-3	BM	fert.	BGLE
MARGUERITE BAY, Debenham Is.	68°08'	67°07'	40	12	On exposed rock face	7 Dec. 1947	FIDS E1124a	BM	fert.	B. Stonehouse

TABLE XXI

*Buellia coniops f. incrassata*

## South Shetland Islands

Locality	Position		Altitude		Collecting Notes	Date of Collection	Specimen Number	Herbarium	Fertile or Sterile	Collector or Expedition
	lat. S.	long. W.	ft.	m.						
KING GEORGE I., Penguin I.	62°05'	57°55'	25	7.5	On vesicular basalt	9 Jan. 1937	DI 1936-37/1951p <i>pr. p.*</i>	BM	fert.	DI 1936-37
DECEPTION I.	62°57'	60°38'	330	100	On tuff cliffs above "chin-strap" penguin rookery	20 Jan. 1936	BGLE 1400-35	BM	fert.	BGLE

\* Type specimen of *f. incrassata*.

TABLE XXII

*Buellia coniops* f. *cervinogranulata**South Orkney Islands*

Locality	Position		Altitude		Collecting Notes	Date of Collection	Specimen Number	Herbarium	Fertile or Sterile	Collector or Expedition
	lat. S.	long W.	ft.	m.						
LAURIE I., Cape Geddes	60°42'	44°35'	100-200	30-60	From slope facing N.W. to E. of base hut	3 Oct. 1946	FIDS C8-1003j	BM	fert.	FIDS
LAURIE I., Cape Geddes	60°42'	44°35'	40-70	12-21	From loose rocks, recently exposed	27 Nov. 1946	FIDS C20-1007f	BM	fert.	FIDS

*South Shetland Islands*

Locality	Position		Altitude		Collecting Notes	Date of Collection	Specimen Number	Herbarium	Fertile or Sterile	Collector or Expedition
	lat. S.	long. W.	ft.	m.						
DECEPTION I.	62°57'	60°38'	—	—	From rocks on inner side of W. headland of entrance	17 Jan. 1936	BGLE 1384a <i>pr. p.</i>	BM	fert.	BGLE
DECEPTION I.	62°57'	60°38'	50	15	From agglomerate rock on S.E. side of harbour, N.W. exposure	6 Feb. 1944	FIDS B1115a	BM	fert.	I. M. Lamb
DECEPTION I., Whalers Bay	62°59'	60°34'	118	35	On a large agglomerate block	6 Feb. 1945	FIDS B2302a*	BM	fert.	I. M. Lamb

\* Type of specimen of f. *cervinogranulata*.

TABLE XXIII

*Buellia isabellina**South Orkney Islands*

Locality	Position		Altitude		Collecting Notes	Date of Collection	Specimen Number	Herbarium	Fertile or Sterile	Collector or Expedition
	lat. S.	long. W.	ft.	m.						
LAURIE I., Cape Geddes	60°42'	44°35'	40-70	12-21	On loose rocks, recently exposed	27 Nov. 1946	FIDS C20-1007n	BM	fert.	FIDS

*South Shetland Islands*

Locality	Position		Altitude		Collecting Notes	Date of Collection	Specimen Number	Herbarium	Fertile or Sterile	Collector or Expedition
	lat. S.	long. W.	ft.	m.						
DECEPTION I.	62°57'	60°38'	—	—	On rocks close to nesting "chinstrap" penguins at largest rookery	10 Jan. 1936	BGLE 1364-3	BM	fert.	BGLE

*West Graham Land*

Locality	Position		Altitude		Collecting Notes	Date of Collection	Specimen Number	Herbarium	Fertile or Sterile	Collector or Expedition
	lat. S.	long. W.	ft.	m.						
MELCHIOR Is.*	64°19'	62°57'	—	—	N.W. side of island	25 Jan. 1936	BGLE 1428-1	BM	fert.	BGLE
MELCHIOR Is., Alpha I.	64°19'	63°00'	17-20	5-6	W. side of island, on ± vertical granodioritic cliff face	21 Dec. 1964	BSWA 7887o BSWA 7889 BSWA 7896a	FH	fert.	I. M. Lamb
MELCHIOR Is., Alpha I.	64°19'	63°00'	20	6	On loose rock in snow melt water gutter at top of granodioritic bird cliff on W. side of island	21 Dec. 1964	BSWA 7894a BSWA 7902	FH	fert.	I. M. Lamb
MELCHIOR Is., Kappa I.	64°19'	63°00'	17	5	From almost vertical cliff on W. side of island	26 Dec. 1964	BSWA 7913a	FH	fert.	R. Waterhouse and A. Arenas

\* Precise locality unidentified.

TABLE XXIII. *Buellia isabellina* (continued)

West Graham Land—cont.

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Locality	Position		Altitude		Collecting Notes	Date of Collection	Specimen Number	Herbarium	Fertile or Sterile	Collector or Expedition
	lat. S.	long. W.	ft.	m.						
MELCHIOR IS., Omega I.	64°20'	62°56'	10-15	3-4	N. side of island, on shore escarpment of steep granodioritic rocks below a snow slope; dry position, forming confluent patches on gently sloping to horizontal rock surface	31 Jan. 1965	BSWA 7987	FH	fert.	I. M. Lamb
MELCHIOR IS., Omega I.	64°20'	62°56'	67	20	N. side of island, on shore escarpment of steep granodioritic rocks below a snow slope; on stone in damp gutter at side of rock ledge, associated with <i>Mastodia tessellata</i>	31 Jan. 1965	BSWA 7994b	FH	fert.	I. M. Lamb
WIENCKE I., Goudier I.	64°50'	63°31'	—	—	“Sur les rochers (diorites) aux endroits un peu abrités”	28 Dec. 1908	FAE 1908-10/92 <i>pr. p.</i> * FAE 1908-10/95 <i>pr. p.</i> †	PC	fert.	FAE 1908-10
WIENCKE I., Goudier I.	64°50'	63°31'	25	7.5	On granodioritic ridge	25 Feb. 1944	FIDS A1136	BM	fert.	I. M. Lamb
WIENCKE I., Goudier I.	64°50'	63°31'	30	9	On ridge of granodioritic rock	27 Feb. 1944	FIDS A1141u	BM	fert.	I. M. Lamb
WIENCKE I., Goudier I.	64°50'	63°31'	33	10	Near summit of island, on granodioritic stones	27 Feb. 1944	FIDS A1145	BM	fert.	I. M. Lamb
WIENCKE I., Goudier I.	64°50'	63°31'	33	10	Near summit of island, on a loose granodioritic stone	29 Feb. 1944	FIDS A1148	BM	fert.	I. M. Lamb
WIENCKE I., Goudier I.	64°50'	63°31'	26	8	On granodioritic rocks	25 Mar. 1944	FIDS A1176	BM	fert.	I. M. Lamb
WIENCKE I., Goudier I.	64°50'	63°31'	26	8	On granodioritic rocks	26 Mar. 1944	FIDS A1181	BM	fert.	I. M. Lamb
WIENCKE I., Goudier I.	64°50'	63°31'	26	8	On vertical face of granodioritic rock	26 Nov. 1944	FIDS A1802	BM	fert.	I. M. Lamb
WIENCKE I., Goudier I.	64°50'	63°31'	25	7.5	On basalt dyke	14 Jan. 1945	FIDS A2232m	BM	fert.	I. M. Lamb
WIENCKE I., Goudier I.	64°50'	63°31'	26	8	On granodioritic rock	18 Jan. 1945	FIDS A2242	BM	fert.	I. M. Lamb

\* Syntype specimen.

† Lectotype specimen.

Locality	Position		Altitude		Collecting Notes	Date of Collection	Specimen Number	Herbarium	Fertile or Sterile	Collector or Expedition
	lat. S.	long. W.	ft.	m.						
ARGENTINE IS., Galindez I.	65°15'	64°15'	10-25	3-7·5	From nearly vertical low sea cliff	31 Mar. 1935	BGLE 1116-89 BGLE 1116-101a	BM	fert.	BGLE
ARGENTINE IS., Galindez I.	65°15'	64°15'	—	—	From rock slopes facing N.W. a few yards back from the sea	31 Mar. 1935	BGLE 1118-5	BM	fert.	BGLE
BERTHELOT IS., Green I.	65°19'	64°10'	15	4	From N.-facing low sea cliff	18 Mar. 1935	BGLE 1094-8 BGLE 1094-22 BGLE 1094-29 BGLE 1094-33 BGLE 1094-62 BGLE 1094-63 BGLE 1094-69 BGLE 1094-73 BGLE 1094-75 BGLE 1094-79 BGLE 1094-83 BGLE 1095-1	BM	fert.	BGLE

TABLE XXIV

*Buellia augusta*

## South Orkney Islands

Locality	Position		Altitude		Collecting Notes	Date of Collection	Specimen Number	Herbarium	Fertile or Sterile	Collector or Expedition
	lat. S.	long. W.	ft.	m.						
LAURIE I., Cape Geddes	60°42'	44°35'	150	45	On outcrop above general level of snow-covered ground	8 Apr. 1946	FIDS C3-1001p* FIDS C3-1001v	BM	fert.	FIDS
LAURIE I., Cape Geddes	60°42'	44°35'	15	4	On exposed rocks	27 Nov. 1946	FIDS C19-1006b FIDS C19-1006d* FIDS C19-1006f*	BM	fert.	FIDS
LAURIE I., Cape Geddes	60°42'	44°35'	40-70	12-21	From loose rocks, recently exposed	27 Nov. 1946	FIDS C20-1007	BM	ster.	FIDS
LAURIE I., Cape Geddes	60°42'	44°35'	100-200	30-60	E. of base hut, facing N.W.	3 Oct. 1946	FIDS C8-1003i	BM	ster.	FIDS
LAURIE I., Scotia Bay	60°46'	44°40'	—	—	On rocks	1 Mar. 1953	AE 10241k	CORD	fert.	A. Hunziker
SIGNY I.	60°43'	45°38'	80	24	Near main base hut	26 Apr. 1947	FIDS H53-11* FIDS H53-1m	BM	fert.	G. de Q. Robin
SIGNY I.	60°43'	45°38'	100	30	—	13 Jan. 1948	FIDS H81-1d	BM	fert.	P. E. Biggs
SIGNY I., North Point	60°41'	45°38'	80	24	—	16 Jan. 1948	FIDS H83-1k*	BM	fert.	P. E. Biggs

\* Juvenile or "brabantica" condition.

TABLE XXIV. *Buellia augusta* (continued)

## South Orkney Islands—cont.

Locality	Position		Altitude		Collecting Notes	Date of Collection	Specimen Number	Herbarium	Fertile or Sterile	Collector or Expedition
	lat. S.	long. W.	ft.	m.						
SIGNY I., near Berry Head	60°42'	45°36'	50	15	—	13 Jan. 1948	FIDS H80-1e*	BM	fert.	P. E. Biggs
SIGNY I., Borge Bay	60°43'	45°36'	25	7.5	On N.-facing hillside	Feb. 1944	FIDS H3027p	BM	fert.	T. Hooley
SIGNY I., Jebsen Point	60°43'	45°40'	40	12	—	16 Jan. 1948	FIDS H84-1t	BM	fert.	P. E. Biggs

## South Shetland Islands

Locality	Position		Altitude		Collecting Notes	Date of Collection	Specimen Number	Herbarium	Fertile or Sterile	Collector or Expedition
	lat. S.	long. W.	ft.	m.						
FILDES STRAIT	62°14'	58°59'	—	—	At base of low crags near foreshore	21 Dec. 1934	DI 1934-35/1483-1*	BM	fert.	DI 1934-35

\* Juvenile or "brabantica" condition.

## West Graham Land

Locality	Position		Altitude		Collecting Notes	Date of Collection	Specimen Number	Herbarium	Fertile or Sterile	Collector or Expedition
	lat. S.	long. W.	ft.	m.						
2 mi. N.N.W. of MT. JACQUINOT	63°21'	57°53'	50	15	—	18 Oct. 1946	FIDS D367-6g FIDS D367-7q* FIDS D367-8e*	BM	fert.	A. Reece
AUGUSTE I.	64°03'	61°36'	—	—	"Sur les rochers"	1897-99	BAE 213 <i>pr. p.</i> †	TUR	fert.	E. Racovitza
BRABANT I.	64°15'	62°20'	990	300	"Sur un rocher isolé au milieu d'un glacier"	1897-99	BAE 251 <i>pr. p.</i> ‡	TUR	fert.	E. Racovitza
MELCHIOR Is.§	64°19'	62°57'	—	—	—	25 Jan. 1936	BGLE 1428-2	BM	ster.	BGLE
MELCHIOR Is., Alpha I.	64°19'	63°00'	15-25	4-75	W. side of island, on top of a granodioritic bird cliff	21 Dec. 1964	BSWA 7893r	FH	ster.	I. M. Lamb
MELCHIOR Is., Omega I.	64°20'	62°56'	—	—	On rock in a cormorant rookery off S.W. side of small offshore islet	13 Jan. 1965	BSWA 79391	FH	sparingly fert.	E. Cueli and A. Gubolin
WIENCKE I.	64°50'	63°25'	—	—	"Sur un rocher"	1897-99	BAE 447 <i>pr. p.</i>	BR	fert.	E. Racovitza
WIENCKE I., Noble Peak	64°48'	63°25'	450	135	From N.E. exposure, on rocky outcrop	19 Nov. 1944	FIDS A1738 FIDS A1785b	BM	fert.	I. M. Lamb
WIENCKE I., Port Lockroy	64°50'	63°31'	6	2	On face of large granodioritic block by sea-shore	23 Aug. 1944	FIDS A1246a	BM	sparingly fert.	I. M. Lamb

TABLE XXIV. *Buellia angusta* (continued)

West Graham Land—cont.

Locality	Position		Altitude		Collecting Notes	Date of Collection	Specimen Number	Herbarium	Fertile or Sterile	Collector or Expedition
	lat. S.	long. W.	ft.	m.						
WIENCKE I., Goudier I.	64°50'	63°31'	—	—	“Sur les rochers (diorites) aux endroits un peu abrités”	28 Dec. 1908	FAE 1908–10/90 <i>pr. p.</i> *	PC	fert. (im- mature)	FAE 1908–10
WIENCKE I., Goudier I.	64°50'	63°31'	26	8	On granodioritic rock	2 Apr. 1944	FIDS A1201 1 FIDS A1202c FIDS A1203 <i>pr. p.</i>	BM	ster. fert. fert.	I. M. Lamb
WIENCKE I., Goudier I.	64°50'	63°31'	26	8	On granodioritic rock	26 Nov. 1944	FIDS A1805b	BM	fert.	I. M. Lamb
ARGENTINE IS., Galindez I.	65°15'	64°15'	10–25	3–7.5	From nearly vertical low sea cliff	31 Mar. 1935	BGLE 1116–47	BM	fert.	BGLE
ARGENTINE IS., Galindez I.	65°15'	64°15'	—	—	From rock slopes facing N.W. a few yards back from the sea	31 Mar. 1935	BGLE 1118–22	BM	fert.	BGLE
ARGENTINE IS., Galindez I.	65°15'	64°15'	—	—	—	10 Dec. 1935	BGLE 1325–12	BM	fert.	BGLE
ARGENTINE IS., Galindez I.	65°15'	64°15'	—	—	From horizontal rock top exposed by thaw in last few days	14 Dec. 1935	BGLE 1305–2†	BM	fert.	BGLE
BERTHELOT IS., Green I.	65°19'	64°10'	15	4	From N.-facing low sea cliff	18 Mar. 1935	BGLE 1094–50 BGLE 1094–59	BM	fert.	BGLE
MARGUERITE BAY, Bourgeois Fjord	67°40'	67°05'	0–3	0–1	On boulders on beach at W. end of narrows between Bourgeois Fjord and Bigourdan Fjord	25 Jul. 1936	BGLE 1488–1b	BM	spar- ingly fert.	BGLE
MARGUERITE BAY, Debenham Is. (Barbara I.)	68°08'	67°07'	—	—	At W. end	5 Jan. 1937	BGLE 1542–8 BGLE 1564–12	BM	fert. ster.	BGLE

\* One of the syntype specimens of *Lecidea isabellina* Hue.

† Showing transition from juvenile “brabantica” condition to typical adult condition in same thallus.

TABLE XXV  
*Buellia latemarginata*

South Orkney Islands

Locality	Position		Altitude		Collecting Notes	Date of Collection	Specimen Number	Herbarium	Fertile or Sterile	Collector or Expedition
	lat. S.	long. W.	ft.	m.						
LAURIE I., Cape Geddes	60°42'	44°35'	150	45	On outcrop above general level of snow-covered ground	8 Apr. 1946	FIDS C3-1001w	BM	fert.	FIDS
LAURIE I., Cape Geddes	60°42'	44°35'	100-200	30-60	From rocks and crevices	3 Oct. 1946	FIDS C8-1003d	BM	fert.	FIDS
LAURIE I., Cape Geddes	60°42'	44°35'	15	4	On exposed rocks	27 Nov. 1946	FIDS C19-1006g	BM	fert.	FIDS
LAURIE I., Cape Geddes	60°42'	44°35'	40-70	12-21	On loose rocks, recently exposed	27 Nov. 1946	FIDS C20-1007d	BM	fert.	FIDS
SIGNY I., Gourlay Point	60°44'	45°35'	80	24	—	15 Jan. 1948	FIDS H82-1e FIDS H82-1p	BM	fert.	P. E. Biggs

West Graham Land

Locality	Position		Altitude		Collecting Notes	Date of Collection	Specimen Number	Herbarium	Fertile or Sterile	Collector or Expedition
	lat. S.	long. W.	ft.	m.						
2 mi. N.N.W. of Mt. JACQUINOT	63°21'	57°53'	50	15	—	18 Oct. 1946	FIDS D367-8d	BM	fert.	A. Reece
BRIALMONT COVE, Spring Point	64°17'	61°04'	—	—	—	1957-58	AE*	LP	fert.	A. Corte
MELCHIOR Is., Alpha I.	64°19'	63°00'	15-25	4-7.5	On ± vertical face of granodioritic bird cliff	21 Dec. 1964	BSWA 7887n BSWA 7898	FH	fert.	I. M. Lamb
MELCHIOR Is., Pi Is.	64°20'	62°53'	50-83	15-25	On steep rocks	25 Jan. 1965	BSWA 7963s	FH	fert.	N. Bellisio
WIENCKE I., Noble Peak	64°48'	63°25'	450	135	On N.E.-facing rocky outcrop, on zenith surface of large rock where gulls and skuas sit, a very nitrogenous position	19 Nov. 1944	FIDS A1774	BM	fert.	I. M. Lamb
WIENCKE I., Port Lockroy	64°50'	63°31'	10-15	3-4	On basalt dyke	12 Mar. 1944	FIDS*	BM	fert.	A. Taylor
WIENCKE I., Port Lockroy	64°50'	63°31'	3	1	On face of large granodioritic block	23 Aug. 1944	FIDS A1246b	BM	fert.	I. M. Lamb
WIENCKE I., Goudier I.	64°50'	63°31'	26	8	Near summit of granodioritic rock where birds sit, a highly nitrogenous position	28 Nov. 1944	FIDS A1825	BM	fert.	I. M. Lamb
BOOTH I.	65°05'	64°00'	100-330	30-100	"Sur les rochers (diorites)"	30 Dec. 1908	FAE 1908-10/116 pr. p.†	PC	fert.	FAE 1908-10



TABLE XXV. *Buellia latemarginata* (continued)

## West Graham Land—cont.

Locality	Position		Altitude		Collecting Notes	Date of Collection	Specimen Number	Herbarium	Fertile or Sterile	Collector or Expedition
	lat. S.	long. W.	ft.	m.						
PETERMANN I.	65°11'	64°11'	—	—	“Sur les rochers (diorites avec filons diabasiques très altérés)”	5 Jan. 1909	FAE 1908–10/179 <i>pr. p.*</i>	PC	fert.	FAE 1908–10
PETERMANN I.	65°11'	64°11'	—	—	“Sur les rochers près de la côte”	14 Mar. 1909	FAE 1908–10/284 <i>pr. p.†</i>	PC	fert.	FAE 1908–10
PETERMANN I.	65°11'	64°11'	—	—	“Sur les rochers près de la côte”	14 Mar. 1909	FAE 1908–10/284 <i>pr. p.‡</i>	PC	fert.	FAE 1908–10
ARGENTINE IS., Galindez I.	65°15'	64°15'	10–25	3–7·5	From nearly vertical low sea cliff	31 Mar. 1935	BGLE 1116–58	BM	fert.	BGLE
BERTHELOT IS., Green I.	65°19'	64°10'	15	4	From N.-facing low sea cliff	18 Mar. 1935	BGLE 1094–35 BGLE 1094–56 BGLE 1094–58a	BM	fert.	BGLE
MARGUERITE BAY, Camp Point	67°58'	67°19'	—	—	—	27 Oct. 1949	FIDS E627d	BM	fert.	B. Stonehouse
MARGUERITE BAY, Debenham Is.	68°08'	67°07'	25	7·5	On exposed rock face	7 Dec. 1947	FIDS E1127s	BM	fert.	B. Stonehouse
MARGUERITE BAY, Neny Fjord (Red Rock Ridge)	68°18'	67°05'	100	30	On moraine	19 Jan. 1948	FIDS E1165	BM	fert.	B. Stonehouse
MARGUERITE BAY, Small unnamed island	68°30'	69°00'	—	—	“Sur les rochers (diorites)”	24 Jan. 1909	FAE 1908–10/266 <i>pr. p.§</i>	PC	fert.	FAE 1908–10

## East Graham Land

Locality	Position		Altitude		Collecting Notes	Date of Collection	Specimen Number	Herbarium	Fertile or Sterile	Collector or Expedition
	lat. S.	long. W.	ft.	m.						
HOPE BAY	63°24'	57°00'	—	—	“Abundante sobre las rocas”	24 Jan. 1953	AE 10158 AE 10159t	CORD	fert.	A. Hunziker
PAULET I.	63°35'	55°47'	—	—	“On rocks . . . on very rough stones”	Sep. 1903	SAE 112	S	fert.	C. Skottsberg
LONG I.	63°46'	58°12'	70	21	On rock at S.W. end of island	17 Aug. 1945	FIDS D2443 FIDS D2446c	BM	fert.	I. M. Lamb

\* Type specimen of *Lecidea actinobola* Hue.† Lectotype specimen of *Lecidea Gainii* Hue.‡ Lectotype specimen of *Lecidea Charcotii* Hue.§ Syntype specimen of *Lecidea Charcotii* Hue.|| Type specimen of *Buellia latemarginata* Darb.

TABLE XXV. *Buellia latemarginata* (continued)

East Graham Land—cont.

Locality	Position		Altitude		Collecting Notes	Date of Collection	Specimen Number	Herbarium	Fertile or Sterile	Collector or Expedition
	lat. S.	long. W.	ft.	m.						
JAMES ROSS I., Cape Lachman	63°47'	57°47'	118	35	On isthmus behind the cape on a knoll frequented by gulls and skuas	21 Nov. 1945	FIDS D2687	BM	fert.	I. M. Lamb
DEVIL I.	63°48'	57°17'	680	205	On rock	13 Nov. 1945	FIDS D2583a FIDS D2589b	BM	fert.	G. Davies and V. I. Russell
PRINCE GUSTAV CHANNEL, Pitt Point	63°51'	58°22'	118	35	On gneissic rock	17 Aug. 1945	FIDS D2451b	BM	fert.	I. M. Lamb
VEGA I., False I. Point	63°55'	57°20'	33	10	On stony isthmus, on a loose stone without accompanying species	5 Dec. 1945	FIDS D2715 FIDS D2719g FIDS D2721b	BM	fert.	I. M. Lamb
JAMES ROSS I., The Naze	63°57'	57°32'	26-83	8-25	On basaltic outcrop associated with traces of <i>Caloplaca</i> sp.	26 Nov. 1945	FIDS 2785	BM	fert.	I. M. Lamb

TABLE XXVI

*Buellia Babingtonii*

West Graham Land

Locality	Position		Altitude		Collecting Notes	Date of Collection	Specimen Number	Herbarium	Fertile or Sterile	Collector or Expedition
	lat. S.	long. W.	ft.	m.						
2 mi. N.N.W. of MT. JACQUINOT	63°21'	57°53'	50	15	—	18 Oct. 1946	FIDS D367-5	BM	fert.	A. Reece
MELCHIOR Is., Omega I.	64°20'	62°56'	—	—	Small offshore islet off S.W. side, on rock in a cormorant rookery	13 Jan. 1965	BSWA 7939k	FH	fert.	E. Cueli and A. Gubolin
MARGUERITE BAY, Debenham Is.	68°08'	67°07'	50	15	On stone in damp crevice	7 Dec. 1947	FIDS E1100r	BM	fert.	B. Stonehouse
MARGUERITE BAY, Debenham Is.	68°08'	67°07'	45	13.5	From hollow on top of rocks	7 Dec. 1947	FIDS E1114x FIDS E1114z	BM	fert.	B. Stonehouse
MARGUERITE BAY, Neny Fjord (Red Rock Ridge)	68°18'	67°05'	40	12	From S. side, on damp shady rock	19 Jan. 1948	FIDS E1171b	BM	fert.	B. Stonehouse

TABLE XXVI. *Buellia Babingtonii* (continued)

## East Graham Land

Locality	Position		Altitude		Collecting Notes	Date of Collection	Specimen Number	Herbarium	Fertile or Sterile	Collector or Expedition
	lat. S.	long. W.	ft.	m.						
COCKBURN I.	64°12'	56°51'	—	—	On volcanic rocks	6 Jan. 1843	—	BM* H†‡	fert.	J. D. Hooker

\* Isotype specimen of *Lecanora Babingtoni* Hook. f. & Tayl.† Holotype specimen of *Lecidea australissima* Nyl.

‡ Botanical Institute, University of Helsingfors, Finland (Herb. Nylander).

TABLE XXVII

*Buellia fulvonitescens*

## West Graham Land

Locality	Position		Altitude		Collecting Notes	Date of Collection	Specimen Number	Herbarium	Fertile or Sterile	Collector or Expedition
	lat. S.	long. W.	ft.	m.						
WIENCKE I., Port Lockroy (Besnard Point)	64°49'	63°30'	3-7	1-2	On face of large grano-dioritic block	23 Aug. 1944	FIDS A1242b FIDS A1245a*	BM	fert.	I. M. Lamb

\* Holotype specimen.

TABLE XXVIII

*Buellia frigida*

## West Graham Land

Locality	Position		Altitude		Collecting Notes	Date of Collection	Specimen Number	Herbarium	Fertile or Sterile	Collector or Expedition
	lat. S.	long. W.	ft.	m.						
MARGUERITE BAY, Bourgeois Fjord	67°40'	67°05'	0-3	0-1	On boulders on beach at W. end of narrows between Bourgeois Fjord and Bigourdan Fjord	25 Jul. 1936	BGLE 1488-1a	BM	fert.	BGLE
MARGUERITE BAY, Horseshoe I.	67°51'	67°12'	0-3	0-1	On gneissic beach pebbles on S.W. side of bay, facing N.W.	24 Jul. 1936	BGLE 1486-3	BM	fert.	BGLE
MARGUERITE BAY, Debenham Is. (Barbara I.)	68°08'	67°07'	—	—	On gneissic rock at W. end of island	5 Jan. 1937	BGLE 1542-5	BM	fert.	BGLE

TABLE XXIX  
*Rinodina turfacea*

*South Orkney Islands*

Locality	Position		Altitude		Collecting Notes	Date of Collection	Specimen Number	Herbarium	Fertile or Sterile	Collector or Expedition
	lat. S.	long. W.	ft.	m.						
LAURIE I., Cape Geddes	60°42'	44°35'	—	—	Higher levels, on steep slopes facing Brown Bay	3 Jan. 1947	FIDS C44-1015g	BM	fert.	FIDS

*South Shetland Islands*

Locality	Position		Altitude		Collecting Notes	Date of Collection	Specimen Number	Herbarium	Fertile or Sterile	Collector or Expedition
	lat. S.	long. W.	ft.	m.						
KING GEORGE I., Potter Cove	62°13'	58°42'	—	—	—	1 Jan. 1955	AE 35063b	BASB	fert.	O. Kühnemann
HALF MOON I.	62°35'	59°55'	—	—	"Sobre el tapiz húmedo de musgos"	11 Jan. 1953	AE 10109b	CORD	fert.	A. Hunziker

*West Graham Land*

Locality	Position		Altitude		Collecting Notes	Date of Collection	Specimen Number	Herbarium	Fertile or Sterile	Collector or Expedition
	lat. S.	long. W.	ft.	m.						
MOSS IS.	64°09'	61°03'	—	—	—	1 Dec. 1902	SAE*	S	fert.	C. Skottsberg
CHALLENGER I.	64°21'	61°35'	—	—	—	2 Dec. 1902	SAE*	S	fert.	C. Skottsberg
ANVERS I., Norsel Point	64°46'	64°06'	50	15	Over moss between rocks	4 Feb. 1965	BSWA 8000c	FH	fert.	I. M. Lamb
ANVERS I., Norsel Point	64°06'	64°06'	70	21	Over moss clumps on rocky hillside	4 Feb. 1965	BSWA 8001b	FH	fert.	I. M. Lamb
ANVERS I., Norsel Point	64°46'	64°06'	70	21	On clumps of moss; common	4 Feb. 1965	BSWA 8010	FH	fert.	I. M. Lamb
ANVERS I., Norsel Point	64°46'	64°06'	70	21	On moss clumps on rocky slope; widespread and common	6 Feb. 1965	BSWA 8072a	FH	fert.	I. M. Lamb and M. H. Zimmermann
PETERMANN I.	65°11'	64°11'	—	—	"Sur la terre des rochers (diorites) du sommet de l'île, face au nord"	5 Jan. 1909	FAE 1908-10/158†	PC	fert.	FAE 1908-10

\* No number.

† Type specimen of *Lecanora egentissima* Hue.

Locality	Position		Altitude		Collecting Notes	Date of Collection	Specimen Number	Herbarium	Fertile or Sterile	Collector or Expedition
	lat. S.	long. W.	ft.	m.						
HOPE BAY, Lake Boeckella	63°24'	57°00'	155	50	On decaying tufts of moss ( <i>Andreaea</i> sp.) on S. shore of lake	10 Oct. 1945	FIDS D2508	BM	fert.	I. M. Lamb
HOPE BAY, Scar Hills	63°25'	57°01'	330	100	On patches of decaying moss; uncommon	25 Sep. 1945	FIDS D2495 FIDS D2496	BM	fert.	I. M. Lamb
DUSE BAY, View Point (N. side)	63°33'	57°22'	450	135	On decayed moss between loose stones near tern nests	10 Nov. 1945	FIDS D2601	BM	fert.	I. M. Lamb
HERBERT SOUND	63°55'	57°40'	50-150	15-45	On gently sloping stony slope periodically irrigated by snow melt water, over decayed moss	8 Dec. 1945	FIDS D2820b	BM	fert.	I. M. Lamb

TABLE XXX

*Rinodina cf. diplocheila*

## South Shetland Islands

Locality	Position		Altitude		Collecting Notes	Date of Collection	Specimen Number	Herbarium	Fertile or Sterile	Collector or Expedition
	lat. S.	long. W.	ft.	m.						
DECEPTION I., Port Foster	62°58'	60°39'	15-20	4-6	On basaltic stones on hillside about 1 km. S.W. of the Argentine station	15 Jan. 1965	BSWA 7948a	FH	fert.	M. H. Zimmermann

TABLE XXXI

*Rinodina deceptionis*

## South Shetland Islands

Locality	Position		Altitude		Collecting Notes	Date of Collection	Specimen Number	Herbarium	Fertile or Sterile	Collector or Expedition
	lat. S.	long. W.	ft.	m.						
DECEPTION I., Whalers Bay	62°59'	60°34'	30	9	On outcrop of weathered agglomerate rock near the abandoned whaling station; W. exposure	6 Feb. 1944	FIDS B1111d	BM	fert.	I. M. Lamb
DECEPTION I., Port Foster	62°58'	60°39'	30	9	On sloping upper side of an agglomerate bird rock on hillside about 200 m. behind the Argentine station	23 Nov. 1964	BSWA 7883*	FH	fert.	I. M. Lamb

\* Type specimen.

TABLE XXXII  
*Rinodina Petermannii*

*South Orkney Islands*

Locality	Position		Altitude		Collecting Notes	Date of Collection	Specimen Number	Herbarium	Fertile or Sterile	Collector or Expedition
	lat. S.	long. W.	ft.	m.						
LAURIE I., Cape Geddes	60°42'	44°35'	150	45	From outcrops above general level of snow-covered ground on small plateau on N.W. seaward edge of cape	8 Apr. 1946	FIDS C3-1001c	BM	fert.	FIDS
LAURIE I., Cape Geddes	60°42'	44°35'	15	4	On exposed rocks on N.W. side of cape	27 Nov. 1946	FIDS C19-1006o	BM	fert.	FIDS
SIGNY I., Borge Bay	60°43'	45°36'	30-40	9-12	On granodioritic and schistose rocks on N.-facing hillside	Feb. 1944	FIDS H3032 FIDS H3034	BM	fert.	T. Hooley

*South Shetland Islands*

Locality	Position		Altitude		Collection Notes	Date of Collection	Specimen Number	Herbarium	Fertile or Sterile	Collector or Expedition
	lat. S.	long. W.	ft.	m.						
FILDES STRAIT	62°14'	58°59'	—	—	At base of low crags near foreshore	21 Dec. 1934	DI 1934-35/1483 <i>pr. p.</i>	BM	fert.	DI 1934-35

TABLE XXXII. *Rinodina Petermannii* (continued)

West Graham Land

Locality	Position		Altitude		Collecting Notes	Date of Collection	Specimen Number	Herbarium	Fertile or Sterile	Collector or Expedition
	lat. S.	long. W.	ft.	m.						
MELCHIOR IS., Alpha I.	64°19'	63°00'	15-25	4-7.5	On granodioritic rock at top of bird cliff at W. side of island	21 Dec. 1964	BSWA 7901	FH	fert.	I. M. Lamb
MELCHIOR IS., Omega I.	64°20'	62°56'	50	15	On steep granodioritic rocks beneath a snow slope on N. side of island	31 Jan. 1965	BSWA 7982	FH	fert.	I. M. Lamb
ANVERS I., Norsel Point	64°46'	64°06'	83	25	On sloping side of summit of bird rock (extremely nitrogenous position)	7 Feb. 1965	BSWA 8096	FH	sparingly fert.	I. M. Lamb and M. H. Zimmermann
WIENCKE I., Noble Peak	64°48'	63°25'	450	135	On N.E.-facing rocky outcrop, forming an association with <i>Mastodia tessellata</i> on side of large granodioritic rock sloping at about 45°; a highly nitrogenous position, with bird excrement running down	19 Nov. 1944	FIDS A1783	BM	fert.	I. M. Lamb
WIENCKE I., Port Lockroy	64°49'	63°30'	15	4	On steeply sloping granodiorite rock near the penguin rookery	30 Dec. 1944	FIDS A2152	BM	fert.	I. M. Lamb
WIENCKE I., Goudier I.	64°50'	63°31'	—	—	“Sur les rochers (diorites) et principalement sur ceux qui sont face au nord”	28 Dec. 1908	FAE 1908-10/81 <i>pr. p.</i>	PC	with apothecial initials	FAE 1908-10
WIENCKE I., Goudier I.	64°50'	63°31'	30	9	On large rounded granodiorite rocks near summit of island (somewhat nitrogenous situation from bird excrement)	29 Feb. 1944	FIDS A1153	BM	fert.	I. M. Lamb
WIENCKE I., Goudier I.	64°50'	63°31'	25	7.5	On a loose stone near summit of island	17 Mar. 1944	FIDS A1174p	BM	with apothecial initials	I. M. Lamb
WIENCKE I., Goudier I.	64°50'	63°31'	3	1	On weathered wooden deck of old whaling boat on beach	1 Apr. 1944	FIDS A1215c	BM	with apothecial initials	I. M. Lamb
WIENCKE I., Goudier I.	64°50'	63°31'	30	9	On basalt dyke at summit of island	10 Jan. 1945	FIDS A2213	BM	fert.	I. M. Lamb
WIENCKE I., Goudier I.	64°50'	63°31'	26	8	On edge of granodiorite bird rock; highly nitrogenous position	14 Jan. 1945	FIDS A2231	BM	fert.	I. M. Lamb

TABLE XXXII. *Rinodina Petermannii* (continued)

## West Graham Land—cont.

Locality	Position		Altitude		Collecting Notes	Date of Collection	Specimen Number	Herbarium	Fertile or Sterile	Collector or Expedition
	lat. S.	long. W.	ft.	m.						
WIENCKE I., Goudier I.	64°50'	63°31'	26	8	On basalt dyke in upper part of island, associated with <i>Mastodia tessellata</i>	18 Jan. 1945	FIDS A2256	BM	fert.	I. M. Lamb
WIENCKE I., Goudier I.	64°50'	63°31'	26	8	On vertical face at side of granodioritic bird rock	24 Jan. 1945	FIDS A2283b	BM	fert.	I. M. Lamb
DOUMER I.	64°51'	63°35'	118	35	Over moss on damp rock face on rocky outcrop on N. side of island; N. exposure	12 Dec. 1944	FIDS A1929	BM	fert.	I. M. Lamb
PETERMANN I.	65°11'	64°11'	—	—	"Sur les rochers (diorites avec filons d'andesite)"	5 Jan. 1909	FAE 1908-10/179 <i>pr. p.*</i>	PC	with im- mature apothecia	FAE 1908-10
PETERMANN I.	65°11'	64°11'	—	—	"Sur les rochers (diorites avec filons d'andesite)"	14 Mar. 1909	FAE 1908-10/304 <i>pr. p.†</i>	PC	fert.	FAE 1908-10
ARGENTINE IS., Galindez I.	65°15'	64°15'	10-25	3-7.5	From nearly vertical low sea cliff	31 Mar. 1935	BGLE 1116-101b	BM	fert.	BGLE
MARGUERITE BAY, islands between Horseshoe I. and Camp Point	67°57'	67°12'	30	9	On exposed rocks	8 Nov. 1948	FIDS E472-3	BM	fert.	B. Stonehouse and K. Blaiklock

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\* Syntype specimen.

† Lectotype specimen.

## East Graham Land

Locality	Position		Altitude		Collecting Notes	Date of Collection	Specimen Number	Herbarium	Fertile or Sterile	Collector or Expedition
	lat. S.	long. W.	ft.	m.						
HOPE BAY	63°24'	57°00'	25	7.5	On stones in the penguin rookery	7 Feb. 1944	FIDS D1131a	BM	spar- ingly fert.	I. M. Lamb
HOPE BAY, near Lake Boeckella	63°24'	57°00'	215	65	On large blocks and loose stones	15 Apr. 1945	FIDS D2361 FIDS D2364	BM	ster. spar- ingly fert.	I. M. Lamb
HOPE BAY, low hill on E. side	63°24'	57°00'	450	135	On rocks in somewhat bird-influenced summit position	16 Apr. 1945	FIDS D2405	BM	fert.	I. M. Lamb
HOPE BAY, near Lake Boeckella	63°24'	57°00'	215	65	On a block of shale	12 Oct. 1945	FIDS D2516a	BM	spar- ingly fert.	I. M. Lamb
HOPE BAY, above Lake Boeckella	63°24'	57°00'	380	115	At summit of hillock, common on rocks and stones	29 Oct. 1945	FIDS D2549	BM	fert.	I. M. Lamb
HOPE BAY	63°24'	57°00'	—	—	Near the coast	24 Jan. 1953	AE10159u	CORD	spar- ingly	A. Hunziker



*Rinodina endophragma*

## East Graham Land

Locality	Position		Altitude		Collecting Notes	Date of Collection	Specimen Number	Herbarium	Fertile or Sterile	Collector or Expedition
	lat. S.	long. W.	ft.	m.						
JAMES ROSS I., Herbert Sound	64°00'	57°38'	100	30	On a loose piece of limestone a short distance inland	23 Nov. 1945	FIDS D2646a*	BM	fert.	A. Taylor

\* Type specimen.

TABLE XXXIV

*Rinodina nimbose f. nimbose*

## East Graham Land

Locality	Position		Altitude		Collecting Notes	Date of Collection	Specimen Number	Herbarium	Fertile or Sterile	Collector or Expedition
	lat. S.	long. W.	ft.	m.						
TAIL I.	63°40'	57°37'	15-26	4-8	From E. side of island, on gently sloping stony patch near the shore, irrigated by melt water from snow slopes above	11 Nov. 1945	FIDS D2751 FIDS D2764	BM	fert.	I. M. Lamb
TAIL I.	63°40'	57°37'	450	135	From summit plateau, on humic detritus between rocks and stones	13 Nov. 1945	FIDS D2827	BM	fert.	I. M. Lamb
VEGA I., False I. Point	63°55'	57°20'	25-70	7.5-21	On stony isthmus, over decayed mosses	5 Dec. 1945	FIDS D2804	BM	fert.	I. M. Lamb
JAMES ROSS I., Cape Lachman (1 mi. S.E. of cape)	63°47'	57°47'	118	35	On stony, gently sloping ground around a snow melt water pond, on humic "soil" (mainly decayed mosses)	21 Nov. 1945	FIDS D2676	BM	fert.	I. M. Lamb
JAMES ROSS I., Cape Lachman	63°47'	57°47'	70-215	21-65	On isthmus behind the cape, over decayed moss	21 Nov. 1945	FIDS D2773	BM	fert.	I. M. Lamb

TABLE XXXV

*Rinodina nimbose f. sphaerocarpa*

## East Graham Land

Locality	Position		Altitude		Collecting Notes	Date of Collection	Specimen Number	Herbarium	Fertile or Sterile	Collector or Expedition
	lat. S.	long. W.	ft.	m.						
VEGA I., False I. Point	63°55'	57°20'	25-70	7.5-21	On stony isthmus, on detritus of decayed mosses	5 Dec. 1945	FIDS D2805	BM	fert.	I. M. Lamb

## EQUIVALENT BRITISH AND ARGENTINE PLACE-NAMES

As this report will also be published by the Instituto Antártico Argentino, the Argentine equivalents of British Antarctic place-names are listed below:

Ablation Point	...	...	punta Ablación	Duse Bay	...	...	bahía Duse
Adelaide Island	...	...	isla Adelaida	Eagle Island	...	...	isla Aguila
Adare, Cape	...	...	cabo Adare	East Antarctica	...	...	Antártida Oriental
Adélie, Terre	...	...	Tierra Adelia	Edsel Ford Ranges...	...	...	cordillera de Edsel Ford
Admiralty Bay	...	...	bahía Lasserre	Egg Island	...	...	isla Huevo
Alectoria Island	...	...	islotte Alectoria	Eklund Islands	...	...	islas Eklund
Alexander Island	...	...	isla Alejandro	Elephant Island	...	...	isla Elefante
Alpha Island	...	...	isla Huidobro	Erebus, Mount	...	...	monte Erebus
Anna, Cape	...	...	cabo Ana	Erebus and Terror Gulf	...	...	golfo Erebus y Terror
Antarctica	...	...	Antártida	Esther Harbour	...	...	puerto Esther
Anvers Island	...	...	isla Amberes	Evans Cove	...	...	ensenada Evans
Ardley Island	...	...	península Ardley	Evensen Nunatak	...	...	nunatak Evensen
Argentine Islands	...	...	islas Argentinas	False Island Point	...	...	punta Falsa Isla
Armitage, Cape	...	...	cabo Armitage	Filchner Ice Shelf	...	...	barrera de Filchner
Arthur Harbour	...	...	near punta Bonaparte*	Fildes Point	...	...	punta Balcarce
Auguste Island	...	...	islotte Augusto	Fildes Strait...	...	...	estrecho Fildes
Baily Head	...	...	punta Rancho	Fitzroy Island	...	...	near isla Stonington
Bald Head	...	...	punta Pelada	Flora, Mount	...	...	monte Flora
Barbara Island	...	...	islotte Bárbara	Foster, Port	...	...	puerto Foster
Barry Island	...	...	islotte Barry	Fredriksen Island	...	...	isla Fredriksen
Beak Island	...	...	isla Pico	Gage, Cape	...	...	cabo Gage
Berry Head	...	...	punta Mora	Galindez Island	...	...	isla Galindez
Berthelot Islands	...	...	islotte Berthelot	Geddes, Cape	...	...	punta Geddes
Besnard Point	...	...	punta Besnard	Geikie Ridge	...	...	dorsal Geikie
Beta Island	...	...	isla Rodeada	George V Land	...	...	Tierra Jorge V
Bills Island	...	...	islotte Bills	George VI Sound	...	...	canal Presidente Sarmiento
Boeckella, Lake	...	...	lago Boeckella	Gneiss Hills	...	...	cerros Gneiss
Booth Island	...	...	isla Booth	Goudier Island	...	...	islotte Goudier
Borge Bay	...	...	bahía Factoría	Gourlay Point	...	...	punta Gourlay
Bourgeois Fjord	...	...	fiordo Bourgeois	Graham Land	...	...	península Antártica
Brabant Island	...	...	isla Brabante	Granite Harbour	...	...	caleta Granito
Bransfield, Mount	...	...	monte Bransfield	Green Island	...	...	islotte Verde
Bransfield Strait	...	...	mar de la Flota	Greenwich Island	...	...	isla Greenwich
Brialmont Cove	...	...	caleta Brialmont	Guébriant Islands	...	...	islotte Roca
Brown Bluff...	...	...	morro Marrón	Half Moon Island	...	...	isla Media Luna
Bryant, Cape	...	...	cabo Briant	Hallett, Cape	...	...	cabo Hallett
Buttress Nunataks	...	...	nunataks Puntal	Harmony Cove	...	...	caleta Armonía
Byrd Land†	...	...	Tierra Byrd	Heard Island	...	...	isla Heard
Cairn Hill	...	...	cerro del Hito	Herbert Sound	...	...	estrecho Azopardo
Camp Point	...	...	punta Campamento	Hidden Lake	...	...	lago Escondido
Cardinal, Mount	...	...	monte Cardenal	Hope Bay	...	...	bahía Esperanza
Carrell, Mount	...	...	monte Rincón	Horseshoe Island	...	...	isla Herradura
Challenger Island	...	...	isla Chica	Hovgaard Island	...	...	isla Hovgaard
Charcot Island	...	...	isla Charcot	Ingrid Christiansen Coast	...	...	costa de Ingrid Christiansen
Church Point	...	...	punta Iglesia	Jacquinet, Mount	...	...	monte Jacquinet
Cockburn Island	...	...	isla Cockburn	James Ross Island	...	...	isla James Ross
Cone Nunatak	...	...	nunatak Cónico	Jeanne Hill	...	...	colina Juana
Cooper, Mount	...	...	monte Cooper	Jebsen Point	...	...	punta Jebsen
Coppermine Cove	...	...	caleta Mina de Cobre	Jenny Island	...	...	isla Juanita
Debenham Islands	...	...	islotte Debenham	Jeremy, Cape	...	...	cabo Jeremy
Deception Island	...	...	isla Decepción	Joinville Island	...	...	isla Joinville
Desolation Island	...	...	isla Desolación	Kappa Island	...	...	isla Observatorio
Devil Island...	...	...	isla del Diablo	Keller Peninsula	...	...	península Keller
Dorian Bay	...	...	bahía Dorian	Kemp Coast	...	...	costa Kemp
Doumer Island	...	...	isla Doumer	Kerguelen, Îles de	...	...	islas Kerguelén
Dundas, Cape	...	...	cabo Dundas	King Edward VII Land	...	...	Tierra del Rey Eduardo VII
D'Urville, Mount	...	...	monte D'Urville	King George Island	...	...	isla 25 de Mayo
				Lachman, Cape	...	...	cabo Lachman
				Lagoon Island	...	...	islotte Laguna

\* There is no precise equivalent.

† Formerly known as "Marie Byrd Land".

Lagotellerie Island ...	...	isla Lagotellerie	Red Rock Ridge ...	...	promontorio Roca Roja
Larsen Ice Shelf ...	...	barrera de Larsen	Reece, Mount ...	...	monte Reece
Latady Island ...	...	isla Latady	Renard, Cape ...	...	cabo Renard
Laubeuf Fjord ...	...	fiordo Laubeuf	Ridge Island ...	...	isla Caballete
Laurie Island ...	...	isla Laurie	Robert Island ...	...	isla Robert
Léonie Islands ...	...	islas Léonie	Rockefeller Mountains ...	...	meseta Rockefeller
Lockroy, Port ...	...	puerto Lockroy	Röhss Bay ...	...	bahía Röhss
Long Island ...	...	isla Larga	Roman Four Promontory...	...	promontorio Cuatro Romano
Longing, Cape ...	...	cabo Longing	Ronald Hill ...	...	cerro Ronaldo
Louis-Philippe Plateau ...	...	Plateau de Luis-Felipe	Roquemaurel, Cape ...	...	cabo Roquemaurel
Mackellar Inlet ...	...	ensenada Mackellar	Ross Island ...	...	isla Ross
Mac.Robertson Coast ...	...	costa Mac.Robertson	Russell East Glacier ...	...	glacier Russell Este
Margerie, Cap de ...	...	cabo de Margerie	Sastrugi, Cape ...	...	cabo Sástrugi
Marguerite Bay ...	...	bahía Margarita	Scar Hills ...	...	cerros de la Cicatriz
Marie Byrd Land ...	...	Tierra de Marie Byrd	Scotia Bay ...	...	bahía Scotia
Martel Inlet ...	...	ensenada Martel	Seal Nunataks ...	...	nunataks Foca
Martins Head ...	...	punta Martins	Signy Island ...	...	isla Signy
Melchior Islands ...	...	islas Melchior (archipiélago Melchior)	Snow Hill Island ...	...	isla Colina Nevada
Mikkelsen Bay ...	...	bahía Mikkelsen	Snow Island ...	...	isla Nevada
Mineral Hill ...	...	cerro Mineral	South Georgia ...	...	isla Georgia del Sur
Moraine Cove ...	...	caleta de la Morena	South Orkney Islands ...	...	islas Orcadas del Sur
Moss Islands ...	...	isla Ricardo	South Shetland Islands ...	...	islas Shetland del Sur
Narrows, The ...	...	La Angostura	Spring Point ...	...	cabo Primavera
Naze, The ...	...	cabo Morro	Square Bay ...	...	bahía Cuadrada
Nelson Island ...	...	isla Nelson	St. Paul, Île ...	...	isla San Paulo
Neny Fjord ...	...	fiordo Neny	Steeple, The... ...	...	El Campanario
Neptune's Bellows ...	...	Fuelle de Neptuno	Stephenson Nunatak ...	...	nunatak Stephenson
Noble Peak ...	...	pico Noble	Summit Pass ...	...	paso de la Cima
Norsel Point ...	...	near punta Bonaparte†	Tabarin Peninsula ...	...	península Tabarín
North Point... ...	...	punta Norte	Tail Island ...	...	isla Cola
Northstar Island ...	...	isla Estrella del Norte	Terra Firma Islands ...	...	islotes Tierra Firme
Omega Island ...	...	isla Sobral	Theodolite Hill ...	...	cerro Teodolito
Palmer Archipelago ...	...	archipiélago Palmer	Tuxen, Cape ...	...	cabo Tuxen
Paulet Island ...	...	isla Paulet	Vega Island ...	...	isla Vega
Penguin Island ...	...	isla Pingüino	Victoria Land ...	...	Tierra Victoria
Pérez, Cape ...	...	cabo Tres Pérez	Victory Glacier ...	...	glaciar Victoria
Petermann Island ...	...	isla Petermann	View Point ...	...	punta Visión
Pi Islands ...	...	islotes Suboficial Rubianes	Visca Anchorage ...	...	fondeadero Visca
Pitt Point ...	...	punta Pitt	Wall Range ...	...	sierra del Muro
Potter Cove ...	...	caleta Potter	Washington Ridge†	...	sierra Washington
Powell Island ...	...	isla Powell	Weddell Sea ...	...	mar de Weddell
Prince Gustav Channel ...	...	canal Príncipe Gustavo	Webb Island ...	...	islote Webb
Pyramid, The ...	...	La Pirámide	Whalers Bay ...	...	caleta Balleneros
Queen Mary Land ...	...	Tierra de la Reina María	Wiencke Island ...	...	isla Wiencke
Queen Mary Coast... ...	...	costa de la Reina María	Winter Harbour ...	...	caleta Invierno
Rasmussen Island ...	...	isla Rasmussen	Wordie Ice Shelf ...	...	barrera de Wordie
Rea, Mount ...	...	monte Rea	Yankee Harbour ...	...	puerto Yanqui

\* There is no precise equivalent.

† Formerly "Mount Helen Washington".

PLATE I

Schematic representation of ascocarp ontogeny in the genus *Buellia*.

a-d. *B. disciformis* and *B. punctata*

- a. Ascogonia developed in generative tissue.
- b, c. Differentiation of asci, paraphyses and excipulum.
- d. Old apothecium with darkened and decaying subhymenial layer, including degenerated spores.

e-h. *Melanaspicilia*-type

- e. Ascogonia developed in generative tissue.
- f. Differentiation of asci, paraphyses and excipulum; apothecium immersed in the thallus (final stage in *Melanaspicilia crystallifera* and *Buellia aethalea*).
- g. Older apothecium rising above thallus-level.
- h. Very old apothecium with darkened and decaying subhymenial layer, including degenerated spores.

i-l. *Buellia Wahlenbergii*

- i. Generative tissue forming an outgrowth from the thallus.
- j. Development of ascogonia in the generative tissue.
- k. Young apothecium with asci, paraphyses and excipulum.
- l. Old apothecium with darkened and decaying subhymenial layer, including degenerated spores.

m-p. *Buellia canescens*

- m. Ascogonia developed between thallus hyphae and symbiotic algal cells.
- n. Generative tissue developed from vegetative hyphae and including ascogenous hyphae; commencement of rupture of the thallus veil.
- o. Differentiation of asci and paraphyses; apothecium still covered by the veil.
- p. Old apothecium extended in the horizontal direction; excipulum arising above thallus-level, its base covered by the remains of the veil; no degenerated spores enclosed in the subhymenial layer.

- |                           |                                  |
|---------------------------|----------------------------------|
| a. Symbiotic algal cells. | g. Generative tissue.            |
| ac. Ascus.                | p. Paraphyses.                   |
| as. Ascogonium.           | sp. Degenerated spores.          |
| e. Excipulum.             | tr. Terminal cell of trichogyne. |

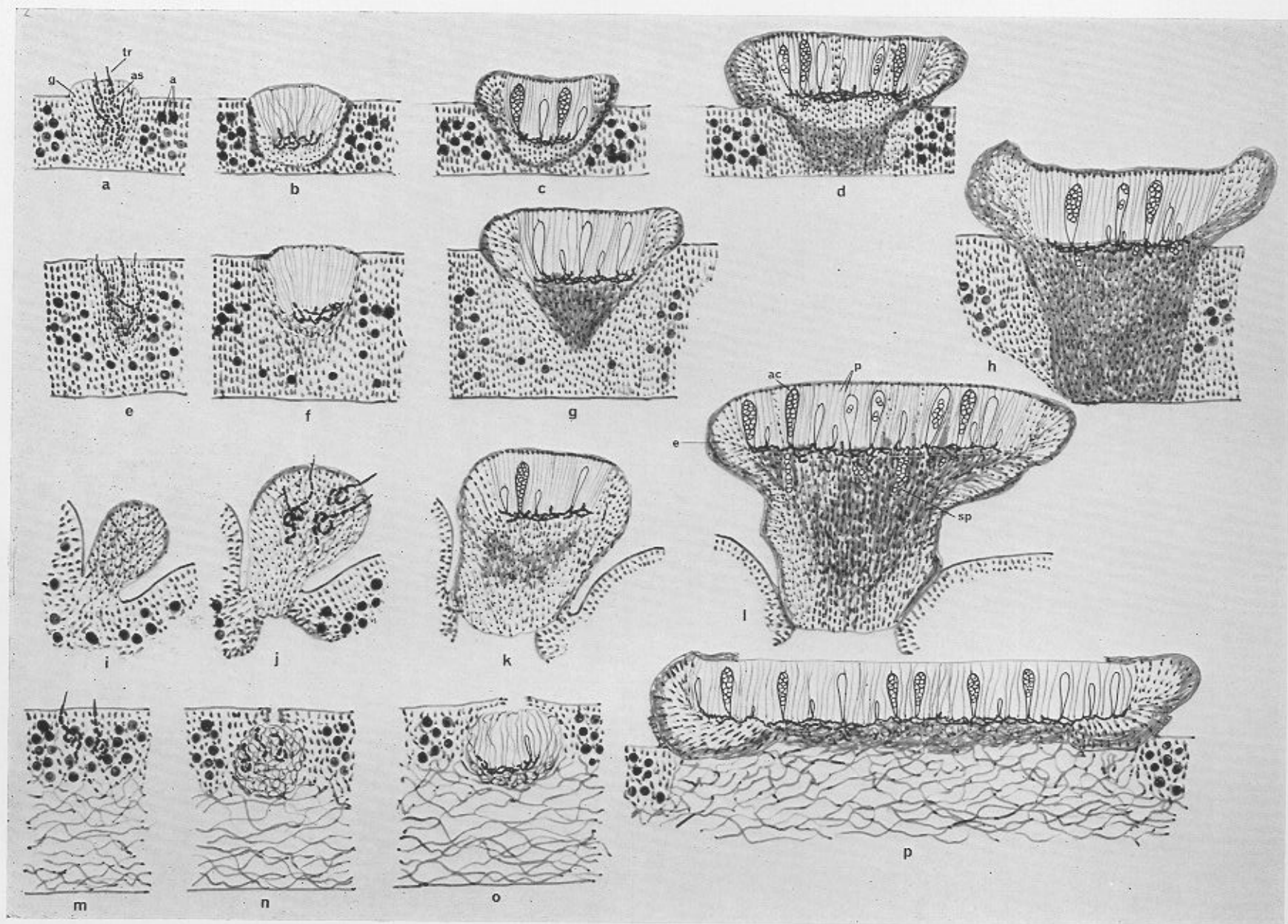


PLATE II

Sections to show ontogenetic development.

- a. *Buellia punctata* (Hoffm.) Mass. (6243). Ascogonia with protruding trichogynes in weft of generative tissue;  $\times 560$ .
- b. *Buellia disciformis* (Fr.) Mudd (15102p). Ascogonia in generative tissue;  $\times 370$ .
- c. *Buellia punctata* (Hoffm.) Mass. (6243). Young apothecium;  $\times 185$ .
- d. *Buellia disciformis* (Fr.) Mudd (6241). Young apothecium with ascogenous hyphae forming the first asci; strong pigmentation of marginal excipulum and tips of paraphyses;  $\times 370$ .
- e. *Buellia disciformis* (Fr.) Mudd (6241). Old apothecium with strongly developed excipulum;  $\times 185$ .
- f. *Buellia Wahlenbergii* (Ach.) Sheard (Le 1042). Part of carpogenic outgrowth with numerous ascogonia;  $\times 370$ .
- g. *Buellia Wahlenbergii* (Ach.) Sheard (Le 1042). Generative tissue forming an outgrowth of the thallus;  $\times 370$ .
- h. *Buellia punctata* (Hoffm.) Mass. (6243). Very old apothecium with darkened and degenerating subhymenial layer containing unejaculated spores;  $\times 170$ .
- i. *Buellia Wahlenbergii* (Ach.) Sheard (Le 1042). Carpogenic outgrowth arising between two thallus-lobes;  $\times 210$ .

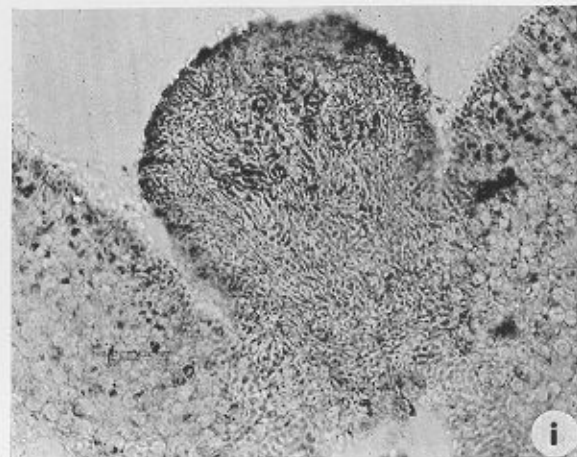
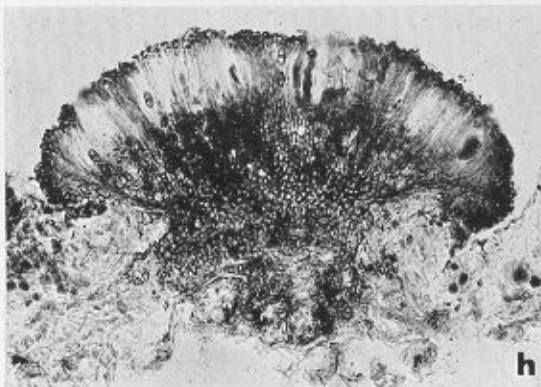
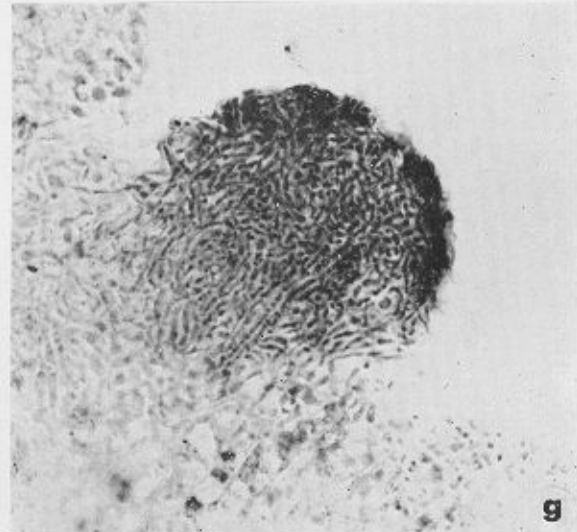
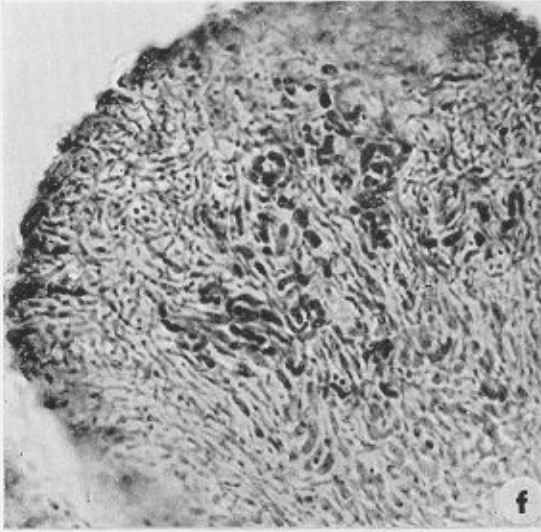
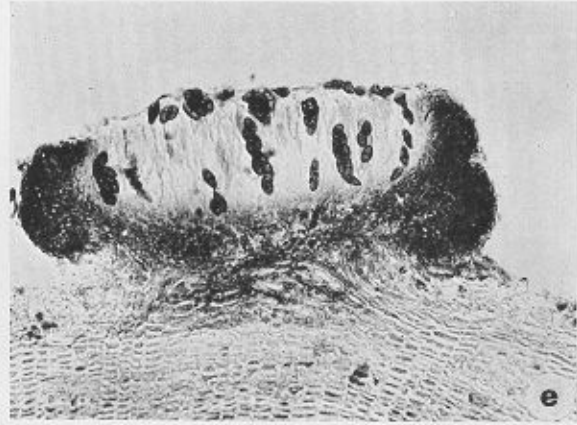
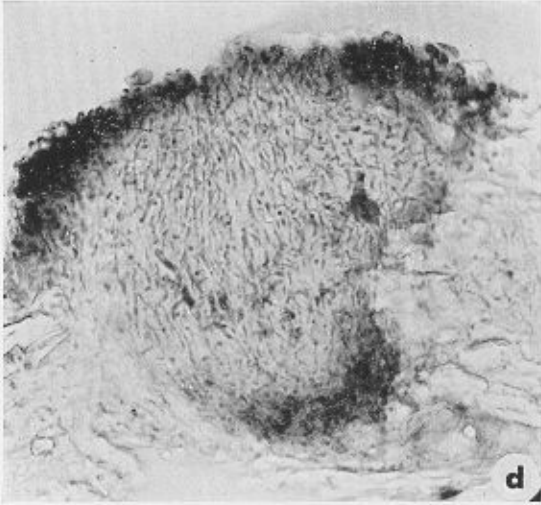
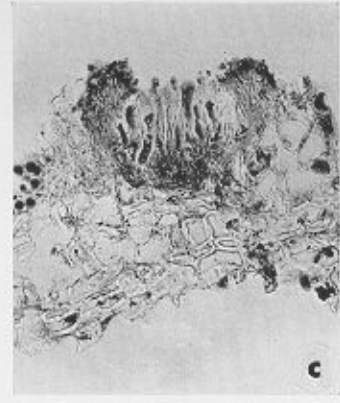
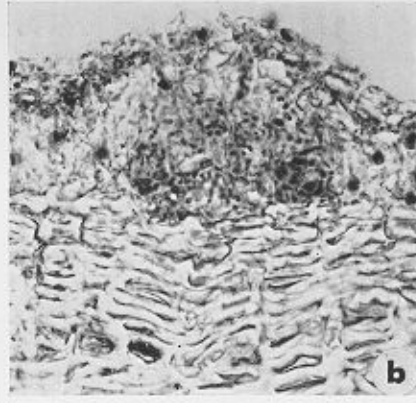
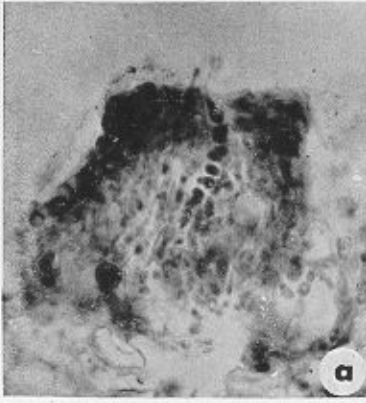


PLATE III

Sections to show ontogenetic development.

- a. *Buellia canescens* (Dicks.) De Not. (Lenormand, 1840). Ascogonia produced between thallus hyphae and symbiotic algal cells;  $\times 370$ .
- b. *Buellia anisomera* Vain. (FIDS A1827). Ascogonia developed above the algal layer;  $\times 185$ .
- c. *Buellia canescens* (Dicks.) De Not. (Lenormand, 1840). Apothecial primordium, consisting of generative tissue later produced by thallus hyphae and including swollen cells of ascogenous hyphae; thalline veil beginning to rupture;  $\times 185$ .
- d. *Buellia canescens* (Dicks.) De Not. (Lenormand, 1840). Generative tissue produced from vegetative hyphae and containing ascogenous hyphae, covered by thalline veil which is beginning to rupture;  $\times 370$ .
- e. *Buellia canescens* (Dicks.) De Not. (Lenormand, 1840). Young apothecium, partly covered by the thalline veil, showing development of paraphyses and beginnings of lateral excipulum;  $\times 185$ .
- f. *Buellia canescens* (Dicks.) De Not. (V. D. Bosch, 63.1). Old apothecium with pigmented subhymenial layer and strongly developed excipulum. Remains of veil still visible at base of excipulum;  $\times 185$ .
- g. *Buellia isabellina* (Hue) Darb. (FIDS A1148). Ascogonia developed in a rudimentary generative tissue;  $\times 250$ .
- h. *Buellia anisomera* Vain. (FIDS A1827). Ascogonia with protruding trichogynes developed in generative tissue;  $\times 370$ .
- i. *Buellia Wahlenbergii* (Ach.) Sheard (Le 1042). Old apothecium with strongly pigmented subhymenial layer;  $\times 90$ .
- j. *Buellia Wahlenbergii* (Ach.) Sheard (Le 1042). Part of foregoing section more highly magnified, showing spores enclosed in the subhymenial layer;  $\times 185$ .



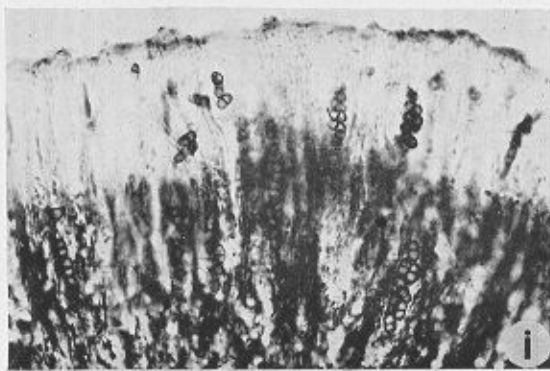
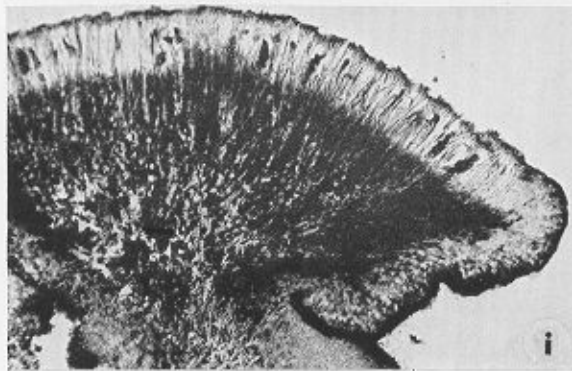
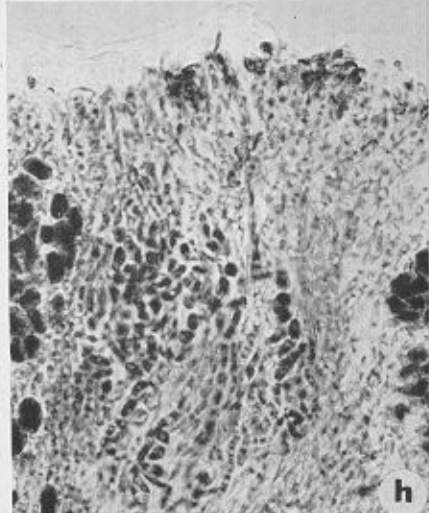
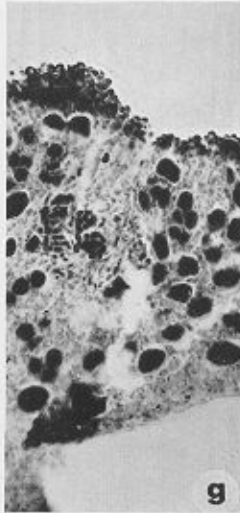
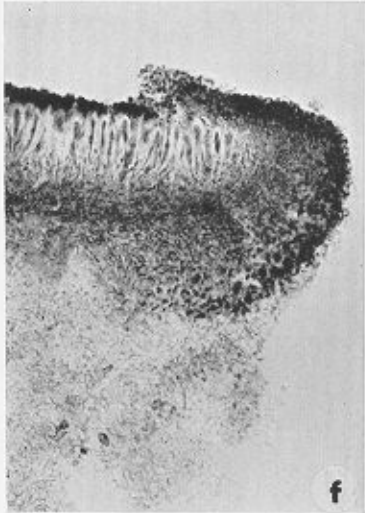
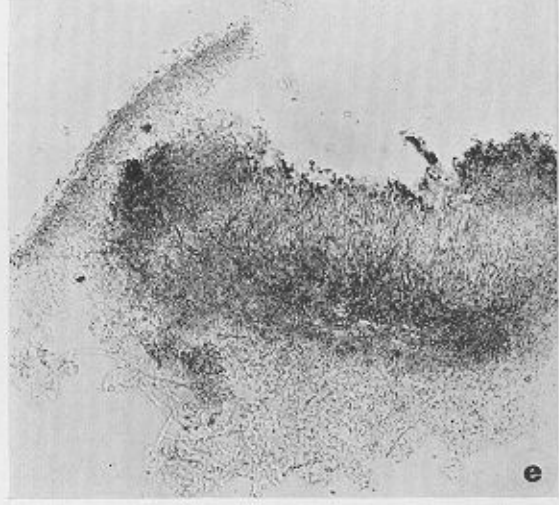
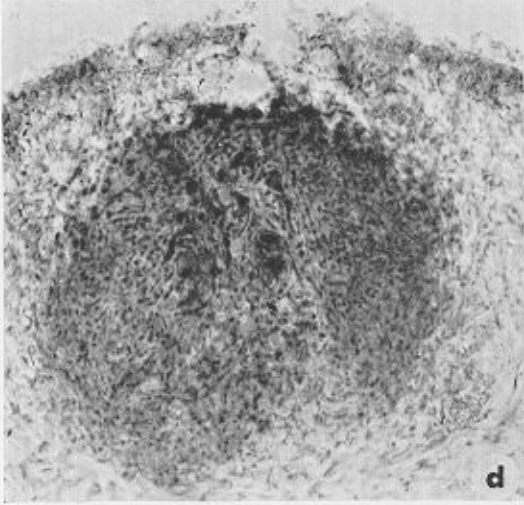
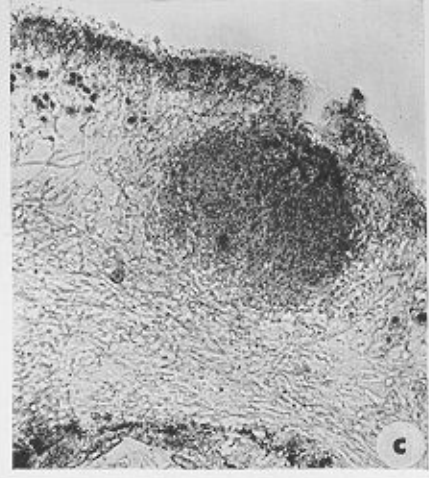
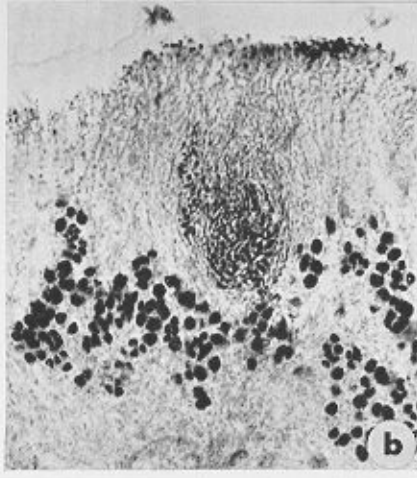
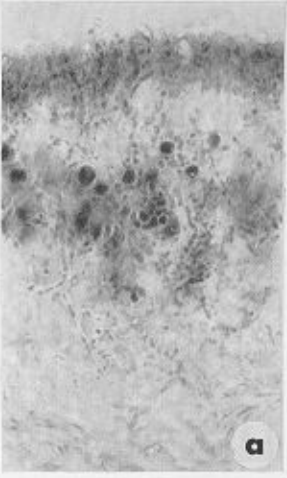


PLATE IV

Sections to show ontogenetic development.

- a. *Buellia anisomera* Vain. (FIDS A1827). Generative tissue with ascogonia; the external cells thickened and pigmented;  $\times 410$ .
- b. *Buellia russa* (Hue) Darb. (FIDS A1810). Ascogonia in a well developed carpogenic weft;  $\times 215$ .
- c. *Melanaspicilia tschuetschorum* Vain. (holotype). Marginal part of apothecium;  $\times 560$ .
- d. *Buellia russa* (Hue) Darb. (FIDS A1810). Old apothecium with dark pigmented subhymenial layer and generative tissue;  $\times 90$ .
- e. *Buellia anisomera* Vain. (FIDS A1208a). Old apothecium with dark subhymenial layer enclosing degenerated spores;  $\times 110$ .
- f. *Melanaspicilia crystallifera* Vain. (holotype). Marginal part of apothecium;  $\times 370$ .
- g. *Buellia russa* (Hue) Darb. (FIDS A2241). Very young apothecium. Ascogenous hyphae not present in marginal part of carpogenic weft;  $\times 185$ .
- h. *Buellia russa* (Hue) Darb. (FIDS C20-1007h). Young apothecium with darkening subhymenial layer;  $\times 185$ .
- i. *Buellia anisomera* Vain. (FIDS A1208a). Part of an old apothecium. Arrow marks an enclosed spore;  $\times 185$ .

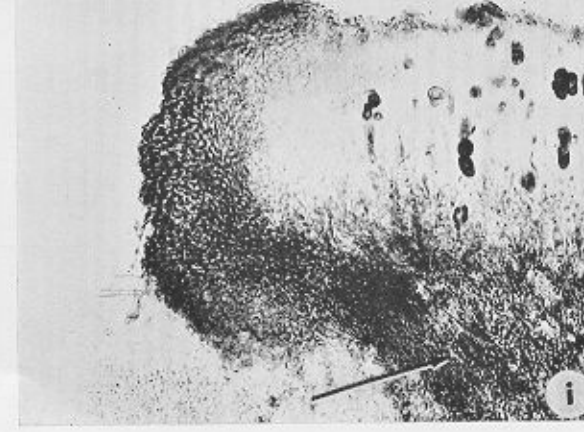
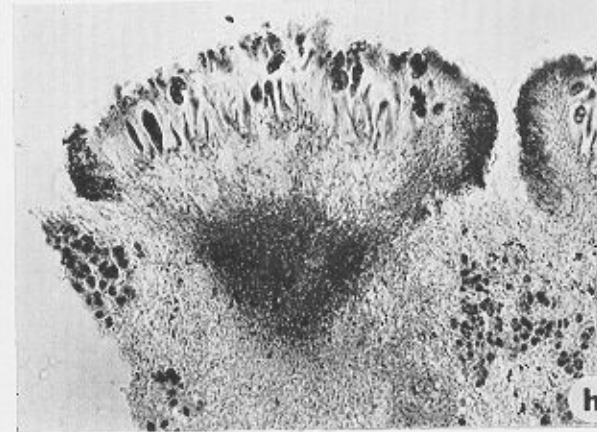
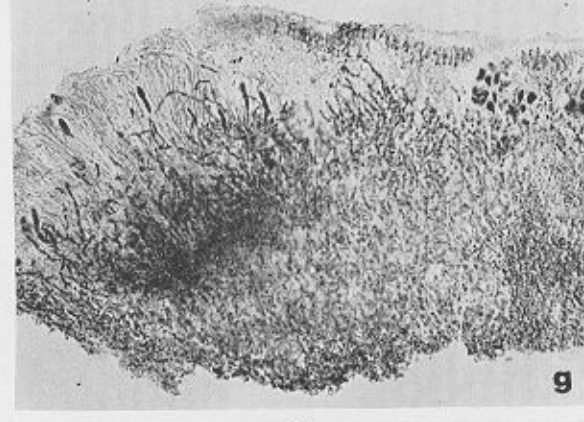
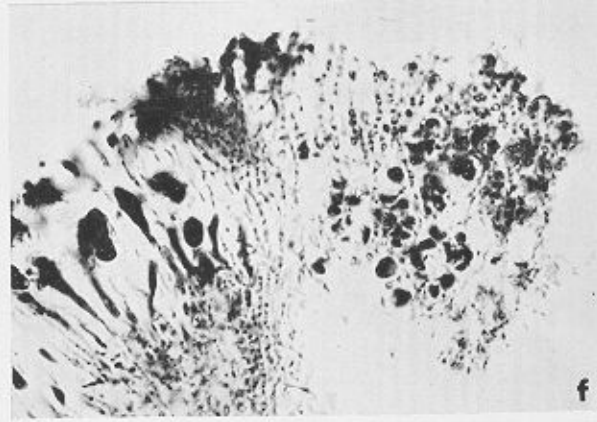
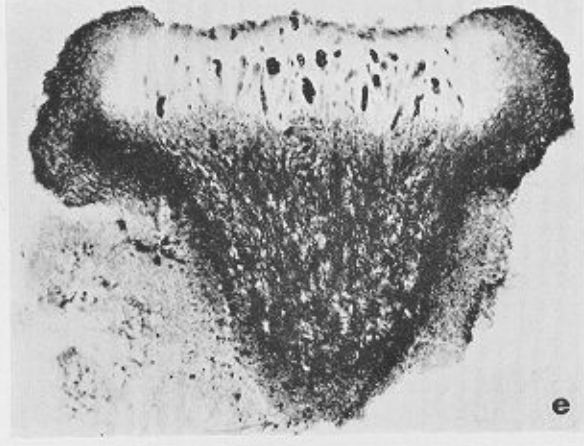
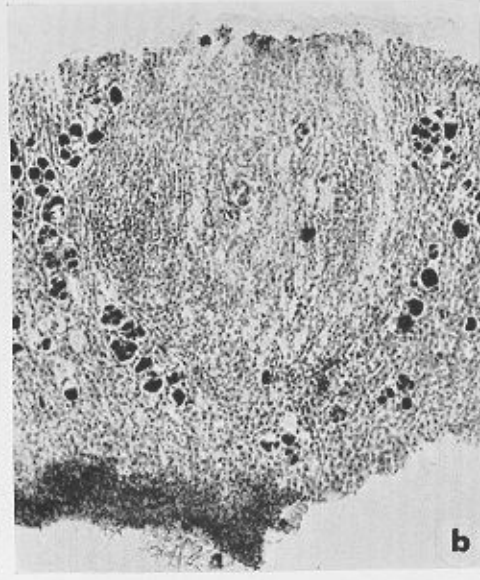
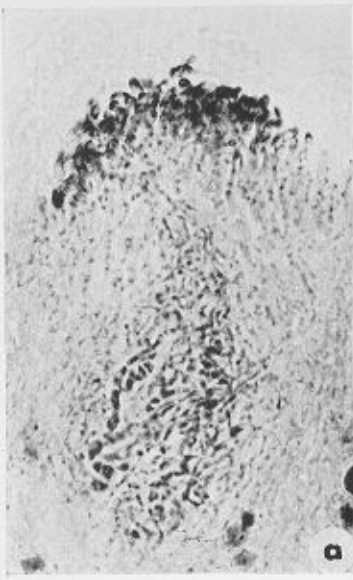


PLATE V

Sections to show ontogenetic development, pycnidia and spores.

- a. *Buellia anisomera* Vain. (FIDS A1827). Young immersed pycnidium;  $\times 185$ .
- b. *Buellia punctata* (Hoffm.) Mass. (6244). Pycnidium, Margin partly dark pigmented and protruding above the thallus surface;  $\times 810$ .
- c. *Buellia Wahlenbergii* (Ach.) Sheard (Le 1040). Chambered pycnidium formed in an outgrowth of the thallus;  $\times 185$ .
- d. *Buellia anisomera* Vain. (FIDS A1827). Old immersed pycnidium, divided into chambers;  $\times 370$ .
- e. *Buellia russa* (Hue) Darb. (FIDS A2241). Old apothecium; marginal part of the excipulum strongly pigmented;  $\times 175$ .
- f. *Buellia russa* (Hue) Darb. (FIDS C20-1007h). Old apothecium with thin excipulum;  $\times 185$ .
- g. *Buellia isabellina* (Hue) Darb. (FIDS A1145). Part of apothecium with excipulum strongly pigmented on the outer side;  $\times 185$ .
- h. *Buellia coniops* (Wnbg.) Th. Fr., f. *verrucosa* M. Lamb (BSWA 7945j). Heterosporous ascus;  $\times 560$ .

PLATE V

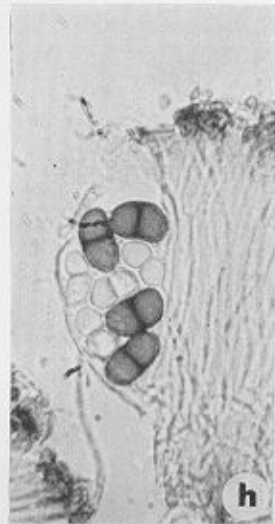
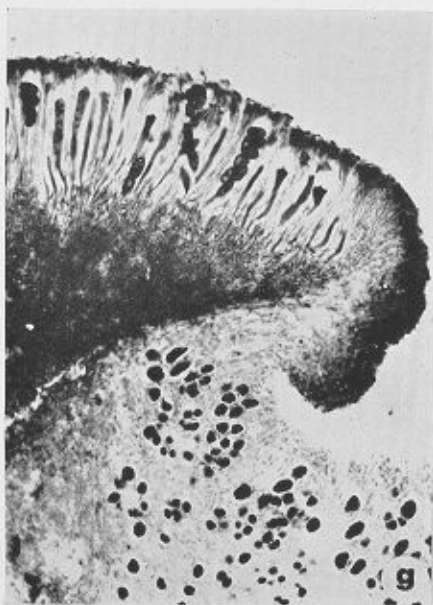
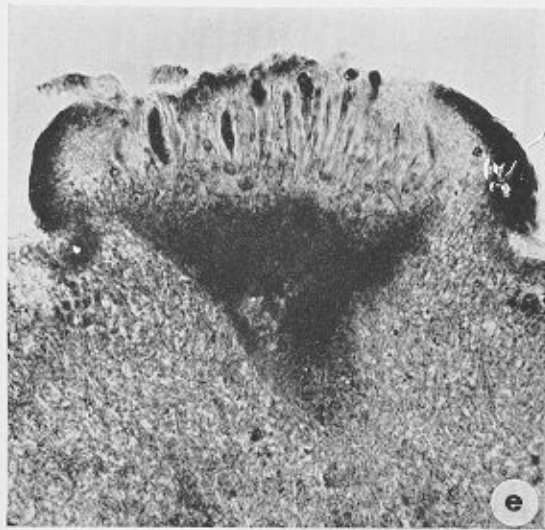
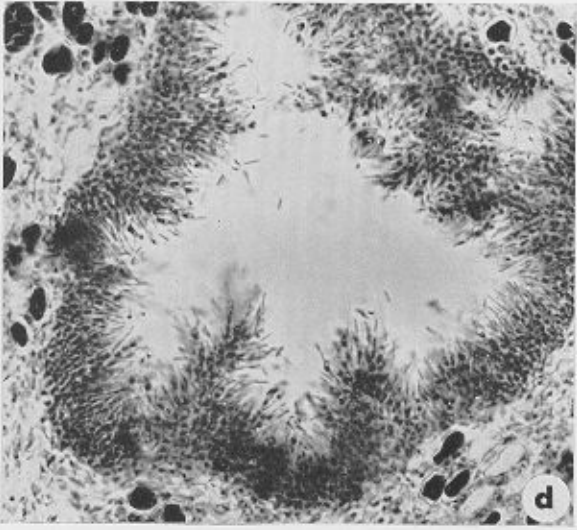
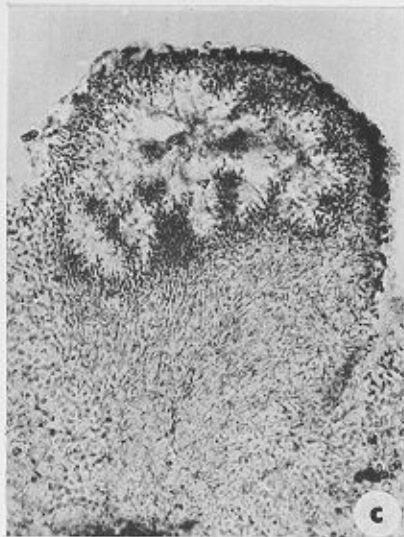
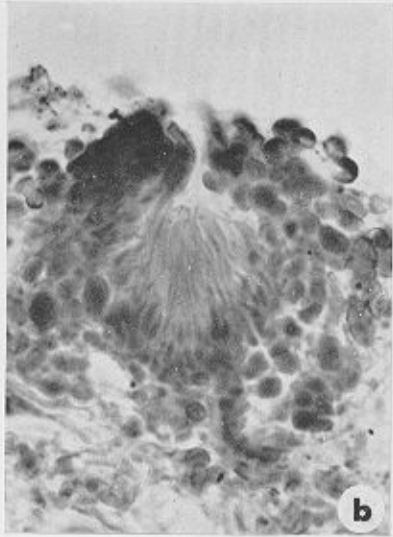


PLATE VI

Habitus-photographs of *Buellia*-species.

- a. *Melanaspicilia crystallifera* Vain. Part of the holotype specimen from Pittekai, Siberia (No. 9117 in herb. Vainio, TUR);  $\times 5$ .
- b. *Buellia anisomera* Vain. (FIDS D2492a). Young growth-phase epiphytic on *Buellia russa*;  $\times 4$ .
- c. *Buellia anisomera* Vain. (BSWA 7890a). Thallus with apothecia and pycnidia, epiphytic on *Buellia russa*;  $\times 4$ .
- d. *Buellia anisomera* Vain. (FIDS D2488). Older thallus, growing directly on rock;  $\times 4$ .

PLATE VI

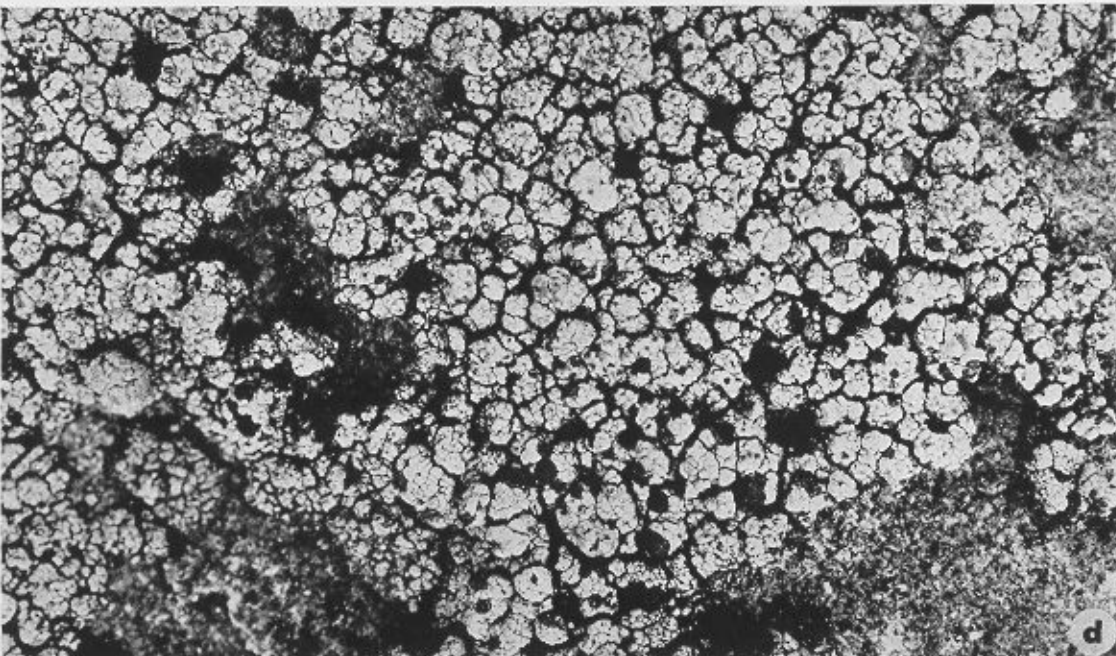
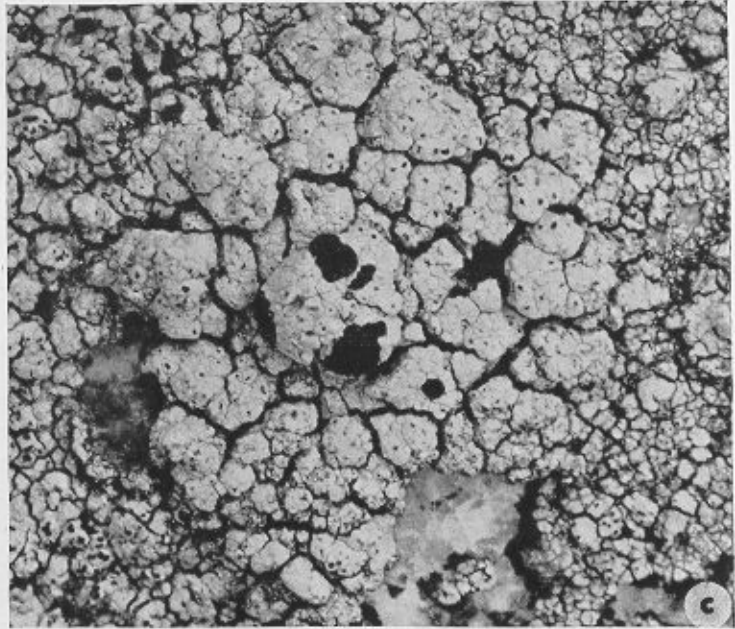
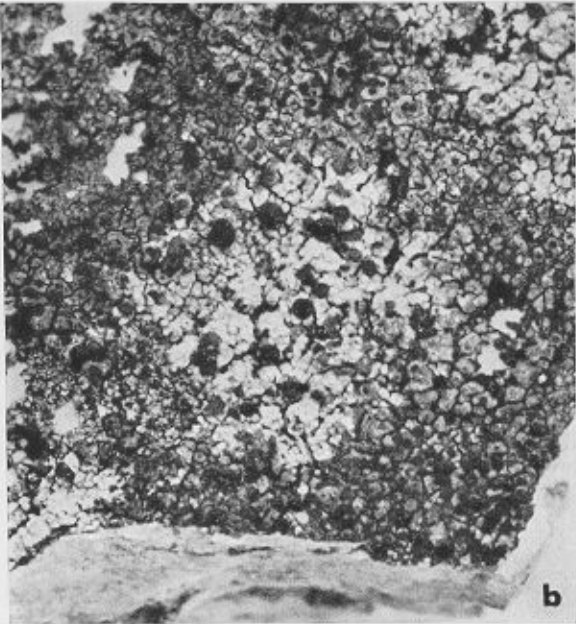
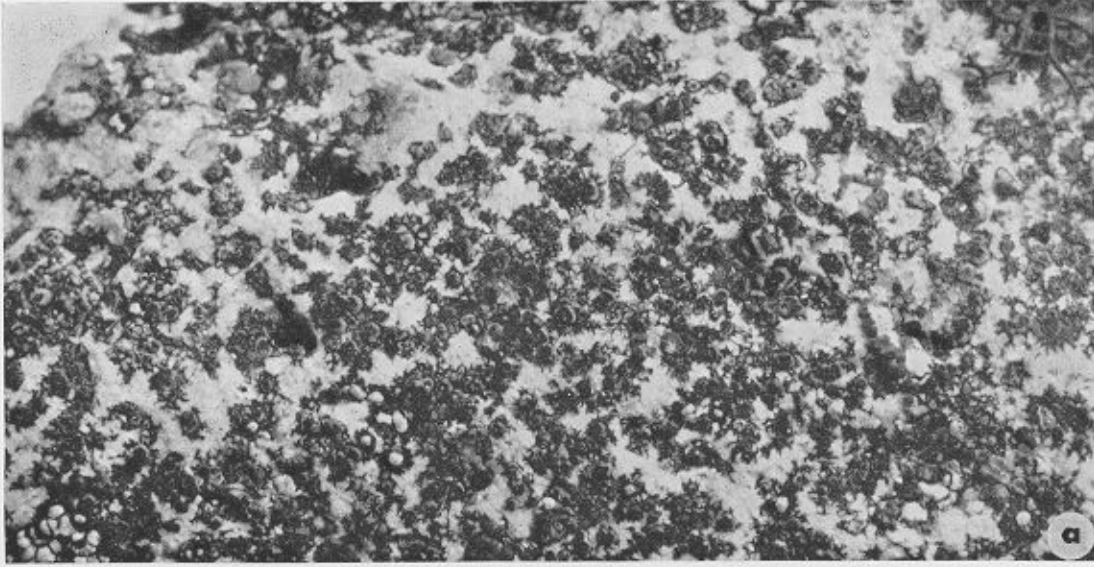


PLATE VII

Habitus-photographs of *Buellia*-species.

- a. *Buellia anisomera* Vain. (FIDS A1832). Thallus growing directly on rock and abraded by environmental agencies;  $\times 4$ .
- b. *Buellia Nelsonii* Darb. The holotype specimen in S, consisting of two small thalli with fringing black protothallus;  $\times 4$ .
- c. *Buellia granulosa* (Darb.) Dodge. The lectotype specimen of *Lecidea cremea* Hue in PC;  $\times 4$ .
- d. *Buellia granulosa* (Darb.) Dodge. The holotype specimen of *Lecidea cremea* f. *incrassata* Hue in PC;  $\times 4$ .
- e. *Buellia subpedicellata* (Hue) Darb. Portion of syntype specimen (304 *pr. p.*) in PC;  $\times 4$ .
- f. *Buellia subpedicellata* (Hue) Darb. (BGLE 1253-10) with fringing brown funoid protothallus;  $\times 4$ .
- g. *Buellia subpedicellata* (Hue) Darb. (FIDS A1169). Portion of well fertile specimen;  $\times 4$ .
- h. *Buellia Darbishirei* M. Lamb. Portion of the holotype specimen (*Rinodina crassa* Darb.) in S;  $\times 4$ .



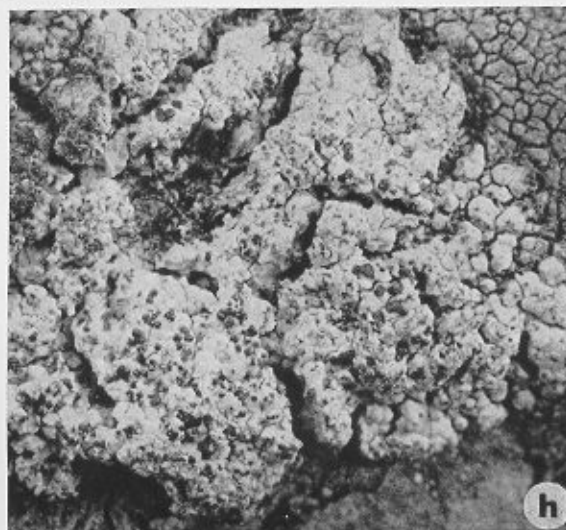
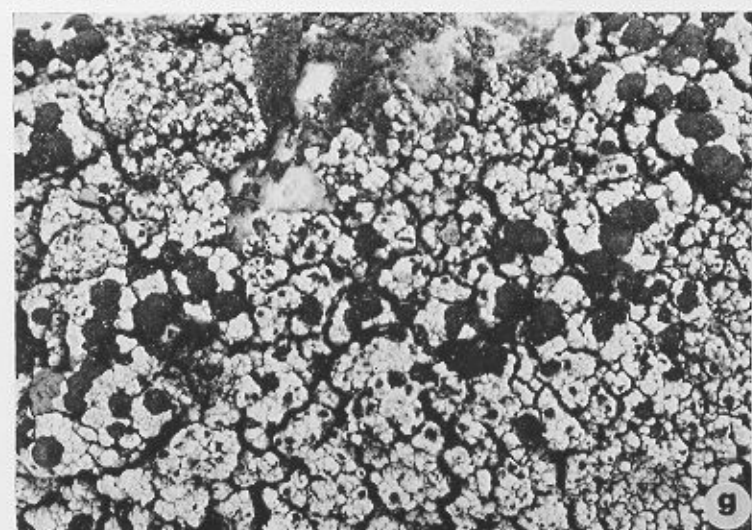
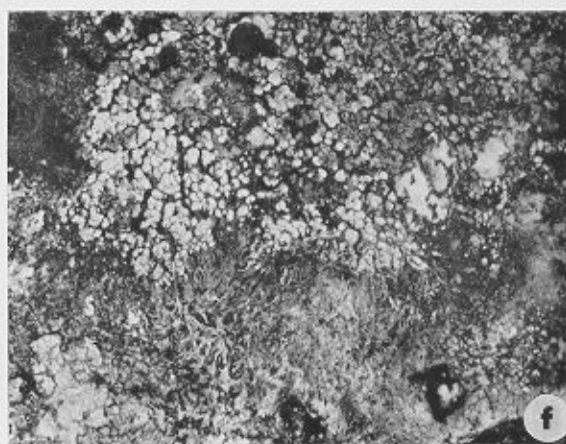
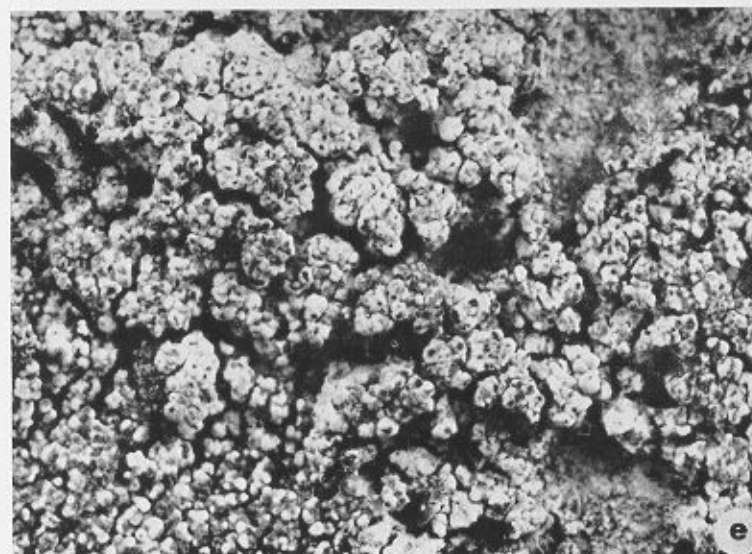
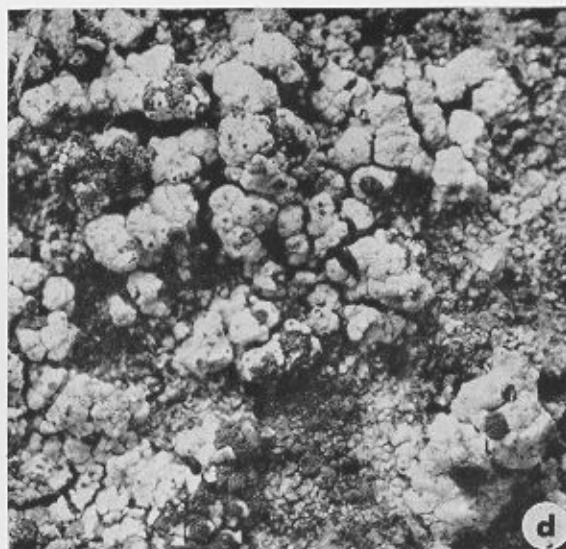
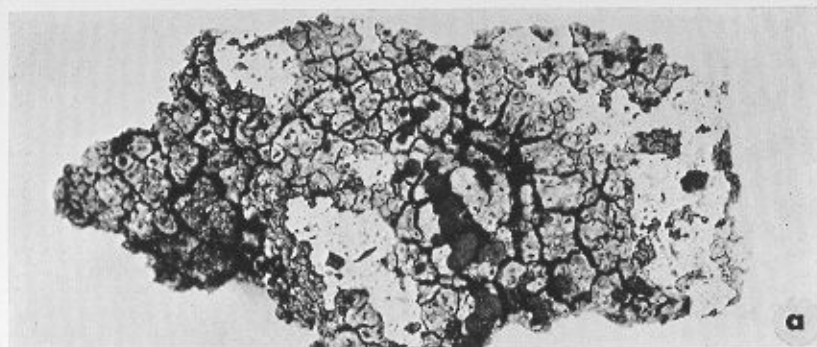


PLATE VIII

Habitus-photographs of *Buellia*-species.

- a. *Buellia cladocarpiza* M. Lamb. Portions of the holotype specimen in BM;  $\times 4$ .
- b. *Buellia pycnogonoides* Darb. Specimen from east Graham Land (FIDS D2555), showing extensive development of dendritic protothallus;  $\times 4$ .
- c. *Buellia russa* (Hue) Darb. Portion of the lectotype specimen in PC;  $\times 4$ .
- d. *Buellia russa* (Hue) Darb. (BGLE 1479-1a). Thallus showing effect of damage by mites (erosion of pycnidial cavities and gall-like hypertrophy of thallus-areolae);  $\times 4$ .
- e. *Buellia russa* (Hue) Darb. Portion of the lectotype specimen of *Lecidea polychora* Hue, around bases of *Usnea* (*Neuropogon*), in PC;  $\times 4$ .
- f. *Buellia russa* (Hue) Darb. A well-developed and typical specimen from Goudier Island, west Graham Land (FIDS A1138 *pr. p.*), with abundant apothecia and pycnidia;  $\times 4$ .
- g. *Buellia russa* (Hue) Darb. The holotype specimen of *Lecidea caesiocinerescens* Hue in PC;  $\times 4$ . (At top and on left, thalli of *Lecidea placodiiformis* Hue.)
- h. *Buellia russa* (Hue) Darb. Portion of the lectotype specimen of *Aspicilia erythroda* Hue in PC;  $\times 2$ .

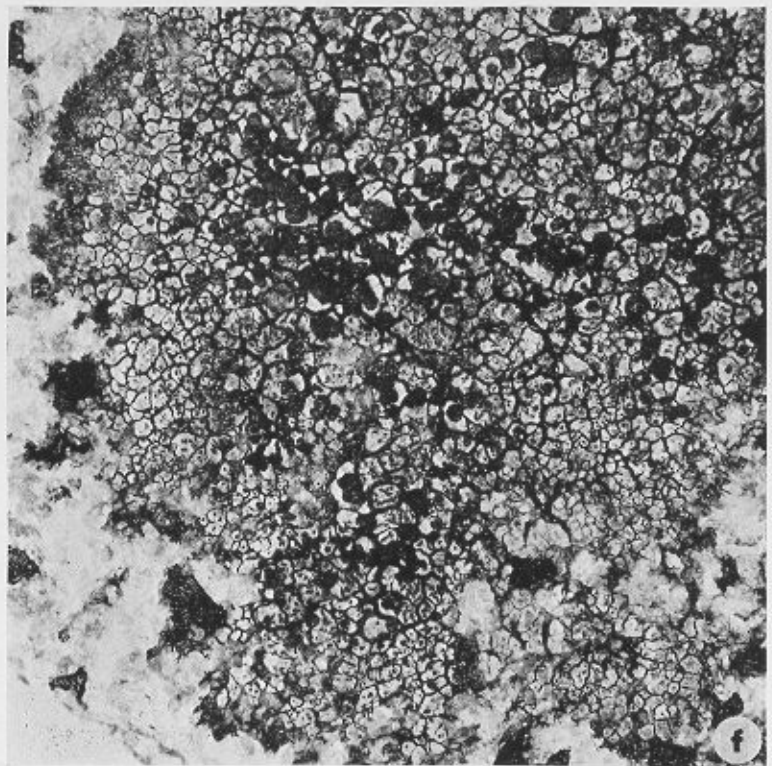
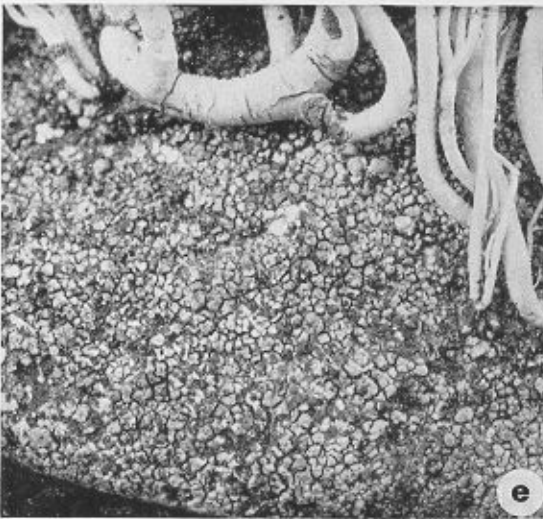
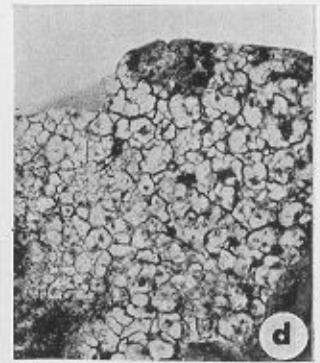
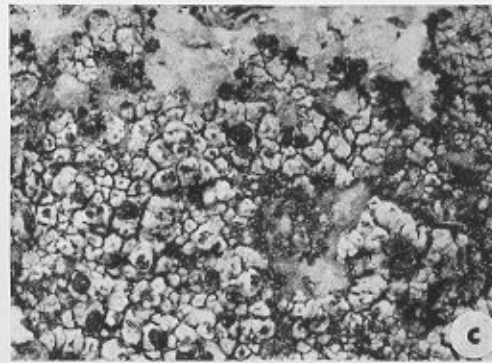
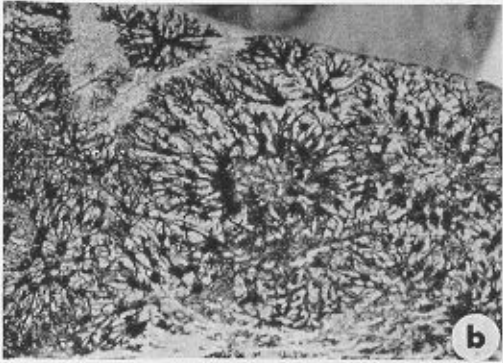
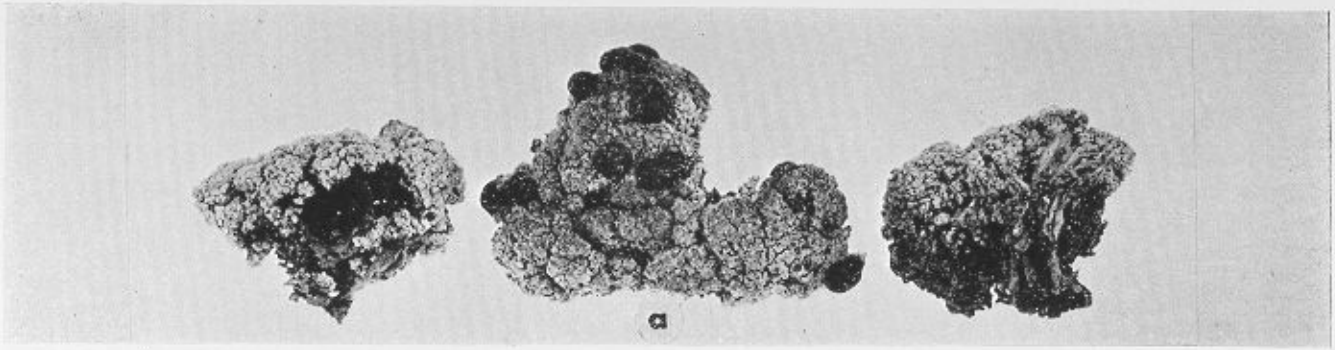


PLATE IX

Habitus-photographs of *Buellia*-species.

- a. *Buellia russa* (Hue) Darb., var. *Liouvillei* (Hue) M. Lamb. Portion of the holotype specimen of *Lecidea Liouvillei* Hue in PC;  $\times 4$ .
- b. *Buellia russa* (Hue) Darb. (BGLE 1487-5). Reduced state due to severe environmental conditions, with metathallus reduced to small, scattered, verrucose areolae, and dendritic protothallus predominating;  $\times 4$ .
- c. *Buellia russa* (Hue) Darb., var. *cycloplaca* M. Lamb. Portion of the isotype specimen in FH;  $\times 5$ .
- d. *Buellia melanostola* (Hue) Darb. The holotype specimen of *Lecidea endomelaena* Hue in PC;  $\times 4$ .
- e. *Buellia russa* (Hue) Darb., var. *cycloplaca* M. Lamb. Specimen from Anvers Island, west Graham Land (BSWA 8021a);  $\times 4$ .
- f, g. *Buellia illaetabilis* M. Lamb. Portions of the holotype specimen in BM;  $\times 4$ .

PLATE IX

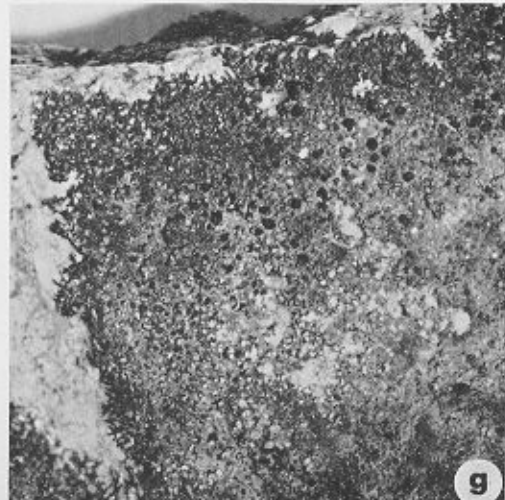
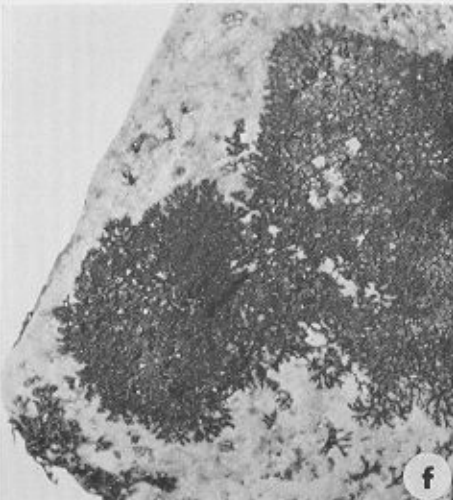
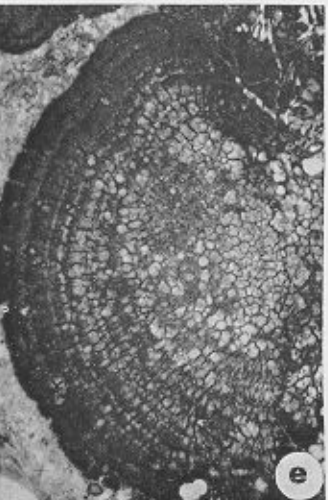
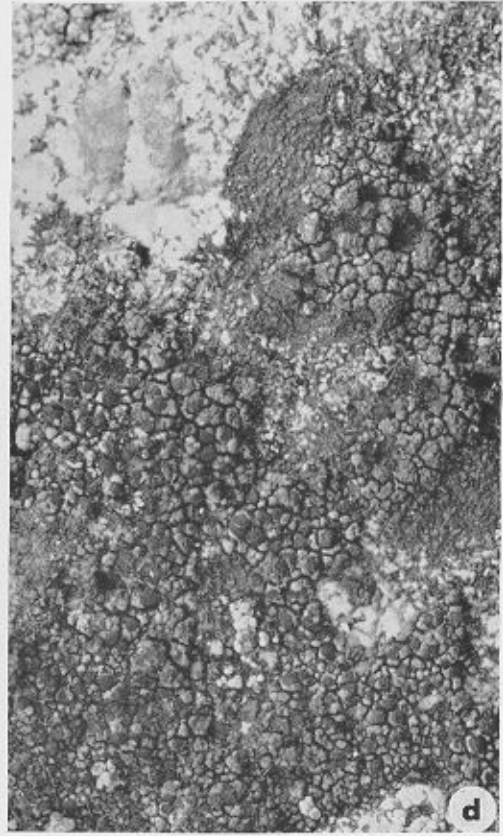
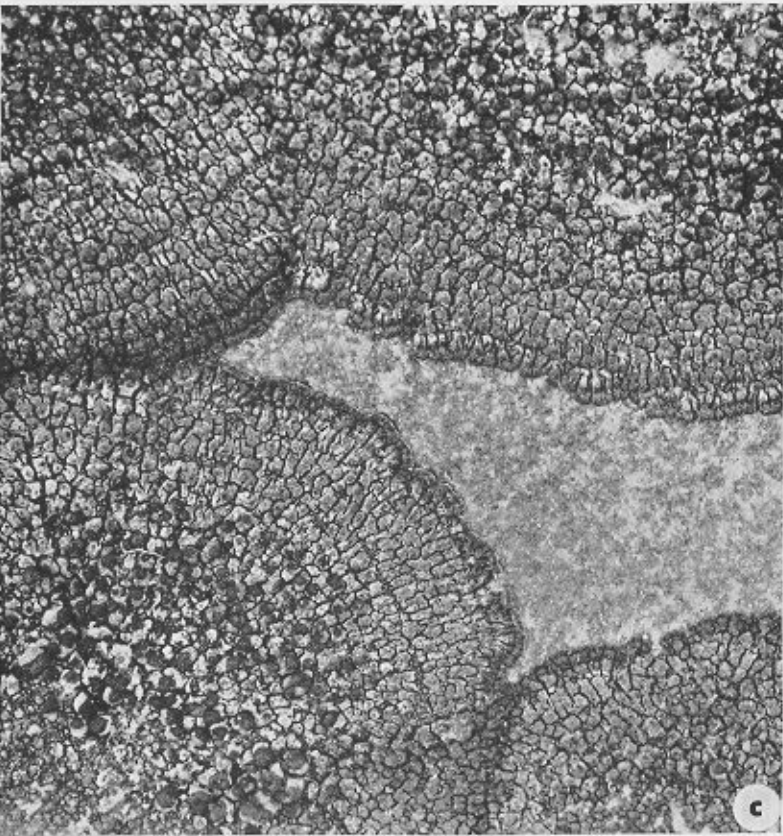
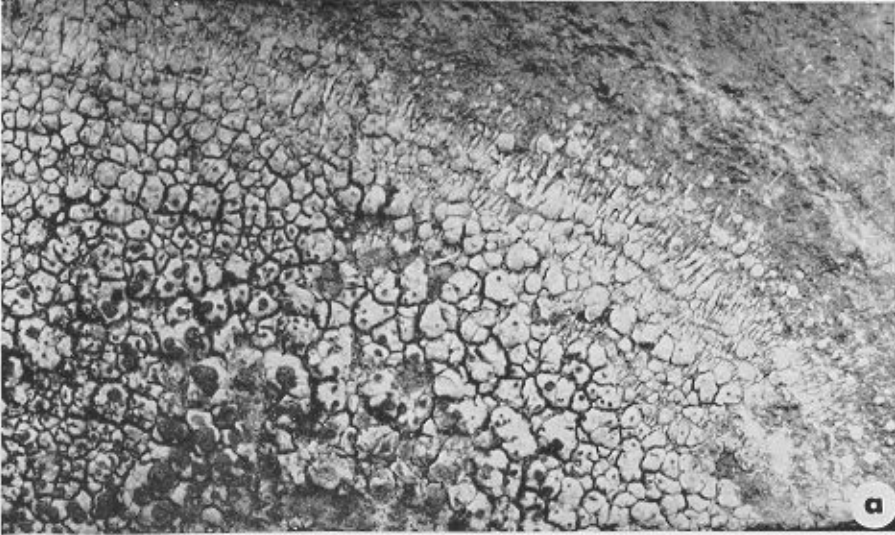


PLATE X

Habitus-photographs of *Buellia*-species.

- a. *Buellia perlata* (Hue) Darb. Portion of the holotype specimen in PC;  $\times 4$ .
- b. *Buellia perlata* (Hue) Darb. The holotype specimen of *Lecidea dimorphota* Hue in PC;  $\times 1$ .
- c. *Buellia perlata* (Hue) Darb. Portion of the foregoing holotype specimen of *Lecidea dimorphota* Hue;  $\times 4$ .
- d. *Buellia coniops* (Wnbg.) Th. Fr. Portion of the holotype specimen of f. *subsquamulosa* Vain. from Norway, Finmark, collected by Th. Fries, No. 9417 in Herb. Vainio (= f. *coniops*);  $\times 4$ .
- e. *Buellia coniops* (Wnbg.) Th. Fr., f. *areolata* Vain. The lectotype specimen from U.S.S.R., Siberia, Pitekai, No. 9418 in Herb. Vainio;  $\times 4$ .
- f. *Buellia coniops* (Wnbg.) Th. Fr., f. *cervinogranulata* M. Lamb. Portion of the isotype specimen in FH;  $\times 4$ .
- g. *Buellia coniops* (Wnbg.) Th. Fr., f. *verrucosa* M. Lamb. Portion of the isotype specimen in FH;  $\times 4$ .
- h. *Buellia coniops* (Wnbg.) Th. Fr., f. *incrassata* M. Lamb. Portion of the holotype specimen in BM;  $\times 4$ .

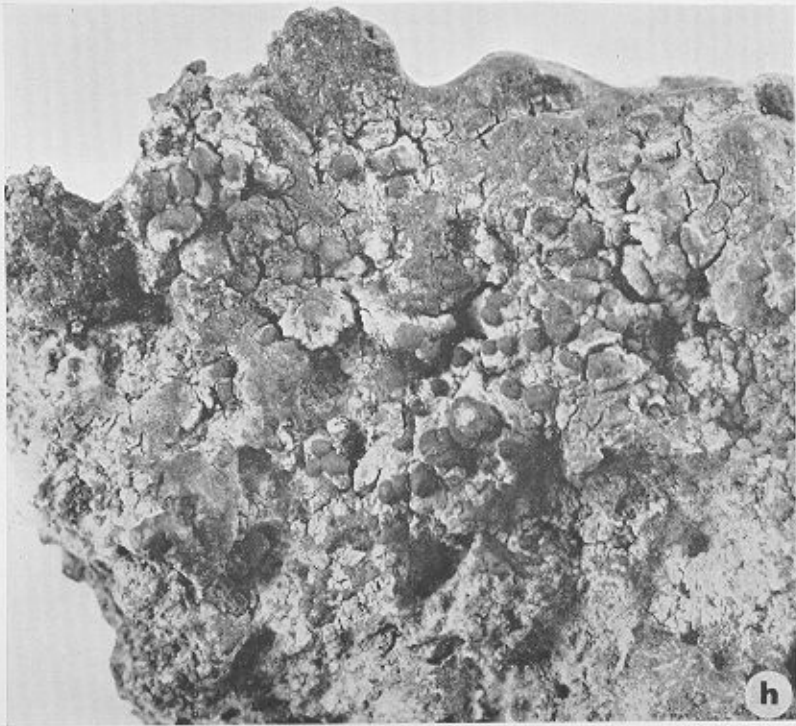
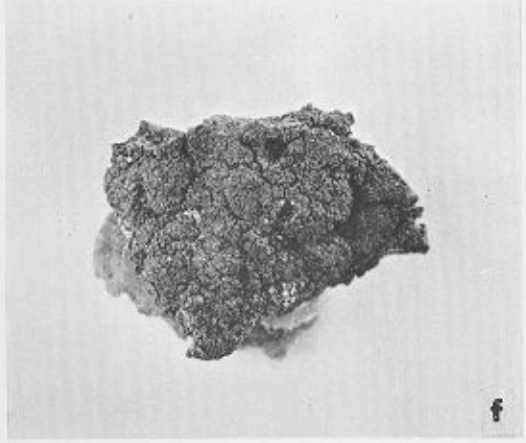
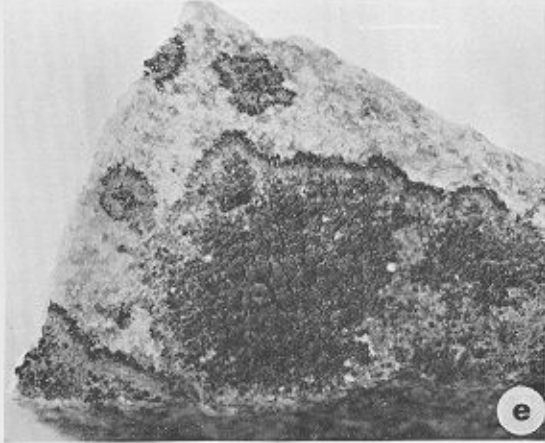
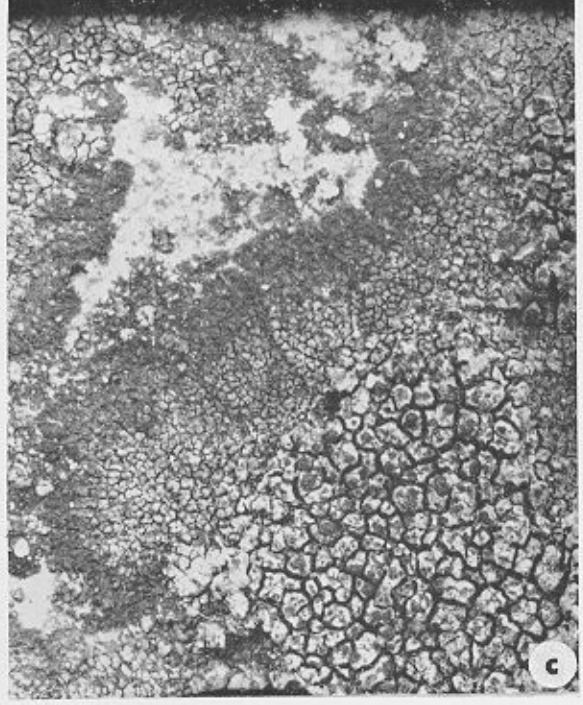
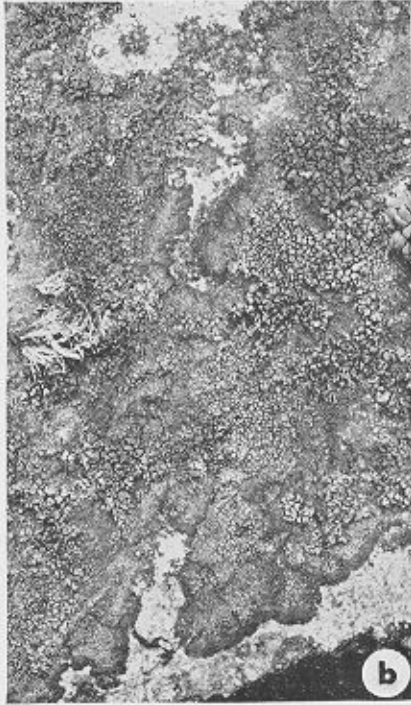
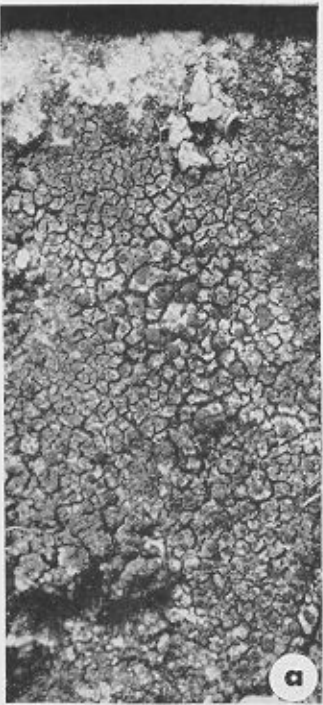


PLATE XI

Habitus-photographs of *Buellia*-species.

- a. *Buellia isabellina* (Hue) Darb. Portion of specimen from Goudier Island, west Graham Land (FIDS A2242);  $\times 4$ .
- b. *Buellia isabellina* (Hue) Darb. Portion of specimen from Melchior Islands, west Graham Land (BSWA 7902);  $\times 4$ .
- c. *Buellia fulvonitescens* M. Lamb. Portion of the isotype specimen in FH;  $\times 4$ .
- d. *Buellia augusta* Vain. Portion of specimen from Goudier Island, west Graham Land (FIDS A1203);  $\times 4$ .
- e. *Buellia latemarginata* Darb. Portion of the lectotype specimen (SAE 112) in S, showing white zone at periphery;  $\times 4$ .
- f. *Buellia latemarginata* Darb. Portion of the lectotype specimen of *Lecidea Gainii* Hue in PC;  $\times 4$ .
- g. *Buellia Babingtonii* (Hook. f. & Tayl.) M. Lamb. Portion of specimen from Melchior Islands, west Graham Land (BSWA 7939k);  $\times 4$ .



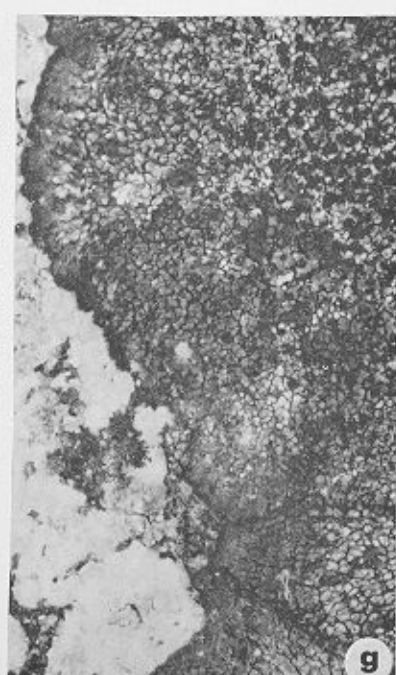
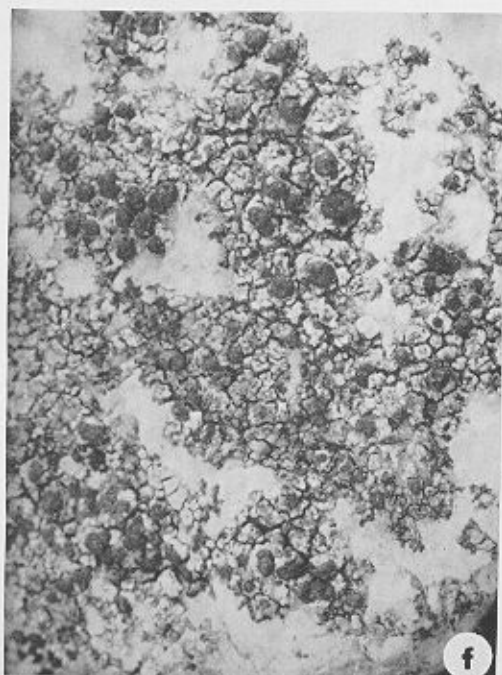
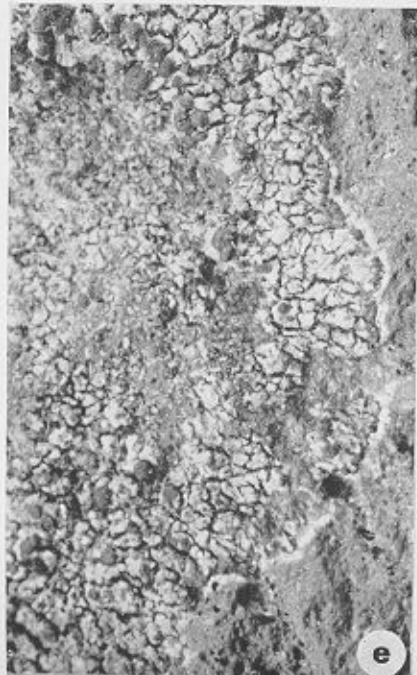
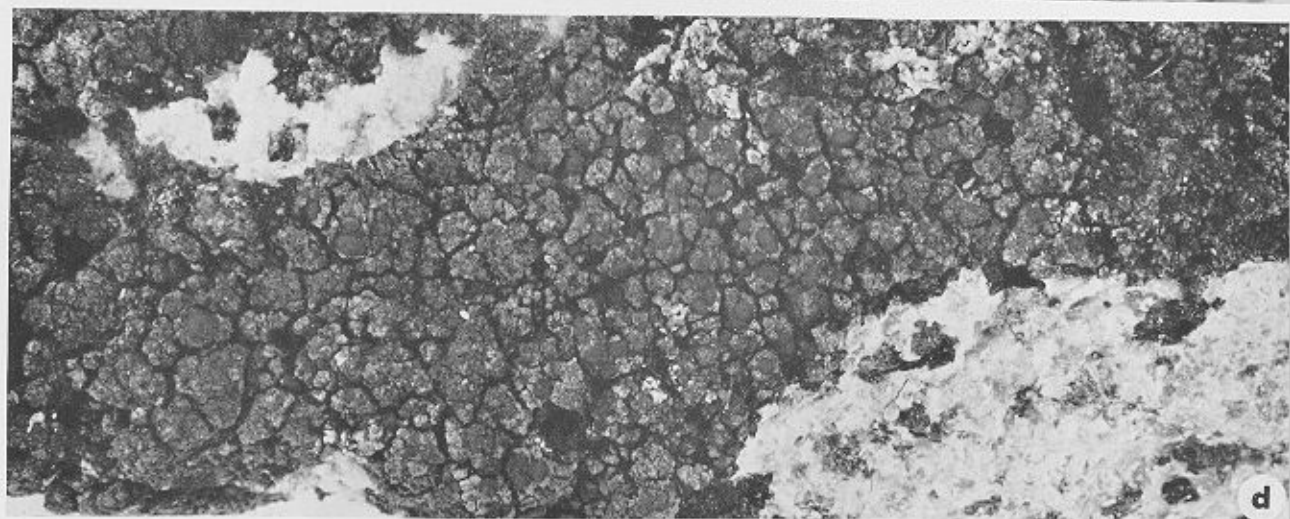
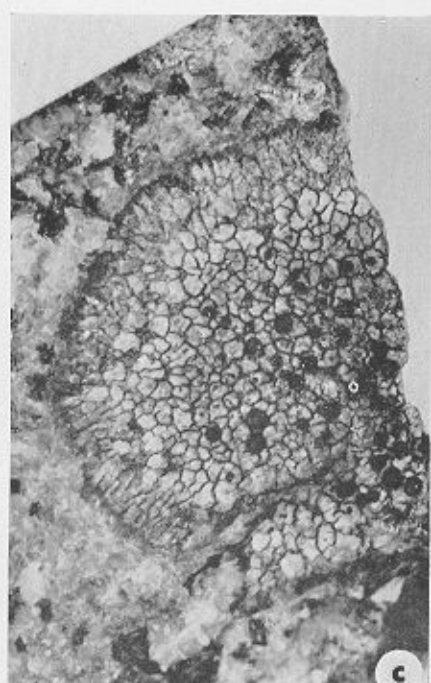
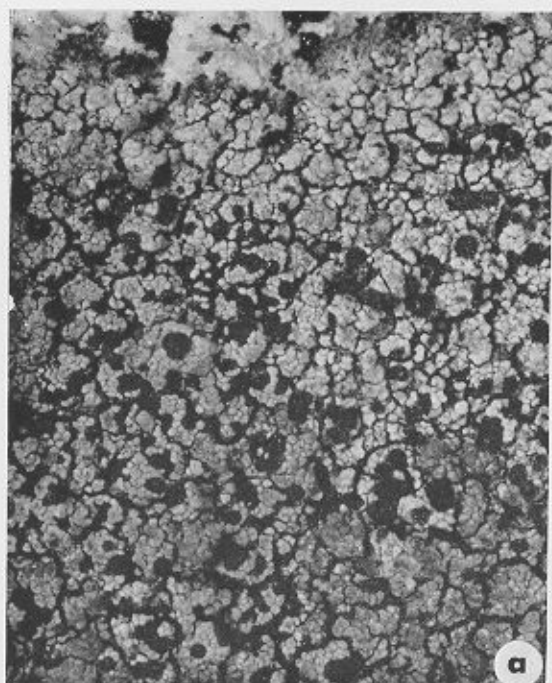


PLATE XII

Habitus-photographs of *Buellia* and *Rinodina*-species.

- a. *Rinodina Petermannii* (Hue) Darb. Portion of specimen from Melchior Islands, west Graham Land (BSWA 7982), showing periphery;  $\times 4$ .
- b. *Buellia frigida* Darb. Portion of specimen from Australian Antarctic Territory, Mawson Base, collected by Gwynn, No. AB/54/L 133, in Herb. Missouri Bot. Gard., showing periphery;  $\times 4$ .
- c, d. *Rinodina deceptionis* M. Lamb. Portions of the holotype specimen in FH;  $\times 4$ .
- e. *Rinodina turfacea* (Wnbg.) Körb. Specimen from Moss Islands, west Graham Land, collected by SAE, 1902, in S;  $\times 4$ .

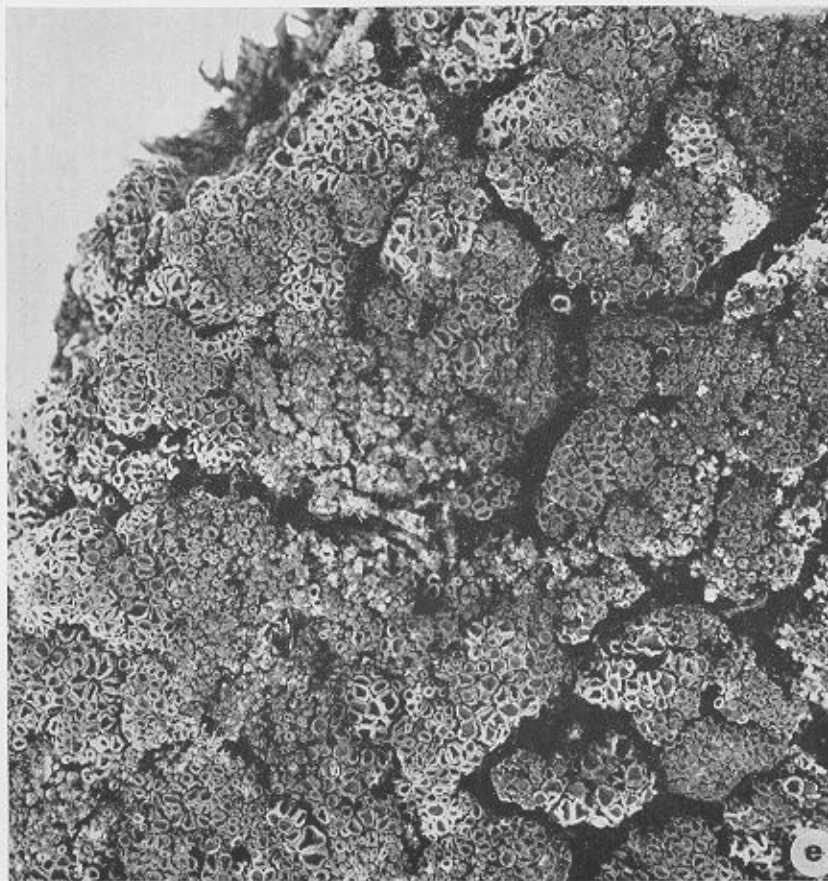
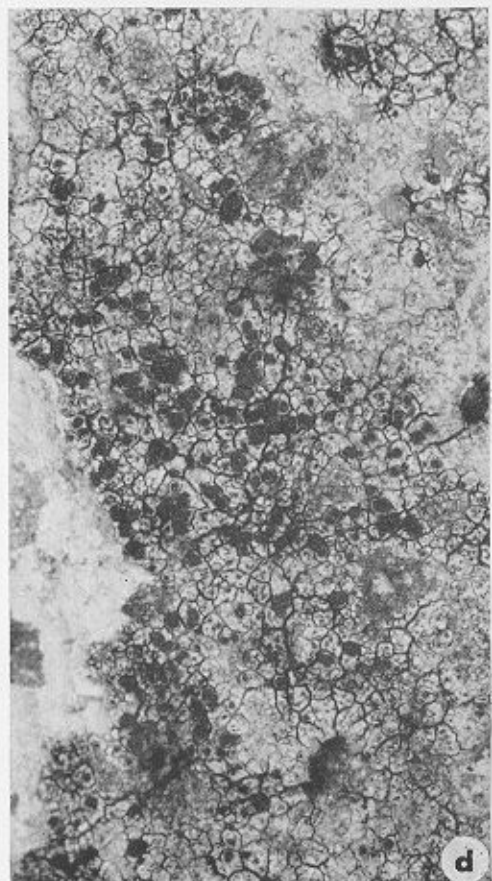
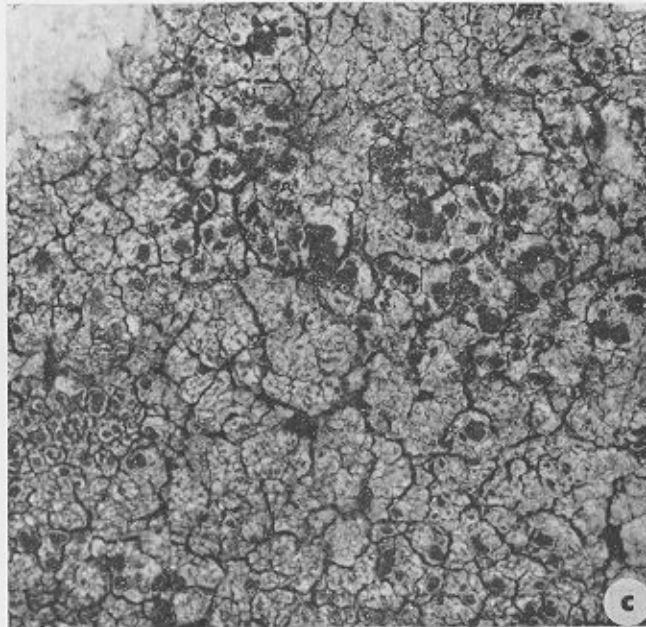
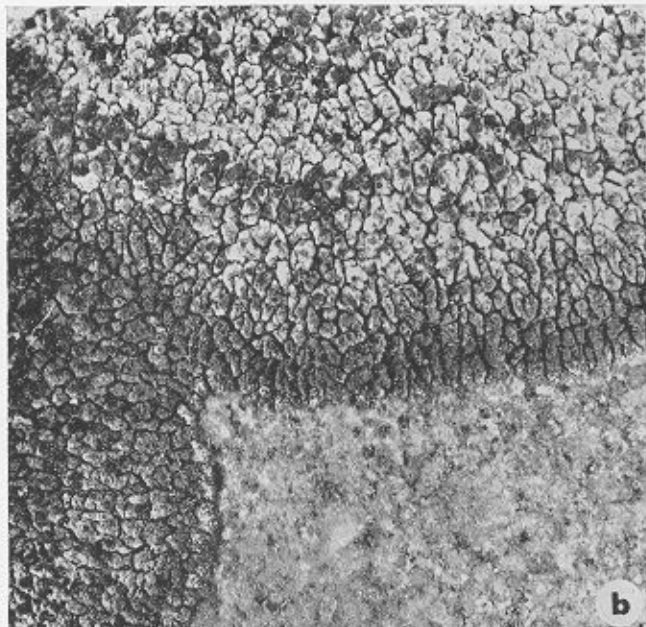
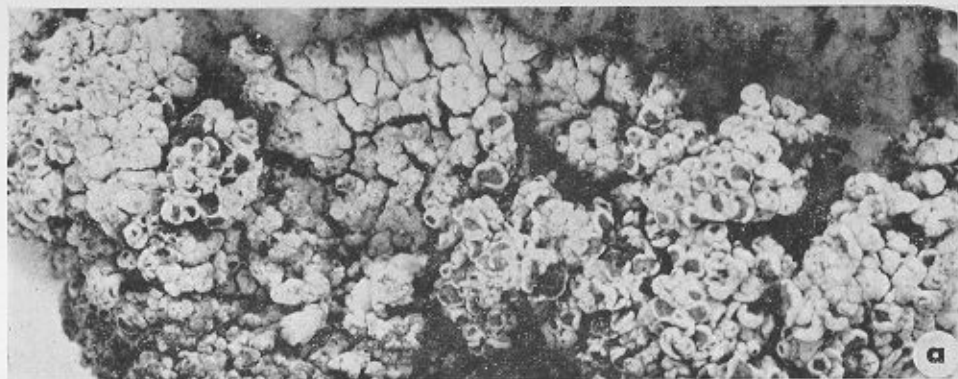


PLATE XIII

Habitus-photographs of *Rinodina*-species.

- a. *Rinodina endophragma* M. Lamb. The holotype specimen in BM;  $\times 4$ .
- b. *Rinodina nimbose* (Fr.) Th. Fr. Specimen from James Ross Island, Cape Lachman (FIDS D2676) in BM;  $\times 4$ .

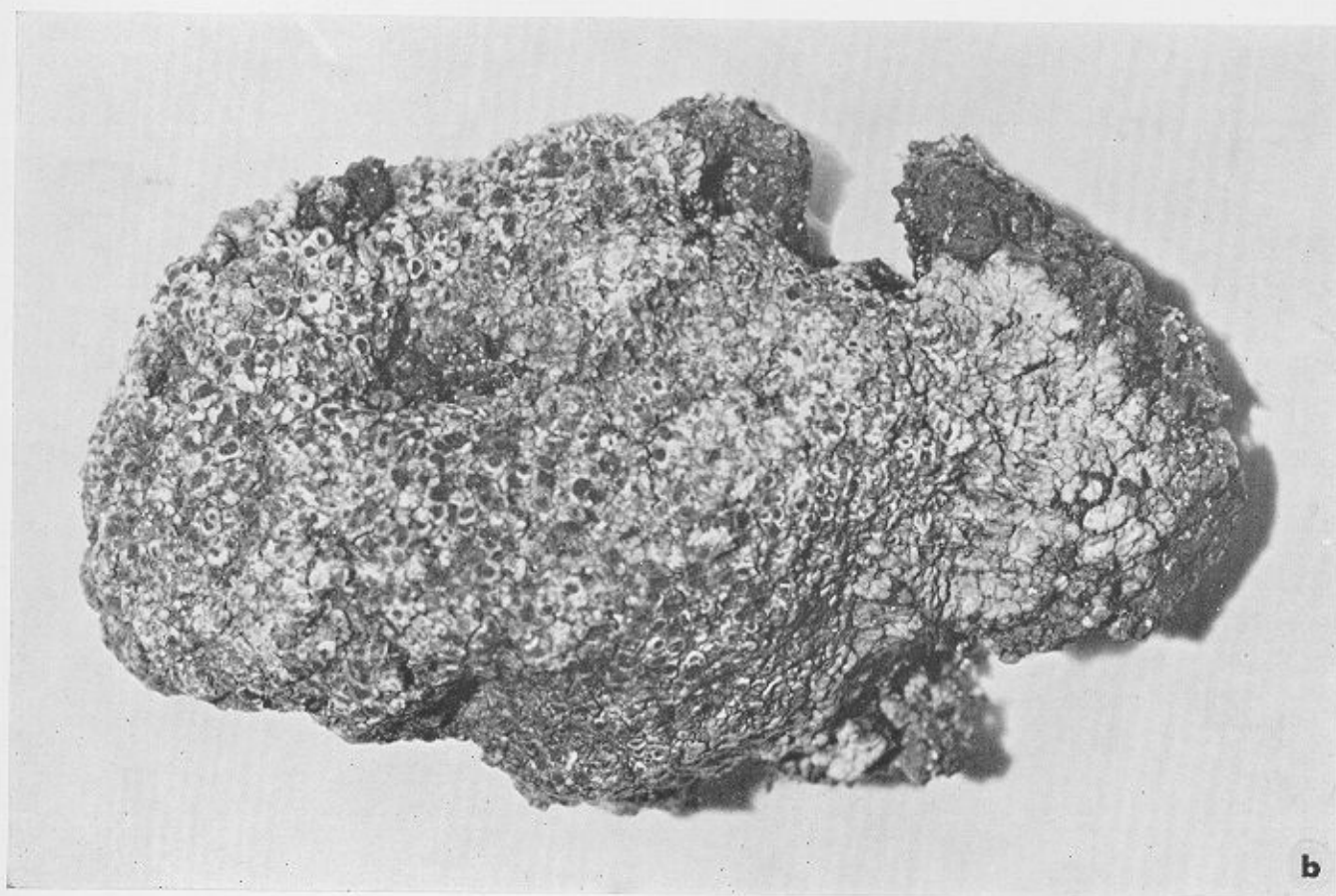


PLATE XIV

Field and habitus-photographs of *Rinodina*-species.

- a. *Rinodina Petermannii* (Hue) Darb. Extensive growth of confluent thalli on basalt dyke at summit of Goudier Island, west Graham Land. (Specimen FIDS A2256 was collected from this population.) (Photo: I. M. Lamb, January 1945.)
- b. *Rinodina Petermannii* (Hue) Darb. Specimen from Anvers Island, west Graham Land (BSWA 8096);  $\times 2$ .

PLATE XIV



PLATE XV

Field-photographs of *Buellia*-species.

- a. *Buellia russa* (Hue) Darb. Part of a large population on smooth, more or less vertical face of granodioritic rock on Goudier Island, west Graham Land. (Specimen FIDS A1807b was collected from this population.) (Photo: I. M. Lamb, November 1944.)
- b. *Buellia russa* (Hue) Darb. A closer view of the same population as above. Small epiphytic thalli of *Buellia anisomera* Vain. and *Lecanora* aff. *polyropa* (Ehrh.) Rabenh. are also present. (Photo: I. M. Lamb, January 1945.)



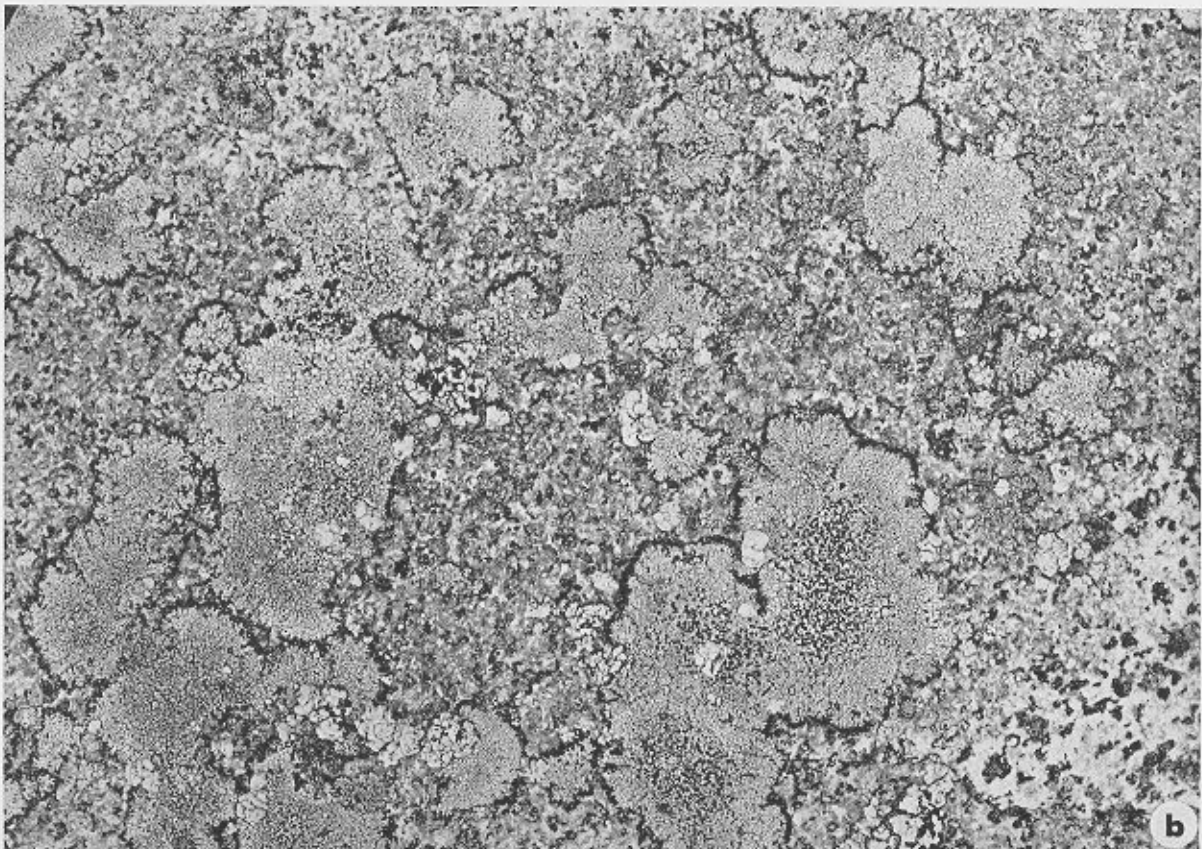
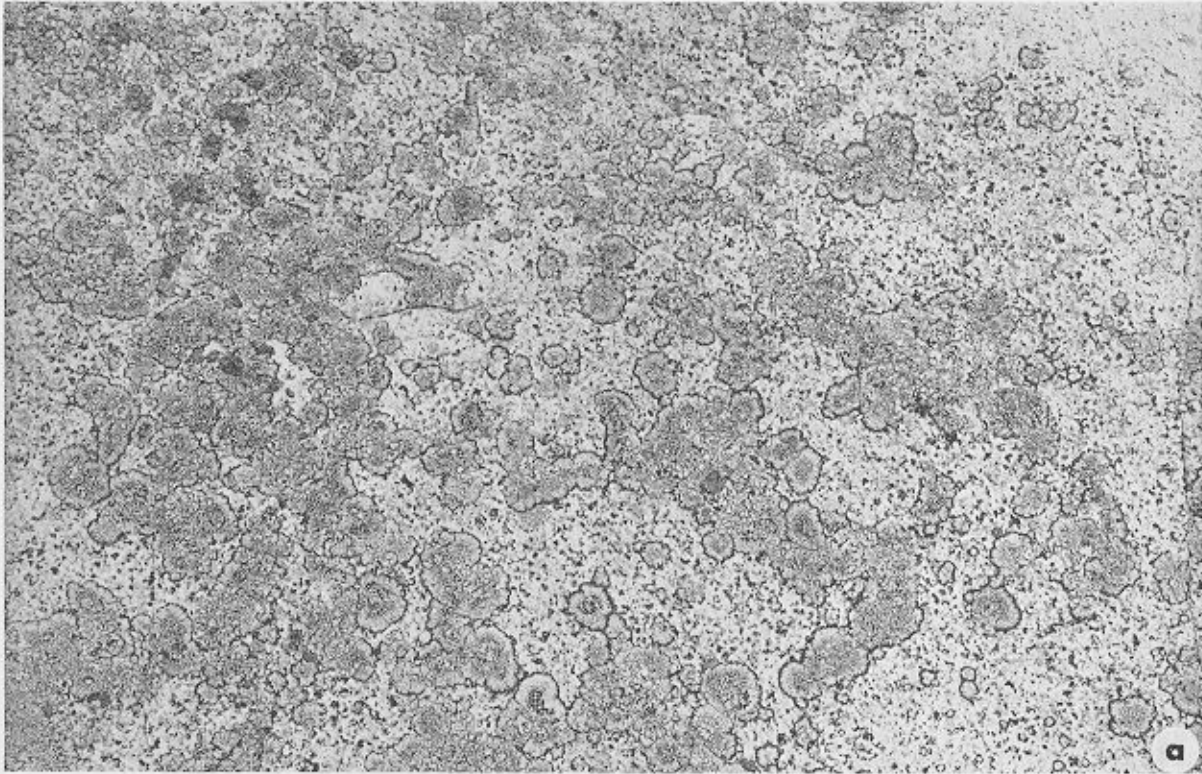


PLATE XVI

Field-photographs of *Buellia*-species.

- a. Association of *Buellia isabellina* (Hue) Darb. and *Mastodia tessellata* Hook f. & Harv. on vertical granodioritic rock face on Goudier Island, west Graham Land. (Photo: I. M. Lamb, January 1945.)
- b. Population of *Buellia latemarginata* Darb. (growth-state corresponding to *Lecidea radians* Hue) on granodioritic rock on Goudier Island, west Graham Land. (Specimen FIDS A1825 was collected from this population.) The dark patches are *Mastodia tessellata* Hook. f. & Harv. (Photo: I. M. Lamb, January 1945.)

PLATE XVI

