A MONOGRAPH OF THE LICHEN GENUS PLACOPSIS NYL.

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RESUMEN

Monografía de *Placopsis* Nyl., género de líquenes de la familia *Lecanoraceae*. — El autor presenta un estudio sistemático de todas las especies conocidas del género citado, fundado en el examen de los tipos originales y de un copioso material conservado en los herbarios de varias instituciones y colecciones particulares. Se discuten problemas fitogeográficos relacionados con la distribución de éste y de otros géneros de líquenes de origen aparentemente austral (repartición bipolar, bicéntrica, etc.). El género *Placopsis*, en la presente delimitación, comprende con grado de secciones las divisiones *Aspiciliopsis* (anteriormente *Lecanora* sect. *Aspiciliopsis*) y *Euplacopsis, sect. nov.*, y se describen las siguientes nuevas entidades: *P. gelida* var. *subreagens*, *P. gelidoides*, *P. chilena*, *P. Dusenii*, *P. effusa*, *P. baculigera*, *P. lateritioides*, *P. cribellans* f. *tuberculifera*, *P. alphoplacoides*, *P. alphoplacoides* var. *clavifera*, *P. Asahinae*, *P. Roivainenii*, *P. parellina* f. *microphylla*, *P. parellina* f. *ampliata*, *P. parellina* var. *carnea* f. *subcribellans*, *P. salazina*, *P. perrugosa* f. *activa*, *P. contortuplicata*, *P. contortuplicata* f. *fuegiensis*.

INTRODUCTION

This monograph is the outcome of a number of years' study of this predominantly subantarctic genus. Like my previous review of the genus *Neuropogon* (Lamb, 1939), it was undertaken with a view to clarifying the geographical relationships of the lichens of the cool temperate and polar zones of the southern hemisphere. As in most groups of crustaceous lichens, the

taxonomy proved to be critical, and it was impossible to arrive at valid phytogeographical conclusions from the unreliable literary records alone. Reference to the original type specimens was necessary, and by detailed macroscopic and microscopic examination, and chemical examination by modern methods, I have endeavoured to establish adequate descriptions of the species and to construct a key to their determination.

GENERAL ACCOUNT

History of the genus. — The name *Placopsis* was first proposed by Nylander in *Ann. Sci. Nat., Bot.*, ser. 4, XV. 376 (1861) with reference to the two species *gelida* and *rhodocarpa*, in the following words: « et thallus et apothecia typum peculiarem a Squamariis recedentem exhibent. Cephalodia thallina, paraphyses graciles, thecae cylindricae pariete apice vix vel non incrassato, gelatina hymenea dilute (nec apice thecarum intensius) coerulescens typum hunc designant... satisque determinant, forsan melius sicut sectionem peculiarem generis Lecanorae considerandum ». Nylander was uncertain whether to regard *Placopsis* as of generic or subgeneric rank, for in his next reference to it, in *Journ. Linn. Soc. Lond.* (Bot.), IX. 251, footnote (1865), he classes it as *Lecanora* subgen. *Placopsis*, and in this has been followed by Hue (in *Nouv. Arch. Mus. Hist. Nat. Paris*, sér. 3, III. 58; 1891), Crombie (*Mon. Lich. Brit.* I. 355; 1894), and Harmand (in *Bull. Soc. Sci. Nancy*, sér. 2, XV. fasc. XXXII. 200; 1898). Müller Argoviensis regarded it as a section of *Placodium* (in *Bot. Jahrb.* V. 135; 1884), and Zahlbruckner as a section of *Lecanora* (*apud* Engler & Prantl, *Nat. Pflanzenfam.*, I. Teil, Abt. 1 *, 202; 1907). The latter (*l. c.*) describes its characters as follows: « Lager am Rande gelappt, im Zentrum krustig, mit grossen, in das Lager versenkten Zephalodien, welche blaugrüne Gonidien enthalten; Apothecien sitzend, Schläuche linearisch, Sporen einreihig angeordnet, Pyknokonidien fädlich, mässig gekrümmt oder fast gerade ». Vainio regarded *Placopsis* as a proper genus, and in *Ann. Acad. Sci. Fenn.*, ser. A, XIX. n° 15, 36 (1923) described it in these words:

« Thallus crustaceus, arcte adnatus, areolis effiguratis, parathallis (cephalodiis) tuberculaeformibus, gonidia cyanophycea continentibus. Apothecia lecanorina aut zeorina. Paraphyses apice ramosae aut ramoso-connexae, ceterum laxe cohaerentes. Asci cylindrici. Sporae 8: nae, monostichae, mediocres, simplices. Gonidia dactylococcoidea aut pleurococcoidea ». More recent authors who have accorded generic rank to *Placopsis* are Bouly de Lesdain (in *Ann. Cryptog. Exot* IV. 100; 1931) and Räsänen (in *Ann. Bot. Vanamo*, II. 25; 1932).

My delimitation of the genus differs from that of previous authors in the inclusion in it, as a special section, of *Aspiciliopsis* (Müll. Arg.) (Syn. *Placodium* sect. *Aspiciliopsis* Müll. Arg. in *Bot. Jahrb.* V. 135; 1884; *Lecanora* sect. *Aspiciliopsis* Zahlbr. *apud* Engler & Prantl, *Nat. Pflanzenfam.*, I. Teil, Abt. 1 *, 203; 1907; *Aspiciliopsis* B. de Lesd. in *Ann. Cryptog. Exot.* IV, 101; 1931), which is characterised by the immersed apothecia, and is analogous to the section *Aspicilia* of *Lecanora*; it is represented by a single species, *P. macrophthalma* (Tayl.) Nyl.

Affinity. — *Placopsis* is very closely related to *Lecanora*, and as mentioned above is sometimes regarded as a subgenus or section of the latter. Divergent views have been held as to the characters upon which the segregation is based, but there is general agreement in respect of the presence of cephalodia and the cylindrical asci. My examination of much material has shown that of these only the former criterion is of value for purposes of classification, for certain species of *Placopsis* (notably *P. illita* and *P. subparellina*) have clavate-cylindric asci with the spores partly biseriately arranged. In view of the evidence on the nature of the cephalodia reviewed in the following pages (pp. 157-60), the treatment of *Placopsis* as a proper genus seems to be justified on account of the presence of these bodies. Its nearest allies are the species of *Lecanora* possessing an effigurate thallus (sect. *Placodium*, otherwise known as *Squamaria* or *Parmularia*). There is however every indication that evolutionary divergence from the latter was accomplished at a remote period, and that in *Placopsis* we have a monophyletic genus derived from the phylogenetic efflorescence of probably a single

original species; this hypothesis is supported by certain features such as the anatomical structure and the almost constant positive $CaCl_2O_2$ reaction. Vainio, in Hedwigia, XXXVIII. 187 (1889), suggests a possible affinity with the genus *Icmadophila* Trev. Magnusson, in *Bot. Notiser*, p. 422 (1932), points out that some of the characters of *Placopsis gelida* (structure of thallus, branching of paraphyses, cylindric asci, and $CaCl_2O_2$ reaction) are found also in *Lecidea (Biatora) coarctata* and *L. Wallrothii*. A cephalodiate species of *Ochrolechia, O. pacifica* Magn. in *Medd. Göteborgs Bot. Trädg.* XIII. p. 249 (1939), has been described, but the cephalodia appear to be of a type quite distinct from those met with in *Placopsis*.

Principles of classification. — As regards the external characters, the difference between the immersed apothecia of sect. *Aspiciliopsis* and the sessile, eulecanorine fruits of sect. *Euplacopsis* is of primary importance. Other macroscopic characters found to be serviceable in the delimitation of the species in sect. *Euplacopsis* are (approximately in the order of their importance): the presence or absence of Depsidone lichen acids in the thallus; the presence or absence of isidia; the morphology of the thallus — whether squamulose, continuous, rimose, or areolate, smooth or verrucose, effigurate or indeterminate; the colour of the thallus; the morphology of the apothecia and the colour of the disc. Soredia, which are an important character in many other groups of lichens, were found to have relatively little taxonomic significance in the present genus, for in the few species possessing them their occurrence seems to be somewhat inconstant. The cephalodia, unlike those of the genus *Stereocaulon*, are found to afford no basis for specific classification, showing considerable variability within the same species.

The internal anatomical structure was studied in considerable detail, but great uniformity of structure was found as regards the thallus and the thalline investment of the apothecia. Apart from the shape and size of the spores, the most useful microscopic criteria are afforded by the height of the thecium and the degree of development of the lower excipular stratum. In one

species (*P. baculigera*) the peculiar form of the pycnoconidia is the most outstanding character.

Thallus. — All species of *Placopsis* possess a well developed crustaceous thallus; no athalline species are known. The thallus is usually more or less distinctly lobate-effigurate at the circumference, with discrete or concrescent lobes, but in one species at least (*P. effusa*) it is indeterminate, and in two other cases (*P. albida* and *P. parellina* var. *microphylla*) is composed entirely of small rounded or crenulate squamules. The central part of the thallus may be continuous (*P. rhodophthalma*), irregularly rimose (*P. parellina, P. alphoplacoides* var. *clavifera*), areolate (*P. gelida* and others), crowded-papillate (*P. perrugosa*), contortuplicate-verrucose (*P. contortuplicata*), or glebose-verrucose (*P. terricola, P. alphoplacoides*).

Attention should be paid to the distinction between the rimose and the areolate types of thallus, for the separation of the *P. parellina* group from *P. gelida* and allied species depends largely on this character. Theoretically the difference between the two types is one of degree only, depending on whether or not the cracks in the thallus anastomose at their ends to delimit more or less regular areolae. Nevertheless there appears to exist in *Placopsis* a definite boundary between the two types; in rimose thalli the cracks, even if they show a limited tendency to anastomose, usually have the sharp edges characteristic of accidental mechanical fission, whereas the cracks dividing the areolae of the second type are more or less rounded off at the edges.

The colour of the thallus is usually dirty whitish, cream-coloured (« flori lactis concolor »), or pale buff (« alutaceus »); in specimens preserved for many years in herbaria a slight darkening to a brownish tinge frequently takes place. Three species are noted for their oxydated thalli (*baculigera, bicolor, lateritioides*), the colour, which varies from orange-yellow to deep ferruginous red, being due to the deposition of iron oxide in amorphous granules between the cells of the upper cortex. The surface of the thallus is nearly always matt, and is in a few species covered with a fine whitish pruina. All species have a white medulla.

Isidia occur on the thallus of the following species: *cribellans, isidiophora, papillosa, pycnotheca,* the var. *clavifera* of *P. alphoplacoides,* and the f. *subcribellans* of *P. parellina* var. *carnea.* In *P. cribellans* they are peculiar in being very easily detachable, and leave after falling off small pit-like depressions which are characteristic of the species. *P. pycnotheca* has globose isidiate outgrowths which are different in colour from the rest of the thallus; dark flesh-coloured or reddish brown, they have the outward appearance of small cephalodia, but the symbiotic algae in them are Cystococcoid, identical with those in the rest of the thallus. The isidia of *P. alphoplacoides* var. *clavifera* are very large and conspicuous, cylindrical or club-shaped, up to 3.5 mm long.

Soredia are found in *P. gelida, P. parellina,* and *P. lateritioides.* Their occurrence in the former two species has been found to be inconstant. As a rule they are circumscribed (± orbicular or radially elongated), but in the f. *argillacea* of *P. parellina* they become confluent and cover the greater part of the surface of the thallus.

The thallus, in vertical section, is bounded by an upper paraplectenchymatic cortex of variable depth. The only exception to this rule is *P. macrophthalma,* in which the uppermost layer is formed by a palisade-like tissue of vertically parallel conglutinated hyphae. The cortex itself is not infrequently covered by a hyaline, almost structureless stratum derived from the disintegration of the outer cell-layers. The cortical cells are more or less isodiametric, irregularly angulose or somewhat rounded, with thin walls usually between 0.7 and 1.0 μ in thickness. Directly below the cortex, and separating it from the medulla, occurs the zone of symbiotic algae (gonidia) in a fairly even stratum of variable depth usually interrupted at intervals by bands of parallel and adnate hyphae connecting the medulla with the cortex. The medulla is commonly compact, with few and small air-cavities, but tends to be looser in the species of the *perrugosa* group and in *P. alphoplacoides.* It is formed of interwoven branched septate hyphae from 2 to 4 μ thick, with usually thin walls (about 0.7 μ), and running either irregularly in various directions, or with a tendency to lie in

a predominantly horizontal or vertical plane. In certain rare cases, as in *P. brachyloba* and some individuals of *P. parellina,* the whole or part of the medulla may be paraplectenchymatic in structure. Often the lower parts of the medulla, by which the thallus is anchored to the substratum, are brownish in colour by degeneration, but as a rule no proper hypothalline tissue is formed. *P. albida, P. alphoplacoides* and *P. illita* are exceptional in this respect, possessing a well-developed hypothallus formed of densely compacted hyphae with darkened walls. Both cortex and medulla are commonly inspersed (nubilated) with minute dull yellowish granules adhering to the cells and making the tissue more or less opaque in section.

Cephalodia. — These are a conspicuous feature of all the species. Out of hundreds of specimens examined, only three (two of *P. gelida* and one of *P. perrugosa*) have been seen without them.

There has been some difference of opinion regarding the essential nature of cephalodia. Th. Fries (1866) and recently Kaule (1931, 1934) regarded cephalodia as abnormal gall-like structures produced by the presence of a foreign alga. On the other hand considerable evidence has accumulated to show that they are more likely to be definite organs of the thallus fulfilling a valuable metabolic function. Forssell (1884) considered this to be the case, and Cengia Sambo (1924, 1931) has shown that the Cyanophyceous algae of some cephalodia are constantly associated with nitrogen-fixing bacteria *(Azotobacter);* she considers the cephalodia to be organs of the lichen comparable to the root nodules of the *Leguminosae.* Goebel (1926) arrived independently at the same conclusion. Whether this is the case or not, it seems clear that the presence of cephalodia is a genetically conditioned feature of generic importance; Kaule (1931, p. 41) writes: « Wie jede Gallenbildung, setzt eben auch jedes Cephalodium eine Empfänglichkeit der befallenen Pflanze für den vom Gallenerreger ausgehenden Reiz voraus », and adds in a footnote: « Wie die Hyphen auf diesen Reiz antworten, das ist natürlich eine Eigenschaft des Pilzes ».

Johnson (1938), as a result of his statistical study of the

various types of cephalodia occurring in the genus *Stereocaulon*, came to the conclusion that the form of these bodies is correlated with the morphology of the other parts of the lichen, and is hence valuable in the classification of the species. My investigations in *Placopsis* show that no such correlation exists in this genus, at any rate in *P. gelida*, the only species of which sufficient material was studied to settle the point conclusively. A classification of the species based on the form of the cephalodia would be completely unnatural, as can be seen from the fact that *P. cribellans*, a very distinct species, produces at least two different types of cephalodia. It seems more likely that the form of the cephalodia is conditioned by the nature of the Cyanophyceous algae accidentally met and taken up as symbionts.

The origin of the cephalodia in *P. gelida* was investigated by Sernander (1908), working with Swedish material. He found that two types of initial thalli are developed, one with bright green, the other with blue-green symbiotic algae. These start as independent thalli, but as soon as they come into contact, the thallus with bright green symbionts, growing faster, surrounds and encloses the other, which is raised up into a central position on the developing thallus, and establishes communication with the latter by means of rhizoidal hyphae. Sernander attributes the origin of the small primary thalli to soredia, and that of the cephalodial fundaments to soredial hyphae commencing their growth among Cyanophyceous algae.

From the morphological viewpoint, the cephalodia met with in *Placopsis* fall into seven groups, between which however transitions sometimes occur. The first type (fig. 1, *a*) is the commonest, and is found in many species; the cephalodia are sessile, closely adpressed to the thallus, flattened and more or less orbicular. There is marked effiguration due to the development of radiating folds and cracks. In some species, notably *P. stenophylla*, the cephalodia are similar, but without cracks (fig. 1, *c*). The third type (fig. 1, *d*), found in *P. alphoplacoides*, *P. parellina* and *P. rhodophthalma*, differs from the foregoing in the irregular nature of the superficial plication; such cephalodia are usually less flattened than the other radiately effigu-

rate types. Fig. 1, *b* represents what is perhaps the simplest form, in which the cephalodia occur as simple rounded tubercles; such occur in *P. contortuplicata*. Fig. 1, *e* and *f* represent two hardly separable types in which the cephalodia are convex to subglobose, usually somewhat constricted at the point of attachment, and with a more or less distinctly verruculose surface; the former is occasionally found in *P. gelida*, and the latter minutely papillate type is known only in *P. Amabilis*, a somewhat problematical species from Mexico. Lastly there is the completely immersed cephalodium of *P. macrophthalma* (Fig. 1, *g*); it is level with the thallus, and similar to the latter

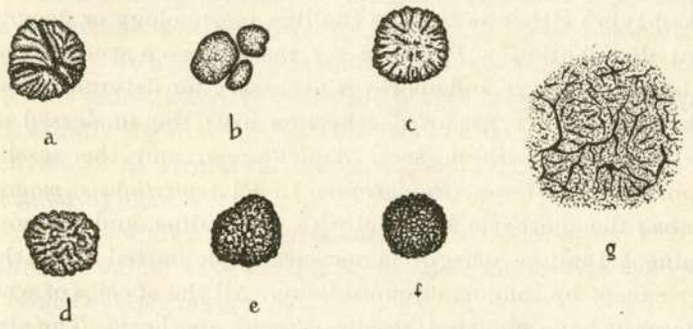

Fig. 1. — Types of cephalodia met with in *Placopsis*.
(For explanation, see text)

in its irregular cracking, and outwardly to be distinguished from the surrounding thalline tissue only by its somewhat deeper colour.

The anatomy of the cephalodia of *Placopsis* is comparatively uniform: an outermost hyaline necrotic layer of variable thickness is often present, and below it is the paraplectenchymatic cortical tissue, commonly faintly yellow-brown or nubilated, and composed of more or less isiodiametric, irregularly angular cells with thin or moderately thickened walls. The inner medullary tissue is hyaline, without air-spaces, and formed of upward-striving, fairly thin-walled hyphae which are coalescent in a prosoplectenchymatic tissue; particularly towards the base of the cephalodium a tendency to form a paraplectenchy-

matic tissue of isodiametric cells is evident. The symbiotic Cyanophyceous algae lie in an ill-defined layer of variable depth in the medullary tissue, and often fill the latter entirely. When they are Scytonemoid or Stigonemoid they form separate nests (trichomes) separated by hyphal bands, but in the case of Nostocoid symbionts they are evenly dispersed and entangled in the medullary tissue.

Apothecia. — These are usually present in specimens of most species of the genus, but are rarely developed in the common northern hemisphere species *P. gelida*. The reason for this is obscure. Except in the case of species presenting well marked types either as regards thalline morphology or geographical distribution — *P. gelida* for instance — a study of the apothecial structure and spores is necessary for determination.

The two main types of apothecium are: the immersed or aspicilioid, met with in sect. *Aspiciliopsis,* and the sessile lecanorine type of sect. *Euplacopsis*. In *P. (Aspiciliopsis) macrophthalma* the apothecia are level with the thallus, and the non-prominent thalline margin is not clearly delimited from the latter except by random circumscission. All the species of sect. *Euplacopsis* have elevated sessile discoid apothecia. The size of the apothecia is fairly constant for each species, ranging from 0.6-0.8 mm diam. in *P. Asahinae* up to 3.5 mm in *P. contortuplicata*. The thalline margin is a continuation of the thallus, and similar to the latter in colour and structure; it is usually rounded and entire, rarely rugose or subcrenulate (in *P. baculigera* and *P. brevilobata,* for instance), and is either persistently prominent or finally depressed and extenuated. In *P. contortuplicata* the thalline margin may sometimes be excluded altogether, giving the apothecia a lecideoid or biatoroid appearance. The disc is more or less plane and at first overhung by the thalline margin; it may be either smooth or minutely scabrid, sometimes rhagadiose-cracked (probably by mechanical contraction). The colour of the disc is somewhat variable. Certain species, such as *alphoplacoides, Asahinae* and *baculigera,* appear to have from the first dark brown or blackish apothecial discs. *P. baculigera* is peculiar, among other respects, in having a

distinctly shining or nitidous disc; in all other known species the disc is matt. Not uncommonly it is suffused with a whitish or ochraceous pruina. The proper margin (excipulum) is often visible in older apothecia as a thin rounded entire ring between the thalline margin and the disc, and is always more or less concolorous with the latter.

The excipulum forms a layer running right round below the hypothecium, and its basal part is almost constantly nubilated with minute dull yellowish granules which make it almost opaque in section. Its depth varies from species to species, the most massive development being found in *P. pycnotheca,* where it reaches a depth of 300 μ. The cells of which it is composed are more or less isodiametric, usually 5-7 μ in diameter, with walls up to 1 μ thick, forming a paraplectenchymatic tissue. At the sides, where it forms the proper margin, the excipulum is usually hyaline in section and indistinctly prosoplectenchymatic in structure, consisting of parallel-compacted thin-walled hyphae.

Fig. 2 shows in semi-schematic representation a section through half of a typical *Placopsis* apothecium with the various tissues composing it.

The hypothecium consists of intricately interwoven thin-walled hyphae running either in various directions or with a predominantly vertically parallel arrangement. Commonly it is colourless and hyaline, but in some species a yellowish tinge is apparent in thick sections. The hyphae composing it are sometimes very fine (1.0-1.5 μ), the average thickness being 2-4 μ. A blue coloration of the hypothecium with iodine is obtained in many species. The depth of the hypothecium is fairly constant for each species, but by no means so much as that of the thecium.

The thecium varies in height considerably from one species to another, and within limits there is a good degree of constancy within the species, so that this is a feature of much importance in the classification. The lowest is found in *P. illita* (80-140 μ), the highest in *P. subgelida* (285-320 μ). In section, it is colourless and hyaline except for the uppermost part (epithecium), which commonly consists of minute sordid

yellowish granules entangled among the tips of the paraphyses. In some cases the paraphyses bud off from their tips loose conidia-like hyphal particles, which have pigmented walls and form the epithecial cover.

The paraphyses are about 1.5-2.0 μ thick, not constricted at the septa except near the apex, where there may be either a very slight simple clavate swelling or a series of constrictions into submoniliform articles. In all species they are entirely free (discrete) when crushed out in water, never conglutinated by mucilage.

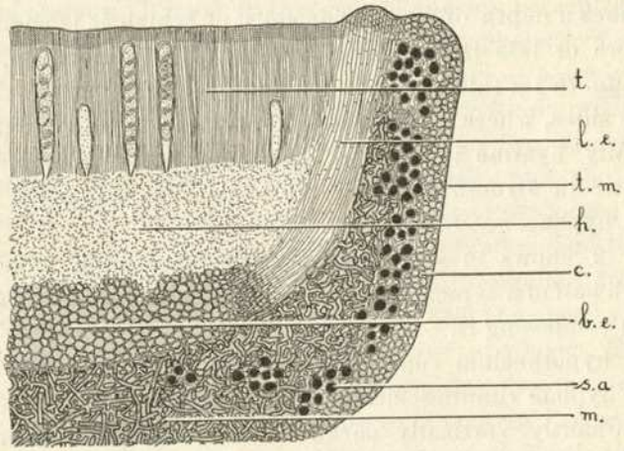

Fig. 2. — Vertical section through apothecium of *Placopsis gelida* : *t.*, thecium ; *l. e.*, lateral excipulum ; *t. m.*, thalline margin ; *h.*, hypothecium ; *c.*, cortex of thalline margin ; *b. e.*, basal excipulum ; *s. a.*, symbiotic algae ; *m.*, medulla.

The asci are commonly cylindrical or cylindric-clavate with the spores in a single row (uniseriate) ; less often, as in *P. alphoplacoides, P. illita,* and *P. subparellina,* the spores are arranged more or less in two rows (biseriate). The ascus wall is 1-2 (rarely 3) μ thick, often apparently thicker at the apex (up to 8 μ or more), but this thickening seems to be due not to an increase in the cell wall itself but to the presence of a plug of hyaline gelatinous material probably functionally connected with the rupture of the ascus and the discharge of the spores. Immature asci are filled with a granular protoplasm containing

numerous small oil droplets ; in species with pink or red apothecial discs, *e. g. P. rhodophthalma,* these oil guttules have in fresh material a delicate rose-pink colour.

The spores are as a rule abundantly developed in mature apothecia. They are always simple, and at maturity are bounded by a smooth even colourless wall about 1 μ in thickess. In certain species, notably *P. bicolor,* two apical vacuoles may be present, giving the spores a spurious polari-bilocular appearance. The smallest spores measure between 12 and 17 μ in length, 6 to 9 μ in breadth, and occur in *P. cribellans* and *P. illita ;* the largest are found in *P. subgelida,* where they reach a size of 30 by 21 μ. As regards shape, the majority of species has ellipsoid spores approximately twice as long as broad, but the following species are characterised by elongate-ellipsoid spores in which the length/breadth ratio is greater than 2 : *alphoplacoides, Asahinae, pycnotheca,* and *subparellina.*

Pycnidia. — Pycnidia have been seen in 22 species. They are completely immersed, usually causing slight swellings, and irregularly dispersed over the more central parts of the thallus. When mature they open by an apical point-like darkened ostiole up to 0.1 mm in diameter. In most species the pycnidia are simple, flask-shaped, subpyriform, or barrel-shaped (doleiform), but in *P. baculigera* the perifulcrial wall is convoluted, so that a number of intercommunicating chambers is formed. The wall (perifulcrium) is always colourless, except at the ostiole. The conidiophores or fulcra are of the « Placodien-Typus » of Glück (1899), and belong to the exobasidial group in Steiner's classification (1901). Except in *P. baculigera,* the pycnoconidia are thread-like, 12-29 μ long, about 0.5 μ thick, commonly arcuate. *P. baculigera* is remarkable in having shortly staff-shaped (bacillar) pycnoconidia 6-10 by 0.8-1.0 μ.

Chemistry. — By the use of Paraphenylenediamine, $C_6H_4(NH_2)_2$, the mode of employment of which in lichenology was originated by Asahina (1934), in conjunction with Potassium hydroxide, KHO, the presence of two distinct depsidone substances can be demonstrated in certain species of the genus

Placopsis. The first of these, and the more common, is Fumarprotocetraric acid, $C_{22}H_{18}O_{12}$, and is found in the following species: *brachyloba*, *chilena*, *contortuplicata* (only in f. *fuegiensis*), *Dusenii*, *gelida* (only in var. *subreagens*), *lateritioides*, *parellina* (only in f. *semireagens*), *patagonica*, *perrugosa* (only in f. *activa*), *stenophylla*, *subparellina* and *terricola*. In *P. brachyloba* and *P. terricola* its occurrence seems to be inconstant in the same thallus, but in the others it is found with regularity. It is usually localised in the medulla, sometimes only in the upper part among the symbiotic algae (as in *P. contortuplicata* f. *fuegiensis* and *P. perrugosa* f. *activa*), but in *P. parellina* f. *semireagens* is produced in the cortical layer. In all these cases the reaction with Paraphenylenediamine (for convenience abbreviated as « Pd ») is yellow changing more or less quickly (within two minutes) to miniate- or vermilion-red. Occasionally in *P. gelida*, and in most specimens of *P. cribellans*, the surface of the thallus alone gives a faint flesh-pink coloration with Pd ; this effect is probably due to a very low concentration of Fumarprotocetraric acid in the cortex, but it is not constant and does not appear to have any taxonomic significance. The second depsidone substance found in *Placopsis* is Salazic acid, $C_{18}H_{12}O_{10}$, occurring as far as is known only in one species, *P. salazina*. Its presence is characterised by the reactions: KHO + yellow then blood-red, Pd + deep yellow or orange-yellow, and under the microscope the red solution produced by KHO is seen to crystallize out rapidly into numerous red acicular crystals of Potassium salazinate which soon assume a very characteristic sheaf- or bushel-like form (Lamb, 1939, fig. 1).

Most species of *Placopsis* contain also in the medulla and often also in the cortex another chemical substance which gives a red reaction with Calcium hypochlorite. This reaction is characteristic of depsides of the Lecanoric acid group, comprising Lecanoric acid, Gyrophoric acid, Olivetoric acid, Anziaic acid, etc. These cannot be distinguished from each other by macroscopic means, but Asahina (1936) has elaborated a microchemical method whereby they can be recognised by the form of the crystals to which they give rise after heating with a mixture of glycerin, alcohol and water. By the use of this method with

fragments of the thallus of a specimen of *P. gelida* from Norway, I obtained crystals similar to those figured by Asahina for Gyrophoric acid, $C_{24}H_{20}O_{11}$, and hence one may be justified in assuming that it is this lichen acid which causes the red reaction with $CaCl_2O_2$ in *Placopsis* species. This reaction is usually lacking in species possessing an oxydated thallus (*P. baculigera*, *P. bicolor*), and also in *P. salazina*.

What is the value of these chemical characters in lichen taxonomy ? Asahina (1937) states that when two morphologically similar lichens contain chemically different substances, they must be regarded as distinct species, and in this view he is followed by some other recent workers, *e. g.* Duvigneaud (1940). In the classification of *Cladonia* there has long been a tacit assumption that this is so. On the other hand, Degelius (1939) points out that such physiological differences are not considered taxonomically important in other groups of plants, and considers chemically different but morphologically indistinguishable individuals to be at most mere races of the same species. In the opinion of the present author, further experimental and field study is necessary to decide this question conclusively. Pending this, provisional use has been made of the chemical characteristics in the present monograph, but to a more limited extent than advocated by Asahina and others. As an arbitrary convention which may perhaps later prove not to be in disharmony with systematic fact, I have considered morphologically similar individuals to be specifically distinct when they contain entirely different lichen-acids (*e. g.* the case of *P. salazina* with Salazic acid and *P. stenophylla* with Fumarprotocetraric acid), but not when the difference involves only presence or absence of a certain lichen-acid. In the latter case an acid-bearing strain is distinguished taxonomically as a form, or, if there appear to be also certain morphological peculiarities present, as a distinct variety.

The reaction of the thecium with iodine has long been considered important as a classificatory character in lichens, and as regards the Pyrenocarpeae at least it is probably so. In *Placopsis* the paraphyses are never affected by iodine, but the ascus walls usually take on a paler or deeper blue colour, which in

certain species (*P. fuscidula, P. gelida, P. rhodophthalma*) may turn to a faint wine-red. The difference appears to be due to the presence of distinct chemical substances in the ascus wall: Isolichenin, $C_6H_{10}O_5$, causing a persistently blue colour, and Glycogen, apparently an isomer of Isolichenin with a structural difference in the molecule, giving the wine-red reaction. No known species of *Placopsis* gives a positive reaction of the medulla of the thallus with iodine.

Symbiotic algae. — The algae which occur in the thallus of all species of this genus are bright green and unicellular, corresponding to the type defined as *Pleurococcus* Näg. by Geitler (1938). They are rounded cells of from 4 to 12μ in diameter, bounded by a colourless wall up to 1μ thick, and containing a parietal chromatophore adhering to the wall for its greater part. Sometimes a central pyrenoid is visible as a globose body about 2μ in diameter. The cells increase by transverse segmentation, never by internal sporulation as in *Cystococcus*.

The Cyanophyceous algae found in *Placopsis* cephalodia belong to three types, probably identical with the genera *Nostoc, Scytonema* and *Stigonema*, but which I prefer to call Nostocoid, Scytonemoid and Stigonemoid respectively on account of the difficulty in referring such forms, much reduced by their mode of life, to the typically developed free living genera. The Nostocoid type consists of small rounded blue-green cells not over 5μ in diameter and arranged in chains which are often much broken up in the cephalodium, so that the concatenate arrangement is hardly apparent. Very rarely a mucilaginous sheath surrounding the cells is visible. In the Scytonemoid type the cells are also singly united in chains, but are much larger (up to 12μ broad) and often strongly transversely flattened; their colour varies from blue-green to orange-pink, and an investing colourless slime-sheath is of not uncommon occurrence. In the Stigonemoid type a mucilaginous envelope is constantly present, containing rounded or oblong blue-green cells arranged in one or more rows side by side.

Ecology. — Almost without exception, the species of *Placopsis* grow on non-calcareous rocks or soil; *P. isidiophora* may grow on dead wood, and I have seen two specimens of *P. gelida* from the Arctic growing on tufts of moss. There is no tendency towards nitrophily.

P. gelida is the only species for which any extensive field studies are available. It shows a marked peculiarity in its altitudinal distribution, in that in the more southern and hyperoceanic part of its range in Europe it descends almost to sea level. It may be found therefore in the company of either arctic or atlantic-temperate species, according to the floristic nature of the region where it occurs. Thus in the Arctic, in Spitsbergen, it is not uncommonly found growing together with *Polyblastia Sommerfeltii* Lynge (an exclusively arctic species); in S. W. Sweden, on the island of Norra Skaftö, Degelius (1939) gathered it together with *Stereocaulon pileatum*, which is a subarctic-temperate species ranging from N. Norway in the north to the northern borders of Italy in the south; and in Ireland, Knowles (1929) found it with *Pilophorus Cereolus*, a species having much the same area of distribution as *Stereocaulon pileatum* and often confused with it, and *Opegrapha zonata*, a temperate species extending in latitude from southern Sweden to northern Italy. I have seen *P. gelida* in western Scotland (Argyll) accompanied by the following species: *Lecidea fuscoatra, L. leucophaea, L. lithophila, L. macrocarpa, L. tumida, Lecanora intricata, Ochrolechia tartarea, Parmelia conspersa, P. fuliginosa, P. omphalodes, P. physodes* f. *vittatoides, P. saxatilis, Pertusaria corallina, Rhizocarpon obscuratum, Rh. Oederi, Stereocaulon coralloides, S. evolutum, Sphaerophorus globosus* and the bryophytes *Frullania fragilifolia, Grimmia trichophylla, Pterogonium gracile* and *Rhacomitrium sudeticum*.

P. gelida is certainly a hygrophilous species; this fact was first noted by Withering (1812), who remarked that it occurs on «rocks in the Highland mountains, and on large stones, generally near water». In certain circumstances its tendency to seek moisture appears to be intensified, so that it may come into the category of hydrophilous species; thus Degelius (1939) mentions that on the island of Norra Skaftö it grows on rock

surfaces which are irrigated by trickling water (Sickerwasserflächen), and Knowles (1929) records it on « damp shady rocks » in Ireland, stating that it may be found also on stones which are submerged for long periods on the shores of the Wicklow lakes. That this peculiarity is shown by *P. gelida* also in the Arctic is shown by Zahlbruckner's remark on its occurrence in Novaya Zemlya (1928): « *Lecanora gelida* ist recht häufig auf den Steinen im Geröll am Fusse der Berge, besonders da, wo Wasser vorbeisickert ».

I have observed the same hydrophilous character in the ecology of a southern hemisphere species, *P. contortuplicata*. On a mountain in the Graham Land peninsula of Antarctica I found it growing on an almost vertical rock face well irrigated in warm summer weather by the snowmelt water from the ice cap above, the thalli occurring directly in the channel of the descending water.

Occasionally the thalli and more particularly the apothecial discs of *Placopsis* species are damaged by animals (slugs and snails, possibly also Acarids). *P. gelida* does not seem to be much subject to these depredations, but some of the southern hemisphere species may be badly attacked. In the type specimen of *P. parellina* f. *semireagens* the cortex of the thallus, in spite of its impregnation with the bitter Fumarprotocetraric acid, had been almost entirely eroded, and appeared on casual inspection to be sorediate. Species with pink or red apothecial discs sometimes have the thecial tissue entirely removed, leaving only the thalline receptacle. Changes due to fungal parasites are dealt with separately (p. 175).

Distribution. — In most species of *Placopsis* ascospores must be the sole means of dissemination, if we leave direct thallus-fragmentation out of consideration. Soredia occur in three species: *gelida, lateritioides* and *parellina*. The first and the last are characterised by a remarkably wide area of distribution in the northern and southern hemispheres respectively, but *P. lateritioides* is known from only one locality in New Zealand, and hence it seems that production of soredia is not necessarily correlated with wide distribution. Isidia are found in six species: *cribellans, isidiophora, papillosa, pycnotheca, alphoplacoides* (var. *clavifera*), and *parellina* (var. *carnea* f. *subcribellans*). In *P. cribellans* the isidial tubercles are apparently very easily detached, and this species has a very wide distribution in both hemispheres (fig. 3). In the other species the isidia are more firmly attached to the thallus, and this is perhaps the reason for their more restricted area.

Of the three species mentioned above as having a particularly wide range of distribution, two, namely *P. gelida* and *P. parellina,* are extremely variable, their variability perhaps indicating incipient speciation. The third species, *P. cribellans,* however, shows complete morphological uniformity throughout the whole of its range (the f. *tuberculifera* is not a variation of any significance). Thus it appears that wide distribution, with the accompanying differences in climatic and edaphic conditions, does not necessarily imply a high degree of morphological variability.

Considerable interest has focussed on the problem presented by plants having bipolar distribution in the northern and southern hemispheres, and one of the main objects of the present monographic study has been to provide further material towards the elucidation of this problem, *Placopsis,* like *Neuropogon,* being one of those genera having a bipolar distribution with the preponderance of species in the southern hemisphere. The whole problem of bipolar distribution in plants has been recently reviewed by Du Rietz in a very illuminating paper (1940), which makes it unnecessary to discuss the matter in general here. Suffice it to say that there are two obvious transtropical routes along which distribution has taken place, namely the Andean bridge of South America, and the Malayan-Papuan bridge in E. Asia, and that there is evidence to show that there are bipolar groups of plants in the southern hemisphere which owe their presence there to the use of either one or the other, or both, of these transtropical highland bridges. The Andean route is a very likely one as far as *Placopsis* is concerned, for we know that it occurs in the Andes at least as far north as Bolivia (*P. parellina*), and again in the Mexican highlands (*P. Amabilis*); possibly further collections will link up these occur-

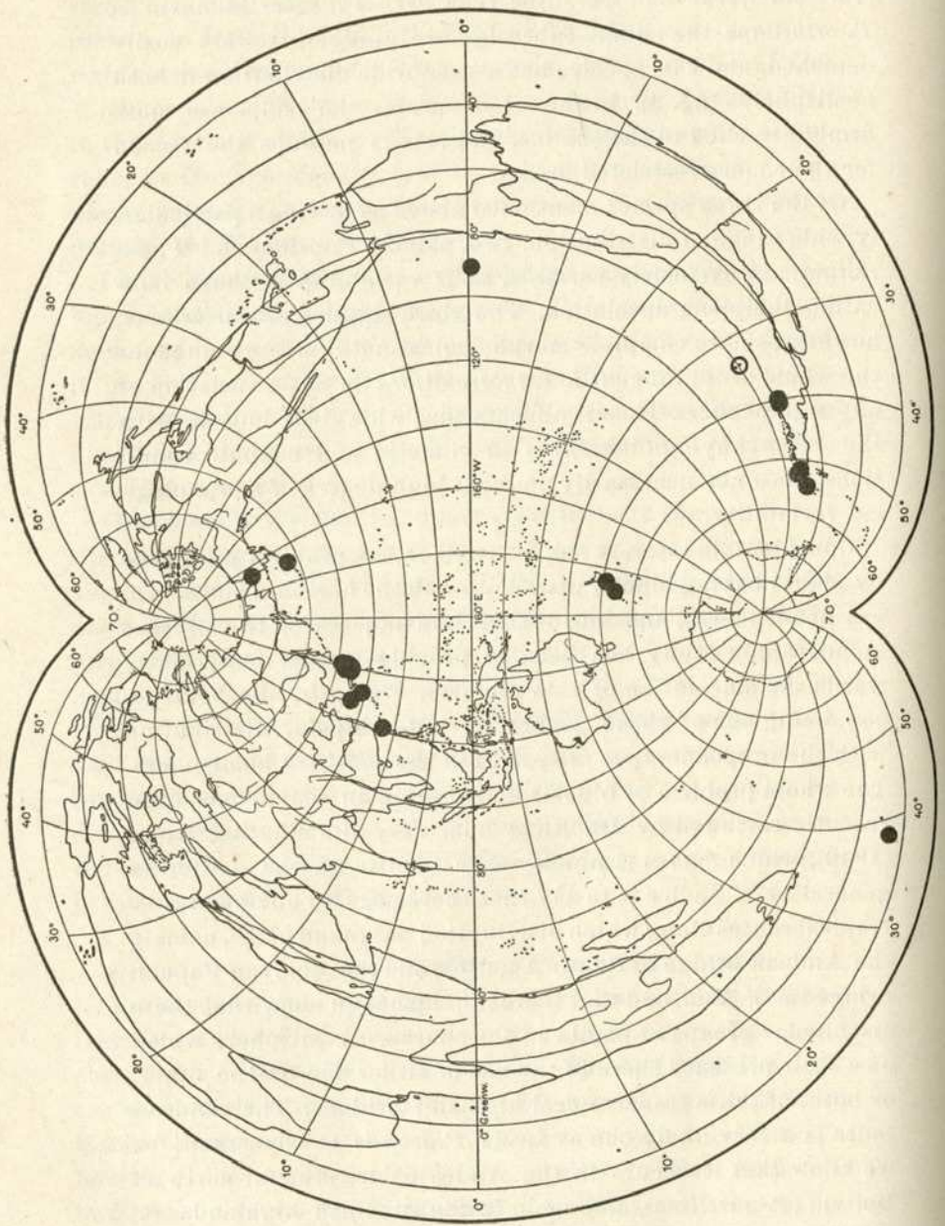

Fig. 3. — Distribution of *Placopsis cribellans*. The open circle refers to a doubtful record

rences with the N. American area of *P. gelida* (south to Oregon). The Malayan-Papuan route has also to all appearances been used by *Placopsis* in effecting a linkage between the New Zealand-Australia area and the coastal regions of E. Asia in the northern hemisphere, but the possibility of any connection with arctic Siberia via the Himalayas and the mountains of central Asia must be ruled out on account of the inability of this oceanic genus to colonise continental regions (see p. 173). The circumpacific distribution of *P. cribellans* (fig. 3) is suggestive, but there is apparently a hiatus exactly in the Malayan-Papuan region where the transtropical connection might have been expected; the outlier on the Galapagos Islands may be of southern origin, having been able to reach the latitude of the equator by virtue of the cold Humboldt current flowing northwards along the Pacific coast of S. America. *P. isidiophora* and *P. papillosa* occur on both sides of the equator in the Philippine-Indonesian area.

Du Rietz had already previously (1929) suggested that certain preponderantly southern hemisphere genera such as *Sphaerophorus* and *Neuropogon* might be regarded as having had their origin in austral regions and subsequently spread into the northern hemisphere. In his latest paper on the subject (1940) he writes: « Everything speaks against the assumption that *Neuropogon* has reached its antarctic-subantartic range by migration from the northern hemisphere » (p. 254), and certainly the genus *Placopsis* represents an almost exactly similar case. Among the phanerogams, the genera *Empetrum, Deschampsia* and *Acaena* may similarly be regarded as having had their original homes in the subantarctic or antarctic regions (Steffen, 1939).

It is a well known phytogeographical fact that bipolar species may have one, two or three centres of distribution in the southern hemisphere, in the South American, Kerguelen and Australia-New Zealand areas respectively; the facts regarding such unicentric, bicentric and tricentric distribution in bipolar plants have been summarised by Du Rietz (1940, pp. 216-7). Two species of *Placopsis* fall into the category of bipolar bicentric plants, namely *P. cribellans* and *P. gelida*, both having their austral centres in South America and New Zealand.

Among the purely southern hemisphere species of *Placopsis* there are 11 unicentric in the South American area, 9 unicentric in the Australia-New Zealand area, and 1 unicentric in the Kerguelen group ; of the bicentric species, 4 occur in the South American and Australia-New Zealand areas and 1 in the South American and Kerguelen areas. None are known to be bicentric in the Kerguelen and Australia-New Zealand areas, nor is there any known tricentric species.

The following analysis of the distribution of *Placopsis* species has been constructed on the lines of a key in order to facilitate reference. It is of course quite provisional, and likely to be modified considerably by future collections.

1. Species occurring in the northern hemisphere.
   2. Widely distributed in arctic and temperate oceanic Europe, N. America, and E. Asia, reaching south to about 45 deg. N. lat. ; Macaronesia (perhaps a distinct variety or species ; see p. 204) ; New Zealand ; Java ; Chile ; a distinct variety also in Chile and Juan Fernández. *P. gelida*
   2*a*. Confined to the Pacific coastline in the northern hemisphere : Alaska, Aleutian Islands, Japan, Korea, Formosa ; New Zealand ; Fuegia ; Chile ; Galapagos Islands : an Atlantic outlier in Tristan da Cunha. *P. cribellans*
   2*b*. Philippines and Java. *P. isidiophora*, *P. papillosa*
   2*c*. Mexico. *P. Amabilis* (doubtful species)
   2*d*. Formosa. *P. Asahinae*

1*a*. Species restricted to the southern hemisphere.
   3. Distribution unicentric.
      4. Occurring in the South American area only *. *P. baculigera*, *P. chilena*, *P. contortuplicata*, *P. Dusenii*, *P. effusa*, *P. fuscidula*, *P. patagonica*, *P. pycnotheca*, *P. Roivainenii*, *P. stenophylla*, *P. terricola*.
      4*a*. Occurring in the Australia-New Zealand area only. *P. albida*, *P. alphoplacoides*, *P. brachyloba*, *P. gelidoides*, *P. illita*, *P. lateritioides*, *P. salazina*, *P. subgelida*, *P. subparellina*.
      4*b*. Occurring in the Kerguelen group only. *P. (Aspiciliopsis) macrophthalma*.
   3*a*. Distribution bicentric.
      5. Occurring in the South American and the Australia-New Zealand areas. *P. brevilobata*, *P. parellina*, *P. perrugosa*, *P. rhodophthalma*.
      5*a*. Occurring in the South American and the Kerguelen areas. *P. bicolor*

* Following the example of Skottsberg (1936), I regard the island of Tristan da Cunha as an outlying station of the South American area.

Placopsis as a genus is markedly oceanic in its distribution. This can best be realised by comparing the range of the various species with the chart prepared by Rosenkranz (1936) showing the regions of equal « Ozeanitätsindex » throughout the world. This index is the product of a formula in which rainfall, humidity, and temperature are the factors under consideration. Expressed in the terms of this formula, regions of very low oceanity have an index up to 25, those of moderate oceanity from 25 to 50, and those of high oceanity from 50 to 200. Tracing the distribution of the various species of *Placopsis* on this map, we find that they are conspicuosly absent from the continental regions of the world in which the index of oceanity is 25 or lower.

The distribution of *P. gelida* in the northern hemisphere, shown in Fig. 4, is seen to be very distinctly oceanic. In the classification of oceanic plants given by Degelius (1935) it appears to come into the second, less extremely oceanic group, and in this group is intermediate between the « northern suboceanic element » and the « northern central European suboceanic element » of Degelius. It appears to find optimal conditions in the colder temperate and arctic regions. In the southern part of its range it occurs at higher altitudes in the few more continental stations known, but in hyperoceanic western Europe, notably in S. W. Ireland, it is found down to sea level (Knowles, 1929). This same phenomenon has been observed with some arctic-alpine phanerogams; Praeger (1934) cites as examples such species as *Sedum roseum*, *Galium boreale*, and *Juniperus sibirica*, which in the southwesternmost part of Ireland all descend to within 20 meters of sea level.

It seems fairly clear that *P. gelida* may be classed with the group called by Hultén (1937) « Atlantic-Pacific plants ». These are arctic-circumpolar plants which are oceanic and have spread southwards along the coasts of the Pacific and Atlantic oceans. The known distribution of this species in the northern

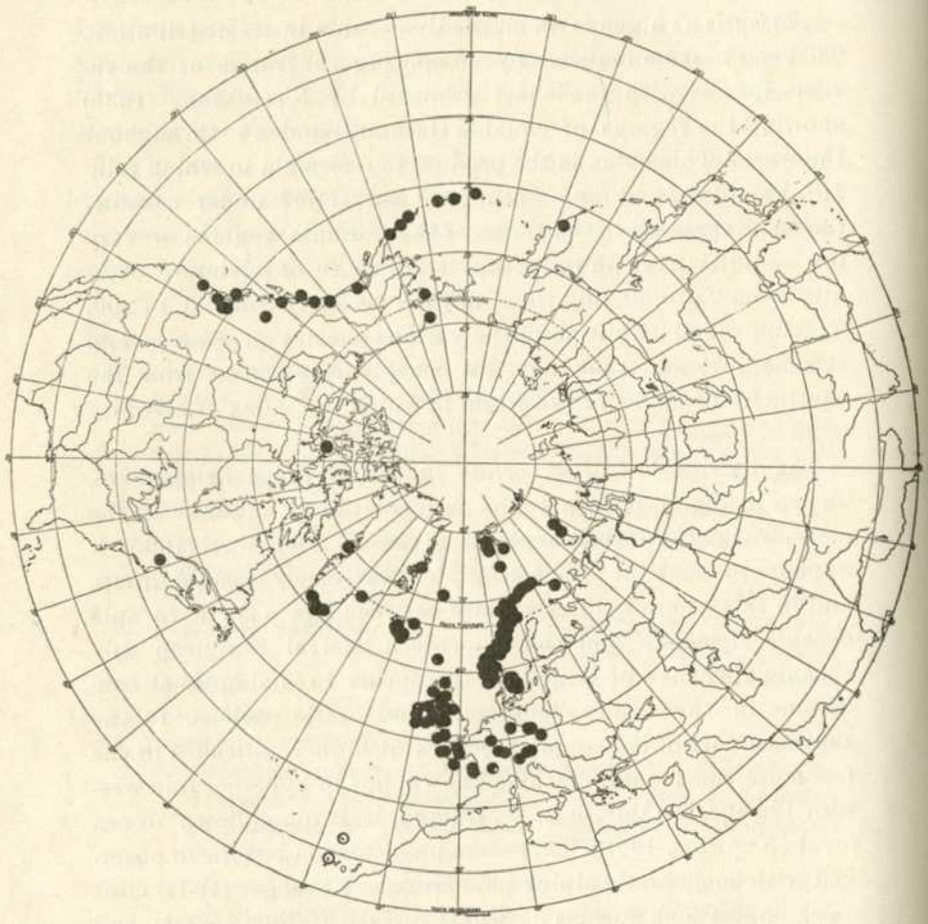

Fig. 4. — Distribution of *Placopsis gelida* in the northern hemisphere. The Macaronesian stations (open circles) perhaps refer to a distinct variety or species

hemisphere corresponds very closely to the area indicated for this group by Hultén on Pl. 15 of his work. The same comparison leads one also to recall the apparent absence of *P. gelida* from the more eastern parts of the Siberian Arctic, a fact which is rather surprising in view of its known abundance in Novaya Zemlya. Several comprehensive lichen collections have been made on the arctic coast in the Taimir region, but *P. gelida* has never been found there, and one can only assume that if it does occur it must be very rare. Hultén quotes the case of two phanerogams, the circumpolar distribution of which is broken in northeastern Siberia: *Honckenya peploides* and *Mertensia maritima*. They are supposed to have been exterminated in that region by the ice during the glacial epoch, and been unable subsequently to fill in the gap thus caused in their distributional area.

The distribution of *P. gelida* in the southern hemisphere (Fig. 5) is seen to correspond more or less closely to that of the phanerogamous families Centrolepidaceae and Epacridaceae, a type called the « Indomalesisch-australisch-südamerikanisch » in the recent work of Vester (1940). « Dieser Typ stellt die Erweiterung der bikontinentalen Arealformen: X. a. dar, austral-antarktisch-südamerikanisch » (Vester, *op. cit.*, p. 208).

The altitudinal distribution of *Placopsis* species is very imperfectly known at present. *P. gelida* in western Europe occurs indiscriminately at sea level and at higher altitudes, as in Great Britain, where it ascends to about 1340 meters (Ben Nevis). The more continental finds in Europe are for the most part from heights of some 1000 meters or over; the highest known record is that of 1900 meters from Austria, Schladmingertauern. The greatest altitude known to be reached by any species is 3100 meters (*P. parellina* in the Bolivian Andes).

Parasites. — Three of the specimens of *Placopsis* seen by me had been attacked by parasites, which in two cases produced a deformation of the thallus.

The holotype specimen of Crombie's « *Squamaria gelida* f. *dispersa* » (see p. 204) is depauperated by *Didymosphaeria micros-*

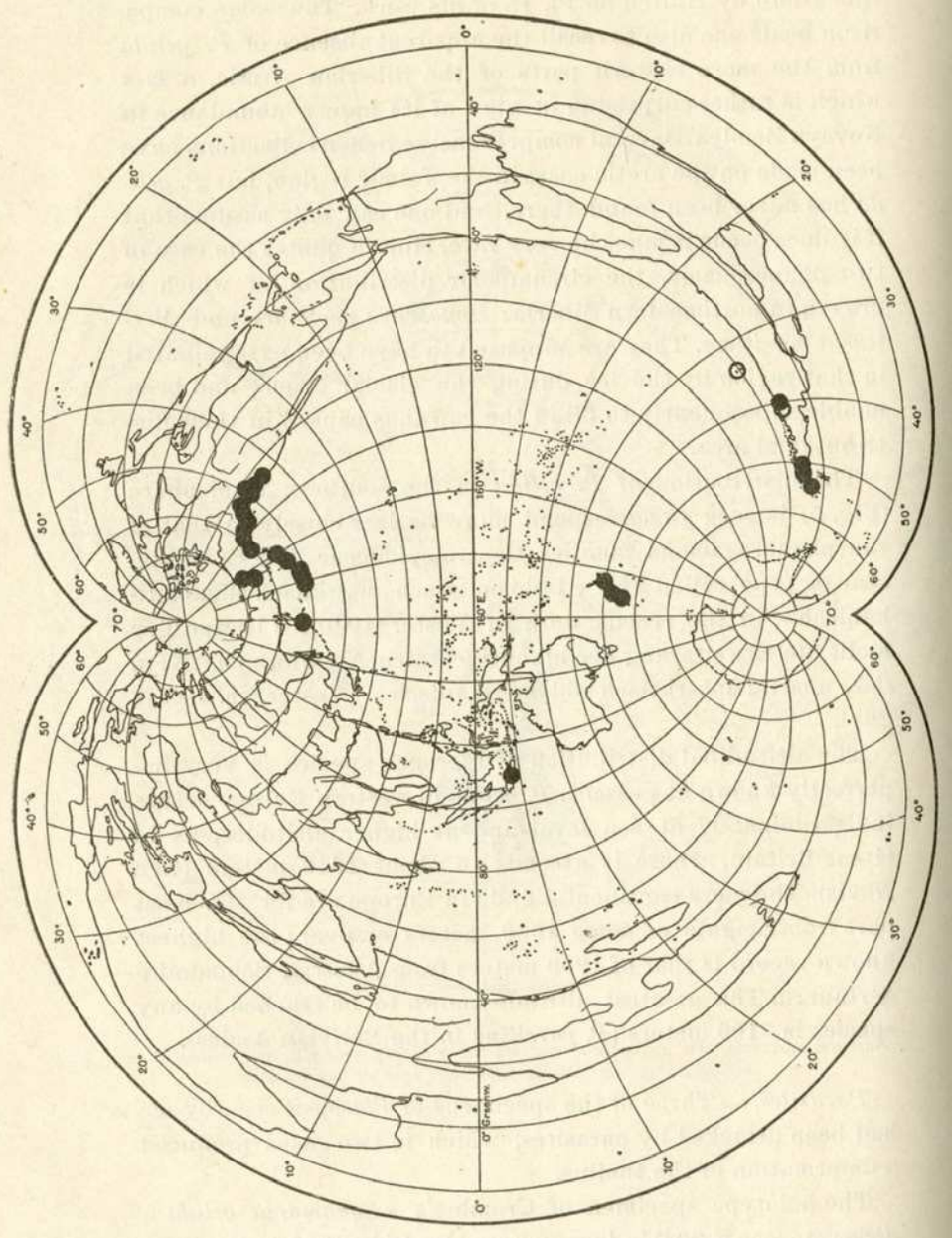

Fig. 5. — Distribution of *Placopsis actida* in the southern hemisphere and the north Pacific. Open circles show stations of the var. *subregens*

tictica var. *alboatrae* Vouaux; the pale violet reaction of the hymenial gelatine with iodine which is characteristic of this variety was well marked, and prevented confusion with *Discothecium squamarioides* (Mudd) Keissl., in which the iodine reaction is negative. The thallus was not galled or swollen to any noticeable extent.

A specimen of *P. gelida* from Ireland, Connemara, coll. Larbalestier, in herb. Nylander, was also attacked by *Didymosphaeria microstictica* var. *alboatrae,* the parasite in this case causing the formation of cephalodia-like galls (containing Pleurococcoid thalline algae) 0.8-2.0 mm diam., irregularly rugulose-verruculose, at first concolorous with the thallus, then becoming darker like cephalodia. The ostioles of the parasitic perithecia were visible as minute black spots on the surface of the galls.

The typical form of *Didymosphaeria microstictica* (hymenial gelatine yellow then wine-red with iodine) was found on a specimen of *P. contortuplicata* from the South Shetlands, causing galls looking like cephalodia and 1.3-3.0 mm in diameter, warted-granulate, concolorous with the thallus or somewhat paler. In section the structure of one of these galls was found to be similar to that of the rest of the thallus, and a stratum of thalline symbiotic algae was also present. The parts of the parasite were somewhat larger than given by Keissler (1930) for this species.

Neither *D. microstictica* nor its var. *alboatrae* were previously recorded for *Placopsis*, neither is the parasite known to produce galls on its other hosts *(Acarospora fuscata* and *Buellia alboatra).*

Other parasites recorded on *Placopsis* are:

1) *Didymosphaeria epicrassa* (Oliv.) Vouaux, on *P. gelida* from Sweden, Jämtland, Handöl, by Keissler in *Ark. f. Bot.* XVIII, n° 16, p. 17 (1923) (Keissler writes «*frigida*» by mistake for *gelida*). The same specimen was previously recorded by Almquist in *Kgl. Svensk. Vetensk.-Akad. Handl.* XVII. n° 6, p. 56 (1880) under the name of *Arthonia vagans* subsp. *A. circinnata* Th. Fr. — Syn. *Lecideopsis circinata* in *Zopf* in *Hedwigia,* XXXVIII, p. 353 (1896).

2) *Didymosphaeria gelidaria* (Mudd.) A. L. Sm., on *P. gelida;* Lorrain Smith in *Trans. Brit. Mycol. Soc.* III, p. 176 (1910). Syn. *Sphaeria gelidaria* Mudd, *Man. Brit. Lich.* p. 130 (1861).

3) *Discothecium squamarioides* (Mudd) Keissl., on *P. gelida;* Keissler in *Rabh. Krypt.-Fl.* ed. 2, Flechten, VIII, p. 403 (1930). — Syn. *Sphaeria squamarioides* Mudd, *Man. Brit. Lich.* p. 130 (1861).

4) *Microthelia perrugosaria* Linds., in the apothecial discs of *P. perrugosa* from Otago, New Zealand (according to Müller Arg. in *Bull. Herb. Boissier,* II, append. I, p. 93; 1894).

5) *Sphaeria cephalodiorum* Rostr. in *Bot. Tidsskr.* IV, p. 98 (1871). This and the following were found on *P. gelida* in the Faeroe Islands. Unfortunately the description does not mention the presence or absence of paraphyses, and hence the identity of the parasite is doubtful.

6) *Sphaeria ventosa* Rostr., *op. cit.,* p. 97.

7) Harmand, in *Bull. Soc. Sci. Nancy,* sér. II, XV, p. 201 (1898), describes an unnamed parasite on cephalodia of *P. gelida.*

List of herbaria consulted. — Material in the herbaria of the following institutions was examined :

Sectio Botanica Musei Nationalis Hungarici, Budapest (BP.); Farlow Herbarium, Cambridge, Mass. (FH.); Institute de Botanique Systématique de l'Université de Genève, Geneva (G.); Botaniska Trädgard, Göteborg (GB.); Helsingin Yliopiston Kasvitieteellinen Laitos, Helsinki (H.); Royal Botanic Gardens, Kew (K.); Rijksherbarium, Leiden (L.); British Museum (Natural History), London (BM.); Botaniska Museet, Lund (LUND); Botanische Anstalten, München (M.); Universitetets Botaniske Museum, Oslo (O.); Laboratoire de Cryptogamie, Muséum d'Histoire Naturelle, Paris (PC.); Missouri Botanical Garden, St. Louis, Mo. (MO.); Naturhistoriska Riksmuseet, Stockholm (S.); Turun Yliopiston Kasvitieteellinen Laitos, Turku (Abo) (TUR.); Institution för Systematisk Botanik, Uppsala (U.); Botanical Department, Dominion Museum, Wellington, New Zealand (WELT.); Botanische Abteilung, Naturhistorisches Museum, Vienna (W.); Royal Botanic Garden, Edinburgh (E.).

The following colleages also placed their private collections at my disposal:

Prof. Y. Asahina. Tokyo (*Asah.*); Dr. Bouly de Lesdain, Dunkerque (*B. de Lesd.*); Dr. H. Des Abbayes, Rennes (*Des Abb.*); Prof. G. Einar Du Rietz, Uppsala (DR.); Dr. Ed. Frey, Bern (*Frey*); Dr. E. W. Jones, Oxford (*Jones*); Dr. A. H. Magnusson, Göteborg (*Magn.*); Dr. Veli Räsänen, Kurkijoki (*Räs.*); Dr. K. Redinger, Berlin (*Redgr.*); Dr. Ö. Szatala, Budapest (*Szat.*); Dr. W. Watson, Taunton (*Wats.*).

Acknowledgments.— The work for this monograph was carried out partly at the British Museum (Natural History), London, and partly at the Instituto Miguel Lillo, Tucumán, República Argentina, and it is a pleasure to record my gratitude to the authorities of both these Institutions for all facilities which were so freely placed at my disposal. I also take this opportunity to convey my sincere thanks to all colleagues and directors of institutions mentioned in the foregoing list for the loan of specimens out of their herbaria.

TAXONOMIC ACCOUNT

Synonymy, generic description, and conspectus of sections

Placopsis *Nyl.* in *Ann. Sci. Nat.*, Bot. sér. 4, XV, p. 376 (1861) emend. *Nyl.* apud *Cromb.* in *Journ. Bot.* XV, p. 106 (1877). *Vain.* in *Ann. Acad. Sci. Fenn.* ser. A, XIX, n° 15, p. 36 (1923).

Synon. — *Lecanora* subgen. *Placopsis* Nyl. in *Journ. Linn. Soc. Lond.*, Bot. IX, p. 251, footnote (1865); *apud* Hue in *Nouv. Arch. Mus. Hist. Nat. Paris,* sér. 3, III, p. 58 (1891). *Cromb. Mon. Lich. Brit.* I, p. 355 (1894). Harm. in *Bull. Soc. Sci. Nancy,* sér. II, XV. fasc. XXXII, p. 200 (1898).

Generic description. — *Thallus* crustaceous, corticate only on upper side, effigurate or effuse and indeterminate, areolate-rimose or with irregularly anastomosing cracks or continuous, smooth or verrucose or plicate-verruculose, usually whitish or

cream-coloured (ferruginous-oxydated in some species), containing Pleurococcoid symbiotic algae; cephalodiate, the *cephalodia* sessile on or (in sect. *Aspiciliopsis*) immersed in the thallus, discoid or subglobose, effigurate-lobed or irregularly plicate, flesh-coloured, reddish, or reddish-brown, containing Cyanophyceous algae. *Apothecia* sessile or (in sect. *Aspiciliopsis*) immersed in the thallus, discoid, lecanorine, with thalline margin, proper margin (the latter sometimes undeveloped), and variously coloured disc. *Hypothecium* colourless; *paraphyses* discrete; *asci* elongate-cylindric, cylindric-clavate, or clavate; *spores* uni- or subbiseriate in ascus, simple, ellipsoid, elongate-ellipsoid, or subfusiform. *Pycnidia* immersed in thallus, with colourless, entire or contorted perifulcrium; fulcra exobasidial; pycnoconidia filiform or rarely bacillar, curved or straight.

Neotype of the genus: *P. gelida.*

The following two sections are distinguished:

1. Sect. *Aspiciliopsis* (Müll. Arg.) M. Lamb, *comb. nov.* — *Synon.*: *Placodium* sect. *Aspiciliopsis* Müll. Arg. in *Bot. Jahrb.* V, p. 135 (1884); *Lecanora* sect. *Aspiciliopsis* Zahlbr. *apud* Engler & Prantl, *Nat. Pflanzenfam.* I. Teil, Abt. 1*, p. 203 (1907); *Aspiciliopsis* B. de Lesd. in *Ann. Cryptog. Exot.*, IV, p. 101 (1931). — Apothecia immersed in the thallus. Monotype of the section: *P. macrophthalma.*

2. Sect. *Euplacopsis* M. Lamb, *sect. nov.* — *Synon.*: *Placopsis* Nyl. in *Ann. Sci. Nat.*, Bot. sér. 4, XV, p. 376 (1861); *Lecanora* sect. *Placopsis* Zahlbr. *apud* Engler & Prantl, *Nat. Pflanzenfam.* I. Teil, Abt. 1*, p. 202 (1907); *Placodium* sect. *Placopsis* Müll. Arg. in *Bot. Jahrb.* V, p. 135 (1884). Apothecia supra thallum elevata. Eutype of the section: *P. gelida.*

Note: Nylander's original description of the genus *Placopsis* was in the sense of my sect. *Euplacopsis*, and his circumscription of it remained thus until 1877, when (*apud* Crombie in *Journ. Bot.* XV, p. 106) he extended it to cover also *P. macrophthalma.*

KEY TO KNOWN SPECIES

1. Apothecia persistently immersed in thallus, aspicilioid (sect. *Aspiciliopsis*). *P. macrophthalma* (p. 187)

1*a*. Apothecia sessile on thallus (sect. *Euplacopsis*).

2. Spores elongate-subfusiform (length/breadth coefficient approximately 3.0—3.3).

3. Thallus isidiate.

4. Isidia subglobose, yellow-brown or flesh-coloured, outwardly resembling small cephalodia; spores (15—) 18—24 × (6—) 7—8 (—8.5) μ. *P. pycnotheca* (p. 232)

4*a*. Isidia cylindrical, claviform, concolorous with the thallus; spores somewhat narrower (17.5—) 18—21 (—25) × (5—) 5.5—6.5μ. *P. alphoplacoides* var. *clavifera* (p. 236)

3*a*. Thallus not isidiate.

5. Thallus minutely effigurate at periphery, with concrescent lobes 1.0—1.5 mm long; apothecia small (up to 1 mm diam.); spores 16—18 × 6—7μ. *P. Asahinae* (p. 239)

5*a*. Thallus either effuse and indeterminate or with large, ± separated marginal lobes 2.0—4.5 mm long; apothecia larger (1—3 mm diam.); spores longer, usually 17—21 × 5—7μ.

6. Thallus apparently effuse and indeterminate; continuous, verrucose; medulla Pd + red. *P. subparellina* (p. 237)

6*a*. Thallus effigurate-lobate at circumference; in centre verrucose-areolate; medulla Pd—. *P. alphoplacoides* (p. 234)

2*a*. Spores ellipsoid (length/breadth coefficient approximately 1.7—2.0).

7. Thallus isidiate or with pock-like depressions due to the breaking off of isidia. (*Note*: the verruculose pycnidia found in some species should not be confused with isidia. *P. Amabilis*, in which the apothecia are not known, has small crater-like depressions with raised rims on the surface of the thallus; they are not derived from isidia, but are undeveloped initials of apothecia).

8. Spores 12.0—16.5 × 6—8μ; thecium 90—150 (—180) μ high. *P. cribellans* (p. 223)

8*a*. Spores over 8μ in breadth.

9. Isidia scattered; central part of thallus smooth; marginal lobes flat, closely adpressed to substratum; spores up to 18μ long. *P. parellina* var. *carnea* f. *subcribellans* (p. 254)

9*a*. Isidia usually crowded ; central part of thallus rugose or subsquamulose ; marginal lobes ± tumid-convex, less closely adpressed to substratum ; spores 18—21μ long.

10. Thecium 120—200μ high. *P. papillosa* (p. 230)

10*a*. Thecium higher, 185—285μ high. *P. isidiophora* (p. 228)

7*a*. Thallus not isidiate.

11. Surface of thallus wholly or partly orange-ferruginous or yellow-oxydated. (*Note* : occasionally in non-oxydated species growing on ferruginous rocks a rusty coloration is visible in cracks in the thallus, and in extreme cases may spread over part of the surface).

12. Thallus with erumpent grey soredia ; medulla Pd+ red. *P. lateritioides* (p. 222)

12*a*. Thallus not sorediate ; medulla Pd-.

13. Thecium 240—285μ high ; pycnoconidia staff-shaped, 6—10μ long. *P. baculigera* (p. 220)

13*a*. Thecium 165—240μ high ; pycnoconidia filiform, usually curved, 18—24μ long. *P. bicolor* (p. 218)

11*a*. Surface of thallus not oxydated.

14. Thallus entirely microphylline, consisting of contiguous or dispersed, adnate, rounded or elongated, sometimes crenate, leaf-like squamules.

15. Thallus sorediate. *P. parellina* f. *microphylla* (p. 249)

15*a*. Thallus not sorediate. *P. albida* (p. 241)

14*a*. Thallus crustaceous, not microphylline.

16. Central part of thallus verrucose, papillate- or contortuplicate-verruculose or rugose-verruculose, continuous or rimose.

17. Papillate-verruculose or contortuplicate-verrucose on a continuous or cracked basal thalline stratum.

18. Thecium 114—200μ high.

19. Central part of thallus crowdedly papillate-verruculose ; peripheral lobes ± discrete, flat and expanded (pterygoid) ; apothecia up to 1.5 mm diam., with persistently prominent thalline margin. *P. perrugosa* (p. 268)

19*a*. Central part of thallus contortuplicate-verrucose ; peripheral lobes ± connate, not or only slightly flattened ; apothecia 1.5 mm diam. or larger (up to 2.5, rarely 3.5 mm), with the thalline margin sometimes almost excluded in large apothecia. *P. contortuplicata* (p. 273)

18*a*. Thecium 200—240μ high ; marginal lobes of thallus ± discrete. *P. brevilobata* (p. 276)

17*a*. Central part of thallus irregularly plicate-verruculose (continuous or with anastomosing cracks), or verrucose-areolate.

20. Central part of thallus ± continuous or with anastomosing cracks, but never truly areolate. (*Note :* see remarks on p. 155).

21. Thecium high, 210—310μ ; spores 20—27 × (9—)13—18μ. *P. rhodophthalma* (p. 255)

21*a*. Thecium lower, 155—210μ, occasionally up to 240μ ; spores narrower, not exceeding 14μ in breadth.

22. Spores 17.0—18.5μ long.

23. Marginal effiguration indistinct ; central part of thallus continuous or with a few sporadic cracks, coarsely and irregularly verrucose ; medulla usually Pd + red. *P. terricola* (p. 263)

23*a*. Thallus plicate-effigurate at periphery, with ± fused marginal lobes ; central part with numerous anastomosing cracks, often subverrucose-uneven ; medulla Pd—. *P. Roivainenii* (p. 242)

22*a*. Spores 18—28μ long. *P. parellina* (p. 244)

20*a*. Central part of thallus regularly ver-

rucose-areolate.

24. Surface of thallus subtly whitish-pruinose (seen under × 10 lens); central part with tumid areolae.

25. Thallus olivaceous-brownish; medulla Pd-.

P. fuscidula (p. 207)

25*a*. Thallus whitish or cream-coloured; medulla Pd+red.

P. chilena (p. 213)

24*a*. Surface of thallus not pruinose; almost shining in places; central part bullate-areolate with almost globose or shortly intestiniform areolae. *P. gelidoides* (p. 210)

16*a*. Central part of thallus ± smooth, not verrucose or rugose-verruculose; continuous or rimose or areolate.

26. Spores 25.5—30.0 × 12—21μ; thecium 285—320μ high. *P. subgelida* (p. 264)

26*a*. Spores not exceeding 25, rarely 27μ in length.

27. Central part of thallus continuous or with anastomosing sharp-edged cracks, not truly areolate. (*Note:* see remarks on p. 155).

28. Spores under or up to 20μ long.

29. Thallus bounded by a distinct dark hypothalline line; thecium 80—140μ high.

P. illita (p. 266)

29*a*. No marginal hypothallus visible; thecium usually over 140μ high.

30. Medulla Pd+red or orange-yellow. (*Note:* in *P. parellina* f. *semireagens* the cortex, but not the medulla, stains red with Paraphenylenediamine).

31. Thecium 175—225μ high; medulla Pd+red.

P. patagonica (p. 261)

31*a*. Thecium 120—162μ high.

32. Medulla KHO+yellow and then blood-red, Pd+orange-yellow; apothecial discs brown-blackish.

P. salazina (p. 259)

32*a*. Medulla KHO-, Pd+red; apothecial discs red-brown.

P. stenophylla (p. 257)

30*a*. Medulla Pd-.

33. Peripheral effiguration distinct, with ± fused marginal lobes

P. Roivainenii (p. 242)

33*a*. Peripheral effiguration variable, marginal lobes when present always distinctly separated by cracks.

P. parellina (p. 244)

28*a*. Spores over 20μ long.

34. Thecium 210—310μ high; spores usually broadly ellipsoid, 20—27 × (9—)13—18μ.

P. rhodophthalma (p. 255)

34*a*. Thecium 150—240μ high; spores 18—28 × 8—14μ.

35. Thallus olivaceous-brownish, with subtly whitish-pruinose surface (seen under × 10 lens).

P. fuscidula (p. 207)

35*a*. Thallus whitish or cream-coloured, not pruinose.

P. parellina (p. 244)

27*a*. Central part of thallus distinctly rimose-areolate.

36. Thallus effuse, indeterminate, without any trace of marginal effiguration; thin (up to 0.2 mm. thick); areolae contiguous or dispersed. *P. effusa* (p. 216)

36*a*. Thallus distinctly effigurate at periphery, thicker, areolae not dispersed.
37. Peripheral lobes very short, less than 1 mm long ; central part of thallus finely and regularly areolate with areolae 0.4—0.9 mm diam. ; medulla paraplectenchymatic. *P. brachyloba* (p. 212)
37*a*. Peripheral lobes over 1 mm long ; areolae of central part of thallus larger and less regular ; medulla hyphose.
38. Surface of thallus subtly whitish-pruinose (seen under × 10 lens) ; general colour of thallus olivaceous-brownish. *P. fuscidula* (p. 207)
38*a*. Surface of thallus not pruinose; colour whitish cream-coloured, or pallid alutaceous (rarely pale brownish).
39. Medulla Pd + red.
40. Thecium 225—255 (—280)μ high. *P. Dusenii* (p. 215)
40*a*. Thecium up to 165μ high.
41. Thallus distinctly areolate, the areolae often tesselate - divided into smaller areolae ; marginal lobes usually slightly convex-tumid and somewhat loosely applied to substratum. *P. gelida* var. *subreagens* (p. 206)
41*a*. Thallus indistinctly areolate, the areolae never subdivided; marginal lobes very flattened and closely applied to substratum. *P. stenophylla* (p. 257)
39*a*. Medulla Pd-.
42. Peripheral lobes more or less fused together ; terricolous. *P. Roivainenii* (p.242)
42*a*. Peripheral lobes distinctly separated by cracks ; saxicolous. *P. gelida* (p. 190)

DESCRIPTIONS OF SPECIES

Sect. 1 ASPICILIOPSIS (Müll. Arg.) M. Lamb

1. **P. macrophthalma** (Tayl.) Nyl.

apud Cromb. in *Journ. Bot.* XV (1877) 106, *cum descript.*
Urceolaria macrophthalma Tayl. in *Lond. Journ. Bot.* III (1844) 640, *cum descript.*
Lecanora macrophthalma Nyl. in *Mém. Soc. Nat. Sci. Cherbourg,* V (1857) 336, in *Flora,* XLI (1858) 499, in *Flora,* LXIX (1886) 320, *cum descript.* ; Tuckerm. in *Bull. Torrey Bot. Club,* VI (1875) 58, *cum descript.* ; Cromb. in *Journ. Linn. Soc. Lond., Bot.* XV (1876) 185 ; Hue in *Nouv. Arch. Mus. Hist. Nat. Paris,* sér. 3, III (1891) 59 ; Zahlbr. in *Deutsch. Südpolar-Exped.* 1901-3, VIII (1906) 48, *Cat. Lich. Univ.* V (1928) 670.
Placodium macrophthalmum Müll. Arg. in *Bot. Jahrb.* V (1884) 135, *Flechten* in *Forschungsreise S. M. S.* « *Gazelle* », IV. Theil (1889) 10, *cum descript.* F. Wils. in *Mém. Herb. Boissier,* n° 18 B (1900) 87.
Aspiciliopsis macrophthalma B. de Lesd. in *Ann. Cryptog. Exot.* IV (1931) 101.

Descript. — *Thallus* determinate, closely adpressed to substratum, lobed-effigurate at periphery, in central part rimose but not areolate, 0.15-0.50 mm thick, sordid whitish or cream-coloured, matt, not pruinose, smooth, the irregular cracks sharp-edged, 0.05-0.10 mm wide. Marginal lobes adnate, plane,

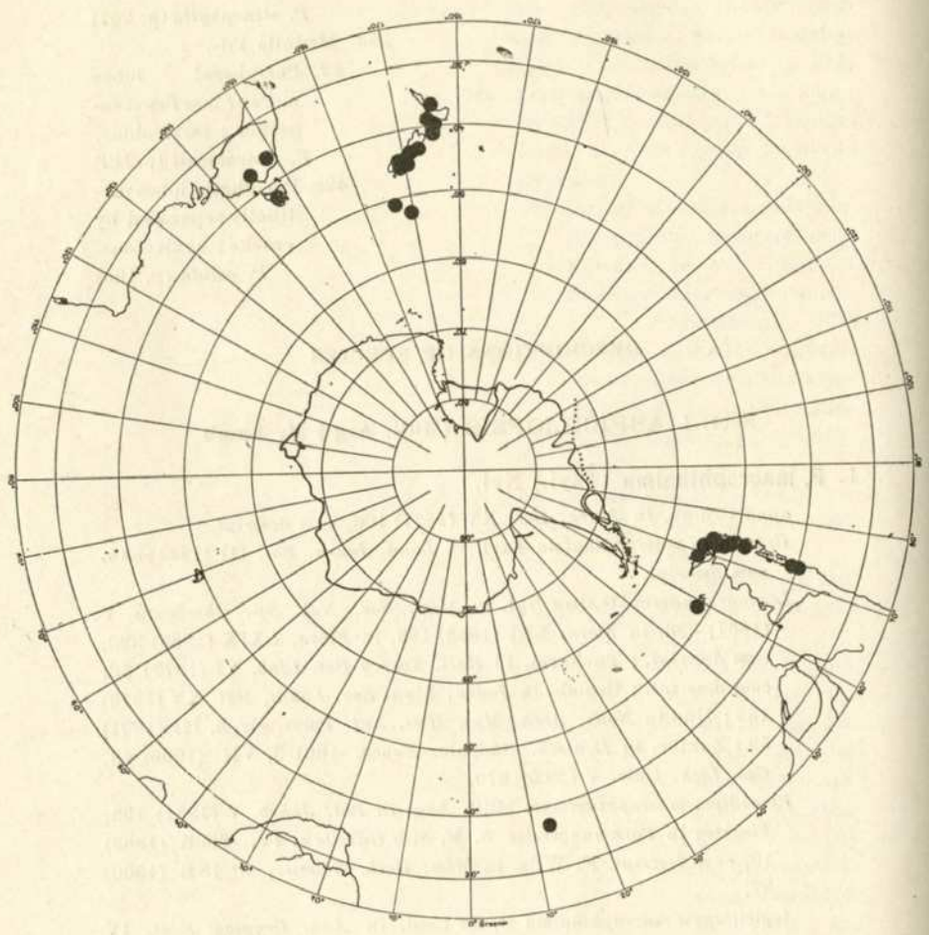

Fig. 6. — Distribution of *Placopsis perrugosa*. Occurrence in Galapagos Islands not shown

rounded at the apices, short, 0.6-1.5 mm broad, separated by very narrow or indistinct cracks. Surface of thallus and medulla KHO + sordid yellow or brownish, $CaCl_2O_2$ + rose-red, Pd + slightly rose-flesh-coloured or —. No visible *hypothallus;* no *isidia* or *soredia*. *Cephalodia* immersed in thallus (innate), sordid yellowish or faintly pink, irregularly rimose, passing gradually into the thallus at their margins, and distinguishable from the thallus only by their somewhat darker colour. *Apothecia* numerous in central part of thallus, entirely immersed (aspicilioid), 1.0-1.5 mm diam., with the non-prominent thalline margin irregularly and sharply circumscissed; proper margin occasionally visible, thin, subconcolorous with the thallus; disc plane or slightly concave, level with the thallus, dark reddish-brown, not shining, not pruinose. Lower *excipular layer* slightly sordid yellow-brownish, paraplectenchymatic ; *hypothecium* colourless ; *thecium* 195-300 μ high, nubilated above, otherwise colourless. *Paraphyses* not thickened at apices. *Spores* 8, uniseriate in the ascus, ellipsoid, 22.5-26.0 × 14-16 μ.

Icon. — Pl. V, fig. 15 (syntype specimen *ex herb.* Churchill Babington) *.

Exsicc. — Zahlbruckner, Lich. rarior. exsicc. 112 («*Lecanora macrophthalma*») (BM.).

Habitat. — On rocks.

Distribution. — Apparently endemic to the islands of Kerguelen and St. Paul in the southern Indian Ocean.

Kerguelen. Exact locality not stated, Hooker (syntype) (fert.) (H., BM.); Christmas Harbour, M'Cormick, 1840 (fert.) (BM.); Christmas Harbour, « on hills 1-700 ft. » (fert.) (BM.); Swain's Bay, Eaton (Venus Transit Exped.) (fert.) (H.).

St. Paul. « Sommet de l'île », Vélain (Expéd. Astron. St. Paul et Amsterdam, 1874-5) (ster.) (H.).

Obs. 1. — In the British Museum syntype specimen, the thallus is not corticate, the upper surface being formed of nubilated, closely adnate, vertically parallel, thin-walled hyphae 2-3 μ thick, forming a layer 60-75 μ deep; medulla nubilated, compact, of irregularly

* The nomenclature of the various categories of types here followed is that of Schenk & McMasters (1936).

intertexted thin-walled hyphae 3.5-5.0 μ thick. Symbiotic algae of thallus 4-7 μ diam., forming an interrupted stratum 180-215 μ deep. Symbiotic algae of cephalodia Scytonemoid, forming nests in the medullary tissue. Excipulum entire below hypothecium, pallid yellow-brown in section, composed of ± isodiametric, angular cells 4.5-6.0 μ diam. with walls up to 1 μ thick : hypothecium about 90 μ deep, colourless or faintly nubilated, of densely compacted hyphae up to 2 μ thick running in various directions. Paraphyses often submoniliform at tips. Asci cylindric-clavate, 150-200×14-27 μ, with walls 1.5-3.0 μ thick at sides, not thicker at apex, with iodine stained persistently blue. No pycnidia seen ; pycnoconidia, according to a drawing and manuscript note by Nylander with the Swains's Bay specimen (n° 23866 in herb. Nyl.), filiform, arcuate, 26-36×0.5 μ ; see also Obs. 3 below.

Obs. 2. — This species occupies a position analogous to the sect. *Aspicilia* of *Lecanora*.

Obs. 3. — Zahlbruckner, apud Engler & Plantl, *Nat. Pflanzenfam. I. Teil, Abt. 1 * (1907) 203*, states that the pycnoconidia of this species are up to 60 μ in length. I have not been able to trace the source of this information nor to verify it.

Sect. 2. EUPLACOPSIS M. Lamb.

2. **P. gelida** (L.) Nyl.

in *Ann. Sci. Nat. Bot. sér.* 4, XV (1861) 376.

Lichen gelidus L. *Mantissa,* I (1767) 133, *cum descript.* *.

Parmelia gelida Ach. *Meth. Lich.* (1803) 188, *cum descript.*

Lecanora gelida Ach. *Lichenogr. Univ.* (1810) 428, *cum descript.*

Placodium gelidum Gray, *Nat. Arr. Brit. Plants,* I (1821) 448, *cum descript.*

Squamaria gelida Del. *apud* Duby *apud* De Cand. *Botanic. Gall.* II (1830) 659, *cum descript.*

Patellaria gelida Trevis. in *Rev. Lavor. Accad. Padova,* I (1853) 256.

Psoroma gelidum Rabh. *Krypt. -Fl. Sachsen,* 2. Abth. (1870) 247, *cum descript.*

Parmularia gelida Nils. *Die Flechtenvegetation des Sarekgebirges, apud* Hamberg, *Naturw. Unters. Sarekgeb.* III (1907) 34.

* Only the original authors of the combinations are quoted in this synonymy ; for a fuller bibliography see Zahlbruckner, Cat. Lich. Univ. V (1928) 665-7.

Lichen heclae Oed. *Icon. Plant. Daniae,* III, 8 (1770) 8, *cum descript.*

Lichen gelidus β. L. Heclae Retz. *Fl. Scand. Prodr.* ed. 2 (1795) 275.

Lichen gelidus β. rubellus Retz. *op. cit.* ed. 1 (1779) 225.

Placodium Pollinieri Del. *ex* Malbr. *Cat. Lich. Normandie* (1870) 132, *cum descript.*

Placodium gelidum var. *obesum* Körb. in *Sitzungsber. Akad. Wiss. Wien, math.-naturw. Cl.* LXXI. Abth. I (1875) 521, *cum descript.*

Lecanora gelida var. *obesa* Zahlbr. *Cat. Lich. Univ.* V (1928) 668.

Lecanora gelida f. *sorediata* Zahlbr. in *Rept. Sci. Res. Norweg. Exped. Novaya Zemlya,* n° 44 (1928) 31, *cum descript.*

Descript. — *Thallus* determinate, effigurate, forming at first orbicular patches which later become confluent into a crust up to 6 centim. across or larger ; marginal lobes closely or somewhat laxly adpressed to the substratum, contiguous and adnate, separated by cracks up to 0.1 mm wide, plane or tumid, 1.5-2.5 mm long (or often produced indefinitely back into the central part of the thallus, where by transverse fission they gradually become converted into areolae), 0.5-1.6 mm broad, 0.2-0.4 mm thick, variously subdichotomously or sympodially branched ; at the apices slightly uneven, rounded or obsoletely crenulate, concolorous at the edge or sometimes with a very narrow darker (olivaceous-brownish) peripheral zone. Central part of thallus rimose-areolate, 0.3-1.5 mm thick; areolae irregularly angulose (often radially elongated), plane or slightly tumid, 0.6-2.0 mm diam., separated by cracks up to 0.1 mm wide, these cracks with ± rounded-off edges; glaucous-whitish, cream-coloured or ivory-coloured, often with a slight olivaceous-brownish tinge (or sometimes, notably in specimens from Iceland, with a faint purple tinge), smooth, matt, not pruinose. Surface of thallus KHO — or + indistinctly yellowish, $CaCl_2O_2$ usually + rose-red, Pd — or pale flesh-coloured; medulla KHO — or + indistinctly yellowish, $CaCl_2O_2$ + red, Pd — (or Pd + red in var. *subreagens*). No *isidia*. *Soredia* usually present, scattered more or less thickly over the central part of the thallus, rounded or radially elongate, 0.3-1.0 mm diam., eroded or plane (pulvinate-erumpent in f. *neglecta*), often irregularly confluent, pulverulent-granulose, olivaceous-greenish or subconcolorous with the thallus (more rarely whitish or olivaceous-fuliginous). No visible *hypothallus*. *Cephalodia* single and central in young thalli,

irregularly scattered in older thalli, sessile, 1.0-3.0 (-8.0) mm diam., 0.4-1.6 mm thick, orbicular, effigurate, radially plicate and cracked (sometimes subglobose and verruculose), yellow-brownish, ferruginous, or reddish-brown, matt. *Apothecia* somewhat rare, scattered, sessile, discoid, well constricted at base, 0.8-1.4 (-2.0) mm diam., with the thalline margin thickish, prominent or finally somewhat depressed, entire, matt; proper margin occasionally visible, thin, entire, brownish-flesh-coloured or brown, matt; disc plane, smooth or minutely scabrid, dark flesh-coloured, yellow-brown, or red-brown, often with a cinereous or whitish pruina, matt. Paraplectenchymatic *excipulum* well developed below hypothecium, nubilated; *hypothecium* colourless (more rarely faintly pink); *thecium* (105-) 115-165 (-183) μ high (in New Zealand specimens up to 200 μ), pale sordid yellowish or granulose-nubilated in upper part, otherwise colourless or sometimes faintly rose-pink. *Paraphyses* not or only slightly thickened at tips. *Spores* 8, uniseriate or subbiseriate in the ascus, ellipsoid, 12-19 (-20) × 6-8 (-13) μ. *Pycnidia* immersed, causing slight swellings of the thallus, indicated externally by brown-blackish spots up to 0.1 mm diam.; spherical, about 330 μ diam., with nubilated paraplectenchymatic perifulcrium; fulcra often branched, acuminate, 1.0-1.5 μ thick; *pycnoconidia* filiform, arcuate or almost straight, 15-270.5 μ.

Icon. — Pl. I, fig. 4 (a fertile specimen from Norway, Voss, nat. size); Pl. IV, fig. 12 (a darker form from British Columbia, Harrison Lake, nat. size); Pl. VI, fig. 20 (a young specimen from Iceland, Lake Medalfellvatn). Further: *Ach. Lichenogr. Univ.* pl. VII, fig. 7 (1810) (sections of apothecia, not good); Bastow in *Victorian Naturalist*, XXX, pl. IX, fig. 50 (1914) (not good, species doubtful); Crombie, *Mon. Lich. Brit.* I, p. 356, fig. 60 (1894) (algae of cephalodia, spores, fulcra, and pycnidiospores); Forssell in *Bih. Svensk. Vetensk.-Akad. Handl.* VIII, 3, pl. I, figs. 1 & 2 (1883) (section of cephalodium and associated alga); Harmand in *Bull. Soc. Sci. Nancy*, ser. II, XV, pl. XV, fig. 48 (1898) (alga from cephalodium); Hedrick in *Pap. Mich. Acad. Sci.* XXI, pl. X, fig. 1 (1936) (good photograph of typical form); Hepp, *Abbild. u. Beschr. Sporen Flecht. Europ.* IV, pl. LXXXIX, fig. 773 (1867) (spores); Keissler in

Rabh. Krypt.-Fl. ed. 2, *Flechten*, VIII, p. 404, fig. 78 (1930) (part of thallus parasitised by *Discothecium squamarioides)*; Lindsay in *Trans. Roy. Soc. Edinburgh*, XXII. pl. XV, figs. 18 & 19 (1859) (section of pycnidium, fulcra and pycnoconidia); Migula, *Krypt.-Fl.* IV, 1, pl. 29B, fig. 4 (1926) (spores); Nylander, *Synops. Lich.* II, pl. I, fig. 39 (1888) * (spores and pycnoconidia); Oeder, *Icon. Plant. Daniae*, III, 8, pl. CCCCLXX, fig. 2 (1770); Sernander in *Svensk. Bot. Tidskr.* I, p. 97 & 135. figs. 1-3, pl. I, figs. 1-15, pl. II, figs. 1 & 2 (1907); Smith, *Lichens (Cambridge Botanical Handbook)*, p. 137, fig. 77 (1921) (part of thallus with cephalodia, after Zopf); Smith & Sowerby, *Engl. Bot.* X, pl. 699 (1800), ed. 2, XI, pl. 2128 (1844) (good); Zopf in *Nova Acta Leop. Carol.* LXX, p. 114, fig. 14 (1897) (part of thallus parasitised by *Sorothelia squamarioides*).

Exsicc. — Arn. *Lich. exs.* 430 (« *Placodium gelidum* ») (H., K., M.) (f. *neglecta)*; Des Abb. *Lich. Armoric. spect. exs.* 74 (« *Squamaria gelida* ») (*Des Abb.)*; Dicks. *Hort. sicc. Brit.* fasc. VII, 25 (« *Lichen gelidus*») (K., BM.) (f. *neglecta*); E. Fries, *Lich. Suec. exs.* 361 (« *Parmelia gelida*») (G., K., M., O.); Th. Fries, *Lich. Scand. rarior. et critic. exs.* 31 (« *Placodium gelidum* ») (K., M., O.) (typical in O., M.; f. *neglecta* in K.); Harm. *Lich. in Loth.* 447 (« *Lecanora gelida* ») (M.); Havaas, *Lich. Norveg. exs.* 42 (« *Placodium gelidum* ») (H., O.); Hepp, *Flecht. Europ.* 773 (« *Lecanora gelida* ») (G., K., S.); Larbal. *Lich.-Herb.* 50 (« *Squamaria gelida* ») (K., BM.); H. Magn. *Lich. sel. Scand. exs.* 272 (« *Lecanora gelida* f. *leprosula* ») (BM.); Malme, *Lich. Suec. exs.* 396 (« *Lecanora gelida* ») (H.); Picquenard, *Lich. Finist.* 116 (« *Squamaria gelida* ») (not seen); Salwey, *Lich. Brit.* III, 95 (« *Squamaria gelida* ») (BM.); Zahlbr. *Lich. rarior. exs.* 54 (« *Lecanora gelida* ») (BP.).

Habitat. — Rocks; very rarely over mosses.

Distribution. — Widely distributed in arctic and temperate oceanic Europe, N. America, and E. Asia, reaching south to about 45 deg. N. lat.; Macaronesia (perhaps a distinct variety

* The unfinished second volume of Nylander's « Synopsis Lichenum » was published in 1885, not in 1863 as is commonly supposed. The plate of illustrations was not issued until 1888.

or species; see p. 204); New Zealand; Java; Chile. In Europe the most southerly known station is in France: Cantal (about 45.15 deg. N. lat.), and the most continental (easterly) station recorded is in Moravia. Kahlenberg near Kunzendorf (16.29 deg. E. long.).

A. NORTHERN HEMISPHERE

SWEDEN *. *Torne Lappmark:* near Lake Torneträsk, Zander, 1927 (ster.) (FH.); Jebrinsuolo in Lake Torneträsk, Vrang, 1919 (ster.) (W.); Jebrinjokk near Lake Torneträsk, Magnusson, 1919 (ster.) (*Magn.*); Kaisepakte near Lake Torneträsk, Magnusson, 1919 (ster.) (GB., *Magn.*). *Lule Lappmark:* Nammats, Hellbom, 1871 (f. *neglecta*) (ster.) (GB.); Kvikkjokk, Tarraälv, Hülphers, 1937 (ster.) (GB.); (Sarek Mts., Alkavagge, recorded by Nilson, Die Flechtenvegetation des Sarekgebirges, *apud* Hamberg, Naturw. Unters. Sarekgeb. III, 1 (1907) 34; Sarek Mts., Mikkajokk, recorded by Nilson, *loc. cit.*; Sarek Mts., Tjagnarisjokotj, recorded by Nilson, *loc. cit.*); *Lycksele Lappmark*: Björkfors, Stenholm, 1924 (ster.) (FH., GB.); Syterbäcken, Magnusson, 1924 (ster.) (*Magn.*); *Jämtland:* Handöl, Du Rietz, 1911 (ster.) (M.), Lundquist, 1913 (partly f. *neglecta*) (ster.) (GB.); Enafors, Du Rietz, 1911 (ster.) (GB., H.), Vrang, 1909 (f. *neglecta*) (ster.) (GB.); (Skurdalsport, recorded by Hellbom in *Kgl. Svensk. Vetensk.-Akad. Handl.* XX, 8 (1884) 47; Areskutan, recorded by Hellbom, *loc. cit.*); *Härjedalen:* Funnesdalsberget, Hellbom, 1867, 1878 (ster.) (GB.); Midtakläppen, Hulting, 1867 (ster.) (GB.); *Dalsland:* exact locality not stated, Hulting, 1870 (f. *neglecta*) (ster.) (W.); (Animskog, recorded by Th. Fries, *Lichenogr. Scand.* I (1871) 228; Köpmannebro, recorded by Hulting in *Bih. Svensk. Vetensk.-Akad. Handl.* XXVI, Afd. III, n° 3 (1900) 50); *Bohuslan:* Ytterby, Magnusson, 1941 (ster.) (*Magn.*); (Skaftö, recorded by Degelius in *Uppsala Univ. Arsskr.* n° 11 (1939) 163); *Västergotland:*

* For considerations of space, no detailed enumeration is given of localities in provinces of Sweden, Norway, and the British Isles where the species is very common. Literary records, when of distributional interest, are included in brackets.

appears to be common, material seen or recorded from 13 localities in all; *Halland:* Älvsaker, Hjälmared, Magnusson, 1936 (ster.) (BM.); (Lindhult, recorded by Th. Fries, *loc. cit.*); *Småland:* Femsjö, Th. Fries, 1851 (fert.) (K.), 1857 (ster.) (W.), 1859 (fert.) (K., M., O.) (partly f. *neglecta*), Blomberg, 1859 (partly f. *neglecta*) (sparingly fert.) (GB., M.), Stenhammar (ster.) (M.), Theorin, 1864 (ster.) (GB.); Svenarum, Theorin, 1878 (ster.) (GB.); (Malmbäck, recorded by Th. Fries, *loc. cit.*).

NORWAY. *Finnmark:* appears to be common, material seen or recorded from 10 localities in all; *Troms:* Tromsö, Norman (ster.) (H.), Th. Fries, 1864 (ster.) (O.), Lynge, 1910 (ster.) (O), 1914 (fert.) (O.); Middagsfjell, Norman, 1869 (ster.) (O.); Lulle, Lynge, 1911 (f. *neglecta*) (ster.) (FH., H., O., W.); Dividal, Norman (ster.) (O.); Finnsnes, Lynge, 1914 (fert.) (O); *Nordland:* Salten, exact locality doubtful (ster.) (M.); Gildeskal, Norman (ster.) (O.); Saltdal, Sommerfelt, 1820 (f. *neglecta*) (ster.) (O.); Bodö, Lynge, 1911 (ster.) (O.); Umbukta, Krabbfjäll, Magnusson, 1924 (ster.) (*Magn.*); (Moskenesöy, recorded by Degelius in *Nyt. Mag. Naturv.* LXXVIII (1938) 282); *Sör-Tröndelag:* Knutshö, Th. Fries, 1863 (ster.) (H.), Lynge, 1925 (f. *neglecta*) (ster.) (O.); Trondheim, 1828 (ster.) (K.); *Möre og Romsdal:* Alesund, Norman, 1877 (ster.) (O.) Björlykke, 1930 (ster.) (O.); Romsdal, Havaas (ster.) (O.); Sunnmöre, Björlykke, 1929 (f. *neglecta*) (fert.) (O); Sunndal, Havaas, 1902 (ster.) (*B. de Lesd.*); *Sogn og Fjordane:* Gaula, Lunde, 1929 (fert.) (O.); (Sognefjord, recorded by Th. Fries, *Lichenogr. Scand.* I (1871) 228; Askvoll, recorded by Degelius in *Bergens Mus. Aarb., naturvidensk. rekke,* n° 3 (1934) 22; Eid, recorded by Degelius, *loc. cit.*; Flekke, recorded by Degelius, *loc. cit.*; Vagsöy, Revvik, recorded by Degelius, *loc. cit.*; Sandane, recorded by Degelius, *loc. cit.*; Öie Bakken, recorded by Degelius, *loc. cit.*; *Hordaland:* Granvin, Havaas, 1900 (fert.) (H., O.), Lynge, 1915 (fert.) (O); Voss, Blytt, 1833 (fert.) (O., BP., W.) (partly f. *neglecta*), Havaas, 1927 (f. *neglecta* (ster.) (O.), Lid, 1923 (ster.) (O); Samnangerfjord, Havaas, 1909 (fert.) (O.); Hardanger, Lillefosse, 1916 (f. *neglecta*) (ster.) (O.), 1920 (fert.) (O), 1928 (ster.) (O); Mosteröy, Havaas & Lynge, 1915 (partly f. *neglecta*) (ster.) (O); *Rogaland:* Suldal, Lynge, 1906 (fert.) (FH-); Sogndal, Havaas,

1905 (fert.) (O.); *Vest-Agder:* Kristiansand, Baur (ster.) (O.); Mandal, Lynge, 1918 (ster.) (O.); Lyngdal, Blytt, 1826 (fert.) (O.); *Opland:* Dovre, Sommerfelt, 1823 (ster.) (O.), Boeck, 1828 (ster.) (O.), Th. Fries, 1863 (ster.) (K.), Schimper (partly f. *neglecta*) (ster.) (K.), Lynge, 1916 (f. *neglecta*) (ster.) (O.); Fokstua, Lynge, 1925 (ster.) (O.).

FAEROES. Strömö, near Thorshavn, Hartz & Ostenfeld, 1897 (fert.) (O., S.), (ster.) (FH., H., W.), Rostrup, 1867 (ster.) (GB., S., U.).

SCOTLAND. *Caithness:* Camster Cairns, Lillie, 1906 (ster.) *(B. de Lesd.); Ross and Cromarty:* exact locality not stated, Howse, 1873 (ster.) (BM.); Applecross, Crombie, 1887 (ster.) (BM.); *Inverness:* Fort Augustus, Lindsay, 1856 (fert.) (K., BM.); Ben Nevis, altit. 1340 m, Lindsay, 1856 (ster.) (K.), by the lake, Crombie (fert.) (BM.); Rothiemurchus, Crombie (ster.) (BM.); Skye, Sgurr nan Gillean, Sligachan, Lindsay 1856 (ster.) (M.); Skye, Quiraing, Lindsay, 1856 (fert.) (K.); Barra, 1935 (Exped. Biol. Soc. Univ. Edinburgh) (ster.) (E.); *Argyll:* Oban, Babington, 1838 (fert.) (BM.); Ben Cruachan, Babington, 1838 (fert.) (BM.); head of Loch Awe, Crombie (fert.) (BM.); Loch Awe, North Port Sonachan, Lamb, 1940 (n^{os} 910, 970) (fert.) (BM.), (n° 1010) (f. *neglecta*) (ster.) (BM.); (Kilchurn Castle near Dalmally, recorded by Hooker, *Fl. Scot.* II (1821) 50; Lochgoilhead, recorded by Stirton in *Guide Book Brit. Ass. Glasgow Meeting* (1876) 102); *Aberdeen:* Braemar, Crombie (ster.) (BM.); Glen Candlic near Braemar, Crombie (fert.) (BM.); Invercauld, Brown, 1792 (fert.) (BM.); *Forfar:* exact locality not stated (fert.) (BM.); Caen Lochan, Crombie (fert.) (BM.); *Perth:* appears to be common, material seen or recorded from 12 localities in all; (*Stirling:* Ben Lomond, recorded by Hooker, *loc. cit.); Kirkcudbright:* New Galloway, McAndrew (ster.) (BM).

ENGLAND. (*Isle of Man:* Sulby Glen, recorded by Watson in *Journ. Bot.* LXXI (1933) 315); *Cumberland:* Buttermere (f. *neglecta*) (ster.) (K.); *Westmorland:* Red Screes, Martindale, 1886 (f. *neglecta*) (ster.) (BM.); Scandale, Martindale, 1887 (f. *neglecta*) (ster.) (BM.); Stavely, Martindale, 1873 (fert.) (BM.); (Ambleside, recorded by Mudd, *Man. Brit. Lich.* (1861) 130);

Durham: Teesdale, Mudd, 1863 (fert.) (BM., M); Egglestone, Winch (fert.) (BM.); (*York:* Cronkley Fell, recorded by Johnson in *Nat. Hist. Trans. Newcastle* VIII (1889) 313; Holwick, recorded by Leighton, *Lich.-Fl. Gr. Brit.* ed. 3 (1879) 160; Winch Bridge, recorded by Leighton, *loc. cit.*; Caldron Snout, recorded by Leighton, *loc. cit.*); *Carnarvon:* Llanberis, Watson, 1919 (ster.) *(Wats.)*; Nant Ffrancon, Leighton (ster.) (BM.); Glyders, 1871 (ster.) (BM.); Moel-y-Gest, Leighton, 1877 (fert.) (K.); (near Capel Curig, recorded by Withering, *Arr. Brit. Plants,* ed. 6, IV (1818) 31; Cwm Idwell, recorded by Withering, *loc. cit.*); *Merioneth:* near Dolgelley, Holl (ster.) (BM); Llyn Bodlyn (ster.) (BM.); Talsarnau, Jones, 1920 (fert.) (*Wats.*), Jones & Rhodes, 1924 (fert.) (FH.); Arthog, Salwey (fert.) (BM.); Cader Idris, Holl (fert.) (BM.), Leighton, 1866 (ster.) (K.), 1869 (ster.) (K.), Price Evans, 1931 (ster.) (BM.); (Aran Mowddwy, recorded by Leighton, *loc. cit.*; *Shropshire:* Longmynd Hill, recorded by Leighton, *loc. cit.*; Stiperstones Hill, recorded by Leighton, *loc. cit.*; *Devon:* Bridford, recorded by Leighton, *loc. cit.*); *Cornwall:* St. Austell, Tellam, 1872 (fert.) (BM.).

IRELAND. *Antrim:* Carnlough, Jones (ster.) (BM.); (Glenmakeeran, recorded by Knowles in *Proc. Roy. Irish Acad.* XXXVIII, sect. B, n° 12 (1929) 273; Fair Head, recorded by Knowles, *loc. cit.*; *Tyrone:* Cappagh, recorded by Knowles, *loc. cit.*); *Mayo:* Clare Island, Lorrain Smith, 1910 (ster.) (BM.); *Wicklow:* Glendalough, Knowles, 1914 (ster.) (*Magn.*); (Lough Dan, Lough Tay, Lugnaquilla, recorded by Knowles, *loc. cit.*); *Galway:* Connemara, exact locality not stated, Larbalestier, 1876 (fert.) (H.); Letterfrack, Larbalestier (fert.) (K., BM.); Recess, Larbalestier, 1875 (fert.) (BM.); Lough Muck, Larbalestier (fert.) (K.); (Lough Inagh, recorded by Knowles, *loc. cit.*; Salrock, recorded by Knowles, *loc. cit.*; *Waterford:* Comeragh Mts., recorded by Knowles, *loc. cit.*); *Cork:* Bantry Bay, Fairhead, « near the level of the sea », Taylor, 1815 (f. *neglecta*) (fert.) (K.); (Glengariff, recorded by Knowles, *loc. cit.*; Pass of Keamaneigh, recorded by Knowles, *loc. cit.*); *Kerry:* Dingle, Carroll (fert.) (K., BM., U.); Dunkerron, Taylor (fert.) (BM.); (Macgillycuddy's Reeks, recorded by Knowles, *loc. cit.*).

FRANCE. *Calvados :* Vire, Delise, 1831 (fert.) (K., BM., M.), Pelvet (fert.) (G., K., M., S., U.), (f. *neglecta*) (ster.) (FH.); (*Orne :* Châtellier, recorded by Harmand, *Lich. France,* V (1913) 939); *Cotes-du-Nord :* Bon Repos near Laniscat, Des Abbayes (fert.) (*Des Abb.*); *Finisterre :* Ergué-Gaberic Mts., Picquenard, 1897 (fert.) (BM.); (Scaer, recorded by Harmand, *loc. cit.*; Quimper, recorded by Harmand, *loc. cit.*; *Morbihan :* Napoleonville (Pontivi), recorded by Cauvin in *Congr. Sci. France,* I (1833) 49); *Sarthe :* St.-Georges-le-Gaultier, Monguillon, 1907 (ster.) (M.); St.-Léonard-des-Bois, Monguillon, 1898 (fert.) (BM.); *Vendée :* Nicachat, Richard, 1884 (ster.) (W.); *Puy de Dome :* Mont Dore, Brevière, 1898 (ster.) (*B. de Lesd.*); (*Cantal :* Le Croiset, near Aurillac, recorded by Harmand, *loc. cit.*; *Haute Savoie :* Glacier des Bois, recorded by Harmand, *loc. cit.*); *Vosges :* Bussang, Claudel, 1890 (ster.) (M.); (Gérardmer, recorded by Harmand, *loc. cit.*; Schlucht, recorded by Harmand, *loc. cit.*; Tête du Houssot, recorded by Harmand, *loc. cit.*; Bonne Fontaine, near Tholy, recorded by Harmand, *loc. cit*).

(BELGIUM. *Luxembourg:* Frahan, recorded by de Wildeman & Durand, *Prodr. Fl. Belge,* I (1898) 492).

(LUXEMBURG : Near Bivers, recorded by Koltz in *Mém. Soc. Bot. Luxemb.* XIII (1897) 191).

GERMANY. (*Anhalt :* Ramberg, near Friedrichsbrunn, recorded by Schwabe, *Fl. Anhalt.* II (1839) 154; *Sachsen :* Zittau, recorded by Körber, *Syst. Lich. German.* (1885) 117); *Schlesien :* exact locality doubtful, Schrader, 1802 (fert.) (BM.); « e Sudetis Siles. », Ludewig, 1809 (ster.) (M.); *Baden :* Präg, near Todtnau, Lösch (ster.) (FH., MO., *Szat.*).

AUSTRIA. *Tirol:* Obergurgl, Arnold, 1878 (ster.) (M.) Pinzgau, Hollersbacher Tal, Laurer, 1865 (ster.) (H.); Umhausen in the Oetztal, Arnold, 1870 (f. *neglecta* (ster.) (H., K., Lund, M., Welt., W.); (Kühtai, recorded by Dalla Torre & Sarnthein, *Fl. Tirol,* IV (1902) 231; Windischmatrei, recorded by Olivier in *Mém. Soc. Nat. Sci. Cherbourg,* XXXVII (1909) 55); *Steiermark :* Schladmingertauern, altit. 1900 m, Frey, 1930 (ster.) *(Frey).*

(CZECHOSLOVAKIA. *Bohemia :* Parchen and Haida, recorded by Migula, *Krypt. Fl.* IV, 1 (1926) 316; *Moravia :* Kahlenberg, near Kunzendorf, recorded by Körber, *Syst. Lich. German.* (1855) 117).

U. S. S. R. (Kola Peninsula, exact locality not stated, recorded by Nylander in *Not. Sällsk. Fauna & Flora Fenn. Förh.*, n. s., V (1866) 126; « Lapponia Rossica : pluribus locis ad Mare glaciale », recorded by Th. Fries, *Lichenogr. Scand.* I (1871) 229); *Novaya Zemlya :* Matotchkin Shar, Lynge, 1921 (f. *neglecta*) (ster.) (O.), Höfer, 1872 (holotype of « *Placodium gelidum* var. *obesum* ») (ster.) (L.); Matotchkin Shar, Mt. Lasareff, Lynge, 1921 (ster.) (O.); Matotchkin Shar, Pomorskaya, Lynge, 1921 (lectotype of « *Lecanora gelida* f. *sorediata* ») (ster.) (O.); Mashigin Fjord, Blomster Bay, Lynge, 1921 (f. *neglecta* (ster.) (O.); Mashigin Fjord, Dal Bay, Lynge, 1921 (f. *neglecta*) (ster.) (O.); Mashigin Fjord, Sol Bay, Lynge, 1921 (ster.) (O.); Mashigin Fjord, Strömsnes Bay, Lynge, 1921 (ster.) (O.); Mashigin Fjord, Mt. Tveten, Lynge, 1921 (ster.) (W.).

SPITSBERGEN. Bellsund, Polunin, 1933 (ster.) (O.); Bellsund, Kolfjellet, Lynge, 1926 (ster.) (BM., O.); Bellsund, Van Mijenfjorden, Lynge, 1926 (f. *neglecta,* muscicola !) (ster.) (O.); Isfjorden, Barentsburg, altit. 75 m., Lid, 1924 (ster.) (O.); Isfjorden, Torvedalen, Höeg, 1924 (ster.) (H., O.) (partly f. *neglecta*), Lid, 1924 (ster.) (O.); Isfjorden, Grönfjorden, Th. Fries, 1868 (ster.) (O.); Sörkapp-Hornsund, Fisnes, Lid, 1920 (ster.) (O.); Sveagruva, Lynge 1926 (ster.) (*Magn.*); Hopen, Iversen & Koefoed, 1924 (ster.) (BM.), Koefoed, 1929 (ster.) (O.); Hopen, Husodden, Iversen & Koefoed, 1924 (ster.) (O.); Hopen, Lyngefjellet, Iversen, 1930 (ster.) (O.); (Hopen, Thorkelsenskardet, recorded by Lynge in *Norges Svalb. og Ishavs-Unders.* n° 44 (1939) 10).

BEAR ISLAND (= BJÖRNÖYA = BEEREN EILAND). Mt. Misery, Irrfärden, Th. Fries, 1868 (ster.) (FH., GB., H., O., U.); Tunheim, Lid, 1924 (ster.) (O.).

ICELAND. *Sudr Thingeyjar :* Husavik, Lynge, 1937 (ster.) (O.); *Myra:* Grabrok, Lynge, 1937 (ster.) (O.); Hredavatn, Lynge, 1937 (ster.) (O.); *Borgar Fjardar :* Lake Medalfellvatn, Magub, 1937 (n° 9 *pr. p.*) (ster.) (BM.); Borg, Lynge, 1937 (partly f. *neglecta* (ster.) (O.); Akrafjell, Lynge, 1937 (ster.) (O.); *Kjosar :* Esja, Grönlund, 1868 (partly f. *neglecta*) (ster.) (U.), Lynge, 1937 (ster.) (O.); near Reykjavik, Lynge, 1937 (f. *neglecta*) (ster.) (O.),

Rabenhorst, 1874, (fert.) (BP., W.); *Gullbringu:* Husfell, Lynge, 1937 (fert.) (O.); (Krisuvik, recorded by Th. Fries in *Acta Soc. Sci. Upsal.*, ser. III, III (1861) 183; Hafnarfjordr, recorded by Grönlund in *Bot. Tidsskr.* IV (1870) 162); *Arnes:* Reykir, Lynge, 1937 (fert.) (O.); Langarvatn, Lynge, 1937 (ster.) (O.); Thingvellir, Ahlstrand, 1930 (ster.) (*Magn.*); Almannagja, Lynge 1937 (ster.) (O.); (Geysir, recorded by Grönlund, *loc. cit.*); *Rangar Valla:* Sidumannaafrjettur, Steindorsson, 1937 (ster.) (O.); Eyjafjall, Ingram, 1936 (ster.) (*Jones*).

JAN MAYEN. Österrikerhuset, Nordlaguna, Lynge, 1929 (ster.) (O., *Magn.*); Nordlaguna, Iversen, 1930 (ster.) (O); Scoresbykrateret, altit. 451 m., Lid, 1930 (ster.) (O); Vogtkrateret, Lid, 1930 (ster.) (O.); Arnethkrateret, altit. 50 m, Lid, 1930 (ster.) (O.); Ekerolddalen, Lid, 1930 (ster.) (O.); Fishburn Valley, Russell, 1938 (ster.) (BM.); Wallross Gat, Russell, 1938 (ster.) (BM.): (Blytts Bjerg, recorded by Mathiesen in *Dansk Bot. Ark.* IV, 5 (1924) 27; stony plains between Mohns Bjerg and Wildberg recorded by Mathiesen, *loc. cit.*; Beerenberg, Mathumpen, altit. 1566 m, recorded by Lynge in *Skr. Svalb. og Ishavet,* n° 76 (1939) 38).

GREENLAND. *W. Greenland:* Disko, Blafjell, Th. Fries, 1871 (ster.) (O.); (*S. W. Greenland:* Igaliko. recorded by Deichmann Branth & Gronlund in *Medd. Grönland,* III (1887) 475; Julianehaab, recorded by Deichmann Branth & Grönlund, *loc. cit.*; Tasermiut, recorded by Deichmann Branth & Grönlund, *loc. cit.*; *S. Greenland:* Ikerasarsuak, recorded by Deichmann Branth & Grönlund, *loc. cit.*; Arsuk Fjord, recorded by Grönlund in *Vidensk. Medd. Naturhist. Forening Kjöbenhavn* (1877) 246); *S. E. Greenland:* Kangerdluluk, Vahl (ster.) (H.); (Kangerdlugsuatsiak, Möretun, recorded by Dahl, Lynge & Scholander in *Skr. Svalb. og Ishavet,* n° 70 (1937) 53; Kangerdluarak, recorded by Deichmann Branth & Grönlund, *loc. cit.*; *E. Greenland:* Drottning Augustas Dal, recorded by Malme in *Ark. f. Bot.* XXIIA, 14 (1929) 5).

AFRICA. *Canary Islands:* Palma, altit. 900 m, Pitard (fert.) (*B. de Lesd.*) * (*Madeira:* recorded by Stizenberger in *Ber. Naturw. Ges. St. Gallen,* 1888/89 (1890) 194).

* This specimen differs in several respects from the typical *P. gelida*, and may be a distinct variety or species; see remarks on p. 204.

E. ASIA. *Kamtchatka:* Awatchinsk Volcano, Hultén, 1920 (n° 690) (Svenska Kamtchatka-Expeditionen 1920-22) (ster.) (U.); *Aleutian Islands:* Kanaga Island, N. W. side, Hultén, 1932 (n° 6490*a*) (holotype of f. *neglecta* Degel.) (ster.) (U.); Carlisle Island, Hultén, 1932 (n° 6608*a*) (fert.) (U.); Amlia Island, Eyerdam, 1932 (ster.) (FH.); Unalaska Island, Eyerdam, 1932 (ster.) (FH.), Hultén, 1932 (n° 5391, 5392, 5398, 5399) (ster.) (U.) (partly together with *P. cribellans* f. *tuberculifera*); Unimak Island, False Pass, Eyerdam, 1932 (ster.) (FH., S.); (Amchitka Island, recorded by Degelius in *Acta Hort. Gothoburg.* XII (1937) 125).

CANADA. (*North West Territories, Franklin:* Boothia Peninsula, Port Kennedy, recorded by Hooker in *Journ. Linn. Soc. Lond., Bot.* V (1861) 87); *British Columbia:* Harrison Lake, Bonser, 1907 (n° 22) (ster.) (*B. de Lesd.*); Vancouver Island, exact locality not stated, Macoun, 1875 (fert.) (K.); (near Stuart Lake, recorded by Macoun, *Cat. Canad. Plants* VII (1902) 104).

U. S. A. *Alaska:* exact locality not stated, Hess, 1905 (ster.) (W.); Glacier Bay, Muir Glacier, Trelease & Saunders, 1899 (Harriman Alaska Exped.) (partly f. *neglecta*) (fert.) (MO.); Alexander Archipelago, Baranoff Island, Hot. Springs, Trelease & Saunders, 1899 (Harriman Alaska Exped. (f. *neglecta*) (ster.) (MO.) Alexander Archipelago, Cape Fox, Trelease & Saunders, 1899 (Harriman Alaska Exped.) (f. *neglecta*) (ster.) (MO.); (Cape Lisburne, recorded by Nylander in *Bull. Soc. Linn. Normandie,* sér. 4, I (1887) 281; Seward Peninsula, Port Clarence, recorded by Cummings in *Harriman Alaska Exped.* V (1904) 109; Alaska Peninsula, Belkoffski, recorded by Cummings, *loc. cit.*; Prince William Sound, Port Wells, recorded by Cummings, *loc. cit.*; Yakutat Bay, recorded by Cummings, *loc. cit.*); *Washington:* exact locality not stated, Suksdorf (ster.) (BM.); Kitsap, Orchard Point, Piper, 1895 (f. *neglecta*) (ster.) (FH.); near Summit, « on exposed boulders of hills », Foster, 1907 (ster.) (FH.); San Juan, Friday Harbor, Trye, 1905 (f. *neglecta*) (fert.) (FH.); *Oregon:* Tillamook, Garibaldi, Sweetser, 1899 (fert.) (FH.); (*California:* exact locality not stated, recorded by Fink, *Lich. Fl. United States* (1935) 308); *New Hampshire:* White Mts., exact locality not stated, Tuckerman (ster.) (MO.).

B. SOUTHERN HEMISPHERE

JAVA. *Kedoe:* Mt. Soembing volcano summit, altit. 3330 m, Van Leeuwen-Reijnvaan, 1927 (n° 8821) (fert.) (*DR.*), (n° 8855) (ster.) (*DR.*).

NEW ZEALAND. Exact locality not stated, Colenso (fert.) (K., BM.), Knight (fert.) (WELT.); North Island, *Wellington:* Ruahine Range, at foot of Mt. Conspicuous, on boulders near a brook in burnt forest country, Du Rietz, 1926 (Swed. Bot. Australas. Exped.) (n° 1134*c*) (fert.) (*DR.*); Tararua Range, summit of Mt. Alpha, altit. 1360 m, Du Rietz, 1926 (Swed. Bot. Australas. Exped.) (n° 1405) (fert.) (*DR.*); South Island, *Westland:* Greymouth, on river-bed boulders near coast, Mackay, 1935 (fert.) (W.); *Otago:* Lower Routeburn Valley, on small stones at roadside, Du Rietz, 1927 (Swed. Bot. Australas. Exped.) (n° 1948 *pr. p.*) (fert.) (*DR.*); shore of Routeburn River, on stones, Du Rietz, 1927 (Swed. Bot. Australas. Exped.) (n° 1805 *pr. p.*) (fert.) (*DR.*); south of Lake Harris Saddle, in alpine belt, Du Rietz, 1927 (Swed. Bot. Australas. Exped.) (n° 1753:16) (fert.) (*DR.*); *Canterbury:* Cass, southern slope of Mt. Misery, in moist prealpine *Podocarpus nivalis* heath belt, on small boulders, Du Rietz, 1927 (Swed. Bot. Australas. Exped.) (n° 1481) (f. *neglecta*) (ster.) (*DR.*).

CHILE. *Valdivia:* Lago Riñihue, Riñihue, Cerro Tralcan, «on stones in *Aristotelia maqui* shrubs», Santesson, 1940 (Swed. Magellan. Exped.) (n° 3429) (fert.) (S.); *Magallanes:* Isla Riesco, Mina Elena, «on stone block in an open place near the shore», Santesson, 1940 (Swed. Magellan. Exped.) (n° 2021) (f. *neglecta*), (fert.) (S.); Natales, Cerro Dorotea, «on a big block of sand stone in very thin forest», Santesson, 1940 (Swed. Magellan. Exped.) (n° 2110) (f. *neglecta*) (ster.) (S.); Canal Beagle, Estancia Yendegaia, on rocks in grassland, Santesson, 1940 (Swed. Magellan. Exped.) (n° 1363) (f. *neglecta*) (ster.) (S.).

Obs. 1. — There is no specimen of «*Lichen gelidus*» in the Linnean herbarium. The original was collected by J. G. König during his trip to Iceland in 1765-6. Oeder's «*Lichen heclae*» seems to have been founded on part of the same gathering, and of this a rough but

adequate figure is given in the *Flora Danica*; the reddish central cephalodium is clearly recognisable. Linné outlined the salient features admirably in his short description: «Lichen crustaceus albicans, peltis tuberculosis rugosis testaceis». The following supplementary description is based upon a specimen from Iceland, collected probably near to the type locality by B. Lynge in 1937 (Arnes, Reykir), and preserved at Oslo: thallus well effigurate at periphery, irregularly areolate in centre, Pd-, sorediate with eroded, pale glaucous-greenish, finally somewhat confluent soredia; corticate, the cortex 12-20μ deep, dull yellowish but hardly nubilated, paraplectenchymatic, of cells 3-5μ diam.; medulla compact, nubilated, of interwoven hyphae 2-3μ thick; symbiotic algae 7-9μ diam., forming an interrupted layer 45-75μ deep. Cephalodia up to 5 mm diam., discoid, radiately split and effigurate, rusty brown, containing Scytonemoid algae. Lower paraplectenchymatic excipular layer of apothecia formed of ± isodiametric thin-walled cells 5.0-7.5μ diam. Hypothecium of compacted hyphae 2-4μ thick running in various directions. Thecium 150-165μ high. Paraphyses often branched, 1.3-1.6μ thick. Asci cylindric-clavate, 105-135×12-18μ, with wall 1.5-2.0μ thick at sides and up to 5μ at apex, with iodine stained faint red. *. Spores 15-18 ×9-12μ.

Obs. 2. — *P. gelida* is a polymorphic species, and may actually be in the process of breaking up into distinct regional subspecies. The New Zealand specimens seen, for instance, differ in being constantly esorediate and in having a higher thecium (up to 200 μ); there may be grounds for considering them as belonging to a distinct subspecies or variety, but having seen so little material I have refrained from segregating them. Specimens from other parts of the southern hemisphere (Java and Chile), have, as far as seen, the typical low thecium (up to 160 μ).

Obs. 3. — The holotype of Körber's «*Placodium gelidum* var. *obesum*» is a typical, abundantly sorediate specimen, sterile. The same applies to the original of Zahlbruckner's «*Lecanora gelida* f. *sorediata*». Schaerer, *Enum. Crit. Lich. Europ.* (1850) 60, published a «b. *rufo-fusca*» of this species, based on an unnamed condition described by E. Fries in *Lichenogr. Europ.*

* The iodine reaction of the ascus wall is fluctuating in *P. gelida*; in European material I find it to be either negative or persistently blue.

Reform. (1831) 104, and it has been taken up as « *Lecanora gelida* f. *rufofusca* » in Zahlbr. *Cat. Lich. Univ.* V (1928) 668. Th. Fries, who saw the original specimen, states that it is a from of *Lecidea (Biatora) coarctata* (*Lichenogr. Scand.* I (1871) 229). Zahlbruckner described a form: « *Lecanora gelida* f. *nuda* », from Juan Fernandez *apud* Skottsberg, *Nat. Hist. Juan Fernandez and Easter Island,* II (1924) 381. Subsequently he applied the name also to non-sorediate individuals of *P. gelida* from Novaya Zemlya, in *Rept. Sci. Res. Norweg. Exped. Novaya Zemlya,* n° 44 (1928) 31. No type specimen has come to light, and hence it seems advisable to discard the epithet as *nomen dubium.* « *Squamaria gelida* f. *dispersa* » Cromb. in *Grevillea,* I (1873) 171 (= *Lecanora gelida* f. *dispersa* Cromb. *Mon. Lich. Brit.* (1894) 356) refers, according to the holotype from Scotland, Craig Tulloch, to a morbose and undeveloped condition caused by the attack of a parasite, *Didymosphaeria microstictica* var. *alboatrae;* see p. 175.

Obs. 4. — Dr. A. Schade (Dresden) kindly supplied me with data concerning the occurrence of *P. gelida* in Saxony; it appears that no reliably authenticated specimen has been collected in that region, at any rate within living memory. The most easterly record in Europe is that from Moravia, Kunzendorf, given in Körber, *Syst. Lich. German.* (1855) 117, and Anders, in his paper on vanishing and extinct lichens in N. Bohemia (1935), states that *P. gelida* is not to be found is this region nowadays: « von L. Rabenhorst als bei Haida und Parchen wachsend angegeben. Dieses Vorkommen konnte trotz eifrigen Suchens bisher nicht bestätigt werden. » Pollini, *Fl. Veronens.* III (1824) 443 records *P. gelida* « in Cenisio et in contingentibus summis alpibus Pedemontii »; this is based on a statement by Bellardi in *Mem. Acad. Roy. Sci. Turin,* V (1793) 265. Bellardi however gives a short description, from which it is obvious that the plant to which he refers cannot have been *P. gelida.*

Obs. 5. — The Macaronesian records from the Canary Islands and Madeira must be accepted with a certain reserve. The specimen which I saw from Palma in the Canaries, altit. 900 m, coll. Pitard, in herb. Bouly de Lesdain, had a sorediate thallus

quite like that of typical *P. gelida,* but the hypothecium was reddish-brown in section in its central part (degeneration ?), and the thecium was very high (180-225 μ). Further material will be necessary to decide on the real status of this regional form, which may be a distinct species.

Obs. 6. — Zahlbruckner, in *Rev. Chil. Hist. Nat.* XXXVII (1933) 167, recorded *P. gelida* from Chile: Río Puelo (Boca), coll. Espinosa. I have not seen the specimen, and it is quite probable that the record refers to another species. « *Lecanora gelida* » recorded from Tristan da Cunha by Crombie in *Journ. Linn. Soc. Lond., Bot.* XVI (1877) 222 is actually *P. parellina,* according to the material preserved at the British Museum and at Kew. Groenhart, in *Nederlandsch Kruidk. Archief,* XLVI (1936) 737, records « *Lecanora gelida* » from two localities in Java: Diëng, coll. Junghuhn, and Mt. Gede, coll. Seifriz. I have not seen the Junghuhn specimen, which was already recorded as « *Parmelia gelida* » by Montagne & Van den Bosch in *Plant. Junghuhn.* I (1856) 25, but in herb. Vienna there is a specimen collected by Seifriz on Mt. Gede in 1920, and it is *P. papillosa* Vain. Nevertheless, the true *P. gelida* does occur in Java (see above). In *Borbásia,* I (1939) 129, Räsänen records *Placopsis gelida* from Urugnay, Dept. Rocha, Sierra de la Carbonera, coll. Hosseus. The specimen in question, kindly sent to me by Dr. Räsänen, is very scanty, but has no cephalodia and in my opinion is certainly not a *Placopsis;* perhaps more likely an *Ochrolechia.*

Forma **neglecta** (Degel.) M. Lamb.

in *Trans. & Proc. Bot. Soc. Edinburgh,* XXXIII (1942) 322.
Lecanora gelida f. *neglecta* Degel., in *Acta Hort. Gothoburg.* XII (1937) 125, *cum descript.*

Diagn. — « Soredia elevata, semiglobosa, albida vel cinereo-albida » (Degel., *loc. cit.*).

Distribution. — Coincident with that of the typical form, but rather less common; the localities are enumerated above together with that of the typical species. Easily recognisable by its pulvinate subglobose pale coloured soredia (in the typi-

cal species they are more or less eroded and usually darker, greenish to olivaceous-greenish). Holotype from Aleutian Islands, Kanaga, seen at Uppsala.

Var. **subreagens** M. Lamb, *var. nov.*

Diagn. — Thallus esorediatus, intus Pd + rubescens, in centro saepe dupliciter rimosus (areolas duarum magnitudinum praebens).

Habitat. — On rocks.

Distribution. — Mainland of Chile; possibly Juan Fernandez and New Zealand (see p. 207).

CHILE. Exact locality not stated, Gay (holotype) (fert.) (H., n° 23856 in herb. Nylander); *Valdivia :* exact locality not stated, Rabenhorst, 1869-70 (fert.) (M., W.); Lago Puyehue, altit. 220 m, Hollermayer, 1936 (fert.) (H., *Räs.*); Lago Riñihue, Enco, on stones on the shore at highwater level, Santesson, 1940 (Swed. Magellan. Exped.) (n° 3765 *b*, *c*) (fert.) (S.); Riñihue, Cerro Tralcan, « on stones in Aristotelia maqui shrubs », Santesson, 1940 (Swed. Magellan. Exped.) (n° 3429) (fert.) (S.).

Obs. 1. — In the holotype specimen (n° 23856 in herb. Nylander), the thallus is 4-5 centim. diam., well effigurate at periphery, with slightly convex or flattened lobes 6-10 mm long, 0.5-1.0 mm broad, 0.15-0.20 mm thick, contiguous, fairly closely applied to substratum, variously branched, separated by rounded-edged cracks, at apices rounded and ± crenulate : in centre up to 0.5 mm thick, doubly areolate, *i. e.*, with a first series of gaping anastomosing cracks 0.20-0.25 mm wide, and a second series of inner, very fine, almost closed-up cracks delimiting obtusely or acutely angulose, plane or slightly convex areolae 0.5-1.0 mm diam. Thallus pallid cream-buff, matt, not pruinose, surface KHO + indistinctly yellowish, $CaCl_2O_2$ + faintly red or —, Pd-; medulla KHO + indistintly yellowish, $CaCl_2O_2$ + rose-red, Pd + red. No visible hypothallus. Thalline cortex nubilated, paraplectenchymatic, 12-17 µ deep, of cells 4-6 µ diam ; medulla nubilated, compact, of hypae 3-4 µ thick running in various directions; symbiotic algae 6-10 µ diam., forming an interrupted stratum 50-75µ deep. Cephalodia irregularly scattered, sessile, orbicular, 1.3-2.8 mm diam., up to 0.4 mm thick, radially plicate-effigurate and cracked,

rusty-flesh-coloured, matt ; containing Scytonemoid algae. Apothecia slightly to well constricted at base, 1.0-1.2 mm diam., with the thalline margin prominent, entire, not pruinose ; no proper margin visible ; disc plane, dull flesh-coloured or brownish-pink, matt, often slightly pruinose. Lower excipular layer nubilated, paraplectenchymatic, up to 75 µ deep, of thin-walled cells 5-8 µ diam. Hypothecium up to 140 µ deep, colourless. Thecium immature ; Nylander noted the spore-measurements as 16-20×7-11 µ.

Obs. 2. — The peculiar double areolation of the thallus is seen in most, but not all, of the specimens examined. Apothecia may be up to 1.8 mm diam. ; thecium 126-165 µ high ; paraphyses sometimes branched, about 1.5 µ thick, at tips submoniliformly thickened up to 2.5 µ ; asci cylindric-clavate, 108-145×15-18 µ, with wall about 2 µ thick at sides and up to 5 µ at apex, persistently pale blue with iodine ; spores 8, uniseriate or partly biseriate, ellipsoid to broadly ellipsoid, 15-18 (-21) × 8-12 µ. Pycnidia not seen.

Obs. 3. — The thallus is very similar to that of *P. Dusenii*, so much so that certain determination is not possible with sterile specimens. Sterile material probably referable to this variety has been seen from Juan Fernandez, Masafuera, coll. Skottsberg, 1917 (S., U.), and also from New Zealand : South Island, Canterbury, Mount Misery near Cass, coll. Du Rietz, 1927 (n° 1468 : 13) (*DR.*). The Juan Fernandez specimens form part of the material upon which Zahlbruckner based his « *Lecanora patagonica* f. *sorediosula* », *apud* Skottsberg, *Nat. Hist. Juan Fernandez and Easter Island,* II (1924) 382 ; see p. 262. The specimen from Lago Puyehue, coll. Hollermayer, has been recorded by Räsänen in *Rev. Univ. Santiago*, XXII (1937) 200, as « *Placopsis gelida* ».

3. **P. fuscidula** M. Lamb

apud Räs. in *An. Soc. Cient. Argent.* CXXVIII (1939) 138, *cum descript.* ; M. Lamb in *Res. Norweg. Sci. Exped. Tristan da Cunha* 1937-38, n° 3 (1940) 1, *cum descript.*

Placopsis gelida var. *pseudosorediosa* Räs., *loc. cit.*

Lecanora gelida f. *leprosula* Zahlbr. *apud* Skottsberg, *Nat. Hist. Juan Fernandez and Easter Island,* II (1924) 382, *cum descript., Cat. Lich. Univ.* V (1928) 668.

Descript. — *Thallus* determinate, effigurate, with well developed peripheral lobes 1.5-5.0 mm long, 0.8-1.4 mm broad, 0.2-0.5 mm thick, variously branched and divided, slightly tumid-convex, the apices flattened and closely adpressed to the substratum, rounded-lobate or obsoletely crenulate; central part of thallus rimose-areolate, up to 0.7 mm thick, brown-whitish or pale olivaceous-brown, matt, almost entirely subtly white-pruinose; areolae irregularly angulose, 0.8-2.2 mm diam., plane to slightly convex, smooth, separated by cracks 0.1-0.2 mm wide with rounded-off edges. Surface of thallus and medulla KHO— or indistinctly yellowish, $CaCl_2O_2$ + rose-red, Pd—. No *isidia* or *soredia*. No visible *hypothallus*. *Cephalodia* numerous, irregularly disposed, sessile, discoid, 1.0-2.5 mm diam., up to 0.5 mm thick, slightly plicate-effigurate, finally also radially cracked, flesh-coloured or rusty flesh-coloured, matt. *Apothecia* sessile, well constricted at base, round, 1.0-1.7 mm diam., with thick, entire, pruinose thalline margin becoming with age thinner and somewhat depressed; proper margin occasionally visible, thin, entire, slightly prominent, flesh-coloured, not pruinose; disc bright or dark red, ochraceous-reddish, or reddish-brown, more or less plane, not or slightly pruinose, matt or slightly shining. Paraplectenchymatic *excipular stratum* moderately developed below hypothecium, up to 75 μ thick, hyaline or slightly nubilated; *hypothecium* colourless; *thecium* 150-225μ high, more or less strongly nubilated above, otherwise colourless or with a slight rosy tinge. *Paraphyses* slightly thickened at apices. *Spores* 8, uniseriate in ascus, ellipsoid, often containing rose-coloured oil guttules, 18.5-22.5 × 10.0-12.5μ. *Pycnidia* immersed in the areolae, indicated externally by minute brown-blackish spots, pyriform, about 200 μ diam.; perifulcrium hyaline, indistinctly paraplectenchymatic, 15-23 μ thick; fulcra branched, pointed, 13-20 × 1-2 μ; *pycnoconidia* filiform, slightly curved or almost straight, 17-21 × 0.5 μ.

Icon. — Pl. IV, fig. 13 (the holotype specimen, nat. size).

Habitat. — Rocks and stones.

Distribution. — Southern S. America (including Juan Fernandez) and Tristan da Cunha.

Argentina (or Chile?). *Tierra del Fuego :* exact locality doubtful, Cunningham (fert.) (K.).

Chile. *Llanquihue :* Ventisquero Manso, altit. circ. 1000 m, « bloques de la morene final », Donat, 1936 (n° 88 *pr. p.*) (fert.) (*Räs.*); *Chiloé :* Isla Chiloé, Península Lacui, Punta Ahui, Santesson, 1940 (Swed. Magellan. Exped.) (n° 3989) (fert.) (S.); Isla Chiloé, Ancud, on stones in earth of a road cutting, Santesson, 1940 (Swed. Magellan. Exped.) (n° 4247, 4248, 4249 *pr. p.*) (fert.) (S.); *Juan Fernandez :* Masafuera, near Las Torres, altit. circ. 1350 m, Skottsberg, 1916 (Svenska Pacificexpeditionen) (ster.) (GB., W.) : Masatierra, Valle Colonial, Skottsberg, 1916 (Svenska Pacificexpeditionen) (fert.) (GB., U.); Masatierra, near Tres Puntas, altit. 200 m, Skottsberg, 1917 (Svenska Pacificexpeditionen) (fert.) (GB., BM., LUND, S., U., W.).

Tristan da Cunha. Stony Beach, altit. 300 m, Mejland, 1938 (n° 1780) (ster.) (O.); the crater, altit. 1950 m, Christophersen & Mejland, 1938 (n° 761) (holotype) (fert.) (O.) (n° 757) (fert.) (O.) (n° 758) (ster.) (O.); the peak, altit. 2000 m, Christophersen & Mejland, 1938 (n° 703) (fert.), (n° 701, 704) (ster.) (O.) (All Norweg. Exped. Tristan da Cunha 1937-38).

Obs. 1. — In the holotype specimen, the thallus has an upper nubilated paraplectenchymatic cortex 30-50 μ deep composed of cells 4.0-6.5μ diam. Medulla partly nubilated, compact, of interwoven hyphae about 3μ thick running in various directions. No special hypothalline tissue is differentiated. Symbiotic algae 7-9 (-12) μ diam., forming an almost continuous stratum 90-155 μ deep. The cephalodia contain Scytonemoid algae. Cells of lower paraplectenchymatic excipular stratum not nubilated, thin-walled, 3-5μ diam., ± isodiametric. Hypothecium up to 215μ deep in centre, of compacted hyphae 1.5-2.0μ thick running in various directions. Paraphyses often branched, 1.3-2.0μ thick. Asci cylindric-clavate, 120-180 × 15-18μ, with walls up to 2μ thick at sides, at apex up to 4μ, with iodine blue then pale wine-red.

Obs. 2. — Although the differences separating this species from *P. gelida* would seem to be slight, it is nevertheless quite a constant and easily recognisable species, separable by its pruinose olivaceous thallus and slightly larger spores. The

pruina gives the thallus a soft velvety appearance under a × 10 lens. A form or state of this species was described already in 1924 by Zahlbruckner under the name of « *Lecanora gelida* f. *leprosula* », and this has by some been erroneously identified with the typical sorediate form of *P. gelida* (Magnusson, *Lich. sel. Scand. exs.* 272; Degelius in *Acta Hort. Gothoburg.* XII (1937) 125).

Obs. 3. — « *Placopsis gelida* var. *pseudosorediosa* » was the name given by Räsänen to a partly eroded specimen of this species from Chile, Ventisquero Manso; the erosion was due to animal agencies (probably snails). The same appearance caused Zahlbruckner to apply the epithet *leprosula* to the material studied by him.

4. **P. gelidoides** Du Rietz ex Lamb, *sp. nov.*

Descript. — Thallus *bene determinatus, rosulas irregulares ad 4 centim. diam. (vel majores) formans, ambitu effiguratus, lobis marginalibus 4-7 mm longis (centrum thalli versus cum areolis sese sensim confundentibus), 1.0-1.5 mm latis, ad 0.4 mm crassis, tumidis, passim transversim ruptis, rimis angustis separatis, apicibus nonnihil expansis et deplanatis, rotundatis aut subcrenulatis; in centro distincte concinneque bullato-areolatus, areolis subsphaericis aut breviter intestiniformibus, 0.5-1.0 mm diam., 0.5-0.8 mm crassis, rimis sat latis distinctissime separatis; alutaceus vel eburneus, epruinosus, passim (praesertim in parte centrali) subnitidus; extus intusque KHO-, $CaCl_2O_2$-, Pd-, sine isidiis et sorediis, hypothallo nullo visibili (rimis autem inter areolas ad basin saepe fusco-conspurcatis).* Cephalodia *in parte centrali thalli sparsa, sessilia, discoidea aut subirregularia, ad 5 mm lata et 0.9 mm crassa, radiatim plicato-rimosa, nec nitida nec pruinosa, carneo-flavescentia.* Apothecia *numerosa, sparsa, sessilia, rotundata, ad 1.3 mm lata visa (verisimiliter etiam majora), margine thallino integro, tumido, disco plano, ochraceo, nonnihil pulverulento, haud nitido, saepe rhagadioso-fisso; margine proprio haud viso.* Excipulum *sub hypothecio ad 280 μ crassum, dense nubilatum, paraplectenchymaticum;* hypothecium *incoloratum;* thecium *160-195 μ altum, superne flavido-griseo-nubilatum, ceterum incoloratum.* Paraphyses *apicibus vix incrassatae.* Sporae *8nae, in asco uniseriatae, ellipsoideae, 16-19 × 8-10 μ.* Pycnidia *areolis immersa, ostiolis punctiformibus ochraceo-fuscis vix prominentibus, simplicia, globosa, circ. 350 μ diam., perifulcrio hyalino 20-25 μ crasso circumdata; fulcra subulata, 12-16 × 1.0-1.5 μ;* pycnoconidia *filiformia, plerumque leviter arcuata, 16-20 × circ. 0.5 μ.*

Icon. — Pl. XVI, figs. 49, 50 (parts of the holotype specimen).

Habitat. — On rock.

Distribution. — New Zealand.

NEW ZEALAND. South Island, *Canterbury*: Mt. Misery near Cass, in the upper subalpine (*Podocarpus nivalis*) belt, Du Rietz, 1927 (Swed. Bot. Australas. Exped.) (n° 1468 : 15) (fert.) (*DR.*).

Obs. 1. — Cortex and medulla of thallus are strongly yellowish-grey-nubilated in section, becoming hyaline in KHO with emission of a slightly yellowish solution. An outermost amorphous layer 8-10μ deep is present. Cortex 25-35μ deep, paraplectenchymatic, of ± isodiametric cells 3-4μ diam., their formation from adnate vertical hyphae ± apparent. Medulla with small air spaces, of irregularly intertexted thin-walled hyphae 2-4μ thick; the lower hyphae, which root into the substratum, are finer and more compacted. Symbiotic algae ± bright green, globose, 7-9μ diam., thin-walled, forming a slightly interrupted stratum 100-200μ deep. Cephalodial algae Scytonemoid, pale blue-green or orange-pink cells 5-9μ diam. Paraplectenchymatic excipular layer below hypothecium up to 280μ deep, nubilated, of thin-walled cells 3-4μ diam. Paraphyses 1.5-2.0μ thick. Asci cylindric or cylindric-clavate, 100-120 × 10-16μ, with wall about 2μ thick at sides, 3μ at apex. With iodine, thecium first blue; then paraphyses and ascus walls yellow, residual plasm around spores wine-reddish.

Obs. 2. — This species approaches *P. contortuplicata* morphologically, but differs in having a truly areolate thallus with more or less rounded individual bullate-tumid areolae; in *P. contortuplicata* there is no true areolation of the thallus, the verrucae being borne on the surface of a continuous or irregularly rimose basal thalline (or hypothalline?) layer. From *P. gelida* it is immediately to be distinguished by the form of the areolae.

5. **P. brachyloba** (Müll. Arg.) M. Lamb, *comb. nov.*

Placodium brachylobum Müll. Arg. in *Bull. Herb. Boissier*, IV (1896) 93, *cum descript.*

Lecanora brachyloba Zahlbr. *Cat. Lich. Univ.* V (1928) 665.

Descript. — *Thallus* determinate, obsoletely effigurate at periphery with very short lobes or marginal areolae 0.4-0.9 mm across, closely applied to substratum and rounded or indistinctly crenulate at their ends, about 0.2 mm thick, more or less matt, cream-coloured. Central part of thallus neatly areolate, up to 0.5 mm thick, sordid subochraceous or pale buff-coloured, in places slightly cinereous-pruinose, with angulose or rounded areolae 0.4-0.9 mm diam. separated by narrow cracks. Surface of thallus KHO —, $CaCl_2O_2$ — or + red on the paler marginal lobes, Pd— ; medulla KHO + sordid yellow-brownish, $CaCl_2O_2$ + red, Pd + red (at any rate in the fertile areolae). No *isidia* or *soredia*. *Hypothallus* not visible at periphery, but developed under central parts of thallus, ferruginous, 0.3-0.4 mm thick. *Cephalodia* irregularly scattered, sessile, finally flattened-discoid, up to 1.8 mm diam., 0.6 mm thick, fissured with radiating and tangential cracks, brownish-flesh-coloured or ochraceous, not pruinose. *Apothecia* arising singly in areolae, at first tumid-verrucose with apical punctiform depression (pertusarioid), finally becoming plane, discoid and constricted at base, sessile, up to 1.3 mm diam.; thalline margin thick, prominent, entire, cream-coloured; proper margin not developed; disc sunk below the margin, brownish-flesh-coloured, with pinkish or cinereous pruina. *Excipulum* entire below hypothecium, paraplectenchymatic, colourless; *hypothecium* colourless; *thecium* 135-210 μ high, colourless, the upper part covered with yellow-brown granules. *Paraphyses* hardly thickened at apices. *Spores* 8, uniseriate in ascus, ellipsoid, 21-24 × 10.5-15.0μ (or 18-20 × 12μ, according to Müll. Arg., descr. orig.).

Habitat. — On dark basaltic rock.

Distribution. — Eastern Australia.

AUSTRALIA. *Queensland :* exact locality not stated, Shirley, 1893 (fert.) (G.).

Obs. — The thallus is bicolorous, the peripheral areolae being cream-coloured and the inner part ochraceous brownish-yellow on account of a superficial deposit, but not truly oxydated. In section, the inner part of the thallus is covered with a dull brownish-yellow layer 4-9 μ deep, composed of indistinct, disintegrating cells ; the underlying cortex is 9-24 μ deep, colourless, paraplectenchymatic, of cells 3-5 μ diam. The medulla appears to be entirely paraplectenchymatic, colourless, of cells similar to those of the cortex. Hypothalline layer made up of intertexted colourless thin-walled hyphae 2-3 μ thick, entangling a copious rusty-red granular deposit. Symbiotic algae 6-13 μ diam., forming a ± continuous stratum 15-57 μ deep. Algae of cephalodia Scytonemoid, forming large clumps in the medulla of the cephalodium. Lower paraplectenchymatic part of excipulum including symbiotic algae, 190-250 μ deep, inspersed with air-bubbles, and formed of ± isodiametric thin-walled cells 3-5 μ diam. ; hypothecium 60-90 μ deep in centre, formed of compacted hyphae 2-3 μ thick running in various directions, staining blue-green with iodine. Paraphyses occasionally branched, 1.5-2.0 μ thick ; asci cylindric-clavate, 120-170 × 12-20 μ, with wall about 3 μ thick, at apex thickened up to 9 μ, persistently blue with iodine. No pycnidia seen.

6. **P. chilena** M. Lamb, *sp. nov.*

Descript. — Thallus *determinatus, plagas efficiens 3 centim. diam. vel majores, ad peripheriam lobato-effiguratus, lobis marginalibus plerumque bene evolutis, 2-6 mm longis, 0.7-1.3 mm latis, 0.2-0.5 mm crassis, contiguis, tumidis, rimis tenuibus separatis, varie ramosis, apicibus rotundatis aut subcuneatis, deplanatis, saepe vage crenulatis ; in centro verrucoso-areolatus, areolis tumidis, irregulariter angulosis, 0.7-1.5 mm diam., ad 0.8 mm crassis, rimis profundis limatis acutisve 0.10-0.25 mm latis separatis ; flori lactis concolor vel eburneus, subtiliter albopruinosus, haud nitidus, extus* KHO —, $CaCl_2O_2$ —, *Pd — vel + leviter roseus ; intus* KHO + *indistincte flavescens,* $CaCl_2O_2$ + *roseo-rubescens, Pd* + *rubescens.* Isidia sorediaque *desunt ;* hypothallus *haud evolutus.* Cephalodia *thallo insidentia, sessilia, discoideo-deplanata, 2-6 mm diam., ad 0.6 mm crassa, radiatim plicata rimosaque, sordide fuscoflavescentia, haud nitida.* Apothecia *irregulariter sparsa, ab initio discoidea, basi modice beneve cons-*

tricta, 1.0-1.3 mm diam., margine thallino albopruinoso, integro, primum tumido, prominenti, demum depresso vel fere excluso; margine proprio in apotheciis vetustioribus bene visibili, prominenti, integro, carneo, haud pruinoso; disco plano, laevigato, obscure rufofusco, interdum leviter albopruinoso, haud nitido. Stratum paraplectenchymaticum excipulare *sub hypothecio evolutum, nubilatum, ad 90 μ crassum;* hypothecium *incoloratum;* thecium *180-220 μ altum, superne sordide fuscoflavescens, ceterum incoloratum vel levissime roseum.* Paraphyses *apicibus vix incrassatae.* Sporae *8nae, in asco uniseriatae, ellipsoideae, 18-21 × 9-12 μ.*

Icon. — Pl. VI, fig. 21 (the holotype specimen).

Habitat. — On rocks and stones.

Distribution. — Southern central Chile and Juan Fernandez.

CHILE. *Valdivia:* Corral, altit. 25 m, «sobre rocas graníticas, expuestas al sol», Gunckel, 1935 (n° 5159) (holotype) (fert.) (*Räs.*); *Chiloé:* Isla Chiloé, Ancud, on stones in the earth of a road cutting, Santesson, 1940 (Swed. Magellan. Exped.) (n° 4249) (fert.) (S.); *Juan Fernandez:* Masafuera, high plateau, altit. circ. 1350 m, « Felsblöcke in der Heide », Skottsberg, 1917 (Svenska Pacificexpeditionen) (fert.) (U.).

Obs. 1. — In the holotype specimen, the thallus has a shallow paraplectenchymatic cortex 12-18 μ deep, colourless and hyaline (necrotic) in outer 3-6 μ, nubilated in inner part, composed of cells 3-5 μ diam. Medulla fairly compact, nubilated, of intertexted hyphae about 3 μ thick running in various directions; at its base the medulla is densely felted and brown by degeneration, but no true hypothalline tissue is present. Symbiotic algae 5-9 μ diam., forming an interrupted stratum 65-95 μ deep. Algae of cephalodia Scytonemoid, reddish, dispersed in nests. Lower paraplectenchymatic stratum of excipulum formed of ± isodiametric thin-walled cells 4-6 μ diam.; hypothecium of compacted hyphae 1.5-4.5 μ thick running in various directions. Paraphyses often branched. Asci cylindric-clavate, 160-180 × 13-18 μ, with wall about 2 μ thick at sides, hardly thicker above, blue (then becoming decolorised) with iodine. No pycnidia seen.

Obs. 2. — Differs from *P. terricola* in the areolate thallus, and from *P. gelida* var. *subreagens* in the verrucose, whitish-pruinose thallus areolae and higher thecium. From *P. patagonica* it is distinguished mainly by the verrucose-areolate inner part of the thallus (smooth and rimose in *patagonica*), and more convex peripheral lobes. Occasionally, as in the specimen from Juan Fernandez, the medulla reacts with Paraphenylenediamine only in its upper part, around the symbiotic algae.

7. **P. Dusenii** M. Lamb, *sp. nov.*

Descript. — Thallus *determinatus, ambitu effiguratus, plagas irregulares ad circa 6 centim. diam. formans, ochraceo-albidus (sed haud oxydatus), haud nitidus, epruinosus; lobis marginalibus 3-5 mm longis, 0.5-1.5 mm latis, tenuibus, applanatis, substrato adpressis, subcuneatis, rimis tenuibus aut passim fere obsoletis separatis, apicibus rotundatis saepeque nonnihil crenatis; in parte centrali laevigatus, tesselato-areolatus, ad 0.8 mm crassus, areolis obtuse angulosis 1.0-1.5 mm diam., rimis circ. 0.1 mm crassis separatis et ipsis iterum subtiliter areolato-divisis* (*ut in* P. gelida *var.* subreagens), *extus intusque KHO + indistincto fulvescens, medulla $CaCl_2O_2$ + rubescens, Pd + lente aurantiaco-rubescenti.* Isidia *et* soredia *desunt;* stratum hypothallinum *fusconigrum passim inter areolas visibile, ad peripheriam deficiens.* Cephalodia *dispersa, supra vel inter areolas insidentia, discoideo-deplanata vel tandem fissione irregularia, ad 3-4 mm diam., 0.5 mm crassa, radiatim rimosa effigurataque, carneo- vel ferrugineo-rufa, haud nitida.* Apothecia *sparsa, discoidea, 1.0-1.5 mm diam., basi denique sat bene constricta, margine thallino crassiusculo, integro, epruinoso; margine proprio haud viso; disco plano, rufofusco, sat laevigato, opaco, saepe fissuris hiantibus rupto.* Excipulum *sub hypothecio bene evolutum, dense nubilatum, circ. 100 μ crassum.* Hypothecium *fere hyalinum.* Thecium *225-255 (-280) μ altum, leviter roseum (praecipue in parte superiori), superne flavido-fuscescenti-nubilatum;* paraphyses *apicibus haud vel vix incrassatae.* Sporae *8nae, in asco uni- vel subbiseriatae, ellipsoideae, 20.0-22.5 × 11.0-12.5 μ.*

Icon. — Pl. XV, fig. 47 (part of the holotype specimen).

Habitat. — On rock.

Distribution. — Fuegia.

CHILE. *Magallanes:* Isla Desolación, Puerto Angosto, Dusén, 1896 (Nordenskjöld's Eldslandsexped.) (n° 199 *pr. p.*) (fert.) (S.).

Obs. 1. — The thallus has in places a slightly ochraceous tinge, not however approaching ferruginous oxydation. No superficial amorphous layer seen in section; cortex 25-35 μ deep, yellowish-grey-nubilated, paraplectenchymatic, its cells 2.5-4.0 μ diam. The whole thallus is densely grey-opaque-nubilated in section, becoming clear in KHO with emission of a faintly yellow solution. Medulla compact, of intertexted hyphae 2-4 μ thick running in various directions, at the base going over into a brownish ± paraplectenchymatic hypothalline tissue. Symbiotic algae 6-10 μ diam, now pale green, forming a slightly interrupted stratum 120-160 μ deep. Algae of cephalodia Scytonemoid, blue-green, up to 8 μ diam, often with conspicuous hyaline slime-sheaths. Lower paraplectenchymatic excipular layer formed of thin-walled ± isodiametric cells 3-4 μ diam. Hypothecium 100-120 μ deep in centre. Paraphyses 1.5-2.0 μ thick. Asci cylindric-clavate, 120-140 × 12-15 μ, with wall up to 3 μ thick at sides, at apex (in immature state) thickened up to 12 μ. Thecium blue with iodine, finally with paraphyses yellow and ascus walls blue. No pycnidia seen.

Obs. 2. — Outwardly similar to *P. gelida* var. *subreagens,* and with apparently the same chemical constitution, but the thecium is much higher and the spores somewhat larger.

8. **P. effusa** M. Lamb, *sp. nov.*

Descript. — Thallus *effusus, indeterminatus, uniformis, tenuis (ad 0.2 mm crassus), plagas irregulares sparsas et interruptas efficiens, omnino areolatus, areolis subplanis, 0.4-0.7 mm diam., rimis tenuissimis separatis et varie angulosis aut passim dispersis et tunc subrotundatis; sordide eburneus vel flori lactis concolor, nec nitidus nec pruinosus, extus intusque* KHO −, $CaCl_2O_2$ + *roseo-rubescens, Pd* −. Isidia *ac* soredia *nulla.* Hypothallus *nullus visibilis.* Cephalodia *sparsa, parva (0.3-0.8 mm diam. et ad 0.4 mm crassa), irregulariter tuberculata, haud plicata nec effigurata, fuscoflavida vel rufofusca, opaca.* Apothecia *thallo irregulariter supersparsa, supra areolas sessilia, discoidea, basi bene constricta, 0.8-1.2 mm diam.; margine thallino mediocri,*

integro, demum attenuato; margine proprio tenui, parum prominenti, integro, pallide carneo, opaco; disco obscure fuscocarneo, planiusculo, laevigato, haud nitido, haud vel interdum levissime albido-pruinoso. Stratum paraplectenchymaticum excipulare *sub hypothecio evolutum, modice incrassatum, nubilatum;* hypothecium *incoloratum;* thecium *140-165 μ altum, hyalinum sed sursum pallide flavido-nubilatum.* Paraphyses *apice saepe leviter incrassatae.* Sporae *8nae, in asco partim uni-, partim biseriatae, ellipsoideae, 17.5-21.0 × 9.0-12.5 μ.* Pycnidia *thallo immersa, ad apicem ostiolo minutissimo punctiformi fuscidulo notata, pyriformia, circa 100 μ lata, perifulcrio indistincte para- vel prosoplectenchymatico, nubilato. Fulcra gracilia, attenuata, saepe ramosa, 13-18 × 1.0-1.5 μ.* Pycnoconidia *filiformia, leviter arcuata, interdum subrecta, 18-21 × 0.5 μ.*

Icon. — Pl. XIV, fig. 42 (part of the holotype specimen).

Habitat. — Rocks.

Distribution. — Chile.

CHILE. *Valdivia:* exact locality not stated, Krause, 1864 (fert.) (M.).

Obs. 1. — The thallus is in places covered by a hyaline amorphous necrotic layer about 3 μ deep; cortex 15-24 μ deep, ± nubilated, paraplectenchymatic, of cells 3-5 μ diam.; medulla compact, nubilated, of closely interwoven hyphae 3-4 μ thick, becoming towards the base of the thallus more compacted and brownish; symbiotic algae 7.5-9.0 μ diam., pale green, forming a ± continuous and even stratum 35-60 μ deep. Algae of cephalodia Nostocoid, pale aeruginose, entirely filling the medulla of the cephalodia. Lower paraplectenchymatic excipular stratum formed of ± isodiametric, fairly thin-walled cells 3-6 μ diam; hypothecium up to 210 μ deep in centre, of densely packed hyphae 1.5-3.0 μ thick running in various directions. Paraphyses about 1.4 μ thick, up to 2.0 or rarely 2.5 μ at tips, occasionally branched. Asci clavate, 80-120 × 18-21 μ, with wall about 3 μ thick at sides, at apex thickened up to 8 μ; persistently blue with iodine.

Obs. 2. — This species differs from *P. gelida* in its completely effuse and non-effigurate thallus, and from *P. parellina* in its distinctly areolate thallus, lower thecium, etc.

9. P. bicolor (Tuckerm.) B. de Lesd.

in *Ann. Cryptog. Exot.* IV (1931) 100 ; Räs. in *Ann. Bot. Vanamo*, II (1932) 25.

Placodium bicolor Tuckerm. in *Bull. Torrey Bot. Club*, VI (1875) 57, *cum descript.*, in *Proc. Amer. Acad. Arts & Sci.* XII (1877) 184 ; Müll. Arg. in *Bot. Jahrb.* V (1884) 135, *cum descript.*, *Flechten* in *Forschungsreise S. M. S.* « *Gazelle* », IV. Theil (1889) 10, *cum descript.*

Lecanora bicolor Zahlbr. in *Deutsch. Südpolar-Exped. 1901-3*, VIII (1906) 48.

Lecanora gelida var. *β. vitellina* Hook. f. & Tayl. *apud* Hook. *Bot. Antarct. Voy. Erebus and Terror*, I, *Flora Antarctica*, part. II (1847) 535, *cum descript.*

Placopsis gelida var. *vitellina* B. de Lesd. in *Ann. Cryptog. Exot.* IV (1931) 101.

Squamaria lateritia Nyl. in *Mém. Soc. Nat. Sci. Cherbourg*, V (1858) 111 *(nomen nudum)*, in *Flora*. XLIV (1861) 718 *(nomen nudum)*.

Placopsis gelida f. *lateritia* Nyl. *apud* Cromb. in *Journ. Linn. Soc. Lond., Bot.* XV (1876) 184, *cum descript.* ; Cromb. in *Journ. Bot.* XV (1877) 106.

Lecanora gelida f. *lateritia* Nyl. *apud* Hue in *Nouv. Arch. Mus. Hist. Nat. Paris*, sér. 3, III (1891) 59.

Descript. — *Thallus* determinate, effigurate at periphery, 0.3-1.0 mm thick ; marginal lobes adnate, separated by cracks with rounded-off edges, 3-5 mm long, 1.5-2.5 mm broad, rounded at ends, variously branched ; central part of thallus areolate with irregularly angulose areolae 1.0-2.5 mm diam., more or less plane, separated by narrow cracks. Thallus entirely or mostly ochraceous-yellow, orange-yellow, or ferruginous-red (oxydated), occasionally partly non-oxydated (impure whitish or cream-colored) ; matt, not pruinose, without *isidia* or *soredia ;* surface of thallus KHO −, $CaCl_2O_2$ −, Pd − ; medulla KHO − or indistinctly yellowish, $CaCl_2O_2$ − (or often + rose-red in non-oxydated parts of thallus), Pd −. No *hypothallus*. *Cephalodia* sessile, suborbicular, 2-8 mm diam., about 1 mm thick, plicate-effgurate and radially cracked, ferruginous-red or red-brown or occasionally dark flesh- coloured, matt. *Apothecia* irregularly scattered, well constricted at base, discoid, 1.2-2.3 mm diam. ; thalline margin moderate to thickish, entire or

often minutely radially cracked, not prominent, concolorous with thallus or paler, matt ; proper margin occasionally visible, prominent, entire, reddish- or purplish-flesh-coloured ; disc more or less plane, red-brown or purplish-brick-red, smooth or scabrid, matt, not pruinose. *Excipulum* entire below hypothecium as a hyaline or nubilated paraplectenchymatic layer 30-100 μ deep. *Hypothecium* colourless. *Thecium* 165-240 μ high, pale brown-yellowish above, otherwise faintly yellowish or almost colourless. *Paraphyses* slightly thickened in a submoniliform fashion at apices. *Spores* (6-) 8 in ascus, uniseriate, ellipsoid, (19-) 20-24 × 10.5-15.0 μ. *Pycnidia* immersed, often forming slight swellings, with brown spot-like ostioles up to 0.2 mm diam., more or less spherical or flask-shaped in section, up to 380 μ diam., with colourless wall ; *pycnoconidia* filiform, curved or sometimes almost straight, 18-24 × about 0.5 μ.

Icon. — Pl. I, fig. 2 (the holotype of « *Placopsis gelida* f. *lateritia* » Nyl.) ; fig. 3 (Tuckerman's holotype specimen).

Habitat. — On rocks.

Distribution. — A southern hemisphere bicentric species, occurring in Kerguelen and Fuegia.

Kerguelen. Exact locality not stated, 1875 (U. S. Transit Exped.) (holotype) (ster.) (FH.) ; exact locality not stated (fert.) (K.), Schimper (fert.) (W.), 1874 (Challenger Exped.) (fert.) (K., BM.) ; Swain's Bay, Eaton (Venus Transit Exped.) (holotype of « *Placopsis gelida* f. *lateritia* ») (fert.) (BM.) ; Cumberland Bay, M'Cormick, 1840 (ster.) (K.) ; Stationsee, Urbansky, 1902 (fert.) (W.) ; « au mont de l'Abri », Aubert de la Rue, 1931 (fert.) (*B. de Lesd.*).

Chile. *Magallanes :* Isla Desolación, Puerto Angosto, « in saxis litoralibus », Dusén, 1896 (Nordenskjöld's Eldslandsexped.) (n° 199 *pr. p.*) (fert.) (S.).

Obs. 1. — In the holotype specimen of « *Placodium bicolor* » no apothecia now remain ; thallus well effigurate at periphery ; its cortex nubilated in outermost 6-11μ with small orange-red granules, otherwise hyaline, in all 18-30μ deep, paraplectenchymatic, of cells 4-6 μ diam. Medulla hyaline, compact, of hyphae 3-5μ diam. running in various directions, often predominantly ± vertically. Symbiotic algae

4.5-8.0μ diam., forming an interrupted layer 90-140 μ deep. Algae of cephalodia Scytonemoid, forming clumps or nests.

Obs. 2. — In the holotype specimen of « *Placopsis gelida* f. *lateritia* », no peripheral lobes are present (incomplete specimen ?) ; the lower paraplectenchymatic excipular layer of the apothecia is 30-48μ deep, hyaline or faintly brownish, of ± isodiametric thin-walled cells 4-6μ diam. Hypothecium hyaline, up to 120μ deep in centre, of compacted hyphae 2-3μ thick running in various directions, chiefly ± vertically. Thecium 190-240μ high. Paraphyses 1.5-2.5μ thick, frequently branched. Asci cylindric or cylindric-clavate, 150-210 × 12-23μ, with walls 1.0-2.5μ thick at sides, not or only slightly thicker at apex, staining blue then green-blue with iodine.

Obs. 3. — *P. bicolor* seems to be a common lichen in Kerguelen. The Fuegian specimen agrees well in all respects. The degree of oxydation of the thallus is rather variable, some specimens being partly cinereous-whitish or cream-coloured, and in these non-oxydated places of the thallus a positive $CaCl_2O_2$ reaction can be obtained in the medulla.

Obs. 4. — I have not seen an authentic specimen of the « *Lecanora gelida* var. β. *vitellina* » of Hooker & Taylor, but there can be no doubt that it is identical with the present species. Tuckerman in his original description of *Placodium bicolor* states : « the infertile specimen called (notwithstanding the orange colour) *Lecanora gelida* by Taylor (herb.) appears to me to belong here ». The records of *P. bicolor* from Fuegia by Räsänen in *Ann. Bot. Vanamo*, II (1932) 25 are erroneous ; one of the plants is *P. Roivainenii* (a new species) and the other is *P. parellina* var. *microphylla*.

10. **P. baculigera** M. Lamb, *sp. nov.*

Descript. — Thallus *effiguratus, plagas ut videtur sat latas (ad circa 8 centim. diam., vel etiam majores?) formans, lobis marginalibus substrato arcte adpressis, tota longitudine adnatis, rimis angustissimis separatis, 4-10 mm longis, 1-2 mm latis, 0.2-0.5 mm crassis, varie dichotome vel sympodialiter ramosis, tumido-convexis, tantum apicibus applanatis expansisque ; in centro verrucoso-areolatus, areolis tumidis, confertis, 0.5-1.0 (-1.3) mm diam., ad 1 mm crassis, marginem versus sensim in lacinias marginales abeuntibus ; omnino aurantiaco-ochraceus (oxydatus), haud nitidus nec pruinosus, extus intusque KHO—, $CaCl_2O_2$ —, Pd —.* Hypothallus *deest ;* isidia *ac* soredia *nulla.* Cephalodia *thallo irregulariter supersparsa, sessilia, primum tumida, deinque leviter deplanata discoideaque, 1-3 mm diam., 0.8-1.2 mm crassa, inferne vix constricta, superficie irregulariter verruculoso-rugosa, haud effigurata, thallo concoloria, haud nitida.* Apothecia *thallo insidentia, irregulariter disposita, basi bene constricta, 1.5-3.0 mm diam., margine thallino crasso, prominenti, integro vel minute radiatim rugoso, introrsus incurvato, discum bene superanti ; margo proprius nullus ; discus subplanus, olivaceo-fuscus, nitidus, haud pruinosus.* Excipulum *inferne haud evolutum ;* hypothecium *incolor ;* thecium *240-285μ altum, superne pallide viridi-flavescens, ceterum incoloratum.* Paraphyses *apice vix vel parum incrassatae.* Sporae *8nae, in asco uniseriatae, ellipsoideae, 24-29 × 14-15μ.* Pycnidia *verrucis thallinis immersa, extus ostiolis punctiformibus, plus minusve impressis, rufofuscis, ad 0.3 mm latis indicata ; sphaerica, ad 570μ diam., nullo perifulcrio circumdata, lamina sporigena convoluta (labyrinthice gyrosa) ; fulcra simplicia, leviter attenuata, 12-21μ longa, circa 1μ crassa ;* pycnoconidia *fulcrorum apicibus enata, baculiformia, recta, utroque truncata, 6-10 × 0.8-1.0μ.*

Icon. — Pl. III, fig. 11 (the holotype specimen).

Habitat. — Granitic rock.

Distribution. — Fuegia.

CHILE. *Magallanes :* Isla Desolación, Puerto Angosto, altit. 400-700 m, Dusén, 1896 (Nordenskjöld's Eldslandsexped.) (n° 197) (holotype) (fert.) (S.) ; Río Azopardo, « in saxis alpinis », altit. 700 m, Dusén, 1896 (Nordenskjöld's Eldslandsexped.) (n° 154) (fert.) (S.).

Obs. 1. — The colour of the thallus corresponds to « cinnamon-buff » (Pl. XXIX. 17″ *b*) and « tawny » (Pl. XV. 13′ *i*) in Ridgway's *Color Standards* (1912) ; in Séguy's *Code Universel* (1936) the nearest equivalent is Pl. XVII. n^{os} 247-9. The thallus has an outer cortex 50-65μ deep, which is paraplectenchymatic, yellow in its outer 15-

20μ (amorphous pigment in the cell-walls), otherwise hyaline, of cells 5.5-9.0μ diam. Medulla hyaline, compact, of intertexted hyphae 3.0-4.5μ thick running in various directions. The verrucose thallus is anchored to the substratum by a ± continuous lower layer of medullary hyphae, as in *P. contortuplicata*. Symbiotic algae 6-9 (-11) μ diam, forming a ± even, slightly interrupted stratum 115-185μ deep. Algae of cephalodia Stigonemoid, forming clumps throughout almost whole depth of cephalodium. No lower paraplectenchymatic excipular stratum is differentiated; the colourless hypothecium, formed of densely compacted hyphae 2.0-4.5μ thick running in various directions, rests directly upon the scattered groups of subhypothecial algae. Paraphyses not constricted at septa, 1.5-2.5μ thick, occasionally branched, at apices sometimes slightly conglutinated and yellow-greenish (pigment in the cell-wall). Asci cylindric to cylindric-clavate, 195-220 × 17-21μ, with colourless, gelatinised wall 1.5-2.5μ thick at sides, at apex thickened up to 5μ, with iodine staining blue then paler blue.

Obs. 2. — A remarkable species, separated from all other members of the genus in the staff-shaped pycnoconidia, in the apothecia with their prominent inflexed thalline margin and smooth shining disc, etc., characters which almost warrant a generic segregation, when considered in conjunction with the anatomical peculiarities (greenish tinge of the epithecium, absence of lower excipular stratum, and convoluted walls of the pycnidia).

11. **P. lateritioides** M. Lamb, *sp. nov.*

Descript. — Thallus *determinatus, bene effiguratus, plagas sat latas (ad circa 6 centim. diam.) formans, totus ferrugineo-oxydatus, nec nitidus nec pruinosus, sorediatus, sorediis sparsis numerosis griseo-albidis erumpentibus subrotundatis ad 1 (-2) mm diam., e areolis thallinis orta; lobis marginalibus tumidis, ad apicem expansis, rotundatis aut grosse crenatis et nonnihil deplanatis (ibique saepe minus oxydatis), 2-5 mm longis, 0.8-1.8 mm latis, ad 0.6 mm crassis, rimis angustis separatis, saepe fissuris transversim ruptis; in parte centrali gleboso-areolatus, areolis tumido-gibbosis, obtuse angulosis vel subrotundatis, 0.5-1.5 (-2.0) mm diam., 0.5-1.0 mm crassis, rimis ad 0.1 mm latis separatis; extus KHO—, $CaCl_2O_2$ + rubescens, Pd—;*

medulla KHO —, $CaCl_2O_2$ rubescens, Pd + lente aurantiaco-rubescens. Isidiis *nullis;* hypothallo *nullo visibili.* Cephalodia *irregulariter sparsa, deplanato-discoidea, effigurata, radiatim lobata rimosaque, 2.0-4.5 mm diam., ad 0.8 mm crassa, ferrugineo-fuscescentia (thallo nonnihil obscuriora), nec nitida nec pruinosa.* Pycnidia *areolis innata, extus punctulis minutissimis fusconigrescentibus manifesta, globosa, simplicia, circa 180 μ diam.; fulcra subulata, passim ramosa, circa 16 × 1μ;* pycnoconidia *filiformia, recta leviterve curvata, 13-16 × circa 0.5μ.* (Apothecia *haud visa).*

Icon.— Pl. XV, fig. 45 (part of the holotype specimen showing soredia), fig. 46 (part of the holotype specimen showing the effigurate margin).

Habitat.— On rock.

Distribution.— New Zealand.

NEW ZEALAND. South Island, *Canterbury*: Mount Misery near Cass, in the upper subalpine (*Podocarpus nivalis*) belt, Du Rietz, 1927 (Swed. Bot. Australas. Exped.) (n° 1468 : 16) (ster.) (*DR.*).

Obs. 1. — In section of thallus, no outer amorphous necrotic layer is present. Cortex 25-30μ deep, yellowish-grey-nubilated, in outer 6-8μ orange- ferruginous; paraplectenchymatic, of thin-walled cells 3-4μ diam. Medulla strongly nubilated, compact, of intertexted thin-walled hyphae 3-4μ thick. Symbiotic algae bright green, globose, 4-8μ diam., thin-walled, forming a somewhat diffuse stratum 160-260μ deep. The cortex becomes hyaline in KHO, except in the outermost oxydated part; $CaCl_2O_2$ + red, Pd-. Medulla almost clear in KHO; $CaCl_2O_2$ + red, Pd + orange. Algae of cephalodia Scytonemoid, blue-green to orange-pink, 6-8μ diam.

Obs. 2.— Perhaps related to *P. bicolor*, from which it differs in the sorediate thallus and in the presence of Fumarprotocetraric acid in the medulla.

12. **P. cribellans** (Nyl.) Räs.

in *Journ. Jap. Bot.* XVI (1940) 90; M. Lamb in *Res. Norweg. Sci. Exped. Tristan da Cunha 1937-38*, n° 3 (1940).

Lecanora cribellans Nyl. *Lich. Japon.* (1890) 42, *cum descript.*; Hue

in *Nouv. Arch. Mus. Hist. Nat. Paris*, sér. 3, III (1891) 59, *cum descript.*, in *Ann. Mycol.* XII (1914) 524, *cum descript.* ; Zahlbr. *Cat. Lich. Univ.* V (1928) 665.

Placopsis pacifica Vain in *Bot. Mag. Tokyo*, XXV (1921) 53, *cum descript.*

Lecanora iwashiroënsis Zahlbr. *Cat. Lich. Univ.* V (1928) 668.

Descript.— *Thallus* determinate, effigurate *, forming more or less orbicular and often confluent small patches; marginal lobes closely adpressed to substratum, 0.6-2.5 mm long, 0.5-1.2 mm broad, 0.1-0.2 mm thick, flattened, simple or irregularly branched (usually rather richly divided and markedly crenulate), contiguous and separated by narrow cracks, with rounded or subcrenulate ends. Central part of thallus rimose or indistinctly areolate, up to 0.5 mm thick, with the narrow cracks here and there anastomosing to form angulose areolae 0.4-1.8 mm diam.; closely pitted-punctate with minute pock-like depressions resulting from the abrasion of *isidia* and up to 0.1 mm diam., sometimes with very thin slightly prominent margins; or (in f. *tuberculifera*) with most of the isidia entire, subglobose, more or less crowded. Thallus cream-coloured or whitish or often darker (light olive-brownish), matt, not pruinose. No *soredia*. No visible *hypothallus*. Surface of thallus KHO + indistinctly yellowish or—, $CaCl_2O_2$ + rose-red (occasionally—), Pd + pale rosy flesh-coloured; medulla KHO + indistinctly yellow or —, $CaCl_2O_2$ + rose-red, Pd —. *Cephalodia* sessile, scattered, flattened-orbicular or depressed-convex, 0.8-5.0 mm diam., 0.4-0.8 mm thick, radially plicate and rimose or plicate without cracks, sordid pale yellowish or flesh-coloured, matt. *Apothecia* scattered, round, constricted at base, 0.5-1.3mm diam.; thalline margin moderate, persistently prominent, entire or finally slightly subcrenulate; proper margin occasionally visible, very thin, not prominent, more or less flesh-coloured; disc plane or slightly concave, flesh-coloured to rose-red or red-brown (rarely becoming brown-blackish in old apothecia), naked or occasionally whitish-pruinose, matt. *Excipulum* entire

* Exceptionally, in specimens growing on soil, no peripheral lobes are developed.

below hypothecium, nubilated, paraplectenchymatic. *Hypothecium* colourless. *Thecium* 90-150 (— 180) μ high, slightly yellowish in upper part, otherwise colourless. *Paraphyses* slightly thickened at apices. Spores 8, uniseriate or subbiseriate in ascus, ellipsoid, 12.0-16.5 × 6-9 μ. *Pycnidia* immersed in thallus, forming minute swellings, with spot-like brownish ostioles, spherical in section, about 120 μ diam., with colourless wall; fulcra subulate, 9-13 × 1.0-1.3 μ; *pycnoconidia* filiform, slightly curved to almost straight, 21-29 × about 0.5 μ.

Icon. — Pl. VII, fig. 24 (a syntype specimen in herb. Nylander); fig. 25 (a fertile specimen from New Zealand).

Habitat. — On rocks and stones; exceptionally over sandy soil.

Distribution. — With the exception of the outlying Atlantic station in Tristan da Cunha, this species is confined to the coasts of the Pacific Ocean in both hemispheres : Alaska, Aleutian Islands, Japan, Korea, Formosa, New Zealand, Chile (possibly also with Juan Fernandez), Fuegia, and the Galápagos Islands; see fig. 3 on p. 170.

E. Asia. *Aleutian Islands :* Unalaska, Eyerdam, 1932 (f. *tuberculifera*) (ster.) (FH., S.), Hultén, 1932 (n° 5398 *pr. p.*) (f. *tuberculifera*) (ster.) (U.).

U. S. A. *Alaska : Seward Peninsula :* Port Clarence, Trelease & Saunders, 1899 (f. *tuberculifera*) (ster.) (MO.).

Japan. Honshiu, *Rikuchu :* Morioka, Mt. Gansu, altit. 2000 m., Faurie, 1898 (n° 755) (ster.) (BM., W.); *Uzen :* Ubayu, Faurie, 1904 (n° 5845) (fert.) (W.); (Sado Island, recorded by Hue in *Ann. Mycol.* XII (1914) 525); *Iwashiro :* Mt. Bandai, Yasuda, 1916 (n° 164) (holotype of « *Placopsis pacifica* » Vain.) (fert.) (Tur.), Faurie, 1898 (n° 966) (fert.) *(B. de Lesd.)*; *Kozuke* : Mt. Nabewari, Yasuda, 1920 (ster.) *(Räs.)*; *Etchu* : Mt. Tateyama, Asahina, 1928 (fert.) *(Asah.)* ; *Shinano :* Matsumoto, Faurie, 1905 (n° 6928) (holotype of f. *tuberculifera*) (ster.) *(B. de Lesd.)* ; Mt. Yatsugatake, Faurie, 1903 (n° 5618) (ster.) (W.), Asahina, 1926 (f. *tuberculifera*) (ster.) *(Asah.)*; *Musashi :* Mt. Chichibu, Asahina, 1933 (fert.) *(Asah.)* ; *Sagami :* Hakone, Asahina, 1925 (ster.) *(Asah.)*, 1930 (fert.) *(Asah.)*; *Izu :* Mt. Amagi, Asahina, 1930 (ster.) *(Asah.)*; *Suru-*

ga : Mt. Fujiyama, altit. circ. 2000 m., Almquist, 1879 (syntype of the species) (ster.) (H.), *(«Lecanora gelida»* Nyl. *Lich. Japon.* (1890) 42) (fert.) (S.), Asahina, 1924 (fert.) *(Asah.)*; Kiushiu, *Osumi :* Yakushima Island, Fujikawa, 1933 (ster.) *(Asah.)*.

Korea (Chosen). *Quelpaert Island (Chedshu) :* Mt. Hallaisan, Faurie, 1906 (n° 729) (ster.) *(B. de Lesd.)*.

Formosa (Taiwan). *Tainan :* Mt. Arisan, Asahina, 1925 (n° 143) (f. *tuberculifera*) (ster.) *(Asah.)*.

New Zealand. Exact locality not stated, Knight, 1867 (n° 325) (fert.) (H.) (f. *tuberculifera*), (ster.). (BM., U., W.), (fert.) (Welt.), Jelinek (f. *tuberculifera*) (fert.) (M.), Hochstetter, 1859 (f. *tuberculifera*) (ster.) (U.); North Island, *Wellington :* near Wellington, Buchanan (f. *tuberculifera*) (ster.) (BM.); South Island, *Canterbury :* southern slope of Mt. Misery near Cass, on small boulders in prealpine belt, Du Rietz, 1927 (Swed. Bot. Australas. Exped.) (n° 1481 *pr. p.*) (ster.) (*DR.*); Cass, on small boulders in a shingle-slip, Du Rietz, 1927 (Swed. Bot. Australas. Exped.) (n° 1489 : 3) (f. *tuberculifera*) (fert.) (*DR.*); Dyer's Pass, on open rocks, Du Rietz, 1927 (Swed. Bot. Australas. Exped.) (n° 1450 : 18 *pr. p.*) (ster.) (*DR.*).

Chile. *Valdivia* : Lago Riñihue, Riñihue, Cerro Tralcan, « on stones in Aristotelia maqui shrubs », Santesson, 1940 (Swed. Magellan. Exped.) (n° 3429 *pr. p.*) (f. *tuberculifera*) (fert.) (S.); Osorno volcano, « östra sluttningen », Dusén, 1896 (Nordenskjöld's Eldslandsexped.) (n° 181) (f. *tuberculifera*) (fert.) (S.); *Magallanes :* Isla Riesco, Mina Elena, « on stone block in an open place near the shore », Santesson, 1940 (Swed. Magellan. Exped.) (n° 2021 *pr. p.*) (f. *tuberculifera*) (ster.) (S.); Isla Desolación, Dusén, 1896 (Nordenskjöld's Eldslandsexped.) (n° 201 *pr. p.*) (ster.) (S.); Canal Beagle, Yendegaia, on fine sand near the end of the glacier, Santesson, 1940 (Swed. Magellan. Exped.) (f. *tuberculifera*) (fert.) (S.); *(Juan Fernandez :* * Masatierra, near Tres Puntas, altit. 200 m, Skottsberg, 1917 (Svenska Pacificexpeditionen) (ster.) (GB., S., U., W.)).

* The Juan Fernandez specimens seen are sterile and habitually not distinguishable with complete certainty from *P. parellina* var. *carnea* f. *subcribellans*.

Argentina. *Tierra del Fuego :* Canal Beagle, Lapataia, on rocks on the S. W. shore of Lago Roca, « trickle-surface at the highwater level », Santesson, 1940 (Swed. Magellan. Exped.) (n° 1030) (f. *tuberculifera*) (fert.) (S.).

Galápagos Islands. Exact locality not stated, 1872 (Hassler Exped.) (f. *tuberculifera*) (ster.) (K.).

Tristan da Cunha. Above potato-patches, altit. 200 m, Mejland, 1938 (n° 1653) (ster.) (O.); the crater, altit. 1950 m, Christophersen & Mejland, 1938 (n° 761 *pr. p.*) (ster.) (O.) (both Norweg. Exped. Tristan da Cunha 1937-38).

Obs. 1. — In the sterile syntype specimen in herb. Nylander (n° 23862), the characteristic excavations in the thallus are very numerous and crowded, giving it a « pock-marked » appearance. The thallus has a paraplectenchymatic cortex (faintly yellowish in section) of cells 3-5μ diam. ; medulla colourless, ± compact, of interwoven hyphae 2.5-4.5μ thick running in various directions, and in the lower parts sometimes brown by degeneration. Symbiotic algae 6-11μ diam., forming an interrupted layer 30-60μ deep. Cephalodia up to 1 mm. diam., dull yellowish, with obsolete radial plication at periphery, not rimose ; containing Stigonemoid algae forming nests and provided with obvious slime-sheaths. In the fertile holotype specimen of « *Placopsis pacifica* » Vain. (n° 4152 in herb. Vain.), the lower paraplectenchymatic stratum of the excipulum is 23-60μ deep, of ± isodiametric thin-walled cells 4-6μ diam.; hypothecium 195-270μ deep in centre, of compacted hyphae 2-3μ thick running chiefly upwards into the thecium ; thecium 140-180μ high. Paraphyses often branched, 1.5-2.0μ thick, up to 3μ at tips. Asci cylindric or elongate-clavate, 95-130 × 7-13μ, with wall about 1μ thick at sides, at apex thickened up to 9μ in immature asci, and persistently blue with iodine. Spores 14-15 × 7-9μ. The pycnidia are described from another syntype specimen in herb. Nylander (n° 23843).

Obs. 2. — It is not always possible to distinguish this species in the sterile condition from *P. parellina* var. *carnea* f. *subcribellans*, but as a rule *P. cribellans* can be recognised by its growth-habit (rather richly divided and crenulate flattened peripheral lobes, numerous, crowded and well-defined « cribellations » or isidia, and often brownish tinge of the thallus); in fertile material, of course, the low thecium and smaller spores are diagnostic. The surface of the thallus almost invariably

gives a delicate flesh-pink reaction with Paraphenylenediamine, as mentioned on p. 164. A specimen from Chile, Yendegaia, collected by Santesson, is peculiar in that it occurs on fine loose sand and completely lacks marginal lobes. Vainio's description of a sorediate thallus in his « *Placopsis pacifica* » is an error; it is easy to mistake the eroded hollows in the thallus for the depressions left by worn-off soredia.

Obs. 3. — Nylander recorded « *Lecanora gelida* » from Japan in his *Lich. Japon* (1890) 42, but the only Japanese specimen in his herbarium under this name is *P. cribellans* with the characteristic pittings only sparingly present. « *Lecanora gelida* » record by Satô in *SaitoHo-on Kai Mus. Research Bull.* n° 4 (1934) 14 from Mt. Hakkôda, Ô-dake, also most probably refers to this species.

Forma **tuberculifera** M. Lamb, *f. nov.*

Diagn. — *Thallus isidiis integris (haud erosis), verruculiformibus, subglobosis; ceterum sicut in forma typica speciei.*

Possibly a growth-stage of the species. Its distribution has been included above together with that of the typical form. The subglobose isidia are crowded or ± scattered over the surface of the thallus, 0.15-0.20 mm. diam. (in one specimen from Chile, Osorno volcano, coll. Dusén, they are unusually large, about 0.4 (-0.8) mm. diam.), concolorous with the thallus. In a few places, where they have been eroded, the punctate depressions characteristic of the species are usually visible, and are seen to have originated from the dropping out of the isidia.

13. **P. isidiophora** Vain.

in *Philipp. Journ. Sci., sect. C*, VIII (1913) 102, *cum descript.* *Lecanora isidiophora* Zahlbr. *Cat. Lich. Univ.* V (1928) 668.

Descript. — *Thallus* determinate, effigurate at periphery; marginal lobes more or less discrete or separated by narrow cracks, 1.5 - 2.0 mm long, 0.5 - 1.0 mm broad, 0.2 - 0.5 mm thick, convex or partly flattened, simple or irregularly branched, rounded at ends; central part of thallus irregularly cracked (not areolate),

rugose or subsquamulose, up to 0.8 mm thick, the cracks 0.1 - 0.3 mm wide; whitish or cream-coloured, not pruinose, matt, thickly isidiate with subglobose, crowded and in places piled-up *isidia* 0.1 - 0.2 mm diam., concolorous with the thallus. Surface of thallus and medulla KHO + indistinctly yellow, $CaCl_2O_2$ + rose-red, Pd —. No *soredia*. No visible *hypothallus*. *Cephalodia* scattered, sessile, flattened-discoid, 0.9 - 2.0 mm diam., up to 0.6 mm thick, obsoletely radially plicate (more rarely rimose), dark yellowish-flesh-coloured, matt. *Apothecia* scattered on central part of thallus, round, well constricted at base, 0.8 - 1.5 mm diam.; thalline margin moderate, entire or obsoletely crenulate; proper margin occasionally visible, slightly prominent, concolorous with the disc, matt; disc dark brownish-flesh-coloured or yellowish-brown (in old apothecia becoming brown-blackish by degeneration), plane or slightly concave, often at first ochraceous-pruinose, matt. *Excipulum* forming an entire stratum below hypothecium, pale brownish, paraplectenchymatic; *hypothecium* colourless to pale yellow-brownish; *thecium* 185-285μ high, yellow-brownish above, otherwise colourless. *Paraphyses* not or only slightly thickened at apices. *Spores* 8, uniseriate in ascus, ellipsoid, 18-24 × 9-12μ.

Icon. — Pl. VI, fig. 18 (the holotype specimen).

Habitat. — Apparently vague in its choice of substratum; the holotype occurs on dead wood, the Javan specimen on rock.

Distribution. — Apparently endemic to the Malay Archipelago, having been found in the Philippines and Java, where it occurs at high altitudes.

Philippine Islands. *Negros:* Canlaon volcano, altit. 1830 m, Merrill, 1910 (n° 6876) (holotype) (fert.) (TUR.).

Java. *Preanger:* Mt. Gede, altit. circ. 3000 m, Schiffner, 1894 (fert.) (FH.).

Obs. — In the holotype specimen, the thallus has an upper faintly nubilated paraplectenchymatic cortex 13-23μ deep, of cells 4.5-6.0μ diam.; medulla slightly nubilated, ± compact, of intertexted hyphae 2.8-5.0μ thick running in various directions, or at the apices of the marginal lobes chiefly horizontally-parallel; symbiotic algae 5-10μ diam., forming a ± continuous layer 24-54μ deep. Algae of cephalodia Scytonemoid, aeruginose or yellow-green, forming a layer in the

upper medulla of the cephalodium. Lower paraplectenchymatic excipular stratum composed of ± isodiametric, thin-walled cells 4-6 diam. ; hypothecium of compacted pale yellowish or colourless hyphae 1.2-1.5μ thick running in various directions ; thecium 200-285μ high. Paraphyses often branched, 1.3-2.0μ thick. Asci cylindric, 165-190 × 12-14μ, with wall 1.0-1.3μ thick at sides, at apex (in immature asci) up to 8μ, with iodine staining blue then greenish-yellow. Spores 18-21 × 9-12μ. (No pycnidia seen).

14. **P. papillosa** Vain.

in *Philipp. Journ. Sci. sect. C*, VIII (1913) 102, *cum descript.*
Lecanora papillosa Zahlbr. *Cat. Lich. Univ.* V (1928) 668.

Descript. — *Thallus* usually determinate and well effigurate with peripheral lobes 1-5 mm long, 0.5-1.0 mm broad, 0.2-0.5 mm thick, tumid-convex or in places flattened, irregularly branched or simple, rounded and often obsoletely crenulate at apices ; sometimes poorly developed and not over 1 mm in length, and even absent in places, the thallus then appearing effuse ; central part subsquamulose, up to 0.8 mm thick (including the isidia), irregularly cracked, not areolate. Thallus usually alutaceous or pale olivaceous-brownish, sometimes lighter (cream-coloured), matt, not pruinose, in central parts thickly isidiate with crowded subglobose *isidia* 0.1-0.3 mm diam., concolorous with the thallus. Surface of thallus and medulla KHO — or sordid brownish, $CaCl_2O_2$ + rose-red, Pd —. No *soredia*. A thin ochraceous *hypothalline layer* visible in places, but not developed at periphery of thallus. *Cephalodia* scattered, irregular, tuberculiform or ± flattened, sessile, up to 1 mm diam., 0.5 mm thick, variously plicate and rugose, semipellucid, dark red-brown (or brown-blackish by degeneration). *Apothecia* scattered, discoid, well constricted at base, up to 1.3 mm diam. ; thalline margin moderate or thickish, often subcrenulate, sometimes slightly whitish-pruinose; disc plane or slightly concave, ochraceous-brown, red-brown, or occasionally brown-blackish, in young apothecia often suffused with a whitish or pale ochraceous pruina. *Excipulum* entire below hypothecium, paraplectenchymatic, yellow-brownish-nubilated. *Hypothecium* colourless to pale brownish-yellow. *Thecium* 120-195μ high, colourless except in upper part, where yellow-brownish. *Paraphyses* not thickened at apices. *Spores* 8, uniseriate in ascus, ellipsoid, 17.0-19.5 × 9-11μ.

Icon. — Pl. VI, fig. 19 (the holotype specimen).

Habitat. — On hard or disintegrated rocks, also on soil.

Distribution. — Similar to that of the closely related *P. isidiophora*, *q. v.*

Philippine Islands. *Negros:* Canlaon volcano, altit. 1830 m, Merrill, 1910 (n° 6866) (holotype) (fert.) (TUR).

Java. *Pasoeroean :* Ardjoena, Lalidjiwa, on tufaceous boulder, Du Rietz, 1927 (Swed. Bot. Australas. Exped.) (n° 102 : 1) (fert.) (*DR.*); Lalidjiwa-Welirang track, Du Rietz, 1927 (Swed. Bot. Australas. Exped.) (n° 65:10) (fert.) (*DR.*); Mt. Welirang, altit 2900 m, on rock, Schröter, 1927 (fert.) (*DR.*); Mt. Brama, Ngadisari, altit. circ. 2000 m, on soil, Schröter, 1927 (fert.) (*DR.*); *Preanger :* Mt. Gede, altit. circ. 3000 m, Seifriz, 1920 (fert.) (W.); Pangerango Mountain, altit. circ. 3000 m, on rocks in a stream, Van Leeuwen-Reijnvaan, 1928 (n° 11914) (fert.) (*DR.*); *Kedoe:* Mt. Sindoro (Soendara), summit of volcano, altit. circ. 3000 m, Van Leeuwen-Reijnvaan, 1927 (n° 8905) (fert.) (*DR.*); *Jogjakarta :* valley of river Kali-Kuning on southern slopes of Merapi, altit. circ. 1200 m, Junghuhn (fert.) (U.); *Kediri :* Mt. Keloed, altit. 1100 m, on andesitic rock, Schröter, 1927 (fert.) (*DR.*)

Obs. 1. — The holotype specimen differs somewhat from the other material seen in having very poorly developed marginal lobes and darker (dark red-brown to blackish) apothecial discs. Its thallus has a colourless or faintly yellowish, indistinctly paraplectenchymatic cortex 8-17μ deep, of cells 3-5μ diam. ; medulla colourless or faintly yellowish in section, compact, of interwoven hyphae 2.0-4.3μ thick running in various directions ; hypothallus not distinctly separated from medulla, spongy, of closely or loosely intertexted hyphae 2-5μ thick with thin brownish walls ; symbiotic algae 5-11μ diam., forming a somewhat diffuse, ± continuous stratum 30-78μ deep. Algae of cephalodia Stigonemoid, aeruginose, in conspicuous, hyaline slime-sheaths. Lower paraplectenchymatic stratum of excipulum of ± isodiametric fairly thin-walled cells 4-7μ diam. ; hypothecium of compacted intricated hyphae 1.3-2.0μ thick running in various directions.

Paraphyses often branched, 1.0-1.7μ thick, the tips covered with minute yellowish epithecial granules. Asci cylindric, 100-170 × 10-14μ, with wall 1.0-1.3μ thick at sides, at apex (in immature asci) thickened up to 6μ, coloured pale blue by iodine. (No pycnidia seen).

Obs. 2. — This species and *P. isidiophora* are very closely related, and not distinguishable externally. The only constant difference which I can find between them is in the height of the thecium : 185-285μ in *isidiophora,* 120-195μ in *papillosa.*

15. **P. pycnotheca** M. Lamb

apud Räs. in *An. Soc. Cient. Argent.* CXXVIII (1939) 139, *cum descript. (excl. synon).*

Descript. — *Thallus* (effigurate ? *), apparently forming quite widespread crusts, 0.2-1.0 mm thick, continuous, not rimose, plicate-verrucose; verrucae irregular, subhemispherical or subglobose, 0.3-0.9 mm diam., in places concrescent and forming an uneven plicate surface; sordid cream-coloured or brownish-ash-grey, matt, not or here and there subtly whitish-pruinose, isidiate with numerous irregularly scattered sessile subglobose *isidia* 0.40-0.75 mm diam., which are darker than the thallus (sordid yellow-brownish or brownish-flesh-coloured), smooth, constricted at the base, matt, not pruinose. Surface of thallus and medulla KHO —, $CaCl_2O_2$ + red, Pd —. No *soredia,* no visible *hypothallus. Cephalodia* sessile, scattered, flattened-discoid, 1.0-2.5 mm diam. up to 0.3 mm thick, radially plicate-effigurate, not cracked, brownish-flesh-coloured to rusty-brown, matt. *Apothecia* irregularly disposed, well constricted at base, discoid, 1.2-1.8 mm diam., with the thalline margin at first prominent, of moderate thickness, entire, occasionally slightly white-pruinose, finally almost excluded; proper margin at length subprominent, thin, brownish-flesh-coloured, often subtly white-pruinose; disc plane, smooth, sometimes cracked, dark red-brown or in age brown-blackish or blackish, matt, naked. Lower paraplectenchymatic *excipular stratum* massive, 225-300μ thick, solid, nubilated; *hypothecium* colourless; *thecium* 135-155μ high,

* The specimens seen are incomplete, and do not show the periphery.

light yellowish-brown above, otherwise colourless. *Paraphyses* not thickened at apices. *Spores* 6-8, uni- or partly biseriate in ascus, elongate-ellipsoid (rarely ellipsoid), (15-) 18-24 × (6-) 7-8 (-8.5) μ. *Pycnidia* immersed in thalline verrucae, indicated by brown-blackish spots about 0.1 mm diam., subpyriform in section, up to 285μ diam., with obsolescent hyaline indistinctly paraplectenchymatic perifulcrium ; fulcra pale rose-pink in

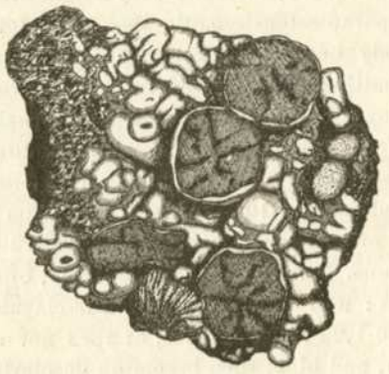

Fig. 7. — *Placopsis pycnotheca* M. Lamb. Part of the holotype [specimen, showing apothecia, a cephalodium (below), and two isidia (right)

the mass, often branched, pointed, 12-18μ long, 1.0-1.2μ thick ; *pycnoconidia* filiform, slightly curved or almost straight, 16-21 × about 0.5μ.

Icon. — Fig. 7 (a portion of the holotype specimen).

Exsicc. — Lechler, Plant. Magell. 1282 (without name) (U.) (sterile, not entirely certain).

Habitat. — On soil.

Distribution. — Southern central Chile and perhaps also Fuegia.

Chile. *Llanquihue :* Río Manso, altit. circ. 850 m, Donat, 1936 (n° 854) (holotype) (fert.) (*Räs.*); (*Magallanes:* near Punta Arenas, Lechler, 1853 (Plant. Magell. 1282) (ster.) (U.), not entirely certain).

Obs. 1. — In the holotype specimen the thallus is in most places covered by a semi-amorphous colourless necrotic stratum 4-8μ thick. Cortex 18-30μ deep, pallid brownish (not nubilated), paraplectenchymatic, of cells 4.5-8.0μ diam. Medulla compact or with a few small air spaces, nubilated, formed of interwoven hyphae 3-4μ thick running in various directions; towards the base this tissue is more compacted and brown by degeneration. Symbiotic algae 8-12μ diam., bright green, forming an interrupted stratum 45-90μ deep. Isidia without any necrotic layer, corticate with a light brown cortex which is less distinctly paraplectenchymatic than that of the thallus, containing immediately beneath the cortex a ± even layer 45-80μ deep of bright green thalline algae derived from the upward invagination of the gonidial layer of the thallus. Algae of cephalodia Nostocoid, pale aeruginose, orange-red, or almost colourless, filling most of cephalodium. The massive lower excipular layer is formed of ± isodiametric thin-walled cells 6-10μ diam. Hypothecium up to 120μ deep in centre, formed of compacted intertexted hyphae 2-4μ thick running in various directions. Paraphyses 1.5-2.0μ thick, often branched, not moniliform at tips; asci clavate or cylindric-clavate, 90-130 × 10-14μ, with wall 1.0-1.2μ thick at sides, at apex not or only slightly thicker (up to 3μ), and blue, then becoming decolorised, with iodine.

Obs. 2. — Distinct by reason of the coloured isidia, which on superficial inspection resemble verrucose cephalodia, the massive basal excipulum, and the elongated spores. The sterile Lechler specimen from Punta Arenas is very similar in appearance to the holotype, but in the absence of apothecia the determination can only be provisional.

16. P. alphoplacoides M. Lamb, *sp. nov.*

Descript. — Thallus *determinatus, bene effiguratus, plagas sat latas confluentesque efficiens, eburneo-albidus aut passim fuscescenti-albidus, opacus, haud pruinosus, lobis marginalibus tumidis, adnatis vel subdiscretis, rimis tenuibus separatis, subcuneatis (apicibus expansis deplanatisque, substrato adpressis), 2.0-4.5 mm longis, 0.7-1.3 mm latis (apicibus ad 2 mm), ad 0.3 mm crassis; in centro ad 1 mm crassus, verrucoso-areolatus, verrucis irregularibus subrotundatis 0.3-1.0 mm diam., rimis ad 0.25 mm latis separatis aut passim fere confluentibus; extus KHO —,*

$CaCl_2O^2$ + bene rubescens, Pd — ; medulla KHO— vel plerumque spurie rufofuscescens (solutione colorata e strato hypothallino diffundenti), $CaCl_2O_2$ + rubescens, Pd — ; isidia *in forma typica speciei nulla, in var.* clavifera (q. v.) *evoluta;* soredia *nulla.* Hypothallus *ad peripheriam haud visibilis, sub parte centrali thalli stratum fusconigrum ad 0.5 mm crassum formans.* Cephalodia *sparsa, haud numerosa, sessilia, irregulariter pulvinata aut subdiscoidea, cerebriformia, haud distincte effigurata, ad 3 mm diam. et 1 mm crassa, pallide flavidocarnea, haud vel parum nitida, epruinosa.* Apothecia *numerosa, irregulariter disposita, basi valde constricta, rotunda, 2-3 mm diam., margine thallino persistenti, primum valido, deinque nonnihil attenuato, integro subcrenulatove, saepe albido-pruinoso; margine proprio demum visibili, zona fuscescenti in latero interiore marginis thallini indicato; disco plano vel demum levissime convexo, ad initio ochraceo-fusco, obscure fusco aut nigrofusco, opaco, haud pruinoso, saepe fissuris irregularibus rupto.* Excipulum *sub hypothecio integrum, bene evolutum, 120-150 μ crassum, paraplectenchymaticum, dense nubilatum;* hypothecium *incoloratum;* thecium *(112-) 130-140 (-160) μ altum, in parte superiore flavofuscescens, ceterum hyalinum.* Paraphyses *apicibus leviter incrassatae crebreque septatae, gemmas moniliformes proferentes.* Sporae *8nae, in asco vulgo biseriatae, fusiformae, apicibus rotundatis, (17.5-) 18-21 (-25) × (5-) 5.5-6.5 (-7) μ.* Pycnidia *(in var.* clavifera*) numerosa, thallo immersa, verticaliter ellipsoidea aut doleiformia, ad 370μ alta et 310μ lata; perifulcrium simplex, incoloratum; fulcra subulata, simplicia ramosave, 16-20 × 1.0-1.5μ;* pycnoconidia *filiformia, arcuata, 12-16 × circa 0.5 μ.*

Icon. — Pl. XVI, fig. 51 (part of the holotype specimen).

Habitat. — On rocks and soil.

Distribution. — New Zealand.

New Zealand. South Island, *Westland:* Otira Gorge, rata belt, Du Rietz, 1927 (Swed. Bot. Australas. Exped.) (n° 2667) (holotype) (fert.) (*DR.*); *Canterbury:* Hooker Valley at the base of Sebastopol, Du Rietz, 1927 (Swed. Bot. Australas. Exped.) (n° 2143 *pr. p.*) (fert.) (*DR.*).

Obs. 1. — In the holotype specimen, the thallus is covered by an outer amorphous necrotic layer 4-5μ thick. Cortex heavily yellowish-

grey-nubilated ($CaCl_2O_2$ + deep red), 20-25μ deep, paraplectenchymatic. of ± isodiametric thin-walled cells 3-4μ diam. Medulla l a x, with numerous air spaces, very nubilated, of thin-walled hyphae 2-3μ thick interwoven in various directions ; towards the base going over gradually into a yellow-brown ± paraplectenchymatic hypothalline tissue of thin-walled cells 2-3μ diam. The nubilation of cortex and medulla disappears in KHO, with a yellow-brownish solution flowing out of the pigmented hypothalline tissue. Symbiotic algae round, bright green, 6-10μ diam., thin-walled, forming a frequently interrupted somewhat diffuse stratum 120-180μ deep. Algae of cephalodia Nostocoid, isolated or in short chains, pale aeruginose, 4μ diam. Cells of lower excipular stratum thin-walled, 5-7μ diam. Paraphyses 1,5-2.0μ thick, occasionally branched, abstricting at their apices masses of pigmented rounded cells 2.0-2.5μ diam. which, entangled among the apices of the paraphyses, form the coloured epithecium ; the latter made lighter but not decolorised by KHO. Asci cylindric-clavate, 88-100×14-16μ, with wall of even thickness, about 1.5μ. Spores often slightly more tapered at one end than at the other, thin-walled. With iodine, thecium blue then aeruginose (ascus walls almost colourless, paraphyses yellow ; the blue colour apparently due to the staining of a thin hyaline mucilage in the thecium). (Pycnidia not seen in the typical form.)

Obs. 2. — Appears to be related to the S. American *P. pycnotheca*, which differs in the nature of the isidia, the absence of a hypothalline stratum, and various anatomical characters, *e. g.* non-nubilated thalline cortex, more shallow gonidial stratum, compact medulla, non-moniliform paraphyses, and slightly broader spores.

Var. **clavifera** M. Lamb, *var. nov.*

Diagn. — *Thallus in parte centrali minus distincte areolatus quam in forma typica, tartareus, ruguloso-verrucosus, circa 1 mm crassus, isidiis magnis cylindraceo-claviformibus, simplicibus aut parce ramosis, teretibus aut nonnihil compressis, ad 3.5 mm. longis, 0.5-0.8 mm crassis, thallo concoloribus, apicibus rotundatis, irregulariter sparsis, singulatim gregatimve dispositis, munitus. Ceteris notis ut in forma typica speciei.*

Icon. — Pl. XVI, fig. 52 (part of the holotype specimen showing a group of isidia).

Habitat. — « On earth in the road side » ; « on moist earth »; « dominant on earth » (collector's notes).

Distribution. — New Zealand.

New Zealand. North Island, *Auckland :* Rotorua, at southern shore of Lake Rotomahana, Du Rietz, 1927 (n° 3103) (fert.) (*DR.*) ; South Island, *Westland :* Otira Gorge, at the lower mouth of the gorge, Du Rietz, 1927 (n° 2668) (holotype) (fert.) (*DR.*) ; *Canterbury :* Hooker Valley, at the base of Sebastopol, Du Rietz, 1927 (n° 2143 *pr. p.*) (fert.) (*DR.*) (all Swed. Bot. Australas. Exped. 1926-27).

Obs. 1. — The thallus apparently forms extensive tartareous crusts over soil. Cortex and medulla KHO—, $CaCl_2O_2$+ red, Pd—. Anatomical characters are in close agreement with those of the typical species. The isidia are covered by a cortex similar to that of the thallus, and have throughout their entire length a zone of thalline symbiotic algae in an interrupted layer 60-110μ thick ; the central part of the isidium is filled with a lax, densely yellow-grey-nubilated medullary tissue with numerous small air spaces, the hyphae running in various directions, but chiefly ± parallel to the long axis of the isidium. Cephalodia scattered, small (up to 2 mm diam.), irregularly plicate-rimose, not effigurate, yellowish-flesh-coloured ; algae Nostocoid. Hypothecium about 140 μ deep, ± colourless, in lower 1/2 to 3/4 with the hyphae more loosely contexted. Thecium 120-140μ high, iodine reaction as in the typical species. Spores 18-20×6-7μ. Pycnidia numerous (described under the typical species).

Obs. 2. — This variety seems to be often closely associated with the typical non-isidiate form, but no intergrades were observed by me in the copious material studied.

17. **P. subparellina** Nyl.

apud Stizenb. in *Flora*, LXXII (1889) 367, *cum descript., Lich. Ins. Guineens.* (1889) 45, *cum descript.*

Lecanora subparellina Hue in *Nouv. Arch. Mus. Hist. Nat. Paris*, sér. 3, III (1891) 59 ; *Zahlbr. Cat. Lich. Univ.* V (1928) 670.

Descript. — *Thallus* effuse, apparently indeterminate, continuous, verrucose, uneven, 0.2-0.9 mm thick, glaucous-whitish or cream-coloured, matt, not pruinose ; thalline verrucae subhemispherical or variously tumid, 0.3-1.0 mm diam. No *isidia* or *soredia* ; no visible *hypothallus*. Surface of thallus and medulla KHO + yellow, $CaCl_2O_2$ + rose-red, Pd + miniate red (the surface sometimes red only in spots here and there). *Cephalodia* scattered, sessile, closely adpressed to thallus, very irregular in form, variously lobate or plicate, sometimes slightly rimose, 0.5-1.0 mm diam., up to 0.4 mm thick, dark yellowish-flesh-coloured, matt. *Apothecia* scattered, moderately to well constricted at base, discoid, 1.0-2.5 (-3.0) mm diam. ; thalline margin moderate, prominent, entire, tumid, often very thinly whitish-pruinose, finally almost excluded ; proper margin developed in larger apothecia, scarcely prominent, entire, red-brown, not pruinose ; disc dark red-brown, plane or slightly concave, whitish-pruinose, often becoming fissured in old age. *Excipulum* entire below hypothecium, about 150 µ thick, paraplectenchymatic, nubilated ; *hypothecium* colourless ; *thecium* 120-165 µ high, nubilated above, otherwise hyaline. *Paraphyses* not or only slightly thickened at apices. Spores 8, biseriate in ascus, elongate-ellipsoid or ellipsoid-fusiform, (15-) 17-21 (-24) × 5-6 (-7.5) µ. *Pycnidia* immersed in thalline verrucae, usually with colourless ostiole ; more or less spherical in section, up to 350 µ across, with hyaline or slightly nubilated perifulcrium ; *pycnoconidia* filiform, slightly curved to almost straight, 18-24 × 0.5 µ.

Icon. — Pl. VII, fig. 23 (the holotype specimen).

Habitat. — Seen only on soil.

Distribution. — Known to me only from New Zealand ; Hue, in *Nouv. Arch. Mus. Hist. Nat. Paris*, sér. 3, III (1891) 59, mentions its occurrence also in Java, but I have seen no material of it from there.

New Zealand. Exact locality not stated, Colenso (n° 4731) (holotype) (fert.) (H.), Colenso (fert.) (BM.) ; South Island, *Canterbury :* exact locality not stated, Haast (fert.) (K., W.).

Obs 1. — In the holotype specimen (n° 23869 in herb. Nylander), the cortex of the thallus is 15-30 µ deep, ± nubilated, paraplectenchymatic, of cells 4-6 µ diam. ; medulla compact, densely nubilated, of interwoven hyphae 3-6 µ thick, brownish and more compacted below where it joins the substratum ; symbiotic algae 4-10 µ diam., bright green, forming a ± continuous stratum 45-90 µ deep. Algae of cephalodia Nostocoid, blue-green, forming a deep layer in the medulla of the cephalodium. Paraphyses 1.3-1.6 µ thick, often branched, abstricting nubilated conidia-like epithecial particles from their tips. Asci persistently blue with iodine. No good sections of apothecia were obtained in the holotype, but the following additional details were gotten from a specimen collected by Colenso and probably a paratype, in the British Museum Herbarium: paraplectenchyma of lower excipular stratum consisting of ± isodiametric fairly thin-walled cells 6-11 µ diam. ; hypothecium about 160 µ deep in centre, of compacted hyphae 2-3 µ thick running in various directions. Asci elongate-clavate, 90-120×12-17 µ, with wall 1.0-1.5 µ thick at sides, at apex not thicker, but apparently so on account of a plug of hyaline material on its inner side.

Obs. 2. — *P. subparellina* appears to be a morphologically constant species, recognisable by its verrucose continuous thallus, positive Paraphenylenediamine reaction, and elongated spores.

18. **P. Asahinae** M. Lamb, *sp. nov.*

Descript. — Thallus *determinatus, effiguratus, plagas plus minusve orbiculares, saepe confluentes, substrato arcte adhaerentes, parvas (0.5-2.0 centim. diam.) efficiens ; ad peripheriam lobatus, lobis fere tota longitudine adnatis, plicis (nec rimis) separatis, 1.0-1.5 mm longis, 0.8-1.0 mm latis, 0.15-0.20 mm crassis, irregulariter ramosis, apicibus rotundato-sinuatis vel lobulatis ; in centro subcontinuus, haud areolatus, parce rimosus, ad 0.4 mm crassus, tuberculis thallinis (pycnidiis) subglobosis, 0.15-0.20 mm diam. (apicibus ostiolis punctiformibus fuscescentibus munitis) creberrime obtectus ; flori lactis concolor, nec nitidus nec pruinosus, extus intusque KHO —, $CaCl_2O_2$ + roseo-rubescens, Pd— ;* hypothallus *nullus visibilis ;* isidia sorediaque *desunt.* Cephalodia *in parte centrali plagarum minorum, in plagis majo-*

ribus irregulariter dispersa, sessilia, deplanata, plus minusve discoidea, 0.3-0.8 (-1.25) mm diam., ad 0.3 mm crassa, obsolete effigurata, haud rimosa ; carnea lateritiave, haud nitida. Apothecia *numerosa, sparsa, discoidea, basi bene constricta, parva, 0.6-0.8 (-1.0) mm diam., margine thallino mediocri, integro, deinque depresso ; margine proprio interdum visibili, nigrescenti, tenui, haud prominenti ; disco plano vel leviter concavo, nigrescenti fusconigrescentive, nec nitido nec pruinoso.* Excipulum *inferne evolutum, ibi paraplectenchymaticum, nubilatum ;* hypothecium *incolor ;* thecium *98-156μ altum, superne nubilatum, ceterum incoloratum,* Paraphyses *apicibus parum incrassatae.* Sporae *8nae, in asco partim bi-, partim uniseriatae, elongato-vel fusiformi-ellipsoideae, 16-18 × 6-7μ.* Pycnidia *extus verruculis subglobosis vel hemisphaericis formantia, ostiolis punctiformibus et leviter fuscescentibus ; globosa subpyriformiave, ad 210μ diam., perifulcrio nubilato, haud paraplectenchymatico, 15-20μ crasso ; fulcris ramosis, 10-15 × 1.0-1.5μ ;* pycnoconidiis *filiformibus, leviter arcuatis vel fere rectis, 15-18 × circa 0.5μ.*

Icon. — Pl. XI, fig. 35 (two pieces of a paratype specimen in herb. Vienna).

Habitat. — On basaltic rock.

Distribution. — Formosa.

Formosa (Taiwan). *Tainan*: Mt. Arisan, Asahina, 1925 (holotype) (fert.) *(Asah.)*, (paratype) (fert.) (W.).

Obs 1. — In the holotype specimen, the thallus is covered by an outermost colourless amorphous necrotic layer 4.5-8.0μ thick ; cortex 12-15μ deep, nubilated, paraplectenchymatic, of cells 4.5-6.0μ diam.; medulla partly nubilated, fairly compact, of interwoven hyphae 2.5-4.0μ thick running in various directions. Symbiotic algae 6-11μ diam., forming a continuous and even stratum 35-50μ deep. Algae of cephalodia Scytonemoid, filling up almost the whole of cephalodium. Cells of lower excipular layer ± isodiametric, thin-walled, 6-9μ diam.; hypothecium of compacted indistinct hyphae 1.5-2.0μ thick running in various directions. Paraphyses often branched ; asci clavate, 96-120×12-15μ, with walls about 1.5μ thick at sides, not or only slightly thicker at apex, and persistently pale blue with iodine.

Obs. 2. — *P. Asahinae* bears a superficial resemblance to the f. *tuberculifera* of *P. cribellans*, on account of the very numerous tuberculate swellings in the central parts of the thallus, but on examination under a lens the pycnidial nature of the swellings is revealed by the brown ostioles at their apices. It is distinguished from *P. parellina* by its blackish apothecial discs, lower thecium, longer narrower spores, etc. The paratype specimen of this species was recorded by Zahlbruckner as «*Lecanora gelida*» in *Repert. Nov. Spec. Regn. Veget.* XXXIII (1933) 53.

19. **P. albida** (Krphb.) M. Lamb, *comb. nov.*

Squamaria albida Krphb. *apud* Nyl. in *Ann. Sci. Nat., Bot.* sér. 4, XX (1863) 277, footnote, *cum descript., Reise Oesterr. Fregatte Novara, Bot. Theil,* I (1870) 111, *cum descript.*

Lecanora albida Nyl. in *Journ. Linn. Soc. Lond., Bot.* IX (1866) 251, footnote, *apud* Hue in *Nouv. Arch. Mus. Hist. Nat. Paris*, sér. 3, III (1891) 59 ; Forss. in *Bih. Svensk. Vetensk.-Akad. Handl.* VIII, 3 (1883) 55 ; Zahlbr. *Cat. Lich. Univ.* V (1928) 665 ; Groenh. in *Nederlandsch Kruidk. Archief*, XLVI (1936) 737.

Descript. — *Thallus* entirely microphylline; the squamules crowded, discrete, or imbricate, occasionally more or less confluent to form an almost continuous uneven crust; variously divided, plane or very slightly convex, rounded or obsoletely crenulate at their ends, 1-3 mm long, 0.4-1.0 mm broad, 0.1-0.3 mm thick, whitish, glaucous-whitish, or sometimes darker (olivaceous-buff), matt, not pruinose, without *isidia* or *soredia*. *Hypothallus* often present, ochraceous, slightly spongy. Surface of thallus KHO − or indistinctly yellowish, $CaCl_2O_2$ + light rose-red, Pd − ; medulla KHO + more or less distinctly yellow, $CaCl_2O_2$ + red, Pd −. *Cephalodia* originating on the hypothallus, ochraceous-flesh-coloured, finally flattened and radially lobate, up to 2 mm diam. and 0.2-0.3 mm thick. *Apothecia* on thalline squamules, discoid, urceolate, up to 1.8 mm diam., well constricted at base; thalline margin entire or very slightly crenulated, moderate; disc concave to plane, reddish-flesh-coloured or brown, matt, sometimes ochraceous-pruinose. *Excipulum* entire below hypothecium, paraplectenchymatic, pale yellowish or colourless ; *hypothecium*

slightly yellow-brownish or almost colourless; *thecium* 170-235 μ high, colourless except in upper part, where sordid pale yellowish. *Paraphyses* not or only slightly thickened at apices. *Spores* 6-8, uniseriate in ascus, ellipsoid, 20-25 × (9-) 10.5-12.0 μ. *Pycnidia* immersed in thalline squamules, showing as minute yellow-brown spots, spherical in section, 120-250 μ diam., with colourless or slightly yellowish wall; fulcra congested, 8-15 × 1.0-1.5 μ; *pycnoconidia* filiform, curved to almost straight, 15-25 × about 0.5 μ.

Icon. — Pl. XI, fig. 36 (a syntype specimen in herb. München); further: Krphb. *loc. cit.* Tab. XII, fig. 3*a*, *b*, *c*, *d*, *e* (not good).

Habitat. — On more or less decomposed rocks and on soil.

Distribution. — Apparently endemic to Java, at high altitudes.

JAVA. Exact locality not stated, Jelinek (syntype) (fert.) (M., W.); *Pasoeroean:* Ardjoena, Lalidjiwa-Welirang track, on wind-exposed upper part of the scrub slope, altit. circ. 3000 m, Du Rietz. 1927 (Swed. Bot. Australas. Exped.) (n° 65:9) (fert.) (*DR.*); *Kedoe:* Mt. Soembing volcano summit, altit. circ. 3300 m, Van Leeuwen-Reijnvaan, 1927 (n° 8792) (fert.) (*DR.*).

Obs. — In the Vienna syntype, the thallus has an upper cortex 15-20 μ deep composed of cells 3-6 μ diam.; medulla of loosely interwoven colourless hyphae 2.5-5.0 μ thick running in various directions, and passing gradually down into the chiefly horizontally contexted yellow-brown hyphae of the hypothallus. Symbiotic algae 5-10 μ diam., forming a continuous and ± even stratum 30-40 μ deep. Algae of cephalodia Nostocoid, forming large clumps. Paraplectenchymatic cells of lower excipulum ± isodiametric, thin-walled, 5-9 μ diam., staining blue with iodine; hypothecium up to 80 μ deep, of compacted hyphae 1-2 μ thick running in various directions, and staining sordid aeruginose with iodine. Asci cylindrical, 150-200 × 9-18 μ, with walls 1-3 μ thick at sides, at apex thickened up to 7.5 μ, persistently blue with iodine.

20. **P. Roivainenii** M. Lamb, *sp. nov.*

Descript. — Thallus *suborbicularis, ad 8 centim. diam., tartareus, 0.5-1.0 mm crassus, ambitu zona 1.0-1.5 centim. lata plicato-effiguratus (haud vel parcissime rimosus, lobis haud discretis), ibi plus minusve continuus, ad peripheriam abrupte terminatus, plicis radiantibus irregularibus, 1-2 mm latis; in centro rimosus vel rimoso-areolatus, areolis varie angulosis, 1-2 mm diam. (rimis 0.1-0.3 mm latis separatis), subplanis vel saepe subverrucoso-inaequalibus; glauco-albidus aut flori lactis concolor, opacus, epruinosus, extus intusque KHO — vel sordide sublutescens,* $CaCl_2O_2$ + *roseo-rubescens, Pd* —. Isidia sorediaque *desunt;* hypothallus *nullus visibilis.* Cephalodia *irregulariter vel subconcentrice dispersa, deplanata, suborbicularia aut demum irregularia, 1-9 mm lata, ad 1 mm crassa, radiatim plicato-effigurata rimosaque, ochracea fuscescentiave, haud nitida.* Apothecia *thallo irregulariter supersparsa, discoidea, 1.0-2.5 (-3.0) mm diam., margine thallino primum crassiusculo, prominulo, integro, passim albidopruinoso, demum tenuiori saepeque subcrenulato; margine proprio raro visibili, leviter prominenti, carneo, integro, interdum subtiliter pruinoso; disco plano (rarius aetate depresso-convexo), demum subradiatim rimoso, obscure carneo vel rufofusco, opaco, vulgo pruina ochracea tenuiter obtecto.* Stratum paraplectenchymaticum excipulare *sub hypothecio evolutum, 90-120 μ crassum, nubilatum;* hypothecium *incoloratum vel lamina crassiori visum pallide flavescens;* thecium *180-210 μ altum, superne sordide roseo-flavidum (haud vel parum nubilatum), ceterum hyalinum.* Paraphyses *apicibus haud incrassatae, moniliformi-proliferentes.* Sporae *8nae, in asco uniseriatae, ellipsoideae, 18.0-18.5 × 9.0-10-5 μ.* Pycnidia *sparsa, verruculis thallinis innata, apicibus ostiolis singulis punctiformibus carneis aut subincoloratis ad 0.1 mm latis; sphaerica, ad 435 μ diam., perifulcrio paraplectenchymatico, nubilato. Fulcra ramosa, acuminata, 10-15 × 1.0-1.5 μ.* Pycnoconidia *filiformia, leviter arcuata vel fere recta, 18-24 × 0.5 μ.*

Icon. — Pl. II, fig. 5 (the holotype specimen).

Habitat. — On sandy soil.

Distribution. — Fuegia.

ARGENTINA. *Tierra del Fuego:* Cabo San Pablo, Roivainen, 1929 (Expeditio Fennica) (holotype) (fert.) (H.), (paratype) (fert.) (*Räs.*).

Obs. 1. — In the holotype specimen, the thalline cortex is 18-36 μ deep, nubilated in upper 10-20 μ but otherwise hyaline, paraplecten-

chymatic, of cells 3-6μ diam. No outermost amorphous necrotic layer is present. Medulla fairly compact, nubilated, of intertexted hyphae 3.0-4.5μ thick running in various directions. Symbiotic algae 6-12μ diam., bright green, forming an interrupted layer 65-120μ deep (with a few sporadic individuals deep down in the medulla). Algae of cephalodia Scytonemoid, orange-reddish, scattered in irregular masses. Lower paraplectenechymatic stratum of excipulum formed of ± isodiametric thin-walled cells 4-6μ diam.; hypothecium of compacted hyphae 1-2μ thick running in various directions, here and there with larger (ascogenous?) hyphae up to 4.5μ thick. Paraphyses 1.3-1.7μ thick, occasionally branched. Asci cylindric-clavate, 120-130 × 9-14μ, with wall 1.3-1.5μ thick at sides, up to 8μ at apex, persistently pale blue with iodine.

Obs. 2. — In small specimens, such as the paratype in herb. Räsänen, the radiating marginal plications may abut directly on the central primary cephalodium, the inner verruculose-areolate part of the thallus not being shown. In places between the ± fused peripheral lobes one can see faint indications of original separating cracks which have apparently closed up again. This species appears to be related to *P. parellina*, but is morphologically distinct. It is based upon one of the specimens recorded as « *Placopsis bicolor* » by Räsänen in *Ann. Bot. Vanamo*, II (1932) 25.

21. **P. parellina** (Nyl.) M. Lamb

in *Res. Norweg. Sci. Exped. Tristan da Cunha* 1937-38, n° 3 (1940) 3.

Lecanora parellina Nyl. in *Ann. Sci. Nat., Bot.* sér. 4, III (1855) 157, *cum descript.*; Hue in *Nouv. Arch. Mus. Hist. Nat. Paris*, sér. 3, III (1891) 59; Zahlbr. *Cat. Lich. Univ.* V (1928) 668.

Squamaria rhodocarpa Nyl. in *Ann. Sci. Nat., Bot.* sér. 4, XV (1861) 376, *cum descript.*

Lecanora rhodocarpa Nyl. in *Journ. Linn. Soc. Lond., Bot.* IX (1865) 251, footnote; Forss. in *Bih. Svensk. Vetensk.-Akad. Handl.* VIII, 3 (1883) 54; Hue in *Nouv. Arch. Mus. Hist. Nat. Paris*, sér. 3, III (1891) 59; Zahlbr. *Cat. Lich. Univ.* V. (1928) 669.

Placopsis rhodocarpa Nyl. *Lich. Nov. Zel.* (1888) 56, *cum descript.*; Vainio in *Hedwigia*, XXXVIII (1899) (187), *cum descript.*

Placodium rhodocarpum Müll. Arg. in *Bull. Herb. Boissier*, II, append. I (1894) 46; Hellb. in *Bih. Svensk. Vetensk.-Akad. Handl.* XXI, Afd. III, n° 13 (1896) 59.

Placopsis parellina var. *rhodocarpa* M. Lamb in *Res. Norweg. Sci. Exped. Tristan da Cunha* 1937-38, n° 3 (1940) 3.

Placopsis rhodomma Nyl. *Lich. Nov. Zel.* (1888) 56, *cum descript.*

Lecanora rhodomma Hue in *Nouv. Arch. Mus. Hist. Nat. Paris*, sér. 3, III (1891) 59.

Placodium rhodomma Hellb. in *Bih. Svensk. Vetensk.-Akad. Handl.* XXI, Afd. III, n° 13 (1896) 59.

Descript. — *Thallus* effuse or effigurate (marginal lobes when developed more or less flattened, closely adpressed to substratum, contiguous, separated by narrow cracks, 1-6 mm long, 0.8-1.5 mm broad, variously divided, rounded or subcrenulate at apices), continuous or with some irregularly anastomosing cracks (not areolate), irregularly rugose-verruculose or sometimes fairly smooth, 0.4-0.6 mm thick; verruculae when well developed are more or less rounded or subangulose, 0.3-0.8 mm diam., often confluent; sometimes (in f. *microphylla*) entirely squamulose; glaucous-whitish or cream-coloured, naked or occasionally in places subtly whitish-pruinose, inside and outside KHO − or indistinctly yellowish, $CaCl_2O_2$+ light rose-pink, Pd −, or (in f. *semireagens*) with the surface only Pd + brick-red. No *isidia* (except in var. *carnea* f. *subcribellans*, *v. v.*); *soredia* often present, scattered, rounded, subglobose-erumpent, up to 0.8 mm diam., pulverulent, concolorous with the thallus (in f. *argillacea* confluent and covering entire surface of thallus). No visible *hypothallus*. *Cephalodia* irregularly disposed, sessile, irregular in shape, variously wrinkled, sometimes plicate-effigurate and radially cracked, 0.6-1.5 (-2.5) mm diam., up to 0.5 mm thick, brownish or flesh-coloured, matt. *Apothecia* scattered, discoid, moderately to well constricted at base (in f. *ampliata* not constricted); thalline margin prominent, thickish, entire, concolorous with the thallus or with a slight flesh-pink tinge, sometimes granulose-pulverulent, not or slightly pruinose, matt; proper margin occasionally developed, thin, slightly prominent, entire, yellowish-flesh-coloured; disc plane, rosy-red, reddish-brown, or brown, often at first somewhat ochraceous-pruinose, matt. *Excipulum* entire below hypothecium, paraplectenchymatic, nubilated. *Hypothecium* colourless. *Thecium* 140-240 μ high, yellowish-brown-nubilated above, other-

wise colourless. *Paraphyses* not or slightly thickened at tips (up to 2.5 μ). *Spores* 8 (sometimes by abortion 5-7) uniseriate in ascus, ellipsoid, (17-) 18-24 (-28) × 8-14 μ, or (in var. *carnea*) smaller, (15-) 16.0-18.5 × (7.5-) 9-11 μ. *Pycnidia* immersed in thallus, not prominent, indicated externally by minute reddish-yellow spots; spherical or ± irregular in section (but not convoluted), up to 450 μ diam., with hyaline wall 9-30 μ thick; fulcra subulate-acuminate, often branched, 1-2 μ thick; *pycnoconidia* filiform, arcuate-curved or more rarely almost straight, 17-25 × 0.5 μ.

Icon. — Pl. II, fig. 6 (a specimen from Tristan da Cunha); Pl. VIII, fig. 26 (two fragments constituting part of the syntype specimen in herb. Nylander); fig. 27 (three fragments constituting the holotype of « *Squamaria rhodocarpa* » Nyl.); fig. 28 (a saxicolous specimen from New Zealand, Ashburton, showing marginal effiguration).

Exsicc. — See under f. *argillacea*.

Habitat. — On soil and rocks, often gregariously, forming confluent patches.

Distribution. — A bicentric southern hemisphere species, occurring in both the South American and the Australia-New Zealand areas, also with a high altitude Malaysian outlier in Java, and an occurrence in the Andean chain as far north as Bolivia.

Chile. Exact locality not stated (fert.) (W.), Gay (syntype) (fert.) (H., PC.); *Concepción:* exact locality not stated, Dusén, 1896 (Nordenskjöld's Eldslands-exped.) (n° 110) (fert.) (S.), Neger (fert.) (TUR.); *Valdivia:* exact locality not stated, Rabenhorst, 1870-71 (fert.) (W., *Frey*); Corral, on stones in roadside in rain forest, Santesson, 1940 (Swed. Magellan. Exped.) (n° 2303) (fert.) (S.), altit. 10 m, Gunckel, 1935 (n° 5212) (fert.) *(Räs.)*; Valdivia, Collico, on rock in road cutting, Santesson, 1940 (Swed. Magellan. Exped.) (n° 3269) (fert.) (S.); Lago Riñihue, Enco, on trickle water surfaces on rocks, Santesson, 1940 (Swed. Magellan. Exped.) (n° 3752) (fert.) (S.); *Magallanes:* Isla Desolación, Puerto Angosto, « in saxis litoralibus », Dusén, 1896 (Nordenskjöld's Eldslands-exped.) (n° 199 *pr. p.*) (fert.) (S.); Canal Beagle, Yendegaia, altit. circ. 20 m, on rocks in grass land, Santesson, 1940 (Swed. Magellan. Exped.) (n° 1360) (fert.) (S.); Peel Inlet on south side of Chatham Island, at the glacier, Skottsberg, 1908 (Swed. Magellan. Exped. 1907-09) (fert.) (U.); *Juan Fernandez:* Masatierra, « stark erodierter Boden im unt. Teil des Kolonie-Tals », Skottsberg, 1916 (Svenska Pacificexpeditionen) (n° 328) (fert.) (GB., BM., LUND); Masatierra, Skottsberg, 1908 (Swed. Magellan. Exped. 1907-09) (in f. *argillaceam* transiens) (fert.) (U.); Masafuera, « Bachravin unweit des Correspondencia-Lagers », altit. 1100m, Skottsberg, 1917 (Svenska Pacificexpeditionen) (fert.) (U.).

Bolivia. *La Paz:* Pocara near Sorata, altit. 3100 m, Mandon (n° 1774) (holotype of « *Squamaria rhodocarpa* » Nyl.) (fert.) (H.), (paratype) (fert.) (BM., PC., W.).

Tristan da Cunha. Exact locality not stated, Mosely, 1874 (Challenger Exped.) (fert.) (K., BM.), Siggeson, 1934 (fert.) (O.) *; above settlement, altit. 50 m, Christophersen & Mejland, 1937 (n° 411) (fert.) (O.), altit. 250 m, Christophersen & Mejland, 1937 (n° 256) (fert.) (O.) (both Norweg. Exped. Tristan da Cunha 1937-38).

New Zealand. Exact locality not stated, Knight, 1867 (lectotype of « *Placopsis rhodomma* » Nyl.) (fert.) (H.), 1882 (fert.) (H.), without date (fert.) (M., U.), Hooker (fert.) (K., BM.); North Island, *Wellington:* Wellington, Berggren, 1874 (fert.) (S.), Buchanan (fert.) (BM.); Maungaroa near Wellington, Berggren, 1874 (fert.) (S.); Tapuaeharuru on southern shore of Lake Taupo, Berggren, 1874 (fert.) (S.); Tararua Range, at margin of track on the ridge between Mt. Marchant and Mt. Omega, « very common », Du Rietz, 1926 (Swed. Bot. Australas. Exped.) (n° 1434) (fert.) *(DR.)*; Raetihi near Ruapehu, on volcanic plateau, Attwood, 1935 (fert.) *(Redgr.)*; South Island, *Westland:* Greymouth, Helms, 1886 (fert.) (H.); Otira, Allan, 1927 (n° 1623) (fert.) *(DR.)*; *Canterbury:* Ashburton, Allen, 1920 (fert.) (BM.); Cass, on boulders at a brook, Du Rietz, 1927 (Swed. Bot. Australas. Exped.) (n° 1483) (fert.) *(DR.)*; Dyer's Pass, on open rocks, Du Rietz, 1927 (Swed. Bot. Aus-

* This is the specimen referred to as « *Lecanora gelida* » by Lynge *apud* Christophersen in *Sci. Res. Norweg. Antarct. Exped. 1927-28 et sqq.*, n° 16 (1937) 13.

tralas. Exped.) (n° 1450 : 18) (fert.) (*DR.*); *Otago:* Dunedin, Berggren, 1874 (fert.) (S.); Routeburn Valley, on small stones in the prealpine *Nothofagus Menziesii* forest, Du Rietz, 1927 (Swed. Bot. Australas. Exped.) (n° 1804 *pr. p.*) (fert.) (*DR.*); lower Routeburn Valley, on small stones at roadside, Du Rietz, 1927 (Swed. Bot. Australas. Exped.) (n° 1948) (fert.) (*DR.*); Ross Creek Reservoir near Dunedin, Thomson, 1933 (fert.) (W.); Morrison's Creek near Dunedin, Thomson, 1933 (fert.) (*Redgr.*).

JAVA. *Preanger:* Mt. Gede, altit. circ. 3000 m, Schiffner, 1894 (n° 3397) (fert.) (BM., M.); altit. circ. 2600 m, Van Leeuwen-Reijnvaan, 1927 (n° 11551) (fert.) (*DR.*); *Pasoeroean:* Mt. Kawi, altit. circ. 2850 m, Van Leeuwen-Reijnvaan, 1927 (n° 12234) (fert.) (*DR.*).

Obs. 1. — In the Helsinki syntype (n° 23868 in herb. Nylander) the thallus has an upper slightly nubilated or almost hyaline paraplectenchymatic cortex 17-30μ deep, of cells 3-5μ diam.; medulla hyaline or in places slightly nubilated, fairly compact, of intertexted hyphae 1.5-3.0μ thick running in various directions; in the lower part the hyphal walls are yellow-brown by degeneration. Symbiotic algae 5-10μ diam., forming a continuous stratum 25-90μ deep. The thallus is apparently effuse and indeterminate, closely verruculose-rugose with a few cracks. Cephalodia irregularly rugose, not effigurate, containing Scytonemoid algae in a well defined stratum. Lower paraplectenchymatic excipular layer of ± isodiametric thin-walled cells 3-5μ diam.; hypothecium of compact hyphae 1.0-1.5μ thick running in various directions. Paraphyses 1.0-1.8μ thick, sometimes branched. Asci cylindric-clavate, 120-160 × 14-18μ, with wall 2-3μ thick (up to 6μ at apex), persistently blue with iodine. Thecium 160-240μ high. Spores 21-28 × 12-14μ.

Obs. 2. — Originally I tried to separate « *Squamaria rhodocarpa* » as a distinct variety, on the basis of the often effigurate thallus, frequent occurrence of soredia and the slightly smaller spores, but the study of much material has shown that the segregation is hardly tenable. *P. parellina* is a species of wide range and great variability, and one can evidently find every transition from the effuse type of thallus to one in which peripheral lobes are well developed, and also from sorediate to non-sorediate individuals. Perhaps, like *P. gelida*, it represents a « Sammelart » or syngameon composed of several incipient species undergoing gradual divergent differentiation. Thalline cortex may be up to 60μ deep, its cells up to 13μ diam.; the medulla may be in places almost paraplectenchymatic, of thin-walled cells 4-12μ diam.; the algal stratum is commonly ± interrupted and 50-100μ deep. The algae of the cephalodia may be Scytonemoid or Nostocoid. Very often the apothecial discs, especially in fresh material, are of a beautiful rose-red colour.

KEY TO THE VARIETIES OR FORMS OF *P. PARELLINA*

1. Thallus squamulose or microphylline; the squamules discrete or contiguous, adpressed to the substratum. Form *microphylla*
1*a*. Thallus crustaceous, not squamulose.
2. Surface of thallus Pd + brick-red. Form *semireagens*
2*a*. Thallus Pd −.
3. Apothecia not constricted at base, almost pertusarioid in appearance. Form *ampliata*
3*a*. Apothecia well constricted at base.
4. Thallus often sorediate; spores (17-) 18-24 (-28) × 8-14μ.
5. Soredia (when present) scattered, isolated, ± rounded. Typical form of the species
5*a*. Soredia widely confluent, covering the greater part of the thallus. Form *argillacea*
4*a*. Thallus apparently never sorediate; spores (15-) 16.0-18.5 × (7.5-) 9-11μ.
6. Thallus not isidiate. Var. *carnea*
6*a*. Thallus with scattered subglobose concolorous isidia Var. *carnea* form *subcribellans*

Forma **microphylla** M. Lamb, *f. nov.*

Diagn. — *Dignoscitur thallo omnino interrupto-squamuloso (nec continuo).*

Icon. — Pl. VIII, fig. 29 (the holotype specimen).

Habitat. — On soil or rocks.

Distribution. — New Zealand, Tasmania, Chile, Fuegia.

NEW ZEALAND. Exact locality not stated, Knight (fert.) (WELT.).

TASMANIA. Exact locality not stated, Fitzgerald, 1895 (ster.) (H.).

CHILE. *Valdivia* : « prope coloniam Arique », Lechler (fert.) (BM.).

ARGENTINA. *Tierra del Fuego :* Cabo San Pablo, Roivainen, 1929 (Expeditio Fennica) (holotype) (ster.) (H.).

Obs. 1. — The thallus is effuse or indistinctly effigurate, everywhere incised- or crenulate-squamulose with squamules 0.4-1.0 mm broad and 0.1-0.7 mm thick, either scattered or more commonly contiguous and separated by sinuous cracks. Soredia fairly numerous, scattered, rounded, 0.3-0.9 mm diam., convex-erumpent or finally eroded and often confluent, pulverulent, concolorous with the thallus. Thecium 165-200μ high. Spores 18-21 × 9-10μ.

Obs. 2. — The holotype specimen is one of the two recorded by Räsänen in *Ann. Bot. Vanamo* II (1932) 25 as « *Placopsis bicolor* ».

Forma **semireagens** (M. Lamb) M. Lamb, *comb. nov.*

Placopsis gelida f. *semireagens* M. Lamb in *Res. Norweg. Sci. Exped. Tristan da Cunha 1937-38*, n° 3 (1940) 2, *cum descript.*

Diagn. — Surface of thallus Pd + brick-red (medulla Pd −); Spores 15-19 × 9-11μ.

Icon. — Pl. IX, fig. 31 (part of the holotype specimen).

Habitat. — On volcanic rock.

Distribution. — Known only from Tristan da Cunha.

TRISTAN DA CUNHA. « Near potato patches », altit. 50 m, Christophersen & Mejland, 1937 (n° 189) (ster.) (O.); « above potato patches », altit. 100 m, Christophersen & Mejland, 1938 (n° 354) (holotype) (fert.) (O.); « above camp », altit. 50 m, Christophersen & Mejland, 1937 (n° 266) (fert.) (O.), 1938 (n° 1350) (ster.) (O.) (all Norweg. Exped. Tristan da Cunha 1937-38).

Obs. 1. — In the holotype specimen, the thallus forms a patch up to 4 centim. diam., and is shortly lobed-effigurate at periphery ; lobes 1.5-2.0 mm long, 0.7-1.5 mm broad, 0.10-0.13 mm thick, flattened, rounded and sometimes indistinctly crenulate at ends, contiguous, separated by narrow cracks. Central part irregularly rimose (not areolate), ± level and even, glaucous-whitish or cream-coloured; surface and medulla KHO + indistinctly yellowish, $CaCl_2O_2$ + rose-red. No isidia or soredia, but with numerous insect bites, which at

first sight look like soredia); no visible hypothallus. Cephalodia irregularly scattered, sessile, flattened-discoid, 1-3 mm diam., up to 0.5 mm thick, effigurate and radially plicate-cracked, flesh-coloured, containing Scytonemoid algae. Apothecia 1.0-1.6 mm diam., with entire matt epruinose thalline margin at first tumid, then ± depressed ; proper margin thin, raised, entire, subnitid, flesh-coloured ; disc plane, yellowish-flesh-coloured, matt, not pruinose. Thecium 150-195 μ high, nubilated in upper part, otherwise hyaline. Asci cylindric-clavate, 115-145 × 11-15μ, with wall 1.5-2.0 μ thick all round, persistent pale blue with iodine. (No pycnidia seen).

Obs. 2. — The deep brick-red reaction with Paraphenylenediamine is obtained also on the parts of the thallus not damaged by insect bites, and is hence not due to irritation caused by the latter.

Forma **ampliata** M. Lamb, *f. nov.*

Diagn. — *Apothecia basi haud constricta, tumido-ampliata (quasi pertusarioidea), margine thallino crasso, obtuse subconico ; ceteris notis ut in forma typica.*

Icon. — Pl. X, fig. 34 (Homoeotype or paratype specimen in herb. München ; a small specimen of *P. illita* is also present, in the lower righthand corner).

Habitat. — On rocks and pebbles.

Distribution. — New Zealand.

NEW ZEALAND. Exact locality not statet, Knight (holotype) (fert.) (H., n° 3644 in herb. Nylander), (homoeotype or paratype) (fert.) (BM., M.).

Obs. — The thallus is effigurate with peripheral lobes up to 2 mm long ; in central part ± smooth and even, cracked but not truly areolate, the cracks very narrow (visible only under a × 10 lens), irregularly anastomosing. Surface of thallus KHO — or indistinctly yellowish, $CaCl_2O_2$ + rose-red, Pd + pale yellowish-flesh-coloured ; medulla KHO —, $CaCl_2O_2$ + rose-red, Pd —. No soredia present. Cephalodia numerous, ± orbicular, adpressed, 1.0-2.5 mm diam., up to 0.3 mm thick, finally plicate-effigurate, flesh-coloured, containing Nostocoid algae. Apothecial discs plane, rose-red, usually whitish-pruinose. Thecium 150-195μ high. Spores 20-22 × 11-12μ. Asci cylindric, 120-160 × 15-21μ, with wall 1.5-2.5μ thick at sides, at apex

up to 7μ, persistently blue with iodine. (No pycnidia seen.) Possibly a growth-stage of the species.

Forma **argillacea** (Kn.) M. Lamb, *comb nov.*

Placodium argillaceum Kn. in *Trans. Linn. Soc. Lond., Bot.*, ser. 2, I (1878) 282, *cum descript.*

Lecanora argillacea Forss. in *Bih. Svensk. Vetensk.-Akad. Handl.* VIII, 3 (1883) 54 ; Stizenb. in *Flora*, LXXII (1889) 366.

Lecanora rhodomma var. *argillacea* Hue in *Nouv. Arch. Mus. Hist. Nat. Paris*, sér. 3, III (1891) 59.

Lecanora rhodophthalma f. *argillacea* Zahlbr. *Cat. Lich. Univ.* V (1928) 670.

Diagn. — A highly sorediate form with the thallus entirely covered by confluent farinose soredia.

Icon. — Knight, *loc. cit.*, Pl. XXXVIII. fig. 14 (ascus and spores).

Exsicc. — Lojka, Lich. Univ. 127 *(« Lecanora argillacea »)* (LUND).

Distribution. — Seen only from New Zealand, but probably occurs also elsewhere. A specimen from Juan Fernández, placed with the typical form, approaches it in the extensive development of the soredia.

New Zealand. Exact locality not stated, Knight (syntype) (fert.) (H., WELT., W.) ; North Island, *Auckland :* Coromandel, Berggren, 1874 (fert.) (S.) ; *Hawkes Bay :* Wairoa, Kiwi, « on hillside in grassland », Hodgson, 1933 (fert.) (W.) ; *Wellington :* near Wellington, Knight (Lojka Lich. Univ. 127) (fert.) (LUND); South Island, *Otago :* above Forbury Heads near Dunedin, Lauder Lindsay, 1861 (ster.) (K., M.).

Obs. — The thallus appears to be effuse and indeterminate; almost continuous, 0.3-0.8 mm thick, glaucous-whitish or cream-coloured, entirely granulose-pulverulent with effuse soredia, outside and inside KHO+ faintly yellowish or —, $CaCl_2O_2$ + rose-red, Pd —. Cephalodia adpressed, orbicular, 1.0-2.5 mm diam., up to 0.5 mm thick, plicate-effigurate, dark flesh-coloured, containing Nostocoid algae. Apothecia not numerous, 1.0-1.5 mm diam., with ± irregular, persistent, granulose-pulverulent thalline margin; disc concave to plane, dull yellow-brown, not pruinose. Thecium 150-216μ high ; asci persistently blue with iodine, cylindric-clavate, 100-120×12-15μ. Spores 18-21×10-11μ.

var. **carnea** (Räs.) M. Lamb

in *Res. Norweg. Sci. Exped. Tristan da Cunha 1937-38*, n° 3 (1940) 3.

Placopsis gelida var. *carnea* Räs. in *Ann. Bot. Fanamo*, II (1932) 25, *cum descript.*

Diagn. — Spores smaller than in the typical form, 16.0-18.5 × 8-11 μ ; thallus never sorediate.

Icon. — Pl. II, fig. 7 (a specimen from Tristan da Cunha) ; Pl. IX, fig. 30 (part of syntype specimen in herb. Helsinki).

Habitat. — On rocks.

Distribution. — Fuegia, Tristan da Cunha, New Zealand (known from the latter only in the f. *subcribellans*).

Chile. *Magallanes* : Brecknock Peninsula, Puerto Queta, Roivainen, 1929 (Expeditio Fennica) (syntype) (fert.) (H., O., S., *Räs.*) ; (holotype of f. *subcribellans*) (fert.) (O.), (paratype) (fert.) (S.) ; Isla Desolación, Puerto Angosto, Dusén, 1896 (Nordenskjöld's Eldslandsexped.) (n° 199 *pr. p.*) (fert.) (S.), (n° 201) (f. *subcribellans*) (fert.) (S.) ; Peel Inlet on south side of Chatham Island, Skottsberg, 1908 (Swed. Magellan. Exped. 1907-09) (f. *subcribellans*) (fert.) (W.), (ster.) (U.) ; Isla Riesco, Mina Elena, on stone block in open place near shore, Santesson, 1940 (Swed. Magellan. Exped.) (n° 2023 *b pr. p.*, 2022) (f. *subcribellans*) (fert.) (S.) ; Canal Beagle, Yendegaia, on rocks in grassland, altit. circ. 20 m, Santesson, 1940 (Swed. Magellan. Exped). (n° 1362) (f. *subcribellans*) (ster.) (S.).

Tristan da Cunha. Inaccessible Island, altit. 350 m, Christophersen, 1938 (Norweg. Exped. Tristan da Cunha 1937-38) (n° 2490) (fert.) (O.).

New Zealand. South Island, *Otago :* Port Chalmers near Dunedin, « on rock near sea », Thomson, 1933 (f. *subcribellans*) (fert.) (W.).

Obs. — In the syntype preserved in the Helsinki herbarium, the thallus forms orbicular patches 0.5-2.5 centim. across, 0.2-0.5 mm thick, well effigurate, with peripheral lobes reaching far in towards centre of thallus, 0.8-2.0 mm broad, variously divided, contiguous, separated by narrow cracks, at apices broader and very flattened ; central part of thallus irregularly rimose (not areolate), plane,

smooth, creamy-whitish, matt, epruinose or in places slightly whitish-pruinose, outside and inside KHO—, $CaCl_2O_2$+ rose-red, Pd—. No isidia or soredia; no visible hypothallus. Internal anatomy of thallus as in the typical species. Cephalodia irregularly disposed, sessile, discoid, 1.5-3.0 mm diam., 0.3-0.6 mm thick, radially cracked and plicate, pale flesh-coloured, matt, containing Nostocoid algae. Apothecia 1.8-2.0 mm diam., slightly to well constricted at base, with moderate entire thalline margin and plane, light rose-red, subtly whitish-pruinose disc. Thecium 170-210μ high. Asci cylindric, 135-180×9-12μ, with wall about 1μ thick all round and persistently pale blue with iodine. Spores 8, 16-18×9-10μ. Pycnidia arranged approximately in a zone about 5 mm in from the periphery, indicated externally by minute flesh-pink spots. Examination of other specimens shows that the extent of effiguration of the thallus is variable. The thecium varies between 160 and 240μ in height. This variety can readily be distinguished from *P. gelida* by the absence of distinct areolation in the central parts of the thallus, which is irregularly rimose, only rarely with a more or less reticulate arrangement of the cracks, and by the higher thecium (usually below 170 μ in *P. gelida*).

Forma **subcribellans** M. Lamb, *f. nov.*

Diagn. — Thallus isidiatus, isidiis subglobosis 0.10-0.15 mm diam., thallo concoloribus, saepe erosis increbre obtectus; ceterum ut in varietate.

Obs. — In the holotype of this form preserved in the Oslo herbarium, the thallus is ± orbicular and effigurate, and apart from the presence of isidia similar in all respects to that of the variety, with which it was growing together. The other specimens show considerable uniformity. The surface of the thallus may give a pale flesh-coloured reaction with Paraphenylenediamine. Thecium varies between 180 and 240μ in height; spores fall within the size-limits 15-18×7.5-9.0 (-10)μ. Usually a number of the isidia are eroded away, leaving shallow pock-like depressions, which are not however so well defined as in *P. cribellans*. Sterile material is sometimes difficult to distinguish from the latter species, but usually there is an obvious habitual difference (see remarks on p. 227). The distribution of this form is included above together with that of the variety.

22. **P. rhodophthalma** (Müll. Arg.) Räs.

in *Ann. Bot. Vanamo*, II (1932) 25.

Lecanora rhodophthalma Müll. Arg. in *Flora*, LXII (1879) 164, *cum descript.*, in *Bull. Herb. Boissier*, II, append. I (1894) 48, *excl. synon.*; Zahlbr. *Cat. Lich. Univ.* V (1928) 669.

Lecanora argillacea f. *rhodophthalma* Zahlbr. in *Kgl. Svensk. Vetensk.-Akad. Handl.* LVII, 6 (1917) 34, *cum descript.*

Descript. — *Thallus* subdeterminate or effuse, sometimes effigurate at periphery with ill-defined lobes 1-3 mm long; continuous or sparingly rimose (never areolate), 0.15 0.25 mm thick, slightly rugose- or verruculose-uneven, more rarely smooth; whitish, glaucous-whitish, cream-coloured, or (in f. *atlantica*) with a purple or rosy tinge; matt, not pruinose; surface KHO−, $CaCl_2O_2$+red, Pd−or sometimes pale flesh-coloured, medulla KHO−or brownish, $CaCl_2O_2$+red, Pd−. No *isidia* or *soredia;* no visible *hypothallus. Cephalodia* scattered, adpressed-sessile, irregular to ± orbicular, flattened, 1-5 mm diam., up to 0.3 mm thick, wrinkled or radially plicate-effigurate, pale yellowish-flesh-coloured, matt. *Apothecia* irregularly disposed, well constricted at base, discoid, 1.0-2.5 mm diam.; thalline margin thickish, entire, matt, not pruinose; proper margin finally developed, slightly prominent, entire, flesh-coloured or pale brownish; disc plane or rarely slightly convex, smooth, rose-red, flesh-coloured, or red-brown, matt, naked or white-pruinose. *Excipulum* entire below hypothecium, paraplectenchymatic, nubilated, up to 180μ thick. *Hypothecium* colourless. Thecium 210-310μ high, nubilated in upper part, otherwise hyaline. *Paraphyses* not or very slightly thickened at apices. *Spores* 8, uniseriate in ascus, commonly broadly ellipsoid, 20-27×(9-) 13-18μ. *Pycnidia* (seen only in f. *atlantica*) immersed in thallus, causing slight swellings, with minute punctate yellowish-pink ostioles; irregularly pyriform in section, up to 420μ deep and 245μ across, with indistinct, almost undeveloped, perifulcrium; fulcra branched, subulate-acuminate, 15-19×1.0-1.6μ; *pycnoconidia* filiform, arcuate, 15-18×0.5μ.

Icon. — Pl. XII, fig. 38 (the holotype specimen).

Habitat. — Soil or rocks.

Distribution. — Chile, Fuegia, New Zealand; a distinct form in Tristan da Cunha.

Chile. *Valdivia:* Corral, «in rupibus litoralibus», Dusén, 1896 (Nordenskjöld's Eldslandsexped.) (n° 66) (fert.) (S.); *Magallanes:* Isla Desolación, Puerto Angosto, «in saxis litoralibus», Dusén, 1896 (Nordenskjöld's Eldslandsexped.) (n° 199 *pr. p.*) (fert.) (S.).

New Zealand. Exact locality not stated, Colenso (fert.) (K.); North Island, *Taranaki:* Mt. Egmont, « vertical cutting on track in forest », Cranwell, 1934 (fert.) (W.); *Wellington:* Wellington, Buchanan (fert.) (BM.); Tararua Range, Mt. Alpha, rocks near summit, Du Rietz, 1926 (Swed. Bot. Australas. Exped.) (n° 1430:9) (fert.) (*DR.*); South Island, *Westland:* near Greymouth, Müller, 1879 (holotype) (fert.) (G.); *Otago:* Route burn Valley, Du Rietz, 1927 (Swed. Bot. Australas. Exped.) (fert.) (*DR.*).

Obs. 1. — In the holotype specimen, the thallus is indeterminate, Pd-; its cortex overlaid in most places by a colourless semi-amorphous necrotic layer 6-10μ deep; cortex 30-45μ deep, heavily nubilated, paraplectenchymatic, of cells 3-6μ diam. Medulla compact, nubilated, of intertexted hyphae 2.5-4.0μ thick running in various directions or in places ± vertically parallel. Symbiotic algae 7-11μ diam., bright green, forming an interrupted uneven layer 50-110μ deep. Cephalodia irregularly wrinkled, not effigurate, with a deep stratum of Nostocoid algae. Cells of basal paraplectenchymatic excipulum ± isodiametric, thin-walled, 4.5-7.5μ diam. Hypothecium up to 165μ deep, composed of compacted intricated hyphae 1.5-2.0μ thick running in various directions. Thecium 230-310μ high. Paraphyses 1.0-1.4μ thick, often branched, budding of nubilated conidia-like epithecial fragments at their tips. Asci cylindric-clavate, 156-210×15-18μ, with wall about 1.5μ thick at sides, at apex thickened up to 8μ; persistently deep blue with iodine. Spores 20.0-22.5×12-13μ.

Obs. 2. — *P. rhodophthalma* appears to be closely related to *P. parellina*, being distinguished by the constantly esorediate thallus, higher thecium, and larger, often very broadly ellipsoid spores. Peripheral effiguration of the thallus is not usually well-marked, often completely absent. In fresh material the spores often contain rose-pink oil droplets; the colour disappears after some years in herbarium specimens. Müller Arg., in his original descripfion, stated that the spores are « hyphematoi-deo-involucratae (superficie peculiariter asperulae)», but this

is not so; in the holotype and all other specimens examined the spore wall is perfectly smooth, as in all other species of the genus. Particularly in this species it is necessary to measure only mature spores freely extruded from the asci, otherwise very misleading data as to size and shape may be obtained.

Obs. 3. — « *Lecanora argillacea* f. *rhodophthalma* » recorded by Zahlbruckner *apud* Skottsberg, *Nat. Hist. Juan Fernandez and Easter Island*, II (1924) 382, does not refer to this species, but to *P. parellina*.

Forma **atlantica** M. Lamb

in *Res. Norweg. Sci. Exped. Tristan da Cunha 1937-38*, n° 3 (1940) 4, *cum descript.*

Diagn. — Thallus purple-whitish or with a rose-pink tinge (not glaucous-whitish or cream-coloured as in the typical species).

Icon. — Pl. III, fig. 10 (the holotype specimen).

Habitat. — Seen only on volcanic rock.

Distribution. — Tristan da Cunha. Above settlement, altit. 250 m., Christophersen & Mejland, 1937 (n° 248) (holotype) (fert.) (O.); altit. 1075 m., Christophersen & Mejland, 1937 (n° 30) (fert.) (O.) (both Norweg. Exped. Tristan da Cunha 1937-38).

Obs. — In the holotype specimen the thallus is effigurate; marginal lobes short and broad, 2.0-4.5 mm long, 1-2 mm broad, contiguous, slightly tumid, rounded or subcrenulate at their ends. Central part of thallus 0.5-0.7 mm thick, tartareous, ± smooth or in places irregularly verrucose, rimose but not areolate; whitish with a distinct faint purple-pink tinge. Apothecial discs reddish-flesh-coloured to dark red, not pruinose. Lower paraplectenchymatic stratum of excipulum poorly developed, 20-30μ deep, not nubilated; thecium 240-300μ high; spores more narrowly ellipsoid than usual in the species: 20-24×10.5-12.0μ. Walls of asci pale wine-red with iodine. In all other respects, external and internal, there is good agreement with the typical form.

23. **P. stenophylla** (Hue) M. Lamb, *comb. nov.*

Lecanora stenophylla Hue in *Ann. Mycol.* XII (1914) 523, *cum descript.*; Zahlbr. *Cat. Lich. Univ.* V (1928) 670.

Descript. — *Thallus* forming orbicular patches up to 2.5 centim. diam. or larger, very distinctly lobate-effigurate at

periphery; lobes contiguous, separated by narrow cracks, flattened and very closely adpressed to substratum, more or less linear or somewhat cuneate, 2-6 mm long, 0.7-1.5 mm broad (the ends often expanded up to 1-2 mm, rounded or subcrenulate), 0.1-0.4 mm thick, variously divided, towards inner part of thallus cut by transverse cracks. Central part of thallus up to 0.4 mm thick, rimose or subareolate with differentiation in places of angulose, plane or tumid areolae 0.3-1.0 mm diam. separated by narrow cracks. Thallus whitish or cream-coloured, matt, not pruinose; surface and medulla KHO – or indistinctly yellow-brownish, $CaCl_2O_2$ + rose-red, Pd + miniatered (the surface often Pd – or red only in spots). No *isidia* or *soredia;* no visible *hypothallus* (but ferruginous material often present beneath thallus and in the cracks). *Cephalodia* scattered, sessile, adpressed, orbicular, flattened, 0.8-1.4 mm diam., up to 0.4 mm thick, radially plicate and effigurate, not rimose, dark flesh-coloured, matt or slightly shining. *Apothecia* dispersed, well-constricted at base, discoid, 1.0-1.6 mm diam.; thalline margin moderate, prominent or finally somewhat depressed, entire; proper margin occasionally visible, thin, entire, fleshcoloured; disc plane, dark brown-red (brighter reddish when moistened) or red-brown, matt, naked or sometimes subtly ochraceous-pruinose. *Excipulum* entire below hypothecium, of moderate thickness, nubilated. *Hypothecium* colourless. *Thecium* 120-162μ high, pale yellowish or nubilated above, otherwise colourless. *Paraphyses* slightly thickened at apices. *Spores* 8, uniseriate in ascus, ellipsoid, 14-20 × 7.5-11.0μ.

Icon. — Pl. V, fig. 16 (a specimen from Chile, Chiloé); fig. 17 (three fragments of a paratype specimen in herb. Nylander).

Habitat. — On schistose rocks.

Distribution. — Seen only from Chile.

CHILE. Exact locality not stated, Gay (paratype) (fert.) (H.); *Chiloé:* exact locality doubtful, Junge, 1932 (Herb. Gunckel n° 6376) (fert.) (*Räs.*).

Obs. 1. — In the paratype specimen studied (n° 3640 in herb. Nylander), the thallus has a nubilated paraplectenchymatic cortex 17-24μ deep composed of cells 3-6μ diam.; medulla compact, nubilated, of closely interwoven hyphae 1.7-3.0μ thick showing chiefly ± horizontally parallel arrangement; towards the base they are brownish by degeneration, and mingled with fragments of the substratum; symbiotic algae 4.5-10.0μ diam., bright green, forming an even slightly interrupted layer 35-75μ deep. Algae of cephalodia Scytonemoid, scattered in clumps of various size. Lower paraplectenchymatic stratum of excipulum formed of ± isodiametric thin-walled cells 3-6μ diam.; hypothecium of compacted interwoven hyphae 1.5-2.0μ thick running in various directions. Paraphyses 1-2μ thick (at tips up to 3μ), occasionally branched, abstricting conidia-like rounded epithecial particles from the apices. Asci elongate-clavate, 90-110 × 12-15μ, with wall 1.0-1.3μ thick at sides, at apex up to 4μ; persistently pale blue with iodine. (Mature spores not found in the paratype specimen; according to Hue 18-20 × 8-12μ, and in the Chiloé specimen they were 14-20 × 7.5-11.0μ. No pycnidia seen).

Obs. 2. — A neat and habitually distinct species, closely related to the chemically different New Zealand *P. salazina* and less closely to *P. gelida* var. *subreagens*, from which it differs in the very flattened and closely adpressed peripheral lobes. It differs from *P. patagonica* in the form of the thallus, lower thecium, etc.

24. **P. salazina** M. Lamb, *sp. nov.*

Descript. — Thallus *determinatus, effiguratus, rosulas ad circa 4 centim. diam. efficiens, lobis ad peripheriam sat bene evolutis, substrato arcte applanatis, rimis tenuibus separatis, 2-3 mm longis (in partem centralem thalli sensim abeuntibus), circa 1 mm latis et 0.15 mm crassis, apicibus rotundatis aut obsolete inciso-crenatis; ceterum reticulato-rimosus (haud rite areolatus), rimis anastomosantibus acutis ad 0.1 mm latis, plerumque angustioribus, incisus; tenuis (0.25, raro ad 0.3 mm crassus), laevigatus, roseo-albescens, haud pruinosus, haud vel passim levissime nitens, extus intusque KHO + flavescens deinque sanguineo-rubescens, $CaCl_2O_2$ –, Pd + fulvescens aut aurantiaco-flavescens.* Isidia *et* soredia *nulla;* hypothallus *nullus visibilis.* Cephalodia *plerumque centralia, deplanata, subdiscoidea, radiatim effigurato-rimosa plicataque, 5-7 mm diam., ad 1 mm crassa, carneo-fuscescentia, nec nitida nec pruinosa.* Apothecia *satis numerosa, irregulariter sparsa aut passim ut videtur sub-*

concentrice disposita, rotundata, basi bene constricta, 1 mm diam. vel majora, margine thallino integro tumido prominenti et disco plano, fusconigrescenti, opaco, haud pruinoso; stratum basale excipuli *80-120μ crassum, nubilatum insuperque saepe leviter fuscescens, paraplectenchymaticum;* hypothecium *incoloratum;* thecium *130-160μ altum, superne flavidofuscescens, ceterum hyalinum.* Paraphyses *apicibus leviter incrassatae et submoniliformi-septatae.* Sporae *8nae, in asco uniseriatae, ellipsoideae, 16-18* × *8-9μ.*

Icon. — Pl. XV, fig. 48 (the holotype specimen).

Habitat. — « On boulders in a brook in the subalpine scrub belt » (collector's note).

Distribution. — New Zealand.

New Zealand. South Island, *Otago :* Mount Barber, above Deep Cove, Du Rietz, 1927 (Swed. Bot. Australas. Exped.) (n° 2063 : 2) (fert.) (*DR.*).

Obs. 1. — The anatomical description has been made from a small fragment separated off the holotype, and is hence in some respects incomplete. Thallus has no outer necrotic layer. Cortex 20-25μ deep, yellowish-grey-nubilated (hyaline in KHO), paraplectenchymatic, of ± isodiametric thin-walled cells 4-7μ diam. Medulla slightly nubilated, compact or with small air-spaces in upper part, composed of thin-walled hyphae about 3μ thick interwoven in various directions; at the base compacted into a brownish almost structureless hypothalline layer up to 20μ thick. Symbiotic algae bright green, round, thin-walled, 6-9μ diam., forming a stratum 45-80μ deep, interrupted at intervals. In KHO, medulla and intergonidial tissue give off a strong yellow solution, in which numerous red acicular crystals soon form and aggregate into star- and bushel-shaped clusters characteristic of Potassium salazinate; in Paraphenylenediamine solution the medulla turns deep yellow. Thallus sections unchanged by $CaCl_2O_2$. In the two apothecia sectioned the basal excipular stratum was faintly brown, perhaps by degeneration; its cells ± isodiametric, thinwalled, 4-5μ diam. Hypothecium 120-200μ deep in centre. Paraphyses 1.5-2.0μ thick, sometimes branched, thickened up to 3μ at apices. Asci cylindric to cylindric-clavate, 100-112 × 12-14μ, with wall about 2μ thick. Thecium and hypothecium persistently blue with iodine (ascus-walls blue, paraphyses yellow). (No pycnidia seen).

Obs. 2. — This is the only species of *Placopsis* known to contain the depsidone substance Salazic acid. Morphologically it resembles very closely *P. stenophylla,* which contains Fumarprotocetraric acid. The small dark specks seen on the surface of the thallus in the photograph are perhaps the remains of a parasite; the degenerated red-brown tissue shows almost no structure under the microscope.

25. **P. patagonica** (Zahlbr.) M. Lamb, *comb. nov.*

Lecanora patagonica Zahlbr. in *Kgl. Svensk. Vetensk.-Akad. Handl.* LVII, 6 (1917) 35, *cum descript., Cat. Lich. Univ.* V (1928) 668.

Descript. — *Thallus* forming more or less orbicular confluent patches 1.0-4.5 centim. diam., effigurate at periphery; marginal lobes contiguous, 1.5-3.0 mm long, separated by narrow cracks, expanded and flattened, thin (about 0.1 mm thick), closely applied to substratum, at the apices more or less rounded or subcuneate and often darker in colour (olivaceous-brownish) at the extreme ends. Central part of thallus smooth, rimose (not distinctly areolate), with cracks about 0.1 mm wide; up to 0.7 (-1.0) mm thick, ochraceous-glaucescent or sordid cream-coloured, matt, not pruinose; cortex and medulla KHO + dirty yellowish becoming brown, $CaCl_2O_2$ + rose-red, Pd + red. No *isidia* or *soredia;* no visible *hypothallus. Cephalodia* irregularly scattered, suborbicular, flattened, sessile, 1-4 mm diam., 0.3-0.5 mm thick, radially rimose effigurate, yellowish-flesh-coloured to terruginous-brown, matt. *Apothecia* dispersed or crowded, moderately to well constricted at base, round or sometimes angulose by mutual pressure, 1.0-1.7 mm diam.; thalline margin of moderate thickness, entire; proper margin sometimes visible, thin, entire, olivaceous; disc red-brown (becoming blackish in old age), slightly concave to plane, smooth, matt, not pruinose. *Excipulum* entire below hypothecium, forming a densely nubilated paraplectenchymatic stratum 60-100 μ thick. *Hypothecium* almost colourless. *Thecium* 175-225 μ high, pale yellow-brownish above, otherwise colourless. *Paraphyses* not thickened at apices. *Spores* 8, uniseriate in ascus, ellipsoid, 16-21 × (8-) 9-11 μ. *Pycnidia* immersed in thallus,

hardly prominent, indicated externally by minute punctiform ostioles not darker than the thallus; spherical in section, about 70 μ diam., with slightly yellowish wall; *pycnoconidia* filiform, slightly curved or almost straight, 20-30 × about 0.6 μ.

Icon. — Pl. III, fig. 8 (the lectotype specimen).

Habitat. — On hard igneous rock.

Distribution. — Fuegia.

CHILE. *Magallanes:* Peel Inlet on south side of Chatham Island, Skottsberg, 1908 (Swed. Magellan. Exped. 1907-09) (lectotype) (fert.) (W.), (syntype) (fert.) (S.); Canal Beagle, Darwin Glacier, Skottsberg, 1909 (Swed. Magellan. Exped. 1907-09) (fert.) (U.).

Obs. 1. — In the lectotype specimen, the thallus has a paraplectenchymatic cortex 15-25μ deep, pale yellow-brownish in its outermost 6-10μ, almost colourless within, composed of cells 3-7μ diam.; medulla pale sordid yellowish or almost colourless, compact, of closely interwoven, chiefly ± horizontally-running hyphae about 3μ thick, becoming gradually yellow-brown in its lower part where it joins the substratum. Symbiotic algae small (4-6μ diam.), pale green, forming an interrupted stratum 35-65μ deep. Cephalodia with Scytonemoid algae forming vertical bands 18-45μ broad in their medullary tissue. Lower paraplectenchymatic stratum of excipulum composed of ± isodiametric thin-walled cells 4-5μ diam.; hypothecium of compacted and interwoven hyphae 2.5-3.5μ thick running in various directions. Paraphyses 1.3-1.8μ thick, occasionally branched. Asci cylindric, 165-185×12-15μ, with wall about 1μ thick, at apex (in immature asci) thickened up to 6μ, and persistently blue with iodine. Thecium 175-225μ high. Spores 19-20×10-11μ. The Darwin Glacier specimen is similar to the lectotype except in that the extremities of the peripheral lobes are not darkened and the spores are somewhat smaller, 16.0-19.5×(8-) 9.5μ.

Obs. 2. — A *Placopsis* of somewhat distinctive habit, with its very flattened marginal lobes. It is distinguished from *P. gelida* var. *subreagens* by the higher thecium, and from *P. Dusenii* by the lower thecium and character of the thallus.

Obs. 3. — In his contribution to Skottsberg's *Natural History of Juan Fernandez*, II (1924), on p. 382, Zahlbruckner published a form called « *Lecanora patagonica* f. *sorediosula* », and Köfarago-Gyelnik subsequently raised it to specific rank as

Lecanora sorediosula (Zahlbr.) Gyel. in *Acta Fauna & Flora Univ.* ser. II, I (1933) 10. In the original description two localities are mentioned, both in Juan Fernandez (Masafuera). I have seen the two specimens in question; one is a sterile sorediate thallus, Pd-, indeterminable, but certainly not referable to *P. patagonica*; the other is not sorediate, although in places with insect-bites resembling soredia, Pd + red, sterile, and is probably referable to *P. gelida* var. *subreagens*, but cannot be determined with certainty.

26. **P. terricola** (Cromb.) M. Lamb, *comb. nov.*

Lecanora gelida f. *terricola* Cromb. in *Journ. Linn. Soc. Lond., Bot.* XV (1876) 232, *cum descript.*; Zahlbr. *Cat. Lich. Univ.* V (1928) 668.

Descript.— *Thallus* forming suborbicular or irregular patches up to 5 centim. or more across, at periphery not or indistinctly effigurate (slightly radially plicate); 0.25-1.00 mm thick, subcontinuous with a few cracks up to 0.25 mm wide, coarsely glebose-verrucose, with irregular, tumid-convex verrucae 0.8-2.0 mm diam.; dirty yellow-whitish or cream-coloured, not pruinose, matt. Surface of thallus KHO —, $CaCl_2O_2$ + rose-red, Pd + rose-pink; medulla KHO + slightly yellow, $CaCl_2O_2$ + rose-red, Pd + miniate-red. No *isidia* or *soredia*, no visible *hypothallus*. *Cephalodia* scattered, difform, 3-6 mm diam., up to 0.7 mm thick, radially plicate and rimose, yellowish-flesh-coloured, matt. *Apothecia* adpressed-sessile, discoid, slightly constricted at base, 1.2-1.6 mm diam.; thalline margin entire, not prominent; proper margin sometimes conspicuous, rather prominent, thin, entire, brownish-flesh-coloured; disc plane, dark red-brown, smooth, matt, not pruinose. *Excipulum* entire, in basal part paraplectenchymatic, 50-65μ thick, nubilated. *Hypothecium* colourless. *Thecium* 155-200μ high, the upper 27-35μ indistinctly yellowish, the rest colourless. *Paraphyses* not thickened at apices. *Spores* 8, uniseriate in ascus, ellipsoid, 17-18 × 8-11μ. *Pycnidia* immersed, forming verruculae 0.2-0.4 mm diam., with minute brown punctiform ostioles; in section almost spherical, up to 390μ diam., with colourless

perifulcrium ; fulcra pointed, usually branched, 15-20 × 1-2μ ; *pycnoconidia* filiform, curved or less often almost straight, 15-24 × 0.5μ.

Icon. — Pl. XII, fig. 37 (part of syntype specimen in British Museum).

Habitat. — On soil ; the collector's original note preserved with the Kew syntype states: «common on rocks at high-water mark forming rather large patches ».

Distribution. — Known only from southern central Chile.

CHILE. *Chiloé :* Huite near Ancud, Cunningham, 1868 (syntype) (fert.) (K., BM., W.)

Obs. — In the British Museum syntype, the thalline cortex is 12-24μ deep, nubilated, paraplectenchymatic, of cells 3-6μ diam. ; medulla compact, nubilated, of interwoven hyphae 3.0-4.2μ thick and mainly upwards-striving ; symbiotic algae 6-12μ diam., forming a slightly interrupted stratum 60-120μ deep. Algae of cephalodia Nostocoid. Paraplectenchymatic basal part of excipulum made up of ± isodiametric thin-walled cells 5-7μ diam.; hypothecium 60-105μ deep, of compacted hyphae 2-3μ thick running in various directions. Paraphyses sometimes branched ; asci cylindric, 110-135×9-15μ, with wall about 1μ thick at sides and up to 6μ at apex, persistently blue with iodine. Apparently the Paraphenylenediamine reaction of the medulla is fluctuating, and no great reliance should be placed upon it, for in the syntype specimen in the Vienna herbarium no reaction could be obtained.

27. **P. subgelida** (Nyl.) Nyl.

Lich. Nov. Zel. (1888) 57, *cum descript.*

Lecanora subgelida Nyl. in *Compt.-Rend. Acad. Sci. Paris,* LXXXIII (1876) 89, *cum descript.;* Hue in *Nouv. Arch. Mus. Hist. Nat. Paris,* sér. 3, III (1891) 59 ; Zahlbr. *Cat. Lich. Univ.* V (1928) 670.

Descript. — *Thallus* determinate, suborbicular, forming effigurate patches 2.5 centim. diam. or larger; peripheral lobes broad, plane, smooth, 1.5-5.0 mm long, 1.0-2.5 mm broad, up to 0.4 mm thick, thinner at the apices (0.1-0.2 mm), contiguous, separated by cracks 0.1-0.3 mm wide, subcuneate, irregularly branched, at the apices expanded and rounded or subcrenulate; produced inwards for a long way towards the centre of the thallus, and becoming gradually converted into the smooth, irregularly cracked (not truly areolate) central part, which is up to 0.5 mm thick. Thallus cream-coloured, matt, white-pruinose, outside and inside KHO — or indistinctly yellowish, $CaCl_2O_2$ + rose-red, Pd —, without *isidia* or *soredia ;* no distinct *hypothallus. Cephalodia* scattered, sessile, suborbicular or irregular, flattened, 2-7 mm diam., up to 0.9 mm thick, effigurate with radiating folds and cracks, dark flesh-coloured or pale brownish, matt. *Apothecia* irregularly disposed, discoid, 1.5-2.0 mm diam., well or moderately constricted at base ; thalline margin at first thick, then moderate, entire, rounded, prominent or somewhat depressed, usually subtly white-pruinose ; proper margin sometimes visible, slightly elevated, moderate, smooth, flesh-coloured, matt, naked ; disc plane or slightly concave, sordid reddish or red-brown, matt, slightly whitish-pruinose. Basal *excipular layer* of moderate thickness, paraplectenchymatic, nubilated ; *hypothecium* colourless ; *thecium* very high (285-320μ), its upper part overlaid with sordid yellowish crystals, otherwise hyaline. *Paraphyses* not thickened at apices. *Spores* 8, uniseriate in ascus, ellipsoid or broadly ellipsoid, large : 25.5-30.0 × (12-) 15.5-21.0μ. *Pycnidia* immersed in thallus, often causing slight protuberances, marked by minute blackish apical spots ; flask-shaped, about 300μ diam., with nubilated indistinctly paraplectenchymatic perifulcrium; (fulcra and pycnoconidia not seen).

Icon. — Pl. VII, fig. 22 (the holotype specimen).

Habitat. — On rock ; according to Nylander also on soil.

Distribution. — Subantarctic islands of New Zealand (Campbell Island).

CAMPBELL ISLAND. Exact locality not stated, Filhol, 1874 (holotype) (fert.) (H.).

Obs. — The cortex of the thallus is in many places overlaid by a hyaline semi-amorphous necrotic layer up to 13μ deep; cortex 20-33μ deep, nubilated, paraplectenchymatic, of cells 3-6μ diam. Medulla slightly nubilated, compact, with few or no air-spaces, composed of chiefly horizontally-running hyphae 2.8-4.5μ thick with somewhat thick walls (1.0-1.3μ) ; in lower 1/4 of medulla the hyphal walls are brown by degeneration. Symbiotic algae 4-9μ diam., bright green,

forming a slightly interrupted stratum 45-75μ deep. Algae of cephalodia Nostocoid, forming a deep layer in upper part of cephalodium. Lower paraplectenchymatic stratum of excipulum 80-90μ deep, composed of ± isodiametric thin-walled cells 4-6μ diam. Hypothecium 160-180μ deep, of compacted intricated hyphae 1.2-2.0μ thick running in various directions. Peculiar crystals are present on top of the thecium and embedded in the lateral excipulum ; they are discoid, flattened, 15-27μ diam., colourless or faintly yellowish, with a distinct radiating lamellation ; they dissolve speedily in dilute HCl, but disintegrate only slightly in KHO. Paraphyses 1.3-2.0μ thick, often branched, budding off conidia-like epithecial fragments from their tips. Asci cylindric-clavate, 200-275×16-27μ, with wall 1-2μ thick at sides, at apex not or only slightly thicker (up to 4μ) ; persistently blue with iodine. As regards internal structure, this species exhibits relative gigantism, the thecium being the highest and the spores the largest known to occur in any *Placopsis*.

28. **P. illita** (Kn.) M. Lamb, *comb. nov.*

Placodium illitum Kn. in *Trans. Linn. Soc. Lond., Bot.* ser. 2, I (1878) 282, *cum descript.*

Lecanora illita Forss. in *Bih. Svensk. Vetensk.-Akad. Handl.* VIII, 3 (1883) 53.

Descript. — *Thallus* more or less determinate, forming suborbicular patches 1.5-2.5 centim. diam., here and there at the periphery bounded by a thin brownish-black, occasionally fimbriate *hypothalline zone;* in other places at the periphery (more rarely) obsoletely plicate-effigurate, with minute concrescent folded lobes; central part of thallus minutely and irregularly cracked (not truly areolate), with very fine cracks visible only under × 10 lens; smooth, thin (up to 0.2 mm thick), glaucous-whitish or cream-coloured, not pruinose, matt; surface and medulla KHO − or indistinctly yellowish, $CaCl_2O_2$ + rose-red, Pd −. No *isidia* or *soredia*. *Cephalodia* scattered on thallus, flattened-discoid, sessile, 2-3 mm diam., up to 0.6 mm thick, radially plicate-effigurate and somewhat cracked, yellowish-flesh-coloured, matt. *Apothecia* adpressed-sessile, discoid, not much constricted at base, up to about 1.3 mm diam., with the thalline margin prominent or depressed, entire or very slightly crenulate, matt, naked; proper margin

sometimes visible, thin, entire, brownish-grey; disc plane, from the first dark brown to brown-blackish, matt, epruinose. *Excipular stratum* developed below the hypothecium, paraplectenchymatic, nubilated; *hypothecium* colourless or (seen in thick sections) slightly yellowish; *thecium* 80-140μ high, yellow-brownish above, otherwise colourless. *Paraphyses* not thickened at tips. *Spores* 8, biseriate or partly uniseriate in ascus, ellipsoid, 12-18 × 6.0-8.5μ.

Icon. — Pl. X, fig. 33 (the lectotype specimen); fig. 34, lower right-hand corner; further: Knight, *loc. cit.*, Pl. XXXVIII, fig. 13 (ascus and spores).

Habitat. — On rocks, boulders, and pebbles.

Distribution. — New Zealand and its subantarctic islands.

New Zealand. Exact locality not stated, Knight (lectotype) (fert.) (H., n° 23848 in herb. Nylander), (paratype) (fert.) (H., BM., M., U., WELT.); South Island, *Westland:* Greymouth, Helms (n° 251 *pr. p.*) (fert.) (W.).

Subantarctic Islands of New Zealand. *Auckland Islands:* Carnley Harbour, Musgrave Peninsula, « on boulders near the seashore », Du Rietz, 1927 (Swed. Bot. Australas. Exped.) (n° 2336) (fert.) (*DR.*).

Obs. 1. — In the lectotype specimen, the thallus is not effigurate, but is bounded in most parts of its periphery by the characteristic somewhat fimbriate, thin, brown-black hypothalline line. In section, its cortex is 7-30μ deep, colourless or faintly yellowish, of cells 3-5μ diam. Medulla hyaline or slightly nubilated, compact, of interwoven hyphae 1.5-4.0μ thick running in various directions; symbiotic algae 5-15μ diam., in a slightly interrupted, irregular, somewhat diffuse stratum 36-75μ deep. Cephalodia contain Nostocoid algae. Paraplectenchymatic lower stratum of excipulum composed of ± isodiametric thin-walled cells 3-9μ diam.; hypothecium of compacted hyphae 1.3-2.0μ thick running in various directions, staining blue-green with iodine. Paraphyses often branched, capped by irregular yellow-brown epithecial granules. Asci cylindric-clavate, 110-120×9-15μ, with wall about 1μ thick at sides and (in younger asci) up to 9μ thick at apex, pale blue then faintly greenish with iodine. (No pycnidia seen).

Obs. 2. — This species is given as a synonym of *P. gelida* by Zahlbruckner in *Cat. Lich. Univ.* V (1928) 667, but it is a ve-

ry distinct species characterised chiefly by the thin thalline patches usually conspicuously bounded by a dark hypothalline edge; also by the brown or brown-black apothecial discs.

29. **P. perrugosa** (Nyl.) Nyl.

Lich. Nov. Zel. (1888) 57, *cum descript.*; M. Lamb in *Res. Norweg. Sci. Exped. Tristan da Cunha 1937-38*, n° 3 (1940).

Lecanora perrugosa Nyl. in *Flora*, XLVIII (1865) 338, *cum descript.*, *Journ. Linn. Soc. Lond., Bot.* IX (1866) 250, *cum descript.*; Hue in *Nouv. Arch. Mus. Hist. Nat. Paris*, sér. 3, III (1891) 59; Zahlbr. in *Kgl. Svensk. Vetensk.-Akad. Handl.* LVII, 6 (1917) 36, *Cat. Lich. Univ.* V (1928) 669.

Squamaria perrugosa Nyl. *apud* Kn. in *Trans. & Proc. N. Z. Inst.* VII (1875) 363, *cum descript.*

Placodium perrugosum Müll. Arg. in *Nuov. Giorn. Bot. Ital.* XXI (1889) 40; Hellb. in *Bih. Svensk. Vetensk.-Akad. Handl.* XXI, afd. III, n° 13 (1896) 60.

Squamaria thaumasta Stirt. in *Ann. Rept. & Trans. Soc. Field Naturalists*, Glasgow, I (1873) 17, *cum descript.*, in *Trans. & Proc. N. Z. Inst.* VI (1874) 237, *cum descript.*, in *Journ. Linn. Soc. Lond., Bot.* XIV (1875) 462, *cum descript.*

Placodium thaumastum Müll. Arg. in *Bull. Herb. Boissier*, II, append. I (1894) 47; Hellb. in *Bih. Svensk Vetensk.-Akad. Handl.* XXI, afd. III, n° 13 (1896) 60.

Descript. — *Thallus* effigurate; peripheral lobes closely adpressed to substratum, discrete, expanded (pterygoid), 1.5-3.0 mm long, 0.7-1.5 mm broad, 0.2-0.4 mm thick, irregularly branched, rounded or somewhat cuneate at ends; central part of thallus entirely papillate-verruculose and usually rimose with cracks 0.2-0.3 mm wide delimiting angulose islands or areolae 0.6-1.3 mm diam.; verruculae crowded, hemispherical, 0.2-0.5 mm diam, borne on a continuous thalline substratum. Thallus 0.3-1.0(-2.0) mm thick, matt, naked or rarely slightly whitish-pruinose, variable in colour: cream-coloured, yellowish-grey, brownish-grey, or olivaceous-brownish; surface KHO+ slightly dull yellowish or—, $CaCl_2O_2$+ rose-red or sometimes—, Pd-; medulla KHO + indistinctly yellowish or —, $CaCl_2O_2$+ rose-red, Pd — (in the typical form), or + red (in f. *activa*). No *isidia* or *soredia*; no *hypothallus* visible. *Cephalodia* scattered,

sessile, either flattened and suborbicular, 2-5 mm diam and 0.4-0.7 mm thick, effigurate and radially cracked, or tuberculiform, 1.0-2.8 mm diam, up to 1 mm thick, or (rarely) verrucose-glomerate, not effigurate, 3-5 mm diam and up to 2 mm thick; sordid yellowish, flesh-coloured, or ferruginous, matt. *Apothecia* scattered, well or moderately constricted at base, round, 1.0-1.3 mm diam; thalline margin moderate, prominent, entire or slightly crenulate; disc plane, brownish-flesh-coloured or brown (brownblackish in old age), matt, naked. *Excipulum* entire below hypothecium as a pale sordid yellowish, often nubilated, paraplectenchymatic stratum. *Hypothecium* colourless or slightly yellowish. *Thecium* (100-) 120-190 (-200)μ high, colourless except in upper part, where pale yellowish or brownish-yellow. *Paraphyses* slightly to moderately thickened at apices. *Spores* 8, uniseriate in ascus, ellipsoid, 15-18(-21) × 7-9 (-10)μ. *Pycnidia* immersed in thalline verruculae, indicated externally by their punctiform brown-blackish ostioles 0.1-0.2 mm diam; in section spherical or flask-shaped, 120-225μ diam., with hyaline wall; *pycnoconidia* filiform, curved or almost straight, 18-24 × 0.5μ.

Icon. — Pl. III, fig. 9 (the holotipe specimen); Pl. XIII, fig. 40 (part of the holotype specimen); fig. 41 (part of a fertile specimen from Australia, Mt. Macedon); further: Kn. in *Trans. & Proc. N. Z. Inst.* VII (1875) Pl. XXIII, fig. 19 (section of thallus and of apothecium, and ascus with spores).

Exsicc.— Lojka, Lich. Univ. 126 (« *Lecanora perrugosa* ») (K.).

Habitat. — On rocks.

Distribution. — A bicentric southern hemisphere species (see fig. 6, p. 188), occurring in the S. American area in Chile, Fuegia and the Falklands, with outliers in the Galapagos Islands and Tristan da Cunha, and in the Australia-New Zealand area in S.E. Australia, Tasmania, and New Zealand (with its subantarctic islands).

Chile. *Valdivia:* Lago Riñihue, Enco, « on a stone in an open Pernettya mucronata-heath », Santesson, 1940 (Swed. Magellan. Exped.) (n° 3770) (ster.) (S.); Riñihue, Cerro Tralcan, « on stones in Aristotelia maqui shrubs », Santesson, 1940 (Swed. Magellan. Exped.) (n° 3429 *pr. p.*) (ster.) (S.); Enco, « on stones on the shore of Lago Riñihue, at the highwater

level », Santesson, 1940 (Swed. Magellan. Exped.) (n° 3765*a*) (fert.) (S.); Territorio Aisen : Río Aisen, altit. circ. 1500 m, Donat, 1933 (n° 22) (ster.) (*Räs.*); *Magallanes:* Basket Island off Brecknock Peninsula, Spegazzini, 1882 (n° 52) (fert.) (H., W.); Isla Riesco, Mina Elena, « on stone block in open place near shore », Santesson, 1940 (Swed. Magellan. Exped.) (n° 2022 *pr. p.*, 2023*b*, *c*) (fert.) (S.); Peel Inlet on south side of Chatham Island, Skottsberg, 1908 (Swed. Magellan. Exped. 1907-09) (fert.) (S., U., W.); Isla Desolación, Puerto Angosto, Dusén, 1896 (Nordenskjöld's Eldslandsexped.) (n° 198, 199 *pr. p.*, 201) (fert.) (S.); Río Azopardo, Dusén, 1896 (Nordenskjöld's Eldslandsexped.) (n° 136) (fert.) (S.); Canal Beagle, Yendegaia, altit. circ. 20 m, « on rocks in grass land », Santesson, 1940 (Swed. Magellan. Exped. (n° 1360 *pr. p.*), (ster.) (n° 1361) (fert.) (S.); Natales, Cerro Dorotea, « on a big block of stone in very thin forest », Santesson, 1940 (Swed. Magellan. Exped.) (n° 2111) (fert.) (S.).

Galapagos Islands. Exact locality not stated, 1872 (Hassler Exped.) (fert.) (BM.).

Falkland Islands (Islas Malvinas). *E. Falklands :* Port Stanley, altit. circ. 100 m, on quartzite stones beside a brook, inundated during wet weather, Lamb, 1946 (n° 2952) (fert.) (BM.).

Tristan da Cunha. Inaccessible Island, E. end of plateau, altit. 350 m, Christophersen, 1938 (n° 2512) (ster.) (O.); Cave Gulch, altit. 700 m, Mejland, 1938 (n° 1524) (fert.) (O.); (both Norweg. Exped. Tristan da Cunha 1937-38).

Australia. *Victoria :* Mt. Macedon, Wilson, 1889 (n° 296) (fert.) (*B. de Lesd.*); « Australia Alps », altit. circ. 460 m, no exact locality, Haast (fert.) (K.).

Tasmania. Exact locality uncertain, Archer (fert.) (K.).

New Zealand. Exact locality not stated, Jelinek (fert.) (M.), Knight (fert.) (H., K., M., S., WELT.); North Island, *Coromandel :* Stony Bay, Cranwell, 1933 (fert.) (*Redgr.*); *Auckland :* Rangitoto, on scoria, Du Rietz, 1927 (Swed. Bot. Australas. Exped.) (n° 2686 : 1) (fert.) (*DR.*); Rangitak Island, « upper limit of boulder beach », Allen, 1933 (ster.) (*Magn.*); *Wellington :* Tararua Mts., altit. circ. 600 m, Chamberlain, 1933 (n° 194) (fert.) (W.); near Wellington, Buchanan (holotype of « *Squamaria thaumasta* » Stirt.) (ster.) (BM.); Ruahine Range, at foot of Mt. Conspicuous, « on boulders near a brook in burnt forest country », Du Rietz, 1926 (Swed. Bot. Australas. Exped.) (n° 1134*c pr. p.*) (fert.) (*DR.*); Ruahine Range, near Rangiwahia, « on boulders at the shore of a brook », Du Rietz, 1926 (Swed. Bot. Australas. Exped.) (n° 1134*b*) (fert.) (*DR.*); South Island, *Canterbury:* Banks Peninsula, Little River, Berggren, 1874-5 (fert.) (S.); Mt. Peel (fert.) (*DR.*); Hooker Valley, at base of Sebastopol, Du Rietz, 1927 (Swed. Bot. Australas. Exped.) (n° 2142 *pr. p.*) (ster.) (*DR.*); Cass, « on small boulders along a brook », Du Rietz, 1927 (Swed. Bot. Australas. Exped.) (n° 1489 : 4) (fert.) (*DR.*); Cass, « on small boulders in a shingle-slip », Du Rietz, 1927 (Swed. Bot. Australas. Exped.) (n° 1489 : 2) (fert.), (n° 1489 : 3 *pr. p.*) (ster.) (*DR.*); Cass River bed, Du Rietz, 1927 (Swed. Bot. Australas. Exped.) (n° 1478 : 2) (fert.) (*DR.*); Cass, Mt. Misery, « on shingle-slip » and « on rocks in the upper subalpine belt », Du Rietz, 1927 (Swed. Bot. Australas. Exped.) (n° 1482*b* : 2) (fert.), (n° 1468 : 12) (ster.) (*DR.*); Cass, Mt. Sugarloaf, « on boulders in the lower part of the shingle-slips », Du Rietz, 1927 (Swed. Bot. Australas. Exped.) (n° 1485 : 2) (ster.) (*DR.*); *Otago :* Lamb Hill near Dunedin, Thomson, 1933 (fert.) (W., *Redgr.*); Ross Creek Reservoir near Dunedin, Thomson, 1933 (fert.) (W.); Dunedin, Lauder Lindsay, 1861 (holotype) (fert.) (H.); Mt. Cargill, « on boulders in open country », Du Rietz, 1927 (Swed. Bot. Australas. Exped.) (n° 1723 *pr. p.*) (fert.) (*DR.*); Humboldt Mts., Bold Peak, above Kinloch, « on boulders in the subalpine scrub belt », Du Rietz, 1927 (Swed. Bot. Australas. Exped.) (n° 1873 *pr. p.*) (fert.) (*DR.*); Lower Routeburn Valley, on stones on shore of Routeburn River, Du Rietz, 1927 (Swed. Bot. Australas. Exped.) (n° 1805, 1949) (fert.) (*DR.*); Blueskin Bay, Berggren, 1874 (fert.) (S).

Subantarctic islands of New Zealand. *Auckland Islands:* Port Ross, Laurie Harbour, « on aerohalophytic boulder at the forest margin », Du Rietz, 1927 (n° 2232) (fert.) (*DR.*); *Campbell Island :* Perseverance Harbour, on steep rocks in saddle between Mt. Lyall and Col Peak, Du Rietz, 1927 (n° 2564 : 3) (ster.) (*DR.*) (both Swed. Bot. Australas. Exped.).

Obs. 1. — In the holotype specimen (n° 23872 in herb. Nylander), the thallus has an upper nubilated paraplectenchymatic cortex 12-20μ deep composed of cells 3-5μ diam. Medulla lax, nubilated in patches, of loosely intertexted hyphae 3-4μ thick running in various directions ; towards the base of the thallus the medullary hyphae are more densely contexted and yellow-brownish by degeneration, thus forming the ± continuous hyphal layer upon which the thalline verruculae are borne. Symbiotic algae 6-12μ diam., bright green, occurring only in the upper parts of the thalline verruculae as a layer 35-75μ deep. Cephalodia of the flattened effigurate type, containing Scytonemoid algae in irregularly distributed masses throughout almost the whole of their depth. Lower paraplectenchymatic stratum of excipulum faintly brownish-yellow, of ± isodiametric thin-walled cells 4-7μ diam. ; hypothecium bowl-shaped, up to 270μ deep in centre, of compacted and interwoven hyphae 1.0-1.5μ thick running in various directions. Thecium 114-150μ high. Paraphyses 1-2μ thick, frequently branched. (No mature asci or spores seen in the holotype). Walls of immature asci persistently blue with iodine.

Obs. 2. — A somewhat variable but easily recognised species, well characterised by the tesselate-verruculose thallus and the discrete, flattened and expanded peripheral lobes. The thallus varies considerably in colour, probably in response to different degrees of exposure; in extreme cases it may be dark olive-brown, or even brown-blackish. The spores are as a rule up to 18 × 9μ, but in a specimen from Tasmania, collected by Archer, they reach a size of 21 × 10μ.

Obs. 3. — Knight, in *Trans. & Proc. N. Z. Inst.* VII (1875) 364, published a new variety, « *Squamaria perrugosa* var. *neglecta* », found by him in New Zealand, and said to differ from the typical species in thalline characters and larger spores. It is listed as « *Lecanora perrugosa* var. *neglecta* » in Zahlbr. *Cat. Lich. Univ.* V (1928) 669. I have not succeeded in obtaining any type or authentic material of this variety, and as Knight's description does not allow of certain recognition, I propose that it should be discarded as a doubtful entity.

Forma **activa** M. Lamb, *f. nov.*

Diagn. — A forma typica speciei contentu levi acidi depsidonici differt, medulla superiore (circa gonidia) Pd + rubescenti.

Habitat. — « On a stone-block in an open place near the shore » (collector's note).

Distribution. — Fuegia.

Chile. *Magallanes :* Isla Riesco, Mina Elena, Santesson, 1940 (Swed. Magellan Exped.) (n° 2023*a*) (fert.) (S.).

Obs. — A well-fruited specimen, morphologically and anatomically quite typical of the species. The nubilated cortex and medulla become hyaline in KHO with emission of a faint yellow solution ; red in $CaCl_2O_2$; in Pd solution the fungal tissue around the gonidial algae takes on an orange-reddish colour. Cephalodial algae Scytonemoid. Thecium 160-200μ high. Spores 16-17 (-19) × 9.5μ. Numerous pycnidia present, with pycnoconidia as in the type.

30. **P. contortuplicata** M. Lamb., *sp. nov.*

Descript. — Thallus *plus minusve orbicularis, ad 13.5 centim. diam., sed saepe minor ; ambitu effiguratus, lobis rimis tenuibus separatis vel saepe connatis (tantum plicis separatis), tumidis, passim verrucosis, apicibus haud vel parum dilatatis, 0.5-1.0 mm. latis, centrum thalli versus sensim in verrucas thallinas abeuntibus ; in centro omnino contortuplicato-verrucosus vel fere cerebriformis, verrucis substrato thallino (vel hypothallino ?) continuo enatis, congestis, 0.4-1.0 mm. diam., rotundatis, ad basin constrictis, varie contortis aut passim breviter intestiniformibus ; thallus 0.6-1.5 mm crassus, albidocinerascens vel flori lactis concolor, opacus vel rarius subnitidus, epruinosus ; extus KHO— vel sordide subflavescens, $CaCl_2O_2$ —, Pd— (in f.* fuegiensis *stratum gonidiale et vulgo cortex superior Pd+ rubescunt); medulla KHO + obsolete flavescens, $CaCl_2O_2$ + roseo-rubescens, Pd —.* Isidia *ac* soredia *nulla.* Cephalodia *primaria centralia, ad 9 mm diam., effigurata radiatimque rhagadioso-lobata ; in thallis majoribus numerosa, saepe subconcentrice dispersa, substrato continuo thallino (aut hypothallino ?) enata, verrucas thallinas leviter superantia, simplicia, subglobosa, 0.8-1.6 (-2.5) mm diam., basi constricta, aut interdum verrucoso-lobata ; aurantiaco-rufescentia vel flavido-ferruginea, superficie laevigata, haud nitida.* Apothecia *thallo insidentia, discoidea, 1.0-2.5 (raro etiam ad 3.5) mm. diam., basi bene constricta, margine thallino integro, haud prominulo, per-*

sistente vel demum excluso (ita faciem lecideinam simulanti); margine proprio plerumque evoluto, prominenti, integro, tenui, fusco nigrescentive (disco subconcolori); disco plano vel leviter convexo, laevigato vel minute scabridulo, olivaceo-nigricanti, fusconigricanti, aut nigro, opaco. Stratum paraplectenchymaticum excipuli *sub hypothecio bene evolutum, 150-240μ crassum, nubilatum;* hypothecium *leviter subflavescens vel fere incoloratum;* thecium *120-180μ altum, superne fuscidulum, ceterum hypothecio concolor.* Paraphyses *apicibus haud vel parum incrassatae.* Sporae *8nae, in asco uniseriatae vel interdum partim biseriatae, ellipsoideae, 18-21 (-25) × 8.5-13.0μ.* Pycnidia *verrucis thallinis immersa, apicibus maculis minutis punctiformibus vel papillaeformibus fuscidulis nigrisve notata; sphaerica, ad 425μ diam., perifulcrio hyalino et indistincte paraplectenchymatico: fulcra subulato-acuminata, ramosa, ad 30μ longa, 1.0-1.5μ crassa.* Pycnoconidia *filiformia, fere recta vel leviter arcuata, 21-25 × circa 0.5μ.*

Icon. — Pl. IV, fig. 14 (the holotype specimen); Pl. XIV, fig. 43 (part of a fertile specimen from the South Orkneys); fig. 44 (part of the holotype specimen magnified).

Habitat. — On rocks and stones, often on trickle-surfaces wetted by melting snow in summer. In the South Orkneys it is reported as «found growing on little stones in the mud and water of sluggish streams on the scree slope».

Distribution. — An antarctic species, with its centre of distribution in the Graham Land peninsula (Palmer Peninsula) and the adjacent South Shetlands and South Orkneys, and having also a subantarctic outlier (partly as a distinct chemical form) in Fuegia and possibly as far north as southern central Chile.

GRAHAM LAND (PALMER PENINSULA). Trinity Peninsula, altit. circ. 15 m, Lamb, 1945 (n° 2621) (fert.) (BM.); altit. circ. 350 m, Lamb, 1945 (n° 2533, 2571, 2577) (fert.) (BM.).

SOUTH SHETLANDS. *King George Island:* Visca Anchorage, Admiralty Bay, Hart, 1934 («Discovery» Exped. 1934-35) (n° 1481 *pr. p.*) (holotype) (fert.) (BM.), (n° 1481 *pr. p.*) (ster.) (BM.); Admiralty Bay, E. side of Mackellar Inlet, «on level stony ground a yard or two behind sea», 1937 («Discovery» Exped. 1936-37) (n° 1954 *pr. p.*) (ster.) (BM.); Admiralty Bay, Berggren, 1926 (ster.) (GB., *Magn.*); *Deception Island:* near the whaling station, on volcanic cinders slightly above sea level, Lamb, 1945 (n° 2323 *pr. p.*) (ster.) (BM.).

SOUTH ORKNEYS. *Signy Island:* Borge Bay, altit. 90 m, 1933 («Discovery» Exped. 1931-33) (n° 1092 *pr. p.*) (fert.) (BM.).

ARGENTINA. *Tierra del Fuego:* Ushuaia, altit. circ. 150 m, «at a rivulet in the burnt forest above the town», Santesson, 1940 (Swed. Magellan. Exped.) (n° 469 *a*) (ster.) (S.); Sierra Alvear, southern slope, above Las Cotorras (about 20 km E. N. E. of Ushuaia), altit. circ. 900 m, «on rocks in the alpine region», Santesson, 1940 (Swed. Magellan. Exped.) (n° 901) (holotype of f. *fuegiensis*) (with immature apoth.) (S.).

CHILE. *Magallanes:* Canal Beagle, Yendegaia, «on rocks in grassland», Santesson, 1940 (Swed. Magellan. Exped.) (n° 1364) (f. *fuegiensis*) (ster.) (S.); (*Chiloé:* Isla Chiloé, Península Lacui, Punta Corona, «on rocks on the sea shore, in the tide water belt», Santesson, 1940 (Swed. Magellan. Exped.) (n° 7221) (ster.) (S.), uncertain).

Obs. 1 — In the holotype specimen, the thallus is covered by an outermost hyaline indistinctly stratified layer 6-10 μ deep derived from degeneration of the upper cortical cells. Cortex 20-60 μ deep, nubilated, paraplectenchymatic, of cells 3-6 μ diam. Medulla lax, hyaline, composed of loosely interwoven hyphae 2.5-4.5 μ thick running in various directions. The lower continuous (hypothalline?) layer is similar in structure to the medulla, but much more compact in texture. Symbiotic algae 4.5-10.0 μ diam., bright green, forming an interrupted, uneven stratum 40-120 μ deep. Cephalodia contain Nostocoid algae lying in rounded clumps throughout almost their whole depth. Lower paraplectenchymatic stratum of excipulum composed of ± isodiametric fairly thin-walled cells 4.5-7.0 μ diam.; hypothecium up to about 300 μ deep in centre, of compacted intertexted hyphae 2.0-3.5 μ thick running in various directions. Paraphyses 1.3-2.0 μ thick, sometimes branched, abstricting nubilated conidia-like epithecial particles from their tips. Asci cylindric-clavate, 110-150 × 15-18 μ, with wall 1.5-2.5 (-3.0) μ thick all round, and persistently light blue with iodine.

Obs. 2. — Morphologically and also from the point of view of its distribution this is a peculiar species. Its affinity to the *P. perrugosa*-group is unmistakable, but nevertheless by its

remarkably plicate-verrucose thallus, large and often almost immarginate apothecia, and other distinctive features it stands widely separated from all other species. The specimen from Chiloé island is a small sterile fragment, not sufficiently well developed for certain determination, and hence this very northern station cannot at present be authenticated.

Forma **fuegiensis** M. Lamb, *f. nov.*

Diagn. — Habitu thalli formae typicae omnino similis, sed medulla superiore (circum stratum gonidiale), et nonnunquam quoque strato corticali, Pd + rubescenti.

Habitat. — On rocks.

Distribution. — Fuegia. (Localities included above with those of the species.)

Obs. — In the holotype specimen from Sierra Alvear, the thallus forms irregular rosettes of at least 5 centim. diam., with a matt, non-pruinose, dirty-whitish surface; the central parts of the thallus are quite as in the typical form, and the peripheral laciniae also very similar, although slightly more distinctly separated by cracks. There are some insect-bites here and there simulating soredia. In section, cortex and medulla strongly yellowish-grey-nubilated, also with included aggregates of coarse grey crystals; the nubilation disappears in KHO, but not the crystals. No outer amorphous necrotic layer present. Cortex 25-35μ deep, $CaCl_2O_2$ + red, paraplectenchymatic, of ± isodiametric cells about 3.5μ diam., with thin colourless walls. Medulla compact, of intertexted thin-walled hyphae 3-4μ thick running in various directions, $CaCl_2O_2$ + light red, Pd + orange-red only in upper part around the algal layer. Algae 4-8μ diam., forming a ± continuous and regular layer 100-180μ deep. Algae of cephalodia Nostocoid. (No mature apothecia or pycnidia seen.) The Paraphenylenediamine reaction indicates the presence of Fumarprotocetraric acid.

31. **P. brevilobata** (Zahlbr.) M. Lamb, *comb. nov.*

Lecanora perrugosa var. *brevilobata* Zahlbr. in *Denkschr. Akad. Wiss. Wien, math.-naturw. Kl.* CIV (1941) 349, *cum descript.*

Descript. — *Thallus* determinate, effigurate, forming patches up to about 7 centim. across; peripheral lobes contiguous, separated by narrow cracks, adhering closely or loosely to the substratum, 2-13 mm long, 0.7-1.0 mm broad, 0.25-0.50 mm thick, variously sympodially or subdichotomously divided, tumid (flattened only at the extremities), smooth or in places more or less corrugated transversely, at the ends not or only slightly expanded, rounded; central part of thallus areolate-tesselate-papillose (as in *P. perrugosa*), up to 0.9 mm thick, the areola-like sections 0.7-2.0 mm diam. and separated by somewhat gaping cracks up to 0.25 mm wide; the surface congested-verruculose with verruculae 0.3-0.7 mm diam. and often containing pycnidia; whitish or cream-coloured, matt, not pruinose, KHO — or slightly yellowish, $CaCl_2O_2$ —, Pd —; medulla KHO —, $CaCl_2O_2$ + red, Pd —. No *isidia* or *soredia*; no visible *hypothallus*. *Cephalodia* numerous, irregularly scattered, sessile upon or between the verruculae, finally rounded, flattened, radially plicate-effigurate, 1-5 mm diam, up to 0.3 mm thick, flesh-coloured or reddish-brown, matt. *Apothecia* scattered, well constricted at base, 1.0-1.5 mm diam., discoid, with the thalline margin persistent, thickish, entire or rugose-crenulate, concolorous with thallus or pale reddish on the inner side; proper margin indistinct or absent; disc subconcave to plane, red-brown, matt, sometimes with a pale ochraceous pruina. *Excipulum* developed below hypothecium, up to 120μ thick, paraplectenchymatic, densely nubilated; *hypothecium* of about the same thickness, colourless; *thecium* 200-240μ high, nubilated above, otherwise colourless. *Paraphyses* slightly thickened at apices. *Spores* 8, uniseriate in ascus, ellipsoid, 20-23 × 10-13μ. *Pycnidia* immersed in thalline verruculae, indicated externally by the brown punctiform ostioles about 0.1 mm diam; almost spherical in section, up to 390μ diam, with paraplectenchymatic nubilated perifulcrium; fulcra pointed, usually branched, 10-18μ long, 1.0-1.5μ thick; *pycnoconidia* filiform, curved or occasionally almost straight, 18-21 × 0.5μ.

Icon. — Pl. I, fig. 1 (a specimen from Fuegia, Isla Desolación. A small thallus of *P. perrugosa* is also present on the right-hand side).

Habitat. — On rocks.

Distribution. — A bicentric southern hemisphere species, occurring in Fuegia and New Zealand.

CHILE. *Magallanes:* Isla Desolación, Puerto Angosto, « in saxis litoralibus », Dusén, 1896 (Nordenskjöld's Eldslandsexped.) (n° 199 *pr. p.*, 201) (fert.) (S.).

NEW ZEALAND. South Island, *Otago:* Abbot's Hill near Dunedin, Thomson, 1934 (n° Z. A. 25) (holotype) (fert.) (W.).

Obs. 1. — In the holotype specimen, the peripheral lobes are not so well developed as in the Fuegian specimen, being only 1.5-2.5 mm long; thallus covered in places by a colourless semi-amorphous necrotic layer 4-9μ thick. Cortex 9-15μ deep, nubilated, paraplectenchymatic, of cells 4-5μ diam. Medulla lax, with numerous air-spaces, nubilated, of loosely interwoven hyphae 3-4μ thick running in various directions. No distinctive hypothalline tissue developed. Symbiotic algae 8.5-14.0μ diam., bright green, forming an interrupted stratum 60-120 (-150)μ deep. Algae of cephalodia Scytonemoid. Lower paraplectenchymatic stratum of excipulum composed of ± isodiametric thin-walled cells 4.5-6.0μ diam.; hypothecium of compacted hyphae 2-3μ thick running in various directions, but chiefly ± vertically. Paraphyses 1.5-2.5μ thick, up to 3μ at tips, often branched. Asci cylindric, 180-195 × 12-18μ, with wall 2-3μ thick all round, and staining persistently blue with iodine.

Obs. 2. — This species differs from *P. perrugosa* in the coarser habitus (cfr. Pl. I, fig. 1) and higher thecium.

Excluded or doubtful species

1. P. Amabilis B. de Lesd.

in *Ann. Cryptog. Exot.* VI (1933) 116, *cum descript.*

This species is known only from a sterile specimen, and is of uncertain systematic position. The following description is based upon the holotype kindly lent by Dr. Bouly de Lesdain:

Thallus indeterminate, forming patches up to 5 centim. diam., not effigurate at periphery, up to 0.6 mm thick, closely adnate to substratum, ± even, cracked-areolate with irregularly angular, plane or subverrucose areolae 0.5-1.5 mm diam. separated

by sharp-edged cracks up to 0.15 mm wide; ash-grey with a faint pinkish tinge, externally KHO—, $CaCl_2O_2$ —or + faintly rose-pink, Pd + slightly brownish-flesh-coloured; medulla KHO —, $CaCl_2O_2$ + rose-pink, Pd —. No visible hypothallus, no isidia or soredia. Cephalodia few, widely scattered over surface of thallus, sessile, almost hemispherical, up to 2.5 mm diam., not constricted at base, entirely minutely granulose, concolorous with the thallus, matt. No apothecia developed, but numerous initials present in the form of minute craters 0.2-0.4 mm diam., one to several in nearly every areola, finally surrounded by a thin thalline rim, with the rudimentary disc pallid pinkish-brown or whitish (these are the structures which are mentioned as « soredia » in Bouly de Lesdain's original description). (No pycnidia seen).

The thallus is corticate, and covered by an outer colourless semi-amorphous necrotic layer 6-30μ deep; cortex dull yellowish-nubilated in upper 9-18μ, inner part colourless and hyaline; paraplectenchymatic, of ± isodiametric thin-walled cells 3-5μ diam. Medulla colourless or in places faintly dull yellowish, compact, of intertexted thin-walled hypae 2-3μ thick. Symbiotic algae globose, bright green, 6-10μ diam., forming a ± continuous stratum 18-60μ deep. The cephalodia in section are seen to be composed of a number of adnate branched outgrowths the ultimate rounded ends of which form the externally visible granules; corticate with a dull brown paraplectenchymatic cortex 8-18μ deep composed of ± isodiametric thin-walled cells 3-5μ diam.; the algae form interrupted groups only in the upper parts of the cephalodium, directly beneath the cortex; they are *bright green*, separate, round or oblong cells 4.0-7.5μ diam. with thin non-gelatinous walls; perhaps referable to the genus *Microcystis* (or *Polycoccus*). The apothecial initials consist of spherical perithecium-like bodies up to 190μ diam.; no traces of sporogenous organs visible, and all parts merely yellowed by iodine.

Icon. — Pl. XII, fig. 39 (two portions of the holotype specimen).

The specimen occurred on scoriaceous volcanic rock, and was collected in Mexico by Frère Amable in 1931: *Puebla:*

Coatzing (Cuautzin), altit. 3200 m (n° 857) (*B. de Lesd.*). Whether the cephalodial algae really are *Microcystis* or *Polycoccus* is uncertain, but I compared them with gonidia of *Coriscium viride*, and they appeared to be exactly similar.

2. **Squamaria hiulca** Nyl.

in *Ann. Sci. Nat., Bot.* sér. 4, III (1855) 153, *cum descript.*
Lecanora (subgen. *Placopsis*) *hiulca* Nyl. in *Journ. Linn. Soc. Lond., Bot.* IX (1866) 251, footnote; Hue in *Nouv. Arch. Mus. Hist. Nat. Paris,* sér. 3, III (1891) 59 ; Zahlbr. *Cat. Lich. Univ.* V (1928) 668.

Nylander in his original description of this species (from Chile, coll. Gay) makes no mention of cephalodia, but included it subsequently in a list of the species belonging to his subgenus *Placopsis,* in 1866. On looking out the holotype (n° 28250 in herb. Nylander), I found it to be a minute fragment less than a centimeter across, with half of an apothecium wrapped in paper. No cephalodia were present. As it is impossible to determine the identity from such a minute scrap, and as Nylander's description fails to give any clear characterisation, I propose that this species be deleted as *nomen dubium.* Jatta, in *Malpighia,* XX (1906) 9, records this species from Chile, near the river Aconcagua; I have not seen the specimen upon which the record is based.

3. **Placodium antarcticum** Müll. Arg.

in *Bot. Jahrb.* V (1884) 136, *cum descript.*
Lecanora (Aspiciliopsis) sublateritia Zahlbr. *Cat. Lich. Univ.* V (1928) 671.

This species was described by Müller Arg. on material collected by Naumann in 1883 in Kerguelen. Although placing it in the section *Aspiciliopsis,* he made no mention of cephalodia. I received the holotype specimen on loan through the courtesy of the Director of the Geneva Botanical Institute, and found that it was not a *Placopsis.* The apothecia are pertusarioid and the paraphyses branched and connected, and hence the plant would seem to belong to the family *Pertusariaceae.* It can hardly be

included in *Pertusaria* itself on account of the effigurate thallus and thin-walled spores, and probably represents the type of a new genus.

4. **Placodium lecanorinum** Kn.

in *Trans. Linn. Soc. Lond. Bot.,* ser. 2, I (1878) 282, *cum descript.*
Ricasolia lecanorina Müll. Arg. in *Bull. Herb. Boissier,* II, append. I (1894) 47.
Placolecania lecanorina Zahlbr. *apud* Engler & Prantl, *Nat. Pflanzenfam.* I. Teil, Abt. 1* (1907) 205.
Solenopsora lecanorina Zahlbr. *Cat. Lich. Univ.* V (1928) 755.

In his original description of this New Zealand species, Knight mentions « cephalodia copiosa *fusca* v. *fusco-atra* madefacta indistincte radiatim rugosa ». The spores are triseptate. A specimen, probably syntype, is present in the British Museum Herbarium, and was investigated by me. The bodies described by Knight as « cephalodia » certainly contain Cyanophyceous algae, but I could not convince myself that they were true cephalodia. Their irregularity and colour seemed rather to indicate accidentally present colonies of blue-green algae. However, the material was not good, and confirmation is desirable.

5. **Lecanora (Placopsis) tararuana** Zahlbr.

in *Denkschr. Akad. Wiss. Wien, math.-naturw. Kl.* CIV (1941) 348, *cum descript.*

Collected by Chamberlain in New Zealand, North Island, *Wellington :* Table Top, Tararua Mts., altit. circ. 800 m, on rock (n° 189). It is described as having a whitish, smooth, finely areolate-rimulose, uniform (not effigurate) thallus; apothecia sessile, up to 1 mm diam., constricted at base, with red-brown discs. Thecium up to 300μ high. Spores 20-24 × 9-10μ. « Von *L. rhodophthalma* Nyl. unterscheidet sie sich schon äusserlich durch das geglättete und feinrissig-areolierte Lager und durch die rotbraunen Apothezien » (Zahlbr., *loc. cit.*). In the present conditions it is impossible to receive a specimen for examination. From the description it seems most likely to be *P. rhodophthalma,* which is known to occur on the Tararua Mountains (collected by Du Rietz in 1926).

6. Lecanora (Placopsis) Dennanensis Zahlbr.

in *Denkschr. Akad. Wiss. Wien, math.-naturw. Kl.* CIV (1941) 348, *cum descript.*

Based on a specimen from New Zealand, North Island, *Wellington :* Mt. Dennan, Tararua Mts., altit. circ. 1200 m, on schistose rock, collected by Chamberlain (n° 188). The salient points from the description are : thallus well effigurate, up to 0.7 mm thick, whitish-grey or rosy-grey ; marginal lobes plane, contiguous, up to 2 mm. broad, ± rounded at ends, adpressed to substratum ; central part of thallus smooth, with plane areolae formed by transverse and radiating cracks. Apothecia sessile constricted at base, up to 2.3 mm diam. ; disc buff-brown or rosy-brown. Thecium up to 200μ high. Spores 15-18 × 6-8μ. « Am meisten nähert sie sich noch der *L. patagonica* A. Zahlbr., der schön geformte Thallus lässt die ansehnliche Flechte von jener unterscheiden » (Zahlbr., *loc. cit.*). The characters given, particularly that of the small spores, appear to indicate the New Zealand form of *P. gelida,* which was collected in the same locality by Du Rietz in 1926.

Appendix

After the foregoing manuscript had been completed, I received a copy of a very illuminating paper by the Norwegian botanist Eilif Dahl : *On different types of unglaciated areas during the Ice Ages and their significance to phytogeography*, in *New Phytologist*, XLV (1946) 225. In this paper the author establishes the existence during the Quaternary epoch of ice-free refuges of two distinct types in the northern hemisphere : *a*) refuges of the coastal mountain type, with an oceanic climate, in western and north-western Scandinavia, probably in Scotland, Iceland, southern Greenland, and possibly Labrador ; *b*) refuges of the tundra type, with a continental climate, in Siberia, possibly in the Kola Peninsula, in northern Norway, Bear Island, Spitsbergen, northern Greenland, arctic Canada, and Novaya

Zemlya. The difference between the oceanic climate in the former type of refuge and the continental climate in the latter type may afford an explanation of the disjunct arctic distribution of *Placopsis gelida,* which, as stated on p. 193, appears to be absent from the eastern Siberian Arctic. Owing to the pronounced oceanic nature of the genus, only the coastal mountain refuges would have been available for it during the Quaternary period ; and its present extension to northernmost Norway, Spitsbergen, Bear Island and Novaya Zemlya in the east, and to the Boothia Peninsula of arctic Canada in the west, must therefore be the result of migration in post-Quaternary times, i. e., during the last 20 000 to 30 000 years. The eastern Asiatic occurrences must then also be derived from coastal mountain refuges along the shores of the northern Pacific Ocean.

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[1] Synonyms are *in italics.*

Summary

EXPLANATION OF PLATES

PLATE IX

(All figures on this plate 3 times natural size)

Fig. 30. *P. parellina* (Nyl.) M. Lamb var. *carnea* (Räs) M. Lamb. Part of a syntype specimen in herb. Helsinki.

Fig. 31. *P. parellina* (Nyl.) M. Lamb f. *semireagens* M. Lamb. Part of the holotype specimen.

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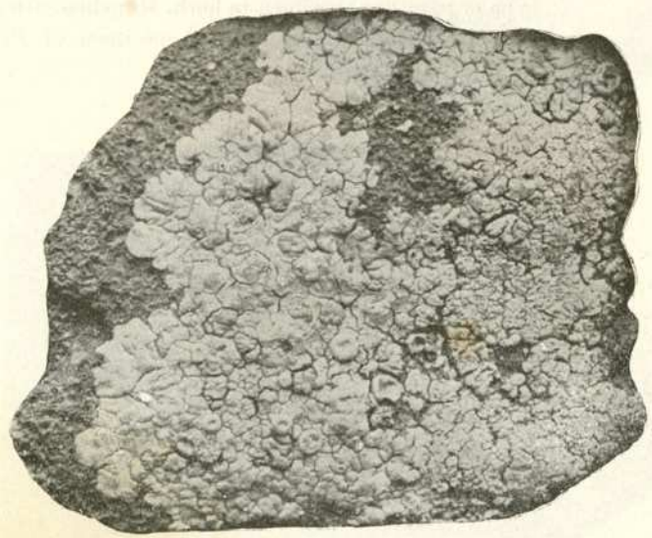

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PLATE X

(All figures on this plate 3 times natural size)

Fig. 32. *P. fuscidula* M. Lamb. The lectotype specimen of « *Lecanora gelida* f. *leprosula* » Zahlbr.

Fig. 33. *P. illita* (Kn.) M. Lamb The lectotype specimen.

Fig. 34. *P. parellina* (Nyl.) M. Lamb. f. *ampliata* M. Lamb. Homoeotype or paratype specimen in herb. München. (In lower right hand corner also a small specimen of *P. illita* (Kn.) M. Lamb).

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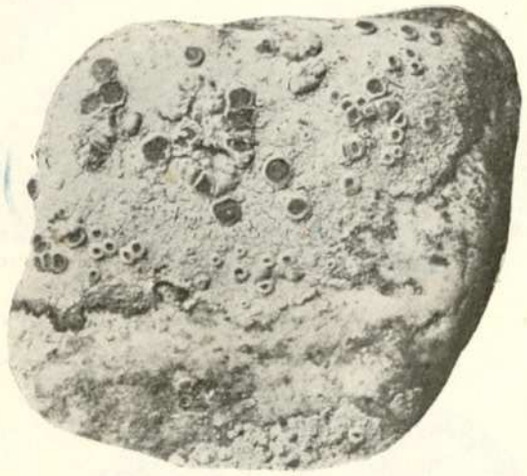

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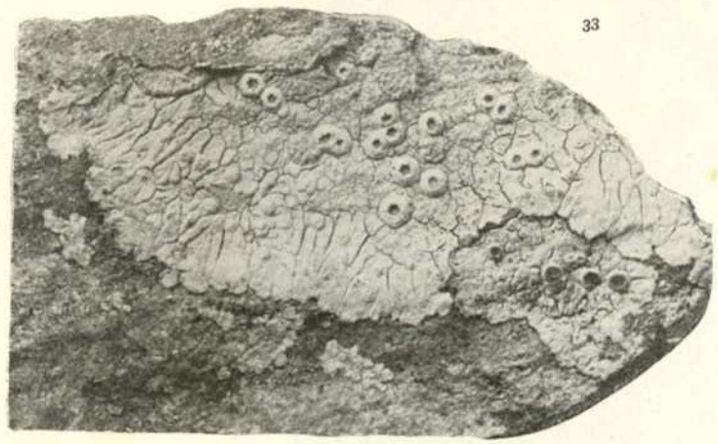

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PLATE XI

(All figures on this plate 3 times natural size)

Fig. 35. *P. Asahinae* M. Lamb. Two pieces of a paratype specimen in herb. Wien.

Fig. 36. *P. albida* (Kphbr.) M. Lamb. A syntype specimen in herb. München.

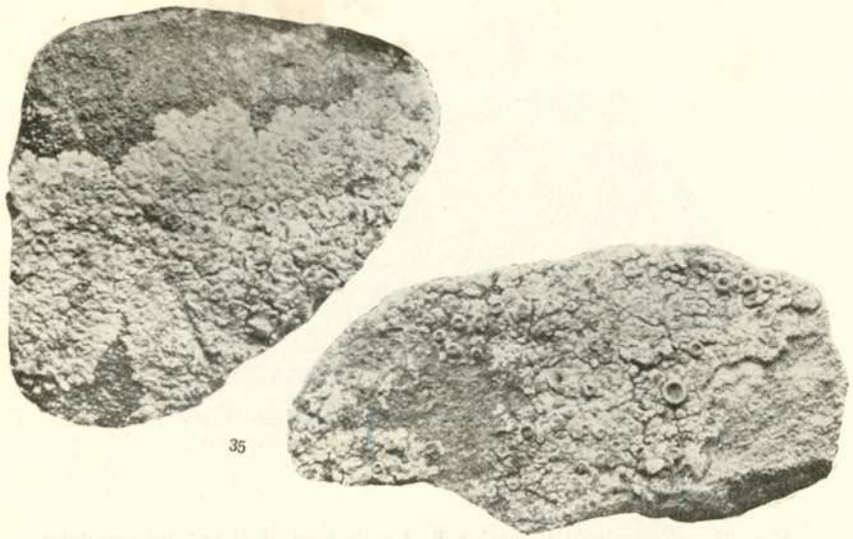

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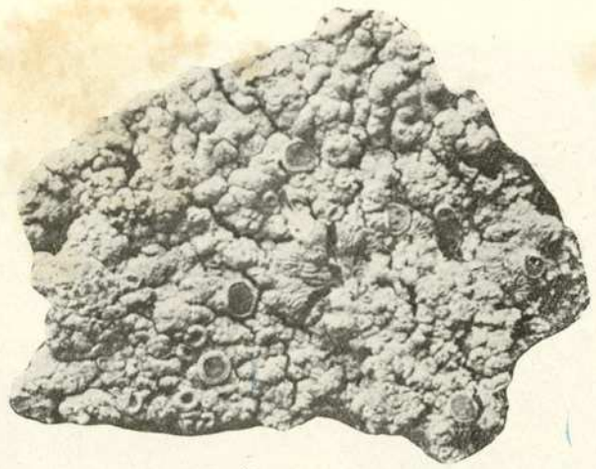
PLATE XII

(All figures on this plate 3 times natural size)

Fig. 37. *P. terricola* (Cromb.) M. Lamb. Part of a syntype specimen in herb. Mus. Brit.

Fig. 38. *P. rhodophthalma* (Müll. Arg.) Räs. The holotype specimen.

Fig. 39. *P. Amabilis* B. de Lesd. Two pieces of the holotype specimen.



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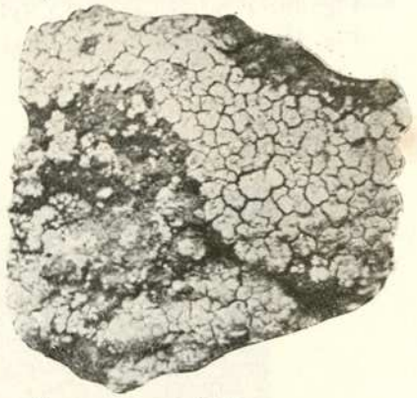

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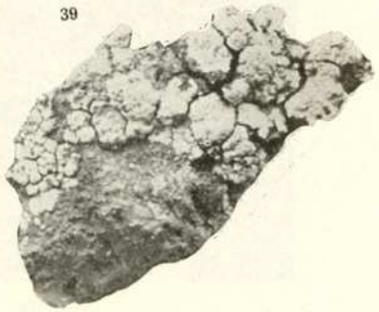

PLATE XIII

(All figures on this plate 3 times natural size)

Fig. 40. *P. perrugosa* (Nyl.) Nyl. Part of the holotype specimen.
Fig. 41. *P. perrugosa* (Nyl.) Nyl. A fertile specimen from Australia, Mt. Macedon.

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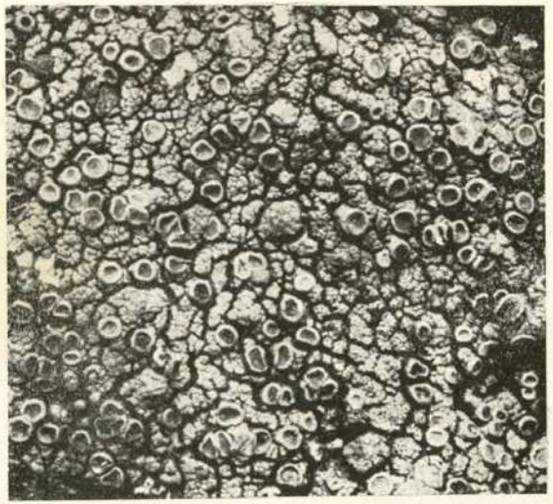

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PLATE XIV

(All figures on this plate 3 times natural size)

Fig. 42. *P. effusa* M. Lamb. Part of the holotype specimen.
Fig. 43. *P. contortuplicata* M. Lamb. Part of a fertile specimen from the South Orkneys.
Fig. 44. *P. contortuplicata* M. Lamb. Part of the holotype specimen.

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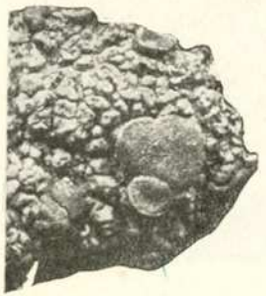

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PLATE XV

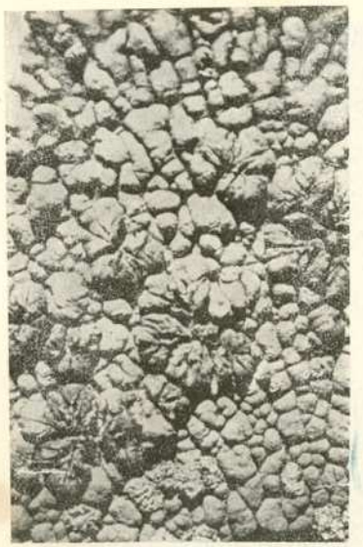
(All figures on this plate slightly over 3 times natural size)

Fig. 45. *P. lateritioides* M. Lamb. Part of the holotype specimen, showing the soredia.

Fig. 46. *P. lateritioides* M. Lamb. Part of the holotype specimen, showing the effigurate margin.

Fig. 47. *P. Dusenii* M. Lamb. Part of the holotype specimen.

Fig. 48. *P. salazina* M. Lamb. The holotype specimen.



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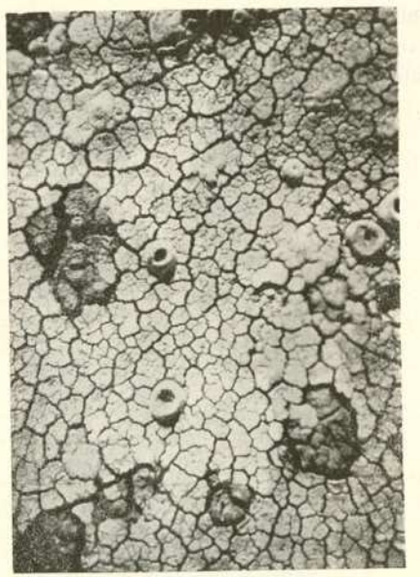

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PLATE XVI

(All figures on this plate slightly over 3 times natural size)

Fig. 49. *P. gelidoides* DR. Part of the holotype specimen, showing the effigurate margin.

Fig. 50. *P. gelidoides* DR. Part of the holotype specimen, showing central part of thallus.

Fig. 51. *P. alphoplacoides* M. Lamb. Part of the holotype specimen.

Fig. 52. *P. alphoplacoides* M. Lamb var. *clavifera* M. Lamb. Part of the holotype specimen, showing a group of isidia.

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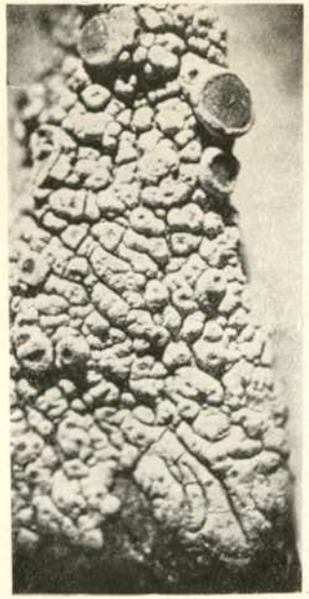

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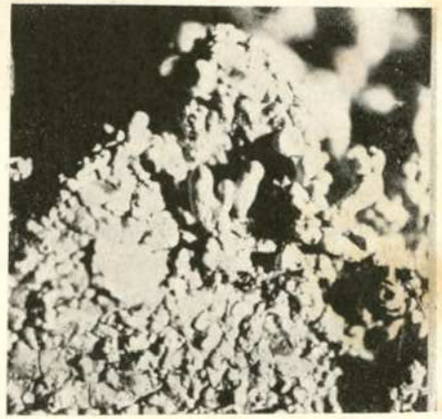

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PLATE I

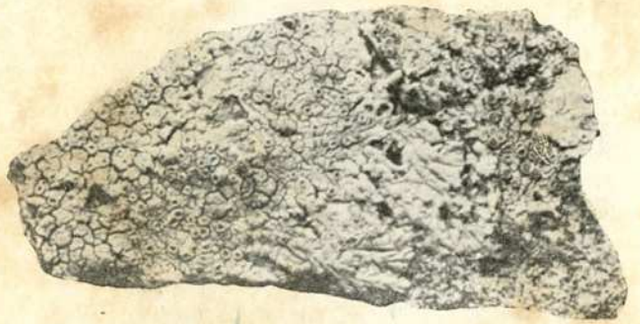
(All figures on this plate natural size)

Fig. 1. *P. brevilobata* (Zahlbr.) M. Lamb. A specimen from Fuegia, Isla Desolación. A small thallus of *P. perrugosa* is also present on the right.

Fig. 2. *P. bicolor* (Tuckerm.) B. de Lesd. The holotype of « *Placopsis gelida* f. *lateritia*» Nyl.

Fig. 3. *P. bicolor* (Tuckerm.) B. de Lesd. The holotype specimen.

Fig. 4. *P. gelida* (L.) Nyl. A fertile specimen from Norway, Voss.



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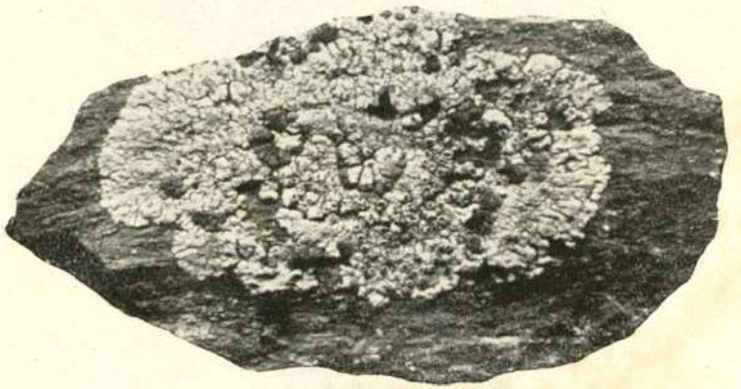

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PLATE II

(All figures on this plate natural size)

Fig. 5. *P. Roivainenii* M. Lamb. The holotype specimen.
Fig. 6. *P. parellina* (Nyl.) M. Lamb. A specimen from Tristan da Cunha.
Fig. 7. *P. parellina* var. *carnea* (Räs.) M. Lamb. A specimen from Tristan da Cunha.

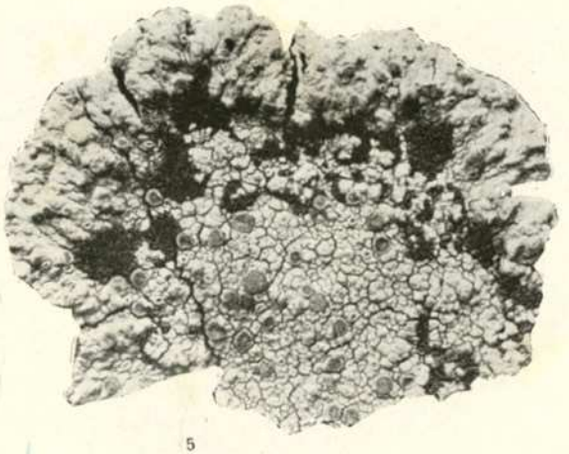

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PLATE III

(All figures on this plate natural size)

Fig. 8. *P. patagonica* (Zahlbr.) M. Lamb. The lectotype specimen.
Fig. 9. *P. perrugosa* (Nyl.) Nyl. The holotype specimen.
Fig. 10. *P. rhodophthalma* (Müll. Arg.) Räs. f. *atlantica* M. Lamb. The holotype specimen.
Fig. 11. *P. baculigera* M. Lamb. The holotype specimen.

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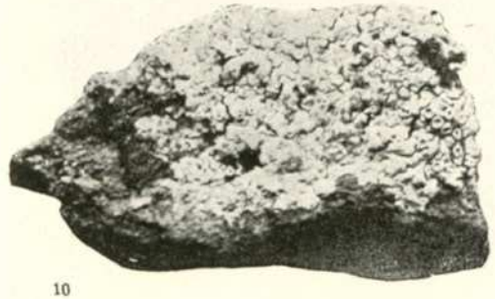

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PLATE IV

(All figures on this plate natural size)

Fig. 12. *P. gelida* (L.) Nyl. A dark form from British Columbia, Harrison Lake.

Fig. 13. *P. fuscidula* M. Lamb. The holotype specimen.

Fig. 14. *P. contortuplicata* M. Lamb. The holotype specimen.

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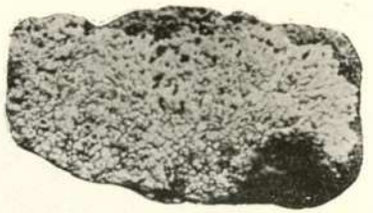

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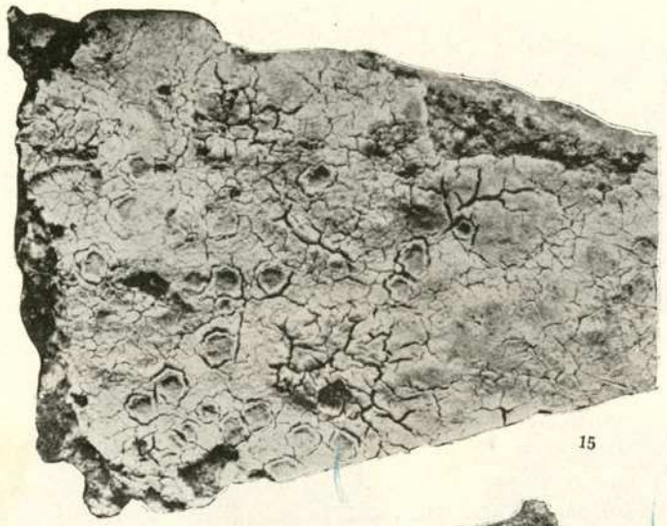
PLATE V

(All figures on this plate 3 times natural size)

Fig. 15. *P. (Aspiciliopsis) macrophthalma* (Tayl.) Nyl. A syntype specimen.

Fig. 16. *P. stenophylla* (Hue) M. Lamb. A specimen from Chile, Chiloé.

Fig. 17. *P. stenophylla* (Hue) M. Lamb. Three fragments of a paratype specimen in herb. Nylander.



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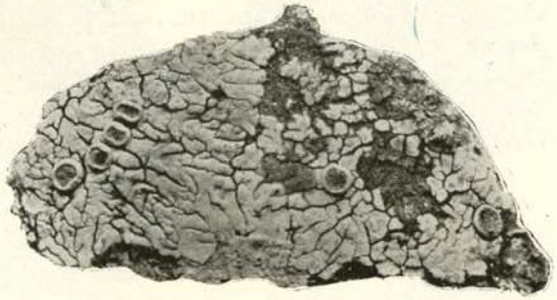

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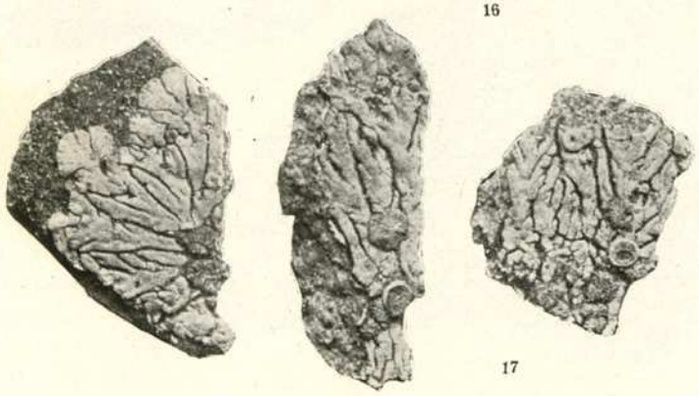

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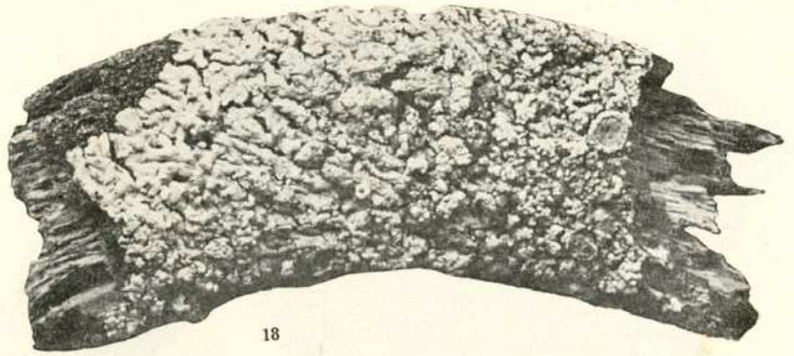
PLATE VI

(All figures on this plate 3 times natural size)

Fig. 18. *P. isidiophora* Vain. The holotype specimen.
Fig. 19. *P. papillosa* Vain. The holotype specimen.
Fig. 20. *P. gelida* (L.) Nyl. A young specimen from Iceland, Lake Medalfellvatn.
Fig. 21. *P. chilena* M. Lamb. The holotype specimen.



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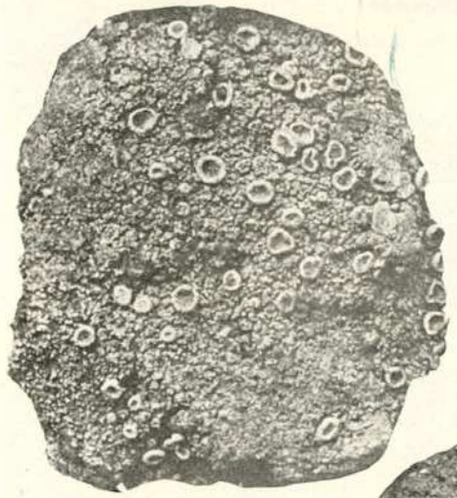

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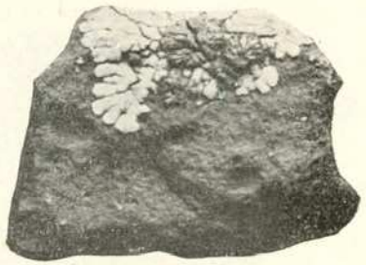

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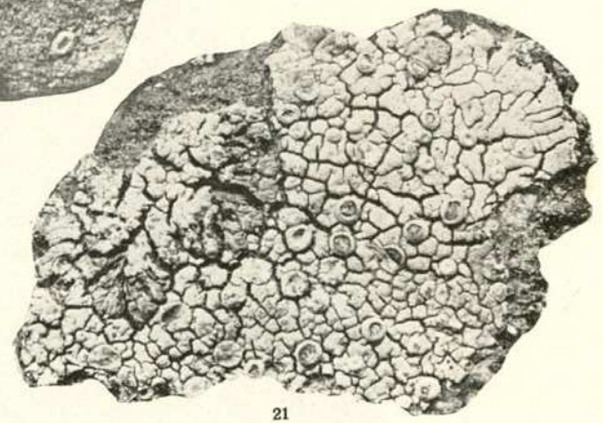

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PLATE VII

(All figures on this plate 3 times natural size)

Fig. 22. *P. subgelida* (Nyl.) Nyl. The holotype specimen.
Fig. 23. *P. subparellina* Nyl. The holotype specimen.
Fig. 24. *P. cribellans* (Nyl.) Räs. A syntype specimen in herb. Nylander.
Fig. 25. *P. cribellans* (Nyl.) Räs. A fertile specimen from New Zealand.

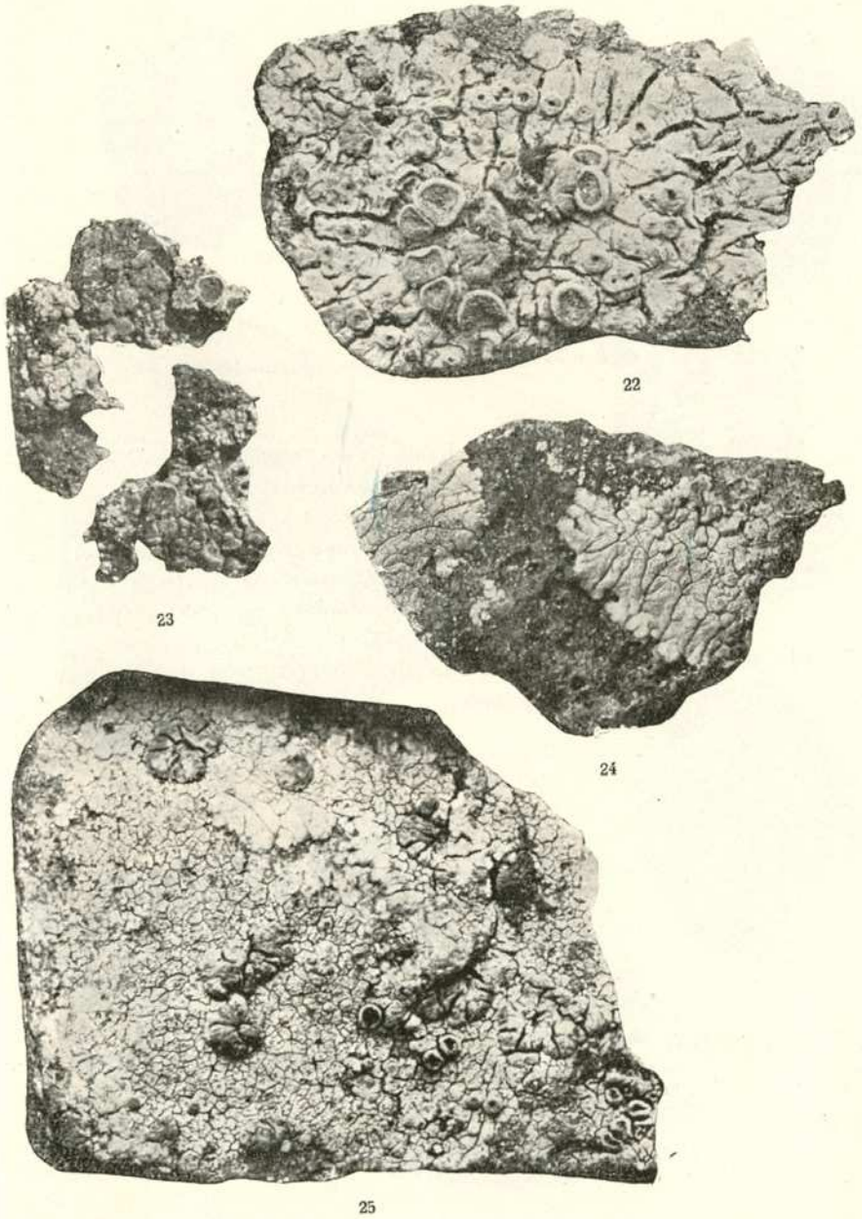

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PLATE VIII

(All figures on this plate 3 times natural size)

Fig. 26. *P. parellina* (Nyl.) M. Lamb. Two fragments constituting part of the syntype specimen in herb. Nylander.

Fig. 27. *P. parellina* (Nyl.) M. Lamb. Three fragments constituting the holotype specimen of «*Squamaria rhodocarpa*» Nyl.

Fig. 28. *P. parellina* (Nyl.) M. Lamb. A saxicolous specimen from New Zealand, Ashburton, showing marginal effiguration.

Fig. 29. *P. parellina* (Nyl.) M. Lamb f. *microphylla* M. Lamb. The holotype specimen.