

*Marcilio J. Marcellis*

ARKIV FÖR BOTANIK  
UTGIVET AV  
K. SVENSKA VETENSKAPSAKADEMIEN  
BAND 31 A. N:o 1.

---

# HAWAIIAN LICHENS

BY

A. H. MAGNUSSON AND A. ZAHLBRUCKNER (†)

---

## I.

The Families *Verrucariaceae* to *Peltigeraceae*

---

COMMUNICATED JUNE 2nd 1943 BY ROB. E. FRIES  
AND C. SKOTTSBERG

---

STOCKHOLM

ALMQVIST & WIKSELLS BOKTRYCKERI A.-B.

BERLIN NW 7

„NATURA“ BUCHHANDLUNG      H. K. LEWIS & CO., LTD      LIBRAIRIE C. KLINCKSIECK  
11 KARLSTRASSE                  138, GOWER STREET                  11 RUE DE LILLE

1943

*Marcelo P. Marcelli*

## Hawaiian Lichens.

By

**A. H. MAGNUSSON and A. ZAHLBRUCKNER (†).**

Communicated June 2nd 1943 by ROB. E. FRIES and C. SKOTTSBERG.

### I. The Families *Verrucariaceae* to *Peltigeraceae*.

#### Introduction.

After having finished the work with the Chinese lichens, collected during Dr. SVEN HEDIN's Expedition 1927—35, I set at work (Dec. 1939) examining the lichens collected in the Hawaiian Islands by Prof. C. SKOTTSBERG, Göteborg, in 1922 and 1926 and by him and his companions during the Hawaiian Bog Survey 1938. The collection comprised about 660 specimens. I started with the largest lichens, the Stictaceae. A result of this research was laid down in the publication: Studies in Species of *Pseudocyphellaria* (*Medd. Göteborgs Bot. Trädg.*, 14: 1—36, 1940), and some other results in New Species of *Cladonia* and *Parmelia* from the Hawaiian Islands (*Ark. f. Bot.* Bd. 30 B. No. 3, 1941). On the 2nd of April 1940, shortly before the frontier was closed up, I received from Dr. E. CHRISTOPHERSEN, Oslo, a box with about 200 specimens, collected by him in the Leeward Islands. These were worked up in 1941 and the MS., Lichens of Nihoa and Necker Islands, comprising 21 species of which 15 were new, was sent to Honolulu for publication in Occasional papers, Bernice P. Bishop Museum, Tanager Expedition.

Meanwhile, Dr. K. REDINGER, Berlin, informed me that Dr. A. ZAHLBRUCKNER, Vienna, had worked on Hawaiian lichens until shortly before his death and that he himself had undertaken the task of preparing the exhaustive MS. in spite of the difficulties in reading it. But at the same time he

proposed to me to unite my own and ZAHLBRUCKNER's researches into one publication and promised me his help in reading ZAHLBRUCKNER's descriptions. Everything agreed, the news of his much regretted death reached me before long. With the consent of Mrs ZAHLBRUCKNER I received the whole MS. from Mrs REDINGER and found that there was a fair copy of only a couple of species. Consequently, the time-absorbing work of making a fair copy of ZAHLBRUCKNER's MS., written mainly in Latin (and partly in German), often almost illegible and largely with endings omitted, was laid upon my shoulders.

I soon came to the conclusion that it was not necessary to copy it word by word, because it contained both descriptions from other authors (especially VAINIO) and ZAHLBRUCKNER's own descriptions of species already described with the most important details by others. In order to save space all these were omitted. Further, for the same reason, I have excluded several statements referring to generic characters, especially such records of the paraphyses, asci and spores that appear in identical terms in nearly all diagnoses. Moreover, the important characters have been spaced out by me.

Another drawback which highly interfered with my work was the impossibility of obtaining specimens determined by ZAHLBRUCKNER for reexamination and comparison. Where most of these lichens are preserved I do not know. Many are probably in the Bishop Museum, Honolulu, some, mainly collected by J. F. Rock, in Vienna. Some are in Berlin according to Dr. MATTICK (in FEDDE'S Repertor. 49: 187, 1940), especially those collected by FAURIE in 1909.

War-conditions have rendered the communications with foreign museums difficult or impossible. Access to authentic specimens, especially from older times, is necessary to obtain reliable results in working up a collection of tropical lichens. Therefore, much uncertainty still reigns and corrections will be made when circumstances permit.

I have found single specimens from Hawaii in different Swedish herbaria, especially in Uppsala (U.), a few in Stockholm, in Göteborg and in my own herbarium, mainly of MERRILL's exsiccata. On my visit to Uppsala, during Easter, 1942, when my research already had taken shape of a MS., I discovered a volume containing about 125 lichens, with the title »Sandwich Islands Lichens» on its back. Most of them had been collected by E. BAILEY, but as a rule no precise locality was given, sometimes only »Insulae Sandw.». The name of an island was indicated in a number of them, in a few also the collector: most often MANN, sometimes BAILEY

or BRIGHAM. The greater part was named and the names written in a probably female hand just as the title of the book. But a few names were apparently written by WILLEY which is obvious by comparison with single specimens in the main herbarium (U.), labelled WILLEY: Lich. Bor. Amer. Two specimens, evidently inserted afterwards and beside the rest, are labelled Mexico. All others have been quoted in my paper as collected in the Hawaiian Islands. Many of them bore only generic name and the determinations were often wrong even as to the genus. In many cases figures and sizes of spores were added to the specimens. The collection contains several species not previously seen by me but treated or mentioned by ZAHLBRUCKNER and also various new species, which had been identified with common European or American lichens. A few collected by MANN and described by TUCKERMAN, may be regarded as co-types and deserve to be fully described. They are perhaps not represented in any other European museum, e. g. *Tylophoron* and *Pyrgillus*. The history of this collection, which probably is unique, is unknown. Presumably, it was a gift to TH. M. FRIES from WILLEY or an American Museum.

This is the first time I have worked on exotic lichens and consequently I have met with many difficulties. Due to the difficulty to obtain specimens for comparison I have been obliged mainly to use the literature. In order to obtain a survey of a genus I have worked out a key of it, partly or completely, especially of genera with many species, an exceedingly tedious job. Thus, such large and hitherto inper-spicuous genera as *Buellia*, *Lecidea*, *Lecanora*, *Ramalina*, *Pyrenula* etc. have been arranged in keys, mainly it is true, after the literature, but nevertheless of great use to myself. They are of course incomplete because many species, especially old ones, were badly described and have never been reexamined, but without these keys I had never dared to describe a new species of e. g. *Buellia* or *Lecanora*, and I consider them so important that they ought to be published, as they would be of use to other lichenologists engaged in the study of exotic lichens.

Another difficulty has been the quotation of the localities. It is evident that many of the names in ZAHLBRUCKNER's MS., as well as of others in the literature, are more or less wrong and consequently not found on any map. Thanks to the kindness of Prof. SKOTTSBERG, who helped me to interpret the geographical names they appear as correct as is possible without the assistance of a person living in Hawaii and familiar with the innumerable Hawiian place-names.

The main part of the lichens determined by me was collected during the Hawaiian bog survey 1938 by C. SKOTTSBERG (leader), Mr. O. SELLING, Stockholm, and Miss LUCY M. CRANWELL, Auckland, N. Z. Their specimens are quoted under H. B. S. 1938. A complete set of this collection will be deposited in the Museum of Natural History (Riksmuseum), Stockholm.

I have also tried to determine fragments of lichens associated with a herbarium specimen and have noted the locality when the determination was successful. For some reason unknown to me three genera, *Pyrenula*, *Cladonia* and *Stereocaulon* are entirely missing in ZAHLBRECKNER's MS.

On the whole, 487 species, 66 varieties and forms have been treated. Of these, 204 species were collected during Dr. SKOTTSBERG's visits to the islands. Fiftythree of these are described by me as new, and seven new species were found in the Botanical Museum, Uppsala. In ZAHLBRECKNER's MS. 50 new species are listed. Previously he has published 43 species from the islands and in addition some 30 new varieties and forms are described by him. In TUCKERMAN's publications we find 47 species and in other publications 3 species recorded from the Hawaiian Islands but never found again.

The number of species in the different islands is: Kauai 231, Oahu 208, Lanai 26, Molokai 56, Maui 169, Hawaii 162. Twenty species are recorded without name of a particular island. The name »Hawaii» in older records most likely refers to the archipelago as a whole.

Göteborg in October 1942.

### On the collectors of Hawaiian Lichens.

In Proc. Amer. Acad. 6: 144—145, 1866, HORACE MANN gave a record of early botanists in the Hawaiian Islands. According to him the first collector of lichens was CHARLES GAUDICHAUD during FREYCINET's expedition 1819 in the corvettes »Uranie» and »Physicienne». They were determined by H. PERSOON and published in 1826. GAUDICHAUD returned to the islands in 1836. The lichens were determined by M. MONTAGNE in Voyage . . . sur la Bonite, Vol. I, 1844—46. In 1831 FR. J. FERD. MEYEN visited the islands on the Prussian vessel »Princess Louise» and his finds were published after his death in Nov. Acta Acad. Caes. Leop. 19 Suppl. 1843. Only 5 species with 3 varieties were recorded from the Hawaiian Islands. That lichens were collected in the islands by T. LAY and ALEX. COLLIE during the expedition of Captain

F. W. BEECHEY 1825—28 and published in 1841 was not mentioned by MANN, and there are no statements of them in ZAHLBRUCKNER'S MS.

CHARLES PICKERING made all the botanical collections during the U. S. South Pacific Exploring Expedition under the command of CHARLES WILKES in 1840. The lichens were determined by TUCKERMAN (Report vol. 17: 115—152, 1861). This volume seems to lack in Swedish libraries but the finds are quoted here from ZAHLBRUCKNER'S MS. The Danish botanist F. DIDRICHSEN collected Hawaiian lichens in 1846, and about 20 specimens in the Uppsala Bot. Museum have been examined by me. »A fine collection of lichens» (acc. to MANN) was made by JULES REMY in the years 1851—55 and part of them are recorded by NYLANDER in his Synopsis and in other publications. REMY went to the islands under the auspices of the Paris museum. A few lichens, collected by the Swede N. J. ANDERSSON during the circumnavigation of the globe of the frigate »Eugenie» 1851—53 were discovered in Uppsala. WM. HILLEBRAND, the well-known author of the Flora of the Hawaiian Islands, sent a valuable collection of lichens to Kew. They were determined by MÜLL. ARG. (Flora 1889), and consist of 37 exclusively non-crustaceous species.

The most important lichen collection from earlier days was made by W. F. BRIGHAM and HORACE MANN in 1864—65 and gave rise to TUCKERMAN'S »Lichenes» in Proc. Amer. Acad. 7: 223—234, 1866, where also older finds are included. He reports 129 species with a large number of varieties, nowadays generally accepted as separate species. With this publication we get a first survey also of the crustaceous lichens, formerly neglected, from the Hawaiian Islands, with descriptions of many new species. To judge from the volum of exsiccata at Uppsala (see above) and from the copy of a list of the lichens in the Bishop Museum (at present in Berlin), E. BAILEY has made vast collections, but no particulars regarding these or his activity are known to me.

During the circumnavigation of the globe by the Austrian frigate Donau 1868—71 lichens were gathered by HENR. WAWRA, 29 numbers, determined by KREMPELHUBER and published in Verh. Zool. bot. Ges., Wien 1876. From labels I have stated that J. W. ECKFELDT collected lichens at least in 1881 and A. A. HELLER in 1895 and 1896. Several of HELLER's specimens were distributed with MERRILL's exsiccata. The lichens gathered in 1905 by K. RECHINGER (19 nos.) were determined by ZAHLBRUCKNER and published in Bot. u. Zool. Ergebn. d. wissenschaftl. Forsch.reise n. d. Samoa Inseln etc.

1911, and those collected by B. P. G. HOCHREUTINER in the same year by K. REDINGER in *Candollea* vol. 8, 1940.

From the citations in ZAHLBRUCKNER's MS. and from HILLMAN's publication (in FEDDE, *Repertor.* 49: 188—206, 1940) we learn that many persons have collected lichens during this century, e.g. H. BRYAN jr., BRUCE CARTWRIGHT (1932; HILLM.: CARTMIGHT), CAROLINE CROSBY, C. N. FORBES (1908—20), Abbé FAURIE (1909), Miss C. HARTT, A. S. HITCHCOCK, C. S. JUDD, V. KRAJINA (1929—30), J. G. KUECHE, Rev. W. LILLIE, H. L. LYON, Brother Matthias, MARIE C. NEAL, Brother NEWELL, G. E. OLSSON (1937; HILLM.), J. F. ROCK (large collections) and G. W. RUSS (1932; HILLM.).

### Abbreviations used.

Beside the usual abbreviations for the chemical reagents: C or CaCl = calcium hypochlorite, I = iodine solution, K or KOH = potassium hydrate, Pd = paraphylene-diamine I have used:

C. U. C. = SÉGUY, Code universelle des couleurs.

H. B. S. = Hawaiian Bog Survey.

U. = Botanical Museum, Uppsala.

Z. in MS. = ZAHLBRUCKNER in his MS.

To save space in the keys I have used.

Ap. = apothecium; Cort. = cortex; Hyp. = hypothecium; Med. = medulla; Per. = perithecia; Pod. = podetia; Sor. = soredia; Sp. = spores; Th. = thallus.

### Pyrenocarpeae.

#### Verrucariaceae.

##### *Verrucaria* (WIGG) TH. FR.

- 1 a. Th. endolithic. Ap. quite immersed, 0.4 mm diam. Sp. 17—20×7.5—8.5  $\mu$ . Calcicolous. 1. *calciseda*.
- 1 b. Th. epilithic.
- 2 a. Th. thick, uniform, uneven. Ap. to 0.25 mm large, prominent. Sp. 10—18×5—7.5  $\mu$ . 2. *laviseda*.
- 2 b. Th. thin, areolate, smooth, areolae very small. Ap. to 0.15 mm large, apex applanated, level with thallus. Sp. 9—11×6—7  $\mu$ . 3. *mauiensis*.

Sect. 1. *Amphoridium* MÜLL. ARG.1. *V. cf. calciseda* DC.

apud LAM. et DC., Flore Franç. 2: 317, 1805; ZAHLBR., Catal. Lich. 1: 21, 1922.

Oahu. Ewa Coral plain, 1922, SKOTTSBERG (1152—4) with *Buellia pruinosa* etc.

There are only a few immersed perithecia in the coral limestone with about 0.15 mm broad, black mouth visible below the surface of the stone. The perithecia are subglobose, about 0.4 mm diam. with a 5—7  $\mu$  thick,  $\pm$  brown surface, at the apex 30—35  $\mu$  thick, blackish brown, concave, and below it very discrete, simple, straight periphyses, 20—25  $\times$  1.5  $\mu$ . Inner 20—25  $\mu$  of exciple pale,  $\pm$  yellowish, high up covered by 60—70  $\times$  20—17  $\mu$  large, swollen ascii. Spores 17—20  $\times$  7.5—8.5  $\mu$ . Inner 7—12  $\mu$  of exciple I  $\pm$  blue like the nucleus. Lumps, 35—40  $\mu$  large, of greenish yellow, 8—10  $\mu$  thick gonidia seen in the endolithic thallus. Hyphae arachnoid, 2.5—3  $\mu$  thick, no oil-cells observed.

The scanty material allows no closer investigation but the observed characters agree rather well with those in *V. calciseda*, considered to be a wide-spread species in Europe, W. Asia and N. America.

Sect. 2. *Lithoicea* ACH.2. *V. laviseda* ZAHLBR. n. sp. in MS.

\*Thallus crassiusculus, usque 1 mm altus, subverruculosus-vel subgyroso-inaequalis, irregulariter vel subareolato-rimosus, cinerascenti-glaucescens, opacus, KOH—, CaCl—, intus pro maxima parte niger; strato corticali tenuissimo, 10—13  $\mu$  crasso, fuscamente, insperso, ex hyphis intricatis formato; strato gonidiali angusto, 35—55  $\mu$  crasso, gonidiis pleurococcoideis, cellulis 6—9  $\mu$  latis, in seriebus  $\pm$  superpositis dispositis. Medulla valde crassa, c.  $\frac{3}{4}$  partem thalli occupans, nigricans, subcarbonacea, pseudoparenchymatica, cellulis  $\pm$  angulosis, leptodermaticis, I—.

Apothecia immersa, vertice nigricantia, convexulo-prominula, subglobosa (in parte superiore conico-semiglobosa), ad 0.25 mm lata, poro tenuissimo pertusa; perithecio integro, fusco-nigro, 18—40  $\mu$  crasso; periphysisibus filiformibus, brevibus,  $\pm$  horizontalibus; hymenio I e dilute rubescente dilute cupreo; hypothecio fere decolore, ex hyphis intricatis formato; paraphysisibus nullis; ascis ovali-cuneatis, mox confluentibus, 40—55  $\mu$  longis et 9—12  $\mu$  latis, 8-sporis; sporis in ascis biserialibus, oblongo-ellipsoideis, ellipsoideis vel

ovalibus, rarius fere fusiformibus, membrana tenui laevique cinctis, 10—18  $\mu$  longis et 5—7.5  $\mu$  latis, guttulis 1—3 majoribus impletis.

Pycnoconidia non visa.

Kauai. Ad lavam, FAURIE (254).» From ZAHLBR. MS.

3. *V. mauiensis* H. MAGN. n. sp.

Thallus maculas minutas cinereas laevigatas formans, tenuis, areolatus, areolis minutissimis planis, angulatis, intus pro maxima parte atris. Perithecia solitaria vel pauca in quavis areola, minutissima, immersa, vertice applanato, atro, superficiem aequante, pariete cum strato atro confuso. Sporae perminutae, ellipsoideae.

Maui. Iao Valley, 350 m, 1922, SKOTTSBERG (in 1614 with *Buellia hawaiiensis*), scantily.

Thallus areas only 3—5 mm large, areolae 0.2—0.3 mm wide, 0.2—0.25 mm thick, base confluent with the substratum, areolae irregularly cracked and separated by very thin blackish cracks, of very irregular, angular shape. — Most part of thallus quite black, only 35—50  $\mu$  of surface pale,  $\pm$  transparent, for the most part filled with 4—6  $\mu$  large, yellowish green gonidia, pale towards surface where no distinct cortex is visible, but upper 6—8  $\mu$  pale sordid yellowish. Hyphae apparently perpendicular in thallus, constrictedly septate, cells about 3  $\mu$ ,  $\pm$  thin-walled. Gonidia in vertical rows. Black tissue KOH + greenish black.

Visible apex of perithecia 0.1—0.15 mm wide, apparently plane, in thallus level. — Perithecia immersed in the black tissue, about 170  $\mu$  deep, 80—100  $\mu$  broad, wall black, sometimes 2(3) together with blackish tissue (about 12  $\mu$  broad) between them. Periphyses at mouth 12—16  $\mu$  long, 1.5  $\mu$  thick, in much gelatine, developed 85  $\mu$  downwards. Nucleus I + greenish blue, soon pale wine-red. Paraphyses indistinct; asci abundant, 35  $\times$  11—15  $\mu$  large, broadly clavate, below periphyses horizontally directed, at base vertical. Spores 8, 9—11  $\times$  6—7  $\mu$  with one large vacuole, in KOH 8—10  $\times$  5—6  $\mu$ , ellipsoid.

The new species belongs to the *V. fuscella* group and may resemble a dwarf form of *V. polysticta* BÖR. both in habitus and structure (cf. fig. 124 in ZSCHACKE, Verrucariaceae, in RABH. Krypt. flora, Bd. 9, Abt. 1: 275, 1934) but has much smaller areolae, perithecia and spores.

**Thrombium (WALL.) MASS.**

**T. endolithicum** H. MAGN. n. sp.

Thallus endolithicus, cinereo-albicans, subfarinosus. Perithecia dispersa, semiimmersa, globosa, atra, vertice haud de-

presso, distinete pertuso. Paraphyses numerosae, intricatae. Sporae simplices, ellipsoideae, mediocres.

Oahu. Ewa Coral plain, 1922, SKOTTSBERG (1152—4).

Surface of the chalk between the perithecia seemingly subfarinose from the  $\pm$  dissolved stone, circumference indistinct. — No gonidia around the perithecia. But in the adjacent limestone arachnoid or intricate, 2—4  $\mu$  thick, thick-walled hyphae have been observed between lumps of yellowish green, 8—14  $\mu$  large gonidia, which are moderately thick-walled, globular, apparently *Protococcus*.

Perithecia 0.15—0.2 mm wide, the visible upper half globose with distinct porus. — Perithecia globular, wall at least 25  $\mu$  thick, quite black, also in HCl, porus 50—70  $\mu$  diam. Paraphyses very numerous, about 1  $\mu$  thick, branched and entangled. Ascii numerous, 65—85  $\times$  18—20  $\mu$ , cylindric-clavate, wall thick for the most part, still thicker at apex, 4—5  $\mu$ . Spores 8, 17—22(25)  $\times$  8—9  $\mu$ , ellipsoid, simple, with  $\pm$  vacuoles. Nucleus I—, spores (in the ascii)  $\pm$  reddish yellow.

Probably nearly related to the endolithic *T. stereocarpum* STNR (Sitz.ber. K. Akad. Wiss. Wien, math. naturw. Classe 105, Abt. 1: 444, 1896), but perithecia and ascii smaller and perithecia quite black (not »obscure fusca»).

### Dermatocarpaceae.

#### *Normandina* (NYL.) VAIN.

##### *N. pulchella* (BORG.) NYL.

in Ann. Sci. Nat. Bot. ser. 4, 15: 382, 1861; ZAHLBR., Catal. Lich. 1: 198, 1921. — *Verrucaria pulchella* BORG. apud. HOOK. and SOWERBY, Suppl. Engl. Bot. 1, 1831, tab. 2602, fig. 1. — *Normandina jungermanniae* NYL., TUCK. in Proc. Amer. Acad. 7: 233, 1866.

Kauai. Hanapepe fall, on bark, FAURIE (Z. in MS.). Haena bay, a few squamules among *Leptogium moluccanum* (in 5610, 5624); Kokee (6014, only a few squamules as in 5678: *Anaptychia spectabilis*, and in 6062: *Pseudocyphellaria Mougeotiana*); Kokee, Kalua Puhi trail (in 5954: *Pannaria lepidophora*), all H. B. S. 1938. — Oahu. On *Pannaria molybdaea*, MANN (TUCK.); Waianae mts, Palehua, in forest at 650 m, 1922, SKOTTSBERG (in 1227: *Pseudocyphellaria Mougeotiana*, 1521: *Parmelia subbahiana*). — Lanai. Mahana valley, on bark, Rock (134) Z. in MS. — Maui. Western part, in the mountains, on *Sticta crenulata*, MANN (TUCK.); Puu Kukui, summit forest, H. B. S. 1938 (in 5908, 5650, 5777).

Cosmopolitan.

### Pyrenulaceae.

#### Microthelia KBR.

- a. Per. entire, 0.4—0.5 mm, base thin. Th. white. Sp. 18—  
23 × 7—10  $\mu$ . 1. *albidella*.
- b. Per. dimidiate, above 0.5 mm. large. Sp. 18—32 × 8—  
11(13)  $\mu$ . 2. *thelena*.

#### 1. M. *albidella* MÜLL. ARG.

in Flora 66: 272, 1883; ZAHLBR., Catal. Lich. 1: 254, 1921.  
Oahu. Tantalus ridge, on branches of *Hibiscus*, LYON (820). — Lanai. Kaiholena valley, on bark, Rock (195, thallus white) Z. in MS.

»Paraphyses ramosae. Sporae fuscae, 16—20 × 8.5—9  $\mu$ . Conceptacula pycnoconidiorum minuta, semiimmersa, perithecio dimidiato, subluteo fusco, hyphoso, fulcris exobasidialibus, subfiliformibus, pycnoconidiis brevibus, bacillaribus, rectis, 3.5 × 0.5  $\mu$ .» ZAHLBR. MS.

Formerly known only from Apiahy in Brazil: the authentic specimen.

#### 2. M. *thelena* (Ach.) TREV.

Conspic. Verruc.: 10, 1860; VAIN., Lich. Brésil 2: 232, 1890 (with description); ZAHLBR., Catal. Lich. 1: 266, 1921. — *Verrucaria thelena* Ach., Synops. Lich.: 92, 1814.

Hawaiian Is., BAILEY (U. exs.), on smooth cortex. Perithecia 0.5—0.8 mm. Spores 23—30 × 12—13  $\mu$ .

General distribution: Tropical regions.

There are in the Upsala exs. two other specimens: one, Haw. Isl., BAILEY, called *Pyrenula punctiformis*, on white cortex, and one from Oahu, MANN, called *Pyrenula thelena*, on nitidous, brownish cortex, both with 0.4—0.5 mm large, dimidiate perithecia and 18—24 × 7—10  $\mu$  spores. They agree partly with *albidella* but are devoid of thallus. Unfortunately I have had no access to the specimens determined by ZAHLBR.

### Arthopyrenia (MASS.) MÜLL. ARG.

- 1 a. Sp. 58—78 × 20—30  $\mu$ . Ap. hardly prominent, of average size. Exciple entire, upwards denudate. 1. *planiuscula*.
- 1 b. Sp. not above 28  $\mu$  long. Exciple dimidiate.
- 2 a. Th. brown, maculiform. Ap. to 1 mm, semiimmersed, free from thallus. Per. lengthened upwards. Sp. 16—26 × 7—8  $\mu$ , 1-septate. 2. *phaeoplaca*.
- 2 b. Th. chalky white, very thin. Ap. 0.4 mm, depressed, base covered by thallus, dilated. Sp. 15—28 × 5—14  $\mu$ , larger ones 3-septate. 3. *planorbis*.

2 c. Th. maculiform, pale, disappearing. Ap. 0.5—1 mm.  
Sp. 14—27 × 6—8 µ, 1-septate. 4. *cinchonae*.

### 1. *A. planiuscula* (NYL.) ZAHLBRE.

Catal. Lich. 1: 310, 1922. — *Verrucaria planiuscula* NYL., Expos. Synopt. Pyrenocarp.: 58, 1858. — *Pyrenula planiuscula* TUCK. in Proc. Amer. Acad. 7: 233, 1866.

Oahu. On trees, MANN (TUCK.). Formerly known only from tropical America (FÉE).

### 2. *A. phaeoplaca* ZAHLBRE.

in Ann. Mycol. 10: 361, 1912; Catal. Lich. 1: 309, 1922.

Lanai. Kaiholena valley, on branches, in damp forest, Rock (140) Z. in MS.

Endemic.

### 3. *A. planorbis* (ACH.) MÜLL. ARG.

in Mém. Soc. Phys. et Hist. Nat., Genève 30, no. 3: 27, 1888; ZAHLBRE., Catal. Lich. 1: 310, 1922. — *Verrucaria planorbis* ACH., Synops. Lich.: 92, 1814. — *Pyrenula planorbis* TREVIS., TUCK. in Proc. Amer. Acad. 7: 234, 1866.

Oahu. Waialua mts, on trees, MANN (TUCK.).

General distribution: tropical regions.

### 4. *A. cinchonae* (ACH.) MÜLL. ARG.

in Flora 64: 287, 1883; ZAHLBRE., Catal. Lich. 1: 302, 1922. — *Verrucaria cinchonae* ACH., Synops. Lich.: 90, 1814. — *Pyrenula cinchonae* TUCK. in Proc. Amer. Acad. 7: 233, 1866. — *Didymella cinchonae* VAIN. in Bot. Tidskr. 29: 150, 1909 (with description).

Oahu. On trees, MANN (TUCK.).

Distribution: Tropical regions.

### *Polyblastiopsis* ZAHLBRE.

» Asci 8-spori. Thallus stramineo-glaucescens. 1. *Fauriei*.  
Asci 2-spori. Thallus subargenteo-lacteus. 2. *subargentea*.

#### 1. *P. Fauriei* ZAHLBRE. n. sp.

Thallus epiphloeodes, tenuissimus, effusus, stramineo-glaucescens, opacus, KOH luteo-fulvescens, continuus, laevigatus, in margine linea obscuriore non cinctus. — Apothecia primum a thallo supertecta, demum erumpentia, vertice nitido, tenue, usque 0.5 mm lata, poro apicali tenuissimo pertuso, perithecio carbonaceo, integrō, depresso-

convexo; paraphysibus dense et irregulariter ramosis; ascis oblongo-clavatis, demum confluentibus, 8-sporis; sporis in ascis biserialibus, anguste ellipsoideis vel anguste ovalibus, in medio nonnihil leviter constrictis, crebre murali-divisis, seriebus cellularum verticalibus 10, horizontalibus utplurimum 4, cellulis cubicis,  $35-54 \times 12-16 \mu$ .

Kauai. Kilauea, corticola (FAURIE 171, in hb. BOULY DE LESDAIN).

Specimen unicum visum, ulterius inquirenda.

2. *P. subargentea* ZAHLBR. n. sp.

Thallus epiphloeodes, tenuissimus, maculiformis, quasi suffusus, argenteo-lacteus, nitidulus, KOH lutescens, CaCl<sub>2</sub>, laevis, in margine linea obscuriore non cinctus. — Apothecia dispersa, sessilia, primum leviter a thallo obducta, demum nuda, nitida, nigra, subsemigloboso-convexa, 0.5—1 mm lata, vertice poro minuto recto pertuso. Excipulum carbonaceum, dimidiatum, superne crassum. Hypothecium decolor (I vix lutescens), ex hyphis dense intricatis formatum. Hymenium decolor, I—. Paraphyses subsimplices, parce ramosae vel clathratim connexae, ad apicem non latiores, ad 1.5  $\mu$  crassae, laxae. Ascii oblongo-clavati v. oblongi, ad apicem rotundati et ibidem membrana parum incrassata cincti, 2-spori. Sporae in ascis superpositae, decolores, ellipsoideae, ovali-ellipsoideae, rectae, multicellulatae, cellulis parvis, subcubicis, membrana sat tenui, ad 2  $\mu$  crassa, cinctae,  $47-60 \times 14-20 \mu$ , I levissime lutescentes.

Conceptacula pycnoconidiorum ignota.

Maui. Haleakala, c. 1000 m, ad corticem laevem (FAURIE 681).» From ZAHLBR. MS.

**Pseudopyrenula MÜLL. ARG.**

- a. Per. 0.5 mm, entire. Sp.  $25 \times 7 \mu$ . 1. *erumpens*.
- b. Per. 0.75 mm, dimidiata. Sp.  $30-35 \times 8-9 \mu$ . 2. *diluta*.

1. *Ps. erumpens* MÜLL. ARG.

in Bull. Soc. Bot. Belgique 32: 170, 1893; ZAHLBR., Catal. Lich. 1: 356, 1922.

Oahu. In *Aleurites moluccana* 1846 DIDRICHSEN (U.).

Perithecia about 0.5 mm, entire, black, base about 35  $\mu$  thick. Nucleus 0.3 mm broad, 150  $\mu$  high, gray from much oil, I + yellowish. Paraphyses distinct, 1  $\mu$ , at least partly anastomosing. Ascii  $85 \times 16 \mu$ , cylindric-clavate. Spores  $25 \times 7 \mu$ , colourless.

Previously known only from Costa Rica.

2. *Ps. diluta* (FÉE) MÜLL. ARG.

in Flora 66: 249, 1883; ZAHLBR., Catal. Lich. 1: 355, 1922.

— *Verrucaria diluta* FÉE, Suppl. Essai Crypt. Écolog. Offic.: 85, 1837, tab. 41, fig. 2. — *Pyrenula diluta* TUCK. in Proc. Amer. Acad. 7: 234, 1866.

Oahu. On trees, MANN (TUCK.).

» Thallus albus. Apothecia 0.75 mm lata, superne denudata, crassa. Peritheciun dimidiatum, subdupo latius quam altum, basi valde attenuatum aut deficiens, lateraliter basi haud anguloso-productum. Sporae 8, 30—35 × 8—9  $\mu$ , 4-loculares, semper hyalinae.» From MÜLL. ARG. in Mém. Soc. Phys. et Hist. Nat., Genève 30: 28, 1888.

General distribution: Tropical regions.

## Porina (Ach.) MÜLL. ARG.

## P. tetracerae (AFZ.) MÜLL. ARG.

in Engl., Bot. Jahrb. 6: 401, 1885; VAIN., Lich. Brésil 2: 223, 1890 (with description); ZAHLBR., Catal. Lich. 1: 407, 1922. — *Verrucaria tetracerae* AFZ. apud Ach., Method. Lich.: 121, 1803.

v. *granularis* ZAHLBR. n. var.

«Thallus tenuis, continuus v. irregulariter rimulosus, ad substratum arctius affixus, leviter granularis v. verruculosogranularis, margine protothallino caerulescenti-nigricante, sat tenui cinctus.

Kauai. Olokele, ± 600 m, corticola (FAURIE 373). — Maui. Wailuku, ± 350 m, ad cortices (FAURIE 670).

Sporen querteilig, bis 8-zellig, 36—50 × 7.5—8(9)  $\mu$ , Zellen oft ungleich gross.» ZAHLBR. MS.

## Pyrenula (Ach.) MASS.

1 a. Sp. above 20  $\mu$  long.

2 a. End-cells not smaller.

3 a. Sp. 21—27 × 9—11  $\mu$ . Ap. 0.5—1 mm, immersed, convex. Th. stramineous white, K+ red. 1. *pudica*.

3 b. Ap. 0.8—1.2 mm. Sp. 60—80 × 21—27  $\mu$ . Th. pale brownish yellow. 2. *Rockii*.

2 b. End-cells smaller.

4 a. Th. pale orange to cream-coloured, K+ red. Ap. 0.5—0.8(1) mm, base ± angular, protruding. Nucleus with much oil. Sp. 19—24 × 11—14  $\mu$ .

3. *subcremea*.

4 b. Ap. 1—1.5 mm, depressed, base not protruding. Pore white, depressed. Sp. 20—25 × 8—13  $\mu$ .

4. *marginata*

- 1 b. Sp. hardly above 20  $\mu$  long.
- 5 a. End-cells not smaller.
- 6 a. Th. thin, smooth. Ap. 0.2—0.3 mm, flattened to impressed. Sp. 18—21  $\times$  6—8  $\mu$ . 5. *nitidella*.
- 6 b. Th. brownish to reddish brown. Ap. 1—1.5 mm, half globose, at last quite naked, often umbilicate. Sp. 18—21  $\times$  8—9  $\mu$ . 6. *Warmingii*.
- 6 c. Th. white. Ap. 0.3 mm, soon emergent, pore white. Sp. 12—15  $\times$  6—8  $\mu$ , olive or pale. 7. *aspisteoides*.
- 5 b. End-cells smaller.
- 7 a. Stramineous to white, K + red. Ap. 0.3—0.8 mm, sessile, shiny, edge not protruding. Sp. 14—18  $\times$  8—11  $\mu$ . 8. *sandwicensis*.
- 7 b. Pale brick-coloured, very thin. Ap. 0.5 mm, shiny, convex or almost plane, edge thin, protruding. Sp. 14—16  $\times$  7.5—11  $\mu$ . 9. *sublateritia*.
- 7 c. Ap. 0.5—0.7 mm, flattened, centre bluntly umbonate, base angular,  $\pm$  protruding. Sp. 17—20  $\times$  7—8  $\mu$ . 10. *mamillana*.

### Sect. Eupyrenula MÜLL. ARG.

#### 1. P. pudica ZAHLBR.

in Ann. Mycol. 30: 427, 1932; Catal. Lich. 10: 97, 1940.  
Kauai. By ROBINSON's summer house  $\pm$  1000 m, on bark,  
FAURIE (327). Z. in MS.

Endemic.

#### 2. P. Rockii ZAHLBR.

in Ann. Mycol. 30: 428, 1932; Catal. Lich. 10: 97, 1940.  
Hawaii. Mt Mauna Loa, on bark of *Sapindus*, Rock (Z.  
in MS.).  
Endemic.

#### 3. P. subcremea MALME.

In Ark. f. Bot. 22: A, no 11: 26, 1929, fig. 3 a; ZAHLBR.,  
Catal. Lich. 8: 120, 1932.  
Oahu. Waianae mts, Palehua  $\pm$  650 m, 1922, SKOTTS-  
BERG (1221), on branches.  
Formerly collected once in Brazil.

4. *P. marginata* Hook.

apud KUNTH., Synops. Plant. Aequinoct. Orb. Nov. 1: 20, 1822; TUCK. in Proc. Amer. Acad. 7: 234, 1866; ZAHLBR., Catal. Lich. 1: 438, 1922.

Oahu. On trunks, MANN (TUCK.). Specimen in Exs. (U.) = *Anthracothecium leucostomum* (Ach.) MALME.

General distribution: Tropical regions.

5. *P. nitidella* (FLK.) MÜLL. ARG.

in Engl., Bot. Jahrbüch. 6: 414, 1885; ZAHLBR., Catal. Lich. 1: 445, 1922. — *Verrucaria nitida* v. *nitidella* FLK. apud SCHÄER., Spicil.: 58, 1826; 342, 1836. — *Pyrenula nitida* v. *nitidella* TUCK. in Proc. Amer. Acad. 7: 234, 1866.

Oahu. On trunks, MANN (TUCK.).

Cosmopolitan.

6. *P. Warmingii* (KRMPH.) MÜLL. ARG.

in Flora 68: 664, 1884; ZAHLBR., Catal. Lich. 1: 455, 1922. — *Verrucaria Warmingii* KRMPH. in Vidensk. Medd. naturh. For., Kjöbenhavn, 5: 395, 1874, tab. 1, fig. 1.

Kauai. Paa iki ± 500 m, on *Aleurites*, H. B. S. 1938 (6059).

General distribution: Brazil (and Australia?).

7. *P. aspisteoides* VAIN.

in Ann. Acad. Scient. Fenn. ser. A, 15, no. 6: 346, 1921; ZAHLBR., Catal. Lich. 8: 113, 1932.

Hawaii. Kohala, Upper Hamakua ditch, 1000 m, H. B. S. 1938 (5985) on the trunk of *Pritchardia* spec., scantily.

Formerly collected once in the Philippine Islands.

8. *P. sandwicensis* ZAHLBR.

in Ann. Mycol. 10: 360, 1912; Catal. Lich. 1: 452, 1922.

Oahu. Tantalus ridge, on branches of *Hibiscus Arnotianus*, LYON (82 b) and *Straussia mariniana* GRAY, LYON (81 b) Z. in MS.; Koolau mts, Kee awa valley, about 400 m, on trees, 1922, SKOTTSBERG (1402); Pupukea—Kahuku trail, ± 400 m, on *Santalum freycinetianum*, H. B. S. 1938 (4728) with *Megalospora sulphurata*.

Endemic.

9. *P. sublateritia* ZAHLBR.

in Ann. Mycol. 10: 360, 1912; Catal. Lich. 1: 453, 1922.

Lanai. Koele valley, on branches of *Aleurites*, Rock (139) Z. in MS.

Endemic.

10. *P. mamillana* (Ach.) TREV.

Conspic. Verruc.: 13, 1860; ZAHLBR., Catal. Lich. 1: 436, 1922. — *Verrucaria mamillana* Ach., Meth. Lich.: 120, 1803; NYL. in Ann. sci. nat., 4. ser. 11: 247, 1859. — *Pyrenula marginata* v. *santensis* NYL., TUCK. in Proc. Amer. Acad. 7: 234, 1866.

Hawaiian Is., on bark (NYL.) l.c. — Oahu. On trunks, MANN (TUCK.); on bark of *Aleurites*, 1846, DIDRICHSEN (U.). General distribution: Tropical regions.

Obs! There are no species of *Pyrenula* in ZAHLENBRÜCKER's MS.

***Anthracothecium* HAMPE**

1 a. Ap. at first immersed.

2 a. Sp. 13—16 × 8—9 µ, with 4 vertical series of cells.

1. *albescens*.

2 b. Sp. 29—58 × 12—18 µ, with 8 vertical series of cells.

2. *libricolum*.

1 b. Ap. sessilia. Sp. 55—90 × 10—12 µ, with 10—24 vertical and 4—8 horizontal series of cells. 3. *sandwicense*.

**Sect. *Euanthracothecium* MÜLL. ARG.****1. *A. albescens* (NYL.) MÜLL. ARG.**

in Linnaea 63: 45, 1880; ZAHLBR., Catal. Lich. 1: 458, 1922. — *Verrucaria albescens* NYL., Expos. Syn. Pyrenocarp.: 50, 1858.

Kauai. Kilauea, 50 m (162); Hanamanulu, 50 m (193), FAURIE. Z. in MS.; Lihue, Mrs D. ISENBERG's Garden, H. B. S. 1938 (5936), scantily. — Maui. Haiku, c. 50 m, FAURIE (684) Z. in MS. All on smooth bark.

»Thallus epiphloeodes, tenuis, ad 0.1 mm crassus, late effusus, albus v. subflavescens-albus, KOH— vel demum vix lutescens, CaCl—, continuus, laevigatus, in margine linea tenui nigricante cinctus, pars supera ex hyphis dense intricatis formata, cortice distincto nullo, in parte inferiore gonidia chroolepoidea crebra includens. Excipulum integrum fuligineum, depresso globosum vel transverse ellipticum, nucleus decolor, non guttulatum. Sporae in ascis biserialis, pallide olivaceae, vetustae nigricantes, cellulis luminibus rotundis. Ascii oblongo-clavati.» ZAHLBR. MS.

v. *subochraceum* (NYL.) ZAHLBR. MS. — *Verrucaria albescens* \**subochracea* NYL. apud CROMBIE in Journ. Linn. Soc., 16: 227, 1877. — *Anthracothecium subochraceum* ZAHLBR., Catal. Lich. 1: 468, 1922.

Kauai. Kilauea, c. 200 m, on smooth bark, FAURIE (145) Z. in MS. »Differt praecipue thallo subochracee tincto.» NYL. l. c.

The type known from British Guyana, the variety from Siam and The Pacific Ocean.

### 2. A. libricolum (FÉE) MÜLL. ARG.

in Linnaea 63: 43, 1880; ZAHLBR. in Sitz.ber. Kais. Akad. Wiss., Wien. math.-naturw. Kl. 111, Abt. 1: 368, 1902 (with description); Catal. Lich. 1: 463, 1922. — *Pyrenula libricola* FÉE, Suppl. Essai Cryptog. Écorce Offic.: 82, 1837, tab. 41, fig. 31. — *Pyrenula leucostoma* ACH., TUCK. in Proc. Amer. Acad. 7: 234, 1866. — *Verrucaria aspista* NYL. in Ann. Sci. Nat. Bot. 4 ser. 11: 247, 1859. — Cf. *A. leucostomum* (ACH.) MALME in Ark. f. Bot. Bd 22 A. No 11: 32, 1929.

Hawaiian Is. (NYL.). — Kauai. Kealia, 10 m, on bark, FAURIE (172). — Oahu. Punaluu mts, 1000 ft, on bark, Rock (45) Z. in MS.; on trunks, MANN (TUCK.). Specimen in Exs. (U.) called *Pyrenula marginata*. Apothecia mostly 2—5 clustered, 0.4—0.5 mm. Sp. 35—47 × 17—20 µ. Mouth indistinct, black.

The species is issued in ZAHLBR. Rar. 2 from »Insula Samoensis Upolu».

General distribution: Tropical regions.

### 3. A. sandwicense ZAHLBR.

in Ann. Mycol. 10: 361, 1912; Catal. Lich. 1: 468, 1922.  
f. *globosum* ZAHLBR. l. c.

Oahu. Tantalus ridge, on *Hibiscus Arnottianus*, LYON (82) Z. in MS.

f. *convexum* ZAHLBR. l. c.

Oahu. Waianae, near Kolekole pass, H. B. S. 1938 (5966, 5968, 5969). Tantalus ridge, on branches of *Pelea* sp., LYON (84). — Lanai. Koele valley, on bark, Rock (138) Z. in MS. Endemic.

## Trypeteliaceae.

### Trypetelium SPRENG.

#### Tr. pallescens FÉE

in Ann. Sci. Nat. 23: 440, 1831, tab. 13, fig. 3; TUCK. in Proc. Amer. Acad. 7: 233, 1866. — *Tr. ochroleucum* v. *pallidescens* ZAHLBR., Catal. Lich. 1: 496, 1922.

Oahu. Waialua mts, on trees, MANN (TUCK.).

General distribution: Tropical regions.

Not found again and perhaps uncertain. Of still more uncertain position is *Verrucaria pyrenuloides* (MONT.) NYL. in

Ann. Sci. Nat. Bot. 4 ser. 11: 247, 1859: »Ad cortices laeves in ins. Sandwic. leg. Remy.» It is in ZAHLBR. MS. referred to *Bottaria* with a query.

### Paratheliaceae.

#### Pleurotrema MÜLL. ARG.

##### Pl. Rockii ZAHLBE.

in Ann. Mycol. 10: 362, 1912; Catal. Lich. 1: 510, 1922.

Lanai. Koele Valley, on bark, Rock (132) Z. in MS.

»Thallus isabellino- vel subochraceo-albidus. Apothecia semiimmersa, 0.4—0.6 mm longa, leviter convexa, ostiolo laterali tenuissimo pertusa, paraphysibus parce ramosis, ascis 8-sporis, sporis decoloribus, uniseptatis, cellula superiore circa triplo majore,  $17-20 \times 8.5-9.5 \mu$ . From ZAHLBE. l. c.

Endemic.

### Astrotheliaceae.

#### Astrothelium (ESCHW.) REV.

*A. congregans* ECKF. in MERR. Exs. 177. Oahu. HELLER 1895, on *Pisonia umbellifera* (in ZAHLBR. MS. and in hb MAGN.). I do not know whether or where this species is described nor have I found a note in ZAHLBR. MS. I have examined a number of apothecia without finding spores or being able to state the structure. Pycnidia numerous at the edges of the thallus, about  $170 \mu$  high,  $120 \mu$  broad, wall about  $17 \mu$  thick, dark brown. Conidia  $16-18 \times 0.7 \mu$ , variously bent.

There is a note in ZAHLBR. MS. that *Arthonia interducta* NYL. quoted by TUCK. in Proc. Amer. Acad. 7: 232, 1866 is not this species but belongs to *Astrothelium*.

### Parmentaria FÉE.

- a. Sp. eight,  $24-35 \times 11-16 \mu$ .
- b. Sp. two,  $140-188 \times 44-54 \mu$ .

- 1. *astroidea*.
- 2. *Lyoni*.

#### 1. P. astroidea FÉE.

Essai Crypt. Écogr. Offic.: 91 et 70, 1824, tab. 1, fig. 14 et tab. 20, fig. 1; ZAHLBR., Catal. Lich. 1: 523, 1922.

Kauai. Wailua, 200 m (161); Kipukai (?) no 179, on bark, FAURIE. — Maui. Iao valley, 350 m (685); Haleakala (686), on bark, FAURIE, Z. in MS.

General distribution: Tropical regions.

#### 2. P. Lyoni ZAHLBR.

in Ann. Mycol. 10: 363, 1912; Catal. Lich. 1: 525, 1922.

Oahu. Tantalus ridge, on smooth bark of *Straussia* sp., LYON (81). — Hawaii. On bark, CROSBY (234).

*f. stramineescens* ZAHLBRE. l. c.

Oahu. Tantalus ridge, on *Hibiscus Arnottianus* GRAY, LYON (82 d). — Lanai. Kaiholena, on bark, Rock (185). — Hawaii. Mahona valley (= Mahana in Lanai I.?), on *Myr-sine* sp. Rock (112) ZAHLBRE. l. c. and MS.

Endemic.

### Mycoporaceae.

#### *Mycoporellum* MÜLL. ARG.

##### *M. tetramerum* MÜLL. ARG.

in Bull. Soc. Bot. Belgique 32: 160, 1893; ZAHLBRE., Catal. Lich. 1: 557, 1922.

Oahu. »Ad corticem *Prosopidis*, 1895, A. A. HELLER in MERR. exs. 156» ZAHLBRE. MS. and in hb. MAGN.

Formerly known only from the original locality in Costa Rica.

### Gymnocarpeae.

#### Coniocarpineae.

#### Caliciaceae.

#### *Sphinctrina* FR.

1 a. Head of ap. up to 0.3 mm broad. Sp. up to  $18 \times 9 \mu$  large.

2 a. Foot K ± violet. Sp.  $12-16 \times 8-9 \mu$ .

1. *leucopodoides*.

2 b. Foot K—. Sp.  $9-18 \times 6-7 \mu$ , or  $7-9 \mu$ , globose. Ascii  $60-80 \mu$ . 2. *microcephala*.

1 b. Head of ap. about 0.5 mm. Ascii  $40-50 \mu$ . Sp.  $7-9 \times 5 \mu$ , or subglobose,  $4-8 \mu$ . Exciple and foot K + sordid violet. 3. *gelasinata*.

##### 1. *S. leucopodoides* NYL.

Lich. Nov. Zeland.: 12, 1888; ZAHLBRE., Catal. Lich. 1: 657, 1922.

Hawaii. Kilauea, Kipuka Puaulu, H. B. S. 1938 (5977 with *Collema rupestre*). On a crustaceous lichen.

Apothecia 0.5—0.8 mm long, immersed about 0.2 mm into a ± thick, pale crust, probably *Pertusaria* (KOH—), as young quite pale (some abortive outgrown ones also pale). Foot about 0.5 mm long,  $150 \mu$  thick, slowly widened upwards to 0.3 mm

long and 0.3 mm broad,  $\pm$  dark brown head, surface applanated, 0.1—0.2 mm, perforated. — Foot consisting of longitudinal hyphae, the centre enclosing much air in  $8-15 \times 2 \mu$  large intercellular spaces, interior part K+ with a violet shade from immersed base to hypothecium. Apothecial wall about 40  $\mu$  thick at margin, brownish. Capillitium threads 1—1.5  $\mu$  thick, net-like intricate, abundant. No asci observed but spores lying in  $\pm$  long rows. Spores abundant,  $12-16(17) \times 8-9 \mu$ , simple, irregular in shape and size, dark greenish brown (in  $HNO_3$  dark sordid green), wall thick.

Seems to agree with NYLANDER's incomplete description, but ought also to be compared with *Sph. leucophaea* MÜLL. ARG. (in Flora 70: 285, 1887) from Brazil. Its spores have a similar size but are reported as  $\pm$  acute.

Formerly recorded only once from New Zealand.

## 2. *S. microcephala* (SM.) NYL.

in Mém. Imp. Soc. Sci. Nat. Cherbourg 3: 168, 1855; ZAHLBR., Catal., Lich. 1: 658, 1922. — *Lichen microcephalus* SM. apud SM. et SOWERBY, Engl. Bot. 26, tab. 1865, 1808. — *Calicium tubaeforme* TUCK. in Proc. Amer. Acad. 7: 233, 1866.

Oahu. On thallus of *Pertusaria* sp., MANN (TUCK.); Punaluu, on thallus of *Pertusaria* (?), Rock (54). Z. in MS.

»Die von Rock gesammelten Exemplare sind deutlich zerteilt, der Stiel ist unter dem Mikroskop braun bis leicht schwarz. Übrigens sind auch die europäischen Stücke oft  $\pm$  zerteilt.« ZAHLBR. MS.

General distribution: Temperate regions.

## 3. *S. gelasinata* (WITH.) ZAHLBR.

Catal. Lich. 1: 654, 1922. — *Lichen gelasinatus* WITH., Arrang. Brit. Plants, ed. 3, 4: 8, 1796, tab. 31, fig. 1.

Kauai. Kokee,  $\pm$  1100 m, on a sterile crust (*Pertusaria*?) H. B. S. 1938 (6023) with *Buellia proximata* H. MAGN.

Apothecia 0.5 mm high, 0.2 mm thick, black towards apex, foot 150  $\mu$  thick, very pale brown,  $\pm$  translucent towards margins. Wall of foot about 50  $\mu$  thick, K- or pale (violet) brown. Hyphae in foot vertical, parallel, about 2.5  $\mu$  thick. Asci protrude under pressure and are cylindric, about  $70 \times 8-9 \mu$  large. Paraphyses simple, 1.7  $\mu$ , I+ blue like the asci. Free spores simple,  $10-12 \times 7-8 \mu$ , dark brown green, wall  $\pm$  thin but double.

General distribution: Temperate regions.

### Cypheliaceae.

#### *Cyphelium* (Ach.) Th. Fr.

##### *C. apostaticum* ZAHLBE. MS. n. sp.

»Thallus epiphloeodes, uniformis, tenuis, 0.12—0.14 mm crassus, effusus, lacteus v. cinerascenti-lacteus, subverniceus, KOH—, CaCl—, contiguus vel tenuissime rimosus, in margine linea fuscescente, subfimbriato cinctus, ecorticatus; gonidiis cystococcoideis, in parte inferiore thalli sitis, glomeratis, globosis vel late ellipsoideis, 6—10  $\mu$  longis, hyphis medullaribus non amylaceis.

Apothecia primum sessilia, dispersa, urceolata, mox plana et angusta, rotunda, rotundata vel fere ellipsoidea, vetusta etiam  $\pm$  irregularia, usque 1 mm lata, lateraliter a thallo accessorio et non persistenter cincta, margine proprio nigro primum distincto, dein evanescente, disco plano v. planiusculo, sicco cinerascente, madefacto fusco-nigricante; perithecio laterali extus fusco-nigricante, versus hymenium cinerascente, labiis linearibus, divergentibus; hypothecio decolore ex hyphis intricatis formato, inferne linea obscure-fusco limitato; hymenio I vino rubescens; paraphysibus ramosis, intricatis, 0.15—0.18  $\mu$  latis, ascis superantibus; ascis mox confluentibus; sporis fuscis, primum 2- sed mox 4-locularibus, oblongis v. ovali-oblongis, rectis, 8—13  $\times$  5—6  $\mu$ .

Conceptacula pycnoconidiorum globosa, convexa, fusca, perifulerio molle, pallido, fulcris exobasidialibus; pycnoconidiis filiformibus, utrinque retusis, arcuatis v. curvatis, 12—15  $\times$  1.2—1.8  $\mu$ .

Kauai. Kilauea, 10—50 m, ad cortices laeves, FAURIE (156, 175)» ZAHLBE. MS.

Endemic.

### *Pyrgillus* NYL.

- a. Th. K—. Ap. margin grayish pruinose. Thecium without oil. 1. *americanus*.
- b. Th. K+ reddish. Ap. margin ochraceous- or citrine-gray. Thecium with oildrops. 2. *hawaiiensis*.

#### 1. *P. americanus* NYL.

Synopsis Lich. 1: 168, 1860, tab. 5, fig. 36; ZAHLBR., Catal. Lich. 1: 677, 1922. — *Acolium javanicum* TUCK. in Proc. Amer. Acad. 7: 233, 1866. — ?*Calicium javanicum* MONT. et v. d. BOSCH apud JUNGH., Plant. Junghuhn. 4: 480, 1855.

Oahu. On smooth bark, MANN (U. exs.). »On trunks», TUCK. l. c.

Thallus very thin, continuous, white with a faint yellowish shade, K-, Pd-. Apothecia widely scattered, 0.5—1 mm high, about 0.5 mm broad at top, ± cylindric with slightly widened base covered by thallus, otherwise black, partly faintly pruinose, somewhat constricted below the top which is ring-shaped, deeply concave, smooth, margin occasionally slightly grayish pruinose.

Gonidia in thallus 5—12  $\mu$ , pale yellowish green, often lengthened or irregular, partly in distinct rows, probably *Trentepohlia*. Foot 0.7—0.8 mm thick, quite black down to the bark of the tree, the upper layer of which is also darkened, structure invisible, consistency very hard. Base with an abrupt swelling, 1 mm broad, covered by a thin, pale tissue, yellowish gray from granules, unchanged in K, Pd, C and HNO<sub>3</sub>, without gonidia. Surface of the very apothecium 50—25  $\mu$  thick, black, very uneven. Exciple 25—30  $\mu$  thick, hyaline, at base about 0.3 mm broad and ± plane. Hypothecium 15—20  $\mu$  thick, hyaline, I-. Paraphyses 1  $\mu$ , in gelatine but ± discrete. Ascii parallel, young ones 55—60  $\mu$  long, 8—9  $\mu$  broad, wall very thin, indistinct, constricted between the 6 to 8 spores. These uniserial, mostly quite dark brown, apparently simple, but young ones 1 to 3-septate, broadly ellipsoid, 10—12  $\times$  6.5—7  $\mu$ , as a rule 3-septate with narrow cells.

Whether *P. javanicus* and *americanus* are specifically distinct seems uncertain, the differences in the incomplete descriptions are hardly noticeable, but *P. javanicus* is recorded from moulder wood. I prefer to use the younger but more reliable name.

Previously recorded from N. America, *P. javanicus* from Java and Australia.

## 2. *P. hawaiiensis* ZAHLBR.

in Ann. Mycol. 10: 364, 1912; Catal. Lich. 1: 677, 1922.

Kauai. Kaholuamano, 3600', on trunks in forest, Rock (16).

»Von den übrigen Arten der Gattung mit vierzelligen Sporen durch die Gestalt der verhältnismässig hohen Apothecien und den langen Hals des Gehäuses ausgezeichnet.» ZAHLBR. l. c.

Endemic.

## *Tylophoron* NYL.

- a. Th. subleprose. Ap. up to 1 mm broad, spore-mass cylindrically protruding. Sp. 10—18  $\times$  7—9  $\mu$ .
  - 1. *protrudens*.
- b. Th. smooth. Ap. often above 1 mm broad. Sp. 7—8  $\times$  4.5—5  $\mu$ .
  - 2. *hawaiiense*.

1. *T. protrudens* NYL.

in Bot. Zeitung 20: 279, 1862; ZAHLBR., Catal. Lich. 1: 679, 1922. — *Acolium protrudens* TUCK. in Proc. Amer. Acad. 7: 232, 1866.

Oahu. On wood or smooth bark in the mountains, MANN (U. exs.).

Agrees well with the description given by NYLANDER in Ann. Sci. Nat. Bot. 19: 291 (sep. 6) 1863, though the protruding spore-mass is depressed on account of the pressure that the apothecia have undergone. — Apothecia beginning as low closed warts, concolorous with the thallus, gradually 0.5 mm high, with perpendicular sides and flattened top. Gonidia in thallus yellowish green, 8—12  $\mu$ , lengthened, in chains, thus *Trentepohlia*. Exciple cupuliform, 35  $\mu$  thick. Thecium 0.5 mm broad, 0.3 mm high, blackish from the apparently simple, dark brown, mostly shrunk spores, but young ones in KOH greenish brown, distinctly 1-septate. Capillitium threads 1.5  $\mu$ , scanty between the spores. Hypothecium K+ dark yellowish brown. Spores only 12—13  $\times$  7  $\mu$ .

General distribution: Tropical America.

2 *T. hawaiiense* (TUCK.) H. MAGN.

*Acolium hawaiiense* TUCK. in Proc. Amer. Acad. 7: 232, 1866. — *Cyphelium hawaiiense* ZAHLBE., Catal. Lich. 1: 664, 1922.

Oahu. Waialua mts (s. n. *Acol. hawaiiense*) on smooth bark (U. exs.). No collector's name given but probably MANN according to TUCK. l. c.; Oahu, MANN (s. n. *Pertusaria velata*) on rugulose bark (U. exs.).

As the two specimens seen agree and probably are from the original locality a full description of them will be given (cf. TUCK. l. c.):

Thallus very thin, whitish, continuous, smooth, or in the second specimen uneven to subtuberulate from the unevenesses of the bark, K+ sordid yellow. Apothecia rather widely scattered, sessile, verruciform, constricted at base, 1—1.4 mm wide, about 0.7 mm high, concolorous with thallus, top flattened with at first punctiform, grayish disc, then  $\pm$  dilated and black to at least 0.4 mm broad, in surface level.

Sections of apothecia showing a 150—300  $\mu$  thick outer thallus part. Exterior layer white from granules, 100  $\mu$  thick at base, tapering to about 30  $\mu$  at edge, in K and in Pd  $\pm$  transparent with very lax, 1.7—2.5  $\mu$  thick hyphae, forming no contiguous outer surface, between them few scattered gonidia and oxalate crystals. An interior tissue, 200  $\mu$  at base, 80—70  $\mu$  at edge, pale orange, in K or Pd dark orange red

with distinct cells or hyphae, delimited towards exciple by a 15—20  $\mu$  whitish granular zone. Exciple 12—15  $\mu$  thick, faintly yellowish, tapering towards edge and passing into the 35—40  $\mu$  thick, hyaline hypothecium also reaching the edge, both with very small, indistinct cells, K—. Ascii very dense, cylindric, young ones  $45—50 \times 6—6.5 \mu$  with long foot, at least 35  $\mu$  from the hypothecium, wall very thin and soon dissolving, I—, constricted between the 8 spores. Spores in masses filling the space upwards,  $7—8(10) \times 4.5—5 \mu$ , sordid yellowish brown, 1-septate, ellipsoid or partly slightly constricted at the septum, which is often difficult to observe.—Gonidia 6—10  $\mu$  in groups or ± distinct chains in the thallus, apparently *Trentepohlia*, in the apothecia very few and indistinct. Remnants of cells from the tree bark occur high up into the tissue of the apothecia.

Endemic.

### Sphaerophoraceae.

#### Sphaerophorus PERS.

##### Sph. australis LAUR.

in Linnaea 2: 44, 1827; ZAHLBR., Catal. Lich. 1: 684, 1922.  
»f. *subteres* ZAHLBR. MS. n. f.

Ramis ultimis teretibus v. subteretibus magis congestis, usque 20 mm altis, et thallo parum pumiliore a typo differt.

Kauai. Auf mossigen Bäumen im Walde Kaholuamano, Rock (8)». ZAHLBR. MS.

General distribution: In the Antarctica and S. America.

### Graphidineae.

#### Arthoniaceae.

##### Arthonia (ACH.) ZAHLBR.

1 a. Ap. black (*Euarthonia*).

2 a. Sp. 4-celled,  $13—20 \times 5—7 \mu$ . 1. *radiata*.

2 b. Sp. with 14 to 16 cells,  $52—73 \times 14—22 \mu$ .  
2. *platygraphidea*.

1 b. Ap. brown or red. Sp. with 5—6 cells (*Coniocarpon*).

3 a. Endcells of spores much larger. Sp.  $40—48 \times 17—22 \mu$ .  
3. *caribaea*.

3 b. One endcell much larger. Sp.  $17—52 \times 8—20 \mu$ .  
4. *rubella*.

3 c. Ap. cinnabarine, pruinose. Sp.  $18—24 \times 7—8 \mu$ .  
5. *cinnabarina*.

Sect. *Euarthonia* (TH. FR.) ZAHLBR.

1. *A. radiata* (PERS.) ACH. v. *Swartziana* (ACH.) ALMQU.

in K. Vet. Akad. Handl. 17, no. 6: 36, 1880; ZAHLBR., Catal. Lich. 2: 91, 1924. — *A. Swartziana* ACH. in Neues Journ. für die Bot. 1: 13, 1806. — *A. astroidea* v. *Swartziana* NYL. in Ann. sci. nat. Bot., 4. ser. 11: 245, 1859; TUCK. in Proc. Amer. Acad. 7: 232, 1866.

Hawaii. REMY (NYL. and TUCK.).

Cosmopolitan.

2. *A. platygraphidea* NYL. in Acta Soc. Sci. Fenn. 7: 483, 1863, not.; TUCK. in Proc. Amer. Acad. 7: 232, 1866; ZAHLBR., Catal. Lich. 2: 75, 1924.

Oahu. On trees, MANN (TUCK.).

General distribution: Tropical regions.

Sect. *Coniocarpon* (DC.) STEIN

3. *A. caribaea* (ACH.) MASS.

Memor. Lichenogr.: 114, 1853, fig. 149; ZAHLBR., Catal. Lich. 2: 17, 1924; TUCK. in Proc. Amer. Acad. 7: 232, 1866. — *Graphis caribaea* ACH., Lichenogr. Univ.: 272, 1810.

Hawaiian Is., BAILEY (U. exs.) s. n. *A. rubella*? Lower endcell only 3.5—4.5  $\mu$ , asci I + blue. — Oahu. On trees, MANN, forma (TUCK.).

General distribution: Tropical regions.

4. *A. rubella* (FÉE) NYL.

in Mém. Soc. Sci. Nat., Cherbourg 4: 98, 1856; ZAHLBR., Catal. Lich. 2: 96, 1924. — *Graphis rubella* FÉE, Essai Crypt. Écorc. Offic.: 43, 1824, tab. 11, fig. 5.

Hawaiian Is., BAILEY (U. exs.) uncertain. Lower end-cell 10—12  $\mu$ , asci I + brownish red. — Kauai. »Kilauea, corticola, FAURIE (211). Sporae 46—52  $\times$  18—20  $\mu$ . — Maui. Haiku, c. 500 m, ad cortices laeves, FAURIE (683). Sporae 17—20  $\times$  7.5—8  $\mu$ . Hymenium I caerulescens, KOH  $\pm$  cerasinum. Asci subglobosi seu obovoidei, in parte superiore membrana crassa. Paraphyses intricatae, ad 1.8  $\mu$  crassae, leptodermatae, ad apicem non latiores. Hyphae thalli I caerule-scentes.» ZAHLBR. MS.

General distribution: Tropical regions.

5. *A. cinnabarina* (DC.) WALL.

Fl. Crypt. Germ. 3: 320, 1831; ZAHLBR., Catal. Lich. 2: 21, 1924.

v. *coccinea* (FLK.) ZAHLBR. l. c. p. 24. — *A. cinnabarina* v.

*adspersa* (MONT.) NYL. in Ann. Sci. Nat. Bot., 4 ser. 11: 245, 1859; TUCK. in Proc. Amer. Acad. 7: 232, 1866.

Hawaiian Is., REMY (NYL. and TUCK.).

Cosmopolitan.

### Arthothelium MASS.

#### A. macrothecum (FÉE) MASS.

Ricerch. Lich.: 55, 1852; ZAHLBR., Catal. Lich. 2: 128, 1924. — *Arthonia macrotheca* FÉE, Suppl. Essai Crypt. Écorc. Offic.: 42, 1837, tab. 40, fig. 18.

Lanai. »Kaiholena, ad corticem *Dracenae aureæ*, Rock (190). Hymenium I vinose rubens. Sporae decolores, murali-divisae, 45—64×22—25 µ.» ZAHLBR. MS.

General distribution: Tropical regions.

### Graphidaceae.

#### Opegrapha HUMB.

1 a. Exciple entire, dark brown (*Euopegrapha*).

2 a. Sp. one-septate, constricted, brownish (see *Melaspilea lentiginosa*).

2 b. Sp. 3-septate, colourless. On bark.

3 a. Epithecium dilated, white-pruinose. Sp. 10—12×3 µ.  
1. *subcentrifuga*.

3 b. Epithecium brim-shaped, black. Sp. 13—16×4 µ.  
2. *atra*.

2 c. Sp. with 5—7 septa, fusiform, 27—36×4—6 µ. On stone.  
3. *Fauriei*.

2 d. Sp. with 14—16 septa, 46—48×5—6 µ. On bark.  
4. *prosodea*.

1 b. Exciple developed only at edge, brown. Sp. with 14—20 cells, 50—65×3.5—4 µ (*Pleurothecium*).  
5. *subcervina*.

#### 1. O. *subcentrifuga* NYL.

in Ann. Sci. Nat. Bot. 4 ser. 11: 245, 1859; TUCK. in Proc. Amer. Acad. 7: 229, 1866; ZAHLBR., Catal. Lich. 2: 248, 1924, Hawaii. On smooth bark, REMY (NYL. and TUCK.).  
Endemic.

#### 2. O. *atra* PERS.

in Neue Ann. der Bot.: 30, 1794, tab. 1, fig. 28; NYL. l. c. and TUCK. l. c. p. 230; ZAHLBR., Catal. Lich. 2: 167, 1924.

Oahu. MANN (TUCK.); Waianae mts., Kealia trail, H. B. S. 1938 (5639) on bark. — Hawaii. On trees, REMY (TUCK. and NYL.).

Cosmopolitan.

## 3. O. Fauriei B. DE LESD.

in Bull. Soc. Bot. France 57: 463, 1910; ZAHLBR., Catal. Lich. 2: 198, 1924.

Kauai. Kilauea, on volcanic rock, ± 10 m, FAURIE (215), B. DE LESD. l. c. and Z. in MS.

Endemic.

## 4. O. prosodea ACH.

Meth. Lich.: 22, 1803; ZAHLBR., Catal. Lich. 2: 232, 1924.

Lanai. Kaiholena valley, on bark, Rock (187) Z. in MS. Distribution: Western Europe and the Tropics.

## 5. O. (Pleurothecium) subcervina ZAHLBR.

in Ann. Mycol. 10: 365, 1912; Catal. Lich. 2: 249, 1924.

Lanai. Kaiholena valley, on *Aleurites moluccana* and *Maba sandwicensis*, Rock (124) Z. in MS.

Endemic.

**Melaspilea NYL.****M. lentiginosa (LYELL) MÜLL. ARG.**

in Mém. Soc. Phys. et Hist. Nat., Genève 29, no. 8: 19, 1887; ZAHLBR., Catal. Lich. 2: 277, 1924. — *Opegrapha lentiginosa* LYELL apud LEIGHT. in Ann. and Magaz. Nat. Hist., ser. 2, 13: 211, 1854, tab. 5, fig. 16; TUCK. in Proc. Amer. Acad. 7: 230, 1866. ZAHLBR. in MS.

Oahu. On trees, MANN (TUCK.).

Distribution: Western Europe and tropical America.

**Dictyographa MÜLL. ARG.****D. sandwicensis ZAHLBR. MS. n. sp.**

»Thallus epiphloeodes, tenuissimus, albidus, nitidulus, KOH—, CaCl—, effusus, continuus, lineis nigris ± decussatis, ecorticatus, gonidiis chroolepoideis. — Apothecia crebra, sessilia, oblonga vel sublinearia, ad apices ± rotundata, 0.25—0.2 mm longa, ad 0.2 mm lata, recta, subrecta, rarius arcuata, dispersa, lateraliter a thallo non vestita, disco nigro opaco, epruinoso, e concaviusculo plano, labiis peritheciis vix prominulis cinctis.

Perithecium dimidiatum, carbonaceum, sat angustum, aequaliter crassum, labiis subrectis vel paulum hiantibus, integris; hypothecium angustum, decolor, inferne strato angusto rufescenti-fusco limitatum; epithecium inspersum, pulverulentum, fusco-nigricans. Hymenium decolor, guttulis oleosis non inspersum, I cupreum; paraphysisibus ramosis et connatis, ad apicem parum latioribus et obscuratis. Asci ellipsoideo-clavati,

70—86×17—19  $\mu$ , 8-spori. Sporæ in ascis 1—2-seriales, verticales, decolores, ellipsoideo-fusiformes vel oblongæ vel digitiformes, rectae v. subrectae, loculis superpositis 8, mediis hinc inde septo verticali divisis, disciformibus, 22—25×5—6  $\mu$ .  
From ZAHLBR. MS.

Hawaiian Islands. Locality and collector not given, probably accidentally omitted.

### Enterographa FÉE

- 1 a. Sp. 4-celled. Ap. immersed, blackish.
- 2 a. Ap. punctiform. Thecium 80—100  $\mu$  high. Sp. 21—  
 $25 \times 3.5 \mu$ . 1. *compunctula*.
- 2 a. Ap. lirelliform. Thecium 120—130  $\mu$ . Sp. 18—24×  
 $5.5—8 \mu$ . 2. *Fauriei*.
- 1 b. Sp. 6—8-celled. Ap. lirelliform, ± branched.
- 3 a. Ap. pale, appressed. Thecium 50—75  $\mu$ . Sp. (25—)  
 $30 \times 3 \mu$ , 8-celled. 3. *pallidella*.
- 3 b. Ap. brown, stellate, immersed. Thecium 175  $\mu$ . Sp.  
 $25—30 \times 3—4 \mu$ , 6-celled. 4. *quassiaecola* v. *Nylanderi*.

#### 1. *E. compunctula* (NYL.) REDGE.

in Fedde, Repertor. 43: 55, 1939. — *Stigmatidium compunctulum* NYL., Lich. Nov. Zeland.: 118, 1888. — *Chiodecton compunctulum* MÜLL. ARG. in Hedwigia 34: 145, 1888; ZAHLBR., Catal. Lich. 2: 474, 1924.

Hawaii. On bark, ECKFELDT (312) MÜLL. ARG. — Maui. Wailuku, ECKFELDT (Hb. NYLANDER, Helsinki) REDGE. Possibly both samples from the same locality.

Endemic.

#### 2. *E. Fauriei* ZAHLBR. MS. n. sp.

»Thallus crustaceus, uniformis, e stromatibus congestis omnino obtectus, non byssaceus. Stromata verrucosa v. verrucoso-bullata, in ambitu irregularia, 1.5—3 mm lata, convexa, in vertice flavo-glaucescentia, nuda, KOH—, ad latera griseo-cinerascentia, pruinosa-suffusa, corticata, medullam albam stuppeam et gonidia chroolepoidea includentia.

Apothecia immersa, linearia, pauciramosa, ramis leviter flexuosis, in uno stromato 2—7, nuda, angusta, disco nigro, opaco, epithecio distincto nullo. Hymenium 120—130  $\mu$  altum, in parte superiore fuscescens, caeterum decolor, purum, I violaceo-caeruleascens. Paraphyses ramosae et connexae. Asci ellipsoideo-clavati, 8-spori; sporis in ascis biseriatis, decoloribus, oblongo-ellipsoideis, 3-septatis, cellulis 2-apicalibus paulum majoribus, 18—24×5.5—8  $\mu$ .

Kauai. Apud Fr. GAY's summer house, 1200', corticola, FAURIE (314).

Specimen unicum visum.» From ZAHLBR. MS.

3. *E. pallidella* (NYL.) REDGR.

in Fedde, Repertor. 43: 61, 1939. — *Platygrapha pallidella* NYL. in Flora 50: 6, 1867. — *Chiodescum pallidellum* VAIN.; ZAHLBR., Catal. Lich. 2: 480, 1924.

Oahu. »Honolulu, ad littora maris, corticola FAURIE (392).

Thallus uniformis, usque 0.14 mm crassus, effusus, sulphureo-glaucescens, passim albidus, opacus, continuus, in superficie subfarinosus, in margine subdeterminatus, linea obscuriore non cinctus, strato corticali tenui, subdecolore, ex hyphis tenuissimis, intricatis, inspersisque formato, gonidiis chroolepoideis.

Apothecia conferta, 0.1—0.4 mm lata, rotundata vel parum elongata et dein recta, subrecta vel leviter curvula, ut plurimum simplicia, rarius furcata, emergenti-sessilia, margine thallino tenui, discum vix superante, integro vel subflexuoso, gonidia sat copiosa includente; disco pallido, thallo subconcolore, planiusculo, epruinoso, madefacto pellucido. Epithecium subpulverulentum, decolor. Peritheciun distinctum non evolutum. Hymenium decolor, guttulis oleosis non impletum, 65—70  $\mu$  altum, I vinose rubescens. Hypothecium decolor. Paraphyses ramosae et connexae. Ascii clavati v. ellipsoideo-clavati, superne membrana primum incrassata, 8-spori; sporis in ascis verticalibus, 3—4-serialibus, decoloribus, fusiformi-acicularibus, utrinque acutis, rectis v. curvulis, 6—8-septatis, septis tenuissimis, cellulis cubicis, membrana tenui cinctis, 26—32  $\times$  3—4  $\mu$ .» From ZAHLBR. MS.

Formerly recorded from S. and E. Asia, Pacific Ocean.

4. *E. quassiaecola* FÉE v. *Nylanderi* REDGR.

in Fedde, Repertor. 43: 64, 1939. — *Stigmatidium stellulatum* NYL. in Mém. Soc. Sci. Nat., Cherbourg 5: 132, 1857.

Oahu. »Leg. BARTING (Hb. NYLANDER, Helsinki)» REDGR. l.c. Endemic.

**Graphis (ADANS.) MÜLL. ARG.**

1 a. Exciple black.

2 a. Exciple entire.

3 a. Edges not sulcate.

4 a. Th. thick. Ap. quite immersed, 0.1 mm broad, simple or with few branches. Sp. with 8 cells, 27—23  $\times$  7—5.5  $\mu$ . 1. *tapetica*.

4 b. Th. thin. Ap. sessile or emergent.

5 a. Hyp. thick. Sp. with 5—10 cells,  $22-38 \times 5-9 \mu$ .

6 a. Ap. emergent. Edges covered by th. Th. K+ yellow 3. *assimilis*

6 b. Ap. sessile, constricted at base Th. K-. Sp.  $22-26 \times 7-8 \mu$ , with 6 cells. 4. *sitiana*.

5 b. Hyp. thick. Sp. with 10—18 cells,  $31-34 \times 5-6 \mu$ . Ap. sessile, edges naked. 2. *anfractuosa*.

5 c. Hy. thin. Sp. with 14—16 cells,  $75-85 \times 11-17 \mu$ . 5. *illinata*.

3 b. Edges sulcate. Hyp. pale. Sp.  $40-60 \times 7-12 \mu$ . 6. *elegans*.

2 b. Exciple dimidiate.

7 a. Edges sulcate, turgid. Sp. with 10—12 cells.

6. *elegans* var.

7 b. Edges not sulcate. Ap. almost straight.

8 a. Sp.  $40-50 \times 7-9 \mu$  with 9—11 cells. Ap. half immersed. 7. *scripta*.

8 b. Sp. shorter.

9 a. Ap. almost sessile. Sp.  $22-36 \times 7-8 \mu$  with 8—12 cells. 8. *lineola*.

9 b. Ap. ± immersed.

10 a. Ap. simple, not above 2 mm long. Sp.  $21-23 \times 5-7 \mu$ . 9. *leptocarpa*.

10 b. Ap. slightly branched, up to 8 mm long, pruinose. Sp.  $21-30 \times 7-8 \mu$ . 10. *tenella*.

1 b. Exciple pale. Sp. with 4 cells.

11 a. Ap. sessile. Sp.  $24-25 \times 13-14 \mu$ . 11. *triticea*.

11 b. Ap. immersed.

12 a. Ap. repeatedly dichotomous, branches lengthened. Sp.  $11-14 \times 6-7 \mu$ . 12. *grammitis*.

12 b. Ap. radiatingly ramosed. Sp.  $12-16 \times 6-7 \mu$ . 13. *radiata*.

12 c. Ap. obsolete, simple, with narrow apices, yellowish brown. Sp.  $15-20 \times 5-8 \mu$ . 14. *tachygrapha*.

### Sect. Solenographa MÜLL. ARG.

1. *Gr. tapetica* ZAHLBR.

in Ann. Mycol. 10: 366, 1912; ZAHLBR., Catal. Lich. 2: 357, 1924.

Kauai. »In den Wäldern von Halemanu, auf Baumrinden (Rock 99).

Von den übrigen Arten der Sektion durch das dicke Lager und die eingesenkten Apothezien verschieden.» ZAHLBR. l. c. Endemic.

## 2. Gr. *anfractuosa* ESCHW.

apud MARTIUS, Flora Brasil. 1: 86, 1833; ZAHLBR., Catal. Lich. 2: 292, 1924.

Exs.: MERR. 170.

Oahu. On bark of *Acacia*, 1895 HELLER in MERR. exs. 170, Z. in MS. Specimen in hb. MAGN. seems to me to be *duplicata* ACH.; Koolau mts, back of Tantalus, about 600 m, 1922, SKOTTSBERG (1500). — Hawaii. On bark, 1000' NEWELL (4, 10, 54) Z. in MS.

General distribution: Tropical regions.

## 3. Gr. *assimilis* NYL.

in Ann. Sci. Nat. Bot., 4 ser. 11: 244, 1859; in Acta Soc. Sci. Fenn. 7: 465, 1863; REDGR. in Arkiv f. Bot. Bd 27 A. No. 3: 21, 1935. — *Gr. scripta* v. *assimilis* TUCK. in Proc. Amer. Acad. 7: 230, 1866. — *Gr. intricata* FÉE, ZAHLBR., Catal. Lich. 2: 313, 1924.

Hawaiian Is., NYL. l. c. 1859. BAILEY, 3 specimens in Exs. (U.), of which one mixed in *Phaeographis punctiformis*, one in *Glyphis cicatricosa*. — Kauai. Waialeale (206 pr. p.) and Koloa (207), on bark, FAURIE, Z. in MS. — Oahu. MANN (TUCK.); Koolau mts, back of Tantalus, 600 m, on trees, 1922, SKOTTSBERG (1496). Spores 30—35(42) × 7—8(10)  $\mu$ , I  $\pm$  blue, with 8—12 cells. — Hawaii. Hilo, ECKFELDT (hb. VINDOB.) Z. in MS.

The difference to *Gr. immersa* FINK (in Mycologia 19: 214, 1927) seems, after the description, uncertain.

General distribution: Tropical regions.

## 4. Gr. *sitiana* VAIN.

Lich. Brésil 2: 120, 1890; ZAHLBR., Catal. Lich. 2: 353, 1924.

Hawaiian Is., BAILEY in Exs. (U.) s. n. *Gr. elegans*.

Previously recorded only from Brazil.

## 5. Gr. *illinata* ESCHW.

in Martius, Flora Brasil. 1: 82, 1833; ZAHLBR., Catal. Lich. 2: 312, 1924; REDGR. in Arkiv f. Bot., Bd 27 A, No. 3: 15, 1935. — *Gr. anguilliformis* TAYL. in Hook. Journ. of Bot 6: 152, 1847; ZAHLBR. in MS.

v. *apoda* ZAHLBR. in MS. n. var.

»Perithecio carbonaceo, integro, undique aequali v. inferne haud vel vix crassiore et thallo KOH aurantiaco (non sanguineo) differt a typo.

Lanai. Koele valley, corticola (ad *Mabam sandwicensem*) Rock (131).

Thallus uniformis, tenuis, effusus, sordidescenti-albidus, opacus, KHO e flavo aurantiacus, ruguloso inaequalis, margine linea obscuriore non cinctus, strato tenui, decolore, corticiformi, ex hyphis tenuissimis, longitudinalibus, conglutinatis formato tectus, medulla alba, I rufescente.

Apothecia numerosa, approximata, sessilia, rarius subrecta, ut plurimum varie curvata v. flexuosa, simplicia v. furcata, ramis dein ± curvatis, 2—5 mm longis et usque 0.75 mm latis, convexis, extus thallino vestita, thallo concoloria, disco rimiformi, angustissimo, nigricante, caesio-pruinosulo. Perithecium carbonaceum, integrum, sat tenue, aequale vel ad basin haud crassior, extrorsum ± rotundatum, non anguloso-productum, labiis acutis, inflexis. Hymenium in sectione ± oblongum, guttulis oleosis non impletum. Paraphyses strictae, ad apicem haud crassiores. Asci oblongo-clavati, 8-spori. Sporae rectae v. subrectae, fusiformi-digitiformes, uniserialiter 14—16-loculares, loculis ± lentiformibus, 75—85 × 11—13 µ.

Beim Typus ist das kohlige Gehäuse unten füssartig fortgesetzt und am Grunde nach aussen zu etwas ausgezogen. Sonst finde ich keine Unterschiede, die zu einer specifischen Trennung ausreichen könnten.» From ZAHLBR. MS.

There is also a specimen of the same collection (see above) in the Bot. Garden, Göteborg.

Distribution of type: Tropical America.

#### Sect. *Aulacographa* MÜLL. ARG.

5. *Gr. elegans* (Sm.) Ach. v. *striatula* (Ach.) TUCK. in Proc. Amer. Acad. 7: 230, 1866. — *G. striatula* (Ach.) SPRENG.; ZAHLBR., Catal. Lich. 2: 354, 1924; REDGE. in Ark. f. Bot. Bd. 27 A. No. 3: 48, 1935.

Oahu. On trunks MANN (TUCK.) l. c. »Lirellae subsessiles, superne nuda, nigrae. Sporae 35—80 µ longae.» REDGE. l. c.

v. *substriatula* (NYL.) TUCK. l. c. — *Graphina substriatula* ZAHLBR., Catal. Lich. 2: 427, 1924. — *Graphis substriatula* REDGE. l. c. p. 7.

Oahu. On trunks, MANN (TUCK.).

According to REDGE. (l. c.) it belongs to Sect. *Aulacogramma* and has: »Apothecia in parte inferiore thallino-vestita, superne ± denudata. Sporae 8, 16—20-loculares, 85—110 × 11—14 µ.»

General distribution: Tropical (and subtropical) regions.

Sect. *Eugraphis* (ESCHW.) MÜLL. ARG.7. Gr. *scripta* (L.) Ach.

in K. Vet. Akad. Handl. 1809, p. 145; NYL. in Ann. Sci. Nat. Bot., 4. ser. 11: 244, 1859; TUCK. in Proc. Amer. Acad. 7: 230, 1866; ZAHLBR., Catal. Lich. 2: 324, 1924. — *Lichen scriptus* L., Spec. plant.: 1140, 1753.

Hawaiian Is., NYL. l. c. — Oahu. On trees, MANN (TUCK.). Cosmopolitan.

8. Gr. *lineola* Ach.

Lichenogr. Univ.: 264, 1810; ZAHLBR., Catal. Lich. 2: 316, 1924.

Hawaiian Is., BAILEY (U. exs.) mixed in *Arthonia caribaea*. — Oahu. Palolo valley, on *Freycinetia Arnotti*, LYON (91); Konahuanui, on *Acacia Koa*, LYON (107 b) Z. in MS. Spores by ZAHLBR. noted as  $35-55 \times 9-10 \mu$ , by REDGR. smaller (see key).

General distribution: Tropical regions.

9. Gr. *leptocarpa* FÉE, Essai Crypt. Écorc. Offic.: 36, 1824, tab. 10, fig. 2; ZAHLBR., Catal. Lich. 2: 315, 1924; REDGR. in Arkiv för Bot. Bd. 27, No. 3: 42, 1935.

Lanai. Kaiholena, on bark, ROCK (186), Z. in MS.

The spore-size is according to REDINGER  $24-28 \times 5-6 \mu$ , thus smaller than that given by ZAHLBRUCKNER (see key).

General distribution: Tropical America.

10. Gr. *tenella* Ach.

Synops. Lich.: 81, 1814; ZAHLBR., Catal. Lich. 2: 358, 1924.

Hawaii. Kilaeua, Kipuka Puaulu, H. B. S. 1938 (5974).

General distribution: Tropical regions.

Sect. *Fissurina* (FÉE) STIZ.11. Gr. *triticea* NYL.

in Acta Soc. Sci. Fenn. 7: 470, 1863; ZAHLBR., Catal. Lich. 2: 359, 1924.

f. *lactea* ZAHLBR. apud RECHINGER in Denkschr. math.-naturw. Classe K. Akad. Wiss., Wien 88: 27, 1911.

Hawaii. Kilaeua, on *Metrosideros*, RECHINGER (2517), ZAHLBR. l. c. »Thallus lacteo albus, subnitidus.»

Endemic.

12. Gr. *grammitis* FÉE

Essai Crypt. Écorc. Offic.: 47, 1824, tab. 9, fig. 3; ZAHLBR., Catal. Lich. 2: 310, 1924; TUCK. in Proc. Amer. Acad. 7: 231, 1866.

Kauai. Waimea, on trunks, MANN (TUCK.). — Maui. Mountain of West Maui, MANN (TUCK.); Iao valley, on bark, FAURIE (669), Z. in MS.

General distribution: Tropical regions.

13. *Gr. radiata* (MONT.) NYL.

in Acta Soc. Sci. Fenn. 7: 473, 1863; TUCK. in Proc. Amer. Acad.: 7: 231, 1866; ZAHLBR., Catal. Lich. 2: 322, 1924.

Kauai. Alakai, swampy wood near Lehua makanoe, 1200 m, H. B. S. 1938 (5618). On smooth bark. Apothecia up to 2 cm long, radiating from a common centre, repeatedly branched. — Oahu. On trees, MANN (TUCK.).

General distribution: Tropical America.

14. *Gr. tachygrapha* NYL.

in Acta Soc. Sci. Fenn. 7: 473, 1863; ZAHLBR., Catal. Lich. 2: 357, 1924.

Hawaiian Is., BAILEY 165 in exs. (U.). — Oahu. Waianae, near Kole Kole pass, H. B. S. 1938 (mixed in 5969 and 5966: *Pert. oahuensis*).

General distribution: Tropical America and Asia.

Note. To judge from TUCKERMAN's remarks (l. c.) and notes in ZAHLBRUCKNER's MS. there may be other species of this or nearly related genera. And a revision of the material in TUCKERMAN's herbarium in the light of recent publications would probably change the list of species.

**Phaeographis** MÜLL. ARG.

1 a. Excipio quite dark, its margins entire, divergent.

2 a. Excipio thicker towards base (*Chiographa*).

3 a. Ap. subimmersed. Sp. 4-celled,  $15-18 \times 6-7 \mu$ .

1. *aggregata*.

3 b. Ap. appressed, base abrupt. Sp. 6 to 7-celled,  $20-27 \times 6-9 \mu$ .  
2. *dendroides*.

3 b. Ap. very prominent, constricted at base. Sp. 8 to 12-celled,  $30-40 \times 10-12 \mu$  (acc. to REDGR. 20— $30 \times 6-8 \mu$ ).  
3. *exaltata*.

2 b. Excipio not thicker at base (*Platygramma*).

4 a. Ap. immersed. Sp. 6 to 9-celled,  $24-35 \times 7-9 \mu$ .

4. *dendritica*.

4 b. Ap. subimmersed. Sp. 4-celled,  $15-18 \times 5-6 \mu$ .

5. *substellata*.

1 b. Excipio dimidiate, absent below thecium. Lips entire, divergent (*Hemitheciun*).

5 a. Sp. up to  $25 \mu$  long with 5—8 cells.

- 6 a. Ap. lirelliform, immersed, disc caesio-pruinose.  
6. *inusta*.  
 6 b. Ap. rounded or ellipsoid, disc black, naked.  
7. *punctiformis*.  
 5 b. Sp. above 25  $\mu$  long with 6—11 cells.  
 7 a. Ap. rounded or oblong. Sp. 26—36  $\times$  8—9.5  $\mu$ . Lips thicker at edge. 8. *lobata*.  
 7 b. Ap. immersed, simple, disc plane, naked, covered by turgid thallus. Sp. 32—42  $\times$  11—14  $\mu$ . 9. *leucocheila*

Sect. *Chiographa* (LEIGHT.) ZAHLBR.

1. *Ph. aggregata* REDGR.

in Ann. Mycol. 31: 175, 1933; ZAHLBR., Catal. Lich. 10: 165, 1924.

Hawaiian Is., BAILEY (U. exs.) s. n. *Graphis dendritica*. Thereto mixed in two specimens, called *Glyphis heteroclitia* and *Achariana*.

Agree completely with REDINGER's description of the single known specimen from Celebes.

2. *Ph. dendroides* (LEIGHT.) MÜLL. ARG.

in Flora 55: 208, 1882; ZAHLBR., Catal. Lich. 2: 370, 1924; REDGR. in Ann. Mycol. 31: 173, 1933. — *Platygrapha dendroides* LEIGHT. in Transact. Linn. Soc. 27: 179, 1869, tab. 36: fig. 24.

Maui. Puu Kukui, 1750 m, on *Metrosideros*, 1922, SKOTTSBERG (1712), and in summit forest, H. B. S. 1938 (5918).

The second specimen is typical, the first has scattered, often simple lirellae and sloping or abrupt thallus base. Spores slightly broader, 9—10  $\mu$ , but usually degenerate.

Formerly recorded from the East Indian Islands.

3. *Ph. exaltata* (MONT.) MÜLL. ARG.

in Flora 65: 336, 1882; REDGR. in Ark. f. Bot. Bd. 27 A. No. 3: 70, 1935; ZAHLBR., Catal. Lich. 2: 372, 1924. — *Lecanactis exaltata* MONT. et v. d. BOSCH in JUNGH., Plant. Jung-huhn, fasc. 4: 475, 1855. — *Graphis diversa* NYL. in Ann. Soc. Nat. Bot., ser. 4. 15: 50, 1861; ZAHLBR. in MS.

Hawaiian Is., BAILEY (U. exs.) s. n. *Glyphis heteroclitia*. — Kauai. Near Fr. GAY's summer house, 1200', on bark, FAURIE (312) Z. in MS.

»Apothecia extus thallino vestita, corticata (cortice ex hyphis longitudinaliter conglutinatis formato), medullam angustum sine gonidiis continentia. Hymenium guttuloso-inspersum. Asci

8-spori, sporis in ascis 2—3-serialibus,  $34—40 \times 10—12 \mu$ , 8-locales.» ZAHLBR. MS.

General distribution: Tropical regions.

Sect. *Platygramma* (MEY.) MÜLL. ARG.

4. *Ph. dendritica* (Ach.) MÜLL. ARG.

in Flora 55: 382, 1882; ZAHLBR., Catal. Lich. 2: 366, 1924; REDGR. in Ark. f. Bot. Bd. 27 A. No. 3: 73, 1935. — *Opegrapha dendritica* Ach., Meth. Lich.: 31, 1803. — *Graphis dendritica* TUCK. in Proc. Amer. Acad. 7: 230, 1866.

Oahu. Waialua mts, on trees, MANN (TUCK.) — Lanai. Kaiholena, on bark, Rock (191) Z. in MS. — Hawaii. MANN (TUCK.).

Cosmopolitan.

5. *Ph. substellata* ZAHLBR. MS. n. sp.

»Thallus hypophloeodes, 60—80  $\mu$  crassus, effusus, continuus, laevigatus, albescens v. glaucescenti-albidus, fere opacus, KOH fulvescens, CaCl —, in margine distincte non limitatus, ecorticatus, hyphis thalli non amyloideis.

Apothecia dispersa v. approximata, subimmersa, + regulariter radiata v. subradiatim ramosa, ramis subsimplicibus et ramis magis elongatis usque 6—8 mm longis, ramis rectis, subrectis v. modice flexuosis, circ. 0.25 mm latis, acutiusculis, lateraliter a thallo parum prominente tenuique cincta, margine proprio distincto non cincta; disco planiusculo nigro, opaco, epruinoso vel leviter pruinoso. Peritheciun integer, undique sat tenue, obscure fuscum, labiis hiantibus. Epitheciun tenue, fulvo-luteum, fuscum. Hymenium decolor, guttulis oleosis creberimis impletum, inde spumoso-oleosum, 60—70  $\mu$  altum, I — vel dilute violaceum. Hypothecium angustum, decolor, ex hyphis intricatis formatum. Paraphyses strictae, coherentes, ad apicem vix latiores. Ascii oblongo-clavati, 8-spori; sporis in ascis 1—3-serialibus, e fumoso fuscis, subcylindrico-oblongis, rotundatis v. subretusis, 4-locularibus, in medio nonnihil parum constrictis, cellulis apicalibus hinc inde parum majoribus, loculis late lentiformibus v. subrotundatis,  $15—18 \times 5—6 \mu$ .

Kauai. Hanalei, ad cortices laeves, FAURIE (208); Kealia, 10 m, corticola, FAURIE (210).

Nähert sich sehr an *Ph. dendritica*, da sie aber durchgehend nur 4-zellige Sporen besitzt, kann ich sie mit dieser, welche 5—10-zellige Sporen hat, nicht vereinigen.» From ZAHLBR. MS.

Sect. *Hemithecium* MÜLL. ARG.6. *Ph. inusta* (ACH.) MÜLL. ARG.

in Flora 55: 383, 1882; ZAHLBR., Catal. Lich. 2: 374, 1924; REDGR. in Ark. f. Bot. Bd. 27 A. No. 3: 84, 1935. — *Graphis inusta* ACH., Synops. Lich.: 85, 1814. — *Gr. dendritica* v. *inusta* TUCK. in Proc. Amer. Acad. 7: 230, 1866.

Oahu. On bark, MANN (TUCK.).

Cosmopolitan.

7. *Ph. punctiformis* (ESCHW.) MÜLL. ARG.

in Flora 65: 385, 1882; ZAHLBR., Catal. Lich. 2: 384, 1924; REDGR. in Ark. f. Bot. Bd. 27 A. No. 3: 83, 1935 (with description). — *Leiogramma punctiformis* ESCHW. apud MARTIUS, Icon. Plant. Cryptog. 2: 12, 1828—34, tab. 7, fig. 4.

Hawaiian Is., BAILEY (U. exs.) s. n. *Graphis patellula*.

Agrees not completely with REDINGER's description. Spores longer, 25—35 × 8.5—9.5  $\mu$ , but young spores 19—24 × 6—7  $\mu$ .

General distribution: Tropical regions.

8. *Ph. lobata* (ESCHW.) MÜLL. ARG.

in Flora 55: 383, 1882; ZAHLBR., Catal. Lich. 2: 379, 1924; REDGR. in Ark. f. Bot. Bd. 27 A. No. 3: 70, 1935. — *Lecanactis lobata* ESCHW., Syst. Lich.: 25, 1824, fig. 7. — *Graphis lobata* VAIN., Lich. Brésil 2: 114, 1890 (with description).

Hawaiian Is., BAILEY (U. exs.) s. n. *Graphis patellula*. — Oahu. Konahuanui, on bark of *Acacia Koa*, Lyon (107 a). — Maui. Haleakala, on bark, FAURIE (65) Z. in MS.

The specimen, seen by me (U. exs.) does not agree completely with VAINIO's description. Exciple at edge 60  $\mu$  thick, dark brown, tapering 50  $\mu$  downwards, laterally 15  $\mu$ , dark yellow, at base sordid yellow, confluent with the reddish yellow tree bark and 10—15  $\mu$  colourless hypothecium, its cells 1—2  $\mu$  large. Thecium 110—125  $\mu$  high, pale gray from oil-drops, upper 8—10  $\mu$  sordid pale greenish brown, Pd + very dark brown. Exciple K + sordid orange also laterally, edge dark greenish brown. Spores 35—50 × 10—12  $\mu$  (VAIN.: 26—30 × 8—9  $\mu$ ), with 8—11 cells, I + blackish blue. Paraphyses indistinct also K +.

General distribution: Tropical regions.

9. *Ph. leucocheila* (FÉE) MÜLL. ARG.

in Mém. Soc. Phys. et Hist. Nat., Genève 29, no. 8: 26, 1887; ZAHLBR., Catal. Lich. 2: 378, 1924. — *Arthonia leucocheila* FÉE, Essai Crypt. Écorc. Offic.: 52, 1824. — *Graphis dendritica* v. *leucocheila* TUCK. in Proc. Amer. Acad. 7: 230, 1866.

Oahu. Kaala mts, on trees, MANN (TUCK.).

General distribution: Tropical regions.

Little known lichens, brought to *Phaeographis* by ZAHLBRUCKNER, are: *Graphis discurrents* v. *Kaalensis* TUCK. and *Gr. patellula* v. *paterella* TUCK. in Proc. Amer. Acad. 7: 230, 1866.

### Graphina MÜLL. ARG.

1 a. Sp. not above 35  $\mu$  long.

2 a. Sp.  $17 \times 10 \mu$ , I + reddish yellow. Ap. immersed, pale. Exciple entire, thin, pale. 1. *cinereoalba*.

2 b. Sp.  $21-29 \times 8.5-9.5 \mu$ . Ap. black, pruinose. Exciple entire, thin, base paler. 2. *sulphurella*.

2 c. Sp.  $30-34 \times 11-12 \mu$ . Exciple »infra connivens, sed haud ibi continuum». Ap. indistinctly sulcate. 3. *substriatula*.

1 b. Sp. above 35  $\mu$  long. Surface sulcate.

3 a. Exciple absent at base, lips erect, pale yellowish. Sp.  $80-130 \times 25-40 \mu$ . 4. *chlorocarpa*.

3 b. Exciple entire, thick, brown.

4 a. Sp.  $4-8, 66-130 \times 9-20 \mu$ . 5. *Acharii*.

4 b. Sp. solitary,  $42-150 \times 10-55 \mu$ . 6. *pseudosophistica*.

1. Gr. (Chlorographina) cf. *cinereoalba* (VAIN.) ZAHLBR.

Catal. Lich. 2: 401, 1924. — *Graphis cinereoalba* VAIN. in Ann. Acad. Sci. Fenn., ser. A. 15: no. 6: 214, 1921.

Hawaiian Is., BAILEY (U. exs.) s. n. *Glyphis heteroclita*, scantily, on bark.

Exciple pale, at edge yellow, to 50  $\mu$  thick, inflexed, laterally and below about 15  $\mu$  thick, base pale to almost colourless. Thec. 85  $\mu$  high, I—, without oil, epithecium pale. Spores 8,  $17 \times 10 \mu$ , colourless, muriform with 8—10 globose cells, I + reddish yellow. — Differs mainly in the I-reaction of the spores (VAIN.: I + violet) and the yellowish, distinct though narrow disc (VAIN.: hardly visible). Ought also to be compared with *Gr. subtorquens* NYL. (Lich. Andaman p. 16) with spores I— and grayish glaucous apothecia.

Previously recorded from The Philippine Islands.

2. Gr. (Mesographina) *sulphurella* ZAHLBR.

in. Ann. Mycol. 10: 366, 1912; Catal. Lich. 2: 428, 1924. Lanai. Koele valley, on bark, Rock (135) Z. in MS. Endemic.

3. Gr. (Eugraphina?) *substriatula* (NYL.) ZAHLBR.

Catal. Lich. 2: 427, 1924. — *Graphis substriatula* NYL. in Acta Soc. Sci. Fenn. 7: 363, 1863, not.; REDGE. in Ark. f. Bot.

Bd. 27 A, No. 3: 7, 1935. — *Gr. elegans* v. *substriatula* TUCK. in Proc. Amer. Acad. 7: 230, 1866.

Oahu. On trunks, MANN (TUCK.).

The species is very incompletely known and the determination perhaps uncertain.

General distribution: Tropical regions.

4. **Gr. (Chlorogramma) chlorocarpa (FÉE) MÜLL. ARG.**

in Mém. Soc. Phys. et Hist. Nat. Genève 29: No. 8: 44, 1887; ZAHLBE., Catal. Lich. 2: 400, 1924. — *Graphis chlorocarpa* FÉE, Essai Crypt. Ecorc. Offic.: 47, 1824, tab. 12, fig. 2. — *Gr. frumentaria* v. *chlorocarpa* TUCK. in Proc. Amer. Acad. 7: 231, 1866.

Oahu. On trunks, MANN (TUCK.).

General distribution: Tropical regions.

5. **Gr. (Rhabdographina) Acharii (FÉE) MÜLL. ARG.**

in Mém. Soc. Phys. et Hist. Nat., Genève 29, No. 8: 38, 1887; ZAHLBE., Catal. Lich. 2: 391, 1924. — *Graphis Acharii* FÉE, Essai Crypt. Ecorc. Offic.: 39, 1824, tab. 10, fig. 4. — *Gr. rigida* (FÉE) TUCK. in Proc. Amer. Acad. 7: 230, 1866.

Oahu. On trees, MANN (TUCK.). — Lanai. Mahana valley, on *Aleurites moluccana*, Rock (123) Z. in MS.

General distribution: Tropical regions.

6. **Gr. (Rhabdographina) pseudosophistica (VAIN.) ZAHLBE.**

Catal. Lich. 2: 421, 1924. — *Graphis pseudosophistica* VAIN., Lich. Brésil. 2: 104, 1890.

Hawaiian Is., BAILEY 208 (U. exs.) s. n. *Graphis (rigida?)*.

Thallus smooth, cream-coloured, K+ faintly yellowish. Apothecia (= exciple) 0.4—0.5 mm broad, 0.4(0.5) mm deep, base blackish, 100 µ, laterally 100—150 µ thick with connivent, thin apices above thecium, surface with 3 lobes. Thecium 150—170 µ high, about 200 µ broad, without oil-drops. Epithecium indistinct. Spores solitary, 150—180×30—35 µ, I+ blue.

Previously recorded from Brazil.

**Phaeographina MÜLL. ARG.**

1 a. Exciple yellowish or ± uncolored. Ap. sessile, edge sulcate.

2 a. Sp. 58—68×14—17 µ with 11—13 horizontal septa.

1. *chrysentera*.

2 b. Sp. 14—18×9—11 µ with three horizontal septa.

2. *tumulata*.

1 b. Exciple dark.

3 a. Exciple not sulcate at edge.

4 b. Sp. 22-28  $\times$  8.5-10.5  $\mu$  with 6-7 horizontal septa.  
*4. Faureiana.*

3 b. Excipio deeply sulcate, horizontal septa 5-7.  
5. *oscitans*.

1. Ph. (*Chrooloma*) *chrysentera* (MONT.) MÜLL. ARG.

in *Hedwigia* 30: 52, 1891; ZAHLBE., Catal. Lich. 2: 436, 1924. — *Graphis chrysenteron* MONT. in Ann. Sci. Nat. Bot. ser. 2, 18: 268, 1842.

Lanai. Koele valley, on bark, Rock (126).

»Thallus epiphloeoëdes, tenuis, pallide-glaucescens vel albidus, KOH lutescens dein rubescens, sat laevigatus. Apothecia lirelline elevata, sat approximata, elongata, 1.5—6 mm longa et 0.4—0.6 mm lata, simplicia aut ramosa, saepe flexuosa vel curvata, disco rimiformi, parum conspicuo. Peritheciun laterale, crassum, pallidum vel fulvescens, inferne tenue; labia conniventia, leviter longitrorsum striata, lateraliter a thallo obducta. Hypothecium pallidum. Hymenium superne fuscescens, centro decolor et oleoso-inspersum. Paraphyses filiformes, simplices aut nonnihil superne breviter ramosae. Asci 8-spori, sporae obscuratae, oblongae, utrinque rotundatae, septis longitudinalibus 7—12, septis transversalibus 1—3, murales, 42—68×13—16  $\mu$ , I + subvinose obscuratae.» ZAHLBR. MS.

#### General distribution: Tropical regions.

## 2. *Ph. tumulata* (Nyl.) Müll. Arg.

in *Hedwigia* 31: 285, 1892. ZAHLBR., Catal. Lich. 2: 447, 1924. — *Graphis tumulata* NYL. in Ann. Sci. Nat. Bot., ser. 4, 20: 266, 1863, not; TUCK. in Proc. Amer. Acad. 7: 231, 1866.

Oahu. On trunks. MANN (Tuck.).

Formerly known from New Caledonia.

3. Ph. (*Eleutheroloma*) *fulgurata* (FÉE) MÜLL. ARG.

in Mém. Soc. Phys. et Hist. Nat. Genève 29, no. 8: 51, 1887; ZAHLBR., Catal. Lich. 2: 439, 1924. — *Graphis fulgurata* FÉE, Essai Crypt. Écorc. Offic.: 35, 1824, tab. 11, fig. 4; TUCK, in Proc. Amer. Acad. 7: 230, 1866.

Oahu. On trees, MANN (TUCK.).

General distribution: Tropical regions.

#### 4. Ph. (Eleutheroloma) Faurieana ZAHLBE. MS. n. sp.

» Thallus epiphlooides, 0.3—0.4 mm crassus, effusus, albus, subnitidus, KOH flavescentia v. rubescens, continuus, laevigatus vel partim subverruculoso-inaequalis, in-

margine linea obscuriore non cinctus vel tenuiter obscure marginatus, cortice distincto non tectus.

Apothecia crebra, subsessilia, simplicia vel varie ramosa (ramis flexuosis), 3—5 mm longa, tenuia (0.18—0.28 mm lata), margine thallino angusto, rectiusculo, bene prominulo, esulcato, fere integro, disco rimiformi, in uno apothecio partim vix conspicuo, partim leviter dilatato, obscure fusco, fere nigro, epruinoso, immerso, margine proprio extus non conspicuo. Peritheciun dimidiatum, angustum, obscure fuscum, molle, KOH magis rufescens, extus a thallo crasso tecto, labiis primum inflexis, demum subpatentibus. Epithecium sat angustum et inaequale, subgranulatum, fusconigricans. Hypothecium decolor, ex hyphis tenuibus intricatis formatum, strato thallino fuscescenti-flavescente angusto superpositum. Hymenium decolor, 75—85  $\mu$  altum, guttulis oleosis non impletum, I—. Paraphyses strictae, simplices. Ascii oblongo-clavati, 8-spori. Sporae in ascis 1—3-seriales, mox fumosae, subcylindricae v. ellipsoideo-subdigitiformes aut ellipsoideae, utrinque retuso-rotundatae, murales, loculis in seriebus verticalibus 7—8, in seriebus horizontalibus 1—2, membrana tenui cinctae, 22—28  $\times$  8.5—10.5  $\mu$ , I violaceo-obscureatae.

Kauai. Kilauea, ad corticem levem, FAURIE (200, 205).»  
ZAHLBR. MS.

##### 5. *Ph. oscitans* (TUCK.) ZAHLBR.

Catal. Lich. 2: 442, 1924. — *Graphis oscitans* TUCK. in Proc. Amer. Acad. 7: 231, 1866.

Oahu. On trunks, MANN (TUCK.).

»Thallo tenui contiguo aequabili albo; apotheciis innato-prominulis simplicibus subramosisve flexuosis, marginibus excipuli profunde canaliculati nigricantis tenuibus, dein hiantibus nudis, cum thallino crassiusculo concretis, hypothecio incolore. Sporae octonae in thecis, mediocres, oblongae, submuriformes (ser. tr. 6—8, long. 1—2), diam. 3—3½ plo longiores, fuscescentes.» TUCK. l. c.

Endemic.

### Chiodectionaceae.

#### *Glyphis* Ach.

##### *Gl. cicatrica* Ach.

Synops. Lich.: 107, 1814; ZAHLBR., Catal. Lich. 2: 444, 1924. — *Gl. Achariana* TUCK. in Amer. Journ. Arts and Sci. 25: 429, 1858 and Proc. Amer. Acad. 7: 231, 1866; ZAHLBR., Catal. Lich. 2: 453, 1924.

Hawaiian Is., ECKFELDT (Mus. Nat. Hist., Vienna). —

Kauai. Kealia, 10 m, on bark, FAURIE (201) Z. in MS. — Oahu. On trunks, MANN. (TUCK.) l. c. 1866.

General distribution: Tropical regions.

According to ZAHLBR. MS. *Gl. Achariana* is a synonym to *Gl. cicatricosa* like *Gl. favulosa* Ach. and *confluens* ZENK.

### Sarcographa FÉE

1 a. Ap. sessile. Sp. with (6)8 cells.

2 a. Ap. 1—2 mm broad. Sp. 22—30 × 6—9 µ.  
1. *heteroclita*.

2 a. Ap. 0.2—0.4 mm broad. Sp. 36—40 × 10—12 µ.  
2. *Rechingeri*.

1 b. Ap. immersed. Sp. 16—20 × 5—8 µ, with 4 cells.

3. *tricosa*.

#### 1. S. *heteroclita* (MONT.) ZAHLBR.

apud RECHINGER in Denkschr. math.-naturw. Kl. K. Akad. Wiss., Wien 88: 19, 1911; REDGR. in Revue Bryol. et Lichenol. 11: 110, 1936. — *Glyphis heteroclita* MONT. in Ann. Sci. Nat., ser. 2, 19: 83, 1843, tab. 2, fig. 1; TUCK. in Proc. Amer. Acad. 7: 231, 1866; ZAHLBR. in MS. — *Sarcographa Leprieurii* ZAHLBR., Catal. Lich. 2: 463, 1924.

Oahu. MANN (U. exs.) s. n. *Glyphis heteroclita*; Kaala and Waialua mts, on trees, MANN (TUCK.).

General distribution: Tropical Asia and Pacific Ocean.

#### 2. S. *Rechingeri* ZAHLBR.

apud RECHINGER in Denkschr. math.-naturw. Kl. K. Akad. Wiss., Wien 88: 27, 1911; Catal. Lich. 2: 465, 1924.

Hawaii. Kilauea, on branches, RECHINGER (2524, 2560). Z. l. c.

Endemic.

#### 3. S. *tricosa* (Ach.) MÜLL. ARG.

in Mém. Soc. Phys. et Hist. Nat., Genève, no. 8, 29: 63, 1887; ZAHLBR., Catal. Lich. 2: 466, 1924. — *Graphis tricosa* Ach., Lichenogr. Univ.: 674, 1810.

Kauai. Waialeale (202); ROBINSON's summer house, 1000 m (324) on bark, FAURIE. — Lanai. Mahana valley, on *Aleurites moluccanum*, Rock (130). Z. in MS.

»Thallus lacteus, ecorticatus, hyphæ thalli I lente violaceæ. Hymenium 100—110 µ altum, decolor, I cupreum. Epithecium pulverulentum, fuscescens. Asci 8-spori. Sporae 18—20 × 5—8 µ, 3-septatae, cellulis apicalibus quam mediis multo majoribus.» ZAHLBR. MS.

General distribution: Tropical regions.

**Sarcographina Müll. Arg.****S. sandwicensis Zahlbr.**

in. Ann. Mycol. 10: 367, 1912 and Catal. Lich. 2: 469, 1924.

**Maui.** Waikapu valley, about 3000' Rock (163); Iao valley, at 350 m, on mossy stones, FAURIE (578). ZAHLBR. l. c. and in MS. (corrected).

»Kommt der *Sarcographina cyclospora* Müll. Arg. zunächst, von welcher sie sich durch das kaum ausgebildete, helle Gehäuse, die angefeuchtet fleischfarbigen Fruchtscheiben und grössere Sporen ( $10-14 \times 7.5-9 \mu$ ) unterscheidet.« ZAHLBR. l. c.

ZAHLBRUCKNER says in his description: »sporis muralidis, septis horizontalibus 8, verticalibus 2» but on a figure in his MS. there are only three horizontal and one vertical septum.

Endemic.

**Chiodecton (Ach.) Müll. Arg.**

- 1 a. Sp.  $38-40 \times 6-7 \mu$ . Th. C+. Stroma as white depressed ridges. Ap. brownish black, oblong to linear.  
1. *perplexum*.
- 2 a. Sp.  $35-50 \times 4-5 \mu$ . Th. C-. Stroma rounded or oblong, half globose. Ap. round, confluent, ± gray, pruinose.  
2. *depressum*.

1. **Ch. perplexum Nyl.**

in Acta Soc. Sci. Fenn. 7: 1863, tab. 2, fig. 51; ZAHLBR., Catal. Lich. 2: 490, 1924; TUCK. in Proc. Amer. Acad. 7: 231, 1866.

**Oahu.** Kaala and Waialua mts, on trees, MANN (TUCK.) = *depressum*? (see below).

v. *hawaiiense* ZAHLBR. MS. — *Ch. hawaiiense* ZAHLBR. in Ann. Mycol. 10: 368, 1912; Catal. Lich. 2: 487, 1924.

Exs.: MERR. 48, s. n. *Platygrapha subattingens* NYL.

Hawaiian Is., BAILEY (Mus. Nat. Hist., Vienna, HELLER no. 2834). — Kauai. ECKFELDT; Kilauea, 200 m (174), ROBINSON's summer house (311), FAURIE; Kaholuamano, HELLER, in MERR. exs. 48. — Lanai. Mahana valley, on bark, Rock (113), Z. in MS. and l. c. — Oahu. Waianae, near Kolekole pass, H. B. S. 1938 (5946).

»Ist wohl nur eine Varietät von *Ch. perplexum* NYL. mit schmäleren Sporen, weniger gehäuften und zusammenfliessenden Apothecien.« ZAHLBR. MS.

General distribution: Tropical regions.

2. *Ch. depressum* FÉE

Essai Crypt. Écogr. Offic.: 65, 1824, tab. 17, fig. 2; ZAHLBR., Catal. Lich. 2: 485, 1924.

Hawaiian Is., BAILEY 5 (U. exs., another specimen without collector). — Oahu. MANN (U. exs.).

Thallus sordid white, thin, smooth, K-, C-, Pd-. Stroma about 1.1 mm broad, 0.2—0.25 mm thick with 2—3 hymenia, 0.2—0.5 × 0.13 mm large upon a common, about 100  $\mu$  thick, brownish black hypothecium and 20—25  $\mu$  thick, columnlike exciples and edges. Thecium about 100  $\mu$  high. Ascii about 65 × 18  $\mu$ , broadly clavate. Paraphyses K+ discrete, very much branched at the very apices, 1—1.5  $\mu$ . Spores 3-seriate, (35)45—50 × 4—5  $\mu$ , 3-septate, not easily escaping.

General distribution: Tropical regions.

## Dirinaceae.

*Dirina* FR.*D. repanda* FR.

Syst. Orb. Veget. I: 285, 1825; TUCK. in Proc. Amer. Acad. 7: 226, 1866; ZAHLBR., Catal. Lich. 2: 508, 1924.

Oahu. On lava, MANN (TUCK.).

Formerly known from S. Europe and East India.

## Cyclocarpineae.

## Lecanactidaceae.

## Lecanactis ESCHW.

- 1 a. Sp. with rounded apices and 5—6 cells, 18—22 × 5  $\mu$ .  
    1. *premnea*.  
 1 b. Sp. with pointed apices and 28—30 cells, 80—90 × 5—5.5  $\mu$ .  
    2. *Rockii*.

1. *L. premnea* (ACH.) ARN.

in Flora 44: 664, 1861; TUCK. in Proc. Amer. Acad. 7: 229, 1866; ZAHLBR., Catal. Lich. 2: 542, 1924. — *Lecidea premnea* ACH., Lichenogr. Univ.: 173, 1810.

Kauai. Near ROBINSON's summer house, c. 1000', on bark, FAURIE (316) Z. in MS. — Oahu. Waialua mts, on trunks, MANN (TUCK.).

Rather widely distributed.

2. *L. Rockii* ZAHLBR.

in Ann. Mycol. 10: 368, 1912; Catal. Lich. 2: 545, 1924.

Kauai. Kaholuamano, in forest, 3600', on bark, Rock (17) ZAHLBR. l. c. — Paa iki, at 500 m, on *Aleurites*, H. B. S. 1938 (6008).

Endemic.

### Thelotremaceae.

#### **Ocellularia (MÉY.) MÜLL. ARG.**

- 1 a. Fertile verrucae sessile, ± constricted at base.
  1. *cinchonarum*
- 1 b. Fertile verrucae subverrucarioid, ± convex.
  - 2 a. Lateral exciple brown.
    - 3 a. Thecium without columella.
      - 4 a. Inner layer of exciple black. Sp. 26—38 × 7.5—9 µ.
        2. *cavata*.
      - 4 b. Central layer of exciple black. Sp. 18—21 × 6—7.6 µ.
        3. *calvescens*.
    - 3 b. Thecium with columella. Sp. 19—27 × 7.5—8 µ with 6—8 cells.
      4. *pyrenuloides*.
  - 2 b. Lateral exciple soft, not brown.
    - 5 a. Spores with 24—30 cells.
      5. *multilocularis*.
    - 5 b. Sp. with 6—8 cells.
      - 6 a. Sp. 16—20(30) × 6—8(9) µ, with 6—8(12) cells. Ap. with columella.
        6. *terebrata*.
      - 6 b. Sp. 15—22 × 6—9 µ with 6 cells. Ap. without columella.
        7. *sexlocularis*.

#### Sect. *Ascidium* (FÉE) MÜLL. ARG.

##### 1. *O. cinchonarum* (FÉE) SPRENG.

Syst. Veget. 4: 242, 1827; ZAHLBR., Catal. Lich. 2: 586, 1924. — *Ascidium cinchonarum* FÉE, Essai Crypt. Écorc. Offic.: 96, 1824, tab. 1, fig. 22.

Kauai. Kaholuamano, in forest, c. 600', on bark, Rock (20).

»In dem vorliegenden Stücke sind die Apothecien normal entwickelt, der Thallus aber, wegen der stark rissigen Borke des Unterlages, nur rudimentär entwickelt.« ZAHLBR. MS.

General distribution: Tropical regions.

#### Sect. *Myriotrema* (FÉE) ZAHLBR.

##### 2. *O. cavata* (ACH.) MÜLL. ARG.

in Flora 65: 409, 1882; ZAHLBR., Catal. Lich. 2: 585, 1924.

— *Thelotrema cavatum* ACH. in K. Vet. Akad. Nya Handl. 33: 92, 1812; TUCK. in Proc. Amer. Acad. 7: 227, 1866.

Kauai. ROBINSON's summer house, 1000' (319); Olokele,

± 600 m (374), on bark, FAURIE, Z. in MS. — Oahu. On trunks, MANN (TUCK.).

»Thallus epiphloeoedodes, tenuis, lacteo-albidus, opacus, KOH lateritio-sanguineus, continuus v. passim irregulariter fissus, inaequalis v. subgranulosus, margine obscuro non cinctus.

Verrucae apotheciorum crebrae, approximatae, congestæ vel confluentes, 0.6—1 mm latæ, convexæ, ad basin non constrictæ, thallo concolores, anguste corticatae, apertura rotundata, parva, 0.1—0.3 mm lata, tenuissime albo-annulata, demum ± nuda, disco immerso, nigricante, ± caesio-pruinoso. Peritheciū integrum, tenue, rufescēti-lutescens, ex hyphis intricatis et cylindricis formatum, usque ad verticem verrucarum apotheciique ascendens, extus et versus hymenium a strato medullari marginis vestitum, stratum medullare marginis cinerascens, in angulo inter hymenium et peritheciū maculatim nigrum. Epitheciū angustum, pulverulentum, sordidescens. Hymenium I—, guttulis oleosis non inspersum, 125—130  $\mu$  altum. Paraphyses ± conglutinatae, simplices, ad apicem vix latiores. Ascii 4—8-spori, cylindrici v. oblongo-clavati. Sporae in ascis uniseriales v. biserales, oblongae v. cylindrico-oblongae, utrinque rotundatae, passim in medio levissime angustiores, 8—10-loculares, 26—38  $\times$  7.5—9  $\mu$ , I + violaceae.» From ZAHLBR. MS.

General distribution: Tropical regions.

### 3. O. calvescens (FÉE) MÜLL. ARG.

in Mém. Soc. Phys. et Hist. Nat., Genève 29, no. 8: 8, 1887; ZAHLBR., Catal. Lich. 2: 584, 1924. — *Thelotrema calvescens* FÉE, Suppl. Essai Crypt. Écorc. Offic.: 89, 1837, tab. 37, fig. 5; TUCK. in Proc. Amer. Acad. 7: 227, 1866.

Oahu. On trunks, MANN (TUCK.).

General distribution: Tropical regions.

### 4. O. pyrenuloides ZAHLBR. MS. n. sp.

»Thallus tenuissimus, effusus v. maculatim confusescens, continuus, laevis, glaucescens vel stramineo- v. ochraceo-glaucescens, subnitidus, lineis nigricantibus protothallinis ± decussatus et etiam in margine linea tenui nigricante cinctus.

Verrucae apotheciorum minutae, 0.18—0.3 mm latae, sessiles, dispersae, rotundatae, disco valde tenui, fere punctiformi, albo, immerso, thallino-vestitae et sensim in thallum abeentes, circa discum nigro-annulatae, inde quasi apothecia *Pyrenulae* cujusdam microcarpae. Peritheciū integrum, nigrum, infra hymenium valde angustum, lineariforme, lateraliter ad hymenium crassum, ± flabellatum, hymen-

nium superans et versus hymenium  $\pm$  oblique limitatum, extus strato valde tenui thallino, filamentoso obducto, basi substrato adpresso et ab eo leviter secedente. Hymenium disciforme, superne tenue inspersum, decolor, guttulas oleosas non continens, 120—130  $\mu$  altum, e columellatum vel columella centrali latiuscula praeditum, I non vel vix lutescens. Hypothecium decolor, angustum, ex hyphis tenuibus intricatisque formatum. Paraphyses strictae, ad apicem vix latiores. Asci oblongo-clavati, 8-spori. Sporae in ascis  $\pm$  biserialis, oblongae v. subcylindrice-oblongae, ad apices late rotundatae, 8-loculares, loculis lentiformibus, 19—27  $\times$  7.5—8  $\mu$ , I violaceo-obscureatae.

Kauai. Kilauea, 60 m (144); Koloa, on *Pandanus* (160), FAURIE. — Maui. Wailuku, FAURIE (676), Z. in MS. — Hawaii. Haena, S. of Hilo, *Pandanus*-forest, 1922, SKOTTSBERG (1251). All on smooth bark.

Endemic.

##### 5. *O. multilocularis* ZAHLBR.

in Ann. Mycol. 10: 369, 1912; Catal. Lich. 2: 596, 1924.

Kauai. Hanapepe fall, 300 m (148, 185); Hanalei (163), FAURIE. — Oahu. Near Honolulu (401), FAURIE. — Lanai. Mahana valley, Rock (17). — Maui. Nahiku, c. 100 m, FAURIE (668), all on bark, ZAHLBR. l. c. and MS. Puu Kukui, 1750 m, forest near the house, H. B. S. 1938 (in 5855: *Megarospora atrorubicans*), on a twig, scanty.

I have noted the following facts in the apothecial structure of no. 5855: Apothecial margin 100—115  $\mu$  thick with most central part filled with large crystals, disappearing in  $HNO_3$ . Gonidia in thallus 6—8  $\mu$ , subglobose, wall thick, gelatinous, colour yellowish green in KOH. Exciple laterally 35—45  $\mu$  thick, gray, minutely cellular, cells thin-walled, 4—7  $\times$  1.5—2  $\mu$ ; at the base 12—14  $\mu$  thick, dark sordid, in  $HNO_3$  reddish yellow-brown like thallus margin, the same in KOH, in Pd yellowish red with mist. Thecium 0.5—0.6 mm broad, 300  $\mu$  high (ZAHLBR.: 240—270  $\mu$ ), with colourless epithecium (Z.: pulverulentum, decolor). Spores 140—170  $\times$  22—25  $\mu$  (Z.: 80—130  $\times$  14—18  $\mu$ ) probably 1—4 in ascii (Z.: 8-sporis) with 20—35 cells, I + dark violet red.

Endemic.

##### 6. *O. terebrata* (Ach.) MÜLL. ARG.

in Flora 70: 398; 1887; ZAHLBR., Catal. Lich. 2: 602, 1924.

— *Thelotrema terebratum* Ach. in K. Vet. Akad. Nya Handl. 33: 88, 1812; TUCK. in Proc. Amer. Acad. 7: 227, 1866.

Oahu. On trees, MANN (TUCK.).

General distribution: Tropical regions.

7. *O. sexocularis* ZAHLBR. MS. n. sp.

»Thallus epiphloeodes, effusus, tenuis, glaucescenti-stramineus, nitidulus, KOH fulvescenti-sanguineus, laevigatus, parum inaequalis, continuus, in margine passim linea tenui et nigro cinctus.

Verrucae apotheciigeræ crebræ, ± dispersæ, 0.25—0.4(0.5) mm, convexæ, ad basin sensim in thallum abeuntes, thallo concolores, poro punctiformi rotundo pertusæ et circa ostiolum subannulatae. Discus valde angustus, immersus, nigricans. Hymenium 85—100  $\mu$  altum, non inspersum, superne non pulverulentum, vix obscuratum, e columellatum, I lutescens. Paraphyses strictiusculæ, simplices, ad apicem non latiores. Ascii subcylindrico-oblongi, 8-spori. Sporæ in ascis ± biserialis, sexocularis (omnes a me visæ), 15—22  $\times$  7—9  $\mu$ , I violaceæ.

Conceptacula pycnoconidiorum marginalia, minuta, convexo-verruculosa, thallo concoloria, vertice punctiformi obscurato, globosa; perifuleria mollia et decoloria; fulcra exobasidialia; basidiis fasciculatis, oblongis v. ampullaceo-filiformibus, pycnoconidiis parum brevioribus; pycnoconidia bacillaria, recta, utrinque retusa, 7.5—9  $\mu$  longa et 1  $\mu$  lata.» From ZAHLBR. MS.

Maui. Haleakala, c. 1000 m, on bark, FAURIE (678).

Some notes concerning this species and *O. Bonplandiae* MÜLL. ARG. are for the most part written in shorthand in his MS. and can not be interpreted by me.

**Phaeotrema MÜLL. ARG.**

- |  |                        |
|--|------------------------|
| 1 a. Ap. punctiform, immersed.                               | 1. <i>Wightii</i> .    |
| 1 b. Ap. gyalectoid or lecanorine, dilated, sessile.         |                        |
| 2 a. Thecium simple without columella.                       | 2. <i>Rockii</i> .     |
| 2 b. Thecium with densely dispersed, subradiating columellæ. | 3. <i>Auberianum</i> . |

1. *Ph. Wightii* (TAYL.) ZAHLBR. MS.

*Endocarpon Wightii* TAYL. in Hook. Journ. of Bot. 6: 155, 1847. — *Leptotrema Wightii* MÜLL. ARG.; ZAHLBR., Catal. Lich. 2: 641, 1924.

Kauai. On the ridge near GAY and ROBINSON's Hanapepe valley house, on bark of Kukui tree, HELLER (2540).

»Omnino quadrat cum speciminibus a cl. RAVENEL in Carolina australi lectis. Thallus KOH—, CaCl—. Hymenium I fulvescit.» ZAHLBR. MS.

General distribution: Tropical regions.

2. *Ph. Rockii* ZAHLBR.

in Ann. Mycol. 10: 370, 1912 and Catal. Lich. 2: 610, 1924.

Hawaiian Is., BAILEY (U. exs.) s. n. *Thelotrema lepadodes*. — Oahu. Koolau mts, back of Tantalus, about 600 m (1499) and Manoa valley on *Eugenia moluccensis* (1453) SKOTTSBERG 1922. — Lanai. Mahana valley, on *Sideroxylon* sp. and *Straussia* sp., Rock (116); Koele valley, on *Pisonia* sp., Rock (128) ZAHLBRE. l. c.

Endemic.

3. *Ph. Auberianum* (MONT.) MÜLL. ARG.

in Flora 69: 311, 1886; ZAHLBRE., Catal. Lich. 2: 605, 1924.

— *Thelotrema Auberianum* MONT. apud SAGRA, Hist. de l'Île Cuba, Botan.: 163, 1838—42, tab. 8, fig. 2; TUCK. in Proc. Amer. Acad. 7: 228, 1866.

Oahu. On trunks, MANN (TUCK.).

General distribution: Tropical regions.

***Thelotrema* (ACH.) MÜLL. ARG.**

1 a. Mouth without periphyses.

2 a. Fertile verrucae indistinctly limited. Ap. immersed.

3 a. Ap. aspicilioid, 0.1—0.2 mm broad. Sp. 30—34 × 12—15  $\mu$ , transversally with 4—5 cells. 1. *lirellizans*.

3 b. Ap. at last 1.5 mm broad, proper margin denticulate. Sp. 27—32 × 12—14  $\mu$ , transversally with 2—3 cells.  
2. *leucomelanum*.

2 b. Fertile verrucae distinctly limited.

4 a. Asci with 1—4 spores.

5 a. Fertile verrucae convex, base dilated. Sp. solitary, 80—90 × 20—23  $\mu$ . 3. *Tantali*.

5 b. Fertile verrucae subglobose, constricted at base. Sp. 85—95 × 18—26  $\mu$ . 4. *lepadinum*.

4 b. Asci with 8 spores.

6 a. Excipio only lateral.

7 a. Excipio very pale. Sp. 18—26 × 9—11  $\mu$ .  
5. *vernicosum*.

7 b. Excipio black, thin. Sp. cylindric, 30—47 × 9—13  $\mu$ . 6. *stenosporum*.

6 b. Excipio entire, ± reddish brown. Sp. 14—21 × 8.5—10.5  $\mu$ . 7. *piluliferum*.

1 b. Mouth with periphyses. Sp. 23—35 × 14—18  $\mu$ , I + blue.  
8. *gibbosum*.

1. *Th. lirellizans* ZAHLBRE. MS. n. sp.

Thallus uniformis, c. 0.18 mm crassus, effusus, subargenteo-albidus, opacus, versus marginem vernicosus, KOH fulvescens, continuus vel parce et tenuissime irregulariterque fissus, parum inaequalis, in margine linea obscuriore non cinc-

tus, quasi evanescens vel passim linea angustissimo nigricante cinctus, strato corticali distincto non evoluto.

A pothecia immersa, aspicilioidea, 0.1—0.2 mm lata, rotunda v. rotundata, dispersa vel 2—5 seriata confluentia, disco nigricante, concavo, opaco, epruinoso, thallum fere aequante, margine distincto nullo vel parum prominulo. Excipulum laterale sordide obscuratum, non bene limitatum. Epithecum vix pulverulentum, sordidum. Hypothecium angustum, decolor, ex hyphis tenuibus, dense intricatis formatum. Hymenium decolor, eolumellatum, guttulis oleosis non inspersum, 120—130  $\mu$  altum, I—. Paraphyses simplices, ad apices non latiores. Asci ellipsoidei, 8-spori. Sporae in ascis biseriales, late ellipsoideae v. ovali-ellipsoideae, murali divisae (seriebus locularum verticalibus 8, seriebus longitudinalibus usque 5, loculis cubicis, parum inaequalibus), membrana tenui cinctae, 30—34  $\times$  12—15  $\mu$ .

Kauai. Kilauea, c. 50 m, corticola (FAURIE 188).

Species distincta, nullae affinis». From ZAHLBR. MS.

### 2. Th. leucomelanum NYL.

in Acta Soc. Sci. Fenn. 7: 452, 1863, tab. 1, fig. 14; ZAHLBR., Catal. Lich. 2: 624, 1924; TUCK. in Proc. Amer. Acad. 7: 228, 1866.

Oahu. On trunks, MANN (TUCK.).

General distribution: Tropical America.

### 3. Th. Tantali ZAHLBR.

in Ann. Mycol. 10: 371, 1912; Catal. Lich. 2: 629, 1924.

Oahu. Tantalus Ridge, on branches of *Hibiscus Arnotianus* LYON (82 a).

»Von den übrigen einsporigen Arten sehr verschieden und durch das doppelte Gehäuse auffällig.» ZAHLBR. l. c.

Endemic.

### 4. Th. lepadinum ACH.

Method. Lich.: 132, 1803; ZAHLBR., Catal. Lich. 2: 620, 1924. — *Lichen lepadinus* ACH., Lich. Prodr.: 30, 1798.

Kauai. Near GAY's summer house, on bark 1200 m, FAURIE (388). — Hawaii. Mauna Loa, 4500', on bark, Rock (169), Z. in MS.

»Thallus epiphloeodes, tenuis, bene non limitatus, glaucescenti-albidus, nitidulus, KOH demum  $\pm$  sanguineus, CaCl—, contiguus, parum inaequalis, superne strato valde angusto, subamorpho tectus, caeterum homoeomericus, hyphis thalli non amylaceis.

Apothecia congesta, totum fere thallum obtegentia, usque 1 mm lata, solitaria v. 2—3 confluentia, sessilia, excipulum verrucas subhemisphaericas, ad basin bene constrictas, ad verticem abruptas formans, ostiolo sat lato, disco immerso, albo-pruinoso, irregulariter velato. Peritheciun laterale, angustum, triangulari-cuneatum, decolor, plerumque in margine extus et superne cinereo-obscuratum versus hymenium, ex hyphis tenuibus transversalibus formatum, I rufescens, extus a thallo crasso vestitum et superatum. Hypothecium crassum, decolor. Epitheciun angustum, cinereum, subpulverulentum. Hymenium guttulis oleosis non inspersum, 170—190  $\mu$  altum, I vix lutescens, eolumellatum. Paraphyses simplices, ad apicem non latiores, strictae, facile liberae. Ascii angusti, oblongo-cylindracei, 1—4-spori. Sporae fusiformi-oblongae vel fusiformae, utrinque acutatae, murali-divisae, septis horizontalibus 13—17, septis verticalibus 1—3, loculis subcubicis, membrana tenui cinctae, I—, 85—95  $\times$  18—26  $\mu$ .» From ZAHLBR. MS.

Cosmopolitan.

##### 5. Th. vernicosum ZAHLBR.

in Ann. Mycol. 10: 370, 1912 and Catal. Lich. 2: 630, 1924.

Kauai. Alakai, swampy woods near Lehua makanoe, 1200 m, H. B. S. 1938 (5620) ster. Kaholuamano, 3600', on trunks without bark (41); Halemanu, on bark (99), Rock. — Oahu. Koolau mts, on *Eugenia sandwicensis*, Rock (101), ZAHLBR. l. c. — Molokai. Near Maunahui Camp, 1040 m, on dead *Metrosideros*, H. B. S. 1938 (mixed in 5856: *Pertusaria molokaiensis*). — Maui. Between Haelaua and Nakalalua, 900—1300 m, H. B. S. 1938 (5872), a fine fertile specimen, Pd + orange.

Endemic.

##### 6. Th. stenosporum ZAHLBR. MS. n. sp.

»Thallus epiphloeodes, effusus, subtartareus, 0.2 mm crassus, cinereo- v. lutescenti-glaucescens, nitidulus, KOH fulvescens v. demum aurantiacus, CaCl—, continuus, parum inaequalis, in margine linea obscuriore non cinctus, strato corticali decolore, ex hyphis tenuibus, dense intricatis, formato, hyphis medullaribus non amyloideis.

Verrucae apotheciigerae convexae, basi sensim in thallum abeuntes, usque 1 mm latae, dispersae v. ± approximatae, ad apicem poro punctiformi, alboannulato (annulo integro angustoque). Hymenium et excipulum in substrato sedentia, a thallo obducta, corticata, medullam et gonidia includentia, inter thallum et peritheciun strato lateritio. Peritheciun lateraliter angustum,

lineari-flabellatum, nigrum, infra hypothecium non evolutum, non linea fuscescente indicatum. Epithecium passim leviter pulverulentum et obscurum. Hypothecium decolor, angustum. Hymenium decolor, eolumellatum, guttulis oleosis non inspersum, 180—190  $\mu$  altum, I—. Paraphyses capillares, ad apices non latiores, basi a substrato facile dehiscentes. Asci cylindrici v. oblongo-clavati, (6—)8-spori. Sporae in ascis subuniseriales, utrinque basi rotundatae, murali-divisae, seriebus cellularum verticalibus 8, mediis verticaliter uniseptatis, halone non circumdatae, 30—47  $\times$  9—13  $\mu$ , I violaceae.

Kauai. Eleele, corticola, FAURIE (178); Kaukao, 1000 m, corticola, FAURIE (264).

Habitu ad *Th. cinereovirentem* KEMPH. accedit, a quo tamen perithecio laterali nigro angustoque et sporis angustis bene differt.» From ZAHLBR. MS.

### 7. *Th. piluliferum* TUCK.

in Proc. Amer. Acad. 7: 227, 1866; ZAHLBR., Catal. Lich. 2: 626, 1924.

Oahu. On trees, MANN (TUCK.).

Endemic.

It seems that ZAHLBRUCKNER has seen a specimen, although no locality is given, because he has the following description (illustrated by a picture of a section): »Thallus KOH + sanguineo obscuratus, corticatus, cortice decolore, ex hyphis longitudinalibus, conglutinatis formato. Verrucae apotheciorum thallo concolores, depressae, in ambitu rotundatae, 0.5—0.8 mm latae, circa ostiolum minutum rotundumque fuscescenti-annulatae. — Peritheciun pallidum, solum lateraliter bene evolutum, infra hymenium angustum, cintus incolor ad marginem rufescens, KOH obscurior, ex hyphis intricatis formatum, thallino vestitum. Discus concavus, dilatatus, pallescens, epithecio evoluto non tectus. Hypothecium decolor, angustus, cum perithecio confluens. Hymenium decolor, guttulis oleosis non impletum, 150—170  $\mu$  altum, I lutescens, superne tenuiter obscuratum. Paraphyses densae, conglutinatae, leviter flexuosa, ad apicem haud latiores. Asci oblongo-cylindrici, ad apicem rotundati, 8-spori. Sporae in ascis uni- v. pluriseriatae, subglobulosae vel late ellipsoideae v. ellipsoideae, utrinque late rotundatae v. subretuso-rotundatae, membrana tenui cinctae, murales, cellulis subglobosis, in seriebus verticalibus circ. 6, in seriebus horizontalibus 1—3, I obscure violaceae, 14—21  $\times$  8.5—10.5  $\mu$ .»

Sect. *Tremotyliopsis* ZAHLBE.8. *Th. gibbosum* H. MAGN. n. sp.

Thallus continuus, albescens, subtenuis, verrucosus, verrucis densis, semiglobosis, majusculis, apicibus applanatis, vestitus basi  $\pm$  constrictis, apothecia singula vel dua triave in-cludentibus, intus periphysibus munita. Excipulum tenue, integrum, pallide aurantiacum. Thecium altum, epithecio deficiente. Sporae octonae, murales, incolores, late ellipsoideae.

Maui. Haelaau, 910 m, H. B. S. 1938 (5836). Probably on decaying bark. The specimen consists only of crumbles with dark brown lower side but cortex tissue apparently present immediately below apothecia.

Thallus almost covered by the 0.7—1.5 mm large verrucae, concolorous with the thallus, mostly solitary, partly low, partly up to 0.6 mm high, sometimes confluent, base varying but usually  $\pm$  abrupt to constricted, apex closed by a 0.15—0.2 mm broad, sordid yellowish mouth or slightly applanated, margin not prominent. Thallus I—, KOH—, Pd + intensely yellow mist.

Apothecial verrucae with a colourless, 15—22  $\mu$  thick cortex with smooth surface, hyphae longitudinal, indistinct. Inside it a 100—200  $\mu$  thick tissue, almost filled with up to 80  $\mu$  large, angular, colourless or grayish oxalate crystals and enclosing much air. Hyphae between the crystals scanty, 2—3  $\mu$  thick, among the widely scattered lumps of 13—19  $\mu$  large *Trentepohlia*-gonidia denser and forming with the gonidia a continuous stratum where the crystals are few. A thin tissue, about 50  $\mu$ , between the apothecia and the substratum. — Excipule round the thecium 20—30  $\mu$  thick, reddish yellow, indistinctly limited, tapering towards apex. Hypothecium at base about 35  $\mu$  thick, colourless. Thecium 150—200  $\mu$  high, colourless without epithecium, I—. Above the thecium a 100—150  $\mu$  high, about 400  $\mu$  broad empty space. Lateral wall 30—35  $\mu$  thick, colourless, in uppermost part with 30—40  $\times$  2  $\mu$  large,  $\pm$  simple periphyses. Mouth 150  $\mu$  broad, occupied by a 100  $\mu$  thick, gray, lump-like substance. Paraphyses dense, conglutinate, 1.5—1.8  $\mu$ , simple? Asci 100—120  $\times$  18—20  $\mu$ , narrowly clavate. Spores 8, uniseriate, colourless, muriform, 23—26(35)  $\times$  14—18  $\mu$ , I+ intensely blue, cells about 16—20, in 4—6 horizontal, 2—3 vertical rows.

*Th. gibbosum* belongs to quite another group than the other Hawaiian species on account of the development of periphyses. It seems to come near to *Th. diploschistoides* VAIN. from Rhodesia, a species with periphyses, broad spores, I+ blue, and

high thecium, but it is saxicolous, has whitish peritheциум (=excipulum), concealed apothecia and a positive I-reaction in the thallus.

**Leptotrema** MONT. et v. d. Bosch.

- 1 a. Thecium with columella, parts of disc punctiform or linear. Sp.  $12-18 \times 7.5-11 \mu$ , transversal septa 4—6, longitudinal 1—2. *1. sandwicense.*
- 1 b. Thecium without columella.
  - 2 a. Ap. drum-shaped, white-pruinose. Sp. 8, transversal septa 16—24, longitudinal four. *2. lepadodes.*
  - 2 b. Mouth of apothecia narrower.
    - 3 a. Sp.  $2-8, 52-78 \times 17-22 \mu$ , transversal septa 18—20, longitudinal 6. *3. pinarocarpum.*
    - 3 b. Sp.  $8, 20-30 \times 12-15 \mu$ , transversal septa 3—5, longitudinal septum one. *4. bahianum.*

1. **L. sandwicense** ZAHLBR.

in Ann. Mycol. 10: 372, 1912; ZAHLBR., Catal. Lich. 2: 639, 1924.

Oahu. Koolau mts (100); Punaluu (60), Rock, ZAHLBR. l. c. Endemic.

2. **L. lepadodes** (TUCK.) ZAHLBR.

in Ann. Mycol. 10: 372, 1912; Catal. Lich. 2: 636, 1924. — *Thelotrema lepadodes* TUCK. in Proc. Amer. Acad. 5: 405, 1862 and 7: 228, 1866.

Oahu. On trees, MANN (TUCK.).

General distribution: Tropical regions.

3. **L. pinarocarpum** ZAHLBR. MS. n. sp.

»Thallus pro maxima parte hypophloeoides, late effusus, tenuissimus, subargenteo-albidus, passim sed rarim sublateritio-glaucescens, nitidulus, KOH fulvescens, continuus, parum inaequalis v. laevigatus, in margine linea valde tenui nigra limitatus, strato corticali angusto, decolore.

Verrucae apotheciorum in ambitu rotundae, subsemiglobosae, dispersae v. approximatae, 0.6—1.2 mm latae, convexae, basi sensim in thallum + abeentes, laeves, leviter glaucescenti-obscuratae, strato corticali tenui obductae, mono- vel valde rare 2-carpicae, apertura rotunda, primum circ.  $\frac{1}{3}$  latitudinis verrucae occupante, dein dilatata, disco usque 1 mm lato, immerso, concavo, obscuro, caesio-pruinoso, opaco. Peritheциум laterale, angustum, intus decolor, subcellulosum. Epitheciun pulverulentum, sordide nigricans. Hypothecium valde angustum, decolor, ex hyphis tenuissimis

intricatis formatum. Hymenium decolor, 150—180  $\mu$  altum, I—. Paraphyses strictae, conglutinatæ, ad 1.5  $\mu$  crassæ. Ascii oblongo-clavati, 2—8-spori. Sporae e decolore fuscae, fusiformi-oblongae, utrinque angustatae vel in uno apice rotundae, in altero angustae, multiloculares (septis horizontalibus 18—20, septis verticalibus usque 6, cellulis cubicis), membrana tenui cinctae, 52—78  $\times$  17—22  $\mu$ .» From ZAHLBR. MS.

Kauai. Kealia, 200 m, on bark, FAURIE (192). — Maui. Wailuku, 350 m, on bark, FAURIE (679). Z. in MS. — Oahu. Manoa valley, on *Aleurites moluccana* 1922, SKOTTSBERG (1449). — A specimen without locality or collector in Exs. (U.).

#### 4. *L. bahianum* (Ach.) MÜLL. ARG.

in Mém. Soc. Phys. et Hist. Nat., Genève 29, no 8: 12, 1887; ZAHLBR., Catal. Lich. 2: 631, 1924. — *Thelotrema lepadinum* v. *bahianum* Ach., Meth. Lich.: 132, 1803. — *Thelotrema bahianum* Ach., TUCK. in Proc. Amer. Acad. 7: 228, 1866.

Kauai. MANN (U. exs.) s. n. *Thelotrema bahianum*. — Oahu. MANN (U. exs. and TUCK. l. c.); Waialua mts, MANN & BRIGHAM (U. exs.) both s. n. *Thelotrema Auberianum*. — Maui. Mountains of W. Maui, on trunks, MANN (TUCK.).

General distribution: Tropical regions.

### Gyrostomum E. FR.

#### G. dactylosporum ZAHLBR.

in Ann. Mycol. 10: 372, 1912; Catal. Lich. 2: 644, 1924.

Lanai. Mahana valley, on *Aleurites moluccana*, Rock (120). ZAHLBR. l. c.

» Apothecia plana, 0.5—1 mm, disco nigricante, mox convexa; perithecio solum lateraliter evoluto, fusco-nigricante; sporis digitiformibus, in apice rotundatis in altero apice  $\pm$  angustatis, ad septa primaria leviter constrictis, murali-divisis, 58—90  $\mu$  longis et 12—16  $\mu$  latis, septis horizontalibus 18—30, septis verticalibus 1—2.» From ZAHLBR. l. c.

Endemic.

### Diploschistaceae.

#### Diploschistes NORM.

1 a. Ap. subpyrenocarpous, disc narrow, enclosed.

2 a. Sp. 18—40  $\times$  10—25  $\mu$ . Th. white to brownish, CaCl  $\pm$  reddish. 1. *actinostomus*.

2 b. Sp. 16—26  $\times$  8.5—12  $\mu$ . Th. subochraceous, CaCl—, KOH—, I + blue. 2. *oceanicus*.

- 1 b. Ap. dilated, lecanorine, Th. CaCl + intensely red, KOH—.
- 3 a. Th. yellowish, subsquamulose, I + bluish. Base of exciple dark. Thecium 90—100  $\mu$ . Sp. 15—20  $\times$  7.5—9  $\mu$ . *3. lutescens.*
- 3 b. Th. grayish white, I—. Base of exciple pale. Thecium 130—150  $\mu$ . Sp. 18—27  $\times$  9—11  $\mu$ . *4. cinereocaesius.*
- 3 c. Th. yellowish white, I + blue, Pd—. Base of exciple dark. Thecium 85  $\mu$ . Sp. 20—25  $\times$  9—10  $\mu$ . *5. scruposus.*

1. *D. actinostomus* (PERS.) ZAHLBR.

in *Hedwigia* 31: 34, 1892; *Catal. Lich.* 2: 651, 1924. — *Urceolaria actinostoma* PERS. apud Ach., *Lichenogr. Univ.*: 288, 1910; TUCK. in *Proc. Amer. Acad.* 7: 227, 1866.

Oahu. Volcanic rocks, MANN (TUCK.).

Cosmopolitan in temperate regions.

2. *D. oceanicus* ZAHLBR. MS. n. sp.

»Thallus epilithicus, uniformis, ad 0.3 mm crassus, dilute ochraceus v. lutoso-ochraceus v. sublateritius, opacus, CaCl—, KOH—, areolatus v. areolato-rimosus; areolis contiguis, parvis, 0.4—1 mm latis, convexiusculis, superne parum inaequalibus vel subpulverulentis, protothallo nullo distincto, ecorticatus; medulla alba, I passim violaceo-caerule-sens, ex hyphis dense intricatis et inspersis formata; gonidia 7—9  $\mu$  lata,  $\pm$  conglomerata.

Apothecia immersa, in areolis 1—5, valde angusta, ad 0.2 mm lata, margine thallino angusto, integro, thallum aequante, margine proprio tenui, nigricante, disco  $\pm$  punctiformi, caesio-pruinoso. Peritheciun dimidiatum, crassiusculum, nigrum, subflabellatum, discum superans et parum inflexum. Hypothecium decolor, subtus linea obscura angustaque limitatum. Hymenium decolor, 90—110  $\mu$  altum, I vix lutescens. Epitheciun angustum, subpulverulentum, nigricans. Paraphyses conglutinatae, simplices, ad apicem vix latiores, ad 1.5 mm crassae. Asci oblongo-clavati, 8-spori. Sporae e decolore fuscae, ovales v. ellipsoideo-ovales, submurales, septis longitudinalibus 5, septis verticalibus 1—3, 16—26  $\times$  8.5—12  $\mu$ .

Kauai. Hanamaulu, 50 m, ad saxa basaltica, FAURIE (235); Kealia, ad saxa basaltica, FAURIE (247). — Oahu. CROSBY (139); Prope Honolulu, ad lavam, FAURIE (481).

A *D. actinostomo* (PERS.) distat thallo  $\pm$  ochraceo tincto, CaCl— et sporis fere duplo minoribus.» From ZAHLBR. MS.

3. *D. lutescens* ZAHLBR.

in Ann. Mycol. 10: 373, 1912; Catal. Lich. 2: 663, 1924.

Hawaiian Is., BAILEY (U. exs.) s. n. *Urceolaria cinereocaesia*.

— Hawaii. Mt Mauna Kea 3000', on volcanic rock, FAURIE (815) Z. l. c.

»Durch die Farbe (lutoso-lutescens) des fast schuppigen Lagers von den übrigen Arten abweichend.« ZAHLBR. l. c. — BAILEY's specimen agrees with *lutescens* in the sordid yellow colour, the reactions and the small spores, but differs by uniform, only scantily fissured thallus and dense, small apothecia, 0.4—0.5 mm. Evidently it has grown on earth.

Endemic.

4. *D. cinereocaesius* (Sw.) VAIN.

in Ann. Acad. Sci. Fenn. ser. A, 15, no 6: 172, 1921; ZAHLBR., Catal. Lich. 2: 660, 1924. — *Lichen cinereocæsius* Sw. apud Ach., Lichenogr. Prodri.: 34, 1798. — *Urceolaria cinereocaesia* Ach., TUCK. in Proc. Amer. Acad. 7: 227, 1866.

Oahu. Kaala, c. 1000 m, on earth, MANN (TUCK.). — W. Maui. MANN, on lava (U. exs.) s. n. *Urceolaria cinereofusca*.

General distribution: Tropical and subtropical regions.

5. *D. scruposus* (SCHREB.) NORM.

in Nyt Magaz. f. Naturw. 7: 232, 1853; ZAHLBR., Catal. Lich. 2: 665, 1924. — *Lichen scruposus* SCHREB., Spicil. Flor. Lipsiens.: 133, 1771.

Hawaiian Is., BAILEY (U. exs.). — Oahu. On open ground, DIDRICHSEN, 1846 (U.); Keanamanu valley, 300 m. H. B. S. 1938, on rocks (with *Stereocaulon supervestiens* in no 5847). — Hawaii. Summit of Hualalai, 2600 m, 1922, SKOTTSBERG (1737) on earth and decomposed vegetable matter with *Baeomyces Skottsbergii*, scantily.

The Hualalai specimen is white (with a yellowish tint), very minutely uneven, continuous with few cracks, medulla I+ blue, K—, Pd—, C+ intensely red. Apothecia dense, 0.7—1 mm broad, almost in thallus level, disc concave, black (not pruinose), margin rather smooth, not inflexed. — Apothecia 150  $\mu$  thick. Exciple 20—25  $\mu$ , dark brown. Hypothecium 20—25  $\mu$ , colourless. Thecium 85  $\mu$ , upper 12—15  $\mu$  dark greenish brown. Spores about 25  $\times$  10  $\mu$ , with 8—10 cells (5 transversal septa).

The Keanamanu specimen is hardly one cm square, somewhat uneven from the dense 0.25—0.5 mm broad, somewhat depressed black discs with their wall-like, prominent, circular, even thallus margin. Reactions as in the first specimen.

Thecium 100  $\mu$  high. Excipe uniformly blackish brown, at surface 50  $\mu$  broad, laterally 30  $\mu$ . Spores 20—25  $\times$  9—10  $\mu$ , pale green, muriform, most of the numerous observed ones shrunk. The species of this group are not yet extricated but the given facts speak more in favour of the real *D. scruposus* than of some other similar species.

Cosmopolitan.

There is in ZAHLBRUCKNER's MS. mentioned a specimen from Hawaii: »Mauna Kea, at 2000 m (FAURIE 802 in hb. Berlin)» without determination, only with the note: »Thallus C coccineus, Med. I + ».

### Gyalectaceae.

#### *Microphiale* (STIZ.) ZAHLBR.

1 a. Ap. deep yellow or yellowish-orange.

2 a. Sp. 9—13  $\times$  4—5  $\mu$ . 1. *lutea*.

2 b. Sp. 17—18  $\times$  1.8—2  $\mu$ . 1. *lutea* f. *stenospora*.

1 b. Ap. pale reddish yellow or whitish flesh coloured. Sp. 9—10  $\times$  3—4  $\mu$ . 2. *diluta*.

#### 1. *M. lutea* (DICKS.) ZAHLBR.

in Sitz.ber. K. Akad. Wiss. Wien, math.-naturw. Classe 111: 393, 1902; Catal. Lich. 2: 697, 1924. — *Lichen luteus* Dicks., Fasc. Plant. Crypt. Brit. 1: 11, 1785, tab. 2, fig. 6. — *Lecidea lutea* NYL. in Ann. Sci. Nat. Bot., 4 ser. 11: 243, 1859. — *Gyalecta lutea* HORNEM., TUCK. in Proc. Amer. Acad. 7: 227, 1866.

Hawaiian Is., REMY (NYL.). — Oahu and Lanai. MANN (TUCK.).

Cosmopolitan.

#### f. *stenospora* ZAHLBR. MS. n. f.

»Sporae angustae, hinc inde leviter curvulae, 16—18  $\mu$  longae et 1.8—2  $\mu$  latae. Apothecia vix 1 mm diam. Hymenium jodo fulvescit. Sporae angustiores quam in forma *tropica* MÜLL. ARG. (cf. Graphideae Fééanae p. 5) eas pro forma tropica huius speciei indicat [8—14  $\times$  2.5—3.5(4)  $\mu$ .]» ZAHLBR.

Kauai. On bark of *Aleurites* by Hanapepe River, about 300 m, HELLER (2512). — Hawaii. Hilo, on bark, LILLIE (672). Z. in MS.

#### 2. *M. diluta* (PERS.) ZAHLBR.

in Ann. Naturhist. Hofmus. Wien 19: 413, 1904; Catal. Lich. 2: 694, 1924. — *Peziza diluta* PERS., Synops. Meth. Fung.: 668, 1801.

Kauai. Haena bay, on *Pandanus*, H. B. S. 1938, scantily (mixed in 5628). — Oahu. Koolau, Pupukea-Kahuku trail,  $\pm 400$  m H. B. S. 1938 (5840), on twigs covered with *Usnea* (cf. *australis*), scantily.

Cosmopolitan.

### Ephebaceae.

#### *Leptogidium* N.Y.L.

Under the head-line: *Leptodendriscum* sp. ZAHLBRUCKNER has written the following description in his MS.: »Thallus byssaceo-crustaceus, plagas sat expansas, substrato adpressas formans, uniformis, obscure aeruginosus vel passim fusco-aeruginosus, increbre ramosus, ramis  $\pm$  intricatis, non elongatis, curvulis vel arcuatis, raro subrectis, solidis,  $30-70 \mu$  crassis, subcylindricis vel subclaviformibus, undique cortice obtectis e serie unica cellularum formata, grosse paraplectenchymaticis, cellulis angulosis, leptodermaticis, intus gonidiis scytonemaceis in una vel ut plurimum in seriebus binis longitudinalibus dispositis, cellulis moniliformiter concatenatis ex hyphis paucis leptodermaticis conglutinatis et crebre septatis seiunctis. Apothecia ignota.

Hawaii. Rainbow fall prope Hilo, c. 50 m, ad cortices, FAURIE (906).

In dem Bau des Lagers stimmt sie mit der Beschreibung von VAINIO (Lich. Brésil: 219, 1890) sehr gut überein. Das Nichtvorhandensein von Apothezien lässt aber eine Zugehörigkeit zu Gattung *Leptodendriscum* nicht sicher erscheinen. Es sei hiermit die Aufmerksamkeit auf diese Flechte gelenkt.» ZAHLBR. MS.

#### *L. dendriscum* N.Y.L.

in Flora 56: 195, not, 1873. — *Leptogium dendriscum* N.Y.L., Synops. Lich. 1: 135, 1858. — *Ephebe byssoides* CARE. in Transact. Bot. Soc., Edinburgh 7: 411, 1862. — *Leptogidium byssoides* ZAHLBR., Catal. Lich. 2: 756, 1924.

Hawaiian Is., BAILEY in Exs. (U.) on bark, fert., s. n. *Leptogium dendriscum*.

One apothecium  $0.9 \times 0.4$  mm, stalked. Chains of *Scytonema*-gonidia penetrating from the stalk into the central part of the exciple. Epithecium K+ pale yellowish brown. Spores abundant,  $10-12 \times 5-7 \mu$ , evidently 1-septate, especially in  $\text{HNO}_3$ , but septum often indistinct or removed towards one end, in K apparently simple, fusiform.

Agrees well with VAINIO's description, l.c. The specimen quoted by ZAHLBR. is evidently the same thing.

Widely distributed.

**Polychidium Mass.**

**P. muscicola** (Sw.) S. GRAY.

Natur. Arrang. Brit. Plants 1: 402, 1821; ZAHLBR., Catal. Lich. 2: 759, 1924. — *Lichen muscicola* Sw. in Nova Acta Acad. Upsal. 4: 248, 1784.

Hawaii. Kilauea, c. 1200 m, on moss, ster., FAURIE (904).

» Die Pflanze liegt nur steril vor; sie ist in Thallus etwas heller als die europäische Flechte, aber stimmt, soweit es der Thallus betrifft, gut überein. Inzwischen bleibt es fraglich, ob sie doch mit der europäischen *P. muscicola* ganz identisch ist. » ZAHLBR. MS.

General distribution: Temperate regions.

**Collemaceae.**

**Lempholemma** (KBR.) ZAHLBR.

**L. (Lemphospora) Dussii** (VAIN.) ZAHLBR.

Catal. Lich. 3: 23, 1925. — *Collema Dussii* VAIN. in Ann. Acad. Sci. Fenn., ser. A. 6, no 7: 114, 1915.

Kauai. Kokee, 1100 m H. B. S. 1938 (6022) on cortex, also mixed in no 6014.

Probably identical with the specimen, described by VAINIO, though the apothecial disc is beautifully reddish brown and the thallus not distinctly lobate. — Specimen 1—2 cm large, only margins occasionally lacerate, surface continuous with a few large perforations, very uneven from variously directed ridges, partly reticulate with foveolate, 1—1.5 mm large depressions, plane at their base, thallus also uneven from  $\pm$  numerous, small granules on the ridges. Lower side pale, bluish green, uneven from low ridges, no rhizinae. — Apothecia very numerous upon the ridges, 0.7—1 mm wide, hardly constricted at the base,  $\pm$  innate with rather thick, uneven margin.

Thallus 150—200  $\mu$  thick, gelatinous, hyphae and *Nostoc*-chains perpendicularly directed to the olivaceous yellow surface, both rather scanty. No cortex on thallus or apothecia. Only a narrow about 35  $\mu$  thick part of centre without gonia, hyphae there  $\pm$  parallel. — Apothecial structure agrees completely with VAINIO's description. Spores with thick, verrucose-uneven wall, 9—14  $\times$  8—10  $\mu$ .

Formerly known only from Guadeloupe Island.

**Physma Mass.**

- |   |                      |
|---|----------------------|
| 1 a. Surface of thallus granular-tuberculate. | 1. <i>plicatum</i> . |
| 1 b. Surface of thallus smooth.               | 2. <i>byrsinum</i> . |

1. *Ph. plicatum* (PERS.) HUE

in Bull. Soc. Linn. Normand. ser. 5, 9: 136, 1906; ZAHLBR., Catal. Lich. 3: 26, 1925. — *Collema plicatum* PERS. apud GAUDICH., Voyage Uranie, Botan., 1826: 205. — *Dichodium plicatum* ZAHLBR. MS.

Kauai. Kilauea, 100 m, on bark, ster., FAURIE (6). — Maui. Haleakala, ± 1000 m (586); Iao valley, 350 m (590), both on bark and ster., FAURIE, Z. in MS.

Formerly known only from the Molucca Islands.

2. *Ph. byrsinum* (ACH.) MÜLL. ARG.

in Flora 68: 531, 1885; ZAHLBR., Catal. Lich. 3: 25, 1925. — *Parmelia byrsea* ACH., Method. Lich.: 222, 1803. — *Dichodium byrsinum* (NYL.) ZAHLBR. MS.

Kauai. Hanapepe fall, 300 m, on bark, ster., FAURIE (5 et 7). — Maui. Nahiku, on bark, ster., FAURIE (585). Z. in MS.

General distribution: Tropical regions.

*Collema* (WIGG) ZAHLBR.

1 a. Th. radiatingly plicate, isidiate.

2 a. Th. very dark, isidia globular. 1. *furfuraceum*.

2 b. Th. brownishgreen, rugae ± indistinctly radiating or intricate. Isidia short, thin, often subfurfuraceous. 3. *oahuense*.

1 b. Th. with non-radiating rugae.

3 a. Th. 50—80  $\mu$  thick, isidia short, subfurfuraceous to squamulose. Ap. 0.2—0.3 mm. 2. *rupestre*.

3 b. Th. 100—150  $\mu$  thick, margin and partly surface with granulaeform' isidia. 4. *kauaiense*.

1. *C. furfuraceum* (AREN.) DR.

in Arkiv f. Bot. Bd. 22 A. No. 13: 3, 1929. — *Synechoblastus nigrescens* v. *furfuraceum* AREN. in Flora 1881 p. 115. — *Collema nigrescens* Huds. etc pr. p., see ZAHLBR., Catal. 3: 51, 1925.

Kauai. Hanapepe fall, on bark, FAURIE (10). — Maui. Iao valley, 350 m, FAURIE (581). »Ganz unsicher, da mir nur sterile Thalli vorliegen. Weiter zu prüfen, ob die Art ein Bürger der hawaiischen Inseln ist.» ZAHLBR. MS.

Known at least from Europe, Brazil and Kamchatka.

2. *C. rupestre* (SW.) RABH.

Deutschl. Krypt.-Flora 2: 50, 1845; ZAHLBR., Catal. Lich. 3: 57, 1925. — *Lichen rupestris* Sw., Method. Muscor.: 37, 1781.

Kauai. Kokee, 1100 m, H. B. S. 1938 (6035) ster., on bark, only  $2 \times 2$  cm large. — Maui. Iao valley, 1922, SKOTTSBERG (in 1613: *Nephroma tropicum*) on rocks. — Hawaii. Kilauea, Kipuka Puaulu, H. B. S. 1938 (5977) fert., associated with *Sphinctrina leucopodooides* NYL.

The small specimen from Kilauea on bark only  $1.5 \times 1$  cm wide, appressed, rugose, surface brownish black from dense, short isidia, almost furfuraceous. Lower side naked. Apothecia several, most of them young, 0.2—0.3 mm wide, one examined 0.6 mm, all constricted at base, sessile, disc brownish red, plane to convex with thin paler margin.

Thallus 50—80  $\mu$  thick, gelatinous; surface, 12—18  $\mu$ , oliveaceous yellow from dense gonidia, 3—4  $\mu$  large (*Nostoc*), apparently cellular seen from above with 3—4.5  $\mu$  rounded cells, but in transversal sections with 3  $\mu$  thick hyphae, variously directed, in much gelatine and with  $\pm$  dense chains of gonidia, paler towards bottom. — Apothecium 0.3 mm thick. Exciple 80—100  $\mu$  thick at margin, hyphae radiating with scanty chains of gonidia, laterally on under side up to 130  $\mu$  thick with exterior 15  $\mu$  distinctly cellular, cells 4—5(7)  $\mu$ , angular or ellipsoid-ovoid. Hypothecium at centre 60—70  $\mu$  thick, dense, cellular, cells 3—4  $\mu$ , angular,  $\pm$  thinwalled. Thecium 80—90  $\mu$ , I  $\pm$  dark blue. Ascii 65—70  $\times$  12  $\mu$ . Spores 20—25  $\times$  7  $\mu$ , 4-septate, fusiform. — Seems to agree with European specimens.

General distribution: Temperate regions.

### 3. C. oahuense H. MAGN. n. sp. ad int.

Thallus late expansus, membranaceus, laxe adpressus, fuscensenti-aeruginosus, breviter et indistincte lobatus, grosse plicato-rugosus vel undulatus, plicis subradiantibus vel saepius intricatis, ambitum versus sublaevis, pro maiore parte isidiosus, isidiis brevibus, tenuibus, saepe furfuraceis, interdum incrassatis dense tectus, subtus pallidior, laevigatus. Sterilis.

Oahu. Manoa valley 1922, SKOTTSBERG (1452). On the bark of *Eugenia malaccensis*.

Thalli 3—4 cm diam., often confluent to at least 7 cm, thallus surface very uneven from irregular, 2—10 mm long rugae with abrupt sides and deep irregular or radiatingly stretched depressions, the few visible lobes very irregular in size and shape. Surface on non-isidiate parts paler,  $\pm$  bluish-green, in most parts  $\pm$  greenish brown from the dense, hardly 100  $\mu$  long isidia which are thinly verruciform, rarely subfoliosely dilated or irregular.

Thallus 50—80  $\mu$  thick, without cortices. Hyphae regularly perpendicular to the surface, 1.7  $\mu$  thick, very few longitudinal.

*Gonidia Nostoc*, scattered, in chains. Upper 15—18  $\mu$  darker, olivaceous yellow, the rest  $\pm$  pale. Isidia 17—100  $\mu$  high, often narrower at the base, bluntly clavate.

In absence of apothecia it is impossible to place this specimen definitively even in the genus *Collema* not to speak of one of its sections. There is a similarity with *C. furfuraceum*, which, however, is darker in colour and has more regularly radiating rugae. ZAHLBRUCKNER's above-mentioned specimens of *furfuraceum* which I have not seen, may belong to this new species.

#### 4. *C. kauaiense* H. MAGN. n. sp. ad int.

Thallus  $\pm$  expansus, membranaceus, substrato arcte adpressus, fuscescenti-olivaceus, ambitum versus irregulariter laciatus, laciniis concavis marginibus adscendentibus, undulatis, marginibus praecipue controversus et pro parte superficie isidiis granuliformibus dense obtectis. Sterilis.

Kauai. Kokee, 1100 m, H. B. S. 1938 (6041) on bark with *Pannaria exasperata* H. MAGN. and *Normandina pulchella*.

Thallus continuous for at least 6 cm, circumference not regular, lacinia there 0.5—3 mm broad, variously directed and only partly discrete, their centre smooth, appressed to the bark, their margins raised and undulate, partly somewhat granular, centre with confluent indistinct lobes, only their centre  $\pm$  smooth, margins erect and deformed by the dense granular-like isidia,  $\pm$  spreading also to the deeper thallus surface.

Thallus 100—150  $\mu$  thick, homogeneous, gelatinous, gelatinous cover 5—6  $\mu$  thick with a few longitudinal, 1—1.5  $\mu$  thick hyphae. *Nostoc*-chains uniformly scattered through the thallus, hyphae 1.7—2  $\mu$  thick, vertical and horizontal ones in about equal number. Granules 100—180  $\mu$  diam., globular, filled with dense *Nostoc* gonidia. Thallus I—.

The new species is distinguished by its membranaceous lobes with raised granular margins. Being sterile it is impossible to place it within a definite section and to state if it is previously described. At all events it deserves a name as it is well represented from the locality mentioned.

#### *Leptogium* (S. GRAY) ZAHLBR.

- 1 a. Lower surface naked. Sp. muriform (*Euleptogium*).
- 2 a. Margin of th. or ap. isidiate.
- 3 a. Margin of ap. isidiate.
- 4 a. Margins of lobes very crispate, granular or isidiate. Thec. 150  $\mu$ . Sp. 24—30  $\times$  12—14  $\mu$ . 1. *chloromelum*.

- 4 b. Resembling *moluccanum* but with foliose isidia.  
 Thec. 100  $\mu$ . Sp. 16—23  $\times$  7—9  $\mu$ . 2. *denticulatum*.  
 4 c. Ap. marginal, 0.3—0.7 mm. Thec. 150—180  $\mu$ .  
 Lobes longitudinally rugose, margin crispat. Sp. 25—35  $\times$  10—13  $\mu$ . 3. *marginellum*.

3 b. Margin of ap. not isidiate. Ap. rare.

- 5 a. Th. 45—75(110)  $\mu$  thick, smooth, not plicate.  
 4. *cyanescens*.

- 5 b. Th. 110—170  $\mu$ , both sides thinly rugose. Isidia  
 $\pm$  branched. 5. *austroamericanum*.

2 b. No isidia developed.

- 6 a. Ap. immersed in swellings. Lobes rugose. Sp. 22—  
 30  $\mu$  long.

- 7 a. Lobes 5—1 mm broad, thick, rugae acute. Thec.  
 100—160  $\mu$  high. Sp. 8—10  $\mu$  broad, cells few.  
 6. *phyllocarpum*.

- 7 b. Lobes 10—2 mm broad, crowded, smooth, longitudinally rugose,  $\pm$  blackish green. Thec. 140—  
 200  $\mu$  high. Sp. 10—13  $\mu$  broad, cells  $\pm$  numerous.  
 7. *vesiculosum*.

6 b. Ap. not immersed.

- 8 a. Th. less than 50  $\mu$  thick.

- 9 a. Th. 20—24  $\mu$  thick with impressed dots. Lobes  
 2—10 mm broad, plumbeous. 8. *phylogenum*.

- 9 b. Th. 35—50  $\mu$ . Lobes 15—1.5 mm broad. Ap.  
 0.7—2.5 mm broad. Thec. 90—130  $\mu$ . Sp. 15—  
 20  $\times$  6—9  $\mu$ . 9. *moluccanum*.

- 8 b. Th. 80—100  $\mu$ , smooth. Thec. 120—150  $\mu$ . Sp.  
 22—28  $\times$  8—10  $\mu$ . Exciple thin, hyphose.  
 10. *azureum*.

- 8 c. Th. 210—400  $\mu$ . Exciple cellular.

- 10 a. Thec. 170  $\mu$ . Ap. 2—1 mm. Lobes 10—3 mm  
 broad, acutely rugose on upper side. Sp.  
 28—38  $\times$  14—16  $\mu$ . 11. *sessile*.

- 10 b. Thec. 175  $\mu$ . Ap. 1 mm. Lobes up to 14 mm  
 broad,  $\pm$  rugulose. Sp. 34—40  $\times$  12—16  $\mu$ .  
 12. *mesotropum*.

- 1 b. Lower surface white tomentose. Almost monophyllous,  
 undulate,  $\pm$  smooth. Sp. 22—27  $\times$  8—10  $\mu$  (*Mallotium*).  
 13. *Menziesii*.

### Sect. 1. *Euleptogium Tuck.*

1. *L. chloromelum* (Ach.) NyL.

in Mém. Soc. Sci. Nat. Cherbourg 5: 333, 1857; Tuck. in

Proc. Amer. Acad. 7: 234, 1866; ZAHLBR., Catal. lich. 3: 131, 1925. — *Parmelia chloromela* ACH., Meth. Lich.: 228, 1803.

Oahu. MANN (TUCK.). — Maui. Haleakala, ± 1000 m, ster., FAURIE (580 pr. p., 582). — Hawaii. Mauna Kea, near SHIPMAN's ranch house, ster., Rock (181), Z. in MS., where a sign of equality is placed between this species and *ruginosum* NYL.

General distribution: Tropical and subtropical regions.

## 2. *L. denticulatum* NYL.

in Annal. Sci. Nat. Bot., ser. 5, 7: 302, 1867. — *L. tremelloides* v. *leptophyllum* MEY. & FLOT. in Nova Acta Acad. Leop.-Carol. 19: 228, 1843 (Suppl.). — *L. leptophyllum* ZAHLBR., Catal. Lich. 3: 136, 1925.

Kauai. Kokee, 1100 m, H. B. S. 1938 (5992), on bark, ster. — Oahu. On bark, fert. (MEY. & FLOT.).

General distribution: Tropical America.

## 3. *L. marginellum* (Sw.) S. GRAY

Natural. Arrang. Brit. Plants 1: 401, 1821; ZAHLBR., Catal. Lich. 3: 143, 1925. — *Lichen marginellus* Sw., Nova Gen. et Spec. Plant.: 147, 1788.

Hawaiian Is.? One sterile specimen without locality and collector in Exs. (U.). — Kauai. Hanalei, on shore (1); near Wailua, 200 m (2, 3), both on bark, FAURIE, Z. in MS.

General distribution: Tropical regions.

## 4. *L. cyanescens* (Ach.) KBR.

Syst. Lich.: 420, 1855; DU RIETZ in Bot. Not. 1922 p. 320. — *Collema tremelloides* v. *cyanescens* ACH., Synopsis: 326, 1814. — *Leptogium caesium* VAIN., Lich. Brésil 1: 225, 1890.

Hawaii. Kilauea, Kipuku Puaulu, H. B. S. 1938 (5976) ster. Cosmopolitan.

## 5. *L. austroamericanum* (MALME) DODGE

in Ann. Missouri Bot. Garden 20: 419, 1933. — *L. cyanescens* v. *austroamericanum* MALME in Arkiv f. Bot. 19. No. 8: 25, 1924.

Oahu. Koolau mts, back of Tantalus ridge, about 600 m, 1922, SKOTTSBERG (1495) ster. — Maui. Between Haelauu and Nakalalua, 900—1300 m, H. B. S. 1938 (5828), on bark, ster.

General distribution: Tropical and subtropical regions.

## 6. *L. phyllocarpum* (PERS.) MONT.

in Annal. Sci. Nat., Bot., ser. 3, 10: 134, 1848; TUCK. in Proc. Amer. Acad. 7: 234, 1866; KEMPH. in Verh. Zool.-bot.

Ges. Wien 26: 434, 1876; ZAHLBR., Catal. Lich. 3: 149, 1925.  
— *Collema phyllocarpum* PERS. apud GAUDICH., Voyage Uranie, Botan.: 204, 1826.

Hawaiian Is., BAILEY (U. exs.) var. — Kauai. Waimea distr., Kohua ridge (Kawaia trail) at 3500', H. B. S. 1938 (5655) ster. — Oahu. MANN (TUCK.); »Lihue, an feuchten, schattigen Stellen, an Bäumen, Wawra (2261)», KEMPH. l. c.

The specimen from Kauai is characterized by its smallness, only  $1-2.5 \times 1-2$  cm, its exceedingly dense and thin ridges.

General distribution: Tropical and subtropical regions.

#### 7. *L. vesiculosum* (Sw.) MALME

in Arkiv f. Bot. 19. No. 8: 14, 1924. — *Lichen vesiculosus* Sw., Nova Gener. et Spec. Plant.: 147, 1788. — *Leptogium bullatum* ZAHLBR., Catal. Lich. 3: 128, 1925 and in MS.

Maui. Crater of Haleakala, on bark, fert., Rock (150).  
Z. in MS.

General distribution: Tropical and subtropical regions.

#### 8. *L. phyllogenum* VAIN.

in Annal. Acad. Sci. Fenn., ser A, 15, No. 6: 36, 1921.

Oahu. Koolau mts, back of Tantalus mt, about 600 m, 1922, SKOTTSBERG (mixed in no 1495 with *moluccanum* and *austroamericanum*), ster.

Resembling *moluccanum* but with  $\pm$  dense impressed dots, as described by VAINIO (l. c.). Uncertain, perhaps only *moluccanum*. — Thallus 35  $\mu$  thick with one row of cortical cells,  $6-8 \times 5-7$   $\mu$  large, thin-walled. Gonidial stratum in centre  $\pm$  contiguous, gonidia 5—6  $\mu$ , rather solitary. Medullary hyphae somewhat dense.

Formerly known from the Philippine Islands.

#### 9. *L. moluccanum* (PERS.) VAIN.

Lich. Brésil 1: 223, 1890; ZAHLBR., Catal. Lich. 3: 145, 1925.  
— *Collema moluccanum* PERS. apud GAUDICH., Voyage Oranie, Botan.: 203, 1826.

Hawaiian Is., BAILEY (U. exs.) fert. — Kauai. On Pandanus (5610) fert.; (5624) ster., with *Physcia* sp.; forest at Lehua makanoe (6046) ster., on bark, H. B. S. 1938; Kaholuanamo, 3600', in forest, fert., Rock (42); Koloa, 300 m, FAURIE (12), both on bark; Kaukao, 1000 m, above moss, FAURIE (275) Z. in MS. — Oahu. In *Aleurites triloba*, DIDRICHSEN (70) 1846 (U.); Near Honolulu, 500 m, on bark, fert., FAURIE (435, 436) Z. in MS.; Koolau mts, Kee awa valley, 400—500 m (1403, 1404) fert.; Koolau, 600 m, back of mt Tantalus (1495) fert.; Koolau, Kawai iki ditch trail (1478), on moss, ster., very

scantly, 1922, SKOTTSBERG. — Molokai. Rim of ravine near Upper Maunahui camp, 1040 m, on a twig (5704); Pelekunu, 1300 m, on the trunk of *Viola robusta* (5599), H. B. S. 1938 fert. — Maui. Haelaau, 910 m, on bark (5818) fert.; between Haelaau and Nakalalua, 910—1030 m (5828) fert., H. B. S. 1938. — Hawaii. Kohala, Upper Hamakua ditch, 1000 m, between 1st and 2nd house, on bark, ster. (5981), on moss (5883) H. B. S. 1938; Mauna Loa, on *Sapindus*, Rock (179); at 1500' on bark, fert., Brother M. NEWELL; mt Kiaeua, on bark, fert. FAURIE (11) Z. in MS.

As the species here called *moluccanum* does not agree with the description given by MALME (in Arkiv f. Bot. Bd. 19. No. 8: 23, 1924) I will record the facts found by an examination of the specimen no 5828 from Maui. The specimen from Molokai, Pelekunu agrees completely.

Thallus 50—70  $\mu$  thick. One cortex consisting of one cell-row with 6—9  $\mu$  large, bluntly angular, thin-walled cells, surface wall about 1.7  $\mu$  thick, colourless. Gonidia 3—5  $\mu$ , bluish green, layer 30—35  $\mu$  thick, gonidia rather uniformly dispersed. The other cortex with 1—2 rows, cells resembling the upper ones, perhaps slightly smaller and often broader than high. — Apothecia about 1 mm broad, 0.3 mm thick. Cortex on lower side, when thickest, 70—90  $\mu$ , tapering towards the edges to 12—15  $\mu$ , there with usually (1)2 cell-rows and 6—8(10)  $\mu$  large, subangular cells, cells in lower part up to 17  $\mu$  long, interior ones angular, 12—15  $\mu$  broad, exterior ones narrower, 7—8  $\mu$ , perpendicularly lengthened, passing into those of the thallus cortex. Gonidial stratum developed up into the margin, there 12—20  $\mu$  thick (absent on one side). Exciple (parathecium) 14—20  $\mu$  thick, in the very margin pseudoparenchymatous with 5—8  $\mu$  large,  $\pm$  rounded cells, below with only 2  $\mu$  broad, often horizontally  $\pm$  lengthened cells, walls thick, gelatinous, refracting. Hypothecium about 25  $\mu$  thick, grayish, disappearing at the base of the margin, intricate, with small, indistinct cells. Thecium 150—170  $\mu$  high, colourless, I + dark blue, only in upper 20  $\mu$  pale sordid yellow. Paraphyses 1—1.5  $\mu$ , contiguous, apices conglutinate, indistinct, also in KOH, in Pd 5—6  $\mu$  thick, with 2—3 clavate joints. Ascii 100—135  $\times$  17  $\mu$ , clavate, apices I + very dark blue. Spores 8, 27—32  $\times$  15—16  $\mu$  with about 12—15 cells (from above), transversal septa 5—6, longitudinal ones 1—2.

The height of thecium and the spores too great for *L. Tuckermannii* DODGE, the thallus too thin and the spores too small for *L. mesotropum* MÜLL. ARG.

General distribution: Tropical regions.

Ges. Wien 26: 434, 1876; ZAHLBR., Catal. Lich. 3: 149, 1925.  
— *Collema phyllocarpum* PERS. apud GAUDICH., Voyage Uranie, Botan.: 204, 1826.

Hawaiian Is., BAILEY (U. exs.) var. — Kauai. Waimea distr., Kohua ridge (Kawaia trail) at 3500', H. B. S. 1938 (5655) ster. — Oahu. MANN (TUCK.); »Lihue, an feuchten, schattigen Stellen, an Bäumen, Wawra (2261)», KEMPH. l. c.

The specimen from Kauai is characterized by its smallness, only  $1-2.5 \times 1-2$  cm, its exceedingly dense and thin ridges.

General distribution: Tropical and subtropical regions.

#### 7. *L. vesiculosum* (Sw.) MALME

in Arkiv f. Bot. 19. No. 8: 14, 1924. — *Lichen vesiculosus* Sw., Nova Gener. et Spec. Plant.: 147, 1788. — *Leptogium bullatum* ZAHLBR., Catal. Lich. 3: 128, 1925 and in MS.

Maui. Crater of Haleakala, on bark, fert., Rock (150).  
Z. in MS.

General distribution: Tropical and subtropical regions.

#### 8. *L. phyllogenum* VAIN.

in Annal. Acad. Sci. Fenn., ser A, 15, No. 6: 36, 1921.

Oahu. Koolau mts, back of Tantalus mt, about 600 m, 1922, SKOTTSBERG (mixed in no 1495 with *moluccanum* and *austroamericanum*), ster.

Resembling *moluccanum* but with  $\pm$  dense impressed dots, as described by VAINIO (l. c.). Uncertain, perhaps only *moluccanum*. — Thallus 35  $\mu$  thick with one row of cortical cells,  $6-8 \times 5-7$   $\mu$  large, thin-walled. Gonidial stratum in centre  $\pm$  contiguous, gonidia 5—6  $\mu$ , rather solitary. Medullary hyphae somewhat dense.

Formerly known from the Philippine Islands.

#### 9. *L. moluccanum* (PERS.) VAIN.

Lich. Brésil 1: 223, 1890; ZAHLBR., Catal. Lich. 3: 145, 1925.  
— *Collema moluccanum* PERS. apud GAUDICH., Voyage Oranie, Botan.: 203, 1826.

Hawaiian Is., BAILEY (U. exs.) fert. — Kauai. On Pandanus (5610) fert.; (5624) ster., with *Physcia* sp.; forest at Lehua makaneo (6046) ster., on bark, H. B. S. 1938; Kaholuanano, 3600', in forest, fert., Rock (42); Koloa, 300 m, FAURIE (12), both on bark; Kaukao, 1000 m, above moss, FAURIE (275) Z. in MS. — Oahu. In *Aleurites triloba*, DIDRICHSEN (70) 1846 (U.); Near Honolulu, 500 m, on bark, fert., FAURIE (435, 436) Z. in MS.; Koolau mts, Kee awa valley, 400—500 m (1403, 1404) fert.; Koolau, 600 m, back of mt Tantalus (1495) fert.; Koolau, Kawai iki ditch trail (1478), on moss, ster., very

10. *L. azureum* (Sw.) MONT.

in Ramon de la Sagra, Hist. phys. polit. et nat. de Cuba, édit. franç., Pl. cell: 114, 1838; DU RIETZ in Bot. Not. 1922 p. 322. — *Lichen azureus* Sw. apud ACH., Lichenogr. Prodr.: 137, 1798. — *Leptogium tremelloides* (L. fil.) MALME in Arkiv f. Bot. Bd. 19. No. 8: 22, 1924 (with descript.); ZAHLBR., Catal. Lich. 3: 158, 1925; TUCK. in Proc. Amer. Acad. 7: 234, 1866; MÜLL. ARG. in Flora 1889 p. 60. — *L. tremelloides* v. *azureum* NYL. in Ann. Sci. Nat., Bot., 4 ser. 11: 235, 1859.

Hawaiian Is. (NYL.). On bark between mosses, HILLEBRAND (MÜLL. ARG.). — Oahu (WILKE's Exp.). — Hawaii. Honolulu, on bark, ster., FAURIE (433, 434), Z. in MS.

v. *laciniatum* TUCK. in Proc. Amer. Acad. 7: 234, 1866; MÜLL. ARG. in Flora 1889 p. 60. »Cum planta normali speciei (HILLEBRAND)» MÜLL. ARG. l. c. — Oahu. Pickering, MANN (TUCK.). I do not know a description of this variety.

General distribution: Tropical regions.

11. *L. sessile* VAIN.

in Ann. Acad. Sci. Fenn. ser. A, 6, no 7: 108, 1915; ZAHLBR., Catal. Lich. 3: 155, 1925.

Kauai. Waimea distr., Kohua ridge (Kawaea trail) about 3500' (5746) and Kokee (in 6011), H. B. S. 1938 fert.

Formerly known from Lesser Antilles.

12. *L. mesotropum* MÜLL. ARG.

in Flora 1889 p. 60; ZAHLBR., Catal. Lich. 3: 145, 1925.

Hawaiian Is. On mossy trunks, HILLEBRAND (MÜLL.). — Kauai. Koloa, c. 100 m, on bark, FAURIE (4), Z. in MS.

»Thallus caerulescenti-plumbeus, opacus, substrato centro adpressus, rosulas 15—50 mm latas, dispersas v. approximatas, irregulares formans, 210—400  $\mu$  crassus, irregulariter laciniato-lobatus, lobis  $\pm$  confertis, concavis et assurgentibus, usque 14 mm latis, rotundato-incisis, crenulatis v. sinuatis, superne laciniis passim rugulosis v. subvelutino-inaequalibus, nudis vel hinc inde squamulis parvis adspersis, inferne rhizinis omnino destitutis, paulum pallidioribus, subrugulosis et subfurfuraceo-inaequalibus. Utrinque corticatus, cortice e serie cellularum unica formato, cellulis subcubicis, 4—5.5  $\mu$  latis, leptodermaticis, gonidiis praecipue versus marginem thalli sitis, nostoca-ceis, concatenatis, centrum thalli versus valde sparsis vel deficientibus; gelatinam copiosam continens, hyphis medullaribus subhorizontalibus, ad 2  $\mu$  crassis, leptodermaticis, ramosis, tenuissime septatis, cellulis cylindricis.

Apothecia ad 1 mm lata, alto sessilia,  $\pm$  approximata, ad basin bene constricta et inde hemisphaerica, disco planiusculo,

rufo, margine thallino angusto, integro, subruguloso, leviter inflexo, extus a serie unica corticata; perithecio infra hymenio evoluto et usque ad verticem hymenii assurgente, prosoparenchymatico, cellulis infra hymenium in seriebus verticalibus 10—15, angulosis, leptodermaticis, 7—11  $\mu$  latis, in parte peritheci laterali minoribus; hypothecio angusto, flavescente, ex hyphis dense intricatis formato; hymenio superne rufescente, caeterum decolore, 170—180  $\mu$  alto, I violaceo-caeruleo; paraphysibus strictis, conglutinatis, ad apicem non latioribus; ascis oblongo-clavatis, membrana modice incrassata cinctis, 8 sporis; sporis in ascis biserialibus, ellipsoideo- v. ovali-fusiformibus, murali-divisis, septis longitudinalibus 8—9, septis verticalibus 2—3, 34—40  $\times$  12—16  $\mu$ .

Der Bau des Margo thallinus gleicht dem von *L. caesium* (Ach.) Vain., die Art ist aber durch den dickeren, breitlappigen und anders gelappten Thallus sicher als verschieden zu erkennen.» From Zahlbr. MS.

The specimens were at first described as *L. Faurianum* n. sp. by Zahlbr., but were afterwards considered as *L. mesotropum*, but probably Zahlbr. has seen no authentic specimen.

Endemic.

### Sect. 2. *Mallotium* (Ach.) Vain.

#### 13. *L. Menziesii* (Sm.) Mont.

in Annal. Sci. Nat., Botan. ser. 3, 18: 313, 1852; Zahlbr., Catal. Lich. 3: 177, 1925; Hue in Nouv. Arch. Muséum, Paris, ser. 3, 10: 229, 1898 (with description). — *Lichen Menziesii* Sm. apud Ach., Method. Lich.: 221, 1803.

f. *fuliginosum* Müll. Arg. in Flora 72: 60, 1889; Zahlbr. l. c. p. 178; ? *L. saturninum* Tuck. in Proc. Amer. Acad. 7: 234, 1866.

Hawaiian Is., Hillebrand (Müll.). — Maui. Ulapalakua, on trees, Mann (Tuck.); on trunks, ster.,  $\pm$  4000', Baldwin (13); Haleakala,  $\pm$  1000 m, ster., Faurie (580) Z. in MS.

»Thallus supra partim crebre fuliginoso-isidiosulus.» Müll. l. c.

General distribution: Tropical and subtropical regions.

There is a curious plant from E. Maui: Haleakala, along Halemau trail, at 2500 m, H. B. S. 1938 (5900) on a twig, ster., which probably belongs to *Leptogium*,

Thallus 1—2 mm thick, in 3—5 mm large groups, very dark brown. Lobes  $\pm$  erect, very thick and flexuous, depressed-compressed with rugulose and partly granular surface, forming cushion-like growths. — Thallus 150—200  $\mu$  thick,

gelatinous. Cortices 4—6  $\mu$  thick on both sides, consisting of 1—2 rows of 2.5—3.5  $\mu$  large, very thin-walled, angular cells, distinct especially from above. Upper 15—20  $\mu$  dark olive brown. Medulla gelatinous, colourless, with scanty, 2—2.5  $\mu$  thick, thin-walled,  $\pm$  longitudinal hyphae. Gonidia bluish green in long chains (*Nostoc*), dense towards surfaces, scanty to absent at the centre. Thallus I—.

### Heppiaceae.

#### Heppia NÆG.

##### 1. H. (*Solorinaria*) *lavicola* ZAHLBE. n. sp.

»Thallus e squamulis formatus, 0.3—0.6(1) mm et ad 0.2 mm crassis,  $\pm$  congestis v. dispersis, rotundatis vel parum difformibus, leviter convexis, laevigatis, ad ambitum angustatis, adpressis vel parum convolutis, pallide olivaceus, opacus, hyphis medullaribus substrato affixus, sorediis et isidiis destitutus, homoeomericus, ecorticatus, superne leviter fuscescens et membrana valde tenui amorpho supertectus, totus pseudoparenchymaticus; hyphis thalli increbris, 3—3.7  $\mu$  crassis, leptodermaticis, septatis, cellulis oblongo-cylindricis, gonidiis crebris, nostocaceis, cellulis  $\pm$  globosis, membrana tenuissima cinctis, 8.5—14  $\mu$  lata, vagina distincta non circumdatis.

Apothecia subimmersa, minuta, in squamulis solitaria et iis minoribus, disco e concavo plano, rufofusco, opaco, margine thallino angusto, integro, parum prominulo, tenui, sed obtusulo; perithecio distincto nullo; epithecio valde angusto, pulverulento; hypothecio angusto, decolore, ex hyphis intricatis formato; hymenio superne tenuiter rufescens-fusco, caeterum decolore, 85—95  $\mu$  alto, I caerulecente (massa sporarum in ascis lutescente), paraphysisibus simplicibus, ad apicem vix latioribus, gelatinam copiosam percurrentibus; ascis ovali-clavatis, ad apicem late rotundatis et ibidem membrana incrassata cinctis, myriosporis; sporis subglobosis v. ovaliglobosis,  $\pm$  3.5  $\mu$  longis.

Pyrenoconidia non visa.

Oahu. prope Honolulu, ad lavam (FAURIE 482 p. p., 484 p. p.).» From ZAHLBE. MS.

##### 2. Heppia sp.

Oahu. Ewa Coral plain, 1922, SKOTTSBERG (in 1152—54).

Only a few sterile squamules. One squamule 0.7  $\times$  0.3 mm, most part filled with bluish green gonidia, stratum at least 100  $\mu$  thick, gonidia  $\pm$  clustered, 8—12  $\mu$ , globular. Cortex

indistinct, thin. Thallus cellular throughout, cells 3—5(6)  $\mu$   $\pm$  angular, rather thin-walled. Base at centre with a (50)100  $\mu$  broad umbilicus, sides free.

### Pannariaceae.

#### *Parmeliella* MÜLL. ARG.

##### *P. nigrocincta* (MONT.) MÜLL. ARG.

in Flora 64: 86, 1881; ZAHLBR., Catal. Lich. 3: 218, 1925.  
— *Parmelia nigrocincta* MONT. in Ann. Sci. Nat., Bot., ser. 2, 6: 91, 1835. — *Pannaria nigrocincta* TUCK. in Proc. Amer. Acad. 7: 226, 1866.

Oahu. MANN (TUCK.). — Maui. Iao valley, on bark, FAURIE (540, 541). — Hawaii. Rainbow fall, on bark, ster., FAURIE (902) Z. in MS.

General distribution: Tropical and subtropical regions.

### Pannaria DEL.

- 1 a. Structure incompletely known. Th. grayish brown, effigurate, covered by ap. Sp. 17—18  $\times$  8—9  $\mu$ . On rocks.
  1. *Hookeri* f. *oceana*.
- 1 b. Med. consisting of a single layer, gonidia immediately below cortex.
  - 2 a. Hypothallus thin, effuse. Th. gray, squamulose, appressed. Ap. 0.5—1 mm. Thec. 120—135  $\mu$ . Sp. 12—15  $\times$  7—8  $\mu$ .
    2. *cinerata*.
  - 2 b. Hypothallus spongiosa-tomentose.
    - 3 a. Cortex and med. Pd + orange. Th. lobes rounded, short,  $\pm$  flabellate.
      - 4 a. Without isidia. 3. *ruginosa*.
      - 4 b. Ap. margin and th. edges isidiate. 4. *lepidophora*.
    - 3 b. Cortex and med. Pd—. Th. lobes elongate, narrow to linear. 5. *marianna*.
  - 1 c. Med. consisting of two strata. Gonidia in central part of thallus.
    - 5 a. Th. lobes with naked margins. 6. *lurida*.
    - 5 b. Th. lobes with caesio-sorediate margins. 7. *fulvescens*.
    - 5 c. Th. lobes with squamulaeform isidia. 8. *exasperata*.

#### 1. *P. Hookeri* (BORG.) NYL. f. *oceana* (KREMPH.) ZAHLBR.

Catal. Lich. 3: 243, 1925. — *Pannaria leucolepis* f. *oceana* KREMPH. in Verh. zool.-bot. Ges., Wien, 26: 436, 1876.

Oahu. »In den Pali auf Felsen, Wawra (1737).» KREMPH. (probably: Nuuanu Pali).

Thallus et apothecia quoad omnes partes magis evoluta, quam in speciminibus Europaeis. . . . Hypothecium angustum, pallide rufum. . . . » From KRMPh. l. c.

Endemic.

2. *Pannaria cinerata* ZAHLBR. MS. n. sp.

» Thallus squamulosus, cinereus, K—, C—, squamulis 50—80  $\mu$  crassis, subdispersis vel approximatis, usque 2 mm latis, crenulato-lobulatis, crenatis vel inciso-lobulatis, adpressis in margine laevissime assurgentibus vel omnino planiusculis, hypothallo effuso, aeruginoso-nigricante superstratus, sorediis et isidiis destitutus; cortice grosse pseudoparenchymatico, uni- vel biseriali, ex cellulis majusculis, leptodermaticis,  $\pm$  angulosis formato; strato gonidiali gonidiis copiosis, nostocaceis, pallide aeruginoso-ceaerulescentibus, concatenato-glomeratis formato, glomerulis subglobosis, gelatinosis; hyphis medullaribus increbris, ad 1.8  $\mu$  latis,  $\pm$  horizontalibus, passim increbre septatis, mox assurgentibus, subverticalibus, ramosis, leptodermaticis; hypothallus crassus, ex hyphis obscuro-fuscis, ramosis et intricatis, leptodermaticis, 3.5—5.5  $\mu$  crassis, dense septatis (cellulis  $\pm$  globosis) constans.

Apothecia sessilia, ad basin bene constricta, dispersa vel  $\pm$  proximata, 0.5—1 mm lata, disco planiusculo, rufo vel obscurato, opaco, epruinoso, margine thallino thallo concolore, persistente, prominulo et inflexo, tenui, leviter crenulato, gonidia copiosa usque ad verticem continentem, corticato, cortice pseudoparenchymatico (cellulis leptodermaticis, majusculis, in seriebus superpositis 3—4), infra discum elongato, in lateribus inaequali; excipulo integro, infra hymenium minute pseudoparenchymatico, ad latus hymenii ex hyphis flabellato-verticalibus septatisque formato, strato gonidiali crasso superposito; hypothecio angusto, lutescente, a hyphis intricatis composito; hymenio superne rufescenti-fuscescente, 120—135  $\mu$  alto, I caeruleo, strato supremo tamen non colorato; paraphysibus conglomeratis, ad 1.5  $\mu$  crassis, simplicibus, ad apicem parum latioribus; ascis oblongo-clavatis, 8 sporis; sporis in ascis subbiseriatis, ovalibus v. ovali-ellipsoideis, membrana tenui, laevique cinctis, 12—15  $\times$  7—8  $\mu$ .

Kauai. Kaukao,  $\pm$  1000 m, FAURIE (274). — Maui. Nahiku, corticola, FAURIE (577).

var. *exornata* ZAHLBR. MS. n. var.

Thallus soralibus parvis, 0.2—0.3 mm latis, adpresso-sessilibus, rotundis, planis v. planiusculis, thallo subconcoloribus v. magis aeruginascentibus, margine tenui, integro cinctus. Apothecia paullo minora, 0.4—0.5 mm lata.

Maui. Hana  $\pm$  50 m, corticola, FAURIE (559). — Hawaii. In volcano Kilauea, c. 1200 m, corticola, FAURIE (910).» From ZAHLBR. MS.

### 3. *P. rubiginosa* (THUNB.) DEL.

in Dictionn. Class. Hist. Nat. 13: 20, 1828; TUCK. apud WILKES, U.S. Expl. Exped. 17: 145, 1861; Proc. Amer. Acad. 7: 226, 1866; ZAHLBR., Catal. Lich. 3: 256, 1925. — *Lichen rubiginosus* THUNB. apud ACH., Lichenogr. Prodr.: 99, 1798.

Kauai. Kaholuamano, in forest, 3600', on bark, Rock (14) and CROSBY (218). — Maui. Haleakala,  $\pm$  1000 m, on bark, FAURIE (545, 547), Iao valley, on bark, FAURIE (548, pr. p., 553). Z. in MS. In the crater of Haleakala, 2200 m, 1922, SKOTTSBERG (1678), fert. — Hawaii. Haena, S. of Hilo, Pandanus forest, 1922, SKOTTSBERG (1264) ster. Uncertain, but medulla Pd + orange. Hawaii, PICKERING (TUCK. 1861); in summit of Hualalai, on earth, 8000', and on trunks, MANN (TUCK. 1866). Mauna Loa, 5000' on *Sapindus*, Rock (158). Z. in MS.

v. *prolifera* (NYL.) MÜLL. ARG. in Bull. Herb. Boissier 2, appendix 1: 43, 1894. — *Pannaria prolifera* NYL., Lich. Nov. Zeland.: 48, 1888. — *P. prolificans* VAIN. in Journ. of Bot. 36: 70, 1896. ZAHLBR., Catal. Lich. 3: 255, 1925.

Maui. Haleakala, in crater, 6700', on bark of *Ilex sandwicensis* Rock (151). — Hawaii. Mauna Loa, about 5000', on bark of *Sapindus*, Rock (159). Z. in MS.

»Thallus colore pallido, laciniis margine microphyllino-proliferis. Apothecia non visa. Subspecies sit *P. rubiginosae*.» NYL. l. c. — A note in ZAHLBR. MS. states that it is not even a variety but only a form.

Cosmopolitan.

### 4. *P. lepidophora* VAIN.

in Annal. Acad. Sci. Fenn., ser. A, 15, no 6: 12, 1921; ZAHLBR., Catal. Lich. 3: 244, 1925.

Kauai. Kokee, Kalua Puhi trail,  $\pm$  1200 m, H. B. S. 1938 (5954) ster., scantily, with *Normandina*. — Oahu. Waianae mts, Makaha valley, 1922, SKOTTSBERG (1685), on bark, ster., uncertain. — Molokai. Edge of ravine near Upper Maunahui camp, 1040 m, H. B. S. 1938 (5721) fert. — Maui. Puu Kukui, 1750 m, summit forest, on top twigs of *Metrosideros*, H. B. S. 1938 (5777, 5899) fert., and in the wood near the hut (5837) fert.

Thallus (in 5777) covering the twigs all round, the abundant apothecia concealing most of the thallus, only few marginal laciniae seen. Their margins and apothecial margin densely

beset with minute ± isidia-resembling squamules. — Comes near to *P. rubiginosa*; the anatomical structure and Pd-reaction the same, e. g. brownish orange = C. U. C. 172. Thallus KOH—.

Formerly known from the Philippine Islands.

5. *P. mariana* (Fr.) Müll. Arg.

in Flora 70: 321, 1887; 72: 62, 1889; ZAHLBR., in Denkschr. Math.naturw. Klasse K. Akad. Wiss., Wien 88: 28, 1911; Catal. Lich. 3: 246, 1925: — *Parmelia mariana* Fr., Syst. Orb. Veget., 1: 284, 1825. — *Parmelia sandwichiana* Pers. apud GAUDICH., Voyage Uranie, Botan.: 199, 1826. — *Pannaria pannosa* (Nyl.) TUCK. in Proc. Amer. Acad. 7: 225, 1866; KEMPH. in Verh. zool.-bot. Ges. Wien 26: 436, 1876.

Exs.: MERR. ser. 1, 83, s. n. *P. pannosa*.

Hawaiian Is., BAILEY 43 (U. exs.) fert.; on trees, GAUDICHAUD (Nyl.). Common on trunks, HILLEBRAND (Müll.); common at low and medium altitudes, MANN (Tuck.). — Kauai. Koloa (15), Hanapepe fall (25), both at 300 m, on bark, FAURIE, Z. in MS. Lehua makanoe, 1200 m (5942) ster. (a small pale specimen with isidia along the margins); Lihue, Mrs D. ISENBERG's garden (5826) fert., both H. B. S. 1938. — Oahu. MANN in Exs. (U.); in *Aleurites triloba*, 1846, DIDRECHSEN (69) U.; on Hau tree, 1895, A. A. HELLER, in MERR. exs. 83 (hb. MAGN.); Nuuanu Pali, WAWRA (KEMPH.); Punaluu valley, 700—800 m, ster.; Kaliuwaa valley, on *Eugenia moluccensis*, fert.; Punaluu mts, 1500' ster., on bark, Rock; Near Honolulu, on bark, FAURIE (423) Z. in MS. Manoa valley on *Eugenia moluccensis* (1451, fert., 1454, ster.); Koolau mts, back of Tantalus ridge, 600 m, fert. (1497, thallus pale glaucous yellow); Kawai ihi ditch trail, on trees, fert. (1466) 1922 SKOTTSBERG; Koolau Kipapa Gulch, 600 m, H. B. S. 1938 (5980) ster. — Molokai. Forest between upper Maunahui camp and Pepeopae, 1000—1200 m, fert. (5709, a small specimen with short, narrow, ascendant laciniae at centre); edge of ravine near Upper Maunahui camp, 1040 m, ster. (5703, a form with pale, radiating thallus, central lobes narrow, ascendant, black hypothallus predominating) H. B. S. 1938. — Maui. Iao valley, on bark, FAURIE (348 pr. p.) Z. in MS.; on stones at 350 m, 1922, SKOTTSBERG (1598); near Needle Point, H. B. S. 1938 ster. (5859, margins of lobes bluish); between Haelaau and Nakalua, H. B. S. 1938, ster. (5829, with dense isidia at centre). — Hawaii. At 1500' (1), at 600' (46, 47) Brother M. NEWELL; on shore, CROSBY (199); Kilauea, fert. (31 pr. p.) FAURIE, all on bark, Z. in MS.; Kilauea, on branches of *Metrosideros*, RECHINGER (2521), ZAHLBR. l. c. 1911.

General distribution: Tropical regions.

6. *P lurida* (MONT.) NYL.

in Mém. Soc. Sci. Nat. Cherbourg 5: 109, 1857; ZAHLBR., Catal. Lich. 3: 245, 1925; TUCK. in Proc. Amer. Acad. 7: 225, 1866. — *Collema luridum* MONT. in Ann. Sci. Nat. Bot., ser. 2, 18: 236, 1842.

Hawaiian Is., GAUDICHAUD (MONT. and TUCK.) and HILLEBRAND (MÜLL.). BAILEY (63) fert. (U. exs.). — Kauai. Ko-loa, 300 m, ster. (28); Wailua, 300 m, fert. (30, 729); Hanapepe fall 300 m (33); Olokele, 500 m, fert. (385), FAURIE; Kaholuamano, in forest at 3600', Rock (18), Z. in MS.; on Kukui tree 1895, HELLER, fert. (hb. MAGN. ex hb. PLITT); Lehua makanoe, 1190 m, fert. (5988); Waimea distr., Kohua ridge (Kawaia trail) 3500', fert. (5747) H. B. S. 1938. — Oahu. MANN (U. exs.); N. J. ANDERSSON 1852 (U.) ster. (forma); CROSBY (229) fert.; Luliehi valley, on branches, 2000' (1778), and without locality, WAWRA (KEMPH.), the latter called *P. sandwichiana*: »margine apothecii plicato-rugoso aut plicato-lobulato»; Luliehi valley, on tree trunks, ECKFELDT in hb. Vindob., Z. in MS.; Manoa valley on *Eugenia malaccensis* (1458, ster., 1457 fert.); Nuuanu Kalihi ridge (1438) fert.; Koolau, Kee awa (mixed in 1403) 1922, SKOTTSBERG; Koolau, Kipapa Gulch, 600 m, fert. H. B. S. 1938 (5989, a form with short and broad lobes, apices  $\pm$  raised); Punaluu valley,  $\pm$  700 m (91), and mt Punaluu, Rock, Z. in MS. — Molokai. Forest between Upper Maunahui camp and Pepeopae, 1000—1200 m (5705, ster., 5722 fert.); valley NW of Upper Maunahui camp 1040 m, fert. (5719), on and under *Metrosideros* (2558) H. B. S. 1938. — Lanai. Matana valley, on bark, Rock (115), Z. in MS. — Maui. Haleakala,  $\pm$  1000 m, fert., FAURIE (554, 555, 562, 563); Mt Kukui, on bark, Rock (115), Z. in MS.; Puu Kukui, 1750 m, on *Metrosideros*, 1922, SKOTTSBERG (1710) fert.; between Haelaau and Nakalalua, 900—1300 m, H. B. S. 1938 (5873, 5916 fert.; 5870, 5878, 5885 ster.). — Hawaii. At 1500', Brother NEWELL (5); in forest on bark, 3000', CROSBY (176); Kalua, on bark, FAURIE (919), Z. in MS.; Kohala, Upper Hamakua ditch,  $\pm$  1000 m, between 1st and 2nd house, H. B. S. 1938 (6042) fert.

v. *hypomela* TUCK. in Proc. Amer. Acad. 7: 225, 1866 (nomen nudum). Hawaiian Islands, HILLEBRAND, MANN (TUCK.).

General distribution: Tropical and subtropical regions.

7. *P. fulvescens* (MONT.) NYL.

in Mém. Soc. Sci. Nat. Cherbourg 5: 109, 1857; ZAHLBR., Catal. Lich. 3: 242, 1925. — *Parmelia fulvescens* MONT. in Annal. Sci. Nat., Bot. ser. 3, 10: 125, 1848.

Kauai. Waialeale, ster. and fert. (17, 18, 20, 37); Kipukai,

over mosses on bark (19, 38); Koloa, 300 m, ster. (21, 22); Kaukao, 1000 m (276); Olokele  $\pm$  600 m (384), all on bark, FAURIE, Z. in MS.; Lehua makanoe, 1200 m, on *Wikströmea*, H. B. S. 1938 (6036) ster. — Oahu. Kalihi, 500 m, ster. (422); Honolulu, 500 m (431) both on bark, FAURIE, Z. in MS. — Maui. Haleakala,  $\pm$  1000 m, on bark, FAURIE (543, 544, 549, 551, 561), Z. in MS.

The only specimen tested by me gave these reactions: med. Pd + intensely ochraceous red, upper medullary layer K + distinctly yellow.

General distribution: Tropical regions.

#### 8. *P. exasperata* H. MAGN. n. sp.

Thallus  $\pm$  late expansus, luridus vel glaucescenti-luride-scaens, ambitu lobatus, lobis dilatatis, arcte adnatis, apice crenatis, marginibus adscendentibus, mox squamulis isideoideis dense obsitus, controversus pulvinulis confluentibus squamularum dense tectus, subtus pallidus vel  $\pm$  obscuratus, haud corticatus. Medulla e stratis duplicitibus formata. Apothecia ignota.

Kauai. Kokee, 1200 m, on decaying bark, H. B. S. 1938 (5994, type, 6025) with *Normandina pulchella*.

Only parts of thalli collected, the largest  $4 \times 3$  cm, with 4—8 mm long, 2—3 mm broad, marginal lobes, plane to concave with raised margins, surface opaque, smooth or with lengthened, shallow, variously directed depressions, the lobulae on the margin about 0.5 mm long, 0.2—0.4 mm broad at apices, in crowded, branched groups, quite covering the centre which is 2—2.5 mm thick, concolorous with the thallus or  $\pm$  caesious or brownish. No hypothallus visible.

Thallus 200—250  $\mu$  thick. Upper cortex 12—15(25)  $\mu$ , colourless or yellowish, cellular, cells  $5—8 \times 5—6$   $\mu$  large, rounded,  $\pm$  thick-walled. Below cortex a distinct medullary layer, 10—20  $\mu$  thick, without gonidia, cells  $2—5 \times 2$   $\mu$ , horizontally stretched. Gonidial layer 30—50  $\mu$  thick with 3—5  $\mu$  large gonidia in  $\pm$  inrolled chains with in KOH gelatinous sheaths. Medulla below gonidial layer darkened by granules, transparent in KOH, hyphae  $\pm$  longitudinal and intricate, 3—4  $\mu$ , thin-walled. No distinct lower surface, hyphae there  $\pm$  brownish or occasionally  $\pm$  bluish green, in  $HNO_3$  pale violet. Thallus KOH— or upper medulla  $\pm$  brownish yellow, Pd—.

The new species has the same anatomical structure as *P. fulvescens* and probably a similar appearance, but there are no soredia and the isidia-resembling outgrowth is more squamulose. Thereto the Pd-reaction of *fulvescens* is positive. *P.*

*exasperata* ought to be compared with *P. Ramosii* VAIN. from the Philippine Islands, but certainly the more microphylline than isidiouse margins and the double strata of the medulla in the former separate them.

### Coccocarpia PERS.

1 a. Sp.  $6-7.5 \times 2-2.5 \mu$ . Upper cortex indistinct. Radiating lobes 1—1.3 mm large, isidiouse, olivaceous brown.

1. *fuscata*.

1 b. Sp.  $7-13 \times 2-5 \mu$ . Upper cortex about  $20 \mu$ , cells 3—6  $\mu$ . Ap. 1—5 mm, adnate. Laciniae irregular, 10—2 mm broad.

2 a. Th. non isidiate. 2. *pellita*.

2 b. Thallus isidiate. 3. *cronia*.

1 c. Sp.  $14-16 \times 7-8 \mu$ . Upper cortex  $15-20 \mu$ , cells 6—8  $\mu$ . Radiating lobes 7—15 mm broad, plumbeous smooth.

4. *Gayana*.

1. *C. fuscata* ZAHLBR.

in Annal. Mycol. 10: 376, 1912; Catal. Lich. 3: 284, 1925.  
Kauai. Halemanu valley, in forest, on bark, Rock (66),

Z. in MS.

Endemic.

2. *C. pellita* (Ach.) MÜLL. ARG.

in Flora 65: 320, 1882; 72: 62, 1889; MALME in Arkiv f. Bot. 20 A, No. 3: 18, 1925 (with descriptions of formae); ZAHLBR., Catal. Lich. 3: 285, 1925. — *Parmelia pellita* Ach., Lichenogr. Univ.: 468, 1810. — *C. pellita* v. *genuina* MÜLL. ARG. in Flora 65: 321, 1882.

Hawaiian Is., among mosses, ster., HILLEBRAND (MÜLL.). — Oahu. Mt Punaluu, 1000 ft, on bark, Rock (50) Z. in MS. v. *parmelioides* (HOOK.) MÜLL. ARG. in Revue Mycol. 9: 139, 1887; ZAHLBR., Catal. Lich. 3: 287, 1925. — *Lecidea parmeloides* HOOK. apud KUNTH, Synops. Plant. Aequinoct. Orb. Novi 1: 15, 1822. — *Pannaria molybdaea* (PERS.) TUCK. in Proc. Amer. Acad. 7: 225, 1866.

Kauai. Haleakala, on bark, FAURIE (362). — Oahu. Near Honolulu, on bark, ster., FAURIE (419) Z. in MS. On trees, Oahu, MANN (TUCK.).

General distribution: Tropical regions.

3. *C. cronia* (TUCK.) VAIN.

in Annal. Acad. Sc. Fenn. ser. A, 6, no 7: 103, 1915; ZAHLBR., Catal. Lich. 3: 282, 1925. — *Parmelia cronia* TUCK. in Proc. Amer. Acad. 1: 228, 1848.

Hawaiian Is., BAILEY (U. exs.) fert., s. n. *Pannaria molybdaea*.

v. *aurantiaca* (HOOK.) VAIN. in Annal. Acad. Sci. Fenn., ser. A, 15, no 6: 24, 1921; ZAHLBR., Catal. Lich. 3: 282, 1925. — *Solorina aurantiaca* HOOK. fil. et TAYL. in Journ. of Bot. 3: 635, 1844. — *C. pellita* v. *aurantiaca* ZAHLBR. MS.

Oahu. Near Honolulu, on bark, ster., FAURIE (416), Z. in MS.

General distribution: Tropical regions.

#### 4. *C. Gayana* (MONT.) NYL.

Syn. Lich. 2: 41, 1863; Hue in Nouv. Arch. Mus., Paris ser. 3, 3: 41, 1891 (with description). — *Parmelia Gayana* MONT. in Annal. Sci. Nat., Bot. ser. 3, 11: 58, 1849. — *Parmeliella Gayana* (MÜLL. ARG.) ZAHLBR., Catal. Lich. 3: 210, 1925.

Kauai. Waimea distr., Kohua ridge (Kawaia trail) 3500', H. B. S. 1938 (5657) fert., with *Erioderma pulchellum*. Seems typical.

Formerly recorded from S. America and the Pacific.

#### *Erioderma* FÉE

- 1 a. Underside yellowish white without veins, sparingly tomentose. 1. *unguigerum*.
- 2 a. Without isidia. type.
- 2 b. Central lobes with granular-isidiate margins. v. *marginatum*.
- 1 b. Underside bluish white with distinct veins, rhizinae white. 2. *pulchrum*.
  - 3 a. Ap. dark carneous, pruinose. Sp. 13—16 × 6—8 µ. Upper side tomentose. type.
  - 3 b. Ap. epruinose. Sp. 10—13 × 7.5—8.5 µ. Upper side less tomentose. v. *sandwicense*.

#### 1. *E. unguigerum* (BORY) NYL.

in Mém. Soc. Sci. Nat. Cherbourg 5: 110, 1857; TUCK. in Proc. Amer. Acad. 7: 225, 1866; ZAHLBR., Catal. Lich. 3: 279, 1925. — *Lichen unguigerus* BORY, Voyage Quatr. Iles d'Afrique 1: 393, 1804.

Oahu. On trees, MANN (TUCK.).

Formerly recorded only from Mauritius.

v. *marginatum* ZAHLBR. apud RECHINGER in Denkschr. math.-naturw. Classe, K. Akad. Wiss., Wien 88: 29, 1911; Catal. Lich. 3: 280, 1925.

Hawaii. Kilauea, on branches of *Metrosideros*, RECHINGER (2543) ZAHLBR.

Endemic.

2. *E. pulchrum* MÜLL. ARG.

in Flora 63: 262, 1880; ZAHLBR., Catal. Lich. 3: 279, 1925.

v. *sandwicense* ZAHLBR. in Annal. Mycol. 10: 377, 1912;

Catal. Lich. l. c.

Hawaiian Is., BAILEY (U. exs.) s. n. *E. unguigerum*, fert. — Kauai. Olokele, 600 m, on bark, FAURIE (382), Z. in MS.; Waimea distr., Kohua ridge (Kawaia trail) 3500' (mixed in 5657: *Cocc. Gayana*, and 5631: *Megal. atrorubicans*); Alakai, Kilohana, 1200 m (5682), H. B. S. 1938. — Molokai. Valley NW of Upper Manuahui Camp, 1040 m (5713, 5715); on and under *Metrosideros* (2558), H. B. S. 1938. — Maui. Puu Kukui, summit forest, 1750 m (5912, 5922, 5927); on top twigs of *Metrosideros* (5652), H. B. S. 1938; Haleakala 6700', on bark, Rock (147); 2000 m, FAURIE (564), Z. in MS. — Hawaii. Kilauea, 1200 m, on bark, FAURIE (950), Z. in MS.

In hb. Uppsala I have found an envelope: *E. polycarpum* LEIGHTON no 55, Ceylon, containing two species: *E. pulchrum* v. *sandwicense* and *E. Wrightii* v. *limbatum* NYL.

Formerly known only from the Hawaiian Islands.

### Stictaceae.

#### *Lobaria* SCHREB.

##### Sect. *Ricasolia* (DNot.) VAIN.

- 1 a. Surface smooth or partly impressed uneven, below pale brownish. Margin of ap. crenulate or usually granular. Sp. 3—7-septate. 1. *patinifera*.
- 1 b. Surface impressed or reticularly uneven, sometimes with white dots or spots, below pale to testaceous. Margin of ap. crenulate to lobate. Sp. 11—15-septate. 2. *crenulata*.

##### 1. *L. patinifera* (TAYL.) HUE

in Nouv. Archiv. Muséum, Paris, ser. 4, 3: 29, 1901; ZAHLBR., Catal. Lich. 3: 308, 1925. — *Parmelia patinifera* TAYL. in Hook. Journ. of Bot., London 6: 172, 1847. — *Ricasolia patinifera* MÜLL. ARG. in Flora 72: 61, 1889.

»Insulae Sandwic.: frequenter ad truncos et ramos ramulosque (HILLEBRAND)» MÜLL. ARG. l. c. — Maui. Between Haelaau and Nakalalua, H. B. S. 1938 (5874). Only a few small specimens on cortex. Thecium destroyed. Cortex KOH +

yellow, medulla K(C) + red, Pd—; W. Maui, in the mountains, MANN & BRIGHAM (U. exs.) fert. s. n. *Sticta erosa*.

General distribution: Tropical regions.

2. *L. crenulata* (HOOK.) TREVIS.

*Lichenotheca Veneta* 1869, no. 75; ZAHLBR., Catal. Lich. 3: 298, 1925. — *Parmelia crenulata* HOOK. apud KUNTH, Synopsis. Plant. Aequinoct. Orb. Nov. 1: 23, 1822. — *Ricasolia crenulata* NYL., Synopsis. Lich. 1: 372, 1860. — *Sticta crenulata* TUCK. in Proc. Amer. Acad. 7: 225, 1866.

Hawaiian Is., GAUDICHAUD (Mus. Paris) NYL. l. c.; BAILEY (U. exs.) fert. — Kauai. Waimea distr., Kohua ridge, about 3500', fert. (5603); forest below Lehua makanoe, fert. (6045), H. B. S. 1938. — Oahu. Waianae mts, Palehua, in forest about 650 m, fert., SKOTTSBERG 1922 (1516). — Molokai. Pepeopae, bog forest; at 1200 m, on trunks, ster. (5710), only a few lobes on moss; in a valley NW of Upper Maunahui Camp, at 1040 m, fert., on and under *Metrosideros* (5714), H. B. S. 1938. — West Maui and other islands, abundant, MANN (TUCK.), specimen in Exs. (U.).

Specimens Pd—, medulla CaCl + violet red, cortex KOH + yellowish.

General distribution: Tropical America and the Pacific.

**Pseudocyphellaria VAIN.**

1 a. *Pseudocyphellae white* (*Leucopseudocyphellatae*).

2 a. Gonidia bluish green.

3 a. Th. indistinctly sorediate with isidia or coraloid branches.

4 a. Lobes short, truncate, with isidia mainly from the surface. 1. *argyracea*.

4 b. Lobes linear, apices and edges with long coraloid branches. 2. *horridula*.

3 a. Th. sorediate.

5 a. Sor. maculiform on the surface of broad lobes. 3. *Thouarsii*.

5 b. Sor. mainly along the margins of narrow lobes. 4. *intricata*.

2 b. Gonidia yellowish green. Th. brownish, scrobiculate to reticulate-rugose with much divided, linear laciniae. 5. *dissimulata*.

1 b. *Pseudocyphellae yellow* (*Xanthopseudocyphellatae*).

6 a. Gonidia bluish green.

7 a. No sor. or isidia generally developed. Med. white. Lobes linear with dense ridges. 6. *carpoloma*.

- 7 b. Th. sorediate.
- 8 a. Lobes rounded, crenulate, reticulate with sor. mainly on the ridges. 7. *crocata*.
- 8 b. Lobes lengthened, surface  $\pm$  smooth.
- 9 a. Lobes moderately lengthened, margins raised, sorediate, apices rounded. Sor. partly also lateral. 8. *Mougeotiana*.
- 9 b. Lobes linear, dichotomous, truncate, brown to bluish gray, plane. Sor. scanty, mainly marginal. 9. *hawaiensis*.
- 6 b. Gonidia yellowish green.
- 10 a. Th. sorediate, with a reddish tone, opaque, below brownish black. Sp.  $23-28 \times 6-9 \mu$ , 3-septate, dark. 10. *aurata*.
- 10 b. Th. non sorediate. Sp.  $35-40 \times 6 \mu$ .
- 11 a. Th. with  $\pm$  flattened isidia or erect lobulae. 11. *flavicans*.
- 11 b. Th. scrobiculate, margins of lobes naked. 12. *orygmaea*.

### Sect. 1. Leucopseudocyphellatae STIZ.

#### 1. *Ps. argyracea* (BORY) VAIN.

in *Hedwigia* 37: (34), 1898. — *Lichen argyraceus* BORY apud DEL., *Hist. Lich. Sticta*: 91, 1822. — *Sticta argyracea* TUCK. in *Proc. Amer. Acad.* 7: 225, 1866; ZAHLBR., *Catal. Lich.* 3: 370, 1925; REDINGER in *Candollea* 8: 52, 1940.

Hawaiian Is., BAILEY (14), ster. (U. exs.). — Kauai. Kaholuamano, 3600 ft, on tree trunks in forest, ster., Rock (11); Hanapepe fall, on bark (94); Kaukao, about 1000 m, above mosses on tree trunks (269); F. GAY's summer house (296), on bark, ster., FAURIE, Z. in MS.; mountains in the interior, at 1300 m, 1905, HOCHREUTINER (3518), REDINGER. — Oahu. Nuuanu Pali, 500 m, on bark, ster. Rock (425), Z. in MS., Oahu, MANN (TUCK.); N. J. ANDERSSON, 1852 (U.) two specimens, ster., dark brown, centre with dense, confluent, brown isidia. — Molokai. Pukoo, about 200 m, on bark, ster., FAURIE (1085), Z. in MS. — Maui. Iao valley, on bark, ster., FAURIE (601), Z. in MS. — Hawaii. Kalua, on bark, ster., FAURIE (926, 929), Z. in MS.; Kohala mts, above Waimea, on trees, about 1100 m, 1922 SKOTTSBERG (1555), a bad specimen, uncertain, ster.

Medulla in the tested specimens C+ and K(C)+ red, Pd—.

f. *isidiophora* NYL. in *Ann. Sci. Nat., Bot.* 4 ser., 15: 141, 1861 (without description).

Oahu. Waianae mts, Palehua, in forest about 650 m, 1922 SKOTTSBERG (1520) ster., and with short, broad, ± contiguous lobes (1218) ster.

The whole flattened surface almost covered with ± branched, coralloid or somewhat applanated isidia, concolorous with the yellowish brown lobes, which are partly sorediate on their surface. Probably referable to this form.

General distribution: Tropical regions.

2. *Ps. horridula* (ZAHLBR.) H. MAGN.

*Sticta horridula* ZAHLBR. MS. n. sp.

»Thallus tenuis, 0.3—0.35 mm crassus, estipitatus, expansus, usque 14 cm latus, alte et radiatim lobatus, lobis primariis ± linearibus, 4—7 mm latis, dichotome v. trichotome divisus, ultimis ad apicem retusis v. rotundato-retusis, omnibus concavis v. subcanaliculatis, in margine (imprimis versus centrum thalli) isidiis cylindricis v. lobulis parvis et parum appanatis, ramosis, 2—4 mm longis densisque ornatus; superne glaucus v. fuscescenti-glaucus, madefactus luridus, foetidus, nitidulus, hinc inde isidiis fasciculatis obsitus, KOH—, sorediis destitutus; subtus flavescens-ochraceus, opacus, late nudus, centrum versus fuscatus et ibidem tomento obscuro brevi dense vestitus; cyphellis veris albis, passim ad 0.5 mm latis, modice concavis. — Cortice superiore 44—50  $\mu$  crasso, decolore, pseudoparenchymatico, cellulis rotundatis vel late ellipsoideis, membrana mediocri v. modice pachydermatico cinctis, in seriebus 5—6 superpositis, usque 9  $\mu$  latis, supremis multo minoribus; cortice inferiore 24—27  $\mu$  lato, extus fuscescente, caeterum decolore et strato corticali simili, ex seriebus cellularum pachydermaticarum 3 (rarius 2) superpositis formato; strato gonidiali angusto, in corticem superiore abeunte, pseudoparenchymatico, cellulis subangulosis leptodermaticis, gonidiis nostocaceis, lurido-aeruginosis, cellulis subrotundis, ad 3.5  $\mu$  latis, filamenta evoluta, gelatina circumdata formantibus; medulla alba, KOH—, CaCl—, ex hyphis laxiuscule intricatis, leptodermaticis, 3—4  $\mu$  crassis, septatis, cellulis cylindricis, pulvere dense insperso formata, rhizinis fasciculatis, fuscescentibus vel fuscis, 5.5—7  $\mu$  crassis, leptodermaticis, sat dense septatis, ad septa non constrictis.

Apothecia ignota.» ZAHLBR. MS.

Kauai. Waimea distr., Waialae valley, on trees, H. B. S. 1938 (5626 a). Waimea (cited under Hawaii), c. 4000 ft, on mossy trunks in bog, Rock (6) Z. in MS. and in Mus. Nat. Hist., Stockholm. — Molokai. Pepeopae, bog forest, at 1200 m, on moss (5726); forest between Upper Maunahui camp and Pepeopae (5723, 5725) H. B. S. 1938, all ster.

»*St. horridula* gehört in der Gruppe der *Eucyphellatae* und in dem Kreis von *St. tomentosa* (Sw.). Habituell sieht sie der *St. variabilis* (BORY) zum Verwechseln ähnlich, sowohl was die Zerteilung der Lagerlappen als auch die Ausbildung der Isidien oder isidienartigen Lagerläppchen betrifft; sie ist jedoch eine *Stictina* und kann daher mit der soeben genannten Art, welche *Pleurococcus*-Gonidien besitzt, in keine nähere Beziehung gebracht werden. Ausgezeichnet ist sie durch das tiefgeteilte Lager, durch die rinnigen Lappen derselben und die reichliche Ausbildung von Isidien.» ZAHLBR. MS.

I will add some details to ZAHLBRUCKNER's description, taken from the co-type in Mus. Nat. Hist., Stockholm: Cortical cells uniform to the surface, 3.5—6.5  $\mu$  large. Gonidia mostly concealed by dark gray granules, also filling the medulla. Cells of lower cortex 4—6  $\mu$  large, more thick-walled. Except the negative K- and Pd-reaction the positive C-reaction, intensely red, ought to be noted. Granules dissolving in either of the reagents.

*Ps. horridula* belongs undoubtedly to *Pseudocyphellaria* because of the farinose white pseudocyphellae, may be that they are rarer than in *Ps. argyracea*. It resembles the latter so much that it might perhaps be considered a variety of this species.

v. *excrescens* (ZAHLBR.) H. MAGN. — *St. intricata* v. *excrescens* ZAHLBR. MS. »Esorediosus, lobi thalli imprimis ad marginem et etiam in superficie iteratim dichotome divisi, fruticulosi, fruticulosi usque 5 mm longis, laciniis linearibus, planiusculis v. subteretibus.» ZAHLBR. MS.

Kauai. Waimea distr., Kohua ridge, about 3500 ft, H. B. S. 1938 (5616, 5647) ster., on branches. Several fine specimens, partly over 1 dm large. — Maui. Iao valley, ster., FAURIE (566) Z. in MS.

Although I have not seen ZAHLBRUCKNER's specimen I have no doubt in uniting the two specimens after the good description. Unfortunately, no reactions are given by ZAHLBRUCKNER but as my specimen is C+ it can not belong to *intricata*.

### 3. *Ps. Thouarsii* (DEL.) DEGEL.

Das ozean. Elem. d. Strauch- u. Laubflecht.flora Skand.: 150, 1935. — *Sticta Thouarsii* DEL., Hist. Lich. Sticta: 90, 1822. — *Stictina intricata* v. *Thouarsii* MÜLL. ARG. in Flora 72: 61, 1889; ZAHLBR., Catal. Lich. 3: 389, 1925.

Hawaiian Is., among mosses, ster., HILLEBRAND (MÜLL. ARG.).

Distribution uncertain. Reliable records occur from W. Europe, S. America and islands outside Africa.

4. *Ps. intricata* (DEL.) VAIN.

in *Hedwigia* 37: (36), 1898; *DEGELIUS*, l. c. p. 157 (with description of authentic specimen). — *Sticta intricata* DEL., *Hist. Lich. Sticta*: 96, 1822; *ZAHLBR.*, *Catal. Lich.* 3: 389, 1925.

f. *subargyracea* (NYL.) H. MAGN. — *Stictina intricata* v. *subargyracea* NYL., *Lich. Nova Zeland.*: 29, 1888. »*Thallus magis laciniosus*.»

Kauai. On bark of *Acacia Koa*, ster., Rock (72). — Maui. Nahiku, on bark, ster., FAURIE (597) Z. in MS.

*Ps. argyracea* and *intricata* are nearly related and sometimes confused. But there seems to be a difference in the medullary C-reaction between them, *intricata* being C—, K(C)— and *argyracea* C+, K(C)+ red, mentioned neither by HUE (in Nov. Arch. 1901) nor by MALME (in Bihang K. V. A. Handl. 1899). Thus, specimens from Juan Fernandez: Masatierra, Portegualo, collected by SKOTTSBERG 1916 (150, 154) ought to be *intricata* (C—), but called *argyracea* by ZAHLBR.

General distribution: Tropical and subtropical regions.

5. *Ps. dissimulata* (NYL.) VAIN.

in *Philippine Journ. of Sci.* 8: 118, 1913. — *Sticta dissimulata* NYL., *Synops. Lich.* 1: 362, 1860; *ZAHLBR.*, *Catal. Lich.* 3: 340, 1925; REDGR. in *Candollea* 8: 52, 1940.

Kauai. Interior mts, 1300 m, 1905 (3514) HOCHREUTINER (REDGR.).

In the specimen of *dissimulata* v. *hyphophaea*, issued in *Krypt. Vind.* 2841 (hb. MAGN.) the reactions are: thallus K—, Pd—, medulla C+ faintly red.

General distribution: S. Asia and the Pacific.

Sect. 2. *Xanthopseudocyphellatae* STRZ.Ser. 1. *Gonidia* bluish green.6. *Ps. carpoloma* (DEL.) VAIN.

in *Hedwigia* 37: (34), 1898; H. MAGN. in *Medd. Göteborgs Bot. Trädg.* 14: 28, 1940. — *Sticta carpoloma* DEL., *Hist. Lich. Sticta*: 159, 1822, additional plate (no. 19?), right figure; *ZAHLBR.*, *Catal. Lich.* 3: 373, 1925; KREMPELHUBER in *Verh. zool.-bot. Ges.*, Wien 26: 435, 1876.

Kauai. Kaokao ± 1000 m, ster. (271); Olokele 500 m, fert. (357, 358) both on bark; near GAY's summer house, 1000 m (295) FAURIE; Kaholuamano 3600', on tree trunks, ster. (37, 148) Rock; near SHIPMAN's ranch house, on mossy stone, ster., Rock & GIFFARD (184). — Molokai. Kamolo, 1000 m, ster., FAURIE (1087). — Maui. Wailuku valley, on

branches in shady forest, WAWRA (1854). — Hawaii. Brother NEWELL, all Z. in MS.

According to my opinion (l. c. p. 20) I refer only non-sorediate specimens to *carpoloma*, thus MERR. exs. 111 is brought to *Mougeotiana* by me. In ZAHLBR. MS. we find: »superne crebre et reticulatim costatae et scrobiculatae, nudae vel citrino isidiato-sorediosae». As I have seen none of his quoted specimens I can express no opinion of his determinations.

General distribution. Tropical and subtropical regions (acc. to ZAHLBR. Catal.).

### 7. *Ps. crocata* (L.) VAIN.

*Hedwigia* 37: (34), 1898; H. MAGN. in Medd. Göteborgs Bot. Trädg. 14: 12, 1940. — *Lichen crocatus* L., Mantissa planitarum altera: 310, 1771. — *Sticta crocata* ACH., KREMPEL-HUBER in Verh. zool. bot. Ges., Wien 26: 435, 1876; TUCKERMAN apud WILKES U. S. Explor. Exped. 17: 138, 1861 and in Proc. Amer. Acad. 7: 225, 1866; ZAHLBR., Catal. Lich. 3: 376, 1925. — *Stictina crocata* MÜLL. ARG. in Flora 72: 61, 1889.

Hawaiian Is., on tree trunks, HILLEBRAND (MÜLL.). — Kauai. Eleele, ster. (88); Kipukai, ster. (89); Hanalei, ster. (92), all on bark, FAURIE, Z. in MS. — Molokai. Kamolo, on bark, ster., FAURIE (1083) Z. in MS.; forest between Upper Maunahui camp and Pepeopae bog, 1938 H. B. S. (5697). — Maui. E. Maui, walls of crater, PICKERING (TUCK. 1861); W. Maui, fert., MANN (TUCK. 1866); Wailuku valley, in dark forest, on branches, ster., WAWRA (1848) KRMPH. — Hawaii. PICKERING (TUCK. 1861); summit of Haleakala 6700' on *Byronia sandwicensis*, ster., Rock (146); Glenwood, on bark (998); Mauna Kea, 2000 m (936) FAURIE, Z. in MS.; Kilauea, Bird Park, 1200 m, on trees, 1922 SKOTTSBERG (1690).

f. *esorediosa* (MÜLL. ARG.) H. MAGN. in Medd. Göteborgs Bot. Trädg. 14: 14, 1940. — *Stictina crocata* f. *esorediosa* MÜLL. ARG. in Flora 66: 354, 1883 and 72: 61, 1889. — *Sticta crocata* f. *esorediata* ZAHLBR., Catal. Lich. 3: 377, 1925 and in ZAHLBR. Lich. exs. rar. 29.

Hawaiian Islands, HILLEBRAND (MÜLL. ARG. 1889). — W. Maui, On shrub, 4000', BALDWIN (15) Z. in MS.

Probably identical with *Ps. hawaiiensis* as pointed out by me (1940).

f. *leucosticta* (PERS.) H. MAGN. l. c. — *Sticta leucosticta* PERS. in GAUDICH., Voyage Uranie, Botan.: 200, 1826 »is very dubious and belongs probably to another species» H. MAGN. l. c. »Ad truncos arborum in ins. Sandwic.» PERS. l. c.

f. *sandwicensis* ZAHLBR. see *Ps. hawaiiensis*.

General distribution: Tropic, subtropic and temperate regions with oceanic climate. .

8. *Ps. Mouceotiana* (DEL.) VAIN.

in *Hedwigia* 37: (36), 1898; H. MAGN. in *Medd. Göteborgs Bot. Trädg.* 14: 16, 1940, fig. 2. — *Sticta Mouceotiana* DEL., *Hist. Lich. Sticta*: 62, 1822, Pl. V, fig. 13; NYL. in *Annal. Sci. Nat. Bot.*, 4 ser. 11: 238, 1859; TUCK. in *Proc. Amer. Acad.* 7: 225, 1866; ZAHLBR., *Catal. Lich.* 3: 395, 1925; REDGR. in *Candollea* 8: 53, 1940. — *Cyanisticta sandwicensis* GYELN. in *Fedde Repert.* 29: 6, 1931.

Exs.: MERR., ser. 1: 111, s. n. *St. crocata* v. *gilva*.

Hawaiian Is., GAUDICHAUD (NYL. and TUCK.). — Kauai. HELLER 1895, fert., in MERR. exs. 111 (hb. MAGN.; U.) called *carpoloma* by ZAHLBR.; above Waimea, Kaholuamao, 1895, HELLER, ster. (U.), probably the same collection as MERR. 111; Kokee, H. B. S. 1938 ster. (6011, 6015); Kueche 1919, ster. (hb. VRANG, comm. PLITT), called *carpoloma* by ZAHLBR.; interior mts, 1300 m, 1905 (3517) HOCHREUTINER (REDGR.). — Oahu. Waianae mts, Palehua, 650 m, 1922 SKOTTSBERG (1227), fert. — Molokai. Edge of ravine near Upper Maunahui Camp, about 1000 m, H. B. S. 1938 (5741) ster., on twigs. — Maui. Iao valley, on bark, ster., FAURIE (599), Z. in MS.; Puu Kukui, top bog, at 1750 m, on *Metrosideros*, ster. (5654); summit forest, ster. (5774, 5904); summit bog, on dead *Lobelia gloriae montis*, ster. (5650); between Haelaau and Nakalalua (5809) ster., young, uncertain; Haleakala, about 2500 m, along Halemau trail (5896, on thin twigs; 4436), all H. B. S. 1938; Haleakala, in the crater, at 2000 m, ster. (1679), at 2200 m (1739) 1922, SKOTTSBERG. — Hawaii. Mauna Loa, 4500', on bark, ster., Rock (168); Glenwood, on bark, ster., FAURIE (933), Z. in MS.; Makahanaloa, Puu Kauku, ster. (1334); Kohala mts, wet forest above Waimea (1544) 1922, SKOTTSBERG; Kilaeua Iki, 1200 m, 1926, SKOTTSBERG (2052); Kohala, Upper Hamakua ditch trail, along road between 1st house and Kamuela, at 1000 m, ster., dark, degenerate, H. B. S. 1938 (5686).

v. *aurigera* (DEL.) H. MAGN. in *Medd. Göteborgs Bot. Trädg.* 14: 19, 1940. — *Sticta aurigera* DEL., *Hist. Lich. Sticta*: 54, 1922. — *Sticta Mouceotiana* v. *aurigera* NYL., ZAHLBR., *Catal. Lich.* 3: 396, 1925.

Maui. Haleakala, on bark, FAURIE (600). — Hawaii. At 1500', on bark, ster., Brother NEWELL (3, 24, 40) and 4000' (39), Z. in MS.

»*Pagina superior thalli pulvinis citrinis sorediosis sparsis obiecta, margine loborum citrino-sorediosos.*» ZAHLBR. MS.

*Cyanisticta sandwicensis* (ZAHLBR.) GYELN. l. c. is typical *Mouceotiana* according to the authentic specimen (hb. Budapest) from Hawaii: Kalulu, Mt Hualalai 6000', ad truncos *Acaciae Koa*, fert., Rock (74). So is also *St. crocata* f. *sand-*

*wicensis* ZAHLBR. apud RECHINGER in Denkschr. math.-naturw. Classe K. Ak. Wiss., Wien 88: 29, 1911. Part of authentic specimen from Kilauea, »Weg zum Kilauea-iki» 1905 K. RECHINGER, ster., obtained from Vienna. According to ZAHLBR. (l. c.) also a specimen from Maui: Wailuku valley (WAWRA Nr. 1848) belongs here.

*Ps. Mougoustona* is a variable species and easily confused with *crocata*, *carpoloma* and *hawaiensis*. Typical specimens are rather pale, but in the Hawaiian islands we also meet with dark red brown specimens with numerous soredia also on the upper surface, probably best brought to v. *aurigera*. But transitional stages occur frequently.

General distribution: Tropical, subtropical and partly temperate regions with oceanic climate.

### 9. *Ps. hawaiensis* H. MAGN.

in Medd. Göteborgs Bot. Trädg. 14: 21, 1940, fig. 3.

Hawaiian Is., BAILEY, (37 a) ster.; MANN, fert. (U. exs.). — Kauai. Kokee, ster. (5677); Kokee, Kalua Puhi trail, 1200 m (5962, small, among mosses, uncertain); Alakai, forest below Lehua makanoe, fert. (6044); forest between Kawaikoi and Kilihana, fert. (6037), H. B. S. 1938. — Oahu. Waialua mts, MANN s. n. *St. orygmea* (U. exs., in WILLEY's hand). — Molokai. Forest near Pepeopae, at 1200 m, ster., on twigs (5792, 5845, ster.), fert. (5791); forest between Upper Maunahui Camp and Pepeopae, mostly fert. (5720 ster., 5724, 5780, 5783, 5791 photo, 5795, 5839 ster., 5842 fert.: type); Pelekunu, at 1300 m, ster. (5950) all H. B. S. 1938. — Maui. Haleakala 6000', MANN, fert., s. n. *St. crocata* (U. exs.). Puu Kukui, summit forest, at 1750 m, fert. (5928, 5929, 5930, 5931) and on top twigs of *Metrosideros* (mixed in 5651: *St. tomentosa*), all H. B. S. 1938. — Hawaii. Kohala, Upper Hamakua ditch trail, at 1000 m, ster. (5665, 5999, 6063) H. B. S. 1938, one specimen  $3 \times 2$  dm large.

»Thallus anguste laciniatus, laciinis fere a centro distinctis, sublinearibus, iterum subdichotome divisus, planis vel leviter concavis, rufescens-fuscis vel  $\pm$  glaucescentibus, apicibus subfurcatis, truncatis. Margo laciinarum sorediis flavis saepius discretis ornatus, raro singulis supra superficiem sparsis. Apothecia marginalia, disco rufo-fusco vel obscure fusco, margine pallescente. Epithecium KOH subviolascens. Upper cortex C + red, K—, Pd—. Medulla K— or  $\pm$  yellowish, C—, K(C)+ generally reddish, Pd— or faintly yellow to brickred. Soredia Pd + ochraceous.» From my description, l. c.

NYLANDER says (Synopsis p. 339, under *St. crocata*): »Quae in insulis Sandwicensibus occurrit thallum habet magis laci-

niatum». Perhaps he has had specimens of *Ps. hawaiiensis* under his eyes.

Ser. 2. *Gonidia* yellowish green.

10. *Ps. aurata* (Ach.) VAIN.

Lich. Brésil. 1: 183, 1890. — *Sticta aurata* Ach., Method. Lich.: 277, 1803; TUCK. in Proc. Amer. Acad. 7: 225, 1866; KRMPH. in Verh. zool.-bot. Ges., Wien 26: 435, 1876; MÜLL. ARG. in Flora 72: 61, 1889; ZAHLBRE., Catal. Lich. 3: 330, 1925; REDGR. in Candollea 8: 51, 1940.

Hawaiian Is., HILLEBRAND (MÜLL.); BAILEY (24 a) ster. (U. exs.). — Kauai. Waimea, Kaholuamano, GAY's summer house, 1300 m, 1905 (3512) HOCHREUTINER (REDGR.). — Oahu. On trees, MANN (TUCK.); Waianae mts, Palehua, 650 m, 1922, SKOTTSBERG (1225), on bark, ster. — Maui. Foot of Haleakala, in dry ravines, WAWRA no 1871 (KRMPH.).

General distribution: Tropical and subtropical regions.

11. *Ps. flavicans* (HOOK.) VAIN.

in Philippine Journ. of Sci. 8: 115, 1913. — *Sticta flavicans* HOOK. f. et TAYL. in London Journ. of Bot. 3: 648, 1844; ZAHLBRE., Catal. Lich. 3: 344, 1925. — *St. endochrysea* v. *flavicans* MÜLL. ARG. in Flora 72: 61, 1889. — *St. orygmaea* v. *flavicans* ZAHLBRE. MS.

Exs.: MERR., ser. 2: 68.

Hawaiian Is., HILLEBRAND (MÜLL.), HELLER 1895 in MERR. exs. 68 (hb. MAGN.), BAILEY, ster. (U. exs.). — Kauai. Kueche 1919 (hb. MAGN.), on branches of *Acacia Koa*, ster., Rock (71); Hanapepe fall, 300 m, ster. (87); ROBINSON's Summer house, 1000 m (800) FAURIE, Z. in MS.; Makai, swampy woods near Lehua makanoe, 1200 m, ster. (5621); Kokee, 1100 m, ster. (6013) H. B. S. 1938, only fragments. — Oahu. BALDWIN (hb. Göteborg), BALDWIN no 14, Near Honolulu, ster., FAURIE (441), Z. in MS. — Molokai. About 1500', BALDWIN (18); Kamolo, 1000 m, on bark, ster., FAURIE (1081), Z. in MS.; forest between Upper Maunahui camp and Pepeopae, 1200 m, ster. (4413) H. B. S. 1938, on trunks. — Hawaii. Kaluo, on bark, ster., FAURIE (930), Z. in MS.

General distribution: The Pacific and southernmost S. America.

12. *Ps. orygmaea* (Ach.) MALME

in Bihang K. V. A. Handl. 25. Afd. 3, no 6: 28, 1899. — *Sticta orygmaea* Ach., Meth. Lich.: 278, 1803; TUCK. in

Proc. Amer. Acad. 7: 225, 1866; ZAHLBR., Catal. Lich. 3: 357, 1925.

Maui. On trees, mountain of West Maui, MANN (TUCK.). Is probably synonym with the preceding species.

### Sticta SCHREB.

- 1 a. Gonidia yellowish green. Th. podicellate, fruticulose, underside with veins, tomentose. Spores colourless,  $20-38 \times 9-11 \mu$ . *1. filix.*
- 1 b. Gonidia bluish green.
  - 2 a. Th. without soredia or isidia.
    - 3 a. Th.  $\pm$  brown, smooth or with impressed dots, below pale. Ap. with gonidia. Sp.  $28-38 \times 6-8 \mu$ . Cyphellae  $0.5-1$  mm. *2. ambavillaria.*
    - 3 b. Th.  $\pm$  glaucous, thin, smooth, partly foveolate or scrobiculate. Ap. without gonidia. Sp.  $35-42 \times 6-7 \mu$ . Cyphellae  $1-1.5$  mm. *3. tomentosa.*
  - 2 b. Th. isidiate.
    - 4 a. Margins of lobes and partly surface  $\pm$  isidiate.
      - 5 a. Cyphellae up to  $1.5$  mm broad. Ap.  $1.5-3$  mm, isidia  $\pm$  brown.
        - 6 a. Cyphellae white, th. brown to dark. *5. Weigelii.*
        - 6 b. Cyphellae yellowish, th.  $\pm$  yellowish. *5 a. Weigelii v. lutescens.*
      - 5 b. Cyphellae up to  $0.2$  mm broad. Ap.  $0.8-1.2$  mm, isidia bluish gray. *4. plumbicolor.*
    - 4 b. Surface isidiate, but not margins. Th. monophyllous, lobes rounded. *6. fuliginosa.*

#### 1. St. *filix* (Sw.) NYL.

in Journ. Linn. Soc. 9: 246, 1865; TUCK. in Proc. Amer. Acad. 7: 225, 1866; ZAHLBR., Catal. Lich. 3: 343, 1925. — *Lichen filix* Sw., Meth. Muscor.: 36, 1781.

Oahu. MANN (TUCK.). Perhaps uncertain, never found again, by later authors quoted only from New Zealand.

#### 2. St. *ambavillaria* (BORY) ACH.

Lichenogr. Univ.: 455, 1810; NYL. in Ann. Sci. Nat., Bot. 4 ser. 11: 237, 1859; TUCK. in Proc. Amer. Acad. 7: 225, 1866; ZAHLBR., Catal. Lich. 3: 369, 1925. — *Lichen ambavillarius* BORY, Voyage Quatre Iles d'Afrique 1: 391, 1804.

Hawaiian Is., REMY (NYL.); BAILEY (U. exs.) s. n. *St. filix* fert. (uncertain). — Kauai. GAY's summer house, 1000 m, on bark, fert., FAURIE (325); Kaholuamano, in forest, 3600',

on stone among other lichens, fert., Rock (5, 22), Z. in MS. — Hawaii, Oahu and W. Maui, 3000—5000 feet, MANN (TUCK.); specimen in Exs. (U.) from Hualalai, 6000 ft, MANN, resembling BAILEY's specimen, uncertain, very small,  $2.5 \times 1$  cm. Gonidia in apothecia at least at base.

»Die Exemplare aus Kauai zeichnen sich durch stark gegliederte Lappung des Lagers aus und stimmen darum weniger mit der Figur in DELISE, Hist. Lich. Indessen sind alle Übergänge vorhanden, so dass ich selbst die am meisten zerspaltenen Stücke nicht als Form oder Varietät abtrennen kann.» ZAHLBR. MS.

General distribution: Tropical regions.

### 3. St. tomentosa (Sw.) ACH.

Method. Lich.: 279, 1803; TUCK. apud WILKES U. S. Explor. Exped. 17: 137, 1861; KRMPH. in Verh. zool.-bot. Ges., Wien 26: 453, 1876; ZAHLBR., Catal. Lich. 3: 403, 1925. — *Lichen tomentosus* Sw., Nova Gen. et Spec. Plant.: 147, 1788.

Hawaiian Is., BAILEY (U. exs.) fert. — Kauai. Waialeale, at 5000', on branches, WAWRA (KRMPH.); forest between Lehua makanoae, fert. (5944) and forest between Kawaikoi and Kilonana, fert. (mixed in 5626 and 6033) H. B. S. 1938. — Molokai. Kamolo, c. 1000 m, on bark, fert., FAURIE (1086), Z. in MS. — Maui. Between Haelaau and Nakalalua, about 1000 m, fert. (5861, 5897); Puu Kukui, summit forest, on top twigs of *Metrosideros* (5651, 5924 var.), fert., H. B. S. 1938. — Hawaii. Forest of Mauna Kea (WILKES Exp.), TUCK. l. c.; Makahanaloa, Puu Kauku, 1922, SKOTTSBERG (1334, 1335) fert.; Kohala mts, upper Hamakua ditch trail, along road between 1st ditch house and Kamuela, about 800 m (5685, 6024); Hilo, along road to Kilauea, at 23 miles (5786, 5787) fert., H. B. S. 1938.

General distribution: Tropical regions.

### 4. St. plumbicolor ZAHLBR.

Catal. Lich. 3: 398, 1925. — *Stictina plumbicolor* ZAHLBR. in Ann. Mycol. 1: 356, 1903.

Molokai. On shrubs, 2500', D. D. BALDWIN (17); Pukoo, c. 500 m, FAURIE (1084). — Maui. Haleakala, 1200 m, ster., FAURIE (596) Z. in MS.; between Haelaau and Nakalalua, about 1000 m, H. B. S. 1938, fert. A small specimen found among several small specimens of *tomentosa* (5897) and resembling them, but isidiose.

Endemic.

5. *St. Weigelii* ISERT

apud ACHARIUS, Lichenogr. Univ.: 446, 1810; ZAHLBR., Catal. Lich. 3: 404, 1925. — *St. quercizans* DEL., Hist. Lich. Sticta: 84, 1822; TUCK. apud WILKES U. S. Expl. Exped. 17: 135, 1861; in Proc. Amer. Acad. 7: 225, 1866. — *Stictina quercizans* NYL., Synopsis. Lich. 1: 344, 1860.

Exs.: MERR., ser. 1: 134.

Hawaiian Is., BAILEY, 37 b, ster. (U. exs.) s. n. *St. quercizans*. — Kauai. Kueche; Hanapepe fall (93); Olokele (356); Kalua (426); GAY's summer house, 1200 m (292), FAURIE, all on bark, Z. in MS.; Waimea distr., Kohua ridge (Kawaia trail), about 3500', H. B. S. 1938 (5627); on the ridge W of Hanapepe river, 1895, HELLER, on *Osmanthus sandwicensis* (hb. MAGN.). — Oahu. MANN (TUCK.); in *Aleurites triloba*, 1846, DIDRICHSEN (76), ster. (U.); on trunks and branches of trees, 1895, HELLER in MERR. exs. 134 (hb. MAGN.); Waianae mts, Palehua, in forest ± 650 m (1518), and Kaala (1538, leg. McELDOWNEY), Nuuanu Pali (1428) SKOTTSBERG 1922; Waianae, near Kole Kole Pass, H. B. S. 1938 (5948), all sterile. — Molokai. Valley NW of Upper Maunahui Camp, 1000 m. H. B. S. 1938 (5717), on and beneath *Metrosideros*; Kamolo c. 1000 m, on bark, ster., FAURIE (1082), Z. in MS. — Maui. Iao Valley, near Needle Point, on rocks, 1922, SKOTTSBERG (1613) and H. B. S. 1938 (5879) on trees?; Nahiku 100 m, (595, 605); Wailuku, on bark (569) FAURIE; summit of Haleakala 6700' on *Ilex Sandwicensis*, ster., ROCK; FAURIE (594) Z. in MS. — Hawaii. Near Hilo, PICKERING (TUCK. 1861); Makahanaloa, Puu Kauku, 1922, SKOTTSBERG (1328) fert.; Kilauea 1200 m (924); Mauna Kea 2000 m, on bark, ster. (932) FAURIE. Z. in MS.

v. *Beauvoisii* (DEL.) HUE in Nouv. Arch. Muséum, Paris, ser. 4, 3: 96, 1901; ZAHLBR., Catal. Lich. 3: 405, 1925. — *St. Beauvoisii* DEL., Hist. Lich. Sticta: 83, 1822. — *Stictina quercizans* v. *Beauvoisii* MÜLL. ARG. in Jahr. Kgl. Bot. Gart., Berlin 2: 311, 1883. — *Sticta lurida* MEY. et FLOT. in Nova Acta Acad. Leopoldin.-Carolin. 19: Suppl.: 214, 1843, tab. 1, fig. 5.

Oahu. »Saxicola, specimen parvulum et sterile», MEYEN l. c.

»Marginibus thallinis magis flexuosis, lobulis rotundatis, colore luride brunneo-rufescente» NYL., Synopsis p. 345.

v. *peruviana* (DEL.) VAIN., Lich. Brésil 1: 190, 1890; ZAHLBR., Catal. Lich. 3: 406, 1925. — *St. sylvatica* v. *peruviana* DEL., Hist. Lich. Sticta: 88, 1822, tab. 7, fig. 28. — *Stictina quercizans* v. *peruviana* NYL., MÜLL. ARG. in Flora 72: 61, 1889.

Hawaiian Is., ster., HILLEBRAND (MÜLL. ARG.). — Kauai.

Kaholuamano, in forest 3600', on stone, ster., Rock (21). — Hawaii. Kilauea, c. 1200 m, on bark, ster., FAURIE (924) Z. in MS.

»Thallo brunneo-fuscescente vel cervino-fuscescente, centro saepe pallidiore, rigescente, inaequali vel obsolete scrobiculoso-inaequali, apothecii marginе glabro et crenulato.» From NYL. Synopsis p. 345.

v. *lutescens* (TAYL.) H. MAGN. — *St. lutescens* TAYL. in HOOK., Journ. of Bot. 6: 179, 1847; MÜLL. ARG. in Flora 71: 137, 1888. — *Stictina lutescens* NYL., Synops. Lich. 1: 346, 1860.

Hawaiian Is., GAUDICHAUD (NYL. l. c.). — Kauai. Hanapepe fall (86); Kipukai (96), on bark, ster., FAURIE, Z. in MS. — Oahu. Koolau, Pa-la-i, ster., H. B. S. 1938 (5813). — Hawaii. Hilo, Lilie (669); Kilauea, FAURIE (95), both on bark, ster., Z. in MS.

»Scheint nur eine Form von *St. Weigelii* mit zum Teil gelblichem Lager und blassgelben Zypheilen.» ZAHLBR. MS.

The specimen determined by me seems to agree well with the description in NYL. Synopsis. MÜLL. ARG., who has seen the authentic specimen of *St. lutescens* TAYL., is of the opinion (l. c.) that it is only a form of *Weigelii*. Also NYLANDER (l. c.), who reports a specimen from Honolulu, leg. D. JARDIN, has the same opinion.

*St. xanthosticta* PERS. apud GAUDICH., Voyage Uranie, Bot.: 201, 1826; MONT. apud GAUDICH., Voyage Bonite: 143, 1844—46 is in ZAHLBR. MS. given as a synonym of *St. lutescens*. In his Catalogus the arrangement is the reverse which is in accordance with the rules of nomenclature. The specimen has not been examined by later authors and remains doubtful. NYLANDER says (Ann. sci. nat., 4 ser. 11: 238, 1859): »Nomen *xanthosticta* PERS., ex speciminibus pro typicis datis, antea a me relatum fuit ad *Stictam* non distinguendam a »*Sticta Beauvoisii*« DEL. (= *quercizans*), at respectu habito definitionis Persoonii (»laciniis marginе crispis sorediis cyphellisque citrinis«) et determinatione Delise »*Sticta aurigera*« pateat *xanthostictam* synonymon esse *St. Mougeotiana*;» MONTAGNE says in his description (l. c.): »lobis apice dilatatis imbricatis rotundatis iterum inciso-crenatis adscendentibus marginе isidiophoris, cyphellis immersis urceolatis flavis glabris limbo revoluto tandem amplis.»

General distribution: Tropical and subtropical regions.

#### 6. *St. fuliginosa* (DICKS.) ACH.

Method. Lich.: 280, 1803; ZAHLBR., Catal. Lich. 3: 383, 1925. — *Lichen fuliginosus* DICKS., Fasc. Plant. Cryptog. Brit. 1: 13, 1785.

Hawaiian Is., BAILEY (U. exs.) ster., specimen 6×4 cm. — Kauai. Kokee H. B. S. 1938 (5681). — Maui. Nahiku, on rocks, rare! ster., FAURIE (622) Z. in MS.

There are five, 2—3 cm large individuals from Kauai. Lower side (as in other specimens of *fuliginosa*) with protrudent hyphae, 20—25  $\mu$  long, thin-walled, constrictedly septate, dense. One isidium 350  $\mu$  high, 40  $\mu$  thick, much branched, surface with about 3.5  $\mu$  large cells, angular, yellowish brown. Thallus 100—150  $\mu$  thick.

Cosmopolitan.

### Peltigeraceae.

#### *Nephroma* ACH.

##### *N. tropicum* (MÜLL. ARG.) ZAHLBR.

Catal. Lich. 3: 442, 1925. — *Nephromium tropicum* MÜLL. ARG. in Flora 66: 21, 1883; 72: 61, 1889. — *Nephroma laevigatum* v. *rufum* and *N. tomentosum* v. *helveticum* TUCK. in Proc. Amer. Acad. 7: 225, 1866. — *N. resupinatum* v. *tropicum* ZAHLBR. MS.

Hawaiian Is., on mossy trunks, HILLEBRAND (MÜLL.). — Kauai. Kaukao, c. 1000 m, above mosses (270); ROBINSON's summer house c. 1000m (302); Fr. GAY's summer house (326); Olokele, c. 600 m, on bark (381) FAURIE; Kaholuamano, in forest, 3600', on bark, Rock (15), Z. in MS.; Kokee, 1100 m, on bark, H. B. S. 1938 (5996) with *Abrothallus microspermus* TUL. — Oahu. On trunks, MANN (TUCK.), specimens in Exs. (U.) s. n. *Sticta ambavillaria*; Koolau mts, back of Tantalus, about 600 m (1486, fert.) among moss (1502, ster.) scantily, 1922, SKOTTSBERG. — Molokai. Forest near Pepeopae, 1200 m (5793) fert; edge of ravine near Upper Maunahui Camp, 1050 m (5702 fert., 5707 ster.), on twigs, H. B. S. 1938. — Maui. Mountain of West Maui, MANN (TUCK.). Haleakala, 1500 m, on bark, FAURIE (578), in summit, on bark, Rock (145); Iao valley, on bark, FAURIE (575); Iao valley, on rocks, 1922, SKOTTSBERG (1613) ster., dark brown, more pulvinate and laciniate; between Haelaau and Nakalalua, about 1000 m (5812, fert., 5875, 5876 fert.); along Honokowai ridge, above Haelaau (5751) fert., pale, ± bluish gray. — Hawaii. NEWELL (2, 8); Kalua, on bark (956); Ferndale, on bark (870); Mauna Kea c. 2000 m, on bark (948) FAURIE, Z. in MS. — Kohala mts, wet forest above Waimea, 1922, SKOTTSBERG (in 1544: *Pseudocyphellaria Mougeotiana*).

»Thallus expansus, plaga usque 10 cm latas formans, substrato (imprimis cortici) ± adpressus, vel (praesertim in ramlulis) ± adscendens, coriaceus, plumbeo-pallescens, luridus vel

obscurato-castaneus, unicolor vel variegatus, nitidus, iteratim et crebre lobatus; lobi marginales  $\pm$  continui, 2—3 mm lati, incisi vel lobato-incisi, lobi centrales  $\pm$  intricati, in margine crispato-adscendentibus et lacinulis lineariformibus aut digitato-lacinulatis, convexiusculis vel rarius hinc inde concaviusculis, sorediis et isidiis nullis; subtus plumbeo-pallidusve, argillaceus vel argillaceo-fuscens, versus centrum umbrino-obscurus, nudus, subnudus vel brevissime tomentosus. — Apothecia marginalia, postica, transversim elliptica, 1.5—3.5 mm lata; discus rufo-fuscus, vel rufescenti-obscurus, opacus, concavus, margine tenui, pallido, integro, a thallo tenui et integro vel minute denticulato vel lobulato-denticulato circumdatus, passim autem haec pars thallina vix evoluta est, receptaculum superne nudum, laevigatum vel sparse et acutiuscule denticulatum, ortum cortice aut paraphysibus, stratum gonidiale latiusculum includens. Excipulum angustum integrum. Hymenium superne dilute rufescens, strato amorpho tenui tectum, caeterum decolor, purum, 85—90  $\mu$  altum, ascis I caerulescentibus, v. caerulescenti-lutescentibus. Hypothecium dilute fuscidulum. Paraphyses ad apicem vix latiores, exprimitis superne conglutinatae. Ascii ovali-oblongi, superne rotundati et membrana modice incrassata. Sporae in ascis 2(1)-seriales, fuscidulae, utrinque rotundatae, rectae vel leviter curvulae, 4-loculares, septis tenuibus, 19—25  $\times$  7.5—8  $\mu$ , membrana tenui cinetae.» ZAHLBR. MS.

In his MS. ZAHLBRUCKNER is of the opinion that this lichen is only a variety: »Habituell ist diese der Tropen eigentümliche Varietät immer gut gekennzeichnet und weicht von *tomentosum* v. *helveticum* durch die schmalen Lagerlappen, deren Ränder mit zahnartigen Gebilden dicht besetzt sind, durch bedeutend kleinere Apotheken, deren thallogischer Teil am Rand nur kurz und wenig gezähnt oder auch ungezähnt ist, ab. Die Farbe des Lagers, welche zumeist ein dunkles Kastanienbraun ist, spielt bei der systematischen Bewertung keine Rolle, da sie stark wechselt.» ZAHLBR. MS.

The Hawaiian material that I have examined seems very uniform seen from above with glaucous to  $\pm$  dark brown colour and laciniate or isidiate margins but seen from below apparently very variable. The colour varies from yellowish white to dark brown and the pilosity from a rather thick cover to none, often in different lobes of the same specimen. It seems therefore impossible to apply GYELNIK's artificial construction of »species» in this material. The margin of the apothecia is also varying from entire and smooth to denticulate in the same specimen.

General distribution: Tropical regions.

**Peltigera PERS.**

- 1 a. Th. naked, smooth, shiny. 1. *polydactyla*.  
 1 b. Th.  $\pm$  tomentose on upper side.  
   2 a. Lobes broad, appressed with ascendant margins, rigid,  
     often pruinose. 2. *rufescens*.  
   2 b. Lobes digitate, usually erect. All lobes fertile.  
     3. *spuria*.

**1. *P. polydactyla* (NECK.) HOFFM.**

Descript. et Adumbr. Plant. Lich. 1: 19, 1790; NYL. in Ann. sci. nat., Bot. 4 ser. 11: 237, 1859; TUCK. apud WILKES U. S. Exped. 17: 133, 1861; Proc. Amer. Acad. 7: 225, 1866; ZAHLBR. apud RECHINGER in Denschr. mat.-naturw. Classe, Wien 88: 29, 1911; Catal. Lich. 3: 475, 1925. — *Lichen polydactylus* NECK., Method. Muscor.: 85, 1771.

Hawaiian Is., REMY (NYL.). — Kauai. Alakai, bog forest, 1200 m, 1922, SKOTTSBERG (1672), fert. — Oahu. MANN; Kaala mts, PICKERING (TUCK.). — Hawaii. PICKERING (TUCK. 1861); Kilauea, on ground, RECHINGER nos. 3136, 3154 (ZAHLBR.); Kalulu, Hualalai, above mosses, ster., Rock (81) Z. in MS.

f. *hymenina* (Ach.) Fw. in Jahresber. Schles. Ges. vaterl. Kultur: 125, 1850. — *Peltidea hymenina* Ach., Meth. Lich.: 284, 1803.

Hawaii. Kohala, Upper Hamakua ditch, between 1 and 2 house, fert. On mossy trunk at about 1000 m. H. B. S. 1938 (5945). Lower side pale ochraceous and whitish, venes very indistinct, low, pale, rhizinae very scanty. Lobes thin, short, margins  $\pm$  undulate, surface partly slightly foveolate. Apothecia numerous.

f. *pellucida* (WEBER) DIETR., Lichenogr. German., 1832—37 p. 27; ZAHLBR., Catal. Lich. 3: 481, 1925. — *Lichen caninus*, *pellucidus* WEBER, Spicil. Flor. Goetting.: 270, 1778.

Hawaii. Mt. Hualalai, Kalulu, 6000' above mosses, fert., Rock (8 a) Z. in MS.

v. *dolichorrhiza* NYL., Synops. Lich. 1: 327, 1860; KRMPH. in Verh. zool.-bot. Ges., Wien 27: 435, 1876; MÜLL. ARG. in Flora 72: 61, 1889. — *P. dolichorrhiza* NYL.; ZAHLBR., Catal. Lich. 3: 466, 1925.

Hawaiian Is., between mosses and small ferns, HILLEBRAND (MÜLL.). — Kauai. Kaholuamano, in forest, 3600', on mossy tree trunks, fert. (36); Halemanu, above mosses in forest, fert. (173) Rock, Z. in MS.; forest between Kawaikoi and Kilohana, 1100 m (6033, 6037 b, 6039) fert.; Waialae valley, near Ranger station, on trees (among 5626) H. B. S. 1938. — Oahu. Lihue, on ground in dense forest, WAWRA (KRMPH.). — Molokai.

In valley NW of Upper Maunahui camp, 1040 m, on and under *Metrosideros*, H. B. S. 1938 (5716, ster., and among 5714, fert.). — Maui. Between Haelaau and Nakalalua, 1100 m, fert. (5811); Puu Kukui, lowest bog (5649) ster.; summit bog, ster. (5907); summit forest, about 1750 m (5785, fert., 5912, ster.) H. B. S. 1938. — Hawaii. Kilauea, ± 2000 m, above mosses and other low plants, FAURIE (954) Z. in MS.; Kohala, Upper Hamakua ditch trail, Kamuela, 800—1000 m, ster., H. B. S. 1938 (5937, 5952, 5941 ster.; 5982 fert.).

Cosmopolitan, v. *dolichorhiza* in tropical regions.

## 2. *P. rufescens* (NECK.) HUMB.

Flor. Friburg. Specimen: 2, 1793; NYL. in Ann. Sci. Nat., Bot. 4 ser. 11: 237, 1859; TUCK. apud WILKES U. S. Expl. Exped. 17: 132, 1861 and in Proc. Amer. Acad. 7: 225, 1866; ZAHLBR. apud RECHINGER in Denkschr. mat.-naturw. Klasse, Akad. Wien 88: 29, 1911; Catal. Lich. 3: 483, 1925. — *Lichen rufescens* NECK., Meth. Muscor.: 79, 1771.

Hawaiian Is., REMY (NYL.). — Maui. E. Maui, walls of crater, PICKERING (TUCK. 1861); Haleakala, ster. (5779); in the crater below Observation house, fert. (5902); Halemanu trail, 2500 m (5824) fert., H. B. S. 1938. — Hawaii. MANN (TUCK.); Kilauea, on ground, ster., RECHINGER (2541, 3121) ZAHLBR. l. c.; top of Hualalai, 1922, SKOTTSBERG (1605, 1688) ster., the latter well developed, the former only a fragment with *Bacidia alpina* and *Baeomyces Skottsbergii*.

Cosmopolitan.

## 3. *P. spuria* (ACH.) DC.

apud LAM. et DC., Flore Franç., ed. 3, 2: 406, 1805; ZAHLBR., Catal. Lich. 3: 492, 1925. — *Lichen spurius* ACH., Lichenogr. Prodr.: 159, 1798. — *P. rufescens* v. *spuria* ZAHLBR. MS. — *P. Plittii* GYELN. v. *sandwichensis* GYELN. in Fedde, Repertorium 29: 9, 1931; ZAHLBR., Catal. Lich. 8: 324, 1932.

»Sandwich Islands, Baldw. 12 (Or. ex. Wien)» GYELN. l. c. — Oahu. On the ground, 2000', BALDWIN (12) Z. in MS. — Hawaii. Kilauea, in crater, 4000', on hot earth in fissures, 1846. DIDRICHSEN (77 a, b; U.) fert.

The specimen recorded by GYELNIK seems to be the same as ZAHLBRUCKNER has called *spuria*. And GYELNIK's rather long description does not point out a single character that can not be found in *spuria*. Why is it then brought to the *canina*-group?

General distribution: Northern temperate regions and N. Zealand.



Tryckt den 24 september 1943.