

New Lichen Records and A Catalogue of Lichens from Palawan Island, The Philippines

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A catalogue of 162 species of lichenized and lichenicolous fungi is presented for the island of Palawan in The Philippines. It includes 53 species not recorded before from the country. Evidence is given that this is only a small portion of all lichen species occurring on the island, which may be over 500. Endemism or phytogeographically relevant occurrences are not recognized with certainty. The observation of the species dates mostly from two periods, 1911-1913 and 1991-1994, with greatly different results. Follicolous lichens seem to have strongly decreased since 1913, while thelotremoid lichens, indicators for ecological continuity of forests, seem not reduced.

Key Words: Philippine lichens, Palawan, Mt. Mantalingahan, phytogeography, epiphytes

INTRODUCTION

The island Palawan, with its many smaller, associated islets, has an isolated position in the archipelago of The Philippines. Away from the main chain of islands, it forms a side-chain connecting Luzon and Mindoro with northern Borneo. This gives Palawan a special phytogeographical interest and makes biodiversity inventories particularly promising. Unfortunately not much primary vegetation is left today and most of the land is or has been used for shifting cultivation. The least disturbed vegetation is probably present in the mountains, in particular on Mt. Mantalingahan, reaching 2086 m, which unfortunately remain largely unexplored lichenologically.

By and large, the lichen flora of Palawan has so far received little attention in the country. During the time

of the Bureau of Science under the American colonial rule, this research institution in Manila had explored the biodiversity of Palawan Island and the Philippines in the early 1900s (see Gruezo 1979). E. D. Merrill made significant collections near Brooke's Point in 1911 and near Taytay in 1913. Both localities are in the coastal lowlands. The lichen specimens from the first locality were probably unintentionally collected as epiphytes on leaves that Santesson separated from phanerogam herbarium specimens (Santesson 1952). The corticolous collections from the second locality were studied and published by Vainio (1921, 1923). A few more specimens were collected by other collaborators of the Bureau of Science. Only in 1991 the lichens of Palawan Island received more than sporadic attention again in an exploring trip organized by Dr. B. C. Tan from 23 April to 2 May 1991 to Mt. Mantalingahan, Tabon Caves and forest remains in the district of Puerto Princesa. The exploration was

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attended by the first author who collected 180 specimens. In 1992-1994 more specimens were collected by Dr. B. C. Tan (formerly at the University of the Philippines at Los Banos), J. Cacavio (formerly at Farlow Herbarium of Harvard University), and, in particular, the second author (75 specimens).

Published records of Palawan lichens after Vainio (1923) are scarce and found scattered in papers by Degelius (1974), Elix (1996), Marbach (2000) and Ertz (2009), who studied material from the collectors mentioned above. One species, *Mazosia bambusae* (Vain.) R. Sant., was distributed as an exsiccate in the series Krypt. Exs. Vindob. under nr. 3811 (Petraik 1955). The compendium of Philippine lichens by Gruezo (1979), useful for general data, did not contribute so much to the records because no localities inside the country are specified.

MATERIAL AND METHODS

For this publication, records of lichens in Palawan were gathered from the literature and from the identification of specimens, mainly those collected by the first two authors in 1991 and 1994 in the localities listed in Table 1.

Table 1. Study sites of H. Sipman & B. C. Tan (1-4) and P. Diederich (5-7).

Location	Date
1. District of Brooke's Point. Macagua, at E-foot of mount Mantalingahan, 8° 45' N, 117° 44' E. Alt. 125 m. Farmland with Cocos plantation and <i>Gliciridia sepium</i> hedge rows	24 April 1991
2. District of Brooke's Point. Along trail from Macagua, at E-foot, to summit of mount Mantalingahan. 8° 47' N, 117° 43' E. Alt. 200-300 m. In valley of River Macagua. 26-27 April 1991. / Alt. 500-900 m. Mossy primary forest on slope. 26-27 April 1991. / Alt. 1100 m. Mossy primary forest on ridge (collected by B. Tan alone)	26 April 1991.
3. District of Quezon. Tabon Caves. Coastal limestone rock with primary forest. 9° 16' N, 117° 59' E. Alt. 50 m. Limestone outcrop in light forest. 29 April 1991	29 April 1991
4. District of Puerto Princesa. San Rafael, 50 km SW of Roxas along the coast. 10° 01' N, 118° 59' E. Alt. 50 m. Primary forest remnants along trail to Batak village through valley of River Tanabag	1 May 1991
5. District of Puerto Princesa. Along road from Puerto Princesa City to Iwahig, km 22. 9° 46' N, 118° 39' E. Alt. 1 m. Swamp forest. 28 July 1994	28 July 1994
6. District of Puerto Princesa. Near Iwahig, side road going to the prison. 9° 44' N, 118° 37' E. Alt. 5 m. Dry secondary forest	28 July 1994
7. District of Puerto Princesa. 25 km NNW of Puerto Princesa City, Maranac, disturbed rainforest with only young trees left. 9° 59' N, 118° 46' E. Alt. 50 m. On wet ground	29 July 1994

The available material was investigated in the usual way using stereo- and compound microscopes. Chemistry of critical specimens was investigated by TLC method (Orange 2001). The newly published specimens leg. Sipman & Tan are kept in herbarium B, those leg. Diederich in herb. Diederich, the others are as indicated.

RESULT: A Catalogue of Species

For all 162 listed species the pertinent vouchers are indicated. For specimens collected by P. Diederich the collector is abbreviated as "D", for those by H. Sipman & B. Tan as "ST", and the locality numbers indicated in Table 1 are used. For records found in the literature, the references are given together with the pertinent specimens; these were usually not studied by us. The 53 species not recorded before from the Philippines are marked with an asterisk.

Amandinea melaxanthella (Nyl.) Marbach - Brooke's Point (1), on *Cocos* trunk, *ST 29900* (Marbach 2000).

***Anisomeridium albisedum** (Nyl.) R.C. Harris - Mantalingahan slope (2), on fallen branches, *ST 29973*.

Anisomeridium consimile (Vain.) R.C. Harris - Taytay, on *Pongamia mitis*, 1913, *Merrill 9053* (Vainio 1923: 14, as *Arthopyrenia consimilis* Vain., type collection).

Anisomeridium palavanum (Vain.) R.C. Harris - Taytay, on *Sonneratia*, 1913, *Merrill 9036* (Vainio 1921: 347, as *Microthelia palavana* Vain., type collection).

Anthracothecium macrosporum (Hepp) Müll. Arg. - Taytay, corticolous, 1913, *Merrill 9031*; Palawan, *Fénix-Bur. Sci. 15635* (Vainio 1921: 326, as *Bottaria columellata* Vain., type collections).

Arthonia antillarum (Fée) Nyl.- Taytay, on *Cocos nucifera*, *Merrill 9037*, pr.p. (Vainio 1921: 300).

Arthonia cinnabarina (DC.) Wallr. - Palawan, corticolous, *Fénix-Bur. Sci. 15637*, pr.p. (Vainio 1921: 304, as *Arthonia gregaria* (Weig.) Koerb. var. *tumidula* (Ach.) Almqu.); Puerto Princesa/Iwahig road (5), corticolous, *D 13337*.

Arthonia cocoes Vain. - Taytay, on *Cocos nucifera*, *Merrill 9037*, pr.p. (Vainio 1921: 300, type collection).

***Arthonia conferta** (Fée) Nyl. (Figure 1) - Brooke's Point (1), *ST 29903, 29908*.

Arthonia cyanea Müll. Arg. (Figure 2) - Brooke's Point, foliicolous, 1911, *Elmer 12640* (Santesson 1952: 79); Aborlan Munic., Apurawan Barangay, trail from Sitio Daan crossing over Mt. Barroro ridge to Barangay kabigaan, 100-2000 ft., foliicolous, 28 April 1992, *Tan 92-*

280i [B]. - Specimen *Tan 92-280i* deviates by multiseptate spores, with *ca.* 7 instead of 2-4 septa (Lücking 2008).

Arthonia opegraphizans Vain. - Taytay bay, on *Hoya*, *Merrill 9010*, pr. min. p. (Vainio 1921: 299, type collection).

Arthonia stenographella Nyl. - Taytay, on *Hoya*, *Merrill 9037*, pr.p. (Vainio 1921: 303, as *Arthonia varia* (Ach.) Nyl. var. *stenographella* (Nyl.) Vain.).

Arthopyrenia pongamiae Vain. - Taytay, on *Pongamia mitis*, 1913, *Merrill 9035* (Vainio 1923: 13, type collection).

Bacidia hypoptiza Vain. - Lake Manguao, corticolous, 1913, *Merrill 9012* (Vainio 1921: 72, type collection).

Catarraphia dictyoplaca (Mont. & Bosch) A. Massal. - Insula Palabac, corticolous, *Mangubat-Bur. Sci. 526* (Vainio 1921: 296, as *Cyclographa interposita* Vain., syntype collection).

Catillaria maquilangensis Vain. (Figure 3) - San Rafael (4), on sunny rock outcrop on bank of stream, *ST 30054*, *30059*. - The specimens fit the original description, except that the ascospores are narrower, measuring 4 µm, instead of 5-8 µm wide. They do not belong to the genus *Catillaria* in the currently accepted sense and are of unclear affinity.

***Celothelium cinchonarum** (Müll. Arg.) Vain. - Puerto Princesa/Maranac (7), corticolous, *D 13371*.

***Chapsa waasii** (Hale) Sipman & Lücking - Mantalingahan slope (2), on thin shady trunk, 900 m, *ST 29941*.

***Chiodecton congestulum** Nyl. - Puerto Princesa/Maranac (7), corticolous, *D 13391*.

Chroodiscus mirificus (Krempelh.) R. Sant. - Lake Mangao, foliicolous, *Merrill 9016*, pr.p. (Vainio 1921: 174, as *Phyllobrassia mirifica* (Krempelh.) Vain. var. *integra* Vain. and var. *radians* Vain., syntype collections); Puerto Princesa, 1911, *Merrill 12989* (Santesson 1952: 314).

***Cladonia fruticulosa** Kremp. - Mantalingahan slope (2), in mossy primary forest on ridge, 1100 m, *ST 29979*.

Coccocarpia erythroxyli (Spreng.) Swinscow & Krog - Taytay, corticolous, *Merrill 9026* (Vainio 1921: 22, as *Coccocarpia pellita* var. *parmelioides* (Hook. f.) Müll. Arg.); Puerto Princesa/Maranac (7), corticolous, *D 13349*.

Coccocarpia palmicola (Spreng.) Arv. & D.J. Galloway - Taytay, corticolous, *Merrill 9026*, pr.p. (Vainio 1921: 23, as *Coccocarpia cronia* (Tuck.) Vain. var. *primaria* Vain.); Mantalingahan slope (2), in mossy primary forest on ridge, 1100 m, *ST 29980*; Mantalingahan slope (2), in mossy primary forest on slope, on fallen trunk, 500 m, *ST*

29989; Brooke's Point (1), on *Cocos* trunk, *ST 29900a*.

Coccocarpia pellita (Ach.) Müll. Arg. - San Rafael (4), on shady trunk, *ST 30026*; Puerto Princesa/Maranac (7), corticolous, *D 13343*, *13350*.

Collema actinoptychum Nyl. - Taytay, on tree, *Merrill 9028*, pr.p. (Vainio 1921: 49, as *Collema punctatum* Vain., syntype collection) (Degelius 1974: 125); id., on *Antidesma ghesambilla*, *Merrill 9028*, pr.p. (Vainio 1921: 48, as *Collema rupestre* (L.) Vain.) (Degelius 1974: 125); Lipnun (?) Point & vicinity, tree trunk, 1964, *Pancho 6790* [CAHUP] (Degelius 1974: 125); Mantalingahan slope (2), on fallen branches, 900 m, *ST 29970*.

Collema leptaleum Tuck. var. **biliosum** (Mont.) Degel. - Brooke's Point (1), on *Cocos* trunk, *ST 29898*.

Collema rugosum Kremp. - Lipnun (?) Point and vicinity, tree trunks, 1964, *J. V. Pancho 6748*, *6750*, *6751*, *6759*, *6913* [CAHUP] (Degelius 1974: 153); Taytay, on *Antidesma ghesambilla* at sea level, 1913, *Merrill s.n.*, pr.p. [TUR] (Degelius 1974: 153); Brooke's Point (1), on *Cocos* trunk, *ST 29898a*; Mantalingahan slope (2), on fallen branches, 900 m, *ST 29970a*.

Cresponea proximata (Nyl.) Egea & Torrente - San Rafael (4), on shady trunk, *ST 30039*; Puerto Princesa/Iwahig road (5), corticolous, *D 13329*.

***Cryptolechia subincolorella** (Nyl.) D. Hawksw. & Dibben (Figure 4) - Mantalingahan slope (2), on thin stem 5 cm. diam., 800 m, *ST 29919a*.

Diorygma erythrellum (Mont. & Bosch) Kalb, Staiger & Elix - Mantalingahan slope (2), on trunk of fallen tree, 800 m, *ST 29915*.

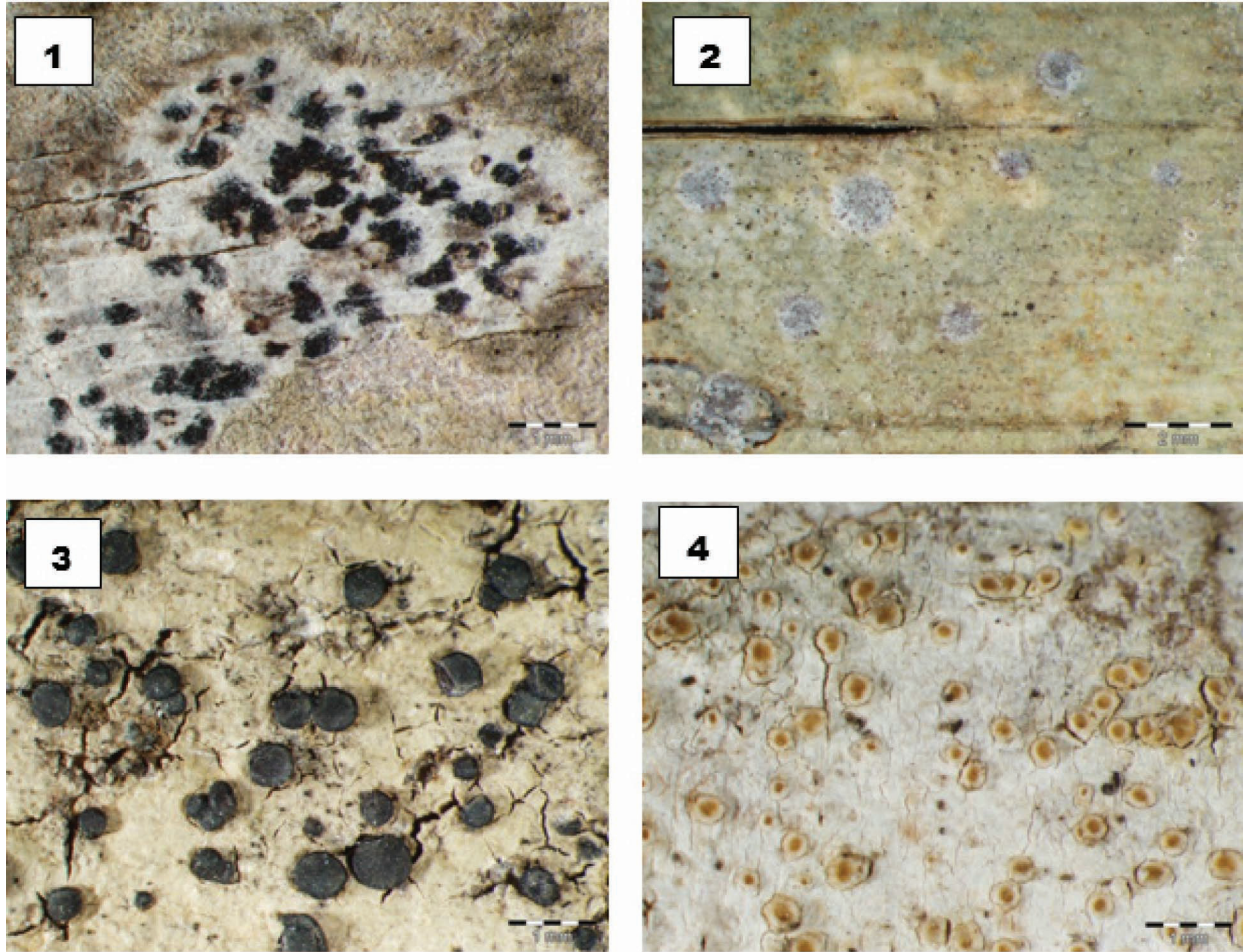
Diorygma hieroglyphicum (Pers.) Staiger & Kalb - San Rafael (4), on shady trunk, *ST 30008*. - Specimen identified by B. Staiger and included in Kalb et al. (2004).

Diorygma junghuhnii (Mont. & Bosch) Kalb, Staiger & Elix - Taytay, on *Pongamia mitis* at coast, *Merrill 9057* (Vainio 1921: 219, as *Graphis mendax* Nyl.) - Several species of *Diorygma* are very similar, and it is possible that the specimen represents another species, such as *D. hieroglyphicum*.

Dirinaria aegialita (Afz. in Ach.) Moore - Mantalingahan slope (2), on fallen branches, 900 m, *ST 29967*.

Dirinaria appanata (Fée) D.D. Awasthi - Brooke's Point (1), on *Cocos* trunk, in *ST 29899* [= *Physcia sorediosa*].

Eremothecella calamicola Syd. & P. Syd. - Puerto Princesa, foliicolous on *Cleistanthus*, 1911, *Merrill 12989* (Santesson 1952: 90, as *Arthonia calamicola* (Syd. & P. Syd.) R. Sant.).



Figures 1-4. 1. *Arthonia conferta* (specimen Sipman & Tan 29903): a pantropical, crustose lichen with black, lobed apothecia without margin, growing on smooth bark of young stemlets or branches; 2. *Arthonia cyanea* (specimen Tan 92-280i): a pantropical, crustose lichen with white-pruinose apothecia, growing on leaves; 3. *Catillaria maquilingensis* (specimen Sipman & Tan 30059): a crustose lichen with black apothecia growing on rock. Its affinity and distribution are still unclear; 4. *Cryptolechia subincolorella* (specimen Sipman & Tan 29919 a): a common but inconspicuous crustose lichen in the forests of SE Asia, with small, pale orange apothecia.

**Eschatogonia prolifera* (Mont.) R. Sant. - Puerto Princesa/Maranac (7), corticolous, *D* 13348.

Eugeniella micrommata (Kremp.) Lücking, Sérus. & Kalb - Puerto Princesa, 1911, foliicolous, *Merrill* 12989 (Santesson 1952: 461, as *Bacidia micrommata* (Kremp.) R. Sant.).

**Fissurina dumastii* Fée (Figure 5) - Mantalingahan slope (2), on shady trunk, 900 m, *ST* 29940, 29952; San Rafael (4), on shady trunk, *ST* 30013, 30041.

Fissurina humilis (Vain.) Staiger - Taytay, on *Calophyllum inophyllum*, 1913, *Merrill* 9067 (Vainio 1921: 257, as *Graphis humilis* Vain., type collection).

**Fissurina nitidescens* (Nyl.) Nyl. - San Rafael (4), *ST* 29998.

Graphis consimilis Vain. - Palawan, corticolous, *Merrill* 9047 (Vainio 1921: 208, as *Graphis analoga* Nyl.

var. *consimilis* (Vain.) Vain. and var. *nana* Vain., type collection of the latter).

**Graphis crassilabra* Müll. Arg. - Mantalingahan slope (2), on shady trunk, 500 m, *ST* 29983b.

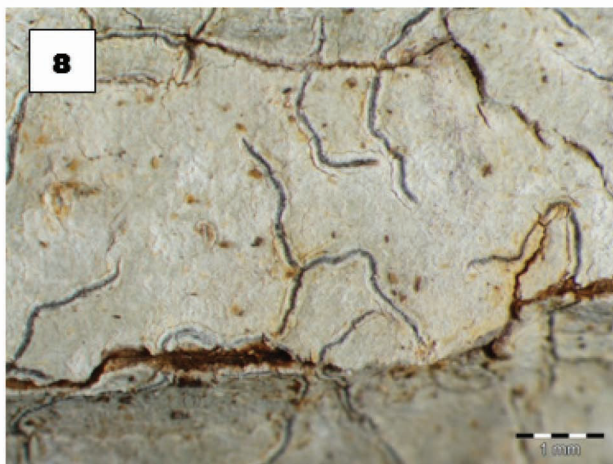
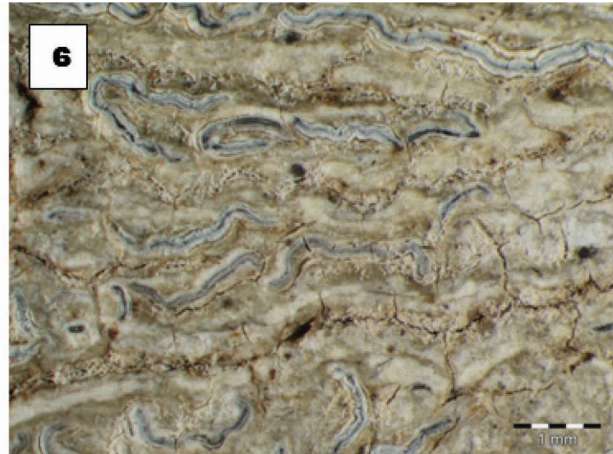
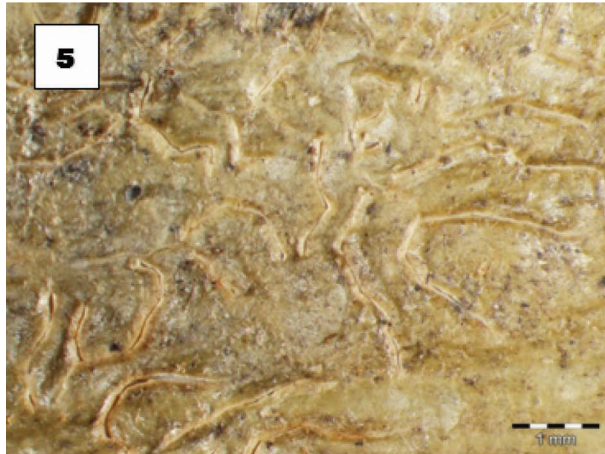
**Graphis dendrogramma* Nyl. (Figure 6) - Mantalingahan slope (2), on fallen branches, 900 m, *ST* 29925, 29974.

Graphis elmeri Vain. (Figure 7) - Mantalingahan slope (2), on fallen branches, 900 m, *ST* 29927a.

Graphis furcata Fée - Brooke's Point (1), on *Gliciridia*, *ST* 29906.

Graphis glaucescens Fée (Figure 8) - San Rafael (4), on shady trunk, *ST* 30036.

Graphis insulana (Müll. Arg.) Lücking - Taytay, *Merrill* 9038 (Vainio 1921: 206, as *Graphis orientalis* Vain., syntype collection).



Figures 5-8. 5. *Fissurina dumastii* (specimen Sipman & Tan 30013): a pantropical, crustose lichen with elongate apothecia hidden under fissures in the thallus; growing on tree bark in forest; 6. *Graphis dendrogramma* (specimen Sipman & Tan 29974): a representative of the species-rich group of script lichens, whose elongated apothecia remind of script characters. Many species, like this one, are widespread in the tropics; 7. *Graphis elmeri* (specimen Sipman & Tan 29972 a): a script lichen described first from The Philippines, recognizable mainly by its chemistry; 8. *Graphis glaucescens* (specimen Sipman & Tan 30036): this script lichen has the apothecia more or less covered by white pruina and immersed in the thallus.

**Graphis leptogramma* Nyl. (Figure 9) - San Rafael (4), on shady liana trunk, *ST 30038b, 30038c*.

Graphis nanodes Vain. - Balabac, lighthouse Melville, mangrove forest, 1 m, 28 April 1993, *Tan 93-239*.

Graphis persicina Meyen & Flot. - Taytay, *Merrill 9046, 9050, 9039* (Vainio 1921: 248).

Graphis stenotera Vain. (Figure 10) - Mantalingahan slope (2), in mossy primary forest on slope, on shady trunk, 500 m, *ST 29985*.

Gyrostomum scyphuliferum (Ach.) Nyl. - Brooke's Point (1), on *Cocos* trunk, *ST 29902*.

Herpothallon philippinum (Vain.) Aptroot & Lücking - Palawan, corticolous, *Fénix-Bur. Sci. 15636* (Vainio 1921: 286, as *Chiodecton (Stigmatidiopsis) philippinum* Vain.,

type collection).

Heterodermia japonica (Sato) Swinsc. & Krog - Mantalingahan slope (2), in mossy primary forest on ridge, 1100 m, *ST 29977, 29977a*.

**Lecanora subimmersa* (Fée) Vain. - San Rafael (4), on rock on stream bank, *ST 30053, 30056, 30061*.

Leiorreuma sericeum (Eschw.) Staiger - Taytay, corticolous at coast, *Merrill 9048* (Vainio 1921: 228, as *Graphis sericea* Müll. Arg.).

**Leptogium cochleatum* (Dicks.) P.M. Jørg. & P. James - Mantalingahan slope (2), on fallen trunk, 500 m, *ST 29990b*.

Leptogium granulans Vain. - San Rafael (4), on rock on stream bank, *ST 30062*.

Leptogium phyllocarpum (Pers.) Mont. - Mantalingahan slope (2), on shady, slanting trunk, 500 m, *ST 29988*.

***Leptotrema wightii** (Taylor) Müll. Arg. - Mantalingahan slope (2), in mossy primary forest on slope, on shady trunk, 500 m, *ST 29986b*.

Letrouitia muralis Haf. - Mantalingahan slope (2), on shady trunk, 900 m, *ST 29971*; San Rafael (4), on shady liana trunk, *ST 30040*.

***Letrouitia parabola** (Nyl.) R. Sant. & Haf. - San Rafael (4), on shady trunk, *ST 30006*.

Letrouitia vulpina (Tuck.) Haf. & Bellem. - Mantalingahan slope (2), on shady stem, 900 m, *ST 29935*.

***Leucodecton glaucescens** (Nyl.) Frisch - San Rafael (4), on shady trunk, *ST 30031, 30034*.

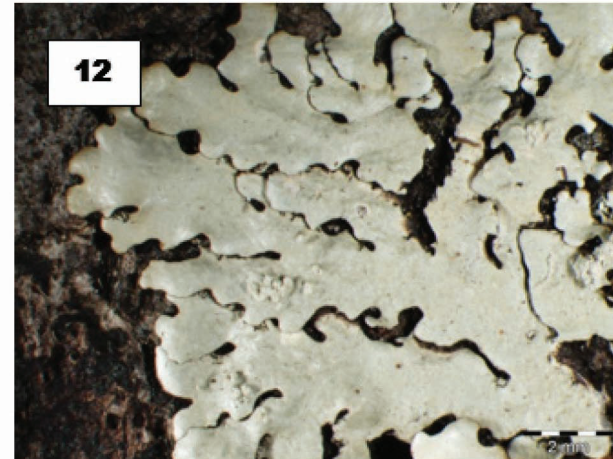
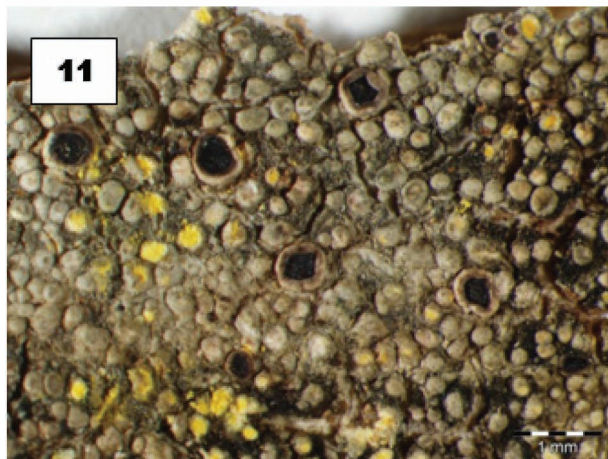
Lobaria meridionalis Vain. - Mantalingahan slope (2), in mossy primary forest on ridge, 1100 m, *ST 29978a*.

Loflammia gabrielis (Müll. Arg.) Vezda - Puerto Princesa, foliicolous, 1911, *Merrill 12989* (Santesson 1952: 4, as *Bacidia gabrielis* (Müll. Arg.) Zahlbr.).

Malmidea chrysostigma (Vain.) Kalb, Rivas Plata & Lumbsch (Figure 11) - Mantalingahan slope (2), on fallen branches, 900 m, *ST 29931*.

Malmidea subaurigera (Vain.) Kalb, Rivas Plata & Lumbsch - Puerto Princesa/Iwahig road (5), corticolous, *D 13342*.

Malmidea taytayensis (Vain.) Kalb, Rivas Plata & Lumbsch - Taytay, corticolous in dry forest, 60 m, *Merrill 9068* (Vainio 1921: 123, as *Lecidea taytayensis* Vain., type collection).



Figures 9-12. 9. *Graphis leptogramma* (specimen *Sipman & Tan 30038 b*): many species of script lichens are difficult to recognize because they have no conspicuous characters. This one has the apothecia largely sunken in thallus ridges; 10. *Graphis stenotera* (specimen *Sipman & Tan 29985*): the apothecia of this species are very gradually decreasing in width towards their ends, and their surface is finely striate; 11. *Malmidea chrysosticta* (specimen *Sipman & Tan 29931*): a conspicuous, crustose lichen from tree bark, with a strong, yellow pigment in the mark of the thallus warts (exposed by damage); 12. *Myelochroa denegans* (specimen *Sipman & Tan 29914*): one of the few leafy lichens on Palawan. Recognizable by the thallus being closely appressed to the tree bark, and the presence of scattered, pustular outgrowths on the surface which break open and produce granules for vegetative reproduction.

Mazosia bambusae (Vain.) R. Sant. - Brooke's Point, foliicolous, 1911, *Elmer 12722* (Santesson 1952: 122). - This is probably the same material as issued in Krypt. Exs. Vindob. 3811 (Petrač 1955).

***Megalalaria leptocheila** (Tuck.) Fryday & Lendemmer - Puerto Princesa/Maranac (7), corticolous, *D 13351*.

Megalospora coccodes (Bél.) Sipman ssp. **nigricans** (Müll. Arg.) Sipman - Mantalingahan slope (2), on trunk of fallen tree, 800 m, *ST 29912*.

Megalospora sulphurata Mey. & Flot. - Mantalingahan slope (2), on fallen branches, 900 m, *ST 29964*.

Megalospora tuberculosa (Fée) Sipman - Mantalingahan slope (2), on fallen branches, 900 m, *ST 29975, 29975a*.

Melaspilea pongamiae Vain. - Taytay, on *Pongamia mitis*, *Merrill 9062* (Vainio 1921: 316, type collection).

***Myelochroa denegans** (Nyl.) Elix & Hale (Figure 12) - Mantalingahan slope (2), on trunk of fallen tree, 800 m, *ST 29914*.

***Ocellularia bahiana** (Ach.) Frisch - Puerto Princesa/Maranac (7), corticolous, *D 13389*. - The pores of the ascomata are consistently narrow, hiding the disc.

***Ocellularia dolichotata** (Nyl.) Zahlbr. - Puerto Princesa/Maranac (7), corticolous, *D 13388*.

***Ocellularia groenhartii** Hale - San Rafael (4), on shady trunk, *ST 30003, 30010, 30012, 30016, 30022*.

***Ocellularia keralensis** Patw. & Kulk. ex Hale - Mantalingahan slope (2), on shady trunk, 900 m, *ST 29965*; San Rafael (4), on shady liana trunk, *ST 30023*. - The identification of *ST 30023* is uncertain.

***Ocellularia marivelensis** (Vain.) Hale - Mantalingahan slope (2), on fallen branches, 900 m, *ST 29960*.

Ocellularia massalongoi (Mont.) Hale - San Rafael (4), on shady liana trunk, *ST 30038a*.

***Ocellularia microstoma** (Müll. Arg.) Hale - Mantalingahan slope (2), on shady trunk, 900 m, *ST 29939*.

***Ocellularia papillata** (Leight.) Zahlbr. - Mantalingahan slope (2), on shady trunk, 900 m, *ST 29926*; San Rafael (4), on shady trunk, *ST 30000, 30018, 30035*; id., on shady liana trunk, *ST 30038*; Puerto Princesa/Maranac (7), corticolous, *D 13382*. - Specimen *D 13382* deviates by the presence of an unidentified substance.

***Ocellularia perforata** (Leight.) Müll. Arg. - Mantalingahan slope (2), on shady trunk, 900 m, *ST 29957, 29966*; San Rafael (4), on shady trunk, *ST 30024, 30030*.

***Ocellularia terebrata** (Ach.) Müll. Arg. - San Rafael (4), on shady trunk, *ST 30028*.

Opegrapha anguinella (Nyl.) Ertz & Diederich - Taytay, corticolous on *Calophallyum*, *Merrill 9033*, pr.p. (Vainio 1921: 280, as *Chiodecton (Enterographa) anguinelum* (Nyl.) Vain. and as *Chiodecton calophylli* Vain., type collection). - *Chiodecton calophylli* was recently synonymized with *Enterographa anguinella* (Nyl.) Redinger (Sparrius 2004), which species is now included in *Opegrapha* (Ertz et al. 2009).

Opegrapha concatenata Vain. - Taytay, corticolous on *Pongamia dulcis* at coast, 1913, *Merrill 9052* (Vainio 1921: 271, type collection) - According to Ertz (2009) the type specimen is in poor condition and its classification uncertain.

Opegrapha gregalis Vain. - Taytay, corticolous on *Cocos nucifera*, 1913, *Merrill 9037*, pr.p. (Vainio 1921: 274, type collection). - This is a lichenicolous fungus on an unidentified pyrenocarpous lichen (Ertz 2009).

Opegrapha medusulina Nyl. - "Insulae Pabellones in sinu Taytay", corticolous on *Hoya*, *Merrill 9010* (Vainio 1921: 275, as *Opegrapha hoyae* Vain.; Ertz 2009).

Opegrapha prosodea Ach. var. **sclerocarpa** (Meyen & Flot.) Vain. - Taytay, corticolous, *Merrill 9070* (Vainio 1921: 270) - This name is not treated by Ertz (2009).

Opegrapha robusta Vain. - Mantalingahan slope (2), on shady trunk, 900 m, *ST 29951*; San Rafael (4), on shady trunk, *ST 30001* (Ertz 2009).

Opegrapha subrimulosa Nyl. - Puerto Princesa/Iwahig road (5), corticolous, *D 13334* (Ertz 2009).

Pallidogramme chlorocarpoides (Nyl.) Staiger, Kalb & Lücking - Mantalingahan slope (2), on trunk of fallen tree, 800 m, *ST 29917*.

Pannaria stylophora Vain. var. **disserpens** Vain. - Taytay, 1913, *Merrill 9027, 9069* pr.p., *Fénix-Bur. Sci. 15634* (Vainio 1921: 10, syntype collection).

***Parmeliella brisbanensis** (C. Knight) P.M. Jørg. & D. J. Gallow. - Brooke's Point (1), on *Cocos* trunk, *ST 29901*; Mantalingahan slope (2), in mossy primary forest on ridge, 1100 m, *ST 29981*.

Parmeliella mariana (Fr.) P.M. Jørg. & D.J. Galloway - Taytay, *Merrill 9069* (Vainio 1921: 7, as *Pannaria mariana* (Fr.) Müll. Arg. var. *radiata* (Nyl.) Vain.).

***Parmotrema ultralucens** (Krog) Hale - Mantalingahan slope (2), in mossy primary forest on slope, on fallen trunk, 500 m, *ST 29987*.

Pertusaria subvaginata Nyl. var. **orientalis** Räs. - Taytay,

on calcareous rock, *Merrill 9023* (Räsänen 1949: 81).

Phaeographis dendroides (Leight.) Vain. - Taytay, corticolous, *Merrill 9060* (Vainio 1921: 222, as *Graphis dendroides* (Leight.) Vain.).

Phaeographis hydrina (Vain.) Redinger - Taytay, corticolous on *Pongamia mitis* at coast, 1913, *Merrill 9051* (Vainio 1921: 232, as *Graphis hydrina* Vain., type collection).

Phaeographis labuana (Nyl.) Redinger - Taytay, corticolous, *Merrill 9030* (Vainio 1921: 225, as *Graphis labuana* (Nyl.) Vain.).

Phaeographis mitis (Vain.) Redinger - Taytay, corticolous on *Pongamia mitis* at coast, 1913, *Merrill 9045, 9046* pr.p. (Vainio 1921: 226, as *Graphis mitis* Vain., type collection).

Phaeographis pongamiae (Vain.) Zahlbr. - Taytay, corticolous on *Pongamia mitis* at coast, 1913, *Merrill 9064* (Vainio 1921: 222, as *Graphis pongamiae* Vain., syntype collection).

Phaeographis semiglyphis (Vain.) Redinger - Taytay, corticolous, *Merrill 9044* (Vainio 1921: 225, as *Graphis semiglyphis* Vain., type collection).

Phaeographis wainioana Zahlbr. - Taytay, corticolous on *Pongamia mitis* at coast, 1913, *Merrill 9063* (Vainio 1921: 223, as *Graphis astroidea* Vain., type collection).

***Phaeographopsis palaeotropica** Kalb & Frisch (Figure 13) - San Rafael (4), on shady trunk, *ST 30021*.

Phyllopsora phaeoglauca (Vain.) Zahlbr. - Balabac, corticolous, *Bur. Sci. 527*. (Vainio 1921: 113, as *Lecidea phaeoglauca* Vain., syntype collection). - The species is treated as unclear by Timdal (The *Phyllopsora* site, <http://nhm2.uio.no/lichens/fl.php?p=ph>, accessed 16 Nov. 2012).

Physcia atrostriata Moberg - San Rafael (4), on sunny rock outcrop on bank of stream, *ST 30058a*.

Physcia solediosa (Vain.) Lynge - Brooke's Point (1), on *Cocos* trunk, *ST 29899, 29904, 29905*.

***Physma pseudoisidiatum** Aptroot & Sipman - Mantalingahan slope (2), on fallen branches, 900 m, *ST 29968*.

***Polymeridium quinqueseptatum** (Nyl.) R.C. Harris - Puerto Princesa/Iwahig (6), corticolous, *D 13320, 13323*.

***Porina internigrans** (Nyl.) Müll. Arg. - Puerto Princesa/Maranac (7), corticolous, *D 13380*.

***Porina mastoidea** (Ach.) Müll. Arg. - Mantalingahan slope (2), on shady trunk, 900 m, *ST 29932, 29934, 29947*; San Rafael (4), on shady trunk, *ST 29999, 30015, 30044*.

***Porina nucula** Ach. - Puerto Princesa/Maranac (7), corticolous, *D 13379*.

***Pseudocyphellaria prolificans** (Nyl.) Vain. - Mantalingahan slope (2), in mossy primary forest on ridge, 1100 m, *ST 29978*.

Pyrenula albohallina Vain. - Taytay, corticolous, 1913, *Merrill 9029* (Vainio 1921: 334, type collection). - This species was accepted by Aptroot (2011).

Pyrenula anomala (Ach.) A. Massal. - Puerto Princesa/Maranac (7), corticolous, *D 13368*; Puerto Princesa/Iwahig (6), corticolous, *D 13328*.

Pyrenula aspistea (Ach.) Ach. (Figure 14) - San Rafael (4), on shady trunk, *ST 30043*; Puerto Princesa/Maranac (7), corticolous, *D 13365*.

Pyrenula confinis (Nyl.) R.C. Harris - Taytay, corticolous, *Merrill 9056* (Vainio 1921: 330, as *Bottaria confinis* (Nyl.) Vain., type collection); Taytay, on *Terminalia catappa*, 1913, *Merrill 9049* (Vainio 1921: 325 as *Bottaria connectens*, type collection). - Synonymy following Aptroot (2011).

Pyrenula fetivica (Krempelh.) Müll. Arg. - Mantalingahan slope (2), on fallen branches, 900 m, *ST 29930*; Puerto Princesa Munic., Irawan Barangay, Mt. Malinao (subpeak W of Mt. Beaufort), on old Benguet Mine Road, 800 m, 4 May 1993, *Cacavio 93-311* [B].

***Pyrenula finitima** Müll. Arg. - Mantalingahan slope (2), on thin shady trunk, 900 m, *ST 29942*.

***Pyrenula interducta** (Nyl.) Zahlbr. - Mantalingahan slope (2), on fallen branches, 900 m, *ST 29963*; Mantalingahan slope (2), in mossy primary forest on slope, on shady trunk, 500 m, *ST 29983a*.

Pyrenula leucostoma Ach. - Taytay, corticolous, *Merrill 9034* (Vainio 1921: 327, as *Bottaria libricola* (Fée) Vain.).

Pyrenula mamillana (Ach.) Trevis. - Puerto Princesa/Maranac (7), corticolous, *D 13366*.

Pyrenula massariospora (Starb.) R.C. Harris (Figure 15) - Mantalingahan slope (2), on fallen branches, 900 m, *ST 29962*; Mantalingahan slope (2), in mossy primary forest on slope, on shady trunk, 500 m, *ST 29984*.

Pyrenula ochraceoflava (Nyl.) R.C. Harris - Taytay, corticolous on *Cocos nucifera*, *Merrill 9019* pr.p. (Vainio 1921: 330, as *Bottaria ochrotropa* (Nyl.) Vain.).

Pyrenula parvinuclea (Meyen & Flot.) Aptroot - Taytay, corticolous on *Cocos nucifera*, *Merrill 9018, 9037* (Vainio 1921: 330, as *Bottaria denudata* (Nyl.) Vain.).

Pyrenula quassiaecola (Fée) Fée - Taytay, corticolous

on *Pongamia mitis*, 1913, *Merrill 9054* (Vainio 1921: 342, as *Pyrenula pallidofulvescens* Vain. and as var. *fulvostraminea* Vain., type collection).

Pyrenula sexocularis (Nyl.) Müll. Arg. - Taytay, corticolous on *Calophyllum inophyllum*, 1913, *Merrill 9043* (Vainio 1921: 341, as *Pyrenula flavofulvescens* Vain., type collection); Brooke's Point (1), on *Glyciridia*, *ST 29906a*.

Pyrenula subdissidens Vain. - Taytay, corticolous on *Pangamia mitis*, 1913, *Merrill 9032* (Vainio 1921: 333, syntype collection). - Aptroot (2011) treats this species as a questionable synonym of *P. arthoniotheca* Upreti.

****Pyrenula subglabrata*** (Nyl.) Müll. Arg. - San Rafael (4), on shady trunk, *ST 30019*.

****Pyxine meissnerina*** Nyl. - Brooke's Point (1), on *Cocos* trunk, *ST 29905a*.

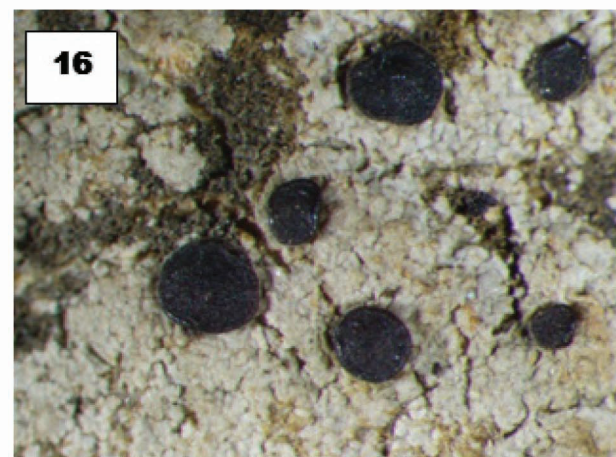
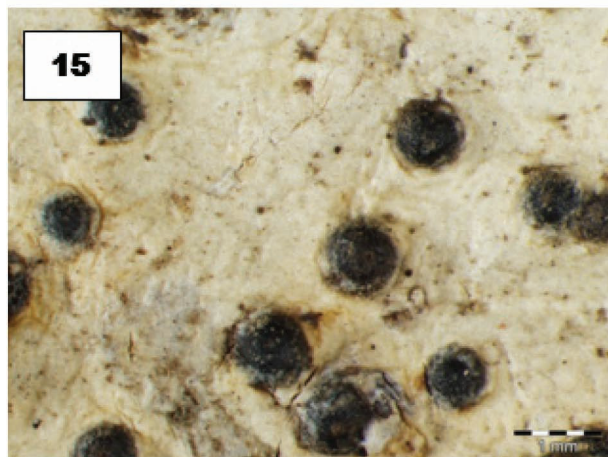
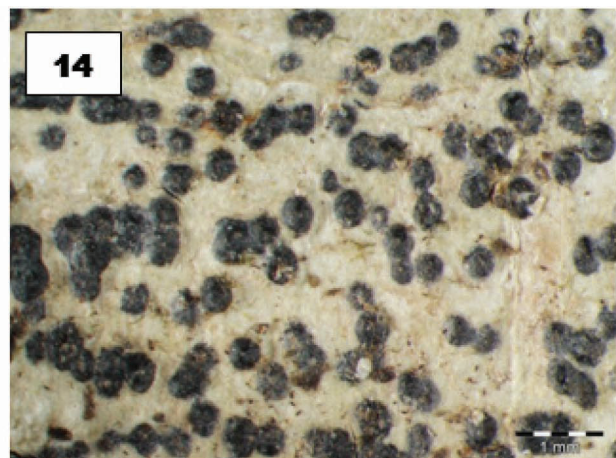
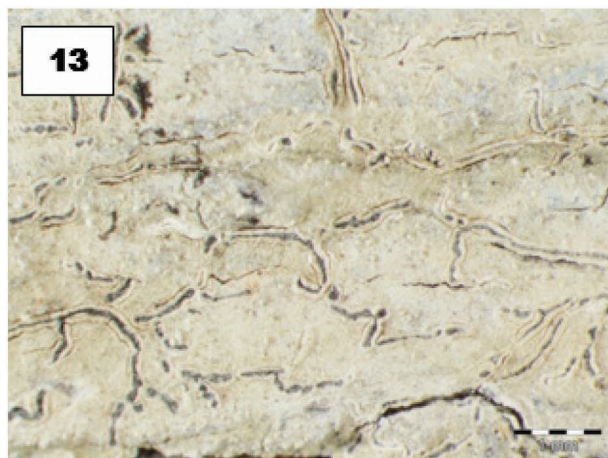
****Ramonia microspora*** Vězda - Puerto Princesa/Iwahig road (5), corticolous, *D 13333*.

Relicina abstrusa (Vain.) Hale - Mantalingahan slope (2), on fallen branches, 900 m, *ST 29956b* (Elix 1996).

Relicina subabstrusa (Gyelnik) Hale - Mantalingahan slope (2), on trunk of fallen tree, 800 m, *ST 29913*; Mantalingahan slope (2), on fallen branches, 900 m, *ST 29956* (Elix 1996).

****Rinodina oxydata*** (A. Massal.) A. Massal. - Mantalingahan slope (2), in valley of river Macagua, on sunny rock outcrops along stream, 200 m, *ST 29993*.

****Rinodina xanthomelana*** Müll. Arg. - Mantalingahan slope (2), in valley of river Macagua on sunny rock outcrops along stream, 200 m, *ST 29992*; San Rafael (4), on sunny rock outcrop on bank of stream, *ST 30050*.



Figures 13-16. 13. *Phaeographopsis palaeotropica* (specimen *Sipman & Tan 30021*): a common species in natural forests of SE Asia, in which the ripe spores accumulate on the top of the elongated apothecia; 14. *Pyrenula aspistea* (specimen *Sipman & Tan 30043*): a common species of tropical forests, tolerating much shade. The black dots are perithecia; 15. *Pyrenula massariospora* (specimen *Sipman & Tan 29962*): the species of *Pyrenula* are externally very similar, and have to be recognized by microscopical examination. This one has much larger perithecia than *P. aspistea*; 16. *Septotrapelia triseptata* (specimen *Sipman & Tan 29991*): a pioneer species on bare, fresh stones of humid road banks, with black apothecia on an inconspicuous, pale thallus.

Sarcographa heteroclita (Mont.) Zahlbr. - Mantalingahan slope (2), on trunk of fallen tree, 800 m, *ST 29916*; San Rafael (4), on shady trunk, *ST 30020*; Puerto Princesa/Maranac (7), corticolous, *D 13364*.

Sarcographa labyrinthica (Ach.) Müll. Arg. - Taytay, corticolous on *Pongamia mitis* and other trees, *Merrill 9061* (Vainio 1921: 230, as *Graphis labyrinthica* (Ach.) Vain.); San Rafael (4), *ST 29997*; id., on shady trunk, *ST 30020a*; Puerto Princesa/Iwahig (6), corticolous, *D 13317*.

Sarcographa ramosoconnexa (Vain.) Redinger - Taytay, corticolous on *Pongamia mitis* at coast, 1913, *Merrill 9058* (Vainio 1921: 237, as *Graphis ramosoconnexa* Vain., type collection).

***Septotrapelia triseptata** (Hepp) Aptroot (Figure 16) - Mantalingahan slope (2), in valley of river Macagua, on stabilized gravel along stream, 300 m, *ST 29991*. - This little-known species was recently recombined into the new genus *Septotrapelia* (Aptroot et al. 2006, 2007). Since no detailed description was given and this is hardly found in the literature, a short characterization is presented here.

Thallus growing over bare, loamy soil or pebbles, thin, usually inapparent and the apothecia seemingly growing directly on the substrate, or more visible, finely warty, consisting of *ca.* 0.1 mm wide, flat or slightly convex, adjacent to overlapping lumps, with scattered apothecia. Apothecia blackish, biatorine, *ca.* 0.5-1.5 mm wide, round, with flat to slightly convex disc and persistent margin that extends hardly above the disc and may become sinuous in very large apothecia over 1.5 mm wide, internally very similar to those of *S. glauca* Aptroot & Chaves (Aptroot et al. 2006); hymenium 60-90 µm; asci *Pilocarpus*-type; ascospores 3-septate, 20-24 x 5-7 µm.

The species is widespread in the Palaeotropics on humid, exposed road cuts, growing on bare, solid, lateritic loam without humus, and acidic pebbles, at mid elevations, *ca.* 300-1800 m. Not to be confused with the European species *Bacidia trisepta* (Nägeli) Zahlbr. = *Micarea peliocarpa* (Anzi) Coppins.

Sporopodium leprieurii Mont. - Puerto Princesa, foliicolous, 1911, *Merrill 12989* (Santesson 1952: 515).

Stegobolus berkeleyanus Mont. - Puerto Princesa/Maranac (7), corticolous, *D 13375*.

Stegobolus crassus (Müll. Arg.) A. Frisch - Mantalingahan slope (2), on shady trunk, 900 m, *ST 29972*.

Strigula maculata (Cooke & Masee) R. Sant. - Taytay, foliicolous, 1913, *Merrill 8744* [S] (Sydow & Sydow 1914: 171, as *Heterodothis leptotheca* Sydow, type

collection; Santesson 1952: 188).

Strigula melanobapha (Krempel.) R. Sant. - Prope lacum Manguao, foliicolous, 1913, *Merrill 9013* (Vainio 1923: 19, as *Strigula linearis* Vain., type collection; Santesson 1952: 190).

Strigula prasina Müll. Arg. - Brooke's Point, foliicolous, 1911, *Elmer 12640* (Santesson 1952: 199, as *Raciborskiella prasina* (Müll. Arg.) R. Sant.).

Strigula smaragdula Fr. - Brooke's Point, foliicolous, 1922, *Elmer 12650* [UPS, W] (Santesson 1952: 170, as *Strigula elegans* (Fée) Müll. Arg.).

Strigula subelegans Vain. - Brooke's Point, foliicolous, 1911, *Merrill 12640* [W] (Santesson 1952: 160).

***Strigula wilsonii** (Riddle) R.C. Harris - Tabon Caves (3), on limestone in light forest, *ST 29995*.

Tapellaria bilimbioides R. Sant. - Puerto Princesa, foliicolous, 1911, *Merrill 12989* (Santesson 1952: 499).

***Tephromela cerasina** (Müll. Arg.) Rambold & Triebel - Mantalingahan slope (2), on fallen branches, 900 m, *ST 29967a*. - Lichenicolous on *Dirinaria aegialita*.

Thecaria quassiaecola Fée - Mantalingahan slope (2), on fallen branches, 900 m, *ST 29959*. - The ascospores are scarce and underdeveloped, 28-25 x 11-13 µm.

***Thecaria montagnei** (v.d. Bosch) Staiger - Mantalingahan slope (2), on fallen branches, 900 m, *ST 29927*.

***Trypethelium tropicum** (Ach.) Müll. Arg. - Puerto Princesa/Iwahig (6), corticolous, *D 13319*.

***Tylophoron protrudens** Nyl. - San Rafael (4), on rock outcrop on bank of stream, on overhang, *ST 30060*.

Usnea baileyi (Stirt.) Zahlbr. - Mantalingahan slope (2), on fallen branches, 900 m, *ST 29921, 29923*.

Usnea flexilis Stirt. - Mantalingahan slope (2), on fallen branches, 900 m, *ST 29922*.

Usnea misamisensis (Vain.) Mot. - Mantalingahan slope (2), on fallen branchlets, 900 m, *ST 29920*; *ibid.*, in mossy primary forest on ridge, 1100 m, *ST 29976*.

***Wirthiotrema desquamans** (Müll. Arg.) Lücking - Mantalingahan slope (2), on shady trunk, 900 m, *ST 29943, 29953, 29955*; *id.*, in mossy primary forest on slope, on shady trunk, 500 m, *ST 29986, 29986a*; Tabon Caves (3), on trunk in light forest, *ST 29996*; San Rafael (4), on shady trunk, *ST 30005*; Puerto Princesa/Maranac (7), corticolous, *D 13383*.

***Wirthiotrema santessonii** (Hale) Rivas Plata & Frisch - Puerto Princesa/Maranac (7), corticolous, *D 13358*.

Almost half of our samples appeared not properly identifiable due to inadequate condition or the lack of adequate taxonomic treatments. They represent most probably several dozen additional species.

DISCUSSION

The strong increase in the number of known lichen species on Palawan after a very limited fieldwork in 1991 and 1994 suggests that the lichen biota of the region is still very incompletely known. This is confirmed by the presence of 53 species unrecorded for the Philippines, a high figure even when taking into account that no recent checklist for the country is available and some records may have been missed by us because we were unable to check all relevant literature. A comparison with species lists from other areas would present a further confirmation of the incomplete knowledge. However, there are very few areas in the Palaeotropics for which an approximately complete inventory of the lichen diversity is available. Perhaps the most similar area is Singapore Island, from where 296 lichen species were reported (Sipman 2009, 2010). Taking into account that Palawan is much larger than Singapore Island and has mountains reaching 2000 m, it is likely that it houses many more lichen species, certainly more than the 162 known by now, and even 500 seems still a low estimate. Already the unidentified specimens seem to represent dozens of additional species.

A well-founded evaluation of the phytogeographical relevance of Palawan can be made only for recently revised groups of which species delimitation and world distribution are sufficiently known. In none of such groups a Palawan endemic species is discovered so far. This seems in contradiction with the fact that, among the species collected 1911-1913, many are known only from their type collection from Palawan. This concerns no less than 35 species out of 48 collected 1911-1913, an extraordinarily high number of new taxa, suggesting the presence of a very special lichen flora with many endemics. However, 21 of these 35 were revised recently, which resulted in 11 being synonyms of widespread species, while 10 were accepted as distinct, usually widespread species. Only for four species accepted in recent treatments we did not find any records outside Palawan, namely, *Anisomeridium consimile*, *Fissurina humilis*, *Malmidea taytayensis* and *Pyrenula albohallina*, and they could possibly be endemic. However, published information of these genera is still very scarce and insufficient for a well founded opinion on its distribution. Evidently the high number of new species based on the earlier collections does not reflect a very specialized lichen biota but rather the limited taxonomic knowledge of that time.

What is remarkable is the great difference in species composition between the lichen collections made in 1911-1913 and those of 1991-1994. Of the total of 162 species, only 6 were found in both periods: *Arthonia cinnabarina*, *Coccocarpia erythroxyli*, *C. palmicola*, *Collema actinoptychum*, *C. rugosum* and *Sarcographa labyrinthica*; 58 species were observed only in 1911-1913, and 98 species only in 1991-1994. A possible explanation could be that Palawan houses a rich but scattered lichen diversity, which needs much time to explore. A short visit will then reveal only a small selection of the total, and two small visits are likely to reveal two very different selections.

Another explanation is a decline of the original lichen flora since 1913, and its replacement by a more widespread lichen flora today. This would be most likely for species restricted to primary forest conditions. A closer look at the foliicolous lichens, the best studied group of tropical lichens, which favors undisturbed forest, shows that 13 species are known from Palawan, of which 12 species are among the 1911-1913 collections. Only one is found recently, in spite of the fact that the group is currently among the best known tropical lichen groups and a much increased number of species could have been expected. This suggests a strong decline of foliicolous lichens, possibly by deforestation. On the other hand, for the thelotremoid Graphidaceae, a specialist group for undisturbed forest, out of a total of 16 listed species, only one was found 1911-1913. This does not support a forest degradation scenario as a source of lichen decline, but it suggests rather a different focus of the collecting activity. The early collections are all from cultivated coastal areas, while the recent collections cover also forest remnants and the mountain species.

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