

Preliminary List of Lichens in the Mariana Islands, Micronesia

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Abstract A preliminary list of lichens is presented on the basis of about 900 specimens from the Mariana Islands, Micronesia mainly collected during the Biological Expedition conducted by the Natural History Museum and Institute, Chiba in 1992. The list includes 171 taxa with 30 identified and 141 unidentified ones.

Key words: Lichenes, flora, Mariana Islands, Micronesia.

The Mariana Islands in Micronesia, located to the east of Philippine and to the south of Japan in the western Pacific, have been almost completely neglected for lichenological study. In 1992, I had a chance to visit there as a member of the Biological Expedition to the northern Mariana Islands, conducted by the Natural History Museum and Institute, Chiba, in cooperation with the Department of Natural Resources (the Commonwealth of the northern Mariana Islands) and the University of Guam Marine Laboratory. During that visit, nearly 700 lichen specimens were collected, mainly by myself. Also, in relation to this, I have made short stays in Saipan, Rota and Guam Islands of the southern Marianas with some of the members, where I spent several days for field surveys and collected more than 200 specimens of lichens. About 900 lichen specimens in total have been collected. Although most of the specimens have not been critically identified as yet, it was required to immediately publish the result of the expedition; therefore, here is presented a preliminary list of lichens of the Mariana Islands with many unidentified species. It will be supplemented by later studies.

Study Sites and General View of Lichen Flora

Mariana Islands consist of a chain of islands lying north and south between 13°20'N and 20°40'N, and between 144°40'E and 146°00'E. The northern islands are volcanic and now mostly uninhabited. Among them, I visited the

following islands during the expedition, from north to south: Uracas, Maug, Asuncion, Agrihan, Pagan, Alamagan, Guguan, Sarigan, and Anatahan (Fig. 1).

Uracas is an active volcano, and most of the area of the island is covered by volcanic ashes or gravels and still unstable, where grasses and herbs sporadically were growing but no lichen was found. Lichen growth seemed to be confined to a large outcrop near the beach on the south of the island. There, only some epilithic lichens were found: *Endocarpon* sp., *Physcia* sp. etc.

Among three islands of Maug, only the East Island was investigated. Like the other two, the East Island is a part of a somma, and has very steep slopes both inside of the crater and on the ocean side. There were relatively tall trees here and there on the slope of the inner side, but corticolous lichens were almost absent there probably because of the influence by abundant birds nesting on the trees.

Asuncion takes a conical shape with forests or bushes in coastal area or at lower elevations, and mostly with grasses, weeds or ferns at higher place. Corticolous lichens were abundant in the lower area excepting *Cocos* forests and *Pandanus* thickets, and species of *Coccocarpia* and Graphidaceae were remarkable among them. At higher altitudes, on the other hand, lichens were found in a limited extent, with *Stereocaulon* sp. as a main saxicolous element and also with *Cladonia* sp. as a terricolous

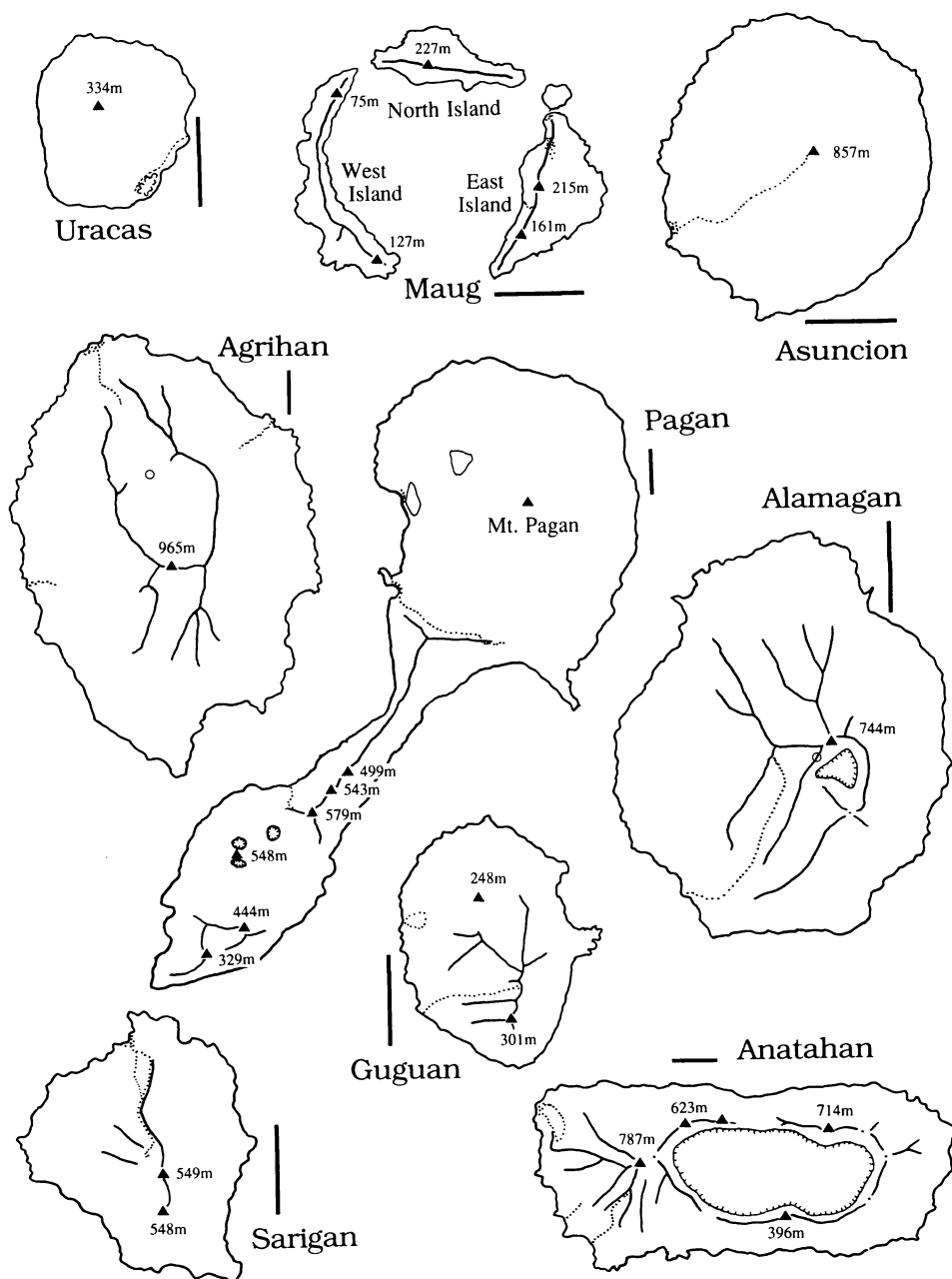


Fig. 1. Study sites. Dot lines indicate survey routes by the present author, and open circles additional sites by Dr. T. Furuki. Mountain ridges are represented by thick lines. Bars indicate 1 km.

element.

Among the northern islands, Agrihan is the only one with a small village at present, and also has the highest mountain in the Marianas. Most areas visited were covered by dense growth of various trees or bushes where corticolous crustose lichens were found ab-

undantly. Fruticose and foliose species were, in contrast, very rare.

Pagan is the largest island in the northern Mariana. On the foot of Mt. Pagan which was erupted recently, lichens were very scarcely found on both rocks and trees. Contrarily, there were abundant corticolous lichens in for-

ests in the southern part of the island.

Alamagan was visited only in the southwestern part. Crustose lichens were more or less abundant on hardwoods and palm trees along the ravine where the author climbed up and down. At altitudes higher than about 300 m, foliose cyanolichens were rather abundantly growing on various trees and tree ferns. These include species of *Physma*, *Coccocarpia*, *Leptogium*, and *Pseudocyphellaria*.

In Guguan, there are two mountain bodies, one a very new volcano and the other an older rather stable mountain. The volcano was covered by volcanic ash or gravels, and has no lichen growth. The older mountain was covered by forests or thickets, and there were some nesting sites of sea birds where lichens were rather scarce as in Maug.

The northern side of Sarigan was visited in this expedition. In coastal forests of Cocos (previously as plantation ?), corticolous lichens were found on trunks of palm trees at sunny or partially shaded sites. There was a rocky ridge with many boulders which was more or less sunny with sporadically standing trees. *Pannaria stylophora* was abundantly growing on these boulders accompanied by crustose lichens. Corticolous lichens were rather abundant on trees on the ridges, bread-fruit trees of an abandoned plantation, and leguminous trees standing on grassland at higher elevations. They are *Ramalina*, Pyrenulaceae, Graphidaceae, *Cryptothecia* or *Chiodecton*.

Anatahan was investigated only on the western side. In coastal forests, tree trunks were usually covered by crustose lichens, but foliose species were not so common here. At middle elevations around 300 or 400 m alt., where tree ferns were growing, there were found some foliose cyanolichens such as *Coccocarpia smaragdina* and *Physma byrsinum*.

In contrast to the northern Marianas, the southern islands are mostly composed of uplifted coral reef with rather large plain lands and without an active or new volcano. Field surveys were made on the following three islands from the north to the south: Saipan, Rota and Guam.

In Saipan, the capital island of the Commonwealth of the Northern Mariana Islands, there

does not seem to be a primeval forest due to the heavy influence of human activities for a long period and due to battles of the last war. However, there was found rather abundant growth of corticolous lichens in *Pandanus* thickets around the summit of Mt. Takpochao, with the following genera of macrolichens: *Coccocarpia*, *Leptogium*, *Parmotrema*, *Ramalina*, *Pyxine*, *Dirinaria*. Some calcicolous lichens such as *Endocarpon* were found on the top of a limestone cliff or outcrops around the summit.

In Rota, lichens were collected around the highest peak at Sabana on the highest elevated plane and below a cliff around there. It looked most abundant of corticolous lichens among the sites investigated in the Marianas. Trunks and branches of *Acacia* were vigorously covered by foliose (*Parmotrema pacifica*, *P. cristifera*, *Pannaria*) and crustose lichens (Graphidaceae spp., *Enterographa*, *Cryptothecia* etc.).

In Guam, which has the largest population in the Marianas, lichens were investigated only around University of Guam, where corticolous species such as *Ramalina* were relatively abundant.

List of Lichens

Taxa are arranged in alphabetical order irrespective of whether or not they have been completely identified. For each taxon, information is presented on the growth substratum, and specimens. In the specimen citation under each taxon, specimens are arranged in order of islands from north to south, then according to the altitude in ascending order. The collector's name is prefixed before the specimen number, and it is abbreviated as 'hh' for specimens collected by the present author.

1. *Acanthothecis* sp. 1

On bark of hardwood. ASUNCION: 70 m alt., hh-12889. AGRIHAN: 250 m alt., hh-12755. PAGAN: 70 m alt., hh-12642; 280 m alt., hh-12661. ALAMAGAN: 100 m alt., hh-12943 & 12951; 220 m alt., hh-12968. GUGUAN: 210 m alt., hh-12565. SARIGAN: 300 m alt., hh-12519 & 12520.

2. *Acanthothecis* sp. 2

On bark of hardwood. ASUNCION: 50 m alt., hh-12878 & 12880; 70 m alt., hh-12894 & 12897.

3. *Agonimiella pacifica* Harada, Nova Hedwigia 57(3-4): 503 (1993).
On mosses on bark of hardwood. ALAMAGAN: 380 m alt., hh-12607. SARIGAN: 300 m alt., hh-12494. ANATAHAN: 380 m alt., hh-12439.
4. *Anaptychia flagilissima* Kurok., Nova Hedwigia, Beih. 6: 60 (1962).
On trunk of palm tree. ALAMAGAN: 100 m alt., hh-12593 & 12949.
5. *Anaptychia japonica* (Sato) Kurok., J. Jpn. Bot. 35: 353 (1960).
On bark of hardwood and rock. ASUNCION: 660 m alt., hh-12815. AGRIHAN: 300 m alt., hh-12761. ALAMAGAN: 380 m alt., hh-12609. SARIGAN: 300 m alt., hh-12490. ANATAHAN: 10 m alt., hh-12414; 40 m alt., hh-12400; 380 m alt., hh-12431 & 12435. SAIPAN: 430 m alt., hh-12323. ROTA: 480 m alt., hh-13005 & 13029.
6. *Anthracotheicum* sp. 1
On bark of hardwood. MAUG: 130 m alt., hh-12830. ASUNCION: 20 m alt., hh-12853; 25 m alt., hh-12782. AGRIHAN: 130 m alt., hh-12734; 150 m alt., hh-12739; 230 m alt., hh-12746; 250 m alt., hh-12756. PAGAN: 5 m alt., hh-12618; 20 m alt., hh-12622; 50 m alt., hh-12623. GUGUAN: 40 m alt., hh-12561. SARIGAN: 150 m alt., hh-12484. SAIPAN: 1 m alt., hh-11736 & 11741; 220 m alt., hh-11735; 330 m alt., hh-13047 & 13050.
7. *Anthracotheicum* sp. 2
On trunk of palm tree. AGRIHAN: 20 m alt., hh-12703. ALAMAGAN: 80 m alt., hh-12910. ANATAHAN: 150 m alt., hh-12376. GUAM: 20 m alt., hh-11683.
8. *Anthracotheicum* sp. 3
On trunk of palm tree. SAIPAN: 190 m alt., hh-11747.
9. *Anthracotheicum* sp. 4
On trunk of hardwood. GUAM: 60 m alt., hh-11701.
10. *Anthracotheicum* sp. 5
On trunk of hardwood. ALAMAGAN: 220 m alt., hh-12967 & 12972. GUAM: 60 m alt., hh-11697.
11. *Arthonia* sp. 1
On trunk of *Cocos nucifera*. AGRIHAN: 25 m alt., hh-12769.
12. *Arthonia* sp. 2
On bark of hardwood. SARIGAN: 150 m alt., hh-12482.
13. *Arthonia* sp. 3
On bark of hardwood. ALAMAGAN: 80 m alt., hh-12915.
14. *Arthonia* sp. 4
On bark of hardwood. SARIGAN: 300 m alt., hh-12551.
15. *Arthonia* sp. 5
On bark of hardwood. PAGAN: 50 m alt., hh-12624.
16. *Arthonia* sp. 6
On trunk of palm tree. SAIPAN: 190 m alt., hh-11751.
17. *Arthonia* sp. 7
On trunk of palm tree. GUAM: 20 m alt., hh-11682.
18. *Arthopyrenia* sp. 1
On bark of hardwood. SARIGAN: 300 m alt., hh-12507.
19. *Arthopyrenia* sp. 2
On bark of hardwood and trunk of palm tree. ASUNCION: 20 m alt., hh-12852; 50 m alt., hh-12875; 70 m alt., hh-12884. AGRIHAN: 20 m alt., hh-12705 & 12706. ANATAHAN: 2 m alt., hh-12393.
20. *Arthopyrenia* sp. 3
On bark of hardwood. ASUNCION: 20 m alt., hh-12865; 25 m alt., hh-12787.
21. *Arthopyrenia* sp. 4
On bark of hardwood. ASUNCION: 20 m alt., hh-12857, 12859 & 12863; 50 m alt., hh-12882; 70 m alt., hh-12890 & 12895; 80 m alt., hh-12791 & 12794. ALAMAGAN: 220 m alt., hh-12970.
22. *Arthothelium* sp. 1
On bark of hardwood. ALAMAGAN: 80 m alt., hh-12914.
23. *Arthothelium* sp. 2
On bark of hardwood. ASUNCION: 25 m alt., hh-12783.
24. *Arthothelium* sp. 3
On bark of hardwood. GUAM: 60 m alt., hh-11703.
25. *Bacidia* sp. 1
On trunk of palm tree. SARIGAN: 330 m alt., hh-12541.
26. *Bacidia* sp. 2
On bark of hardwood and trunk of palm tree. AGRIHAN: 50 m alt., hh-12708. PAGAN: 40 m alt., hh-12636. ALAMAGAN: 80 m alt., hh-

12928. SAIPAN: 220 m alt., hh-11729; (? m alt.) hh-12338. GUAM: 60 m alt., hh-11688.

27. *Bacidia* sp. 3

On bark of hardwood. GUAM: 60 m alt., hh-11687.

28. *Bacidia* sp. 4

On bark of hardwood. MAUG: 130 m alt., hh-12832. AGRIHAN: 70 m alt., hh-12718.

29. *Bacidia* sp. 5

On bark of hardwood. ROTA: 480 m alt., hh-13013.

30. *Bacidia* sp. 6

On bark of hardwood. PAGAN: 60 m alt., hh-12640; 280 m alt., hh-12660.

31. *Bacidia* sp. 7

On rock. ASUNCION: 845 m alt., hh-12821. ALAMAGAN: 100 m alt., hh-12594; 130 m alt., hh-12962.

32. *Bacidia* sp. 8

On bark of hardwood and trunk of palm tree. GUGUAN: 40 m alt., hh-12562. SAIPAN: 190 m alt., hh-11753.

33. *Buellia* sp. 1

On rock. ASUNCION: 720 m alt., hh-12817.

34. *Buellia* sp. 2

On trunk of *Cocos nucifera*. ALAMAGAN: 30 m alt., hh-12981.

35. *Bulbothrix goebelii* (Zenker) Hale, Smithsonian Contr. Bot. 32: 14 (1976).

On trunk of palm tree. PAGAN: 40 m alt., hh-12631. ALAMAGAN: 100 m alt., hh-12591.

36. *Calicium* sp.

On trunk of palm tree. ALAMAGAN: 80 m alt., hh-12918 & 12918; 100 m alt., hh-12590.

37. *Caloplaca* sp. 1

On rock. URACAS: 40 m alt., hh-12846. MAUG: 50 m alt., hh-12825. PAGAN: 5 m alt., hh-12664; PAGAN: 10 m alt., hh-12621. ALAMAGAN: 30 m alt., hh-12904. SARIGAN: 80 m alt., hh-12470. ANATAHAN: 5 m alt., hh-12390 & 12455.

38. *Caloplaca* sp. 2

On bark of hardwood. AGRIHAN: 320 m alt., hh-12686. ANATAHAN: 150 m alt., hh-12365; 200 m alt., hh-12451.

39. *Caloplaca* sp. 3

On bark of hardwood and trunk of palm tree. ANATAHAN: 30 m alt., hh-12389; 40 m alt., hh-12403. SAIPAN: 220 m alt., hh-11728. GUAM: 80 m alt., hh-11710.

40. *Caloplaca* sp. 4

On sunny rock. URACAS: 40 m alt., hh-12849. MAUG: 50 m alt., hh-12826; 130 m alt., hh-12840.

41. *Catillaria* sp.

On bark of hardwood. ASUNCION: 20 m alt., hh-12858; 50 m alt., hh-12868 & 12883; 70 m alt., hh-12887; 120 m alt., hh-12797.

42. *Chiodecton* sp.

On bark of hardwood and trunk of palm tree. ASUNCION: 50 m alt., hh-12879. AGRIHAN: 20 m alt., hh-12707; 70 m alt., hh-12680 & 12722; 80 m alt., hh-12726; 230 m alt., hh-12747. ALAMAGAN: 50 m alt., hh-12906. GUGUAN: 40 m alt., hh-12563. SARIGAN: 330 m alt., hh-12531. ANATAHAN: 40 m alt., hh-12399. SAIPAN: 220 m alt., hh-11727. ROTA: 280 m alt., hh-13004.

43. *Cladonia humilis* (With.) Laundon, Lichenologist 16: 220 (1984).

On rock. ASUNCION: 450 m alt., hh-12808.

44. *Cladonia* spp.

ASUNCION: 580 m alt., on rock with mosses, hh-12810; 650 m alt., on rock, hh-12813. ALAMAGAN: 460 m alt., on humus on rock, hh-12614. ANATAHAN: 380 m alt., on bark of *Elaeocarpus joga*, hh-12436.

45. *Coccocarpia adnata* Arvidss., Opera Bot. 67: 42 (1982).

On trunk of palm tree. GUAM: 80 m alt., hh-11711.

46. *Coccocarpia erythroxyli* (Spreng.) Swinsc. et Krog, Norw. J. Bot. 23: 256 (1976).

On trunk of palm tree. ALAMAGAN: 250 m alt., hh-12596.

47. *Coccocarpia palmicola* (Spreng.) Arvidss. et Galloway, Bot. Notiser 132: 242 (1979).

On bark of hardwood, trunk of palm tree and rock. AGRIHAN: 120 m alt., hh-12666; 350 m alt., hh-12764 & 12765. PAGAN: 300 m alt., hh-12655. ALAMAGAN: 100 m alt., hh-12589. SARIGAN: 300 m alt., hh-12492.

48. *Coccocarpia pellita* (Ach.) Muell. Arg., Flora 65: 320 (1882).

On bark of hardwood and trunk of palm tree. ASUNCION: 25 m alt., hh-12786; 50 m alt., hh-12874; 70 m alt., hh-12885 & 12891; 80 m alt., hh-12792. AGRIHAN: 80 m alt., hh-12727; 120 m alt., hh-12669, 12672 & 12674; 150 m alt., hh-12736; 180 m alt., hh-12696; 250 m alt., hh-

12754; 300 m alt., hh-12763; 320 m alt., hh-12684. PAGAN: 60 m alt., hh-12637; 300 m alt., hh-12654. ALAMAGAN: 80 m alt., hh-12911; 100 m alt., hh-12945 & 12947; 210 m alt., hh-12980; 250 m alt., hh-12595; 380 m alt., hh-12608. GUGUAN: 210 m alt., hh-12584. SARIGAN: 150 m alt., hh-12486; 300 m alt., hh-12498; 330 m alt., hh-12524 & 12545. ANATAHAN: 5 m alt., hh-12343; 10 m alt., hh-12396; 130 m alt., hh-12379; 150 m alt., hh-12378; 200 m alt., hh-12347, 12349 & 12356; 380 m alt., hh-12446. SAIPAN: 430 m alt., hh-12316.

49. *Coccocarpia smaragdina* Pers. in C. Gaudichaud-Beaupre, Voyage autour du mode ... sur les corvettes de S. M. l'Uranie et la Physicienne. Bot.: 206 (1826).

On bark of hardwood. ANATAHAN: 380 m alt., hh-12442 & 12445. ROTA: 480 m alt., hh-13022.

50. *Collema leptaleum* Tuck. var. *leptaleum*, Proceed. Amer. Acad. Arts and Sci. 6: 263 (1864).

On bark of hardwood. ASUNCION: 50 m alt., hh-12870 & 12877.

51. *Collema leptaleum* var. *bilosum* (Mont.) Degel., Symb. Bot. Upsal. 20(2): 105 (1974).

On bark of hardwood. AGRIHAN: 180 m alt., hh-12697; 190 m alt., hh-12743. ALAMAGAN: 100 m alt., hh-12946 & 12948; 400 m alt., hh-12613. SARIGAN: 300 m alt., hh-12497. ANATAHAN: 150 m alt., hh-12419.

52. *Collema rugosum* Krempel. in Fenzl, Reise Novara, Bot. 1: 128 (1870).

On bark of hardwood. ASUNCION: 25 m alt., hh-12785; 50 m alt., hh-12881; 70 m alt., hh-12892. AGRIHAN: 150 m alt., hh-12670. ALAMAGAN: 220 m alt., hh-12971. GUGUAN: 210 m alt., hh-12576. SARIGAN: 80 m alt., hh-12468. ANATAHAN: 380 m alt., hh-12447.

53. *Collema subflaccidum* Degel., Symb. Bot. Upsal. 20(2): 140 (1974).

On bark of hardwood and *Pandanus* sp. ASUNCION: 50 m alt., hh-12790 & 12873; 200 m alt., hh-12350. SARIGAN: 300 m alt., hh-12518. ANATAHAN: 40 m alt., hh-12405.

54. *Collema* sp. 1

On limestone. SAIPAN: 430 m alt., hh-12334; 440 m alt., hh-13044.

55. *Collema* sp. 2

On bark of hardwood. ANATAHAN: 150 m

alt., hh-12368.

56. *Cryptothecia* sp. 1

On bark of hardwood. MAUG: 130 m alt., hh-12836.

57. *Cryptothecia* sp. 2

On bark of hardwood. AGRIHAN: 150 m alt., hh-12735; 320 m alt., hh-12690.

58. *Cryptothecia* sp. 3

On bark of hardwood. ALAMAGAN: 100 m alt., hh-12592. ANATAHAN: 10 m alt., hh-12394 & 12395.

59. *Cryptothecia* sp. 4

On limestone. SAIPAN: 440 m alt., hh-13046.

60. *Cryptothecia* sp. 5

On bark of hardwood. SARIGAN: 80 m alt., hh-12465 & 12466; 150 m alt., hh-12480; 330 m alt., hh-12525.

61. *Dimerella* sp.

On bark of hardwood and trunk of palm tree. AGRIHAN: 50 m alt., hh-12712; 70 m alt., hh-12717. SARIGAN: 330 m alt., hh-12543. ROTA: 280 m alt., hh-12995.

62. *Dirinaria applanata* (Fee) Awas., J. Ind. Bot. Soc. 49: 135 (1970).

On bark of hardwood and trunk of palm tree. MAUG: 130 m alt., hh-12834. ASUNCION: 20 m alt., hh-12854. AGRIHAN: 20 m alt., hh-12780. PAGAN: 5 m alt., hh-12620. ALAMAGAN: 50 m alt., hh-12586; 80 m alt., hh-12922. GUGUAN: 210 m alt., hh-12575. SARIGAN: 5 m alt., hh-12459; 300 m alt., hh-12553. ANATAHAN: 5 m alt., hh-12454.

63. *Dirinaria aspera* (Magn.) Awas., Bryologist 67: 271 (1964).

On trunk of palm tree and rock. ALAMAGAN: 100 m alt., hh-12952. SARIGAN: 300 m alt., hh-12489; 330 m alt., hh-12547.

64. *Dirinaria picta* (Sw.) Clem. et Shear, Gen. Fungi: 323 (1931).

On trunk of palm tree. PAGAN: 40 m alt., hh-12630. ALAMAGAN: 80 m alt., hh-12908. GUAM: 20 m alt., hh-11685.

65. *Endocarpon* sp. 1

On rock. URACAS: 40 m alt., hh-12847 & 12848. ALAMAGAN: 80 m alt., hh-12924. ANATAHAN: 5 m alt., hh-12456.

66. *Endocarpon* sp. 2.

On limestone with mosses. SAIPAN: 430 m alt., hh-12333; 440 m alt., hh-13043.

67. *Enterographa* sp. 1

On bark of hardwood. ALAMAGAN: 100 m alt., hh-12955; 220 m alt., hh-12965; 250 m alt., hh-12975. SARIGAN: 330 m alt., hh-12527 & 12530.

68. *Enterographa* sp. 2

On bark of hardwood. SARIGAN: 330 m alt., hh-12528 & 12535.

69. *Enterographa* sp. 3

On trunk of palm tree. PAGAN: 40 m alt., hh-12634. GUAM: 80 m alt., hh-11716.

70. *Enterographa* sp. 4

On bark of hardwood. AGRIHAN: 70 m alt., hh-12719.

71. *Enterographa* sp. 5

On trunk of palm tree. AGRIHAN: 20 m alt., hh-12779.

72. *Enterographa* sp. 6

On trunk of palm tree. AGRIHAN: 30 m alt., hh-12773 & 12775.

73. *Glyphis cicatricosa* Ach., Synops. Lich.: 107 (1814).

On bark of hardwood. ASUNCION: 20 m alt., hh-12862. GUGUAN: 210 m alt., hh-12568. SARIGAN: 330 m alt., hh-12522. ANATAHAN: 380 m alt., hh-12444.

74. Graphidaceae sp. 1

On bark of hardwood. PAGAN: 280 m alt., hh-12662.

75. Graphidaceae sp. 2

On bark of hardwood. PAGAN: 190 m alt., hh-12651.

76. Graphidaceae sp. 3

On bark of hardwood. GUGUAN: 210 m alt., hh-12582. SARIGAN: 300 m alt., hh-12515.

77. Graphidaceae sp. 4

On bark of hardwood. ROTA: 280 m alt., hh-13003.

78. *Graphina subpulcaris* Zahlbr., Repert. Spec. Nov. Reg. Veget. 31: 212 (1933).

On bark of hardwood and *Pandanus* sp. PAGAN: 320 m alt., hh-12653. ALAMAGAN: 500 m alt., hh-12616. ROTA: 480 m alt., hh-13030.

79. *Graphina* sp. 1

On bark of hardwood. ANATAHAN: 380 m alt., hh-12426.

80. *Graphina* sp. 2

On bark of hardwood. SAIPAN: 43 m alt., hh-12324. ROTA: 480 m alt., hh-13020 & 13039.

81. *Graphina* sp. 3

On trunk of palm tree. GUAM: 80 m alt., hh-11718.

82. *Graphina* sp. 4

On bark of hardwood. SARIGAN: 330 m alt., hh-12548. GUAM: 60 m alt., hh-11699.

83. *Graphina* sp. 5

On bark of hardwood. ROTA: 480 m alt., hh-13007.

84. *Graphina* sp. 6

On bark of hardwood. ROTA: 480 m alt., hh-13021 & 13035.

85. *Graphina* sp. 7

On bark of hardwood and trunk of palm tree. AGRIHAN: 190 m alt., hh-12694; 250 m alt., hh-12752 & 12753; 300 m alt., hh-12760; 350 m alt., hh-12767. PAGAN: 50 m alt., hh-12628. ALAMAGAN: 100 m alt., hh-12959; 220 m alt., hh-12966; 250 m alt., hh-12600 & 12976. GUGUAN: 210 m alt., hh-12579. SARIGAN: 300 m alt., hh-12517. ANATAHAN: 10 m alt., hh-12415; 100 m alt., hh-12381; 380 m alt., hh-12440 & 12448. SAIPAN: 1 m alt., hh-11740. ROTA: 280 m alt., hh-13000.

86. *Graphis* sp. 1

On bark of *Pandanus* sp. ANATAHAN: 200 m alt., hh-12359.

87. *Graphis* sp. 2

On bark of hardwood and trunk of palm tree. ASUNCION: 50 m alt., hh-12900; 70 m alt., hh-12886. AGRIHAN: 120 m alt., hh-12668; 150 m alt., hh-12701, 12737 & 12738. PAGAN: 60 m alt., hh-12639; 190 m alt., hh-12646 & 12649. ALAMAGAN: 80 m alt., hh-12939. GUGUAN: 210 m alt., hh-12569. ANATAHAN: 100 m alt., hh-12383; 150 m alt., hh-12374.

88. *Graphis* sp. 3

On bark of hardwood. ASUNCION: 20 m alt., hh-12866; 70 m alt., hh-12898. AGRIHAN: 50 m alt., hh-12709 & 12713; 80 m alt., hh-12724; 100 m alt., hh-12728. PAGAN: 5 m alt., hh-12619. ALAMAGAN: 80 m alt., hh-12925. GUGUAN: 210 m alt., hh-12566. SARIGAN: 300 m alt., hh-12509. ANATAHAN: 150 m alt., hh-12361.

89. *Graphis* sp. 4

On bark of hardwood. AGRIHAN: 130 m alt., hh-12730; 150 m alt., hh-12740. ANATAHAN: 80 m alt., hh-12409. SAIPAN: 430 m alt., hh-12320 & 12327.

90. *Graphis* sp. 5

On bark of hardwood. ANATAHAN: 150 m alt., hh-12369.

91. *Graphis* sp. 6

On bark of hardwood. ROTA: 280 m alt., hh-12987.

92. *Graphis* sp. 7

On bark of hardwood. GUGUAN: 210 m alt., hh-12573. SAIPAN: 220 m alt., hh-11724. ROTA: 280 m alt., hh-12984.

93. *Graphis* sp. 8

On bark of hardwood and trunk of palm tree. ALAMAGAN: 80 m alt., hh-12919. SARIGAN: 300 m alt., hh-12508.

94. *Graphis* sp. 9

On bark of hardwood or shrub. MAUG: 130 m alt., hh-12829 & 12837. AGRIHAN: 70 m alt., hh-12678.

95. *Graphis* sp. 10

On bark of hardwood and *Pandanus* sp., and trunk of palm tree. PAGAN: 50 m alt., hh-12627. ALAMAGAN: 250 m alt., hh-12598; 500 m alt., hh-12617. ROTA: 480 m alt., hh-13038.

96. *Graphis* sp. 11

On bark of hardwood. MAUG: 130 m alt., hh-12833 & 12835. ALAMAGAN: 80 m alt., hh-12926, 12932 & 12934. SARIGAN: 150 m alt., hh-12483; 300 m alt., hh-12512, 12513 & 12516.

97. *Graphis* sp. 12

On bark of hardwood. ALAMAGAN: 80 m alt., hh-12930.

98. *Graphis* sp. 13

On bark of hardwood. ROTA: 480 m alt., hh-13028.

99. *Graphis* sp. 14

On bark of hardwood. AGRIHAN: 120 m alt., hh-12676.

100. *Graphis* sp. 15

On bark of hardwood. SARIGAN: 150 m alt., hh-12475; 300 m alt., hh-12506.

101. *Gyalecta* sp.

On bark of hardwood. ASUNCION: 20 m alt., hh-12851. AGRIHAN: 70 m alt., hh-12715. ALAMAGAN: 80 m alt., hh-12929 & 12931; 120 m alt., hh-12961.

102. *Lecanactis* sp.

On bark of hardwood. SARIGAN: 150 m alt., hh-12474; 300 m alt., hh-12504.

103. *Lecanora* sp. 1

On bark of hardwood and trunk of palm tree.

SAIPAN: 190 m alt., hh-11748; 220 m alt., hh-11733; (? m alt.), hh-12337. GUAM: 80 m alt., hh-11717.

104. *Lecanora* sp. 2

On bark of hardwood. SARIGAN: 150 m alt., hh-12473 & 12477.

105. *Lecanora* sp. 3

On bark of hardwood. AGRIHAN: 50 m alt., hh-12711. SAIPAN: 220 m alt., hh-11723.

106. *Lecanora* sp. 4

On bark of hardwood. SAIPAN: 3 m alt., hh-11839.

107. *Lecidea* sp. 1

On bark of hardwood and trunk of palm tree. AGRIHAN: 190 m alt., hh-12695. PAGAN: 70 m alt., hh-12641; 120 m alt., hh-12643; 190 m alt., hh-12644; 280 m alt., hh-12657. ALAMAGAN: 220 m alt., hh-12964; 250 m alt., hh-12978. GUGUAN: 210 m alt., hh-12572. SARIGAN: 300 m alt., hh-12500; 330 m alt., hh-12540. ROTA: 280 m alt., hh-12989 & 12999. GUAM: 60 m alt., hh-11692.

108. *Lecidea* sp. 2

On trunk of palm tree. ALAMAGAN: 80 m alt., hh-12917.

109. *Leptogium azureum* (Sw.) Mont. in Webb., Hist. Natur. Iles Canar. 3(2): 129 (1840).

On bark of hardwood. ANATAHAN: 200 m alt., hh-12345, 12436, 12351 & 12355; 380 m alt., hh-12443.

110. *Leptogium cyanescens* (Ach.) Koerb., Syst. Lich. German.: 420 (1814).

On bark of hardwood and trunk of palm tree. ASUNCION: 70 m alt., hh-12893. AGRIHAN: 120 m alt., hh-12665; 150 m alt., hh-12671; 250 m alt., hh-12758. PAGAN: 60 m alt., hh-12638. ALAMAGAN: 80 m alt., hh-12909; 100 m alt., hh-12944; 250 m alt., hh-12973; 380 m alt., hh-12603. GUGUAN: 210 m alt., hh-12581. SARIGAN: 300 m alt., hh-12499. ANATAHAN: 200 m alt., hh-12352.

111. *Leptogium* sp. 1.

On bark of hardwood. ALAMAGAN: 380 m alt., hh-12612.

112. *Leptogium* sp. 2.

On bark of hardwood. ANATAHAN: 380 m alt., hh-12438.

113. *Mazosia melanophthalma* (Muell. Arg.) Sant., Symb. Bot. Upsal. 12(1): 117 (1952).
On leaves of hardwood. AGRIHAN: 150 m alt., hh-12698.
114. *Ocellularia cf. meiosperma* (Nyl.) Hale, Mycotaxon 11: 137 (1980).
On trunk of hardwood. ROTA: 280 m alt., hh-12997.
115. *Opegrapha* spp.
On bark of hardwood. MAUG: 130 m alt., hh-12831. ASUNCION: 20 m alt., hh-12855. AGRIHAN: 30 m alt., hh-12772 & 12774; 70 m alt., hh-12681, 12716, 12720, hh-12721 & 12723. PAGAN: 50 m alt., hh-12625. ALAMAGAN: 80 m alt., hh-12587 & 12935; 100 m alt., hh-12958. SARIGAN: 300 m alt., hh-12496. ANATAHAN: 80 m alt., hh-12407. SAIPAN: 1 m alt., hh-11737 & 11738; 330 m alt., hh-13048. ROTA: 480 m alt., hh-13031.
116. *Pannaria stylophora* Vain., Add. Lich. Antill.: 102 (1914).
On bark of hardwood and *Pandanus* sp., and trunk of palm tree. AGRIHAN: 220 m alt., hh-12693. ALAMAGAN: 380 m alt., hh-12606. SARIGAN: 150 m alt., hh-12487; 330 m alt., hh-12533 & 12544. ANATAHAN: 10 m alt., hh-12397; 150 m alt., hh-12372; 200 m alt., hh-12348 & 12357; 380 m alt., hh-12432 & 12437."
117. *Parmentaria* sp. 1
On bark of hardwood, *Ficus prolixa*. ASUNCION: 20 m alt., hh-12864.
118. *Parmentaria* sp. 2
On bark of hardwood, *Ficus prolixa*. ASUNCION: 180 m alt., hh-12799.
119. *Parmotrema cristiferum* (Tayl.) Hale, Phytologia 28: 335 (1974).
On trunk of hardwood, *Acacia confusa*. ROTA: 480 m alt., hh-13014, 13024, 13025 & 13026.
120. *Parmotrema pacificum* (Kurok.) Kurok., J. Jpn. Bot. 66: 157 (1991).
On bark of hardwood and trunk of palm tree. AGRIHAN: 120 m alt., hh-12673. ALAMAGAN: 80 m alt., hh-12921. SARIGAN: 330 m alt., hh-12546. ANATAHAN: 2 m alt., hh-12392; 5 m alt., hh-12344; 380 m alt., hh-12429. SAIPAN: 430 m alt., hh-12318. ROTA: 480 m alt., hh-13023 & 13037.
121. *Paulia* sp.
On bark. SAIPAN: 430 m alt., hh-12332.
122. *Peltula* sp.
On rock. MAUG: 40 m alt., hh-12824; 130 m alt., hh-12842. ALAMAGAN: 30 m alt., hh-12902; 80 m alt., hh-12923. GUGUAN: 5 m alt., hh-12560.
123. *Pertusaria* spp.
On bark of hardwoods, palm trees, and rocks. AGRIHAN: 120 m alt., hh-12675. PAGAN: 40 m alt., hh-12632. ALAMAGAN: 80 m alt., hh-12907; 100 m alt., hh-12950; 250 m alt., hh-12597. SARIGAN: 300 m alt., hh-12488. ANATAHAN: 80 m alt., hh-12410; 150 m alt., hh-12371; 150 m alt., hh-12373. SAIPAN: 430 m alt., hh-12325 & 12330. ROTA: 480 m alt., hh-13015. GUAM: 60 m alt., hh-11690 & 11694; 80 m alt., hh-11709.
124. *Phaeographina* sp. 1
On bark of hardwood. GUGUAN: 210 m alt., hh-12580 & 12583.
125. *Phaeographina* sp. 2
On bark of hardwood, *Elaeocarpus joga*. ANATAHAN: 380 m alt., hh-12427.
126. *Phaeographis planiuscula* (Mont. et v. d. Bosch) Muell. Arg., Flora 65: 336 (1882).
On bark of hardwood and trunk of palm tree. AGRIHAN: 180 m alt., hh-12742; 210 m alt., hh-12744; 230 m alt., hh-12748. PAGAN: 190 m alt., hh-12645 & 12648. GUGUAN: 210 m alt., hh-12570 & 12574. SARIGAN: 300 m alt., hh-12505 & 12510; 330 m alt., hh-12523. ANATAHAN: 100 m alt., hh-12380 & 12382; 150 m alt., hh-12370 & 12377; 200 m alt., hh-12353; 380 m alt., hh-12433. SAIPAN: 220 m alt., hh-11732.
127. *Phaeographis* sp. 1
On bark of hardwood. SAIPAN: 430 m alt., hh-12326. ROTA: 480 m alt., hh-13036.
128. *Phaeographis* sp. 2
On bark of hardwood. ROTA: 480 m alt., hh-13006 & 13010.
129. *Phaeographis* sp. 3
On bark of hardwood. SAIPAN: 430 m alt., hh-12321 & 12328.
130. *Phaeographis* sp. 4
On trunk of hardwood, *Elaeocarpus joga*. PAGAN: 300 m alt., hh-12656.
131. *Physcia* sp. 1
On bark of hardwood and trunk of palm tree. ASUNCION: 25 m alt., hh-12784; 50 m alt., hh-12867; 80 m alt., hh-12796; 180 m alt., hh-12800, 12801 & 12805. AGRIHAN: 20 m alt.,

hh-12776; 130 m alt., hh-12768; 320 m alt., hh-12685, 12687 & 12689. ALAMAGAN: 20 m alt., hh-12901; 80 m alt., hh-12912. SARIGAN: 5 m alt., hh-12460; 300 m alt., hh-12554. ANATAHAN: 2 m alt., hh-12391; 40 m alt., hh-12401 & 12404. SAIPAN: 190 m alt., hh-11749. GUAM: 80 m alt., hh-11713 & 11714.

132. *Physcia* sp. 2

On bark of hardwood, trunk of palm tree and rock. MAUG: 50 m alt., hh-12827. SARIGAN: 5 m alt., hh-12458; 80 m alt., hh-12463; 300 m alt., hh-12556. ANATAHAN: 30 m alt., hh-12388.

133. *Physcia* sp. 3

On bark of hardwood and rock. ASUNCION: 600 m alt., hh-12812. SARIGAN: 300 m alt., hh-12521; 330 m alt., hh-12532. SAIPAN: 430 m alt., hh-12331.

134. *Physcia* sp. 4

On sunny rock. URACAS: 40 m alt., hh-12850.

135. *Physcia* sp. 5

On bark of hardwood. SARIGAN: 80 m alt., hh-12471.

136. *Physma byrsinum* (Ach.) Muell. Arg.,
Flora 68: 531 (1885).

On bark of hardwood and trunk of palm tree. ASUNCION: 50 m alt., hh-12789; 80 m alt., hh-12795. AGRIHAN: 120 m alt., hh-12667; 250 m alt., hh-12750; 320 m alt., hh-12683. ALAMAGAN: 100 m alt., hh-12588; 210 m alt., hh-12979; 250 m alt., hh-12602; 380 m alt., hh-12611. SARIGAN: 300 m alt., hh-12493 & 12502. ANATAHAN: 200 m alt., hh-12354; 300 m alt., hh-12422.

137. *Physma* sp.

On bark of hardwood, *Elaeocarpus joga*. ANATAHAN: 380 m alt., hh-12430.

138. *Plagiotrema* sp.

On bark of hardwood. AGRIHAN: 80 m alt., hh-12725; 180 m alt., hh-12741. ALAMAGAN: 80 m alt., hh-12933; 100 m alt., hh-12954 & 12956; 120 m alt., hh-12960; 250 m alt., hh-12977. ANATAHAN: 80 m alt., hh-12411; 150 m alt., hh-12420. SAIPAN: 330 m alt., hh-13049. GUAM: 60 m alt., hh-11686.

139. *Pleurotheliopsis* sp.

On trunk of hardwood, *Elaeocarpus joga*. PAGAN: 190 m alt., hh-12647.

140. *Porina perminuta* Vain., Univ. Calif. Publ. Bot. 12: 14 (1924).

On leaves of *Aglaia mariannensis*. GUGUAN: 40 m alt., hh-12564.

141. *Porina* sp. 1

On bark of hardwood and trunk of palm tree. PAGAN: 240 m alt., hh-12652. SARIGAN: 300 m alt., hh-12495; 330 m alt., hh-12529 & 12539.

142. *Porina* sp. 2

On trunk of hardwood. GUAM: 60 m alt., hh-11695.

143. *Porina* sp. 3

On rock. SARIGAN: 80 m alt., hh-12472; 330 m alt., hh-12549.

144. *Porina* sp. 4

On rock. SARIGAN: 300 m alt., hh-12491.

145. *Porina* sp. 5

On bark of hardwood. AGRIHAN: 230 m alt., hh-12745. ANATAHAN: 150 m alt., hh-12367. SAIPAN: 1 m alt., hh-11739.

146. *Porina* sp. 6

On bark of hardwood. AGRIHAN: 320 m alt., hh-12692.

147. *Porina* sp. 7

On trunk of *Cocos nucifera*. AGRIHAN: 150 m alt., hh-12699.

148. *Pseudocyphellaria* sp.

On bark of hardwood. AGRIHAN: 250 m alt., hh-12757. ALAMAGAN: 380 m alt., hh-12605 & 12610. ANATAHAN: 380 m alt., hh-12441.

149. *Pseudopyrenula* sp. 1

On trunk of hardwood, *Acacia confusa*. ROTA: 480 m alt., hh-13009, 13018 & 13042.

150. *Pseudopyrenula* sp. 2

On trunk of hardwood, *Acacia confusa*. ROTA: 480 m alt., hh-13040.

151. *Pyrenula flagellata* Harada, Bryologist 96(4): 635 (1993).

On bark. SAIPAN: 430 m alt., hh-12322.

152. *Pyrenula* sp. 1

On trunk of palm tree and bark of hardwood. AGRIHAN: 20 m alt., hh-12704, 12777 & 12778; 25 m alt., hh-12770; 150 m alt., hh-12700. PAGAN: 40 m alt., hh-12635. SARIGAN: 5 m alt., hh-12461; 300 m alt., hh-12552 & 12557. ANATAHAN: 30 m alt., hh-12386.

153. *Pyrenula* sp. 2

On trunk of hardwood. ROTA: 280 m alt., hh-12986.

154. *Pyrenula* sp. 3

On bark of hardwood, *Morinda citrifolia*. ASUNCION: 80 m alt., hh-12793.

155. *Pyrenula* sp. 4

On bark of hardwood. ALAMAGAN: 220 m alt., hh-12963; 250 m alt., hh-12974; 380 m alt., hh-12604. ANATAHAN: 150 m alt., hh-12364 & 12366. GUAM: 60 m alt., hh-11689.

156. *Pyrenula* sp. 5

On bark of hardwood, *Ficus prolixa*. ASUNCION: 20 m alt., hh-12861.

157. *Pyrenula* sp. 6

On bark of hardwood. ALAMAGAN: 80 m alt., hh-12937; 250 m alt., hh-12601. ROTA: 280 m alt., hh-12985 & 13002.

158. *Pyrenula* sp. 7

On bark of hardwood. PAGAN: 150 m alt., hh-12663; 190 m alt., hh-12650. ROTA: 480 m alt., hh-13032.

159. *Pyrenula* sp. 8

On bark of hardwood. PAGAN: 280 m alt., hh-12659.

160. *Pyrenula* sp. 9

On bark of hardwood. ASUNCION: 20 m alt., hh-12856 & 12860; 25 m alt., hh-12788; 120 m alt., hh-12798; 180 m alt., hh-12802 & 12806. AGRIHAN: 50 m alt., hh-12710; 70 m alt., hh-12679; 130 m alt., hh-12731 & 12733; 230 m alt., hh-12749; 320 m alt., hh-12688. GUGUAN: 210 m alt., hh-12571. SARIGAN: 300 m alt., hh-12501 & 12511. ANATAHAN: 250 m alt., hh-12450; 380 m alt., hh-12449.

161. *Pyrenula* sp. 10

On bark of hardwood, *Elaeocarpus joga*. ANATAHAN: 380 m alt., hh-12428.

162. *Pyxine coccoes* (Sw.) Nyl., Mem. Soc. Imp. Sci. Nat. Cherbourg 5: 108 (1857).

On bark of hardwood, also on rock. MAUG: 130 m alt., hh-12844. ASUNCION: 180 m alt., hh-12807. GUGUAN: 210 m alt., hh-12577. SARIGAN: 80 m alt., hh-12467; 300 m alt., hh-12555.

163. *Pyxine* sp.

On bark of hardwood and palm tree, also on rocks. MAUG: 130 m alt., hh-12841. ASUNCION: 50 m alt., hh-12871; 70 m alt., hh-12888. AGRIHAN: 20 m alt., hh-12682; 25 m alt., hh-

12771; 110 m alt., hh-12729; 120 m alt., hh-12677; 150 m alt., hh-12702. ANATAHAN: 5 m alt., hh-12342 & 12453; 10 m alt., hh-12417; 50 m alt., hh-12384 & 12385; 150 m alt., hh-12360. SAIPAN: 190 m alt., hh-11746; 430 m alt., hh-12329. GUAM: 80 m alt., hh-11712.

164. *Ramalina* spp.

On bark and rocks. MAUG: 120 m alt., hh-12828; 130 m alt., hh-12838 & 12843. ASUNCION: 50 m alt., hh-12872 & 12899; 650 m alt., hh-12814. AGRIHAN: 250 m alt., hh-12751; 300 m alt., hh-12762. ALAMAGAN: 100 m alt., hh-12953; 500 m alt., hh-12615. GUGUAN: 80 m alt., hh-12559; 210 m alt., hh-12567 & 12578. SARIGAN: 80 m alt., hh-12462; 150 m alt., hh-12479 & 12481; 330 m alt., hh-12526, 12534 & 12536. ANATAHAN: 5 m alt., hh-12452; 10 m alt., hh-12413. SAIPAN: 190 m alt., hh-11752A & 11752B; 430 m alt., hh-12317; 440 m alt., hh-13045. ROTA: 280 m alt., hh-12982.

165. *Rinodina* sp.

On trunk of palm tree and *Pandanus* sp. SAIPAN: 400 m alt., hh-11781. GUAM: 20 m alt., hh-11684.

166. *Sarcographa* sp. 1

On bark of hardwood. ROTA: 280 m alt., hh-12992; 480 m alt., hh-13011 & 13033.

167. *Sarcographa* sp. 2

On bark of hardwood. ROTA: 280 m alt., hh-12991 & 12993; 480 m alt., hh-13012 & 13027.

168. *Sclerophyton* sp.

On trunk of palm tree. ALAMAGAN: 250 m alt., hh-12599.

169. *Thelotrema* sp.

On bark of hardwood. ROTA: 280 m alt., hh-12983.

170. *Trichothelium* sp.

On leaves of fern. ANATAHAN: 150 m alt., hh-12363.

171. *Usnea* sp.

On bark of hardwood, *Elaeocarpus joga*. ANATAHAN: 380 m alt., hh-12423.

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