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Author(s)	Iwatsuki, Kunio; Price, Michael G.
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The Pteridophytes of Mt Burnay and Vicinity, Northern Luzon

Kunio IWATSUKI* and Michael G. PRICE**

Abstract

A brief account of the 1975 Filipino-Japanese botanical expedition to the previously unstudied Mt Burnay is given, with special reference to the pteridophytes. The approximately 200 species of pteridophytes are enumerated, several reductions to synonymy newly made, and range extensions reported. A short commentary on Luzon-Taiwan phytogeography is appended.

Introduction

Mt Burnay is part of the northern extension of the Cordillera Central Mountains, the major mountain complex of extreme northern Luzon. Its highest summit is located at 17°57' N and 120°55' E, at an elevation of 2050 m, near the boundary where meet the three provinces Ilocos Norte, Abra, and Kalinga-Apayao. Strung out to the southwest of Burnay are several subsidiary peaks, Mt Bubonbilit, Mt Bubungkayo, Mt Karabas-pusa, and Mt Siminublan. Just to the north is the even higher Mt Sicapoo at 2350 m. Burnay proper consists of an uneven east-west ridge 7 km long fluctuating in elevation from 1780 to 2025 m, and an additional separate peak of 2050 m just south-east of the main ridge. Neither Burnay nor any of its subsidiary peaks (nor Sicapoo) had ever been climbed by botanists; there are no reports in the literature of any plant collections from these mountains. This region was chosen for a botanical expedition not only because it was previously unbotanized, but also because it was hoped that being in the far northwest of Luzon, it would provide material for a reassessment of the floristic relationships between Luzon, and Taiwan to the north.

Background of the Expedition

The expedition was a cooperative effort by the Philippine National Museum at Manila and Kyoto University, Kyoto, Japan. The Filipinos involved were the curator of the Philippine National Herbarium, Hermes G. Gutierrez, and his assistant, Wilfredo Vendivil, and the Japanese were the director of the herbarium of Kyoto University, Kunio Iwatsuki, and a member of the staff, Gen Murata. Invited to participate was Michael G. Price of the University of the Philippines at Los Baños.

* 岩槻邦男, Department of Botany, Faculty of Science, Kyoto University, Japan.

** Department of Botany, UPCA, College, Laguna 3720, Philippines. Present address: Department of Botany, University of Michigan, Ann Arbor, MI 48109, U. S. A.

The team from the Philippine National Herbarium was motivated by the need to continue the rebuilding of that institution from its total destruction in 1945 and particularly the opportunity to collect in a virgin area. It was especially fortunate that Gutierrez had spent much of his childhood in Ilocos Norte and was fluent in the regional language, Ilocano. Vendivil also had a good working knowledge of Ilocano. The team from Kyoto University, aside from a general interest in the botany of south-east Asia, had a special interest in comparing the flora of Luzon and Taiwan. Kyoto already has an excellent representation of the plants of Taiwan, primarily through the efforts of M. Tagawa. Price had made a brief trip to the area north of Burnay and Sicapoo in May 1974 and was able to reach an elevation of 1400 m; he collected two new fern species (*Pronophrium solsonicum* and *Elaphoglossum calanasanicum*) described by Holttum (1974) and the first Philippine record of a species described from Taiwan (*Metathelypteris uraiensis*) reported on by Holttum (1976). These finds were considered further indication that the Burnay area would be worthwhile to study.

Altogether, 2 weeks were spent in Ilocos Norte in November-December 1975, and approximately 200 species of pteridophytes were secured, with many more flowering plants. Most of the collections were labeled with the three collectors' names Iwatsuki, Murata, and Gutierrez, and in this series bear numbers with the prefix P-, indicating Philippines, similar to the past practice of Kyoto University in marking collections from Thailand with the prefix T-. These specimens were prepared by the "wet" method and were shipped to Kyoto for drying and labeling, and have been shared by the Philippine National Museum (PNH) and Kyoto University (KYO), with duplicates to be distributed to A, L, TI, etc. In addition, Price collected sparingly in his own series, and most of his specimens are still to be distributed.

Description of the Expedition

The route of the collection trip in Ilocos Norte is indicated on the map in Fig. 1. We had been told that a mining camp had been established on one of the upper slopes of Mt Burnay and that a road to the camp, passable by jeep, originated in the town of Nueva Era. After purchasing supplies in Laoag, we left for Nueva Era on the morning of 25 November. Arriving in the afternoon, we were disappointed to learn that the mine had not begun operations and no road existed. However, we were informed that there was a foot trail to the mining camp from the barrio of Santo Niño in the town of Banna, just to the north of Nueva Era.

In Nueva Era, we decided to spend several days in a side trip to Mt Siminublan, whose beckoning forested slopes towered over the town. Siminublan is one of the foothill mountains of the Burnay-Sicapoo mountain mass, and rises to an elevation of about 1460 m. In the late afternoon, we collected in the vicinity of the Nueva Era

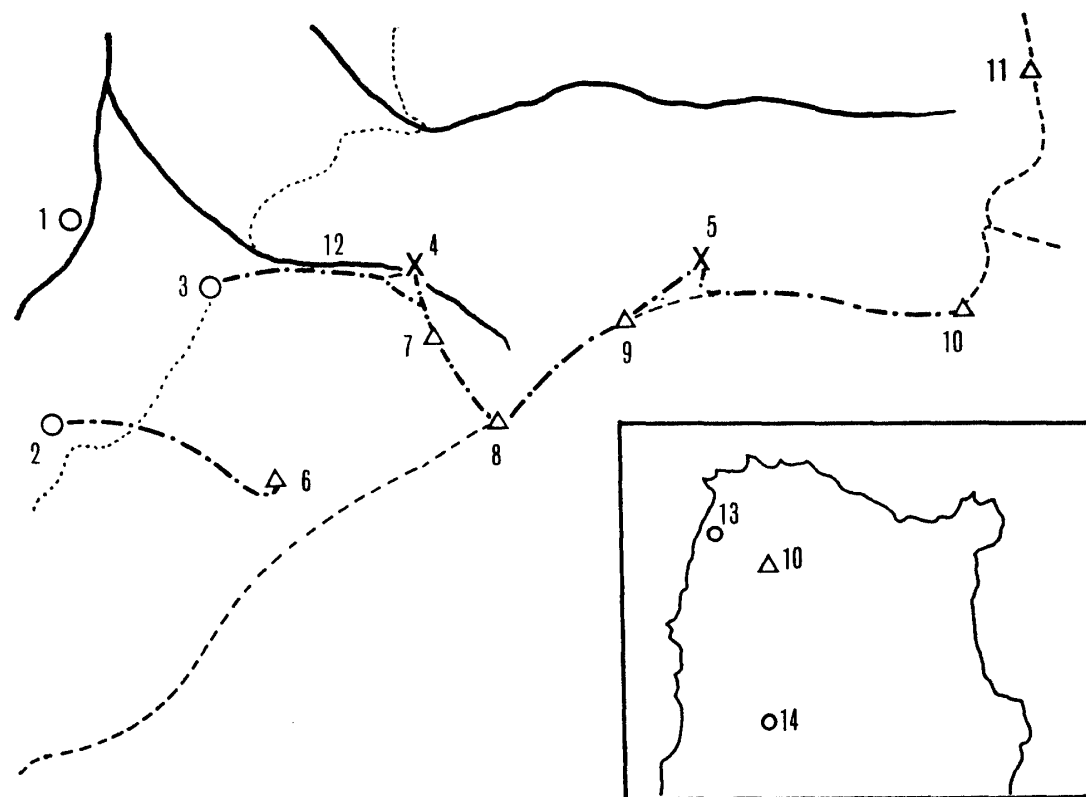


Fig. 1 A map of Mt Burnay and vicinity, 1:250,000. - - - - route of exploration; ---- boundary of provinces; boundary between mountains and cultivated area; — river. 1, Banna; 2, Neuva Era; 3, Santo Niño; 4, Tangig; 5, mining camp; 6, Mt Siminublan; 7, Mt Karabas-pusa; 8, Mt Bubungkayo; 9, Mt Bubonbilit; 10, Mt Burnay; 11, Mt Sicapoo; 12, Pagsan River. Lower right: a map of northern Luzon; 13, Laoag; 14 Bontoc.

office of the Bureau of Forestry, where we were very kindly permitted to spend the night. The area contained a patch of dry secondary growth forest mostly consisting of introduced *Tectona grandis*. The pteridophytes were all common widely-distributed lowland species.

On the morning of 26 November we began the approach to Mt Siminublan, traversing open hills and crossing a large stream several times, seeing mostly common species except for *Pteris heteromorpha* and *Sphaerostephanos smithianus*. Making camp at an abandoned shed at 450 m, we proceeded to explore the lower slopes, finding several species of interest, among which were *Selaginella intertexta* and *Pyrrrosia floccigera*. The forest at elevations of 450–800 m was mostly confined to ravines, and the ridges bore grassland; everything was exceedingly dry.

It required the whole of the next day to reach the summit of Siminublan and return to camp. The evergreen forest that from Nueva Era had seemed so inviting was very dry up to and including the summit, and nearly everywhere the soil of the forest floor had been dug up by wild pigs. We were further disappointed to find that the

entire eastern side of the mountain and most of the hills beyond were covered by open grassland maintained by regular burning. The western portion of Luzon is blocked by the eastern mountain ranges from the rain clouds which originate in the east and consequently has a very severe dry season. The forest that once covered the grassland areas must have been burned off many years previously, perhaps even centuries ago, and most of it is now unable to support even the fire-resistant pines. The ecology of the pyrogenic grasslands in Malesia has been carefully described by van Steenis (1972) and Jacobs (1972). The forested eastern slope of Siminublan may have been spared as a result of its demarcation by very steep ravines and the dearth of readily burnable materials. In this forest we found such species as *Arthropteris palisotii*, *A. repens*, *Bolbitis sculpturata*, *Teratophyllum leptocarpum*, and *Tectaria laxa*. The very dry mossy forest at the summit contained *Polystichum biaristatum*, *Crepidomanes brevipes*, *C. latealatum*, *Mecodium polyanthos*, and *Loxogramme avenia*.

We returned from the camp to Nueva Era on 28 November, making occasional collections, and proceeded to Laoag in the evening to replenish supplies and place our Siminublan collections in safekeeping. On the 29th we drove to barrio Santo Niño of Banna and made arrangements to begin the ascent of Burnay the next day, hiring several villagers as assistants. None of the villagers had ever been to the summit of Burnay, and several disclaimed the existence of any trail.

Early in the morning of 30 November, with heavy burdens, we headed for Burnay, at first following the Pagsan River and making numerous crossings. In the early afternoon we reached a site known as Tangig and there left the river to begin a steep ascent of Mt Karabas-pusa. Our progress was slow and we were forced to make camp on Karabas-pusa at about 750 m in a place that was near the last water source for many kilometers. That evening, one of the villagers fashioned a small instrument of bamboo which by holding in his mouth and twanging with the fingers of both hands, he could quite precisely imitate the unusual song of a small bird.

On the first of December, we began collecting in earnest in the evergreen forest on the very steep slopes, finding an unusually beautiful *Balanophora*, but most of the ferns we had seen previously on Mt Siminublan. At about 1000 m, we emerged into grassland with occasional stands of *Pinus kesiya*, and then followed an undulating ridge crest known as Mt Bubungkayo, with occasional patches of dry evergreen forest to an elevation of about 1400 m, collecting along the way such ferns as *Lecanopteris carnosa*, *Plagiogyria adnata*, *Ctenitis subglandulosa*, and a small *Asplenium* that we were unable to identify. The trail that followed the ridge-crest branched off to the right at a place known to the villagers as Patani, and delayed by the illness of one villager, we made camp for the night in a sheltered spot shortly beyond there. Two of the villagers made a long trek to fetch water in a valley where they knew the location of a spring.

The following morning we began the ascent of Mt Bubonbilit, a direct extension of

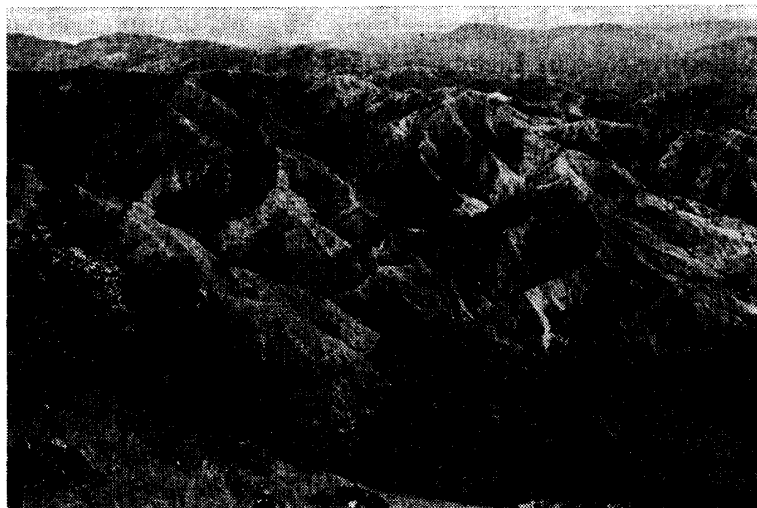


Fig. 2 View of mountains from second camp at about 1300 m alt.; mostly covered by the grasses and sparsely by pine trees.

the summit ridge of Mt Burnay, which was now in sight. Passing through sparse pine forest on rocky slopes, we found a patch of mossy forest laden with such epiphytes as *Ctenopteris solida*, *Oleandra benguetensis*, *Polypodium argutum*, and *Crypsinus whitfordii*. Most of the fronds of the *Oleandra* and the *Polypodium* had abscised and we collected them from both the branches and the ground. At the summit ridge of Burnay at about 1900 m we discovered *Dennstaedtia hirsuta*, and from there descended to the mining camp just north of the ridge and at an elevation of 1700 m.



Fig. 3 Evergreen forest at about 1300 m alt.

The mining camp was serviced by helicopter, and had a resident guard and radio operator, who were cooperative and friendly. Nearby was a wet sheltered slope covered with luxuriant mossy forest where we collected *Lycopodium volubile*, *Pteris wallichiana*,

Asplenium cheilosorum, *Selaginella opaca*, *Cornopteris banahaoensis*, and many other species. It was to be the single richest collecting ground during the entire trip.

It had taken us three full days to reach the mining camp, and we still planned to spend several days on Burnay and also attempt to reach the summit of Sicapoo, so we decided to send three of the villagers back down the mountain to procure additional food. So on the morning of 3 December, three men returned to Santo Niño while the main party left for Mt Burnay. We regained the summit ridge in about one hour, finding *Culcita javanica* on a steep grassy slope, and then followed the ridge eastward. Among the grasses were numerous orchids of the genera *Spiranthes* and *Thelymitra*. The exposed ridge was very windy, the wind coming from the north and carrying considerable moisture; epiphytes on pine trunks, such as *Scleroglossum minus*, were restricted to the northern side. *Elaphoglossum angulatum* was collected in rock crevices also with a northern exposure. After a hike of several kilometers along the pine-covered ridge-crest, we finally entered unbroken mossy forest, and found ourselves in thick clouds with no trail. Most of the ferns in this mossy forest were epiphytes. Unlike most Philippine mountains, Burnay is not volcanic, and the mineral soil is very poor in nutrients with a correspondingly impoverished herb flora. In the late afternoon, we made camp at a small col surrounded by mossy forest at about 1900 m in dense mist. Immediately after sunset, the moist wind intensified and the temperature dropped rapidly, and we were able to sleep only fitfully. December is the coldest month in the Philippines because at that time of year there is a shift in wind patterns and cold air masses believed to originate in Siberia move down to Luzon.



Fig. 4 Mossy forest at about 1950 m alt.

The morning of 4 December found us completely immersed in clouds and in the absence of any trail we were able to make progress only with considerable difficulty. Once we were confronted with a steep descent in three directions and had to explore

blindly for several hours to find the narrow connecting ridge which finally brought us to one of the two main summits of Burnay, over 2000 m. In the late afternoon, the clouds lifted momentarily and we were able to see clearly for the first time Mt Sicapoo to the north and the steep intervening ridges and ravines. We estimated that it would require another three or four days to reach Sicapoo, a horizontal distance of only 7 km, if the weather were clear and we had ample supplies, which of course we did not. For water, we were forced to use the muddy liquid from wallows of wild pigs, first subjecting it to vigorous boiling.



Fig. 5 A view of ridge near the summit of Mt Burnay at about 2000 m alt.

After another miserable nearly sleepless night we collected intensively on Mt Burnay and retraced our marked trail towards the mining camp, eating the last of our food on the way. Among the many interesting species we collected on Burnay were *Lycopodium multispicatum*, *Plagiogyria falcata*, *Mecodium paniculiflorum*, *Microtrichomanes digitatum*, *Meringium blandum*, *Macroglena* sp., *Dennstaedtia merrillii*, *D. scabra*, *Nothoperanema hendersonii*, *Dryopteris formosana*, *D. pulvinulifera*, *D. uropinna*, *Metathelypteris uraiensis*, *Coryphopteris pubirachis*, *Diplazium latifrons*, *D. geophilum*, *D. sp.*, *Cheiropleuria bicuspis*, *Ctenopteris mollicoma*, *C. merrittii*, *Grammitis alepidota*, *G. sp.* and *Calymmodon cucullatus*. The summit vegetation was dominated by a *Podocarpus* and was unusual in the complete absence of Cyatheaceae, Gleicheniaceae, and Blechnaceae, which generally characterize higher elevations of volcanic mountains in the tropics.

Following the trail we had previously cut, we reached the mining camp in the late afternoon of 5 December and were fortunately soon joined by the three villagers who had returned with additional food supplies. The next day we moved rapidly down the trail towards Santo Niño, collecting along the way. On Mt Bubonbilit we passed through a grass fire that may have been set several days earlier but had only then crossed the trail. From Mt Karabas-pusa we took an alternate trail to the river, not through

Tangig as on the way up. This trail was in places deeply cut into the mountainside, and must have been very old. Apparently it was a portion of the trail to Anayan in Abra province, and it may have been travelers on this trail who over the course of decades or centuries wantonly destroyed so much of the original forests by setting fires.

We arrived at Santo Niño at dusk on 6 December. Other members of the party were delayed on the trail until the next day as they had killed a wild pig along the way and had stopped to prepare it. In the distance we caught a brief glimpse of Sicapoo before it was engulfed in mist; only those who had been so close to it would have been able to recognize it from afar. After a celebration with the local wine known as *basi*, we left for Laoag on the afternoon of 7 December.

Enumeration of the Pteridophytes

The sequence of families and genera is in accordance with Tagawa & Iwatsuki (1972) and with Holttum (1971) for the genera of the Thelypteridaceae. As explained above, collection numbers with the prefix P- refer to the series of Iwatsuki, Murata, and Gutierrez. Citation of literature is restricted to the name-carrying reference and those of special importance, and in all cases the Fern Flora of the Philippines (Copeland, 1958-61) and the Flora of Taiwan, vol. 1, Pteridophyta and Gymnospermae (DeVol et al., 1975) are cited. The following abbreviations are employed throughout:

FFP — Fern Flora of the Philippines

FOT — Flora of Taiwan

PJS — Philippine Journal of Science

APG — Acta Phytotaxonomica et Geobotanica

LYCOPODIACEAE

Lycopodium casuarinoides Spring, Mem. Acad. Roy. Brux. 15: 94. 1842; Herter, PJS 22: 70. 1923; FOT 40.

Near mining camp, 1800 m, along path at edge of mossy forest, *P-584*; between mining camp and Mt Burnay, 1850 m, in light shade on ridge at edge of forest, *P-759*.

Lycopodium cernuum L. Sp. Pl. 2: 1103. 1753; Herter, PJS 22: 69. 1923; FOT 35.

Near mining camp, 1800 m, in half shade at edge of forest, *P-593*.

Lycopodium clavatum L. Sp. Pl. 2: 1100. 1753; Herter, PJS 22: 68. 1923; FOT 35.

Between Mt Bubonbilit and mining camp, 1600 m, in rather dry forest, *P-583*.

Lycopodium multispicatum Wilce, Nova Hedwig. 3: 103. 1961. — *Lycopodium complanatum*; Herter, PJS 22: 68. 1923; FOT 38.

Between mining camp and Mt Burnay, 1850 m, open place along ridge-crest,

P-690.

Lycopodium phlegmaria L. Sp. Pl. 2: 1101. 1753; FOT 30. — *Urostachys phlegmaria*; Herter, PJS 22: 66. 1923.

Near mining camp, 1800 m, on trunk in mossy forest, P-524.

Lycopodium piscium (Hert.) Tagawa & K. Iwats. APG 22: 103. 1967. — *Urostachys pinifolius*; Herter, PJS 22: 65. 1923.

Near mining camp, 1800 m, on trunk in mossy forest, P-561; Mt Burnay, 1900 m, on mossy branches, P-843, Price 3386.

Lycopodium serratum Thunb. Fl. Jap. 341. t. 38. 1784; FOT 29. — *Urostachys serratus*; Herter, PJS 22: 61. 1923.

Near mining camp, 1800 m, on humus-rich ground along trail in mossy forest, P-521; Mt Burnay, 1900 m, in deep shade on slope in mossy forest, P-850.

These plants belong to the form named var. *longe-petiolatum* Spring, Mem. Acad. Roy. Brux. 24: 18. 1850; FOT 29.

Lycopodium volubile Forst. Prodr. 86. 1786; Herter, PJS 22: 70. 1923.

Near mining camp, 1800 m, scrambling at forest edge, P-544, Price 3361.

SELAGINELLACEAE

Selaginella aristata Spring, Bull. Acad. Brux. 10: 232. 1843; Alston, PJS 58: 373. 1936.

Between Nueva Era and Mt Siminublan, 250 m, along trail in open forest, P-112.

Selaginella ciliaris (Retz.) Spring, Bull. Acad. Brux. 10: 231. 1843; Alston, PJS 58: 370. 1936; Tagawa, APG 25: 178. 1973; FOT 49.

Nueva Era, 100 m, dry way-side in light shade, P-41; on dry bank of stream in light shade, P-40.

Selaginella delicatula (Desv.) Alston, J. Bot. 70: 282. 1932; PJS 58: 366. 1936; Tagawa, APG 25: 173. 1973; FOT 43.

Mt Bubungkayo, 1200 m, in thicket on slope, P-382; near mining camp, 1800 m, wet ground along trail in mossy forest, P-530.

Selaginella flagellifera Bull, Cat. No. 225: 9. 1886. — *Selaginella biformis*; Alston, PJS 58: 374. 1936.

Mt Siminublan, 800 m, along streamlet in shade, P-215, P-251; between Mt Bubonbilit and mining camp, 1600 m, on mossy trunk, P-509; near mining camp, 1800 m, on rather wet ground along trail, P-562.

There is no reason not to adopt Bull's earlier and quite appropriate name.

Selaginella intertexta Spring, Bull. Acad. Brux. 10: 233. 1843; Alston, PJS 58: 369. 1936.

Between Nueva Era and Mt Siminublan, 300 m, on clayey way-side in rather dry

forest, *P-130*.

Selaginella involvens (Sw.) Spring, Bull. Acad. Brux. 10: 136. 1843; Reed, Mem. Soc. Brot. 18: 133. 1966; Tagawa, APG 25: 176. 1973; FOT 45. — *Selaginella peltata*; Alston, PJS 58: 376. 1936.

Mt Siminublan, 700 m, epiphytic on trunk in light shade, *P-214*.

Selaginella myosuroides (Kaulf.) Spring, Bull. Acad. Brux. 10: 232. 1843; Alston, PJS 58: 373. 1936.

Mt Siminublan, 800 m, *P-203*; near mining camp, 1800 m, on wet ground along trail in mossy forest, *P-563*; Mt Burnay, 1950 m, on moist humus-rich slope in gloomy mossy forest, *P-755*.

Selaginella opaca Warb. Monsunia 1: 108, 122. 1900; Alston, PJS 58: 370. 1936.

Near mining camp, 1800 m, along trail in mossy forest, *P-485*, *P-564*, *P-567*; between mining camp and Mt Burnay, 1800 m, on humus-rich ground in mossy forest, *P-753*.

Selaginella remotifolia Spring in Miq. Pl. Jungh. 3: 276. 1854; Alston, PJS 58: 364. 1936; Tagawa, APG 25: 172. 1973; FOT 48.

Near mining camp, 1800 m, on moist slope in mossy forest, *P-542*; between mining camp and Mt Burnay, 1800 m, on moist slope in gloomy forest, *P-754*.

OPHIOGLOSSACEAE

Ophioglossum reticulatum L. Sp. Pl. 2: 1063. 1753; FFP 17; Wicff. Blumea 12: 327. 1964. — *Ophioglossum petiolatum*; FFP 17; FOT 70.

Between Nueva Era and Mt Siminublan, 250 m, along trail in forest, near streamlet, *P-128*.

PLAGIOGYRIACEAE

Plagiogyria adnata (Bl.) Bedd. Ferns Brit. Ind. 51. 1865; FFP 195; FOT 144. — *Plagiogyria rankanensis*; Nakaike, Bull. Nat. Sci. Mus. Tokyo 14: 258. 1971.

Between Mt Bubonbilit and mining camp, 1800 m, along trail in mossy forest, *P-590*; near mining camp, 1800 m, in mossy forest, *P-654*.

Following Hayata, Nakaike proposed separating the Javan *P. adnata* from the plants so-named elsewhere in Asia, for which he took up the name *P. rankanensis*. However, the only Javan specimen he cites is Blume's type, which is insufficient to gauge the variability of the species in Java. The Philippine specimen cited by Nakaike was listed only by collection data, omitting collector and number; it is *Copeland 1926*.

Plagiogyria falcata Copel. PJS 2C: 133. pl. 1B. 1907; FFP 196.

Between mining camp and Mt Burnay, 1900 m, terrestrial on moist slope in mossy forest, *P-764*.

This is the first report from Luzon and only the second known collection. *P. falcata* is closely related to the Chinese *P. dunnii* and *P. hayatana*; if all three are eventually combined, *P. falcata* is the earliest name.

Plagiogyria glauca (Bl.) Mett. *Plagiogyria* 273. 1858; FFP 195; FOT 142. — *Plagiogyria nana*; FFP 195. — *Plagiogyria formosana*; Ching, *Acta Phytotax. Sin.* 7: 149. pl. 37. f. 2. 1958.

Mt Burnay, 1950 m, terrestrial on humus-rich slope in mossy forest, *P-830*.

This plant is the form of *P. glauca* with a conform terminal pinna, frequent in N. Luzon and Taiwan, but occasional throughout the range of the species, with numerous intermediates with the form having a pinnatifid frond apex. This form is responsible for the names *P. nana*, *P. formosana*, *P. glauca* var. *philippinensis* Christ, *Bull. Herb. Boiss.* 6: 150. 1898; FOT 142, and *P. glauca* subsp. *formosana* (Nakai) Nakaike, *Bull. Nat. Sci. Mus. Tokyo* 14: 264. 1971.

Plagiogyria tuberculata Copel. *PJS Suppl.* 1: 153. 1906; FFP 194.

Between mining camp and Mt Burnay, 1850 m, terrestrial on moist slope in mossy forest, *P-764 bis*.

SCHIZAEACEAE

Lygodium circinnatum (Burm.) Sw. *Syn. Fil.* 153. 1806; FFP 33; *Holt. Fl. Mal.* II. 1: 59. f. 5d, 14. 1959.

Mt Karabas-pusa, 600 m, along trail in evergreen forest, *P-892*.

Lygodium japonicum (Thunb.) Sw. *Schrad. J. Bot.* 1800(2): 106. 1801; FFP 36; *Holt. Fl. Mal.* II. 1: 51. f. 8 d-f. 1959; FOT 84.

Between Nueva Era and Mt Siminublan, 250 m, scandent in light shade, *P-150*; Mt Karabas-pusa, 800 m, along ridge-crest, *P-897*.

GLEICHENIACEAE

Gleichenia hirta Bl. *Enum.* 250. 1828; *Holt. Fl. Mal.* II. 1: 25. f. 7d, 8 h-j. 1959. — *Sticherus hirtus*; FFP 40.

Between mining camp and Mt Burnay, 1800 m, along ridge-crest in half-shade, *P-693*.

Gleichenia longissima Bl. *Enum.* 250. 1828; *Holt. Fl. Mal.* II. 1: 13. f. 4 b-g, 5. 1959. — *Hicriopteris glauca*; FFP 43. — *Diplopterygium glaucum*; FOT 93.

Mt Karabas-pusa, 900 m, ridge-crest in pine forest, *P-896*.

Dicranopteris linearis (Burm.) Underw. *Bull. Torr. Bot. Club* 34: 249. 1907; FFP 45; *Holt. Fl. Mal.* II. 1: 33. f. 12, 14 f-i. 1959; FOT 90.

Between Nueva Era and Mt Siminublan, 350 m, dry exposed hillside, *P-149*.

HYMENOPHYLLACEAE

Mecodium badium (Hook. & Grev.) Copel. *PJS* 67: 23. 1938; FFP 53; FOT

124. pl. 42.

Near mining camp, 1800 m, on moist boulder in forest, *P-532*; between mining camp and Mt Burnay, 1800 m, on trunk in dense forest, *P-651*.

Mecodium emarginatum (Sw.) Copel. PJS 67: 21. 1938; FFP 52.

Between mining camp and Mt Burnay, 1850 m, on trunk in mossy forest, *P-745*.

Mecodium paniculiflorum (Sw.) Copel. PJS 67: 19. 1938; FFP 50.

Between mining camp and Mt Burnay, 1900 m, on mossy trunks in dense forest, *P-683*, *Price 3382*.

Mecodium polyanthos (Sw.) Copel. PJS 67: 19. 1938; FFP 49; FOT 127.

Mt Siminublan, 1450 m, on mossy trunk in dense forest, *P-270*; between Mt Bubonbilit and mining camp, 1800 m, *P-553*; between mining camp and Mt Burnay, 1900 m, on mossy trunks in dense forest, *P-748*, *Price 3382A*.

Mecodium productum (Kunze) Copel. PJS 67: 20. 1938; FFP 51.

Between mining camp and Mt Burnay, 1900 m, on mossy trunks in dense forest, *P-750*.

Mecodium reinwardtii (v. d. B.) Copel. PJS 67: 20. 1938; FFP 51.

Between mining camp and Mt Burnay, 1900 m, on mossy trunk in dense forest, *P-752*.

Meringium blandum (Racib.) Copel. PJS 67: 43. 1938; FFP 63; FOT 121.

Between mining camp and Mt Burnay, 1900 m, on mossy trunk in dense forest, *P-677*, *P-682*.

Meringium holochilum (v. d. B.) Copel. PJS 67: 41. 1938; FFP 62; FOT 124.

Between mining camp and Mt Burnay, 1900 m, on mossy trunk in dense forest, *P-749*; Mt Burnay, on mossy trunk, *P-838*, *Price 3381*.

Meringium meyenianum Presl, Hymen. 116. pl. 8. B. 1843; FFP 58.

Between mining camp and Mt Burnay, 1900 m, on mossy trunk in dense forest, *P-685*; Mt Burnay, 1900 m, *Price 3383*.

Microtrichomanes digitatum (Sw.) Copel. PJS 67: 36. 1938; FFP 55.

Between mining camp and Mt Burnay, 1900 m, on trunk in dense mossy forest, *P-688*; Mt Burnay, 1900 m, on mossy trunks, *P-839*, *Price 3380*.

The Malesian form of this species is liable to separation at the rank of subspecies; it has been given the illegitimate name *Trichomanes flabellatum* v. d. B. Ned. Kruid. Arch. 4: 353. 1859, non Bory 1828; K. Iwats. Fern Gaz. 11: 121. 1975.

Gonocormus minutus (Bl.) v. d. B. Hymen. Jav. 7. pl. 3. 1861; FFP 68; FOT 111.

Between mining camp and Mt Burnay, 1900 m, on base of trunk in dense mossy forest, *P-743*; on mossy trunk, *P-751*; Mt Burnay, 1900 m, on mossy trunk in dense forest, *P-840*.

We treat *G. minutus* in the broad sense, including the flabellate non-proliferous form

named *Trichomanes saxifragoides* by Presl.

Pleuromanes pallidum (Bl.) Presl, Epim. Bot. 258. 1851; FFP 67; FOT 113.

Between mining camp and Mt Burnay, 1900 m, on mossy trunk in dense forest, *P-687*.

Crepidomanes brevipes (Presl) Copel. PJS 67: 60. 1938; FFP 71.

Between Nueva Era and Mt Siminublan, 400 m, on wet boulder along stream in light shade, *P-118*; Mt Siminublan, 1450 m, on mossy trunk in dense evergreen forest near summit, *P-272*.

Crepidomanes latealatum (v. d. B.) Copel. PJS 67: 60. 1938; FOT 103. --- *Didymoglossum latealatum* v. d. B. Ned. Kruid. Arch. 5: 138. 1863.

Mt Siminublan, 1450 m, on mossy branch in dense evergreen forest near summit, *P-271*.

A new record for the Philippines, previously known from N India to Taiwan.

Callistopteris apiifolia (Presl) Copel. PJS 67: 65. 1938; FFP 75; FOT 99.

Between mining camp and Mt Burnay, 1900 m, terrestrial on wet ground in mossy forest, *P-741*.

Selenodesmium obscurum (Bl.) Copel. PJS 67: 81. 1938; FFP 79; FOT 98.

Near mining camp, 1800 m, on wet sandy ground along trail in dense mossy forest, *P-598*; between mining camp and Mt Burnay, 1800 m, on sandy soil in mossy forest, *P-683*; Mt Burnay, 1900 m, on wet rocky slope in mossy forest, *P-826*.

Macroglena *sp. nov.*

Between mining camp and Mt Burnay, *P-686*, *P-825*.

CYATHEACEAE

Cyathea fuliginosa (Christ) Copel. PJS 40: 43. 1909; FFP 224; Holtt. Fl. Mal. II. 1: 108. 1963.

Between Mt Bubonbilit and mining camp, 1800 m, along trail in mossy forest, *P-537*; Mt Burnay, 1900 m, in dwarf ridge crest forest, *Price 3385*.

DICKSONIACEAE

Culcita javanica (Bl.) Maxon, J. Wash. Acad. Sci. 12: 456. 1922; Holtt. Fl. Mal. II. 1. 168. f. 34 a-c. 1963. --- *Culcita copelandii*; FFP 86.

Between Mt Bubonbilit and mining camp, 1500 m, in pine forest, *P-582*; near mining camp, 1700 m, in pine forest, *P-692*.

DENNSTAEDTIACEAE

Dennstaedtia hirsuta (Sw.) Mett. ex Miq. Ann. Mus. Bot. Lugd.-Bat. 3: 181. 1867; FOT 241. --- *Davallia hirsuta* Sw. Schrad. J. Bot. 1800(2): 87. 1801.

Between Mt Bubonbilit and mining camp, 1800 m, open slope at edge of forest,

P-514; 1900 m, in light shade at edge of forest, *P-538*; 1900 m, in rock crevices along trail in pine forest, *P-585*, *Price 3360*.

A new record for the Philippines, previously known from China, Korea, Japan, and higher elevations in Taiwan. By its extremely small size, very distinct from all other Philippine species of *Dennstaedtia*.

Dennstaedtia smithii (Hook.) Moore, Ind. Fil. 308. 1861; FFP 89; FOT 243.

Between Mt Bubonbilit and mining camp, 1600 m, in light shade at edge of forest, *P-533*.

Dennstaedtia merrillii Copel. PJS 2C: 126. 1907; FFP 92.

Between mining camp and Mt Burnay, 1800 m, on slope in pine forest, *P-769*.

Dennstaedtia scabra (Wall. ex Hook.) Moore, Ind. Fil. 307. 1861; FFP 92; FOT 241.

Mt Burnay, 1900 m, on slope in mossy forest, *P-828*; 1950 m, on humus-rich slope in mossy forest, *P-852*, *Price 3365*.

Microlepia herbacea Ching et C. Chr. apud Tard. et C. Chr. Not. Syst. 6: 6. pl. 1. f. 1-2. 1937. — *Microlepia trapeziformis* auct. non (Roxb.) Kuhn; FFP 98, FOT 252. — *Microlepia herbacea* var. *trichosora* (Ching) Serizawa, J. Jap. Bot. 47: 46. f. 1. 1972.

Mt Bubungkayo, 1000 m, ridge-crest in evergreen forest, *P-386*.

According to Morton, Contr. U. S. Nat. Herb. 38: 313-315. 1974, the true *M. trapeziformis* is a member of the *M. speluncae* complex; plants referred to *M. trapeziformis* by Holttum, Rev. Fl. Mal. 2: 313. 1955, and Sledge, Kew Bull. 1956: 529. 1957, should be shown as *M. rhomboidea* (Wall. ex Kunze) Prantl. Philippine plants are quite the same as those from Taiwan and should best be called *M. herbacea*, of which *M. trichosora* Ching is only a minor variant.

Microlepia speluncae (L.) Moore, Ind. Fil. 93. 1857; FFP 96; FOT 250.

Nueva Era, 100 m, in dry forest along stream, *P-45*; in light shade, *P-86*; Mt Karabas-pusa, 700 m, ridge-crest in evergreen forest, *P-887*.

Microlepia strigosa (Thunb.) Presl, Epim. Bot. 95. 1851; FFP 98; FOT 251.

Mt Siminublan, 600 m, along trail in thin forest, *P-197*; between Mt Bubonbilit and mining camp, 1800 m, along trail, *P-557*.

Hypolepis punctata (Thunb.) Mett. ex Kuhn, Fil. Afric. 120. 1868; FFP 122; FOT 245.

Mt Bubungkayo, 900 m, ridge-crest forest, *P-375*.

Hypolepis tenuifolia (Forst.) Bernh. Schrad. Neu. J. Bot. 1(2): 34. 1806; FFP 121; FOT 245.

Between mining camp and Mt Burnay, 1750 m, on moist ground in forest, *P-768*.

Monachosorum subdigitatum (Bl.) Kuhn, Chaetop. 345. 1882; FFP 99. — *Monachosorum henryi*; FOT 253.

Between mining camp and Mt Burnay, 1900 m, on humus-rich slope in mossy forest,

P-775; Mt Burnay, on slope in mossy forest, *P-829*; on old landslip on steep sheltered slope, *Price 3391*.

The Burnay plant is identical with the Himalayan and Taiwanese form named *M. henryi* by Christ.

Pteridium aquilinum (L.) Kuhn, v. Deck. Reisen 3(3) Bot. 11. 1879; FFP 123; FOT 255.

Between Mt Bubonbilit and mining camp, 1800 m, open slope at edge of forest, *P-551*.

The Burnay plant is var. *wightianum* (Ag.) Tryon, Rhodora 43: 22. 1941; subsp. *wightianum* (Ag.) Shieh, Quart. J. Chin. For. 6: 98. 1973; FOT 258.

Histiopteris incisa (Thunb.) J. Sm. Hist. Fil. 295. 1875; FFP 125; FOT 243.

Between Mt Bubonbilit and mining camp, 1800 m, along trail, *P-535*.

LINDSAEACEAE

Lindsaea obtusa J. Sm. ex Hook. Sp. Fil. 1: 224. 1846; Kramer, Fl. Mal. II. 1: 218. f. 31. 1971. — *Lindsaea decomposita*; FFP 111, p. p. — *Lindsaea cultrata*; FOT 260.

Mt Burnay, 1900 m, on boulders in sheltered ravine, *Price 3390*.

Lindsaea odorata Roxb. Calc. J. Nat. Hist. 4: 511. 1844; Kramer, Fl. Mal. II. 1: 228. 1971; FOT 262. — *Lindsaea cultrata*; FFP 107.

Mt Burnay, 1900 m, on steep cliff near ridge-crest, *Price 3392*.

Lindsaea orbiculata (Lam.) Mett. ex Kuhn in Miq. Ann. Mus. Bot. Lugd.-Bat. 4: 279. 1869; FFP 112, p. p.; FOT 262; Kramer, Fl. Mal. II. 1: 206. f. 15. 1971.

Between Mt Bubonbilit and mining camp, 1600 m, on clayey soil along trail in forest, *P-579*.

Sphenomeris retusa (Cav.) Maxon, J. Wash. Acad. Sci. 3: 144. 1913; FFP 116; Kramer, Fl. Mal. II. 1: 180. f. 5. 1971.

Mt Karabas-pusa, 500 m, along trail in forest, *P-891*.

DAVALLIACEAE

Davallodes hirsutum (J. Sm. ex Presl) Copel. PJS 3C: 33. 1908; FFP 169; Holtt. Kew Bull. 27: 248. 1972.

Between Mt Bubonbilit and mining camp, 1900 m, on trunk in mossy forest, *P-543*.

Davallia trichomanoides Bl. Enum. 238. 1828; FFP 172.

Mt Siminublan, 1100 m, on trunk in dense evergreen forest, *P-275*; between Mt Bubonbilit and mining camp, 1600 m, on trunk in mossy forest, *P-646*.

Humata obtusata v. A. v. R. Bull. Jard. Bot. Buitenz. II. 1: 8. 1911; FFP 176. — *Humata chrysanthemifolia* (Hayata) Hayata, Gen. Ind. Fl. Formos. 109. 1916; FOT 274, *synonym novum*.

Mt Burnay, 1900 m, *Price* 3369.

Humata vestita (Bl.) Moore, Ind. Fil. 92. 1857; FFP 177; FOT 278.

Between Mt Bubonbilit and mining camp, 1600 m, on trunk in dense evergreen forest, *P-581*.

Leucostegia immersa Presl, Tent. Pterid. 95. pl. 4. f. 11. 1836; FFP 167; FOT 279.

Between Mt Bubonbilit and mining camp, 1900 m, on moist ground along trail in mossy forest, *P-539*.

OLEANDRACEAE

Arthropteris palisotii (Desv.) Alston, Bol. Soc. Broter. II. 30: 6. 1956; Holtt. Blumea 14: 226. 1966; FOT 318. — *Arthropteris glabra*; FFP 190.

Mt Siminublan, 1000 m, on trunk in dense evergreen forest, *P-268*.

Arthropteris repens (Brack.) C. Chr. Bishop Mus. Bull. 177: 48. 1943; Holtt. Blumea 14: 227. 1966. — *Nephrolepis repens* Brack. U. S. Expl. Exped. 16: 209. 1854.

Mt Siminublan, 1000 m, scandent on trunks in dry forest on slope, *P-267*, *Price* 3339.

A new record for the Philippines, previously known from N Borneo, New Guinea, Samoa, and Fiji. Differs from the very similar *A. beckleri* by sori exindusiate and lamina glabrous above.

Nephrolepis multiflora (Roxb.) Jarrett ex Morton, Cont. U. S. Nat. Herb. 38: 309. 1974. — *Nephrolepis hirsutula*; FFP 188, p. p.; FOT 322, p. p.

Nueva Era, 100 m, on rather dry slope in forest, *P-49*.

Distinguished from the less frequent *N. hirsutula* by the erect hairs on pinna-costae above.

Oleandra benguetensis Copel. PJS 46: 217. 1931; FFP 183.

Between Mt Bubonbilit and mining camp, 1600 m, on trunks and branches among mosses, fronds deciduous, *P-597*, *Price* 3355.

This species is very close to *O. hainanensis* Ching, Acta Phytotax. Sin. 8: 166. pl. 20. f. 17. 1959. The growth habit seems to have never been adequately described. The rhizome is creeping in short graceful downward arcs 2–10 cm long, the upcurved high point at the end of each arc constituting a node bearing 2 or 3 fronds on short pedicels, side branches (usually dormant) borne facing downwards shortly beyond nodes and departing in downward arcs in opposite pairs, roots emerging at low point of arc near center of internode, roots also in opposite pairs.

Oleandra cumingii J. Sm. ex Presl, Epim. Bot. 41. 1851; FFP 184.

Between Mt Bubonbilit and mining camp, 1800 m, on trunk in mossy forest, *P-531*.

PARKERIACEAE

Cheilanthes farinosa (Forsk.) Kaulf. Enum. 212. 1824; FOT 282. — *Aleuritopteris farinosa*; FFP 153.

Mt Siminublan, 450 m, along trail in forest, *P-131*.

Hemionitis arifolia (Burm.) Moore, Ind. Fil. 114. 1859; FFP 157; FOT 314.

Nueva Era, 100 m, crevices in stone embankment, *P-42*.

Pityrogramma calomelanos (L.) Link, Handb. 3: 20. 1833; FFP 158; FOT 315.

Mt Karabas-pusa, 600 m, along trail in evergreen forest, *P-888*.

Onychium japonicum (Thunb.) Kunze, Bot. Zeit. 6: 507. 1848; FFP 157; FOT 290.

Mt Karabas-pusa, 700 m, along trail in evergreen forest, *P-879*.

Onychium siliculosum (Desv.) C. Chr. Ind. Fil. 469. 1906; FFP 156; FOT 290.

Nueva Era, 100 m, on clayey slope along stream in light shade, *P-87*.

Adiantum caudatum L. Mant. 308. 1771; FFP 161; FOT 303.

Nueva Era, 100 m, in light shade, *P-85*.

Adiantum diaphanum Bl. Enum. 215. 1828; FFP 162; FOT 305.

Mt Bubungkayo, 1200 m, on humus-rich slope in evergreen forest, *P-366*; 1000 m, on mountain slope in evergreen forest, *P-380*; between Mt Bubonbilit and mining camp, 1600 m, along trail in mossy forest, *P-519*.

Adiantum philippense L. Sp. Pl. 2: 1094. 1753; FFP 159; FOT 306.

Nueva Era, 100 m, in crevices of stone embankment, *P-43*.

Adiantum soboliferum Wall. ex Hook. Sp. Fil. 2: 13. pl. 74a. 1851; FFP 160; FOT 308.

Between Nueva Era and Mt Siminublan, 250 m, on rather dry slope in light shade, *P-119*.

VITTARIACEAE

Vittaria anguste-elongata Hayata, Icon. Pl. Formos. 6: 161. 1916; FOT 237. — *Vittaria stenophylla*; FFP 549.

Between Mt Bubonbilit and mining camp, 1800 m, on trunk in mossy forest, *P-522*; Mt Burnay, 1950 m, on mossy trunks in dense forest, *P-841*, *Price 3370*.

Vittaria ensiformis Sw. Ges. Nat. Fr. Berl. Neu. Schr. 2: 134. t. 7. f. 1. 1799; FFP 551.

Between Nueva Era and Mt Siminublan, 400 m, on trunk in forest, *P-132*; Mt Siminublan, 1450 m, on mossy trunk in dense evergreen forest, *P-265*.

Antrophyum alatum Brack. U. S. Expl. Exped. 16: 64. 1854; FFP 547.

Between Nueva Era and Mt Siminublan, 300 m, on trunk in light shade, *P-133*.

PTERIDACEAE

Pteris biaurita L. Sp. Pl. 2: 1076. 1753; FFP 145; FOT 293.

Nueva Era, 100 m, in light shade, *P-51*.

Pteris blumeana Agardh, Rec. Sp. Gen. Pterid. 22. 1839; FFP 138.

Mt Burnay, 1800 m, terrestrial on slope, *P-836*.

Pteris excelsa Gaud. in Freyc. Voy. Bot. 388. 1827; FFP 144; FOT 295.

Near mining camp, 1800 m, along trail in mossy forest, *P-566*.

Pteris glaucovirens Goldm. Nova Acta Suppl. I. 19: 457. 1843; FFP 134.

Nueva Era, 100 m, in light shade, *P-50*, *P-50 bis*; near mining camp, 1800 m, along trail in mossy forest, *P-512*; between mining camp and Mt Burnay, 1800 m, on humus-rich ground, *P-765*.

Apparently the same is *P. linearis*; FOT 297, p. p.?

Pteris heteromorpha Fée, Mém. 5: 127. 1852; FFP 132.

Between Nueva Era and Mt Siminublan, 400 m, on dry slopes in light shade, *P-116*.

Pteris longipinnula Wall. ex Agardh, Rec. Sp. Gen. Pterid. 19. 1839; FFP 144.

Mt Siminublan, 950 m, on dry slope in dense evergreen forest, *P-274*.

Pteris oppositi-pinnata Fée, Mém. 10: 17. t. 13(3). 1865; Price, Brit. Fern Gaz. 10: 261. 1972. — *Pteris asperula*; FFP 141.

Between Nueva Era and Mt Siminublan, 400 m, on humus-rich ground along trail in light shade, *P-120*; Mt Karabas-pusa, 800 m along trail in evergreen forest, *P-894*.

Pteris pellucida Presl, Rel. Haenk. 1: 55. 1825; FFP 130.

Mt Siminublan, 800 m, along streamlet in shade, *P-216*.

Pteris philippinensis Fée, Mém. 8: 114. 1857; Tagawa, APG 27: 138. 1976. — *Pteris longipes* Don var. *philippinensis* (Fée) C. Chr. Gard. Bull. S. S. 7: 286. 1934. — *Pteris longipes*; FFP 133.

Mt Siminublan, 1000 m, on rather dry slope in dense evergreen forest, *P-279*; Mt Karabas-pusa, 800 m, along trail in evergreen forest, *P-884*.

Pteris spinescens Presl, Rel. Haenk. 1: 56. 1825; Holtt. Nov. Bot. Inst. Bot. Univ. Carol. Prag. 1968; 23. 1969. — *Pteris setuloso-costulata*; FFP 137; FOT 298.

Between Mt Bubonbilit and mining camp, 1800 m, in dense forest, *P-546*; between mining camp and Mt Burnay, 1900 m, on humus-rich ground in mossy forest, *P-771*.

Pteris wallichiana Agardh, Rec. Sp. Gen. Pterid. 69. 1839; FOT 301.

Near mining camp, 1800 m, on moist ground along trail in dense forest, *P-558*, Price 3362.

This species is now confirmed as occurring in the Philippines; Copeland merely

mentioned it as a possibility in a note under *P. biaurita*, FFP 145, and included it in his key, FFP 128.

ASPLENIACEAE

Asplenium affine Sw. Schrad. J. Bot. 1800(2): 56. 1801; FFP 445; Sledge, Kew Bull. 15: 401. 1962. — *Asplenium spathulinum*; FFP 445.

Near mining camp, 1800 m, on moist ground along trail in mossy forest, *P-526*.

Asplenium cheilosorum Kunze in Mett. Aspl. 133. pl. 5. f. 12, 13. 1859; FFP 433; K. Iwats. APG 27: 52. 1975; FOT 481.

Near mining camp, 1800 m, on wet muddy rock along trail in dense mossy forest, *P-528*.

Asplenium crinicaule Hance, Ann. Sci. Nat. 5: 254. 1866; FFP 436.

Mt Siminublan, 600 m, on trunk in forest, *P-226*; between Mt Bubonbilit and mining camp, 1700 m, at base of trunk in mossy forest, *P-652*.

Asplenium cuneatum Lam. Encycl. 2: 309. 1786; FFP 446; FOT 482.

Mt Siminublan, 800 m, at base of tree trunk along streamlet in dense forest, *P-224*.

Asplenium elmeri Christ, PJS 2C: 164. 1907; FFP 444.

Mt Burnay, 1900 m, on mossy trunk in dense forest, *P-761*, *P-819*.

Asplenium lepturus J. Sm. ex Presl, Epim. Bot. 72. 1851; Holtt. Nov. Bot. Inst. Bot. Univ. Carol. Prag. 1968: 29. 1969. — *Asplenium contiguum*; FFP 438.

Near mining camp, 1800 m, on humus-rich ground along trail in dense mossy forest, *P-513*, *P-525*.

Asplenium nidus L. Sp. Pl. 2: 1079. 1753; FFP 450; Holtt. Gard. Bull. Sing. 27: 147. 1974; FOT 485.

Mt Karabas-pusa, 800 m, on trunk in evergreen forest, *P-890*.

Asplenium normale Don, Prod. Fl. Nepal. 7. 1825; FFP 431; FOT 486.

Between Mt Bubonbilit and mining camp, 1800 m, along trail in mossy forest, *P-529*; 1900 m, on humus-rich ground along trail in mossy forest, *P-541*; between mining camp and Mt Burnay, 1800 m, on humus-rich slope, *P-763*.

Asplenium polyodon Forst. Fl. Ins. Austr. Prodr. 80. 1786; Morton, Cont. U. S. Nat. Herb. 38: 40. 1967. — *Asplenium falcatum*; FFP 437. — *Asplenium adiantoides*; FOT 478.

Nueva Era, 100 m, on trunk in light shade, *P-62*; between Nueva Era and Mt Siminublan, 400 m, base of trunk in light shade along stream, *P-123*.

Asplenium steerei Harr. J. Linn. Soc. Bot. 16: 28. 1877; FFP 438.

Near mining camp, 1800 m, on humus-rich ground along trail in mossy forest, *P-523*, *P-527*, *P-540*.

Reported from Taiwan in FFP 438.

Asplenium subnormale Copel. Perk. Fragm. 183. pl. 4B. 1905; FFP 433; K. Iwats. APG 27: 51. 1975.

Mt Siminublan, 1100 m, on slope in dense evergreen forest, *P-276*.

Reported from Taiwan by Iwatsuki, *loc. cit.*

Asplenium unilaterale Lam. Encycl. 2: 305. 1786; FFP 432; K. Iwats. APG 27: 46. 1975; FOT 490.

Near mining camp, 1800 m, on wet muddy rock along trail in mossy forest, *P-560*; between mining camp and Mt Burnay, 1800 m, on wet rocky slope in mossy forest, *P-766*.

The Burnay plant is var. *udum* Atkins. ex Clarke, Trans. Linn. Soc. II. Bot. 1: 481. 1880; K. Iwats. APG 27: 47. 1975. — *Asplenium filipes*; FFP 433.

Asplenium vulcanicum Bl. Enum. 176. 1828; FFP 440; FOT 491.

Between mining camp and Mt Burnay, 1800 m, on mossy trunk in dense forest, *P-776*; Mt Burnay, 1900 m, on trunk in mossy forest, *P-820*.

Asplenium *sp. nov.*

Mt Bubungkayo, 1100 m, on slope in evergreen forest, *P-379*; 1250 m, in dry forest, *P-383*, *Price 3350*.

BLECHNACEAE

Blechnum orientale L. Sp. Pl. 2: 1077. 1753; FFP 421; FOT 151.

Between Nueva Era and Mt Siminublan, 250 m, along trail in forest, *P-126*.

LOMARIOPSIDACEAE

Bolbitis heteroclita (Presl) Ching in C. Chr. Ind. Fil. Suppl. 3: 48. 1934; FFP 257; FOT 348.

Mt Siminublan, 800 m, on boulders in stream bed in part shade, *P-217*, *Price 3346*.

Bolbitis rhizophylla (Kaulf.) Hennipm. Blumea 18: 148. 1970. — *Egenolfia rhizophylla*; FFP 266; FOT 352.

Between Nueva Era and Mt Siminublan, 400 m, along trail in forest, *P-114*; 500 m, on steep slope along trail in deep shade, *P-196*; Mt Siminublan, 800 m, on boulders in stream bed, *Price 3347*; Mt Karabas-pusa, 800 m, along trail in dense evergreen forest, *P-895*.

Bolbitis scalpturata (Fée) Ching in C. Chr. Ind. Fil. Suppl. 3: 50. 1934; FFP 262.

Mt Siminublan, 1000 m, terrestrial on slope in dry forest, *P-254*, *Price 3349*; 700 m, on boulders in stream bed, *Price 3348*.

Reported from Taiwan by Iwatsuki, APG 18: 59. 1959.

Elaphoglossum angulatum (Bl.) Moore, Ind. Fil. 5. 1857; FFP 278; FOT

353.

Between mining camp and Mt Burnay, 1800 m, in rock crevices at ridge crest under pine forest, *P-760*.

Elaphoglossum blumeanum (Fée) J. Sm. Ferns Brit. & For. 106. 1866. — *Elaphoglossum petiolatum*; FFP 276.

Between mining camp and Mt Burnay, 1850 m, on trunk in mossy forest, *P-694*.

The use of the name *E. blumeanum* and the literature citation is on authority of Dr R. E. Holttum and will be published shortly in Flora Malesiana.

Elaphoglossum callifolium (Bl.) Moore, Ind. Fil. 7. 1857; FFP 277; FOT 353.

Between Mt Bubonbilit and mining camp, 1800 m, on trunk in mossy forest, *P-511*.

Elaphoglossum luzonicum Copel. Leaf. Philip. Bot. 1: 235. 1907; FFP 278. — *Elaphoglossum lepidopodum* C. Chr. ex Ogata, J. Jap. Bot. 13: 121. 1937; FOT 354, *synonym novum*.

Teratophyllum leptocarpum (Fée) Holtt. Gard. Bull. S. S. 9: 143. 1937; FFP 271.

Mt Siminublan, 900 m, on trunks in dense evergreen forest, *P-264*.

DRYOPTERIDACEAE

Polystichum biaristatum (Bl.) Moore, Ind. Fil. 86. 1858; Sledge, Bull. Brit. Mus. (Nat. Hist.) Bot. 5: 35. 1973; FOT 388. — *Polystichum aquilinum* Copel. PJS 81: 20. 1952; FFP 245, *synonym novum*.

Mt Siminublan, 1000 m, on rather dry slope in dense evergreen forest, *P-263*; Mt Bubungkayo, 1100 m, ridge-crest in evergreen forest, *P-385*.

Polystichum edanioi Copel. PJS 83: 97. 1954.

Between Nueva Era and Mt Siminublan, 300 m, in dry forest, *P-219*; Mt Bubungkayo, 1100 m, on rather dry slope in evergreen forest, *P-372*; Mt Karabas-pusa, 800 m, along trail in forest, *P-882*.

Polystichum obtusum J. Sm. ex Presl, Epim. Bot. 53. 1851; FFP 245.

Between Nueva Era to Mt Siminublan, 300 m, along trail, *P-129*; Mt Siminublan, 600 m, on rather dry slope in light shade, *P-222*.

Arachniodes amabilis (Bl.) Tindale, Contr. N. S. W. Nat. Herb. 3: 90. 1961. — *Rumohra amabilis*; FFP 254. — *Arachniodes rhomboides*; FOT 365.

Between Mt Bubonbilit and mining camp, 1800 m, humus-rich ground along trail in dense forest, *P-536*, *P-565*.

Arachniodes aristata (Forst.) Tindale, Contr. N. S. W. Nat. Herb. 3: 89. 1961; FOT 364. — *Rumohra aristata*; FFP 252.

Mt Bubungkayo, 1100 m, on rather dry floor of evergreen forest, *P-368*.

Ching, Acta Bot. Sin. 10: 256. 1962 would restrict *A. aristata* to Australia and named the Asian plant *A. exilis*, but he failed to provide any characters by which the two differ. In fact, Asian plants usually have a longer creeping rhizome than those of Australia, but this character is especially variable in Philippine material.

Arachniodes tripinnata (Goldm.) Sledge, Bull. Brit. Mus. (Nat. Hist.) Bot. 5: 41. 1973. — *Rumohra carvifolia*; FFP 253.

Mt Siminublan, 800 m, in light shade, *P-201*; 950 m, on dry slope in dense evergreen forest, *P-277*.

Dryopteris cochleata (Don) C. Chr. Ind. Fil. 258. 1905; FFP 282; Price, Gard. Bull. Sing. 30. 1976.

Between Nueva Era and Mt Siminublan, 250 m, in light shade, *P-113*, *P-151*; Mt Siminublan, 700 m, in light shade, *P-221*; 1200 m, at border of grassland and dry forest, *Price 3341*.

Dryopteris formosana (Christ) C. Chr. Ind. Fil. 266. 1905; FOT 376; Price, Gard. Bull. Sing. 30. 1976.

Mt Burnay, 1900 m, on slope in light shade at edge of forest, *P-851*, *Price 3384*.

Dryopteris pulvinulifera (Bedd.) O. Ktze. Rev. Gen. Pl. 2: 813. 1891; Price, Gard. Bull. Sing. 30. 1976.

Mt Burnay, 1900 m, on sheltered slope in light shade, *P-827*, *P-848*, *Price 3363*.

Dryopteris uropinna Price, Gard. Bull. Sing. 30. 1976.

Mt Burnay, 1900 m, on sheltered slope in light shade, *P-849*, *Price 3364*.

Dryopteris varia (L.) O. Ktze. Rev. Gen. Pl. 2: 814. 1891; FFP 284; FOT 381; Price, Gard. Bull. Sing. 30. 1976.

Mt Siminublan, 500 m, on rather dry bank along trail, *P-202*; 800 m, along streamlet in light shade, *P-225*; 1200 m, at border of grassland and dry forest, *Price 3342*; Mt Karabas-pusa, 800 m, in shade of seasonally dry forest, *P-886*, *Price 3398*.

Nothoperanema hendersonii (Bedd.) Ching, Acta Phytotax. Sin. 11: 28. 1966; Price, Gard. Bull. Sing. 30. 1976. — *Ctenitis mearnsii*; FFP 289. — *Dryopteris hendersonii*; FOT 377.

Between mining camp and Mt Burnay, 1900 m, on humus-rich slope in mossy forest, *P-774*.

Diacalpe aspidioides Bl. Enum. 241. 1828; FFP 239.

Mt Bubungkayo, 1200 m, ridge-crest forest, *P-384*; Mt Burnay, 1900 m, in moist shaded ravine, *Price 3389*.

Acrophorus nodosus Presl, Tent. Pterid. 94. t. 3. f. 2. 1836. — *Aspidium nodosum* Bl. Enum. 171. 1828, non Willd. 1810. — *Acrophorus stipellatus*; FFP 241; FOT 360.

Mt Burnay, 1900 m, on humus-rich slope in mossy forest, *P-816*.

A. stipellatus is based on a *nomen nudum* of Wallich and refers to the Himalayan plant which differs from that of Malesia by not having prickly axes.

Ctenitis subglandulosa (Hance) Ching, Bull. Fan Mem. Inst. Biol. Bot. 8: 302. 1938; FFP 292; FOT 327.

Mt Bubungkayo, 1100 m, humus-rich slope in light shade in evergreen forest, *P-370*.

Ctenitis setosa (Presl) Holtt. Nov. Bot. Inst. Bot. Univ. Carol. Prag. 1968: 20. 1969. — *Ctenitis vilis*; FFP 288.

Mt Siminublan, 800 m, in seasonally dry evergreen forest, *P-280*, *Price 3343*.

Tectaria dissecta (Forst.) Lell. Amer. Fern J. 58: 156. 1968. — *Ctenitis dissecta*; FFP 286. — *Ctenitopsis dissecta*; FOT 330.

Nueva Era, 100 m, in rather dry forest, *P-48*; Mt Siminublan, 800 m, along trail in dry forest, *P-195*; Mt Karabas-pusa, 900 m, along trail in evergreen forest, *P-885*.

Tectaria hilocarpa (Fée) Price, Kalikasan 3: 175. 1974. — *Hemigramma latifolia*; FFP 317.

Between Nueva Era and Mt Siminublan, 200 m, on dry slope in light shade, *P-115*, *P-148*.

Tectaria laxa (Copel.) Price, Kalikasan 1: 37. 1972. — *Ctenitis laxa* Copel. PJS 83: 98. 1954.

Mt Siminublan, 1000 m, slope in seasonally dry evergreen forest, *P-269*, *Price 3345*; Mt Karabas-pusa, 500m, along trail in evergreen forest, *P-893*, *Price 3398*.

Pleocnemia macrodonta (Fée) Holtt. Kew Bull. 29: 348. 1974. — *Tectaria irregularis*; FFP 309, p. p.

Mt Siminublan, 700 m, in dry forest, *P-194*.

THELYPTERIDACEAE

Pseudophegopteris paludosa (Bl.) Ching, Acta Phytotax. Sin. 8: 315. 1963; Holtt. Blumea 17: 23. 1969. — *Lastrea pyrhorhachis*; FFP 330. — *Thelypteris paludosa* (Bl.) K. Iwats. APG 19: 11. 1961; Mem. Coll. Sci. Univ. Kyoto B 31: 139. 1965. — *Pseudophegopteris hirtirachis*; FOT 434.

Near mining camp, 1800 m, in dense mossy forest, *P-556*.

Metathelypteris uraiensis (Rosenst.) Ching, Acta Phytotax. Sin. 8: 306. 1963; Holtt. Kalikasan 5: 117. 1976; FOT 419. — *Thelypteris uraiensis* (Rosenst.) Ching, Bull. Fan Mem. Inst. Biol. Bot. 6: 336. 1936; K. Iwats. Mem. Coll. Sci. Univ. Kyoto B 31: 148. 1965.

Mt Burnay, 1900 m, on humus-rich slope in mossy forest, *P-767*, *P-815*, *Price 3368*.

Macrothelypteris torresiana (Gaud.) Ching, Acta Phytotax. Sin. 8: 310. 1963; Holtt. Blumea 17: 27. 1969; FOT 417. — *Lastrea torresiana*; FFP 331. — *Thelypteris torresiana* (Gaud.) Alston, Lilloa 30: 111. 1960; K. Iwats. Mem. Coll. Sci. Univ. Kyoto B 31: 151. 1965.

Between Nueva Era and Mt Siminublan, 250 m, in light shade, *P-121*.

Chingia ferox (Bl.) Holtt. *Blumea* 19: 31. 1971; *Kalikasan* 3: 21. 1974. — *Cyclosorus ferox*; FFP 347. — *Thelypteris ferox* (Bl.) Tagawa & K. Iwats. *APG* 23: 54. 1968.

Between Nueva Era and Mt Siminublan, 400 m, along trail in rather dry mountain forest, *P-127*; Mt Siminublan, 800 m, along streamlet in shade, *P-220*.

Parathelypteris beddomei (Bak.) Ching, *Acta Phytotax. Sin.* 8: 302. 1963; Holtt. *Kalikasan* 5: 112. 1976; *FOT* 421. — *Lastrea beddomei*; FFP 321. — *Thelypteris beddomei* Ching, *Bull. Fan Mem. Inst. Biol. Bot.* 6: 308. 1936; K. Iwats. *Mem. Coll. Sci. Univ. Kyoto B* 31: 166. 1965.

Near mining camp, 1800 m, along trail in mossy forest, *P-549*.

Parathelypteris grammitoides (Christ) Holtt. *Kalikasan* 5: 114. 1976. — *Thelypteris grammitoides* (Christ) Ching, *Bull. Fan Mem. Inst. Biol. Bot.* 6: 317. 1936. — *Lastrea grammitoides*; FFP 320.

Mt Bubungkayo, 1350 m, in seasonally dry forest, *Price 3401*.

Coryphopteris pubirachis (Bak.) Holtt. var. **philippinensis** Holtt. *Blumea* 23: 37. 1976. — *Lastrea viscosa*; FFP 324, p. p. — *Thelypteris pubirachis* (Bak.) Reed, *Phytologia* 17: 307. 1968.

Between mining camp and Mt Burnay, 1800 m, on humus-rich slope in mossy forest, *P-697*, *P-758*.

Sphaerostephanos diversilobus (Presl) Holtt. *Kalikasan* 4: 57. 1975. — *Cyclosorus diversilobus*; FFP 357. — *Thelypteris diversiloba* (Presl) Reed, *Phytologia* 17: 273. 1968.

Mt Siminublan, 800 m, on slope in seasonally dry forest, *P-278*, *Price 3344*.

Sphaerostephanos lobatus (Copel.) Holtt. *Kalikasan* 4: 64. 1975. — *Cyclosorus lobatus*; FFP 356. — *Thelypteris lobata* (Copel.) Reed, *Phytologia* 17: 289. 1968. — *Cyclosorus bordenii*; FFP 345, p. p.

Mt Karabas-pusa, *Price 3397*.

Sphaerostephanos loherianus (Christ) Holtt. *Kalikasan* 4: 61. 1975. — *Cyclosorus loherianus*; FFP 342. — *Thelypteris loheriana* (Christ) Reed, *Phytologia* 17: 289. 1968.

Mt Bubungkayo, 900 m, ridge-crest in evergreen forest, *P-376*.

Sphaerostephanos punctatus Holtt. *Kalikasan* 4: 60. 1975. — *Cyclosorus megaphyllus*; FFP 367. — *Cyclosorus nitidulus*; FFP 364, p. p.

Between Nueva Era and Mt Siminublan, 400 m, along stream in light shade, *P-122*.

Sphaerostephanos smithianus (Presl) Holtt. *Kalikasan* 4: 65. 1975. — *Cyclosorus boholensis*; FFP 348. — *Cyclosorus productus*; FFP 348, p. p.

Between Nueva Era and Mt Siminublan, 250 m, streamside, exposed and in light shade, *P-125*, *Price 3338* (det. R. E. Holttum).

Sphaerostephanos unitus (L.) Holtt. J. S. Afr. Bot. 40: 165. 1974; Kalikasan 4: 63. 1975. — *Cyclosorus unitus*; FFP 360. — *Thelypteris unita* (L.) Morton, Amer. Fern J. 49: 113. 1959.

Nueva Era, 100 m, along stream at edge of forest, P-46.

Pneumatopteris laevis (Mett.) Holtt. Blumea 21: 308. 1973. — *Cyclosorus nitidulus*; FFP 364, p. p. — *Thelypteris laevis* (Mett.) Reed, Phytologia 17: 286. 1968.

Between Nueva Era and Mt Siminublan, 250 m, on humus-rich slope in light shade, P-200; Mt Karabas-pusa, 800 m, along trail in evergreen forest, P-889.

Christella arida (Don) Holtt. in Nayar & Kaur, Comp. to Bedd. Handb. 206. 1974; Kew Bull. 31: 320. 1976; FOT 404. — *Cyclosorus aridus*; FFP 362. — *Thelypteris arida* (Don) Morton, Amer. Fern J. 49: 113. 1959; K. Iwats. Mem. Coll. Sci. Univ. Kyoto B 31: 185. 1965.

Nueva Era, 100 m, on wet ground alongside streamlet at edge of forest, P-47.

Christella hispidula (Decne.) Holtt. Kew Bull. 31: 312. 1976. — *Thelypteris hispidula* (Decne.) Reed, Phytologia 17: 283. 1968. — *Cyclosorus benguetensis*; FFP 313.

Mt Siminublan, 800 m, in rather dry forest near streamlet, P-198.

Christella dentata (Forssk.) Brownsey & Jermy, Brit. Fern Gaz. 10: 338. 1973; Holtt. Kew Bull. 31: 314. 1976; FOT 404. — *Cyclosorus dentatus*; FFP 337. — *Thelypteris dentata* (Forssk.) E. St. John, Amer. Fern J. 26: 44. 1936.

Between Nueva Era and Mt Siminublan, 250 m, along stream in light shade, P-117.

Christella subpubescens (Bl.) Holtt. Webbia 30: 193. 1976; Kew Bull. 31: 323. 1976. — *Thelypteris subpubescens* (Bl.) K. Iwats. Mem. Coll. Sci. Univ. Kyoto B 31: 173. 1965. — *Cyclosorus subpubescens*; FFP 338.

Mt Siminublan, 800 m, in rather dry forest, P-199.

ATHYRIACEAE

Lunathyrium japonicum (Thunb.) Kurata, J. Geobot. (Kanazawa) 9: 99. 1961. — *Athyrium japonicum*; FFP 385. — *Athyriopsis japonica*; FOT 444.

Near mining camp, 1800 m, on wet sandy ground along trail in mossy forest, P-545, P-547.

Cornopteris banahaoensis (C. Chr.) K. Iwats. & Price, *comb. nov.* — *Dryopteris tenerrima* Copel. PJS 4C: 111. 1909, non Rosenst. 1906. — *Dryopteris banahaoensis* C. Chr. Ind. Fil. Suppl. 1: 30. 1913. — *Dryopteris fluvialis* Hayata, Icon. Pl. Formos. 4: 152. f. 94. 1914, *synonym novum.* — *Cornopteris fluvialis* (Hayata) Tagawa, APG 1: 158. 1932; FOT 456. — *Dryopteris athyriiformis* Rosenst. Hedwigia 56: 344. 1915. — *Athyrium nudum* Copel. FFP 391.

Near mining camp, 1800 m, on wet ground along trail in mossy forest, P-548.

Athyrium anisopterum Christ, Bull. Herb. Boiss. 6: 962. 1898; FFP 387; FOT

446.

Near mining camp, 1800 m, on wet ground along trail in mossy forest, *P-589*; Mt Burnay, 1950 m, *Price 3373*.

Athyrium drepanopteron (Kunze) A. Br. ex Milde, Fil. Europ. 49. 1867; FFP 387; FOT 448.

Near mining camp, 1800 m, in light shade at edge of forest, *P-596*; Mt Bubonbilit, 1600 m, *Price 3352*; between mining camp and Mt Burnay, 1900 m, on moist slope in mossy forest, *P-756*.

Athyrium mearnsianum (Copel.) v. A. v. R. Mal. Ferns Suppl. 279. 1917; FFP 388.

Near mining camp, 1800 m, humus-rich ground along trail in mossy forest, *P-552*; Mt Burnay, 1900 m, *Price 3395*.

Reported from Taiwan in FFP but not mentioned by name in FOT.

Diplazium geophilum (Copel.) v. A. v. R. Bull. Jard. Bot. Buitenz. 2: 12. 1912. — *Athyrium geophilum*; FFP 392.

Mt Burnay, 1900 m, on clay embankments at sides of dark sheltered gorge, *Price 3394*.

This is an apparently disjunct population 450 km further north than Mt Banahaw, the previously known northernmost locality.

Diplazium polypodioides Bl. Enum. 194. 1828. — *Athyrium blumei*; FFP 396.

Mt Siminublan, 1100 m, on rather dry slope in dense evergreen forest, *P-273*; Mt Bubungkayo, 1000 m, on humus-rich slope in evergreen forest, *P-378*.

Attributed to Taiwan in FFP.

Diplazium latifrons v. A. v. R. Mal. Ferns Suppl. 271. 1917. — *Athyrium platyphyl- lum*; FFP 400. — *Diplazium petri* Tard. Aspl. Tonkin 67, 181. pl. 9. f. 1-2. 1932, *synonym novum*; FOT 467.

Mt Burnay, 1900 m, on slope in gloomy mossy forest, *P-837*, *Price 3371*.

Diplazium *sp. nov.*

Mt Siminublan, *P-374*, *Price 3340*; Mt Bubonbilit, *P-554*, *Price 3354*; Mt Burnay, *P-773*, *Price 3388*, *3396*.

DIPTERIDACEAE

Dipteris conjugata Reinw. Sylloge 2: 3. pl. 2. 1824; FFP 455; FOT 161.

Mt Bubungkayo, 900 m, in pine forest at ridge, *P-377*; between mining camp and Mt. Burnay, 1900 m, open spot in mossy forest on ridge crest, *P-691*.

P-691 is very close to the form described as *D. novoguineensis* Posth. Rec. Trav. Bot. Neerl. 25a: 248. f. 1. 1928.

CHEIROPLEURIAACEAE

Cheiropleuria bicuspis (Bl.) Presl, Epim. Bot. 189. 1851; FFP 456; FOT 163.

Between mining camp and Mt Burnay, 1900 m, along trail in mossy forest, *P-659*, *P-762*.

POLYPODIACEAE

Pyrrosia adnascens (Sw.) Ching, Bull. Chin. Bot. Soc. 1: 45. 1935; FFP 471; FOT 205.

Nueva Era, 100 m, on trunk in light shade, *P-66*.

Pyrrosia floccigera (Bl.) Ching, Bull. Chin. Bot. Soc. 1: 71. 1935; Holtt. Ferns of Malaya 147. 1955. — *Pyrrosia lanuginosa*; FFP 472.

Mt Siminublan, 500 m, on trunk in open forest, *P-192*; 800 m, on trunk alongside streamlet, *P-262*.

Saxiglossum Ching is supposed to differ from *Pyrrosia* by having the sori protected by a modified reflexed margin, but this is merely due to the inrolling of the edges of the blade in response to dry conditions. It is probable that *Saxiglossum angustissimum* (Gies. ex Diels) Ching, Acta Phytotax. Sin. 10: 301. 1965; FOT 208 is not different from *P. floccigera*; it was placed in *Pyrrosia* by Tagawa & K. Iwats. APG 26: 171. 1975.

Belvisia revoluta (Bl.) Copel. Gen. Fil. 192. 1947; FFP 468.

Mt Siminublan, 1450 m, on trunk near summit, *P-266*; between Mt Bubonbilit and mining camp, 1600 m, on trunk in mossy forest, *P-588*.

Lemmaphyllum accedens (Bl.) Donk, Reinwardtia 2: 409. 1954. — *Weatherbya accedens*; FFP 466.

Mt Bubungkayo, 1100 m, on mossy trunk in evergreen forest, *P-371*.

Microsorium heterocarpum (Bl.) Ching, Bull. Fan Mem. Inst. Biol. Bot. 4: 295. 1933; FFP 485.

Mt Siminublan, 800 m, on boulder along streamlet in shade, *P-218*; 1000 m, on trunk in dense evergreen forest, *P-261*; Mt Bubungkayo, 1200 m, on trunk in evergreen forest, *P-367*.

Microsorium heterolobum (C. Chr.) Copel. Gen. Fil. 196. 1947; FFP 485.

Between Mt Bubonbilit and mining camp, 1400 m, at base of trunk in dense forest, *P-648*; Mt Burnay, 1900 m, on twigs of small tree in sheltered ravine, *Price 3393*.

These plants appear to be of hybrid origin, one parent, at least, being *M. heterocarpum*.

Microsorium punctatum (L.) Copel. Univ. Calif. Publ. Bot. 16: 111. 1929; FFP 483; FOT 197.

Mt Karabas-pusa, 800 m, on trunk in evergreen forest, *P-883*.

Microsorium sablanianum (Christ) Copel. Gen. Fil. 196. 1947; FFP 482.

Mt Siminublan, 800 m, in light shade along streamlet, *P-204*.

Microsorium zippelii (Bl.) Ching, Bull. Fan Mem. Inst. Biol. Bot. 4: 308. 1933; FFP 484.

Near mining camp, 1800 m, on trunk in sheltered place in mossy forest, *P-550*.

Lecanopteris carnosa (Reinw.) Bl. Enum. 120. 1828; FFP 499.

Mt Bubungkayo, 1200 m, on trunk in dense forest, *P-381*.

Colysis pothifolia (Don) Presl, Epim. Bot. 148. 1851. — *Colysis elliptica*; FFP 491; FOT 170.

Mt Siminublan, 800 m, on boulder along streamlet, *P-223*.

C. pothifolia differs from the Japanese *C. elliptica* in having larger fronds, thicker rhizome, and an opaque lamina.

Loxogramme avenia (Bl.) Presl, Tent. Pterid. 215. 1836. — *Loxogramme malayana*; FFP 540, p. p.

Mt Siminublan, 1450 m, on trunk near summit, *P-295*; Mt Bubungkayo, 1350 m, *Price 3351*; between Mt Bubonbilit and mining camp, 1800 m, on trunk in mossy forest, *P-518*.

Drynaria descensa Copel. PJS 3C: 36. 1908; FFP 497.

Between Nueva Era and Mt Siminublan, 250 m, at base of trunk in light shade along river, *P-124*.

Drynaria quercifolia (L.) J. Sm. J. Bot. 3: 398. 1841; FFP 496.

Nueva Era, 100 m, on trunk in light shade, *P-75*.

Drynaria sparsisora (Desv.) Moore, Ind. Fil. 348. 1862; FFP 497.

Mt Karabas-pusa, 800 m, at base of trunk along ridge-crest in evergreen forest, *P-880*.

Selliguea feei Bory, Dict. Class. 6: 588. 1828; FFP 507.

Var. **elmeri** (Copel.) Tagawa, APG 16: 78. 1956. — *Selliguea elmeri*; FFP 508.

Between Mt Bubonbilit and mining camp, 1500 m, petrophytic in pine forest, *P-580*.

Var. **vulcanica** (Bl.) Tagawa, APG 16: 77. 1956.

Mt Burnay, 1950 m, on mossy trunks, *P-696*, *Price 3366*.

Crypsinus albidosquamatus (Bl.) Copel. Gen. Fil. 207. 1947; FFP 501.

Near mining camp, 1800 m, on trunk in mossy forest, *P-534*.

Crypsinus enervis (Cav.) Copel. Gen. Fil. 207. 1947; FFP 506.

Between Mt Bubonbilit and mining camp, 1600 m, on trunk in mossy forest, *P-576*, *Price 3356*.

Crypsinus taeniatus (Sw.) Copel. Gen. Fil. 206. 1947; FFP 502; FOT 175.

Between Mt Bubonbilit and mining camp, 1600 m, on trunk in mossy forest, *P-577*; Mt Burnay, 1900 m, on mossy trunk, *P-831*; between mining camp and Mt Burnay, 1850 m, *P-770*.

Crypsinus whitfordii (Copel.) Copel. Gen. Fil. 206. 1947; FFP 504.

Between Mt Bubonbilit and mining camp, 1600 m, on trunks and branches in mossy forest, *P-587*, *Price 3357*; Mt Burnay, 1900 m, *Price 3367*.

Polypodium argutum (Wall. ex Hook.) Hook. Sp. Fil. 5: 32. 1863. — *Goniophlebium argutum*; FFP 462; FOT 178.

Between Mt Bubonbilit and mining camp, 1600 m, on mossy trunks, *P-578*, *Price 3359*; between mining camp and Mt Burnay, 1900 m, on mossy trunks, *P-772*, *Price 3387*.

Polypodium subauriculatum Bl. Enum. 133. 1828. — *Goniophlebium subauriculatum*; FFP 461.

Between Mt Bubonbilit and mining camp, 1600 m, on trunk in mossy forest, *P-647*.

GRAMMITIDACEAE

Ctenopteris merrittii (Copel.) Tagawa, APG 9: 210. 1940; FFP 532. — *Polypodium apoense* Copel. PJS 56: 105. pl. 9. 1935, *synonym novum*. — *Xiphopteris apoensis*; FFP 521. — *Ctenopteris subcorticola* Tagawa, APG 9: 209. 1940, *synonym novum*.

Between mining camp and Mt Burnay, 1900 m, on mossy trunks in sheltered spots, *P-674*, *P-675*, *P-678*; Mt Burnay, 1900 m, *P-821*, *P-844*, *Price 3379*.

Ctenopteris mollicoma (Nees & Bl.) Kunze, Bot. Zeit. 4: 425. 1846; FFP 528.

Between mining camp and Mt Burnay, 1900 m, on mossy trunks in sheltered sites, *P-669*, *P-747*; Mt Burnay, 1900 m, *P-842*, *Price 3378*.

Ctenopteris solida (Mett.) Copel. PJS 81: 103. 1953; FFP 533.

Between Mt Bubonbilit and mining camp, 1600 m, on mossy trunk, *P-591*, *Price 3358*.

First published report from Luzon.

Calymmodon cucullatus (Nees & Bl.) Presl, Tent. Pterid. 204. 1836; FFP 522. — *Calymmodon gracillimus*; FOT 216.

Between mining camp and Mt Burnay, 1850 m, on mossy trunk in dense forest, *P-672*, *P-746*.

Calymmodon gracilis (Fée) Copel. PJS 34: 266. 1927; FFP 523; FOT 217.

Between mining camp and Mt Burnay, 1850 m, on mossy trunk in dense forest, *P-680*; Mt Burnay, 1900 m, *Price 3377*.

Grammitis adspersa Bl. Fl. Jav. 115. pl. 48. f. 2. 1828; FFP 514; FOT 221.

Mt Burnay, 1900 m, on mossy trunk in sheltered ravine, *Price 3374*.

Grammitis alepidota Price, Philip. Agric. 57: 34. f. 1. 1974.

Mt Burnay, 1900 m, on mossy trunk in dense forest, *P-824*.

Second known collection and a range extension northward of 450 km.

Grammitis caespitosa Bl. Enum. 115. 1828; FFP 515.

Between mining camp and Mt Burnay, 1900 m, on mossy trunk in dense forest, *P-668*; Mt Burnay, 1900 m, *P-833*.

Although Copeland described this species as glabrous, the Burnay plant has a velutinous lamina.

Grammitis reinwardtii Bl. Enum. addenda 1828; FFP 518; FOT 223.

Between mining camp and Mt Burnay, 1900 m, on mossy trunk in dense forest, *P-671*; Mt Burnay, 1900 m, *Price 3375*.

Grammitis *sp. nov.*

Between mining camp and Mt Burnay, 1900 m, on mossy trunk in dense forest, *P-742*; Mt Burnay, 1950 m, on mossy trunks, *P-822*, *Price 3376*.

Scleroglossum minus (Fée) C. Chr. Dansk Bot. Ark. 6: 29. t. 2. 1929; FFP 520.

Between mining camp and Mt Burnay, 1900 m, on trunk at ridge-crest in pine forest, *P-679*, *P-681*, *Price 3372*; Mt Burnay, 1900 m, on mossy trunk in dense forest, *P-818*.

Phytogeographical Remarks

Malesia contacts the continental south-east Asian floristic region in two places, lower Thailand and Taiwan. Although a characteristically Malesian flora extends into southern Thailand up to the seasonally dry central plain, the convenient political boundary with Malaysia is widely used as a line of demarcation. This has been discussed with emphasis on pteridophytes by Iwatsuki (1973).

There is a considerable literature on the floristic gap between Luzon and Taiwan. Merrill (1926) provided evidence for their separation geologically since the early Tertiary, and allowed that they may never have been contiguous. Dickerson (1928) believed strongly in an early Tertiary connection between Luzon and Taiwan and "that the plants common to the two islands spread southward ... at that time." Van Steenis (1950) emphasized the demarcation between the Philippines and Taiwan by showing that 686 genera of flowering plants occur on only one side of the Bashi Channel, either in Taiwan or in the Philippines, but not in both. Li & Keng (1950) proposed that an intermediate zone between Taiwan and Luzon be recognized, comprising the southernmost tip of Taiwan and its offshore islands, and stretching to also include Hainan to the west and the Volcano Islands to the east. Additional literature is cited in the above papers.

Comparison of the pteridophytes of Luzon and Taiwan is facilitated by the existence of recent floras, Copeland (1958-61) for the Philippines and DeVol et al. (1975) for Taiwan. Unfortunately neither of these two floras was written with a thorough knowledge of the pteridophytes of the other area, and comparison is difficult in some cases. Copeland's Fern Flora was updated to 1971 by Price (1972). For Taiwan, special mention should be made of Tagawa's work, especially the papers of 1940-1949.

Batan Island, approximately half-way between Luzon and Taiwan, has one volcanic peak just over 1000 m high from which 75 pteridophytes were identified by Iwatsuki (in Hatusima, 1966). Orchid Island, slightly to the east of the southern tip of Taiwan, has slightly more than 100 pteridophyte species (Liew, 1976).

Of the 199 species of pteridophytes we collected on Mt Burnay and vicinity, 8 appear to be endemic to northern Luzon, *Selaginella intertexta*, *Oleandra benguetensis*, *Polystichum edanioi*, *Tectaria laxa*, *Asplenium* sp., *Macroglena* sp., *Grammitis* sp., and *Diplazium* sp. Two species occur in N. Luzon and the Asian mainland, but not Taiwan nor elsewhere in the Philippines, *Dryopteris cochleata* and *D. pulvinulifera*, and one, *Arthropteris repens*, occurs only to the south and east of the Philippines. Of the remaining 188 Burnay species, 120 occur also in Taiwan, 171 occur also in S. Luzon and the central Philippines, and 105 occur in both areas considered. Stated otherwise, of the Burnay pteridophytes we collected, only 15 species are found to the north, in Taiwan, but not in an area equivalently distant to the south. However, 68 species occur in the Philippines over 400 km to the south of Burnay but are not in Taiwan.

According to our figures, 39 percent (77 of 199) of the Burnay species reach their northernmost extension in the northern Philippines, and have not succeeded in establishing themselves across the 350 km of ocean between Luzon and Taiwan. It must be recognized that ferns readily establish disjunct populations by single spores (Wagner, 1972) and that once established, disjunct populations can be expected to have low rates of divergence and probably low rates of extinction (Smith, 1972). Furthermore, the prevailing direction of the numerous storms that reach Luzon from the Pacific is to the west and the north and these should have so facilitated the transport of spores to Taiwan that 350 km of intervening ocean cannot be considered a meaningful barrier. In addition, there is no notable difference in climate between the Burnay area and southern Taiwan.

How is the rather unexpectedly strong disparity between the fern floras explained? We believe that it is partly an artifact of the lack of coordination in nomenclature between Taiwan and Luzon, and partly due to insufficient botanical exploration. But we also wish to suggest that migration of spores between Luzon and Taiwan was not as easy in the past as now, and that conditions only in recent times have been so very favorable. Our evidence for this is as follows:

Thirty-nine percent of the Burnay pteridophytes have failed to reach Taiwan despite favorable winds and climate and reasonable proximity, as stated above. The volcanic islands intermediate between Luzon and Taiwan which can now serve as way stations for migrating plants are of very recent origin. The present wind patterns may have existed only since the last major glacial period. It is known that the Malesian archipelago is drifting northward, towards Taiwan. The data for the flowering plant disparity as summarized by van Steenis (1950) is extremely strong. There seems to be no real evi-

dence of there ever having been any direct connection between Luzon and Taiwan. Of the species which in the reverse direction have apparently entered Luzon from Taiwan, they appear to be recent arrivals as almost all are restricted to northern Luzon, a point made by Copeland (1958); to argue that they constitute a remnant of an early Tertiary land distribution assumes that there has been virtually no evolution in the last fifty million years. We therefore conclude, in opposition to Dickerson (1928), that the Himalayan-Taiwanese floral component of northern Luzon is not relict in distribution but recent.

Summary

The first collections on Mt Burnay yielded 199 species of pteridophytes including four possibly new species in the genera *Asplenium*, *Diplazium*, *Grammitis*, and *Macroglena*, which are being held for further study. New records for the Philippines are *Arthropteris repens*, *Crepidomanes latealatum*, and *Dennstaedtia hirsuta*; confirmed is *Pteris wallichiana*. New to Luzon are *Ctenopteris solida* and *Plagiogyria falcata*, and considerable range extensions from southern Luzon are *Diplazium geophilum* and *Grammitis alepidota*. New reductions to synonymy are: *Humata chrysanthemifolia* (Hay.) Hay. to *H. obtusata* v. A. v. R.; *Elaphoglossum lepidopodum* C. Chr. ex Ogata to *E. luzonicum* Copel.; *Polystichum aquilinum* Copel. to *P. biaristatum* Bl.; *Polypodium apoense* Copel. and *Ctenopteris subcorticola* Tag. to *C. merrittii* (Copel.) Tag.; *Dryopteris fluvialis* Hay. to *Cornopteris banahaoensis* (C. Chr.) K. Iwats. & Price, *comb. nov.*; *Diplazium petri* Tard. to *D. latifrons* v. A. v. R. It is argued that the gap between Taiwan and Luzon constitutes a strong phytogeographic boundary that has been blurred only in relatively recent times.

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