

## MISCELLANEOUS NOTES ON THAI MOSSES

by

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### SUMMARY

Notes on the distribution and ecology of 195 species, of which 84 are reported as new to the country. One new combination is provided: *Rhaphidostichum chaetomitriopsis* (Dix.), several species are reduced to synonymy, and the distinctions of other species are discussed.

This paper deals mainly with mosses I collected during the Thai-Dutch Botanical Expedition 1965/1966, which was realized through grants from the Treub Foundation, the Treub Society, and the State University at Leyden. About 4200 collections of bryophytes were made, to wit c. 2800 mosses and c. 1400 hepatics. The first two sets are placed in the Rijksherbarium (L) and the Forest Herbarium, Bangkok (BKF). The remaining sets will be distributed by the Rijksherbarium. Details concerning the collecting localities have been previously published in this bulletin (HENNIPMAN & TOUW 1966).

I seize this opportunity to publish a number of interesting finds that have come to me from various other sources. The greater part of these were made by HANSEN and SMITINAND during the 5th Thai-Danish Expedition in 1966. Of all specimens mentioned a set has been placed in the Rijksherbarium. Collection numbers refer to the author's collection, unless stated otherwise.

One will not find here a complete identification list of all specimens I collected or studied. I have refrained from naming plants belonging to groups that are clearly in need of revision. As a result, one will find here only few names in such large, polymorphous groups as *Hypnaceae*, *Sematophyllaceae*, etc. The list as published here consists of:

1. Species not previously reported from Thailand (these have been marked by an asterisk);
2. Range extensions within that country;
3. New collections of rare species.

Reports from already previously known localities have usually been omitted.

*Trachypodaceae* and *Racopilaceae* have been identified by Dr. B.O. VAN ZANTEN; *Papillaria* was studied by Mr. J.H. HILBRANDS, who is engaged in a revision of the malesian species of that genus. Several other groups not mentioned in the present publication (including the hepatics) have been sent to various specialists.

#### BRACHYTHECIACEAE

\**Rhynchostegiella menadensis* (Lac.) Bartr. UDON: near Ban Na Luang, 370 m, on tree in dry evergreen forest (10366).

Distr.: Tonkin, Malesia, New Hebrides.

\**Rhynchostegiella scabriseta* (Schwaegr.) Broth. PAYAP: Doi Inthanon, 2250 m, on tree in moist hill evergreen forest along streamlet (10167).

Distr.: Sikkim, Assam.

*Rhynchostegium celebicum* (Lac.) Jaeg.: widespread in the north; was collected at altitudes between 700 and 1550 m, in Payap (Doi Suthep), Nakhon Sawan (Doi Musoe), Udon (Phu Luang, Phu Krading), and Prachin Buri (Khao Yai).

*Rhynchostegium javanicum* (Bel.) Besch.; NAKHON SAWAN: Doi Musoe, 780-800 m, on tree in moist evergreen forest along streamlet (8103). Previously reported from Peninsular Thailand (Khao Luang) only.

*Rhynchostegium vagans* Jaeg.: common on wet rocks and tree bases along streams.

#### CALYMPERACEAE

*Calymperes nietneri* C. Muell. Common in Peninsular Thailand, but also collected in PRACHIN BURI: Khao Yai, 700 m, epiphytic in evergreen forest along rivulet (12233).

\**Calymperes serratum* A. Braun ex C. Muell. UDON: Phu Krading, 1150-1250 m (11043, 11105); PRACHIN BURI: Khao Yai, 700 m (12322). On tree trunks in evergreen forest.

Distr.: Indomalesia, Pacific Islands.

\**Calymperes subserratum* Fleisch. PHUKET: Phuket I., Khao Kluay, 150-200 m, at base of tree trunks in evergreen secondary forest (11194); Terutao I., 15 m; on bark in evergreen forest (HANSEN & SMITINAND 12513 p.p.).

Distr.: Malaya, Java.

Questionably separable from *C. serratum*!

\**Calymperes tahitense* (Sull.) Mitt. PHUKET: Krabi, Khao Nang Hong 200-300 m, on limestone rocks in evergreen forest (11311).

Distr.: Indomalesia, Pacific Islands.

*Calymperopsis langbianensis* Tix. UDON: Phu Luang, 1300-1400 m, on trees near streamlet in dense low evergreen forest (10672). NAKHON SI THAMMARAT: Khao Luang, 1250-1450 m, on forest trees (11656); 1740 m, summit region, on trees in stunted mossy forest (11837).

*Calymperopsis semilibra* (Mitt.) Fleisch. NAKHON SAWAN: Doi Musoe, 750-800 m, at base of tree in plantation; UDON: Phu Luang, 1150-1250 m, on tree trunks in open forest (10472); 1200 m, on trees and shrubs in dense hill evergreen forest along streamlet (10755); Phu Krading, 1150 m, on sheltered rocks in stream (10971, 10973).

*Calymperopsis wiemansii* (Fleisch.) Fleisch. NAKHON SAWAN: Doi Musoe, 750-800 m, crown epiphyte in moist evergreen forest (8233).

\**Syrrhopodon confertus* Lac. UDON: Phu Krading, 1150m, on tree trunks in dense evergreen forest along Mae Nam Pong River (11042); PHUKET: Phuket I., Khao Kluay, 200 m, at base of tree trunks in evergreen secondary forest (11148).

Distr.: Malaya, Sumatra, Banka.

\**Syrrhopodon flammeo-nervis* C. Muell. var. *robustus* Dix. NAKHON SI THAMMARAT: Khao Luang, 1250-1740 m, on tree trunks in evergreen forest (11666, 11717, 11796).

Distr.: Borneo, Malaya.

\**Syrrhopodon larminatii* Par. & Broth. UDON: Ban Na Luang, 370 m, deciduous forest (10363A); Phu Luang, 750-850 m, evergreen forest (10401); PHUKET: Phuket I., Khao Kluay, 80-180 m, evergreen secondary forest (11139); NAKHON SI THAMMARAT: Khao Luang, 600 m, evergreen forest (11509). On tree trunks.

Distr.: India, Southeast China, Tonkin, Borneo, New Guinea, Luzon, South Japan.

In 1965 IWATSUKI reduced *S. philippinensis* Bartr. and *S. doii* Sak. to *S. tsushimae* Card. Recently, PÔCS and TIXIER (1967) united *S. tsushimae* with *S. larminatii* Par. & Broth. in their publication 'On the Ciliiferous *Syrrhopodon* Species in Asia'. They consider *S. larminatii* as 'a South-East Indian, Far East species, of a subtropic character'. Unfortunately, they overlooked the New Guinean record (in BARTRAM 1965: Morobe Distr., Botanic Gardens, Lae, 200 ft, BRASS 29268 sub *S. philippinensis* Bartr.), and recently I received a sample from Borneo (Sabah, near Sandakan, MEIJER B 12109). In Japan, *S. larminatii* is restricted to the coastal lowlands of the southwest (IWATSUKI 1960, 1965), an area inhabited by many tropical bryophytes. In my opinion *S. larminatii* is a widespread tropical species.

Its small size and rusty colour when dry make it quite inconspicuous, and I presume it has been overlooked by many collectors. According to PÖCS & TIXIER, *S. cavifolius* Lac. from Banka and Borneo differs in having a comparatively wider leaf base, short teeth instead of cilia along the margin, and cancellinae arranged in 10 rows at least. However, leaves, from the holotype in L are not or slightly narrowed above base, and have 6-8 rows of cancellinae (vs. 3-7 in *S. larminatii*). The teeth at the shoulders of the leaf are usually few in number (occasionally even absent), and short, but in some leaves up to  $25\mu$  long, vs.  $30-80\mu$  in *S. larminatii*. As the number and the length of the teeth are variable in *S. larminatii* as well as in the allied species, I strongly doubt whether the distinction between *S. cavifolius* and *S. larminatii* can be maintained at the species level when more material becomes available. If they have to be united, the name *S. cavifolius* has priority. Closely allied species that have not yet been revised are *S. subelimbatus* Dix. from Thailand and *S. trachyphyllus* Mont. from Singapore. As *S. trachyphyllus* Mont. 1856 is the oldest name in the group a revision of these species has become necessary, if it were only to stabilize the nomenclature. Judging from the description, *S. subelimbatus* shows no important differences from *S. larminatii* sensu PÖCS & TIX.

\**Syrrhopodon nymanii* Fleisch. PHUKET: Terutao I., 5 m, on wet rock in the shade (HANSEN & SMITINAND 12449).

Distr.: Java.

*Syrrhopodon spiculosus* Hook. & Grev. PHUKET: Terutao I., 5 m, on sandy soil (HANSEN & SMITINAND 12458, 12459, 12467). Very common in West Malesia (South Peninsular Thailand, Malaya, Sumatra, Borneo), but apparently very rare or absent in the monsoon region of Thailand. Several malesian species (*S. hispidissimus* Dix., *S. hispido-ciliatus* Bartr., *S. ledruanus* C. Muell. ex Dix., *S. patens* Dix., *S. patulifolius* Thér. & Dix., and *S. trachyphyllus* Mont.) might appear to be forms of *S. spiculosus* but are not included in the revision of that species by PÖCS & TIXIER (1967).

\**Syrrhopodon treubii* Fleisch. NAKHON SI THAMMARAT: Khao Luang, 1650 m, on damp rocks in evergreen mossy forest (11711).

Distr.: Sumatra, Java.

\**Syrrhopodon tristichus* Nees ex Schwaegr. NAKHON SI THAMMARAT: Khao Luang, 1250-1740 m (11653, 11708A, 11756); on tree trunks and damp rocks in evergreen forest.

Distr.: Annam, Indomalesia, Pacific Islands.

\**Thyridium cardotii* Fleisch. NAKHON SI THAMMARAT: Khao Luang, 150-800 m, common on tree trunks, usually in open evergreen forests along streams (11355, 11496, 11532, 11985); on trees in *Areca* plantation (12010).

Distr.: Burma, Java.

\**Thyridium flavum* (C. Muell.) Fleisch. PRACHIN BURI: Khao Yai, 700m, epiphytic in evergreen forest along stream (12330, 12361); NAKHON SI THAMMARAT: base of Khao Luang, 250-370 m, on tree trunks in plantation (11394); PHUKET: Phuket I., Khao Kluay, 80-200 m, at base of tree trunks in evergreen secondary forest (11132, 11134, 11149, 11153, 11195); Khao Phara, 150-350 m, on tree trunks in evergreen secondary forest (11210, 11220); Terutao I., Koh Ra, 5 m, on tree in beach forest (HANSEN & SMITINAND 12535).

Distr.: Tonkin, Malaya, Riouw Arch., Sumatra, Banka, Java, Borneo, Philippines.

\**Thyridium manii* Fleisch. PHUKET: Krabi, Khao Nang Hong, 170-320 m, on tree trunks in evergreen forest at base of limestone mountain (11293).

Distr.: Andaman I., Malaya, Java.

#### CRYPHAEACEAE

\**Acrocryphaea concavifolia* (Griff.) Bosch & Lac. PAYAP: Doi Suthep, summit region of Doi Pui, 1650-1685 m, on tree trunks and branches in open evergreen forest with *Pinus khasya* (8700); 30 km S. of Khun Yuam, 550 m, on twigs in deciduous forest along rivulet (10319); NAKHON SAWAN: Doi Musoe, 780 m, on isolated trees in plantation (8186).

Distr.: Indomalesia.

#### DICRANACEAE

\**Brothera leana* (Sull.) C. Muell. PAYAP: Doi Suthep, summit region of Doi Pui, 1600-1685 m, on tree trunks and branches in open evergreen forest (8482, 8707); Doi Inthanon, between Pha Mon and Sop Aep, 1150 m, on tree trunks in hill evergreen forest rich in *Pinus khasya* (10294).

Distr.: Himalayas, Nepal, Assam, S. India, Burma, Yunnan, Manchuria, Luzon, Japan, N. America.

\**Campylopodium euphorocladum* (C. Muell.) Besch. PAYAP: Doi Suthep, summit region of Doi Pui, 1650-1685 m (8721); summit region of Doi Buak Ha, 1550-1600 m (8846, 10356). Terrestrial in evergreen forests and on loamy roadside banks.

Distr.: Africa, Indomalesia, Pacific Islands, Australia, New Zealand.

\**Dicranella coarctata* (C. Muell.) Bosch & Lac. PAYAP: Doi Suthep, summit region of Doi Buak Ha, 1550 m (10357); NAKHON SAWAN: near Doi Musoe, 700-800 m (8254, 8310). On loamy roadside banks in evergreen forests.

Distr.: Ceylon, Burma, Malaya, Sumatra, Java, Tonkin, Formosa.

\**Dicranoloma braunii* (C. Muell.) Par. PAYAP: Doi Suthep, summit region of Doi Pui, 1600-1685 m, sometimes growing in mixture with *D. fragile* Broth.

(8595, 8653, 8769); summit region of Doi Buak Ha, 1550-1600 m (8817); Doi Inthanon, 1500m, moist evergreen forest along streamlet, on tree trunks (9538); UDON: Phu Luang, 1300-1400 m, on trees in open ridge vegetation (10579); on trees in dense low evergreen forest near streamlet (10662); PRACHIN BURI: Khao Khieo, 1200 m (12038). On tree trunks and branches in evergreen forest, unless stated otherwise.

It is surprising, that this rather conspicuous species has never been collected before, though it is common in the forest on Doi Suthep, so often visited by botanists.

Distr.: Indomalesia.

*Dicranoloma fragile* Broth. Common in the mountain forests of North Thailand. I collected this species many times on Doi Suthep (Doi Pui), Doi Chiang Dao, Doi Inthanon, and Phu Luang at altitudes between 1300 and 2150 m, but it has also been recorded previously from lower altitudes (Doi Suthep: 700-1000 m, Phu Krading: 1200 m).

*Holomitrium griffithianum* Mitt. Common in the same localities as *Dicranoloma fragile*, often bearing microphyllous gemmiform branchlets. As far as I know, these have not yet been reported from this species before.

*Leucoloma molle* (C. Muell.) Mitt. Apparently common in the mountains of Northeast, East and Peninsular Thailand, but not yet found in the north. We collected it in Udon (Phu Luang, Phu Krading) and Prachin Buri (Khao Khieo) between 1150 and 1400 m, and in Nakhon Si Thammarat (Khao Luang) between 750 and 1700 m.

\**Symblepharis vaginata* (Hook.) Wijk & Marg. (syn.: *S. helicophylla* Mont.). PAYAP: Doi Inthanon, 2500-2570m, on tree trunks and branches in mossy hill evergreen forest rich in *Ericaceae* (9766).

Distr.: Himalayas, China, Central America.

ROBBINS 3635 from the same locality (8100 ft), and reported sub *S. reinwardtii* (Dz. & Mb.) Lac. by TIXIER & SMITINAND (1966) belongs to the same species.

*Trematodon longicollis* Michx. PAYAP: Doi Suthep, summit region of Doi Buak Ha, 1550m, at loamy roadside bank in evergreen forest (10350).

*Wilsoniella pellucida* (Wils.) C. Muell. NAKHON SAWAN; Lansang Forest Park W. of Tak, 300 m, on steep bank of woodland track in evergreen forest on limestone (8039).

*Wilsoniella pellucida* (Wils.) C. Muell. var. *acutifolia* Dix. PAYAP: 25 km N. of Mae Sarieng, 300 m, on loamy roadside bank in deciduous forest (10313); 30 km S. of Khun Yuam, 550 m, on weathered rocks and loamy soil at steep, shady roadside bank (10329).

## DIPHYSICIACEAE

\**Diphyscium rupestre* Doz. & Molk. PAYAP: Doi Suthep, summit region of Doi Buak Ha, 1550-1600 m, terrestrial in evergreen forest (8845); UDON: Phu Luang, 1300-1350 m, on rocks in forest streamlet (10700); Phu Krading, 1150 m, on shaded rocks in stream (10986); NAKHON SI THAMMARAT: Khao Luang, 1000 m, on rocks in evergreen forest (11614).

Distr.: Malaya, Java, Borneo.

## ERPODIACEAE

\**Erpodium mangiferae* C. Muell. UDON: Phu Krading, 300-500 m, on tree trunks in deciduous dipterocarp forest rich in bamboo (11127).

Distr.: India (Western Ghats, North Bengal).

*Solmsiella biseriata* (Aust.) Steere. PAYAP: Doi Chiang Dao, 550-750 m, on tree trunks in deciduous forest rich in bamboo and *Dillenia* (8866); NAKHON SAWAN: Lansang Forest Park W. of Tak, 300-350 m, on tree trunks in evergreen forest on limestone (8352).

This species, rare throughout its range, was previously reported from Thailand (Udon, Phu Luang, 700 m) by IWATSUKI & SHARP (1967).

## FISSIDENTACEAE

*Fissidens anomalus* Mont. PAYAP: Doi Chiang Dao, 1550-1900 m (9206, 9275); Doi Suthep, summit region of Doi Pui, 1650-1680 m (8729); Doi Inthanon, 1500-2250 m (9547, 9663, 9844, 9902, 10176, 10212); UDON: Phu Luang, 1250 m (10503); Phu Krading, 1250 m (11101). Always found on tree trunks and branches, except the specimen from Phu Krading, which was found growing on sandstone rocks in a dry streambed. This species was previously reported from Doi Inthanon only.

*Fissidens areolatus* Griff. Collected several times in North-east Thailand (Phu Krading, Phu Luang) and in the peninsula (Khao Luang), but apparently absent or rare in the north, as it has never been reported from that part of the country. The report from Doi Chiang Dao in TIXIER & SMITINAND (1966) is based on a misidentification.

\**Fissidens microcladus* Thwait. & Mitt. PAYAP: Doi Chiang Dao, 1550-1600 m (9187); NAKHON SAWAN: Lansang Forest Park W. of Tak, 300-350 m (8353); UDON: Phu Krading, 300-500 m (11128). On tree trunks and branches in the forest.

Distr.: Ceylon, Java.

*Fissidens mittenii* Par. PHUKET : Phuket I., Khao Kluay, 200 m, on earth bank in evergreen secondary forest (11187).

Previously reported from Chanthaburi (Koh Chang).

\*var. *javensis* Fleisch. NAKHON SAWAN : near Doi Musoe, 700 m, on steep loamy roadside bank (8309); PRACHIN BURI : Khao Khieo, 1200 m, on felled trees (12079).

Distr. of var. *javensis* : Tonkin, Sumatra, Java.

*Fissidens sylvaticus* Griff. Numerous collections from Doi Suthep, Doi Inthanon, Phu Luang, Phu Krading, Khao Yai, Khao Nang Hong, Khao Luang and Terutao I., presumedly common all over the country.

\**Fissidens virens* Thwait. & Mitt. NAKHON SAWAN : Lansang Forest Park W. of Tak, 300 m, on steep bank of woodland track in evergreen forest on limestone (8040, mixed with *F. xiphoides*); near Doi Musoe, 725-800 m, on earth bank in moist evergreen forest along streamlet (8255, mixed with *F. xiphoides*); PRACHIN BURI : Khao Yai, 650-680 m, on soil covered tree trunks and rocks (12395, 12415).

Distr. : Ceylon, Java.

\**Fissidens wichurae* Broth. & Fleisch. NAKHON SI THAMMARAT : Khao Luang, 750-950 m, on decaying wood in evergreen forest (11549).

Distr. : Tonkin, Java, New Guinea.

\**Fissidens xiphoides* Fleisch, NAKHON SAWAN : Lansang Forest Park W. of Tak, 300-350 m, terrestrial in evergreen forest on limestone (8040, mixed with *F. virens*, 8345); near Doi Musoe, 725-800 m, on earth bank in moist evergreen forest along streamlet (8255, mixed with *F. virens*).

Distr. : India, Burma, Java, Luzon.

#### HOOKERIACEAE

*Actinodontium adscendens* Schwaegr. NAKHON SAWAN : Doi Musoe, 750-800 m, on tree in banana plantation (8006); PRACHIN BURI : Khao Yai, 700 m, epiphytic in evergreen forest along rivulet (12227).

Previously reported from Udon.

\**Actinodontium raphidostegum* (C. Muell.) Bosch & Lac. PAYAP : Doi Chiang Dao, 1400 m, on tree trunks and branches in hill evergreen forest (8995).

Distr. : Indomalesia.

*Callicostella papillata* (Mont.) Mitt. : NAKHON SAWAN : near Doi Musoe, 750-800 m (8013, 8025, 8132); UDON : Phu Luang, 850-950 m (10422); PHUKET : Phuket I., Khao Phara, 100 m, evergreen forest, on rock in streambed (11283); NAKHON



SI THAMMARAT: Khao Luang, very common between 370 and 1100 m (9 collections). Usually growing at tree bases and on decaying logs in moist evergreen forests.

*Callicostella prabaktiana* (C. Muell.) Bosch & Lac. PRACHIN BURI: Khao Yai, 700m, on earth bank in forest along rivulet (12352); PHUKET: Krabi, Khao Nang Hong, 50-200 m, on rocks in forest rivulet at base of limestone mountain (11322, 11328).

*Chaetomitriopsis glaucocarpa* (Schwaegr.) Fleisch. PAYAP: Doi Inthanon, near Sop Aep, 740 m (9501); NAKHON SAWAN: Doi Musoe, 780-800 m (8140, 8164); Lansang Forest Park W. of Tak, 450 m (8357). On tree trunks in moist evergreen forest. Previously reported from Udon and Chanthaburi.

\**Distichophyllum tortile* Doz. & Molk. ex Bosch & Lac. NAKHON SI THAMMARAT: Khao Luang, 700-800 m, on rock in forest stream (11979).

Distr.: Annam, Banka, Java.

\**Eriopus remotifolius* C. Muell. NAKHON SI THAMMARAT: Khao Luang, 1000-1740 m, on tree trunks in evergreen forest (11612, 11840).

Distr.: Indomalesia.

*Hookeriopsis utacamundiana* (Mont.) Broth. PAYAP: Doi Inthanon, 1700-2450 m, on rocks in streambed and tree trunks in evergreen forest (9695A, 9973, 10191, 10213); UDON: Phu Luang, 1150-1250 m, on tree trunks in open forest (10458).

#### HYLOCOMIACEAE

*Foreauella orthohecia* (Schwaegr.) Dix. & Vard. Common in North and Northeast Thailand. Was collected between 550 and 1650 m on Doi Musoe, Doi Suthep (incl. Doi Pui), Doi Chiang Dao, near Fang, and on Phu Luang.

*Leptohymenium tenue* (Hook.) Schwaegr. Common from 1300 m upwards in the mountain forests on Doi Chiang Dao and Inthanon.

*Macrothamnium macrocarpum* (Reinw. & Hornsch.) Fleisch. Very common from 1250 m upwards in the mountain forests of the north and northeast; usually growing on decaying logs.

#### HYPNACEAE

\**Platygyrium brevicaudatum* Bartr. PAYAP: Doi Chiang Dao, 900-1650 m, on tree trunks and branches in deciduous and evergreen forests, and on isolated trees on a ridge (8889A, 8902, 8922, 8962, 8993, 9096, 9148, 9150).

Distr.: Adjacent Burma (South Shan States).

Instead of being nerveless, as BARTRAM states in his diagnosis, the leaves have two short, and occasionally indistinct nerves of variable length.

One is tempted to compare the present species with *Ectropothecium alternarioides* Tixier from South Vietnam, and *Isopterygium propaguliferum* Toyama from South Japan (Kyushu). These all show peculiar short and erect branches bearing apical clusters of gemmae. Judging from descriptions and illustrations, *Ectropothecium alternarioides* and *Isopterygium propaguliferum* are very closely allied. *Platygyrium brevicaudatum* has much in common with both, but differs clearly in having papillose gemmae and numerous short alar cells. Unfortunately, the sporophytes of *Ectropothecium alternarioides* and *Platygyrium brevicaudatum* have not yet been found. *Isopterygium propaguliferum* has pendulous capsules. If the sporophytes of the first mentioned species turn out to be of the same type, classification near *Homomallium* will be more justified than in any of the genera, in which these enigmatic plants hitherto have been placed.

*Taxiphyllum taxirameum* (Mitt.) Fleisch. PAYAP: near Fang, 600 m, on rocks along forest stream (9404, 9449); 30 km S. of Khun Yuam, 550 m, on mud covered rocks along forest stream (10326); Doi Suthep, 1000-1100 m, on wet rocks along forest streamlet (8461); Doi Inthanon, 780-820m, terrestrial in open forest (9484); 2300 m, on tree trunks in forest (10136); NAKHON SAWAN: Lansang Forest Park W. of Tak, 450 m, on tree trunks in forest along stream (8361).

Previously reported only from Rachaburi (Prachuap Khiri Khan).

\**Vesicularia dubyana* (C. Muell.) Broth. NAKHON SI THAMMARAT: Khao Luang, 150-250 m, on wet rocks along river (11363).

Distr.: Malesia.

*Vesicularia reticulata* (Doz. & Molk.) Broth. Common in the areas visited in Peninsular Thailand, but also collected in NAKHON SAWAN: Doi Musoe, 750-800 m, on decaying logs in evergreen forest along streamlet (8031).

#### HYPOPTERYGIACEAE

*Cyathophorella adiantum* (Griff.) Fleisch. PAYAP: Doi Chiang Dao, 1400-1600 m (9017, 9028, 9198); Doi Inthanon, 1500-1800 m (9545, 9660, 9939). On tree trunks in evergreen forests.

\**Cyathophorella hookeriana* (Griff.) Fleisch. PAYAP: Doi Inthanon, 2300-2450 m, on tree trunks in hill evergreen forest (9704).

Distr.: Himalayas, Luzon, Formosa, Japan.

*Cyathophorella tonkinensis* (Broth & Par.) Broth. Common in the mountain forests of North, Northeast and East Thailand.

\**Hypopterygium vriesei* Bosch & Lac. PHUKET: Krabi, Khao Nang Hong, 200-300 m, on limestone rocks in forest (11319); NAKHON SI THAMMARAT: Khao Luang, 700-800 m, on sheltered rocks in waterfall (11997).

Distr.: Malesia, Fiji I.

\**Lopidium trichocladon* (Bosch & Lac.) Fleisch. UDON: Phu Luang, 1000-1250 m, on rocks and tree trunks in open forest (10450, 10462); Phu Krading, 1150-1250 m, on tree trunks in evergreen forest (10949, 11052, 11103); NAKHON SI THAMMARAT: Khao Luang, 250-1530 m, on rocks, fallen logs and tree trunks in evergreen forest (11415, 11461, 11546, 11572, 11905, 11994).

Distr.: Annam, Sumatra, Mentawai I., Java, Halmahera.

#### LEMBOPHYLLACEAE

*Dixonia thamioides* (Broth. & Dix.) Horik. & Ando. PAYAP: Doi Chiang Dao, 1400-1750 m, on tree trunks in hill evergreen forest (8970, 9170, 9235); Doi Inthanon, 1500-2250 m, on rocks in forest streamlet and on tree trunks in hill evergreen forest (9570, 10192); UDON: Phu Krading, 1180m, on rocks near waterfall in evergreen forest (10932).

#### LESKEACEAE

*Pseudoleskeopsis decurvata* (Mitt.) Broth. UDON: Phu Luang, 850-950 m, on rocks and trees in temporarily dry forest rivulet (10836, 10848); Phu Krading, Pa Nok Aen, 1250 m, on sandstone rocks in dry streambed (11095); PRACHIN BURI: Khao Yai, 650-680 m, on rocks along forest stream (12420); NAKHON SI THAMMARAT: Khao Luang, 150-250 m, on wet granitic rocks along river (11368).

\**Regmatodon orthostegius* Mont. PAYAP: Doi Chiang Dao, 1000-1550 m, on tree trunks in deciduous and evergreen forests (8903, 9063); Doi Inthanon, 1750 m, on branches of tree in clearing (9845).

Distr.: Ceylon, India, Assam.

#### LEUCOBRYACEAE

\**Exodictyon blumii* (C. Muell.) Fleisch. PRACHIN BURI: Khao Yai, 700 m, epiphytic in forest along rivulet (12240, 12290); NAKHON SI THAMMARAT: Khao Luang, 750-1100 m, on rocks, tree trunks and decaying logs in evergreen forest (11545, 11611, 11971).

Distr.: Tonkin, Malesia, Formosa, Marianas.

The Khao Yai plants have the leaves less spinose and papillose than those from Khao Luang.

*Leucobryum bowringii* Mitt. Common in Northeast and Peninsular Thailand, but apparently rare in the north. Has also been reported from Chanthaburi (Koh Chang).

\**Leucobryum chlorophyllosum* C. Muell. PAYAP: Doi Suthep (incl. Doi Pui,) 1000-1600m, on decaying logs in evergreen forest (8421, 8795); NAKHON SI

THAMMARAT: Khao Luang, 900-1100 m, on decaying logs in evergreen forest (11569, 11972).

Distr.: Ceylon, Malesia.

*Leucobryum javense* (Brid.) Mitt. Very common in Northeast, East and Peninsular Thailand, less common in the north.

*Leucobryum neilgherrense* C. Muell. Very common in North Thailand at altitudes between 1400 and 1800 m, but during the Thai-Dutch Botanical Expedition only once collected in the northeast (Phu Krading).

*Leucobryum sanctum* (Brid.) Hpe. PRACHIN BURI: Khao Yai, 650-680 m, on rocks near stream (12421); NAKHON SI THAMMARAT: Khao Luang, 1650-1740 m, on tree trunks in mossy forest (11716, 11860).

Has also been reported from Chanthaburi.

*Leucobryum scalare* C. Muell. ex Fleisch. Common in all areas visited from low altitude up to 1700 m.

*Leucophanes albescens* C. Muell. PRACHIN BURI: Khao Yai, 700 m, on tree trunks in evergreen forest along rivulet (12288).

Common in Peninsular Thailand.

*Leucophanes octoblepharoides* Brid. PRACHIN BURI: Khao Yai, 650-700 m, on tree trunks in evergreen forest along stream (12239, 12334, 12396). Common in Peninsular Thailand; has also been reported from Chanthaburi (Koh Chang).

#### LEUCODONTACEAE

*Leucodontopsis siamensis* Dix. A small scrap of this highly interesting endemic species was collected in NAKHON SAWAN: Doi Musoe, 780-800 m, on fallen branch in moist evergreen forest along streamlet (8150).

Previously known only from the type locality (Prachin Buri).

#### LEUCOMIACEAE

\**Leucomium aneurodictyon* (C. Muell.) Jaeg. UDON: Phu Krading, Pha Nok Aen, 1250 m, on sandstone rocks of dry streambed in evergreen forest at border of escarpment (11096).

Distr.: Ceylon, Malesia, Pacific Islands.

#### METEORACEAE

*Aerobryidium filamentosum* (Hook.) Fleisch. Very common between 600 and 2150 m in North Thailand, apparently less frequent in the northeastern and eastern part of the country, and not yet found in the peninsula. We collected

this species between 600 and 2150 m. Like HORIKAWA & ANDO (1964) I have not been able to find differences of any importance between the present species and *A. aureo-nitens* (Schwaegr.) Broth.

*Aerobryopsis longissima* (Doz. & Molk.) Fleisch. UDON: Phu Krading, 1150-1200 m, on trees in forest along stream (10945, 11077); NAKHON SI THAMMARAT: Khao Luang, 200-600 m, on tree trunks in evergreen forest (11505), and on trees in *Areca* plantation along stream (12011).

\**Barbella asperifolia* Card. NAKHON SAWAN: Doi Musoe, 780-800 m (8128); UDON: Phu Krading, 1150-1200 m (10962). On trees in moist evergreen forests.

Distr.: Ceylon, India, Java, Formosa, Japan.

*Barbella bombycina* (Ren. & Card.) Fleisch. PAYAP: Doi Chiang Dao, 1500-1750 m (9162, 9174, 9270); Doi Inthanon, 1800-2750 m. On tree trunks, branches and branchlets in undergrowth of evergreen forest.

Previously reported from Rachaburi.

\**Chrysocladium flammeum* (Mitt.) Fleisch. PAYAP: Doi Inthanon, 2530 m, summit region, on trees surrounding a small *Sphagnum* bog (9817).

Distr.: Himalayas, Laos, Tonkin.

*Floribundaria sparsa* (Mitt.) Broth. (syn. *Papillaria lanosa* Bartr., *P. formosana* Nog.). Common in the mountains of North Thailand, especially in open forest near summits and on ridges. Collected from 1500 m upwards on Doi Suthep (Doi Pui summit), Doi Chiang Dao, and Doi Inthanon, on trees and sometimes on rocks.

*Meteoriopsis uncistrodes* (Ren. & Card.) Broth. NAKHON SAWAN: Doi Musoe, 780-800 m, on tree trunk in moist evergreen forest along streamlet (8152).

Previously known only from Payap.

\**Meteorium buchananii* (Brid.) Broth. PAYAP: Doi Chiang Dao, 1550-1600 m, on tree trunks and branches in hill evergreen forest (9090).

Distr.: India, Himalayas, Yunnan, Tonkin.

*Papillaria fuscescens* (Hook.) Jaeg. (det. J.H. HILBRANDS). PAYAP: Doi Suthep, summit region of Doi Pui, 1600-1650 m, open evergreen forest (8670); NAKHON SAWAN: Doi Musoe, 780-800 m, moist evergreen forest along streamlet, on tree trunks and branches (8129).

Forms approaching var. *pilicuspis* Broth.: PAYAP: Doi Chiang Dao, 1300-1450 m (8924, 8934, 8944, 9041); Doi Suthep, summit region of Doi Buak Ha, 1550-1600 m (8813A); NAKHON SAWAN: Doi Musoe, 750-800 m (8157, 8241); on tree trunks and branches in evergreen forests.

var. *pilicuspis* Broth. (syn. nov.: *Papillaria auriculata* Bartr. non (Mitt.) Jaeg., Rev. Bryol. Lichénol. N.S. 23: 251. 1954): common in North, Northeast and East Thailand. PAYAP: Doi Chiang Dao, 1100 m, on exposed limestone rocks (8891), 1400-1750 m, on tree trunks and branches in hill evergreen forest (9021, 9123, 9267); Doi Suthep, summit region of Doi Pui, 1600-1680 m, on tree trunks and branches in open evergreen forest (8463, 8553, 8554, 8605, 8671, 8735); Doi Inthanon, 1500-2570 m, on tree trunks and branches in evergreen forest (9544, 9617, 9633, 9714, 9742, 9866, 10074, 10251); UDON: Phu Luang, 1300-1400 m, on trees in dense evergreen forest along streamlet and in open ridge vegetation, and in crevices of exposed sandstone rocks (10576, 10581, 10613, 10720, 10739); Phu Krading, 1150-1200 m, on exposed sandstone rocks (10935), on trees in forest along streamlet (10944).

Mr. HILBRANDS (verbal communication) holds the opinion that *P. auriculata* Bartr. cannot be maintained as a species distinct from *P. fuscescens*, but has to be considered as a variety of that species. BROTHERUS based his var. *pilicuspis* (originally spelled '*pilicuspis*') on a Thai specimen collected by HOSSEUS.

*Papillaria semitorta* (C. Muell.) Jaeg. (det. J.H. HILBRANDS). PAYAP: Doi Inthanon, 2150-2570 m, pendulous from tree trunks and branchlets in moist hill evergreen forest and in the mossy forest of the summit region (9741, 10179, 10227).

#### MNIACEAE

*Mnium maximoviczii* Lindb. Common in North Thailand; collected on Doi Inthanon, Doi Chiang Dao, and Doi Suthep from 1250 m upwards.

*Mnium succulentum* Mitt. PAYAP: Doi Inthanon, near Sop Aep, 740m (9508); Doi Suthep, 1000-1100 m (8390); NAKHON SI THAMMARAT: Khao Luang, 700-800 m (11980); on rocks along streams.

*Orthomnium bryoides* (Griff.) Nork. Apparently common in North Thailand (Doi Suthep, Doi Chiang Dao, Doi Inthanon). Two new records from other areas are: NAKHON SAWAN: Doi Musoe, 750-800 m, crown epiphyte in evergreen forest (8239); UDON: Phu Luang, 1300-1400 m, on trees in open ridge vegetation (10584).

#### MYURIACEAE

*Myurium rufescens* (Reinw. & Hornsch.) Fleisch. Collected in most areas visited, but nowhere found very frequently.

\**Piloecium pseudorufescens* (Hpe.) C. Muell. PHUKET: Terutao I., 15 m, on tree trunk in evergreen forest (HANSEN & SMITINAND 12510).

Distr.: Malesia, Fiji.

## NECKERACEAE

*Himanthocladium plumula* (Nees) Fleisch. UDON : Phu Krading, 1150 m, on tree trunks in dense evergreen forest (11035); PRACHIN BURI : Khao Yai, 700 m, on tree trunks in evergreen forest along stream (12223); NAKHON SI THAMMARAT : Khao Luang, 600-1100 m, on rocks, tree trunks, and decaying logs in evergreen forest (11472, 11538, 11576, 11940, 11944).

Previously reported from Surat.

\**Homalia arcuata* Bosch & Lac. : NAKHON SI THAMMARAT : Khao Luang, 370-950 m, on decaying logs in forest (11439, 11469, 11551).

Distr. : Yunan, Sumatra, Halmaheira.

\**Homaliadelphus targionianus* (Mitt.) Dix. & Vard. PAYAP : near Fang, 600 m, on tree trunks in evergreen forest along stream (9434); Doi Chiang Dao, 550-750 m, on tree trunks in deciduous forest (8857); UDON : Phu Luang, 750-850 m, on tree trunks in evergreen forest (10388); Phu Krading, 1100-1200 m, on tree trunks in evergreen forest (11123).

Distr. : India, Yunnan, Annam, Japan.

*Homaliodendron exiguum* (Bosch & Lac.) Fleisch. Very common between 150 and 1400 m in North and Peninsular Thailand, far less frequently found in Northeast and East Thailand (Phu Luang and Khao Yai).

*Homaliodendron flabellatum* (Sm.) Fleisch. This species was collected in all parts of the country, but appears to be less common in the north than the allied *H. scalpellifolium*; 900-1800 m.

*Homaliodendron microdendron* (Mont.) Fleisch. Common on rocks, trees, and decaying logs in moist forests all over the country; 200-2250 m.

*Homaliodendron scalpellifolium* (Mitt.) Fleisch. Was collected in all regions visited, viz. *H. flabellatum*; 700-2250 m.

\**Homaliodendron sphaerocarpum* (Nog. det. A. NOGUCHI). PAYAP : Doi Inthanon, 2250-2570 m, on tree trunks in evergreen forest (9734, 10174).

Distr. : Eastern Himalayas (Darjeeling).

*Neckera crenulata* Harv. [syn. : *Calypothecium luzonense* (Williams) Broth.]. Common in the mountain forests of North Thailand, but not yet found in other parts of the country. Was collected on Doi Inthanon, Doi Chiang Dao, and Doi Suthep (Doi Pui and Doi Buak Ha) at altitudes from 1400 up to 2150 m.

\**Neckera himalayana* Mitt. PAYAP : Doi Inthanon, from 1750 m upwards, on trees in evergreen forest (9631, 9695, 9737, 9996, 10177, 10229).

Distr. : Himalayas, Ceylon, Burma.

*Neckeropsis crinita* (Griff.) Fleisch. PAYAP: Doi Suthep, 1000-1100 m, on branch in moist evergreen forest along streamlet (8440). The fourth record of this rare species I have seen, and the second one from Thailand. Recently I could investigate the type specimen of *Neckeropsis pilosa* Fleisch. from Sumatra, found in FLEISCHER's herbarium at Farlow. As presumed before (TOUW 1962), *N. pilosa* cannot be distinguished from *N. crinita*, which extends the area of that species considerably to the south.

*Neckeropsis exserta* (Hook.) Broth. var. *exserta*. Frequently found between 300 and 1100 m in North Thailand (Payap and Nakhon Sawan), and also collected on Phu Luang in the northeast.

*Neckeropsis fimbriata* (Harv.) Fleisch. (syn. nov.: *Calyptothecium himanthocladoides* Bartr., Philipp. J. Sc. 68: 238.1939). PAYAP: Doi Inthanon, 1700-1800 m (9625, 9900, 9929); NAKHON SAWAN: Doi Musoe, 750-800 m (8139, 8160, 8206); RACHABURI: Hard Palom, 300 m (LARSEN 8860a); PRACHIN BURI: Khao Yai, 600-700 m (12203, 12321); SURAT: Khao Pak Chong, 200 m, on limestone rocks (SMITINAND & SLEUMER 1261A); PHUKET: Krabi, Khao Nang Hong, 170-320 m (11302). Rather frequent on trees in evergreen forests, especially along the western cordillera and in the southeast. After having studied the type of *Calyptothecium himanthocladoides* Bartr. I have come to the conclusion, that it represents nothing else but *Neckeropsis fimbriata*. The distribution of that species now comprises the Himalayas (Nepal, Sikkim), Burma, Thailand, the Malay Peninsula (Langkawi I.), and Luzon. New finds might be expected from Vietnam.

*Neckeropsis lepineana* (Mont.) Fleisch. In Thailand restricted to the southern part of the peninsula. PHUKET: Krabi, Khao Nang Hong, 170-320 m, on tree trunks and limestone rocks in forest (11305, 11315); NAKHON SI THAMMARAT: Khao Luang, 700-1000 m, on tree trunks and branchlets in forest (11571, 11974).

*Pinnatella alopecuroides* (Hook.) Fleisch. Common in North Thailand, and collected during the expedition between 340 and 2000 m in the forests on Doi Inthanon, Doi Chiang Dao and between Tak and Mae Sot.

Has also been reported from Koh Tao.

\**Pinnatella anacamptolepis* (C. Muell.) Broth. NAKHON SI THAMMARAT: Khao Luang, 600 m, on fallen logs in forest (11466, 11497).

Distr.: Indomalesia.

*Pinnatella intralimbata* Fleish. Common in North and Northeast Thailand, and collected between 350 and 1650 m in Payap (Doi Chiang Dao, Doi Suthep and near Fang), Nakhon Sawan (between Tak and Mae Sot), Udon (Phu Luang, Phu Krading) and Prachin Buri (Khao Yai). Its southernmost Thai locality is: SURAT: Khao Pak Chong, 200 m, on limestone rocks (SMITINAND & SLEUMER 1261B).



*Pinnatella kuehliana* (Bosch & Lac.) Fleisch. Has been found in Payap (common on Doi Chiang Dao and Doi Inthanon, alt. 1400-2250 m), and in Nakhon Si Thammarat (Khao Luang, 250-620 m). The plants from North Thailand differ slightly from the malesian form.

\**Pinnatella microptera* Fleisch. PHUKET: Krabi, Khao Nang Hong, 170-320 m, on tree trunks in evergreen secondary forest (11288).

Distr.: Malaya (Singapore), Sumatra, Luzon.

\**Thamnum subseriatum* (Hook.) Besch. UDON: Phu Luang, 900-950 m, on rocks in temporarily dry forest rivulet (10825); NAKHON SI THAMMARAT: Khao Luang, 700-800 m, on rock in waterfall (11987).

Distr.: Ceylon, Himalayas, Burma, Luzon.

#### ORTHOTRICHACEAE

*Groutiella goniorrhyncha* (Doz. & Molk.) Bartr. This species was collected all over the country at altitudes varying from 430 to 1400 m, mainly on isolated trees, but also at the base of trees in forests.

*Macromitrium brevissimum* Dix. PAYAP: Doi Inthanon, near Sop Aep, 780-820 m, on exposed rocks in open deciduous forest (9472); near Mae La Noi, 430 m, on tree trunks in dry dipterocarp forest (10315). This endemic species was previously known from Northeast and East Thailand only.

\**Macromitrium concinnum* Mitt. ex Bosch & Lac. UDON: Phu Krading, 1200 m, on exposed sandstone rocks in *Pinus* savannah (11107).

Distr.: Java, Celebes.

\**Macromitrium minutum* Mitt. NAKHON SI THAMMARAT: Khao Luang, 620 m, on fallen logs in forest (11447).

Distr.: Malaya, Sumatra, Java.

*Macromitrium nepalense* (Hook. & Grev.) Schwaegr. Common between 350 and 1700 m in North and Northeast Thailand. Was mainly found growing on isolated trees, and trees in open forests.

*Macromitrium orthostichum* Nees ex Schwaegr. NAKHON SI THAMMARAT: Khao Luang, 600-650 m, on decaying logs in forest (11531).

*Macromitrium sulcatum* (Hook.) Brid. Common in North and Northeast Thailand at altitudes from 1100 m upwards. Was mainly found growing in the same habitat as *M. nepalense*.

*Zygodon intermedius* B.S.G. PAYAP: Doi Chiang Dao, 1900-2100 m, stunted forest on exposed ridge (9330); Doi Suthep, summit region of Doi Pui, 1600-1650 m, open forest (8473A, 8666); Doi Inthanon, 1750-2200 m (9673, 9909, 10080); on tree trunks and branches.

*Zygodon obtusifolius* Hook. PAYAP : Doi Suthep, summit region of Doi Pui, 1600-1650m, on tree trunks and branches in open evergreen forest (8473); Doi Inthanon, summit region, 2530 m, on trees in a small *Sphagnum* bog (9800).

#### PLAGIOTHECIACEAE

*Stereophyllum anceps* (Bosch & Lac.) Broth. PAYAP : near Fang, 600 m, on isolated trees, and on trees in evergreen forest (9407, 9419); Doi Chiang Dao, 550-1650 m, on tree trunks in deciduous and evergreen forests (8862, 8976, 9014, 9169); 30 km S. of Khun Yuam, 550 m, on tree trunks in deciduous forest along rivulet (10322); NAKHON SAWAN : Lansang Forest Park W. of Tak, 340 m, at base of tree trunks in evergreen forest along stream (8047); Doi Musoe, 780 m, on isolated trees in plantation (8175); UDON : near Ban Na Luang, 370 m, on tree trunks in dry evergreen forest (10369).

Also reported from Phitsanulok.

*Stereophyllum tavoyense* (Hook.) Jaeg. PAYAP : Doi Chiang Dao, 1000 m, on tree trunks in forest (8907); NAKHON SAWAN : Lansang Forest Park W. of Tak, 300 m, on decaying log in evergreen forest along stream (8037).

Previously reported from Doi Suthep.

#### POLYTRICHACEAE

*Pogonatum flexicaule* Mitt. PAYAP : Doi Suthep, summit region of Doi Pui, 1650-1685 m, on burnt soil (8720); Doi Inthanon, 2150-2570 m, terrestrial in evergreen forest (9761, 10092); UDON : Phu Luang, 1250-1300 m, on rocks in temporarily dry rivulet, and on exposed sandstone rocks (10505, 10569); Phu Krading, 1150-1200 m, on rocks in evergreen forest along stream (10924, 10985, 11032); PRACHIN BURI : Khao Khieo, 1200 m, terrestrial in forest (12075); NAKHON SI THAMMARAT : Khao Luang, 900-1450 m, terrestrial in evergreen forest (11655, 11941).

\**Pogonatum microstomum* (Schw.) Brid. PAYAP : Doi Inthanon, 2150-2250 m, terrestrial in evergreen forest (10090).

Distr. : Indomalesia.

*Pogonatum subtortile* (C. Muell.) Jaeg. NAKHON SI THAMMARAT : Khao Luang, 1450-1650 m, terrestrial in evergreen forest (11696).

\**Rhacelopodopsis cf. crassinervis* Thér. & Henry. NAKHON SAWAN : Doi Musoe, 700 m, on steep, loamy roadside bank in moist evergreen forest (8312); NAKHON SI THAMMARAT : Khao Luang, 1250-1650 m, terrestrial in evergreen forest (11663, 11693).

Distr. : Tonkin.

The genus *Rhacelopodopsis* has never been reported from Thailand before. However, there are several records of the superficially alike *Rhacelopus pilifer*, Doz. & Molk. which is widespread in Malesia. I have seen two out of the four Indochinese samples of that species mentioned in the literature: a Thai sample (BUNNAK 366), and the only sample from Tonkin (leg. BALANSA). Both appear to be misidentified and belong to *Rhacelopodopsis cf. crassinervis*. Presumably, *Rhacelopus pilifer* is absent in this part of the world, but this has to be proved by a reinvestigation of the remaining Indochinese specimens (both Thai ones).

### POTTIACEAE

*Anoetangium stracheyanum* Mitt. PAYAP: Doi Inthanon, near Sop Aep, 780-820 m, terrestrial and on rocks in open deciduous forest on S. slope (9481, 9487).

Previously known from Doi Suthep.

*Pseudosymblypharis angustata* (Mitt.) Chen. PAYAP: Doi Chiang Dao, 1000-2100 m (8896, 9100, 9107, 9331, 9345, 9367, 9368); Doi Suthep, summit region of Doi Pui, 1600-1650 m (8475); Doi Inthanon, 1650-1800 m (9639, 10282, 10289). On limestone rocks and trees.

Previously reported only from Doi Suthep.

In my opinion, the separation between the present species and *P. papillosula* (Card. & Thér.) Broth., as given by CHEN (1941) is very unsatisfactory; in some samples one finds plants combining the leaf base characters of *P. angustata* with the areolation of *P. papillosula*, in others the reverse is found. These two characters are found in CHEN's key, but in his note below *P. angustata* he mentions the leaf base alone. However, this character varies considerably in samples from one locality, and this is why I have not tried to keep these species apart. If one accepts CHEN's delimitation, the samples 9345 and 9367 (Doi Chiang Dao, 1900-2100 m, on limestone rocks) belong to *P. papillosula*.

\**Pseudosymblypharis subduriuscula* (C. Muell.) Chen. PRACHIN BURI: Khao Yai, 600-650 m, on wet rocks near waterfall (12217); SURAT: Khao Pak Chong, 150 m, on limestone rocks (SMITINAND & SLEUMER 1263).

Distr.: Burma, China, Malesia.

\**Reimersia inconspicua* (Griff.) Chen. PAYAP: Doi Chiang Dao, 6000 ft. terrestrial in lower montane forest (ROBBINS 3681).

Distr.: Himalayas, South China, Luzon.

\**Timmiella anomala* (B.S.G.) Limpr. PAYAP: Doi Chiang Dao, 1900-2100 m, on limestone rocks (9356).

Distr.: Himalayas, China, Luzon, Formosa, Japan.

## PRIONODONTACEAE

\**Neolindbergia rugosa* (Lindb.) Fleisch. NAKHON SI THAMMARAT: Khao Luang, 700-800 m, on tree trunk in forest (11990).

Distr.: Borneo, Celebes, Mindanao, Luzon.

## PTEROBRYACEAE

\**Calyptothecium burmense* Bartr. PAYAP: Doi Chiang Dao, 1400-1600 m, on tree trunks and branches in hill evergreen forest (8983, 9033, 9208).

Distr.: Burma.

\**Calyptothecium crispulum* (Bosch & Lac.) Broth.: NAKHON SI THAMMARAT: Khao Luang, 600 m, on fallen logs in forest (11459).

Distr.: Nepal (?), Malesia.

*Calyptothecium hookeri* (Mitt.) Broth. PAYAP: Doi Chiang Dao, 1650-1750 m, on tree trunks and branches in hill evergreen forest (9166, 9250); Doi Inthanon, 1500-2570 m, same habitat (9550, 9619, 9740, 9856, 10217),

One of the dominant species amongst the epiphytic bryophytes on these mountains, and sometimes forming festoons of over half a meter.

Sometimes difficult to separate from the next species.

\**Calyptothecium urvilleanum* (C. Muell.) Broth. PAYAP: Doi Chiang Dao, 1400 m, on tree trunks and branches in dense and moist hill evergreen forest (9013); UDON: Phu Luang, 900-1350m, on trees in evergreen forest, and on rocks in rivulet (10434, 10710, 10823); NAKHON SI THAMMARAT: Khao Luang, 700-800 m, on sheltered rocks in a waterfall (11992).

Distr.: Indomalesia.

*Calyptothecium wightii* (Mitt.) Fleisch. PAYAP: near Fang, 600 m (9426); NAKHON SAWAN: Lansang Forest Park W. of Tak, 460m (8085); Doi Musoe, 725-800 m (8107, 8145, 8156, 8211, 8245); PRACHIN BURI: Khao Yai, 600-700 m (12184, 12286, 12387, 12406); PHUKET: Krabi, Khao Nang Hong, 170-320 m (11296); NAKHON SI THAMMARAT: Khao Luang, 200 m, on tree trunks in *Areca* plantation (12029).

Usually growing in evergreen forest, on tree trunks and less frequently on rocks.

Distr.: Nepal, Burma, Yunnan, Laos, Annam.

In Thailand previously known from Rachasima (as *Pterobryopsis auriculata* Broth.), Prachin Buri, Chanthaburi and Nakhon Si Thammarat.

*Pezigiella cordata* (Harv.) Fleisch. Common in the mountain forests of the north, at altitudes between 1300 and 1800 m.

\**Pterobryopsis crassicaulis* (C. Muell.) Fleisch. NAKHON SI THAMMARAT: Khao Luang, 600-1450 m, on tree trunks in forest (11500, 11657).

Distr.: Ceylon, Annam, West Malesia.

\**Pterobryopsis divergens* (Mitt.) Nog. PAYAP: Doi Chiang Dao, summit region, 1900-2150 m, on isolated trees and in low forest composed of stunted trees on exposed ridge (9346, 9388); Doi Suthep, summit region of Doi Pui, 1600-1650 m, on tree trunks and branches in open evergreen forest (8654); Doi Inthanon 2000-2300 m, on tree trunks and branches in hill evergreen forest (10005, 10061, 10100, 10111).

Distr.: Khasia, Sikkim, Burma.

*Pterobryopsis orientalis* (C. Muell.) Fleisch. Common in the mountain forests of North, Northeast and East Thailand, and collected at altitudes between 700 and 2300 m in Payap (Doi Chiang Dao, Doi Suthep, Doi Inthanon), Nakhon Sawan (Doi Musoe), Udon (Phu Luang, Phu Krading), and Prachin Buri (Khao Khieo, Khao Yai). Previously known only from Doi Chiang Dao.

\**Pterobryopsis yunnanensis* Broth. PAYAP: Doi Chiang Dao, 900-1100 m, on tree trunks and rocks in deciduous forest (8870, 8882); Doi Suthep, 1000-1100 m, on tree trunks and wet rocks in moist evergreen forest along streamlet (8435, 8452); NAKHON SAWAN: Doi Musoe, 725-800 m, on tree trunks in moist evergreen forest along streamlet (8163, 8220, 8251); UDON: Phu Luang, 750-850 m, on tree trunks in evergreen forest (10396).

Distr.: Yunnan, Annam.

\**Symphysodon splendens* (Reinw. & Hornsch.) Broth. NAKHON SI THAMMARAT: Khao Luang, 750-1000 m, on tree trunks in forest (11541, 11610, 11930).

Distr.: Java, New Guinea.

\**Symphysodontella attenuatula* Fleisch. PHUKET: Phuket I., Khao Phara, 300-350 m, on tree trunks in forest (11229).

Distr.: Java, Luzon.

\**Trachyloma indicum* Mitt. UDON: Phu Krading, 1150 m, on tree trunks in dense evergreen forest (11036); NAKHON SI THAMMARAT: Khao Luang, 1530-1740 m, on tree trunks and rocks in evergreen forest (11742, 11887).

Distr.: Ceylon, Annam, Malesia.

#### RACOPILACEAE (det. B.O. VAN ZANTEN)

\**Racopilum orthocarpum* Mitt. Common in all collecting localities visited by the Thai-Dutch Botanical Expedition, and collected at altitudes between 350 and 2100 m.

Distr.: Himalayas.

The differences between the present species and *R. cuspidigerum* (Schwaegr.) Aongstr. are small, and presumably the Thai records of the last mentioned species have to be transferred to *R. orthocarpum*. On the other hand, sterile specimens cannot be named safely, and have been placed here with some hesitation.

#### RHIZOGONIACEAE

*Rhizogonium spiniforme* (Hedw.) Bruch. Very common in Northeast and Peninsular Thailand, and collected here between 600 and 1740 m; not yet reported from the north.

#### SEMATOPHYLLACEAE

We made numerous collections of representatives of this difficult group. Most of these have to be identified by a specialist.

*Acanthocladium filipendulum* Dix. UDON: Phu Krading, 1150-1200 m, on trees and sheltered rocks in forest along stream (11076, 11087); PRACHIN BURI: Khao Yai, 700 m, on trees in forest along stream (12327); NAKHON SI THAMMARAT: Khao Luang, 150-1100 m, on tree trunks in forests and plantations (11352, 11385, 11946).

This endemic species was previously reported from Peninsular Thailand only.

*Acanthocladium longipilum* Broth. Common in North, Northeast and East Thailand at altitudes between 1000 and 1800 m; usually found growing on decaying logs.

\**Acanthocladium penicillatum* (Mitt.) Broth. PAYAP: summit region of Doi Inthanon, 2500-2570 m, on trunks and branches of trees standing in and around a small *Sphagnum* bog (9723, 9763, 9778, 9781, 9818).

Distr.: Himalayas.

*Acanthocladium surculare* (Mitt.) Broth. Previously reported from North Thailand where it is a common species, collected by us between 1100 and 1800 m. We also found it in Northeast and East Thailand. UDON: Phu Luang, 1150-1250 m, on tree trunks in open forest (10464); PRACHIN BURI: Khao Khieo, 1200 m, on felled trees (12134). Previously known only from Payap.

\**Acroporium hermaphroditum* (C. Muell.) Fleisch. NAKHON SI THAMMARAT: Khao Luang, 1250-1740 m, on tree trunks in forest (11639, 11645, 11698, 11832).

Distr.: Ceylon, Malesia, Pacific Islands.

*Acroporium lamprophyllum* Mitt. NAKHON SAWAN: Doi Musoe, 780-800 m, on tree trunks and epiphyllous in moist evergreen forest along streamlet (8130, 8377); PRACHIN BURI: Khao Yai, 700 m, on branch in forest along rivulet (12291).

Previously reported from Southeast Thailand and the peninsula, where we collected it on Phuket I. and Khao Luang.

*Acroporium laosianum* (Broth. & Par.) Broth. Very common in Northeast and East Thailand, but not yet found elsewhere in the country. During the expedition numerous collections were made at altitudes between 700 and 1400 m in Udon (Phu Luang, Phu Krading) and Prachin Buri (Khao Khieo and Khao Yai).

*Chionostomum rostratum* (Griff.) C. Muell. (syn.: *C. latifolium* Thér. & Henry). PAYAP: Doi Chiang Dao, 1400-1500 m (8935, 8996, 9051); Doi Suthep, summit region of Doi Pui, 1600-1685m (8524, 8529, 8709, 9754); NAKHON SAWAN: Doi Musoe, 725-800m (8274); UDON: Phu Luang, 1150-1300m (10480, 10564); PRACHIN BURI: Khao Khieo, 1200 m (12153). On tree trunks and branches in evergreen forests.

\**Meiothecium jagorii* (C. Muell.) Broth. NAKHON SI THAMMARAT: Khao Luang, 200-600 m, on tree trunks in plantations, and on fallen logs in evergreen forest (11376, 11490, 12013).

Distr.: Indomalesia, New Caledonia.

BARTRAM (1939) doubts, whether the presents pecies can be separated satisfactorily from the next one.

*Meiothecium microcarpum* (Hook.) Mitt. UDON: Phu Luang, 1250 m, on trees and shrubs in streambed of temporarily dry rivulet (10514); PRACHIN BURI: Khao Yai, 600-700 m, on tree trunks near waterfall, and on shrub in streambed of a forest stream (12178, 12384).

Previously known only from Chanthaburi and the peninsula, where we collected it several times.

*Rhaphidostichum chaetomitriopsis* (Dix.) comb. nov. (*Trichosteleum chaetomitriopsis* Dix., J. Siam Soc. Nat. Hist. Suppl. 10: 23. 1935). PRACHIN BURI: Khao Khieo, 1200 m, on felled trees in evergreen forest (12091).

Previously known only from the type locality in Udon (Phu Krading).

*Sematophyllum tristiculum* (Mitt.) Fleisch. UDON: Phu Luang, 850-900 m, on trees in streambed of temporarily dry forest rivulet (10854); PRACHIN BURI: Khao Yai, 700 m, epiphytic in evergreen forest along rivulet (12372).

*Taxithelium instratum* (Brid.) Broth. NAKHON SI THAMMARAT: Khao Luang, 900-1100 m, on tree trunks in evergreen forest (11954).

Previously known from Chanthaburi.

\**Taxithelium merrillii* Broth. PHUKET: Terutao I., common on mangrove trees, roots and stones (HANSEN & SMITINAND 12493).

Distr.: Philippines (Palawan), New Guinea.

*Taxithelium vernieri* (Dub.) Besch. NAKHON SI THAMMARAT : Khao Luang, 1000 m, on tree trunks in forest (11587, 11589).

\**Trichosteleum singaporense* Fleisch. PHUKET : Terutao I., 15 m, on earth (HANSEN & SMITINAND 12511).

Distr. : Singapore.

*Trismegistia rigida* (Mitt.) Broth. UDON : Phu Luang, 1300-1400 m, on rocks in forest stream (10643, 10688); NAKHON SI THAMMARAT : Khao Luang, 1250-1740 m, very common on rocks, tree trunks, and decaying logs (10 samples).

\**Tristichella spiculifera* Dix. NAKHON SI THAMMARAT : Khao Luang, 1530-1740 m, on tree trunks and branches in undergrowth of forest (11766, 11880).

Distr. : Sumatra, Java.

#### SPLACHNACEAE

\**Splachnobryum giganteum* Broth. PAYAP : deciduous forest near Mae La Noi, 350-400 m, on rocks incrustated with lime in a streamlet (10305).

Distr. : Yunnan.

Previously known only from type locality.

\**Tayloria subglabra* (Griff.) Mitt. PAYAP : Doi Suthep, summit region of Doi Pui, 1650-1685 m, on tree trunks and branches (8710).

Distr. : Himalayas.

This species does not figure in previous papers concerning the Thai moss flora, but recently I received a specimen from Payap (Bo Luang, 1290 m, HANSEN, SEIDENFADEN & SMITINAND 11453) identified by Dr. A. NOGUCHI.

#### SYMPHYDONTACEAE

*Symphyodon complanatus* Dix. PAYAP : Chiang Dao, 1400-1650 m, (8936, 8972, 9018, 9057, 9163, 9182); Doi Suthep, summit region of Doi Pui, 1600-1650 m (8532); *ibid.*, summit region of Doi Buak Ha, 1550-1600 m (8806); Doi Inthanon, 1750-1800 m (9899); NAKHON SAWAN : Doi Musoe, 750-800 m (8216); UDON : Phu Luang, 750-850 m (10384, 10395). Mainly on branches in undergrowth of evergreen forest.

Previously known only from Doi Inthanon.

*Symphyodon echinatus* (Mitt.) Jaeg. PAYAP : Doi Chiang Dao, 1750 m in forest (9255); Doi Inthanon, very common between 1500 and 2300 m (16 samples); PRACHIN BURI : Khao Khieo, 1200 m (12055). Same habitat as *S. complanatus*.

Previously known only from Doi Inthanon.



\**Symphiodon erinaceus* (Mitt.) Jaeg. PAYAP: Doi Inthanon, 1700-2300 m, pendulous from trunks and branches in forest (9930, 10002, 10139, 10151, 10211).  
Distr.: Himalayas.

Already recognized by Dr. A. NOGUCHI among Thai material from Payap (Khun Kong Sang; HANSEN, SEIDENFADEN & SMITINAND 11426).

*Symphiodon umesaoi* Horik. & Ando (Nat. Life SE. Asia 3: 26. 1964) seems to be identical with *S. erinaceus*.

\**Symphiodon oblongifolius* (Ren. & Card.) Broth. PAYAP: summit region of Doi Chiang Dao, 2150 m (9380); Doi Suthep, summit region of Doi Pui, 1600-1650 m (8539, 8578); Doi Inthanon, common from 1750 m upwards (11 samples). Same habitat as *S. complanatus*.

*Symphiodon perrottetii* Mont. NAKHON SI THAMMARAT: Khao Luang, 1250-1740 m, on tree trunks, branches, and damp rocks in forest (11671, 11701, 11792, 11874).

Previously known from Chanthaburi.

#### THUIDIACEAE

\**Haplohymenium pseudo-triste* (C. Muell.) Broth. PAYAP: near Fang, 600 m, on tree trunks in evergreen forest along stream (9440); NAKHON SAWAN: Lansang Forest Park W. of Tak, 300-450 m, on tree trunks and limestone rocks in evergreen forest along stream (8079, 8090); UDON: Phu Luang, 750-850 m, on tree trunks in evergreen forest (10379, 10407); PHUKET: Krabi, Khao Nang Hong, 170-320 m, on tree trunks in evergreen forest (11287, 11290).

Distr.: South Africa, Ceylon, Tonkin, Formosa, Ryukyus, Japan, Australia, New Zealand.

\**Herpetineuron toccocae* (Sull. & Lesq.) Card. PRACHIN BURI: Khao Yai, 600-700 m, on the mud covered basal portion of tree trunks and rocks in streambed of forest stream (12194, 12349, 12424); NAKHON SI THAMMARAT: Khao Luang, 150-250 m, on tree trunks in open forest along river (11346).

Distr.: Pantropical s.l.; a distribution map is given by NORRIS & SHARP (1961). Another new record of this species may be given here: Ethiopia, 5 km W. of Ambo, 2000 m, on rocks along river (DE WILDE-DUYFJES 11543B, deposited in L).

*Thuidium cymbifolium* (Doz. & Mol.) Doz. & Mol. Very common all over the country, but especially in North and Northeast Thailand at altitudes from 600 m upwards. Mainly growing on rocks, decaying logs, and tree trunks.

*Thuidium glaucinum* (Mitt.) Bosch & Lac. Common in North, Northeast and East Thailand at altitudes between 700 and 1700 m. Was collected during the

Thai-Dutch Botanical Expedition in Payap (Doi Chiang Dao, Doi Suthep, Doi Inthanon), Nakhon Sawan (Doi Musoe), Udon (Phu Luang, Phu Krading), and Prachin Buri (Khao Yai, Khao Khieo).

\**Thuidium investe* (Mitt.) Jaeg. PAYAP: Doi Chiang Dao, 1100-1450 m, on rocks and tree trunks in deciduous and evergreen forests (8871, 8978, 9030); Doi Inthanon, 780-820 m, on rock in open deciduous forest (9489); near Mae La Noi 350-400 m, on rocks in streamlet (10302); NAKHON SAWAN: Lansang Forest Park, W. of Tak, 340-400 m, on limestone rocks along stream (8046, 8089).

Distr.: Burma.

*Thuidium meyenianum* (Hpe) Bosch & Lac. Common in the north. Has been collected in Payap (near Fang, between Khun Yuam and Mae Sarieng, on Doi Chiang Dao and Doi Inthanon), Nakhon Sawan (Lansang Forest Park, Doi Musoe and Doi Pha Wo), and Udon (Phu Luang) at altitudes between 300 and 950 m. Previously reported also from Rachaburi, Surat and Nakhon Si Thammarat. Mainly growing on limestone rocks, tree bases and decaying logs

*Thuidium orientale* Mitt. ex Dix. PAYAP: Doi Inthanon, 850 m, on decaying log (10296); UDON: Phu Luang, 1000-1350 m, on rocks and trees in forest along stream (10451, 10690, 10722, 10749); Phu Krading, 1150-1200 m, in forest along streamlet, on rocks, on tree bases, and terrestrial (10864, 10899, 10955, 11109); PRACHIN BURI: Khao Khieo, 1200m, on trees and rocks in forest (12052, 12071); Khao Yai, 700 m, on mud covered stem-base of forest tree (12254); NAKHON SI THAMMARAT: Khao Luang, 800-1740 m, on damp rocks and tree trunks in forest (11564, 11705, 11761, 11890).

Previously known from Udon.

\**Thuidium tamariscellum* (C. Muell.) Bosch & Lac. PAYAP: Doi Chiang Dao, 1400-1600 m, on trees in forest (8947, 9050, 9185); Doi Suthep, summit region of Doi Pui, 1600-1650 m, on tree trunks and branches in open evergreen forest (8472); Doi Inthanon, near Sop Aep, 740 m, on trees in evergreen forest along stream (9492); NAKHON SAWAN: Doi Musoe, 780m, on isolated trees in plantation (8177); UDON: Phu Luang, near Ban Na Luang, 370 m, on tree trunks in dry evergreen forest (10365).

Distr.: Indomalesia.

#### TRACHYPODACEAE (det. B.O. VAN ZANTEN)

\**Diaphanodon blandus* (Harv.) Ren. & Card. PAYAP: Doi Chiang Dao, 1900-2100 m, on tree trunks and branches in low brushwood on exposed ridge (9320); Doi Inthanon, 2000-2530 m, on trees in evergreen forest (9831, 10031).

Distr.: Himalayas, Indomalesia.

\**Duthiella wallichii* (Mitt.) Broth. PAYAP: Doi Chiang Dao, 1550-1650 m, on trees and rocks in evergreen forest (9196, 9212, 9226); Doi Inthanon, 740 m, on trees in forest along stream (9510).

Distr. : Himalayas, Java.

*Trachypodopsis serrulata* (P.B.) Fleisch. var. *crispatula* (Hook.) Zant. Common on trees and rocks in the mountain forest of the north at altitudes from 1100 m upwards. Was collected in Payap (Doi Chiang Dao, Doi Pui, Doi Inthanon) and UDON (Phu Krading).

*Trachypus bicolor* Reinw. & Hornsch. var. *bicolor*. NAKHON SI THAMMARAT: summit region of Khao Luang, 1740 m, on trees in stunted mossy forest (11841).

var. *hispidus* (C. Muell.) Card. PAYAP: Doi Suthep, summit region of Doi Pui, 1600-1685 m, on trees in open evergreen forest (8498, 8667, 8730); Doi Inthanon, 1650-2450, on forest trees (9632, 9717, 9895, 10117, 10275); NAKHON SAWAN: Doi Musoe, 780-800 m, on trees in moist evergreen forest along streamlet (8169); UDON: Phu Luang, 1300 m, on exposed sandstone rocks (10555); Phu Krading, 1100-1200 m, on trees and rocks in forest (10958, 11115); PRACHIN BURI: Khao Khieo, 1200 m, on forest trees (12035).

var. *viridulus* (Mitt.) Zant. PAYAP: Doi Inthanon, 1500-2750 m, (9586, 9607A, 9738, 9951, 10066, 10182); Doi Suthep, summit region of Doi Buak Ha, 1550-1600 m (8813); UDON: Phu Luang, 750-1400 m (10392, 10411, 10670, 10741); PRACHIN BURI: Khao Khieo, 1200 m (12099); NAKHON SI THAMMARAT: Khao Luang, 1250-1450 m (11692). On forest trees.

Intermediate forms between var. *hispidus* and var. *viridulus*: PAYAP: near Fang, 600 m (9427); Doi Chiang Dao, 1600-2100 m (9119, 9335); Doi Suthep, summit region of Doi Pui, 1600-1650 m, (8545, 8643); Doi Inthanon, 1500 m (9579); NAKHON SAWAN, Doi Musoe, 750-800 m (8205); UDON: Phu Luang, 1150-1250 m (10457); Phu Krading, 1100-1200 m, on rocks (11113); PRACHIN BURI: Khao Yai, 600-700 m (12179, 12325). On forest trees, unless stated otherwise.

*Trachypus humilis* Lindb. var. *humilis*. PAYAP: Doi Inthanon, 1500 m, on trees in evergreen forest along streamlet (9586A, 9607).

\*var. *flagelliferus* (Herz.) Miller. NAKHON SI THAMMARAT: Khao Luang, 750-1000 m, on tree trunks and decaying logs in forest (11542, 11607).

Distr. : India, Ceylon, China, Korea, Japan, Hawaii.

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