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A REPORT ON THE THAI-JAPANESE BOTANICAL EXPEDITION 1979

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For the purpose to contribute to the Flora of Thailand Project, since 1965 the Japanese botanists have visited Thailand several times and made the botanical expeditions in close cooperation with the Royal Forest Department. As a link of this research, the Thai–Japanese Botanical Expedition was newly carried out in 1979. The expedition was authorized by the Ministry of Education of Japan (Grant No. 404126) and by the National Research Council of Thailand (Document No. 0408/20613).

The present paper aims to sketch the outline of this expedition.

DURATION, MEMBERS, FINANCES

Duration : October 1, 1979 to December 31, 1979.

Members participated : During the course of the expedition, the team was supported by a lot of Thai people, the government staffs of the Royal Forest Department, National Parks and Wildlife Sanctuaries and the villagers living in the botanized areas. Here we wish to mention many thanks to them for their various helps.

The following list shows the Japanese and Thai botanists participated in this expedition (alphabetically except the leader).

Shimizu, T., Leader, Shinshu University, Matsumoto;
Kitagawa, N., Nara University of Education, Nara;
Koyama, H., Kyoto University, Kyoto;
Niyomdham, C., Royal Forest Department, Bangkok;
Phanichapol, D., Royal Forest Department, Bangkok;
Phengklai, C., Royal Forest Department, Bangkok;
Santisuk, T., Royal Forest Department, Bangkok;

[1&5]Shinshu University, Matsumoto, Japan: [2]Nara University of Education, Nara, Japan; [3&6]Kyoto University, Kyoto, Japan; [4]Forest Herbarium, Royal Forest Department, Bangkok 9, Thailand.

Smitinand, T., Royal Forest Department, Bangkok;
Toyokuni, H., Shinshu University, Matsumoto; and
Yahara, T., Kyoto University, Kyoto.

Finances : All expenses were paid by the Ministry of Education of Japan.

AIM OF EXPEDITION

The expedition was carried out under three categories of research. First of all, it aims to contribute to the Flora of Thailand Project. Throughout the whole course of the botanical trips, therefore, the general collection of the flowering plants, ferns and bryophytes were attempted. Some families will be revised by the Japanese and Thai botanists as shown in the following:

Fagaceae, Dipterocarpaceae, Rhamnaceae, Aquifoliaceae (**T. Smitinand**);
Urticaceae (**T. Yahara**);
Elaeocarpaceae, Taccaceae, Ebenaceae (**C. Phengklai**);
Saxifragaceae, Balsaminaceae (**T. Shimizu**);
Leguminosae p.p. (**C. Niyomdham**);
Aceraceae, Lythraceae, Sonneratiaceae (**T. Santisuk**);
Ericaceae, Primulaceae, Gentianaceae (**H. Toyokuni**);
Compositae (**H. Koyama**); and
Hepaticae (**N. Kitagawa**).

The collection of the other families or groups will be distributed to the specialists participated in the Flora of Thailand Project for further identification and study. After completion of the priliminary identification, the first, the second and the third set of the collection will be deposited in the herbarium of Kyoto University (KYO), of Royal Forest Department (BKF) and, of Shinshu University (SHIN), respectively. The rest will be distributed to the other main herbaria of the world.

The second is to analyse the Thai flora from the viewpoint of the regional plant geography. Although Thailand is generally included in the South-east Asiatic floristic region, a lot of the Sino-Japanese and the Himalayan elements of the flowering plants are encountered. In this respect, the northern and north-eastern montane flora should be scrutinized in particular.

The third aim is to study the Thai plants through the procedure of experimental taxonomy. The living samples and fixed materials of Urticaceae (Yahara), Balsaminaceae (Shimizu), Gentianaceae (Toyokuni) and Compositae (Koyama) were gathered for chromosome counting, karyotype analysis, observation of fine structure, embryological analysis, cross test, and so on.

ITINERARY

Through three month's expedition, five trips were made from north to south, covering all of the floristic districts of Thailand delimited by the Editorial Board of the Flora of Thailand Project, viz. Northern, North-eastern, Eastern, South-eastern, Central, South-western and Peninsular (see Map—Figure 16.).

First Trip : October 6–29, 1979.

Bangkok—Saraburi—Khao Yai National Park—Chum Phae—Nam Nao National Park—Thung Salaeng Luang National Park—Lansang National Park—Chiang Mai—Doi Suthep—Doi Pui—Doi Inthanon National Park—Om Koi—Mae Tuen—Mae Sariang—Mae Hong Son—Pai—Doi Chang—Chiang Dao—Doi Chiang Dao—Chiang Mai—Bangkok.

Second Trip : November 1–8, 1979.

Bangkok—Kanchanaburi—Salak Phra Wildlife Sanctuary—Erawan National Park—Sai Yok Arboretum—Tham Than Lot National Park—Kanchanaburi—Bangkok.

Third Trip : November 11–18, 1979.

Bangkok—Uthai Thani—Huai Kha Khaeng Wildlife Sanctuary—Uthai Thani—Nam Nao National Park—Chum Phae—Phu Kradung National Park—Pha Nok Khao—Nam Nao National Park—Lomsak—Saraburi—Bangkok.

Fourth Trip : November 22–30, 1979.

Bangkok—Khao Khieo Wildlife Sanctuary—Phe Arboretum—Khao Chamao National Park—Chanthaburi—Khao Soi Dao Wildlife Sanctuary—Khitchakut National Park—Bangkok.

Fifth Trip : December 4–22, 1979.

Bangkok—Sam Roi Yot National Park—Ranong—Hot Spring Park—Khlong Nakha Wildlife Sanctuary—Khao Phota Luang Kaeo—Takuapa—Khao Sok National Park—Phuket—Khao Pathaeo Wildlife Sanctuary—Phangnga—Than Bokkhorani Arboretum—Trang—Khao Chong Botanical Garden—Satun—Ton Nga Chang Wildlife Sanctuary—Hat Yai—Thale Noi Wildlife Sanctuary—Thung Song—Prachuap Khiri Khan—Bangkok.

As a result, 138 localities were botanized and about 30,000 sheets of the vascular plants, 1,800 packets of bryophytes and 200 stocks of the living sample were collected. Many seeds and fixed materials were also collected.

All the specimens were dried and labeled until the end of May, 1980 in Kyoto and Matsumoto.

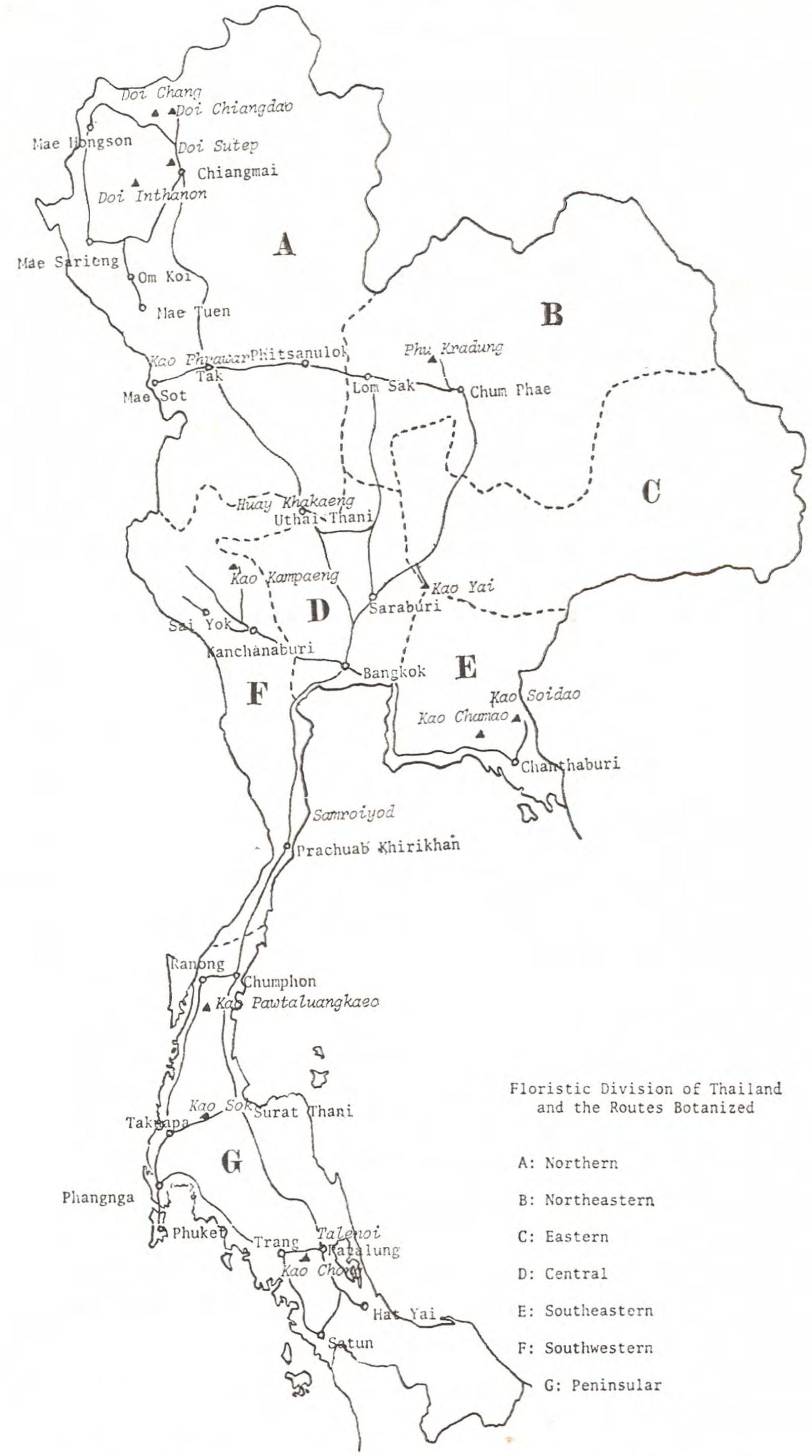

Figure 16. Floristic Division of Thailand and the Routes Botanized.
A : Northern; B : North-eastern; C. : Eastern; D : Central;
E : South-eastern; F : South-western; G : Peninsular.

BOTANICAL NOTES

A short botanical sketch including some noteworthy information acquired will be made here in each floristic district. The plants referred to are mainly those of Urticaceae, Balsaminaceae (*Impatiens*), Ericaceae, Gentianaceae and Compositae.

The article on the bryophytes is on the last pages.

A. Northern District

Needless to mention, this area is rich in high mountains, having the highest peak in Thailand, Doi Inthanon 2,576 m. The geological formation is of sandstone or granite in majority. The limestone hills occur here and there. The long, magnificent ranges of limestone hills are encountered between Mae Hong Son and Pai district where botanical accesses have hardly been made. The main places botanized are Doi Suthep, Doi Pui, Doi Inthanon, Doi Chang, Doi Chiang Dao and some lowland hills near Mae Sot and Mae Hong Son. Mae Tuen area (about 60 km. south of Omkoi) has never been visited by foreign botanists.—Figure 17.

October is the nice season to botanize the high mountains, except the case of Compositae. It is too early for the flowering time of most of the native species of Compositae.

Generally speaking, three zones of the vegetation are recognized : dry dipterocarp forest below 500 m in altitude, dry evergreen forest 500 to 1,000 m and hill evergreen forest higher than 1,000 m. On Bo Luang tableland ranging from 950 to 1,350 m, there occurs a large area of Pine-Dipterocarp forests.

As for the genus *Impatiens*, it is interesting that the members of Violaeflora-group are growing in the evergreen forest zone and silicicolous, while those of Vaughanii-group are calcicolous in the deciduous forest zone. Three species of the former have been confirmed, *I. violaeflora*, *I. patula* and an undescribed species. *I. hongsonensis*, *I. psittacina* and two new species are the representatives of the latter found in this district. The Himalayan elements, *I. racemosa*, *I. longiloba*, *I. garretti* and *I. jurpioides* have come from the higher elevation over 1,500 m of Doi Inthanon and Doi Chang.

The Urticaceous flora is also very rich. Himalayan or Chinese elements such as *Elatostemma monandrum*, *Pilea plataniflora* and *Lecanthus peduncularis* are common on the hill evergreen forest over 1,000 m in altitude. Of the genus *Boehmeria*, about ten species were collected in this district, many of them being found along the edge of the evergreen forest. *B. platyphylla*, *B. polystachya*, *B. macrophylla* and *B. hamiltoniana* (new to Thailand) are Himalayan elements and *B. malabarica*, *B. zollingeriana*, *B. tomentosa* (a species hardly known to current flora) are common to Java. One of the polymorphic species, *B. clidemioides* were

collected in many other localities. Through the field observation in this trip, three types have been confirmed to be distinct in morphological traits and ecological preferences. Many samples of *Pilea* were obtained. At least two are new species : one in Doi Inthanon and the other in Doi Chiang Dao.

Although few flowers of Compositae could be seen in the natural vegetation, many specimens were collected. *Inula cappa*, *Saussurea venosa*, *S. peguensis*, *Laggera alata*, *L. pterodonta*, *Anaphalis margaritacea*, *A. adnata*, *Ainsliaea latifolia*, *Pluchea polygonata* etc. are the representatives of the hill evergreen forest zone. *Vernonia volkameriifolia* is a woody species growing up to 5 to 7 m tall. The weedy roadside species of Compositae are rather common and well flowering as exemplified by *Emilia sonchifolia*, *Ageratum conyzoides*, *Bidens biternata*, *Youngia japonica*, *Spilanthes paniculata*, *Dichrocephala integrifolia*, *Synedrella nodiflora*, *Elephantopus scaber* and so on.—Figure 18.

As regards the other flowering plants *Exacum sutaepense*, *E. pteranthum*, *Swertia angustifolia*, *S. striata*, *S. kachinensis* (Gentianaceae), *Agapethes hossei*, *Craibiodendron stellatum* (Ericaceae), *Paris polyphylla*, *Tupistra* sp., *Disporum calcaratum* (Liliaceae), etc. should be mentioned as Himalayan elements, all growing in the hill evergreen or pine forests.

B. North-eastern District

Phu Kradung, one of the oldest national parks in Thailand, is famous for the beautiful scenery of pine forests and grasslands widely developing on the flat top area 1,200 to 1,350 m in altitude. The mountainside is covered with bamboo and deciduous tree nearly up to 900 m. The higher part is the zone of hill evergreen or lower montane forest. November is a nice season for the collection of temperate species.

Impatiens chinensis, *I. pseudochinensis*, *Gentiana lakshnakarae*, *G. hesseliana*, *Swertia angustifolia*, *Inula nervosa*, *Anisopappus chinensis*, *Emilia prenanthoides* etc. were just flowering on the sandy humid grasslands on the top. Some Himalayan elements such as *Boehmeria platyphylla*, *Senecio nagensium*, *Inula cappa*, *I. eupatorioides* and *Vernonia silhetensis* are inhabitants of the thicket there. —Figure 19.

A small area near the entrance of Nam Nao National Park, about 850 m in altitude was also botanized. There extends a light pine-oak-dipterocarp forest. In the middle of October, *Impatiens masoni*, *Exacum tetragonum*, *Swertia angustifolia*, *Vernonia squarrosa*, *V. silhetensis*, *Blumeopsis flava*, *Gynura integrifolia* and many kinds of orchid flowering on the sandy grassy floor of forest could be seen. The quick phenological change owing to advance of the dry season resulted that nearly all of these plants had been dying away when a revisit to this area was made in the middle of November. Indeed, any living plants of *Impatiens masoni*

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Figure 17. Distant view of Doi Chiang Dao, a limestone massive having the various Sino-Japanese elements.

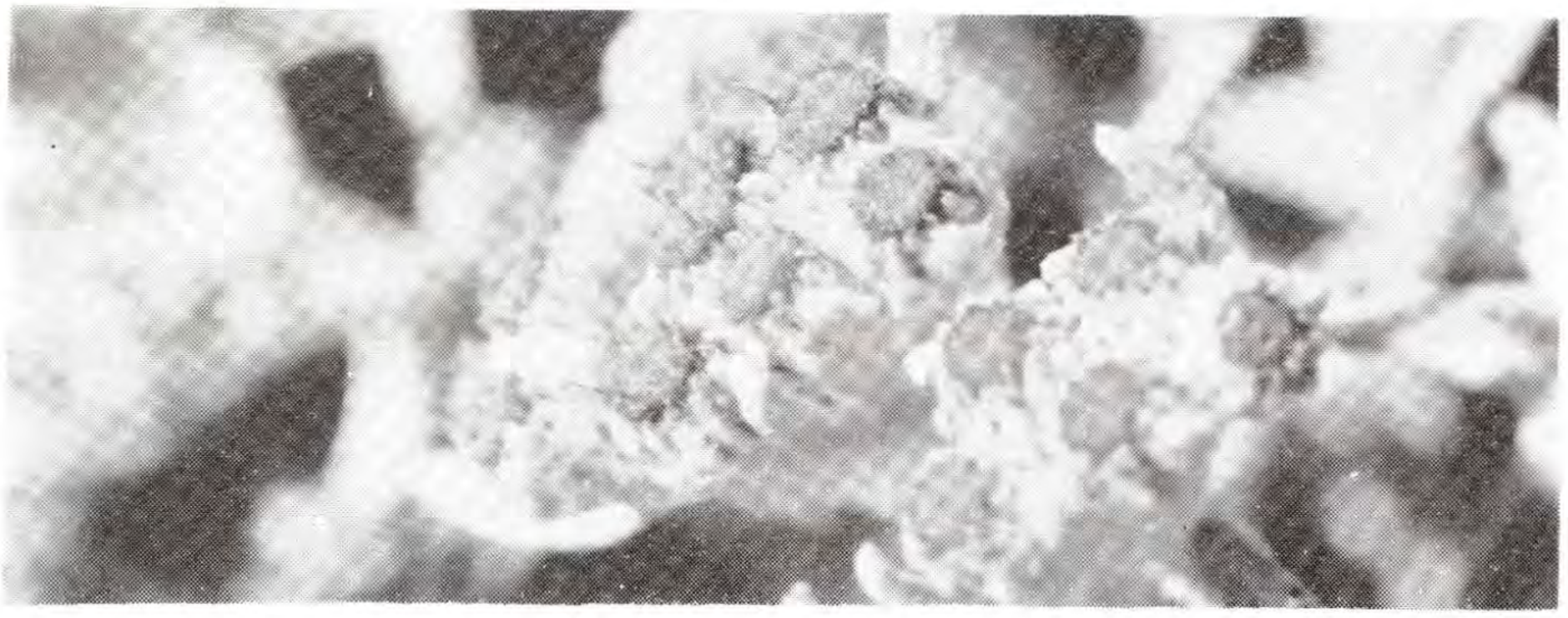

Figure 18. *Pluchea polygonata* just flowering in the dipterocarp forest on Bo Luang Tableland.

Figure 19. An abundant gentian species on Phu Kradung : *G. lakshnakarae*.

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Figure 20.
Pinus-Dipterocarpus forest, one of the dry monsoon forest, in Nam Nao National Park, 850 m in altitude.

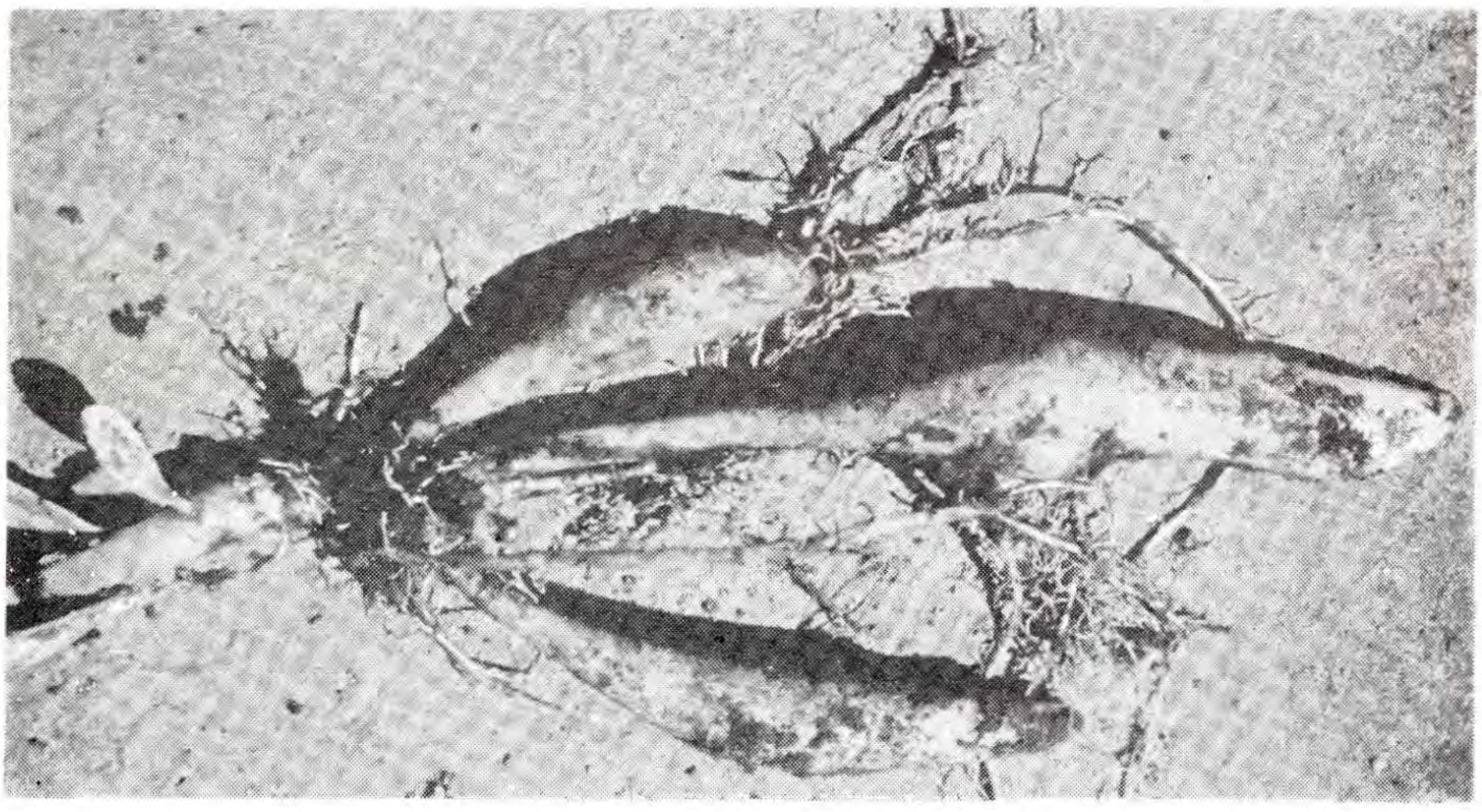

Figure 21. Showing big tubers of *Impatiens pseudochinensis* on Phu Kradung.

could be seen at the second visit at all. Though similar very much to each other, interestingly enough, *I. masoni* is growing on the dry sandy ground under the forest as an annual whereas *I. pseudochinensis* occurring on the open humid grassland is a perennial possessing big tubers, underground.— Figure 20–21.

C. Eastern District

The main place visited is Khao Yai National Park, a well botanized mountain. As it is situated at the south-west corner of this district, it doesn't show the typical phase of flora and vegetation. The major part is covered with the tropical rain forest in the sense of *Smitinand* (1968) up to 1,000 m in altitude, where several evergreen gigantic dipterocarps such as *Dipterocarpus gracilis*, *D. costatus*, *D. retusus* and *Shorea henryana* are characteristic. The higher part is occupied by the hill evergreen or lower montane forest characterized by *Podocarpus neriifolius*, *P. imbricatus*, *Quercus ramsbottomii*, *Lithocarpus eucalyptifolius*, *L. rodgerianus*, etc. This is the southernmost locality for *Betula alnoides*. — Figure 22.

Unfortunately, few flowering plant specimens of Balsaminaceae, Gentianaceae and Ericaceae were collected. Two species of *Compositae*, *Blumea* sp. and *Camchaya eberhardtii* were obtained in flower at the edge of the hill evergreen forest. *Disporum calcaratum* and *Rhododendron moulmainense* are again the examples of the Himalayan elements.

D. Central District

The present district corresponds with the southern half of Bangkok plain or Central valley in term of geography, containing vast agricultural land. A lot of limestone hills of botanical interest are scattered here and there throughout the plain.

Two limestone hills in Saraburi Province were chosen for botanizing early in October. Two *Impatiens* species belonging to Vaughanii-group growing segregatedly could be found. The first one is *I. calcicola*. The other is very near to it, but different in shape and color of the flower. A calcicolous species of *Elatostemma* and a wild banana are also characteristic of these limestone hills. The weedy composites, *Synedrella nodiflora*, *Tridax procumbens*, *Vernonia cinerea*, *Ageratum conyzoides*, *Eupatorium odoratum*, *Crassocephalum crepidioides*, etc. are common here, too. But, *Lagascea mollis* was never seen at any other places botanized.

E. South-eastern District

The most part of this district has been converted to the agricultural land of coconut, manihot, sugar cane, rubber and so on. Nearly all of the forests are secondary dry evergreen forests or else bamboo thickets except the higher part over than 1,000 m altitude like Khao Soi Dao, Chanthaburi.

The hill evergreen forest of Khao Soi Dao is characterized by the species of *Podocarpus*, *Castanopsis*, *Cinnamomum*, *Neolitsea*, *Camellia*, etc, in which there is a rich fern flora representing by *Dryopteris*, *Diplazium*, *Polystichum*, *Arachniodes* and *Pteris*. This mountain is the type locality of a problematical species of *Impatiens*, *I. subaequalis* (Balsaminaceae). But, none of *Impatiens* could be seen at that time. The weedy species of Compositae, *Adenostemma lavenia*, *Eupatorium odoratum*, *Crassocephalum crepidioides* and *Ageratum conyzoides* were found even at the middle elevation of the mountain.

F. South-western District

Geologically, this district is predominated by the limestone formation. Climatologically, it has rather small annual precipitation between 1,000 mm and 1,200 mm. Even in the rainy season, it is hardly more than 1,000 mm. Because of such environmental conditions, the vegetation is generally represented by savanna scrub, savanna forest or dry dipterocarp forest excluding riverside or vicinity of the waterfall. In addition, it was exceptionally dry last year. The trip to Kanchanaburi was made in mid November and to Prachuap Khiri Khan early in December in the dry season. As a result, only the last plant of *Impatiens cardiophylla* in Sam Roi Yot National Park could be seen, but both *I. siamensis* and *I. noei* recorded from Kanchanaburi Province were not found.

Nevertheless, the new species of *Pouzolzia* s. l. of Urticaceae and of *Impatiens* in Sam Roi Yot National Park and Tham Than Lot National Park can be expected respectively. On the other hand, we can recognize close floristic affinity between northern district and south-western district as far as the elements from the hill evergreen forests in Khao Kamphaeng are concerned as exemplified by *Polygonum* sp., *Pilea* sp., *Impatiens violaeflora*, *Maoutia puya*, and *Disporum calcaratum*. *Canscora diffusa*, *Exacum tetragonum*, *Swertia angustifolia* (Gentianaceae), *Wedelia wallichii*, *Blumeopsis flava*, *Vernonia squarrosa* (Compositae), etc. are here noteworthy.— Figure 23.

The next trip in the rainy season to these areas should be taken into consideration.

G. Peninsular District

The peninsula is conspicuously different from the inland in being heavily rainy through the whole year. There occur on marked monsoon forests as from Thap Sakae District of Prachuap Khiri Khan southwards.

Khao Phota Luang Kaeo, 1,300 m in altitude, is the highest mountain botanized in the peninsula. The disturbed forests with bamboos extend from foothills to about 350 m. The mountain side from 350 m to 900 m is occupied by the upper tropical rain forest. The top area over 900 m belongs to the zone of the hill evergreen forest. On the ridge of the top area the open shrubbery and

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Figure 22.
Tropical rain forest in Khao Yai, 600 m, characterized by gigantic evergreen dipterocarps.

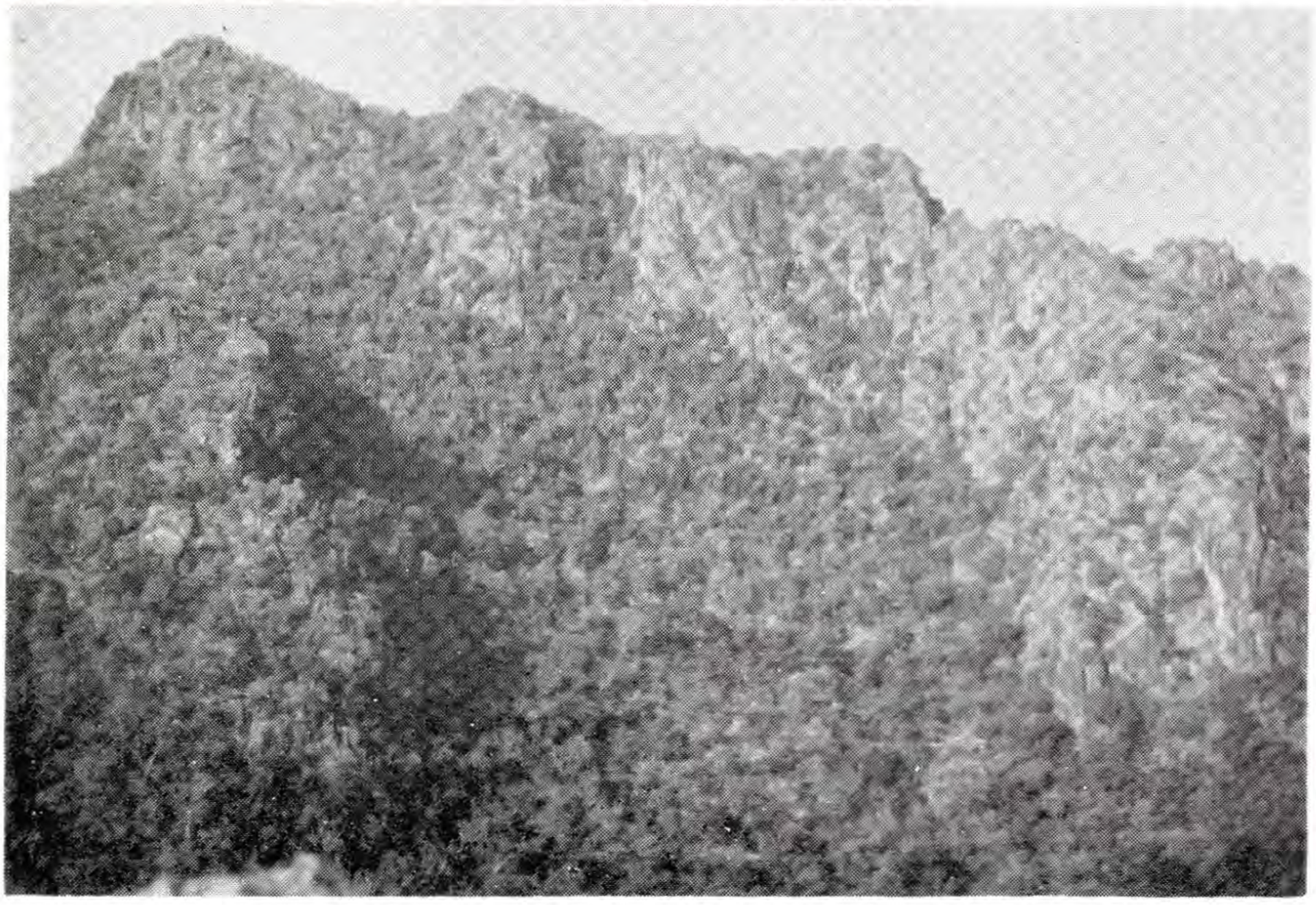

Figure 23. A dry limestone hill showing savanna scrub on Sam Roi Yot National Park.

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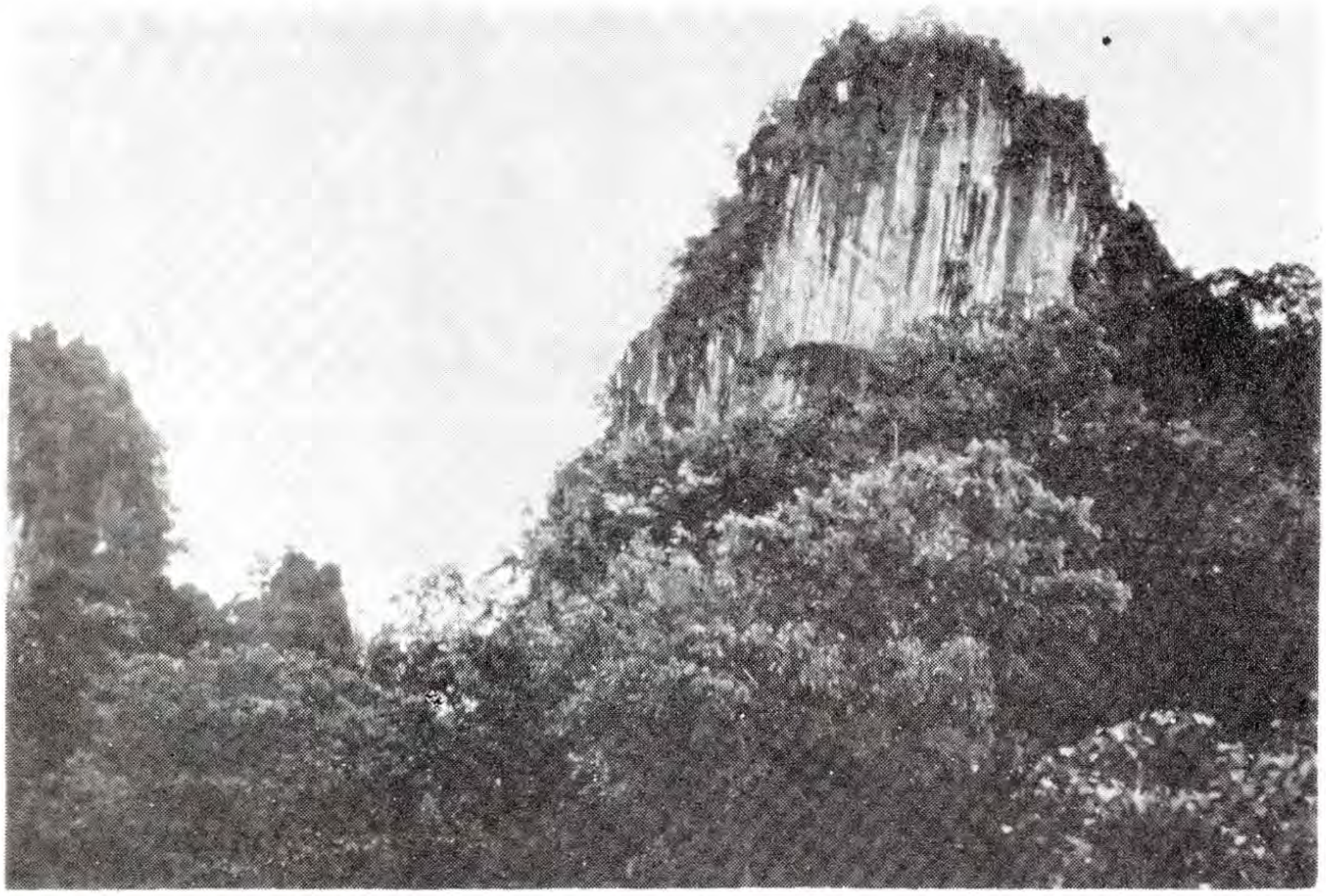

Figure 24. Khao Sok National Park, rich in steep limestone hills.

Figure 25.
A woody composite, *Vernonia arborea*, retaining 13 m high. At the vicinity of Klong Nakha Wildlife Sanctuary.

grassy scree are predominant, where an *Exacum* (Gentianaceae) species was found as the first record to the peninsula. The other important plants are *Rhododendron siamense*, *Vaccinium bracteatum* (Ericaceae), *Quercus* sp. (Fagaceae), *Cinnamomum* sp., etc. There are no species of Compositae found.

Around a small marshy area at about 900 m in altitude, we have met with *Gynura procumbens* and *Impatiens griffithii* var. *sarcantha*. Both of them are very rare on this mountain. Speaking of *Impatiens*, *I. mirabilis*, *I. macrosepala* and *I. larsenii*, all belonging to Vaughanii-group, can be found on the lowland limestone hills in Surat Thani and Satun. In contrary, *I. griffithii* var. *sarcantha* belonging to Platypetala-group is a silicicolous highland plant. Two calcicolous species of *Pilea* (Urticaceae) are new to science as well as the representatives of the lowland limestone flora in Surat Thani and Satun. Other Urticaceous genera, *Elatostemma*, *Boehmeria* and *Villebrunea* were found in the rain forest and/or hill evergreen forest. A large collection including problematic taxa such as *Boehmeria malabarica*, *B. depauperata*, *Villebrunea aff. integrifolia* and some species of *Elatostemma* were obtained. At the vicinity of Khlong Nakha Wildlife Sanctuary, a woody composite, *Vernonia arborea* can be seen sporadically in the secondary forest as well as on the bank along highway.— Figure 24–25.

BRYOPHYTES (by **Kitagawa**)

As mentioned above, about 1,800 packets of bryophyte specimens— 1,300 of liverworts (Hepaticae), 500 of mosses (Musci), and 20 of hornworts (Anthocerotae) were collected. Although this number of specimens is rather small for the three-month trip, the collection is fairly extensive covering many areas that have been bryologically little investigated before. The most important areas explored are Doi Chang (Chiang Mai), Khao Soi Dao North (Chanthaburi), and Khao Photo Luang Kaeo (Ranong), because any other bryologist has never been there but we could botanize up to the summit of these high mountains.

We have spent much time in exploring dry lowland areas, especially of limestone hills, in various places, where the bryophyte flora is very poor. Although the specimens collected in these dry areas are very limited in number, they include several, very interesting species.

Cyathodium, a luminous liverwort of Marchantiales, prefers to limestone areas and two or three species were found in shady habitats on limestone at several localities both northern and peninsular. It should be mentioned here that another curious species of *Cyathodium* was found at an unusual habitat in the lowland of Uthai Thani; the thallus is rather thick and fleshy looking like a *Riccia*, and occurs on fairly-lighted sandy soil in a dry dipterocarp forest.

Fossombronia (Metzgeriales) has been poorly known in south-eastern Asia, but three (?) species of the genus were collected at higher altitudes of northern and north-eastern parts of this country (Doi Chang, Doi Inthanon, Doi Suthep, and Phu Kradung).

Colura (Jungermanniales) is known as a carnivorous liverwort plants are epiphyllous or corticolous and each leaf bears a tiny valvate sac, an elaborate device for trapping minute animals (just like in *Utricularia*). Three species of this curious liverwort were collected, two from Khao Yai National Park and one from Khao Phota Luang Kaeo. Many epiphyllous species of *Cololejeunea* were collected in various places, especially in tropical rain forests in the peninsular region. A peculiar species of this genus (subgenus *Chondriolejeunea*), *C. shimizui*, was found at three additional localities, all on limestone hills in Phangnga and Surat Thani.

Notothylas, a small genus of Anthocerotae poorly represented in south-eastern Asia, has been known from Thailand by a single species, *N. depressispora*, which was recently described as new species on the basis of a collection made by our second Expedition to Thailand 1967. In this time, however, two other species were found in the northern part of the country.

This valuable collection of bryophytes will be studied by several Japanese specialists: Musci by Drs. **A. Noguchi** and **Z. Iwatsuki** (Hattori Botanical Laboratory); Anthocerotae by Mr. **J. Hasegawa** (Kyoto University); Plagiochilaceae by Dr. **H. Inoue** (National Science Museum); some of Lejeuneaceae by Dr. **M. Mizutani** (Hattori Botanical Laboratory); and all other Hepaticae by **N. Kitagawa.**

MEETING

After completion of the botanical trips a final meeting to discuss about the future of the Flora of Thailand Project and the roles of Japanese botanists for the Thai Flora was held at the Royal Forest Department on December 27, 1979. The topics discussed are as follows:

1. Flora of Thailand Project : Its Present Status and Future Plan.
2. Expectation from the Thai Side for the Japanese Botanists in Future.
3. Evaluation on this Expedition, especially from the Thai Side.
4. On Exchange of the Plant Materials, Specimens and Living Samples.
5. News Letters of the Flora of Thailand Project.
6. Publication of the Papers on the Results of this Expedition.

We should like to say that our botanical collection as well as field experience resulted from the present expedition will surely play an important role to clarify the Thai flora in the future.

REFERENCE

Smitinand, T., 1968. Vegetation of Khao Yai National Park, *Nat. Hist. Bull. Siam Soc.* **22** : 289–305.