REPORT ON

THE SECOND "FLORA OF THAILAND" EXPEDITION JULY-AUGUST 1968

by

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Introduction

In 1968 the Thai-Danish botanical cooperation was continued during a two months' collecting campaign mainly concentrated on the northern part of the country, the part which was formerly named the Payap district. The expedition, planned and led by the senior author, had received support from various quarters. The main grant was given by the Danish State Research Foundation, whereas the greater part of the expedition outfit was given by the University of Aarhus. We are indebted to both institutions for their support. As always we met the greatest sympathy for the scientific exploration of Thailand from the Board of Directors of the East Asiatic Company, who offered free freight for all outfit and collections. We want to express our gratitude for this generosity. From the beginning the work in the field was carried out as collaboration between the Danish and the Thai authorities. The Royal Forest Department, represented by Mr. Tem SMITINAND, placed a landrover at our disposal during the two months, as well as all facilities possible at forestry stations and units all over the country. It would be impossible, here, to thank all the forest officers and their helpers in the many localities we visited; we were everywhere received in the most cordial way, which considerably increased the efficiency of the expedition. To two persons, however, we are particularly indebted : The divisional forest officer of Chiengmai, Mr. Saran MANGKLATSATHIAN, and his assistant Mr. Somphet PUKMANI; without their help several working days would have been lost, particularly during critical periods when our own landrover broke down. Also the forest officer Mr. Thawatchai SANTISUK, who participated from the first day to the last, is

LARSEN & WARNCKE



Fig. 1 Map.

81

thanked most cordially, not only for efficient organization of the daily work in the jungle, but also for good companionship. Finally we want to express specials thanks to the Royal Danish Embassy in Bangkok for help to the participants in the expedition.

The route of the expedition is given on the map Fig. 1.

Itinerary and Collection Numbers 1968

			ivos.
30.6	Chie	ngmai: Doi Suthep	1873-1911
1	6.7.	Bo Luang area	
	1.7.	Bo Luang	1912-1940
	2.7.	10 km S. of Bo Luang along the Om Koi trail	1941-2004
	3.7.	30 km S. of Bo Luang along the Om Koi trail	2005-2076
	4.7.	20 km W. of Bo Luang towards Mae Sariang	2077-2120
	5.7.	Doi Pha Dam between Hang	
		Dong and Bo Luang	2121-2197
	6.7.	20 km N. of Bo Luang, near Ban Om Khut	2198-2225
8. –	12.7.	Mae Sariang area	
	8.7.	S. of Mae Sariang	2226-2268
	9.7.	Ban Mae La Noi, 25 km N. of Mae Sariang	2269-2299
	10.7.	East of Mae Sariang	2300-2337
	11.7.	Ban Mae Pang, 30 km N. of Mae Sariang	2338-2368
	12.7.	Ban Huai Sai, 12 km. S. of Mae Sariang	2369-2386 2400-2401
	12.7.	15 km E. of Mae Sariang	2387-2399 2402-2412
14. –	16.7.	Chiengmai–Chieng Dao area	
	14.7.	Doi Suthep (Doi Pui)	2436-2457
	14.7.	8 km N. of Doi Saket towards Wieng Pa Pao	2458-2467
	15.7.	Along waterfalls and streams at	
		Mae Rim, 15 km N. of Chiengmai	2586-2587

LARSEN & WARNCKE

		Nos.
15.7.	Doi Suthep (Doi Pui)	2486-2539
		and 3102
16.7.	South of Chieng Dao	2540-2572
17.7.	Doi Suthep (Doi Pui) at Chiengmai	2573-2585 2588-2595
23. – 27.7.	Fang area	
23.7.	10 km W. of Fang	2596-2618
24.7.	10 km W. of Fang	2619-2668
25.7.	10 km W. of Fang	2669-2721
26.7.	12 km SE. of Fang along the	
	Fang-Chiengmai trail	2722-2761
27.7.	Along the road Fang-Chiengmai	2762-2777
28.7.	Chiengmai: Doi Suthep	2778-2814
		2818-2828
29.7. – 3.8.	Chieng Dao Area (NW of Doi Chieng Dao)	
29.7.	Pang Bo	2815-2817
30.7.	Pang Bo	2829-2917
31.7.	Pang Bo-Khun Klong	2918-2983
1.8.	Pang Bo	2984-3022
2.8.	Teen Tok	3023-3063
3.8.	Teen Tok	3064-3101
4.8. Doi	Suthep	3102
8 14.8.	Foothills of Khao Yai National	
	Park and surroundings	
8.8.	Pak Thong Chai (TREND Camp)	3103-3171
9.8.	Khao Lotung S. of Pak Thong Chai	3172-3230
10.8.	Eastern part of Khao Yai National	
	highway	3231-3289
11.8.	Ibidem	3290-3319
11.8.	Pak Thong Chai (TREND Camp)	3320-3344
13.8.	Nang Rong waterfall at Nakhon Nayok	3345-3391
14.8	Sarika waterfall at Nakhon Navok	3392-3420

Comments on the Itinerary

The second "Flora of Thailand" expedition was undertaken as a continuation of an exploration programme discussed at conferences in Kew and Leyden. During these meetings it was stated that Thailand is still in need of basic botanical exploration and is still behind the neighbouring countries as far as collecting density is concerned. Many parts of the country have been accessible with difficulty, and it is evident that the majority of the collections are concentrated in certain "attractive" areas, such as e.g. Doi Suthep. Doi Inthanon, Doi Chieng Dao, etc., so that for many groups the voucher specimens in the herbaria are unable to give a real idea of the distribution pattern of the species. Recent years' rapid development of the country, and in this connection not least the road development, has given many new possibilities of reaching unexplored areas. At the same time it is evident, as mentioned before in these reports, that we are now forced to act quickly and do the basic field work before it is too late. With these thoughts in mind the expedition was planned. It has been concentrated on the North-Western part of the country mainly.

Two groups of plants were mainly collected, viz. flowering plants and mosses. As far the flowering plants are concerned, most collecting numbers are represented in at least 7 duplicates, which will be distributed among the 7 herbaria which are directly engaged with the "Flora of Thailand-Project", viz. Aarhus, Bangkok, Copenhagen, Edinburgh, Kew, Leyden, and Paris. The mosses, when possible, were collected in larger quantities, which makes it possible to send out an exsiccate to all the more important centres for research into tropical mosses.

The collecting method is illustrated on (Pl. XI. Figs. 1 & 2.)

Besides collecting work a number of fixations of choice groups have been undertaken. A particular large number of fixations of mosses were brought home, a material which is to be worked up together with moss fixations from the first "Flora of Thailand" expedition, and thus gives us the first cytological account of the Thai moss flora.

In what follows the areas visited are briefly described.

The Bo Luang area

In 1958 the senior author tried to reach this area, which was accessible only with difficulty in the rainy season. On account of the many difficulties the result was meagre. Now the road system allows car traffic to Bo Luang all the year round.

The expedition worked with the Bo Luang forest station as base. The station which is mainly occupied by reafforestation of the area with *Pinus insularis* is situated at the altitude of 1000-1100 m. Only a little natural vegetation is left in the surroundings, but towards the south along the Om Koi trail pretty good forest can still be seen.

At the altitude of 1000 m. the main dominants are species of *Castanopsis*, *Quercus*, *Randia*, *Schima wallichii*, and scattered *Pinus insularis*, and a rich grass-herb vegetation is found. Here a few genera seem rarely to be missing, such as e.g. *Aspargus*, *Aneilema*, and *Polygala*, all with several representatives. Very often *Phoenix acaulis* occurs as dominant on the drier soil (Pl. XII. Fig. 1), while along streams a rich and varied vegetation of *Zingiberaceae* is found. Here such species as *Iris collettii*, *Boesenbergia pandurata*, *Curcuma parviflora*, *Disporum pullum*, *Chlorophytum orchidastrum*, and others are found. *Pieris ovalifolia* is furthermore a common small tree in these gallery forests. The vegetation may be classified as upper mixed deciduous forest.

In one locality a meadow-like vegetation with *Ranunculus japonicus*, *Hypericum japonicum* and *Lysimachia japonica* was particularly interesting, showing a very varied vegetation pattern.

Furthermore it may be mentioned that particularly in those forests the trees are rich in Loranthaceae, such as e.g. Dendrophtoe pentandra, Macrosolen avenis, and Scurrula ferruginea, to name the commonest. The older pine trees (30 years) nearly all have their branches covered with Usnea while the humidity does not seem constant enough to develop a real moss flora. Representatives of the genera Leucobryum, Macromitrium, and Frullania are the only epiphytic bryophytes still found in any quantities in this type of forest.

The account above may give an impression of the vegetation of the Bo Luang plateau. The pattern is, however, more complex. which is particularly evident west of Bo Luang on the slope of the plateau towards the Mae Sariang-Khun Yuam valley. There deep creeks with a very rich evergreen vegetation is found at the altitude of about 800-1000 m. Many of these valleys may be worthwhile protecting through nature conservation. One of the valleys was visited in July. A rich herb vegetation with ferns and Zingiberaceae covered the slope towards a small stream bordered by Pollia, Angiopteris, Impatiens, Chloranthus, and Costus speciosus, while tall Manglietia insignis and Tetrameles nudiflora seem to be the dominants among the Prominent bryophytes covering the loamy banks were trees. Dumortiera nepalensis and species of Riccia and Anthoceros. Here also the epiphytic moss vegetation was much richer than in the more open Obviously the closed vegetation provides a better high-plateau. protection during critical dry periods.

During the stay at Bo Luang an excursion to the Doi Pha Dam was undertaken. This is part of the Doi Inthanon (Doi Angka) massif, the highest mountain group of Thailand. Doi Pha Dam reaches an elevation of 1100 m; the foot hills are covered with dry deciduous dipterocarpous forest while the upper regions harbour a dry evergreen wood somewhat affected by the hill tribes. The ground flora shows among its herbaceous dominants such species as *Iris collettii* (Pl. XII. Fig. 2.), *Gentiana*, *Striga*, *Sopubia*, and *Knoxia* species; on rocky outcrops a rich fern flora is developed. In the open hillside forests *Cycas pectinata* plays a dominant role (Pl. XIII. Fig. 1.)

Finally, the area north of Bo Luang was investigated; there collecting took place in the lower forests around Ban Om Khut. The stony lateritic soil harboured the common dry deciduous forest. An area with hot sulphureous springs was studied. There the *Fimbristylis* species seem to be those most resistant to the hot-water conditions; this is also the case in the more well-known hot spring area west of Fang 150 km. north of this locality. On the bare flats with white gravel surrounding the spring area, the main dominants are *Eragrostis* sp. *Cleome* sp., and *Portulacca oleracea*.

The Mae Sariang area

In Mae Sariang the expedition was housed in a new forestry rest house outside the town along the Khum Yuam road; this road is quite new and only the first kilometres have a concrete surface. The river valley around the amphur is situated at an altitude of approx. 250 m. The cultivated ground is a narrow strip on both sides of the river while the road transects good deciduous forests little influenced by man. Thai villages are few and hill tribes seem scarce in the area.

The dominant species in the dry lowland forest is almost everywhere Dipterocarpus tuberculatus, with such subdominants as Strychnos, Dillenia, and Shorea obtusa; among the common trees and shrubs Cratoxylon prunifolium, Randia, Gardenia and Lagerstroemia may be mentioned. In these lowland forests teak is frequent, particularly south of Mae Sariang, where an almost impassable trail (in the rainy season) was followed. At about an elevation of 500 m. Dipterocarpus tuberculatus is replaced by D. obtusifolius, and the first Pinus merkusii occurs about that altitude, too. On some west-east going ridges between Mae Sariang and Khun Yuam an open forest of nearly pure stands of Dipterocarpus obtusifolius and Pinus merkusii was found.

As a sharp contrast to the country found north and south of Mae Sariang, mountains east of the amphur should be mentioned. There all hillsides are bare and transformed into rice fields; the rice is not only grown in the narrow valleys but on terraces up to 1000 m. Natural vegetation is left only in the narrow creeks, where interesting things may still be found, such as just outside the amphur where an extraordinary white *Globba* was found which may be a new species.

The Chiengmai-Chieng Dao area

This area is well-known, as it was one of the main working fields not only for KERR and GARRETT, but also the base of the Thai-Danish expedition in 1958-59. It is, however, still worthwhile paying some attention to this mountainous region, and in the future the new road from Chiengmai-Doi Saket-Wieng Pa Pao to Chiengrai will offer good opportunities for collecting in a very interesting

mountain-range only a little studied so far. At present this road is in the initial stage of construction, and the southern part of the hills between Wieng Pa Pao and Doi Saket was only briefly visited. There local climatic conditions produce evergreen and mixed evergreen forests at low elevations. Meadow-like vegetation was also observed. The whole region deserves thorough investigations in connection with an expedition in the future. The same may be said of the mountains north of Doi Suthep. There the trail from Mae Rim to Sa Moeng running through wet hillside forests may be recommended as a future working field.

During the stay at Doi Suthep in the middle of July exsiccates were collected of bryophytes from this mountain together with fixations for cytological purposes. (Pl. XIII. Fig. 2.)

The humidity in the forest covering the summit of this mountain (1100-1300 m elevation) is very high all the year round; therefore, a bryoflora of the most outstanding development is found; with the meteoriaceous genera *Papillaria*, *Aerobryidium*, and *Floribundaria* as dominating epiphytes together with species of *Homaliodendron*, *Syrrhopodon ambiguus*, and hepatics mainly of the genera *Bazzania* and *Plagiochila*. *Diphyscium rupestre* was collected here for the second time in Thailand; hitherto it has only been collected from Phu Miang.

The Fang Area

In the north-western corner of Thailand the expedition had a week's stay, in part at the agricultural station. Here a high annual precipitation gives a rich evergreen forest in the lowlands at the altitude of 300 m. There the ground flora was rich in Zingiberaceae, e.g. Boesenbergia longiflora, B. pandurata, Curcuma parviflora, and others were found to be common, but such genera as Zingiber, Globba and Kaempferia were also represented by several species. The Araceae were represented as some of the commoner species; also the Marantaceae are an important component in these forests, commonly represented by Haplopegia brachystachys, Stachyphrynium sp., Phynium malaccense, and P. placentarium.

LARSEN & WARNCKE

The border mountains are to some extent influenced by man, as was to be expected from earlier visits to Pha Hom Pok. The pine, *Pinus insularis*, continues in the upper mixed deciduous forest from 800 m. There the forest is very open which may not only be the result of overcutting but due to the stony lateritic soil. During the 1958 expedition the senior author twice drove a landrover from Fang to Chiengrai and collected there during the dry season. This year the same trail was followed, but after 10-12 km the trail was found to be impassable by car. Some of the hills in the neighbourhood and a great swamp area were studied. The first part of the trail seems only to be kept reasonably passable on account of a small wolfram mine run by a Japanese company and an oil refinery. Everywhere the lower hills bear a partly destroyed deciduous forest dominated by *Dipterocar pus tuberculatus*, but in large areas dense bamboo scrub constitutes the secondary vegetation.

It was with some interest that we noticed *Salix tetrasperma* in a small brook. This species, the only generic representative in Thailand, was previously found in the Chiengmai area.

Chieng Dao area

The last area in North Thailand which was investigated is situated north of the Doi Chieng Dao massif.

A find of *Notothylas* (Anthocerotales) in the northern part of this area at the Chiengmai-Fang road is a new record for the country.

From the small hamlet Ban Muang Ngai a trail was followed towards the west, and the three forestry stations, Khun Klong, Pang Bo, and Teen Tok were used as bases of collecting.

Between the main road and Ban Muang Ngai some limestone outcrops harbour a very rich and interesting vegetation of ferns, mosses, *Commelinaceae*, and *Zingiberaceae*. Otherwise the road to Teen Tok led through dry dipterocarpous forest in the lowlands. Teen Tok is situated at the altitude of 600 m. in evergreen forest near a small stream cut down in rather a narrow valley. The forest there is almost unspoiled, with tall trees and very dense under-scrub. It was difficult to find any clear dominants but *Dillenia indica*,

Tetrameles nudiflora, Knema sp., and some Ficus species were among the more prominent representatives. Along the stream which was followed up some kilometres Eugenia siamensis was characteristic all over the area. On the rocks Argostemma, Begonia, and Globba species dominated together with the bryophytes Fissidens nobilis and Dumortiera nepalensis and on sandy soil a 2 metre tall Begonia was collected; Angiopteris evecta was seen everywhere together with many other fern species; Forrestia, Costus, Chloranthus, Piper and several members of the Euphorbiaceae together with Memecylon and Salix tetrasperma lined the stream.

From Teen Tok the road winds uphill very steeply and in the rainy season is very slippery to Pang Bo situated at the altitude of approx. 1000 m. It passes through good upper mixed deciduous forest, and it was with great surprise and disappointment that the Pang Bo camp was reached. This area, which is now under reafforestation is today almost bare hill covered with grassland. All natural vegetation has disappeared. After the first disappointment was overcome the eye fell on some small remains of forest on the hilltops not far from These bits of forest were found to be the last remains of the camp. an evergreen hillside forest of a composition not very different from the nature reserve on Doi Suthep at the same elevation, and along streams also there good collection and interesting finds were made, thus e.g. Botrychium lanuginosum, previously only known from Doi Inthanon, was collected and perhaps one of the most interesting finds of the expedition, a Cotylanthera coerulea; but besides, several temperate genera were noticed such as e.g. Thalictrum sp. and Paris polyphylla. All in all the area is worth-while visiting more than once.

The bryoflora in these last remains of hillside forests showed the same composition of species dependent on constant high humidity as outlined above on Doi Suthep, which really seems to represent the typical mountain vegetation of Northwest Thailand, even if also the Doi Suthep forest is influenced by the hill tribes.

The third forestry station: Khun Klong was visited for a short time. Most of the way from Pang Bo to Khun Klong the trail follows bare hillsides, the elevation of the pass is 1300 m. Only along streams remains of the previously rich vegetation is left.

Pak Thong Chai area (TREND camp)

In the middle of August the eastern part of the vast Khao Yai national park was visited. As base the so-called TREND camp (tropical environment data camp) was used. This area has previously been very difficult of access, but now a new highway constructed from Sattahip to Korat gives the botanist excellent opportunities to work in almost untouched vegetation. The camp is situated at the altitude of 500 m. near the village Pak Thong Chai in a transition area between deciduous and evergreen forests. It was noticed that the evergreen forests there vary a good deal and that the dominants change, probably on account of varied soil factors, which, however, have not yet been studied.

East of the camp an open degraded deciduous forest is found, the dominants being *Dipterocarpus intricatus*, *Sindora maritima* and *Shorea obtusa*; several shrubby species of *Rutaceae*, *Dalbergia*, and *Indigofera* were collected and the interesting endemic leguminous species, *Afgekia sericea* was found to be very common; already CRAIB suggested that it may be closely related to the genus *Millettia*; it may be included in *Millettia* after a closer study. It should be added that *Arundinaria pusilla* is the dominating grass all over the area and that *Cycas siamensis* is extremely common.

West of the camp a dense evergreen forest is met with. There an ecological group undertakes micro-climatological measurements with ultramodern methods. The expedition, however, concentrated on the basic collecting work and succeeded in collecting *Neuwiedia* singapureana once more in Thailand. The evergreen lowland forests have there *Hopea odorata* as one of the dominating species, but apart from this a great number of *Rubiaceae*, *Myrtaceae*, *Euphorbiaceae*, and others were collected.

20-30 km. south of the camp the evergreen forests change, giant Corypha palms were dominating and the whole forest gave the impression of being real untouched jungle. The undergrowth was poor, restricted to only a few species of ferns, *Begonia*, *Elatostemma*, and others which are able to survive in the dark damp environment.

Epiphytic species of *Bazzania* and *Floribundaria* were fairly well represented here. But otherwise the bryoflora was poor.

On the eastern side of the highway the Khao Lotung were visited. Again another type of evergreen forest was found, with big sandstone boulders, which open up the forest and give rise to an interesting plant community, not unlike the one found on the Phu Mieng plateau. Khao Lotung, however, is between 600-800 m. above sea level only. It is a several kilometres long ridge running parallel to the highway.

As conclusion of the stay in the well-equipped TREND camp we should like to emphasize the unique opportunity botanists have got there to be stationed in the middle of an area in which certainly a considerable amount of imformation can be gained. It would be of great importance if the Forest Department could undertake a systematic mapping of the vegetation in the area.

Finally a few days were spent on the southern slopes of the Khao Yai national park at Nakhon Nayok, where the evergreen forests on the steep mountain sides and along the waterfalls were studied. There it was noticed that many of the herbs, common on the top of Khao Kieo at the altitude of 1400 m., follow the streams down to 400 m. on this side. This is thus the case with *Caulokaempferia saxicola*, and some *Gesneriaceae* and *Acanthaceae* earlier described from the top of the mountain.

After our return to Bangkok the future exploration of Thailand was discussed at a conference. It was suggested by the Director of the Forest Herbarium Mr. Tem SMITINAND, that a future Thai-Danish expedition should concentrate on the southern part of the country and there take special interest in the lowland moist forests in the Yala district, and furthermore undertake an investigation of the island of Terutao on the west coast of the Peninsula. It was provisionally settled that the next expedition should be planned for the end of the rainy season in 1970.

LITERATURE

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Nat. Hist. Bull. Siam Soc. 23



Figs. 1 & 2: The drying method: two portable "drying beds" heated by 4 kerosene pressure stoves.



Fig. 1: Phoenix acaulis near Om Koi.



Fig. 2: Iris collettii near the summit of Doi Pha Dam.

Plate XII



Fig. 1: Cycas pectinata at Doi Pha Dam.



Fig. 2: From the hill evergreen forest near the summit of Doi Suthep. The trees have a rich cover of mosses, mainly *Meteoriaceae* of the genus *Papillaria*.

Nat. Hist. Bull. Siam Soc. 23

Plate XIV



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Damrongia purpureo-lineata Craib.