PRELIMINARY REPORT ON THE THAI-DANISH BOTANICAL EXPEDITION TO THE KANCHANABURI PROVINCE 1961/62

by

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(with 1 Map, 9 Figs.)

A grant from the ***Rask-Örsted*** Foundation made it possible for me to revisit Thailand and thus to continue the botanical work started by the fruitful Thai-Danish botanical cooperation during the years 1957-1959. The first expedition has been surveyed by ***Bruun*** (1961) and ***Gram, Syrach Larsen*** & ***Sørensen*** (in ***Larsen*** ed. 1961).

This second botanical expedition was made possible not only by the above-mentioned grant, but first of all because the leader of the Thai-Danish Pre-historic Expedition 1960-62, Dr. ***Eigil Nielsen,*** kindly allowed me to use the camps of this expedition as working bases for the botanical work. The outlines of the pre-historic expedition were published by ***Nielsen*** (1961).

It was an alluring thought for a botanist to go to the so-called River Kwae area, as this is one of the most unexplored regions of Thailand, an area in which not only several species new to science might be expected to occur, and species new to Thailand; but also the whole vegetation pattern of the region is extremely interesting, as this is the place where the evergreen forest from the Malay Peninsula meets the dry deciduous forest of northern and central Thailand. Arid limestone hills alternate with dense primary forest, and different types of savanna forests, deciduous forests, and swamps represent other vegetational types.

In this preliminary report it is intended to draw up the principal lines of the botanical activities. The more special result will go into the treatment of the other collections from Thailand in Copenhagen and be published in the Dansk Botanisk Arkiv in a series " Studies in the Flora of Thailand " edited by the author.

Map of the area investigated. Only the localities from where plant Collections exist are inserted.

The botanical work naturally falls into three phases, viz. 1. November 1961, when Ban Kao at the lower Menam Kwae Noi was used as base (cp. Map Fig. 1), 2. December 1961, when the rafts of the pre-historic expedition, anchored up at the Sai Yok Cave (= Tham Pra) was the centre of the botanical trips, and finally the third phase when I, through the initiative of Mr. ***Tem Smitinand,*** Chief of the Botanical Section, Royal Forest Department, Bangkok, participated in a trip from the lower Menam Kwae Yai to Sri Sawat and from there to the hills between Sri Sawat and Thong Pha Phum (= Tha Khanun). This third phase ranged from medio January to medio February 1962.

Ban Kao at the lower Kwae Noi was chosen as the first working area as the forest there is deciduous and generally the victim of surface fires in January and February. In November, however, the herbal flora had not yet withered, and several rare water plants were collected. The vegetation in the Ban Kao area can be divided into several communities which I have surveyed below.

The banks of the Menam Kwae Noi alternate between steep abrasion cliffs and flat sandy areas in the places where the eroded material is deposited. On these sandy flats the outer zone is stands of pure *Homonoia riparia,* which shrub is extremely tolerant to water-covering and often during the rainy season may be covered with water for several weeks. Other common species are the low trailing shrub *Rhabdia lycioides,* which starts flowering in the later part of November, and *Ficus heterophylla;* behind these *Saccharum spontaneum* is rarely missing here as well as on the steep banks. Another small tree common everywhere is the beautiful flowering *Crataeva nurvula,* while *Salix tetrasperma,* which is so common on the upper Menam Kwae Noi and the Menam Kwae Yai is missing here. At the end of November several herbs are flowering on these sandy areas, e.g. *Cynodon dactylon, Dactyloctenium aegyptiacum, Eleusine indica, Cyperus sp., Fimbristylus sp. Commelina obliqua,* some small *Scrophulariaceae, Amaranthus spinosus, etc.*

On both sides of the river a belt of about two km. is cultivated; there greater plantations of silk cotton (*Bombax malabaricum*) and kapok (*Ceiba pentandra*) are met with and all the villages grow several useful plants. Thus the castor-oil plant (*Ricinus communis*) is among the most important together with tobacco, ground-nuts, beans, pine-apple, papaw (*Carica papaya*), pomelo, and of course several varieties of banana. On the other hand, the soil is not suitable for oranges or mandarins, while lime is frequently in culture. Of minor economic importance but indispensable for daily use is of course chili pepper, lemon grass, sweet potatoes and some *Solanum* species the fruits of which are eaten. Where the soil is lower and water-covered during the rainy season, small paddy fields are seen, but all in all this is not an area suitable for rice until effective irrigation systems have come into use.

The cultivated areas are often interrupted by low-lying areas with loamy soil, water-covered during the rainy season. Such areas harbour a kind of swamp forest with evergreen trees, *Fissistigma sp.*, *Ficus sp.*, rotang and large woody vines as e.g. *Lasiobema scandens.*

The investigations of the natural plant communities have been concentrated on the left bank, where the plain in this place is about 5-7 km. broad calculated from the river and situated at an altitude of about 70 m. above sea level. This plain, outside the above-mentioned cultivated strip, harbours a deciduous forest which is highly influenced by man. All the big trees have been cut for building purposes and for use as sleepers of the railway, which on this stretch (as far as Nam Tok; see map) is still in use, with one train a day in each direction. The forest now left is a poor open savanna forest with groups of bamboo, which is also exploited commercially. The dominating trees on the lateritic soil are *Sindora siamensis* and *Cassia garrettiana.*

Locally, groups of *Shorea obtusa*, *Pentacme suavis*, and *Combretum* (several species) are dominant. Among these low trees a rich grass vegetation of *Coelorrhachis sp.*, *Arundinella setosa*, *Themeda triandra*, and several others occur. On low, temporary water-covered

Fig. 2. Sandy bank of the Menam Kwae Noi at Ban Kao with *Homonoia riparia* shrub.

Fig. 3. Deciduous forest at Ban Kao. Foothills of Khao Pattawee.

areas a rich herbaceous flora is found with *Xyris*, *Eriocaulon*, *Burmannia*, *Fimbristylis*, *Eragrostis* (several sp.).

5-7 km. from the river the hills begin, which all consist of a hard limestone, the so-called Kanchanaburi limestone, which has a very rough surface and often forms more or less inaccessible outcrops of 200-300-400 m.

At foot hills the plains has a soil derived from limestone, which is clearly reflected in the herbaceous flora. Other grasses than on the lateritic soil are dominant here and also the woody flora changes.

Two of the hills were investigated more closely, Khao Talu and Khao Pattawee.

At lower altitudes the ground flora is dominated by herbs, among which may be mentioned a great variety of *Acanthaceae*, several *Gesneriaceae*, some *Labiatae* and one *Impatiens*. On the exposed ridges *Dracaena sp.* and *Euphorbia sp.* are always dominant, often together with one or two species of *Ficus*. The flora of these extremely dry habitats cannot be sufficiently studied during the dry season; June, July, August are the right months to study this "true limestone flora".

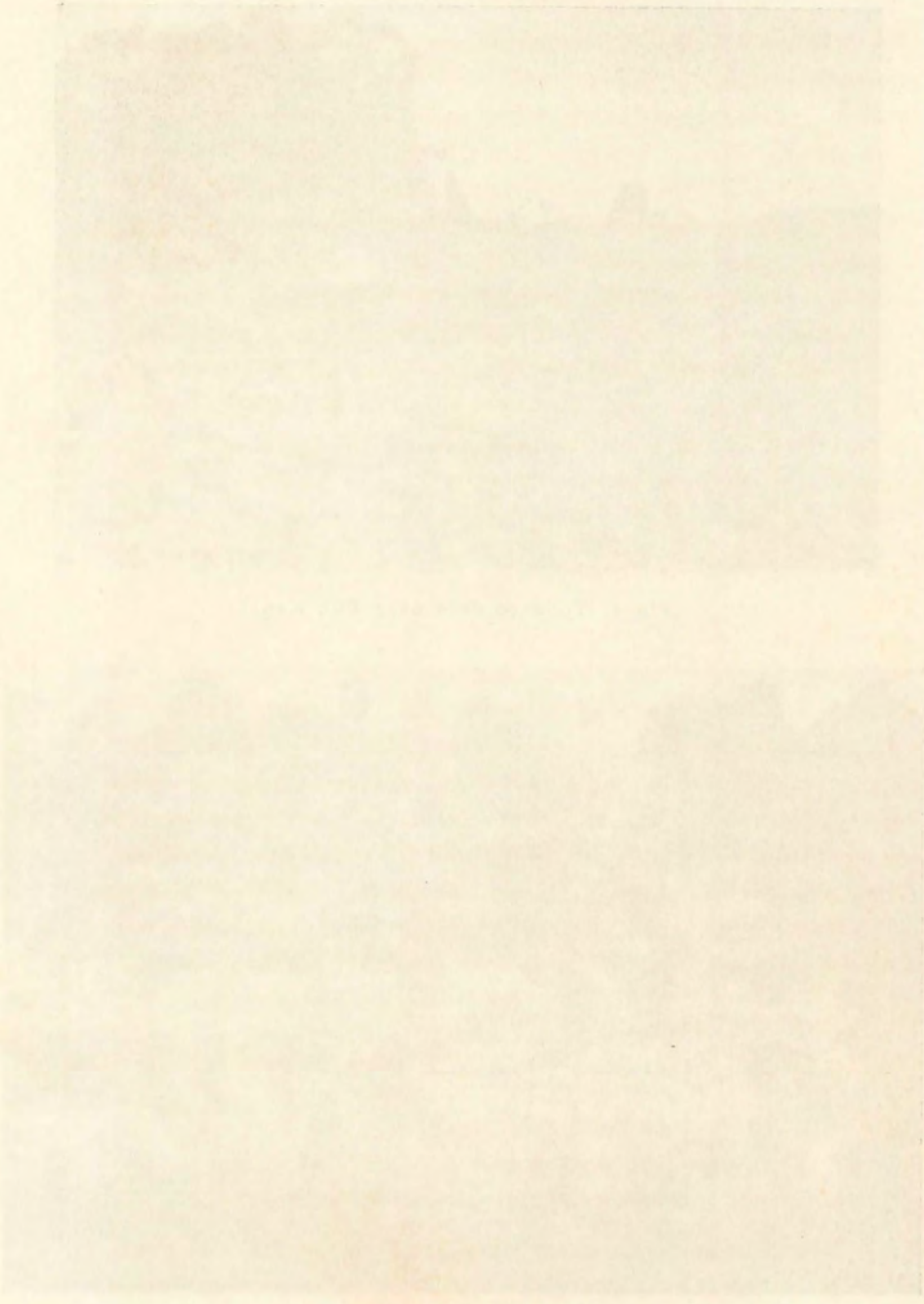
From Ban Kao to Sai Yok, a stretch of about 80 km., the nature changes completely. At Sai Yok (which here indicates the Priests Cave = Tham Pra) the banks are covered with ever-green forest as well as the north-exposed hillsides, while the south-exposed slopes harbour a mixed deciduous forest. Near the river bank *Homonoia riparia* and *Rhabdia lycioides* are still very common, but on the sand other trees mingle with *Crataeva*. One of the most beautiful is *Barringtonia edaphocarpa* the long red pendulous inflorescences colour the banks in January. A large cauliflorous *Ficus* is common everywhere, and it might be mentioned that Sai Yok just means "the swaying fig". On the rocks of the bank *Eugenia limnaea* is always found, and on small sandy patches among the rocks a nice small *Cryptocoryne* is growing. From a forestal point of view it is worth while mentioning that good old trees of *Hopea odorota* are

common on the cliffs. The plain is here very varying in width. Where it is more or less uninfluenced by man good evergreen forest develops, with *Dillenia pentagyna* and other. *Dillenia* species, *Lagerstroemia* (also several species) and a great variety of other genera. In this forest there is often a rich undergrowth of shrubby species and several *Zingiberaceae* are dominant in the rainy season. Here and there, at distances of several kilometres small plantations are found, the proprietors of which nearly always live on rafts on the river. On these small cultivated patches the crops are generally banana and castor-oil plants. As this gives little profit, the men work in the forest for the timber merchants, as elephant–and truck-drivers.

On the right bank of the Menam Kwae Noi at Sai Yok the topography is very varied; already a few hundred metres from the bank the hills, composed of limestone, sandstone, and conglomerate of the Kanchanaburi-series, rise up to several hundred metres and deep dark valleys with primary evergreen forests are found in between. Even in the dry season considerable mountain streams are found in the whole area from the tributary Huey Menam Noi down to Hard Palom, where swamps and swamp forests are found, and even in February the whole vegetation has an extremely luxuriant character. Locally, on the right bank around Hard Palom, and on the left bank from Tapoh downstream, rich mixed teak forests occur. This growth of *Tectona grandis* gives on the whole an impression of being a natural occurrence on areas with special soil conditions. Soil samples have been collected in the teak forest in order to compare it with soil and subsoil of the northern teak forests in the Payap province, particular areas North and East of Chiengmai. It is impossible to tell how large an area the teak covers, but several trees seem to be far over 100 years old and the frequency of teak trees is extremely high. A glance at the soil and vegetation shows close agreement with the best *Tectona* areas for North Thailand, and beyond doubt the plain on the left bank around Sai Yok would be highly suitable for plantations on a large scale.

Fig. 4. Tobacco field near Ban Kao.

Fig. 5. The rafts at Sai Yok.



On the left bank the mixed evergreen jungles rich in bamboo cover large areas. If one starts from Sai Yok towards the east and after about one kilometre climbs the escarpment, a plateau situated at an altitude of about 300 m. is reached. This plateau stretches to the foothills of the mountains between the Menam Kwae Noi and the Menam Kwae Yai, here and there with rough limestone outcrops, which harbour a special flora. A very beautiful species which is never lacking on these hills is the pink orchid *Calanthe rosea*. A great number of *Acanthaceae* is also among the characteristic species, two or three species of *Euphorbia* of the candelabra type and a *Dracaena*. The *Euphorbia's* are certainly other species than those found at Ban Ka, while the *Dracaena* may be the same but unfortunately it was never met with in flower.

Above Tapoh an interesting hillside with large limestone boulders and dominated by scattered palms (*Phoenix humilis*) is found. This plant community seems to be unique around here and local forest people as well as experts from Bangkok had never seen a vegetation type like this. The palms stand single or in groups up to 10, they give evidence of frequent surface fires, but still in January of this year the whole impression was green, and the hillside reminded of an enormous rock garden. On the limestone boulders a special flora occurs, but also here the rainy season will give a better idea of the composition of the flora. One 2 m. high umbellifer, certainly a cow-parsnip belonging to the genus *Herachleum* was found here as dry, fruiting specimens. Besides *Phoenix*, the dipterocarp *Shorea obtusa* is the most predominant tree.

Near the foothills of the high mountains between the rivers great swamp areas are found and around Thung Kang Yang these are cultivated. Outside the farms, swamps with big grasses are seen, and good evergreen forest. In these it was amazing at the beginning of January to find several specimens of flowering *Acer oblonga*, a maple previously only reported from North Thailand.

Few kilometres upstream from Sai Yok the Sai Yok Falls, locally famous for their beauty all the year round, is reached. Here the escarpment of the plateau reaches the river, and a 50 m. high

vertical limestone cliff rises from the water. On the top of this *Dracaena* draws a wonderful silhouette against the sky. Opposite these cliffs, on the right bank, one meets with the tributary Huey Menam Noi, which comes from the watershed forming the Thai-Burmese frontier. The farther one goes from the river towards the west, the more the vegetation bears the impress of higher humidity and certainly higher annual rainfall. Mixed evergreen forest with bamboo alternates with true hillside evergreen forests. Several small streams, all bordered with *Taxotrophis ilicifolia* and an abundance of ferns, run to the Huey Menam Noi, frequently interrupted by small waterfalls.

On the whole the area from the right bank of the Menam Kwae Noi to the frontier is more untouched by man than the left bank. Very rarely one or two houses belonging to a Kareen family or a few domesticated elephants with their drivers are met with. Wild game, however, is not rare here.

The third phase of the expedition started in the middle of January from Sai Yok, where Mr. ***Tem Smitinand*** and the author crossed the mountains between the Menam Kwae Noi and the Menam Kwae Yai with elephants. At Ban Klang, situated at the altitude of 600 m. the first camp was pitched in good evergreen forest with plenty of water. Only a few trees were in flower at that season and already after one night we went down to the Menam Kwae Yai, where a motorboat from the forest station at Erawan was waiting at Keng Ibar. On the boat trip downstream to Erawan it was interesting to note that the hills there seemed much drier than at the Menam Kwae Noi, and that the common Southeast Asiatic willow, *Salix tetrasperma* was abundantly represented with trees of good size, while it is absent from the Menam Kwae Noi south of Sai Yok.

At Erawan forest station we stopped for some days to study the vegetation on the travertine along the series of waterfalls at Erawan and at Keng Liang north of Erawan. In these interesting localities the fern flora was extremely richly developed. The whole area is now by the Royal Forest Department planned as a national park, a part of a great scheme of nature preservation in Thailand.

Fig. 6. Sai Yok, Evergreen forests cover the plain and the hillsides.

Fig. 7. *Phoenix humilis* on limestone hill at Sai Yok.

At the end of January, at Keng Khaep, we joined the divisional forest officier Mr. ***Prasert Yusamran*** from Ban Pong on his inspection trip. By jeeps we travelled from Keng Khaep on the left bank some kilometres from the river on the plateau here situated at an altitude of 300-400 m. Most of this plateau was covered with open, dry deciduous forest with a rich grassland vegetation composed of tall grasses, e.g. *Themda triandra*, *Arundinella setosa* and several others. *Cycas siamensis* is common there as well as *Phoenix humilis* and *Shorea obtusa*. At Sri Sawat (called Ban Song Salung on some maps) the river was crossed on rafts and after one day the trip was continued to the hills between this village and Thong Pha Phum (previous called Tha Khanun). In these hills the altitude at which the party worked are about 800 m. above sea level. Deciduous forest in which *Engelhardia sp.*, several oak species, some *Bignoniaceae*, *Bombax* and *Sterculia* species are dominant alternates with evergreen forests with no clear dominant species and, where the light is sufficient, with a rich undergrowth of *Acanthaceae*, some *Liliaceae* and *Zingiberaceae*. Also these forests ought to be studied during the rainy season where the ground herbs flower. All over the area water is not scarce even in the dry season. Several streams pass through these hills and even a lake of a considerable size is situated at Grerng Gavia. This lake was approached from the trail to Thong Pha Phum, but the thick vegetation of 3 m. high grasses and the swampy, loamy, water-covered soil prevented us from reaching the open water; from a neighbouring hilltop, however, it was observed that it really was an open lake with a broad zone of grass-swamps along the margins. In the loam *Utricularia*, *Najas*, and *Chara* species formed dense masses.

From Thong Pha Phum motorboats were hired, and after short stops at Sai Yok and Keng Lawa I returned to Bangkok with the last collections. The whole material was kindly sent to Copenhagen by the East Asiatic Company.

During the expedition about 2,000 numbers were collected as herbarium specimens, a considerable number of which are also represented as alcohol samples (of flowers, rhizomes, fruits, etc.),

wood samples, and even seed samples for growing in the Botanical Garden, Copenhagen, for cytological studies.

I offer my sincerest thanks to several persons who have all helped to facilitate the work and accomodate me during the travels. The Director-General of the Royal Forest Department, Bangkok, has paid the expedition particular interest and sent one of the officials from the Section of Botany, Mr. ***Chamlong Plengklai*** as assistant to me during the stay at Sai Yok. The Divisional Forest Officier, Mr. ***Prasert Yusamran*** and Mr. ***Suwan Klipbua,*** Proprietor of Mines, during the last trip not only planned the travels extremely well but also gave a fresh example of the famous hospitality of the Thai people; also the managers of the lumber camps in the forests between Sri Sawat and Thong Pha Phum are most heartily thanked for their help during our stays. Mr. ***Sakas Phuengboon,*** the officier in charge of the Erawan forest station and national park during the few days we stayed there at the guesthouse planned two very interesting excursions and placed workers at our disposal; also the officer in charge of the Sai Yok forest station on several occasions was extremely helpful to us.

The Danish Ambassador in Bangkok, Mr. ***Ebbe Munck,*** once more turned the Danish Embassy into the real headquarters of the whole expedition. I wish here to thank him for his great help in several practical matters, for his hospitality, and friendship.

Finally I owe my most cordial thanks to one man for the success of the expedition, the Chief of the Botanical Section of the Royal Forest Department, Mr. ***Tem Smitinand,*** who again has made the whole venture to a piece of real cooperation between Thai and Danish botany.

It is my sincere hope that those ties which were bound during the first Thai-Danish Botanical Expedition and further strengthened during this last expedition in the times to come will prove to be so strong that the botanical cooperation in Thailand can be continued, the exploration of a vast and highly unsatisfactorily known area. Deep jungles still cover large areas in the Tenasserim ranges, in the southeastern hills, as well as in the northeastern mountains. In

Fig. 8. *Bombax insignis*, common tree in mixed deciduous forest in the hills at an altitude of 700 m.

Fig. 9. *Dracaena* sp. on top of limestone outcrop.

the rainy season, unfavourable for travelling, a rich ground flora is flowering, but we know very little about its components, several of which are of great plant-geographical and taxonomical interest. It should not, however, be forgotten that as the forests of Indo-China are rapidly disappearing in order to give room to plantations and fields, we have not indefinite time to explore these jungles. Unfortunately it is today very difficult to travel in most of the countries of Southeast Asia, but Thailand is an exception and the understanding in the Thai Government and Forest Department for the scientific botanical work gives me a hope that this important exploration can be continued.

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