

## A Floristic Survey of Doi Inthanon, Thailand in 1998

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**Abstract** The floristic and vegetational outline are mentioned on the basis of our collection and physiognomical data obtained in February 1998 in Doi Inthanon. Several routes for floristic study were newly surveyed. Natural forest vegetations as well as the vegetation changing from opium fields of about 20 years ago to re-forest plantations were observed. As a result of floristic investigation, 39 species including a presumable new one are added to the flora of Doi Inthanon.

**Key words :** Doi Inthanon, flora, vegetation, new survey routes.

Doi (Mount) Inthanon is the highest mountain in Thailand, 2,590 m in altitude, which is located at the southwest of Chiang Mai, the biggest city in northern Thailand, and forms an independent mountainous area of a large area, about 900 km<sup>2</sup> extending 30 km east and west and 30 km north and south. Topographically, the east slope of this mountainous area is comparatively gentle from the foot about 300 m in altitude at the riverside of the Ping River to the middle elevation about 1,300 m. The slopes in the upper part are distinctively steeper than in the lower part. Main ridge of Doi Inthanon extends from north to south and the top is located at the north of this ridge. The mountain descends abruptly toward the west to the Chaem River. There are two peaks, Doi Liam and Doi Fua Sua (Mt. Tiger's Head), in the south of the peak of Doi Inthanon.

Climatically Doi Inthanon belongs to the tropical monsoon area. There are various types of representative natural forest vegetations with a big scale under the tropical monsoon climate. Mountain slopes from the foot to about 1,000 m in altitude are covered by dry *Dipterocarpus* forests being characterized by deciduous *Dipterocarpus* trees shedding leaves during dry season from early winter to spring. Mountain slopes above about 1,600 m are covered by mountain evergreen broad-leaved forests dominated by *Schima*, *Eugenia*, *Cinnamomum*, *Lithocarpus*, *Castanopsis*, *Quercus* etc. These forests are sometimes also called as hill evergreen forests. Pine forests dominated by *Pinus kesiya* develop on the ridges and mountain slopes between 1,000 m and 1,600 m in altitude and form a vegetational zone between evergreen forest and deciduous one. Evergreen trees growing along the valleys form mixed evergreen forest extending from the middle elevation of the dry *Dipterocarpus* forest to the lower part of the mountain evergreen broad-leaved forest through the pine forests as

Table 1. Representative natural forest in Doi Inthanon.

Altitude (m)	Forest
1,600–2,590	mountain evergreen broad-leaved forest
1,000–1,600	<i>Pinus Kesiya</i> forest
300–1,000	dry <i>Dipterocarpus</i> forest

shown in Table 1 (Robins and Smitinand, 1966).

Doi Inthanon has many important characteristics from the viewpoint of floristic research. 1) It occupies a large mountainous area which is geographically distinguishable from the surrounding ones. 2) It has altitudinally wide range from 300 m to 2,590 m, which causes the diversity of climate from the tropical monsoon in the lower elevation to the temperate one in the higher elevations. 3) Various natural forest vegetations are preserved in a large scale. Temperate floristic elements in East Asia are distributed in the higher elevations of this mountain, while the tropical elements are luxuriant in the lower elevations. Doi Inthanon is, therefore, located at the very important phytogeographical position connecting the temperate flora and the tropical one in East Asia. Thai botanists and many botanists who came from foreign countries including Japan had carried out various floristic researches there. Preliminary check lists of the vascular plants have been published by the third author under the cooperation with Thai specialists (Koyama, 1986, Koyama and Fukuoka, 1990, 1991).

Natural forest vegetations have long been destroyed by the people of hill tribes. Natural forests on gentle slopes have been changed to their houses, gardens, and rice fields. Those on rather steep slopes have been used for opium cultivation in a large scale. The opium cultivations, however, had come to an end until 1970's. Enthusiastic activities by the Royal Project for forest restoration seem to have made effective change in the vegetational condition of Doi Inthanon at present. The central part of Doi Inthanon is being controlled by Royal Forest Department as a national park. Management by Royal Forest Department also seems to support the restoration of the forest vegetations. The Royal Project recently has promoted flower and vegetable cultivation around villages and constructed new roads connecting minorities villages and downhill towns. The life style of minority people in Doi Inthanon is going to change from the opium cultivation with closed for outside community to the flower cultivation with open one. This change of the life style is interesting from the viewpoint of the conservation of biodiversity and/or of the sustainable use of natural resources in Doi Inthanon.

Our field research was carried in February, 1998, as a part of The International Project of the National Science Museum of Tokyo, Japan on the Cooperation with Natural History Museums in Asia and the Countries around the Pacific Ocean. Our research was also carried as a part of Taxonomic Study of the Asclepiadaceae in

Thailand under the Flora of Thailand Project conducted by Fumihiko Konta, under the permission of National Research Council, Thailand.

### **Itinerary and Research Method**

We botanized along many routes in Doi Inthanon (Fig. 1) from 3rd to 18th in February, 1998.

3rd.: Around the Park Headquarters, ca. 1,300 m in altitude; by open plaza and along the stream in evergreen forest and/or edge of it. Along the main road about elevation of 1,700 m, near the top, and along the Angka trail at 2,300 to 2,500 m alt.

4th.: From the Park Headquarters to the north to the Park Check Point No. 5, along the road on the eastern slope of Doi Inthanon and in the source of the Mae Klang Pat River, Ban Phamon village.

5th.: Western slope of Doi Inthanon along the descending road from the Park Check Point No. 2 to Mae Chaem and around two big falls of the Mae Pan and the Huai Sai Luaeng. Taking a long left-handed way around Doi Inthanon via Obluang and Chom Thong.

6th.: From the Park Headquarters to the northern Khun Wang Agricultural Center beyond the Park Check Point No. 5 on the eastern slope of Doi Inthanon. From Khun Wang Agricultural Center to the Park Headquarters taking a long right-handed way around Doi Inthanon via Chom Thong.

7th.: The Siriphum Falls near the Park Headquarters.

8th.: Along descending road from the Headquarters to Mae Klang Water Falls via the Varchirathern Falls and the Visitor Center, and the Mae Ya Falls.

9th.: Along a road extending southwardly from the Park Headquarters to Mae Ya Noi.

10th.: From the Khun Wang Agricultural Center to the western foot of Doi Inthanon beyond the pass at the north of the top of Doi Inthanon.

11th.: From Mae Chaem to the middle slope at 1,100 m in altitude.

12th.: Along the main road to the top.

15th.: From San Pa Tong to Khun Wang along the route No. 1,013.

16th.: Along the narrow road from the 23 km point on the main route of the Doi Inthanon National Park to Ban Khun Klang via Ban Nong Lum, Ban Angka Noi, and Ban Pha Mon.

17th.: Along the main road in both ways from the Park Headquarters to Visitor Center.

18th.: Near the top of Doi Inthanon and along the Gew Mae Pan Trail.

The vegetations were studied from the viewpoint of physiognomy. The floristic research was followed by the usual inventory methods. Herbarium specimens were collected by Fumihiko Konta, Chamlong Phengkklai, Chawalit Niyomdham, and Sumit Khao-Iem. Specimens collected are preserved in the herbaria of National Science

Museum (TNS) in Japan and the Royal Forest Department (BKF) in Thailand. Identification was made by Chamlong Phengkklai and/or Fumihiro Konta except the specimens of which determination was done by other specialists. The list of specimens collected will be published in the other report.

### Results and Discussions

New information and/or results on the study of flora and vegetation of Doi Inthanon were reported in this paper.

Firstly, it could be pointed out that the field works were carried out along the several new routes in addition to the main route in the Doi Inthanon National Park. All research routes in the present survey are shown in Fig. 1. Among them, such routes seem to be new routes for botanists including Thai specialists: 1) a route start-

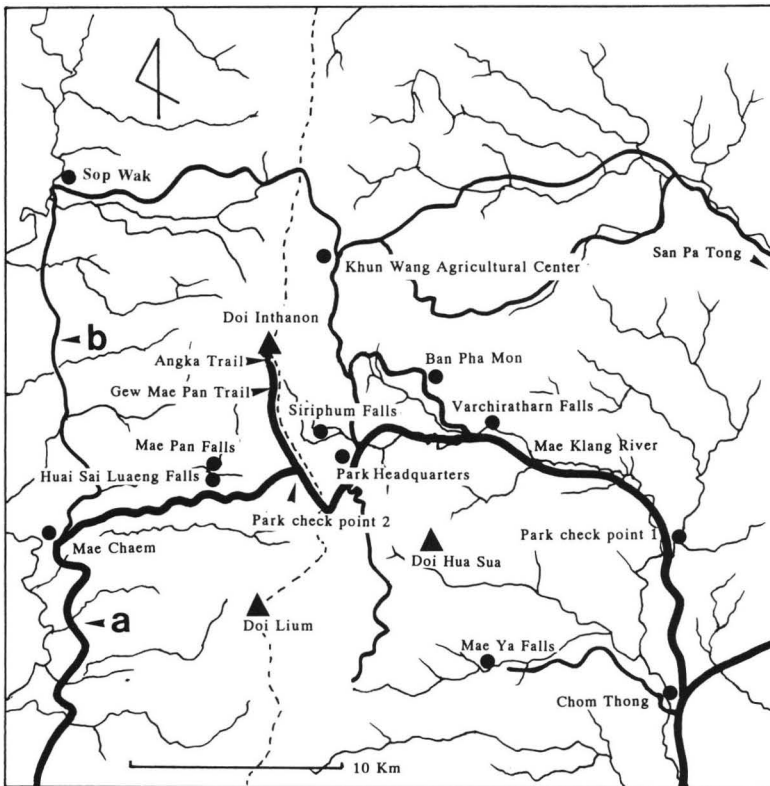


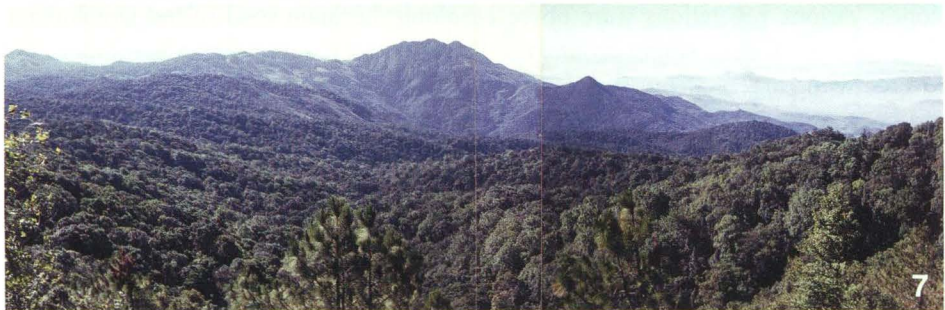
Fig. 1. Map showing topography and research routes in Doi Inthanon. Thick lines (a, b) show the research routes; a shows routes along the drive ways (regional roads) through Doi Inthanon National Park; b shows routes along narrow country roads (the secondary roads); the thin lines show rivers; dotted line shows main ridge of Doi Inthanon.

ing from the Park Headquarters and arriving at Mae Chaem in left-handed manner via Khun Wang Agricultural Center and Sop Wa Mon, 2) two routes elongating from Khun Wang eastwardly and arriving at San Pa Tong, and 3) a route elongating from the Park Headquarters southwardly and arriving at the upper stream of the Mae Ya Falls (Fig. 1). Some routes might be the first for Japanese botanists such as: 1) a route starting from Mae Chaem and arriving at the Park Headquarters in left-handed manner via Op Luang and Chom Thong, 2) Gew Mae Pan Trail, and 3) a route visiting the Mae Ya Falls. The floristic study of Doi Inthanon should be fruitful by the field works along these new routes.

Secondly, it should be pointed out that many specimens were collected including a new species or rare ones. In this work, 116 species were collected. Among them, 39 species are new to Doi Inthanon. A species of genus *Elaeocarpus* is supposed to be new to science. *Saurauia napaulensis* and *Euchresta horsfieldii*, are considered to be rare and endangered species in Thailand. The floristic record of Doi Inthanon has been prepared mainly by the third author and a part was already published (Koyama, 1986; Koyama and Fukuoka, 1990, 1991). There are observed many blooming plants in dry season which are cited below and we could get valuable specimens of these plants.

Thirdly, it was pointed out that the present condition of vegetations and land uses by hill tribes as well as the topography of Doi Inthanon could be observed and recorded with photographs from all directions on the way of the research routes including new ones under clear sky in the dry season.

Representative natural vegetations were confirmed such as the dry *Dipterocarpus* forest covering mountain slopes of lower elevations, the mixed evergreen forest stretching along the valleys of lower elevations, the *Pinus kesiya* forests developing at the middle elevations, and the hill evergreen forest covering top and mountains of higher elevations all of which were recognized by the proceeding works (Robins and Smitinand, 1966; Koyama and Fukuoka, 1991). Altitudinal distribution of these vegetations was observed on both eastern and western slopes. Concerning to the eastern slopes, various vegetations were observed along the main road of the Doi Inthanon National Park. Gentle slopes around the Visitor Center, about 400 m in altitude, were covered with *Dipterocarpus* forests in which leaves of trees have completely shed and soil became to dry up. Plants such as *Butea monosperma*, *Congea tomentosa*, *Dalbergia ovata*, *Cassia bakerina*, *Mintingia calabura*, *Capparis zeylanica*, and *Thunbergia laurifolia* were in full bloom. Trees of *Dipterocarpus turbinatus* with green leaves, about 20 m high, grew in groups along stream of the Mae Klang River about 600 to 900 m in altitudes, though branches of trees on the higher slopes in the valley were completely naked (Fig. 2-1). Pine forests dominated by *Pinus kesiya* have developed on dry slopes near the ridge about 900 to 1,100 m in altitudes. Pine trees were mixed with *Dipterocarpus* trees below 1,000 m and mixed with evergreen ones in higher elevations than 1,000 m. Natural forests on slopes about 1,000 to 2,000 m in



altitudes had been changed to the plantation of opium or artificial forests of *Pinus kesiya* and *Prunus cerasoides* etc. The mixture of artificial pine, *Pinus kesiya*, forests and natural *Dipterocarpus* forests including *Pinus kesiya* was observed from the northeast slope (Fig. 2–2). Plants such as *Bombax ceiba*, *Litsea cubeba*, *Alpinia bracteata*, *Hedychium villosum*, *Buddleja asiatica*, *Mallotus khasianum*, *Castanopsis argyrophylla*, *Wendlandia tinctoria* var. *floribunda*, and *Bischofia javanica* were in full bloom. Natural mountain evergreen broad-leaved forests develop on the main ridge and the eastern slopes in higher elevations than 2,000 m (Fig. 2–4, 2–7). Evergreen trees such as *Schima wallichii*, *Litsea dubelea*, *Lithocarpus eggregata*, and *Naeolitsea foliosa* were observed in the canopy layer of the forest. Deciduous trees such as *Prunus cerasoides*, *Betula alnoides*, and *Sorbus verrucosa* were observed at the edge of forest. *Rhododendron delavayi*, *Rhododendron veitchianum*, and *Vaccinium splengrlii* had flowers as well as deciduous trees cited above.

There are three types of vegetation on the western slope of Doi Inthanon on higher elevations than 1,400 m. They are mountain evergreen broad-leaved forest near the top area, the grassy fields on steep slopes near the main ridge from north to south, and mountain evergreen broad-leaved forest of lower elevations with some deciduous trees about 1,400 to 1,500 m in altitudes (Fig. 2–4).

Vertical vegetational changes were observed on the western slope of Doi Inthanon from the foot at 600 m near Mae Chaem to the middle slope at 1,100 m at intervals of 100 m in altitude. Deciduous forests and cultivated fields developed on gentle slopes in the mosaic manner. Gently waving slopes were covered by dry *Dipterocarpus* forests which were composed of uniform trees belonging to Dipterocarpaceae as well as some *Pinus* trees (Fig. 2–5) at 700 m in altitude. At 800 to 900 m in altitude, slopes were steeper than those at the lower elevations and forests changed from pure *Dipterocarpus* forest to mixing one of *Dipterocarpus* and species such as *Lithocarpus* sp., *Buchanania latifolia*, *Suregada multiflorum*, *Albizia odoratissima*, *Gmelina arborea*, *Rhaphiolepis indica*, etc. However, high density of *Dipterocarpus tubinatus* and *Pinus merksii* forming the canopy layer represented distinctive scenery in the dry season (Fig. 2–6). At the elevations of 900 to 1,000 m, dominant species at the canopy layer was also *Dipterocarpus turbinatus* like in the forests at 800 to 900 m in altitudes, but pine community was changing from *Pinus merksii* to *Pinus kesiya*.

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Fig. 2. Vegetations in Doi Inthanon. 1. Dry *Dipterocarpus* forest on the eastern slope of Doi Inthanon at 600 m in altitude. Trees of *D. turbinatus* with green leaves grow along stream and almost all trees on slopes have no leaves. 2. Forests on the north-eastern slope of Doi Inthanon observed at 1,000 m in altitude. Artificial pine forests and natural *Dipterocarpus* ones are mixing. 3. Mountain evergreen broad-leaved forest near the top of Doi Inthanon. 4. Western slope of Doi Inthanon from 1,400 m in altitude. 5. Dry *Dipterocarpus* forest on the western slope at 700 m in altitude. 6. *Dipterocarpus turbinatus* and *Pinus merksii* forest on the western slope at 900 m in altitude. 7. Mountain evergreen broad-leaved forest and Doi Lium from 1,900 m in altitude on the main ridge near two big pagodas.

Table 2 List of species new to Doi Inthanon.

Species	Collection data
<i>Albizzia odoratissima</i>	10990, 4221*, tree 7 m h.
<i>Ardisia attenuata</i>	10894, 4049, small tree 2 m h, fruits dark red.
<i>Bauhinia ornata</i>	11045, 4295, climber, fl. white.
<i>Bauhinia pulla</i>	10936, 4123, climber.
<i>Bischofia javanica</i>	10897, 4053, tree 14 m h, fl. green.
<i>Bombax ceiba</i>	10829, 3913, tree 27 m h, fl. red.
<i>Buchanania lancifolia</i>	10981, 10858, 3992, 3993, tree 4 m h, fr. dark red.
<i>Butea monosperma</i>	4091, tree 12 m h, fl. orange red.
<i>Cajanus geonisis</i>	3984, 4327, 4047, climbing vine, fl. yellow.
<i>Calotropis gigantea</i>	4343, shrub 2.5 m h, fl. white.
<i>Capparis zeylanica</i>	10909, 4089, climber, fl. white, anther red purple.
<i>Dalbergia obovata</i>	10907, 11038, 4325, 4317, 4068, tree 5–18 m h, fl. white.
<i>Drymaria diandra</i>	3973, fl. white.
<i>Elaeocarpus floribundus</i>	10798, 10917, 3883, 4118, tree 5 m h, fl. white.
<i>Evodia glomerata</i>	4067, 4173, climber, fl. yellow.
<i>Ficus abelii</i>	10926, 4104, small tree 3 m h.
<i>Garcinia speciosa</i>	11036, 4324, tree 12 m h.
<i>Gaultheria discolor</i>	4235, 4372, small tree 70 cm h, fl. white, fr. black.
<i>Glochidion lanceoraliun</i>	10975, 4039, tree 6 m h.
<i>Gluta usitata</i>	4285, 4350, 10856, 3995, tree, bract dark red.
<i>Heteropanax fragrans</i>	10983, 4228, tree 5 m h.
<i>Lindenbergia philippensis</i>	4270, sunny slope by road. fl. yellow.
<i>Macropanax dispermus</i>	10901, 4067, tree 7 m h, fr. black.
<i>Mahonia siamensis</i>	10944, 4149, shrub 3 m h.
<i>Mallotus paniculatus</i>	11033, 4328, tree 5 m h, fr. reddish brown.
<i>Melastoma malabathricum</i>	10937, 4130, 4208, shrub 1–2.5 m h.
<i>Mucuna thailandica</i>	11001, 4238, climber, fl. pale green.
<i>Muntingia calabra</i>	3996, tree 5 m h, fl. white, by the roadside.
<i>Nothaphoebe umbelliflora</i>	10963, 10835, 10842, 3923, 3938, 4171, tree.
<i>Phlogacanthus curviflorus</i>	4146, 4204, 10945, small tree 4 m h, fl. brown.
<i>Phoebe cathia</i>	10960, 10841, 10896, 4166, 3928, 4064, tree.
<i>Pterospermum grande</i>	11039, 4334, tree 7 m h, fr. brown.
<i>Rhaphiolepis indica</i>	10992, 4231, tree 5–10 m h, fl. greenish yellow.
<i>Semecarpus cochinchinensis</i>	11030, 4333, tree 13 m h, fr. green.
<i>Solanum indicum</i>	4133, 4155, shrub 1–2.5 m h, fl. white, roadside.
<i>Spatholobus pottingeri</i>	10893, 11029, 4059, 4330, climber, fl. red-brown.
<i>Suregada multiflorum</i>	10987, 4216, tree 10 m h, fl. yellow.
<i>Trema angustifolia</i>	4002, tree 6 m h, in thickets.
<i>Wendlandia tinctoria</i> var. <i>floribunda</i>	10859, 3994, 4000, 4286, tree 4 m h, fl. yellowish white, roadside, common.

\* numeral shows collection number.



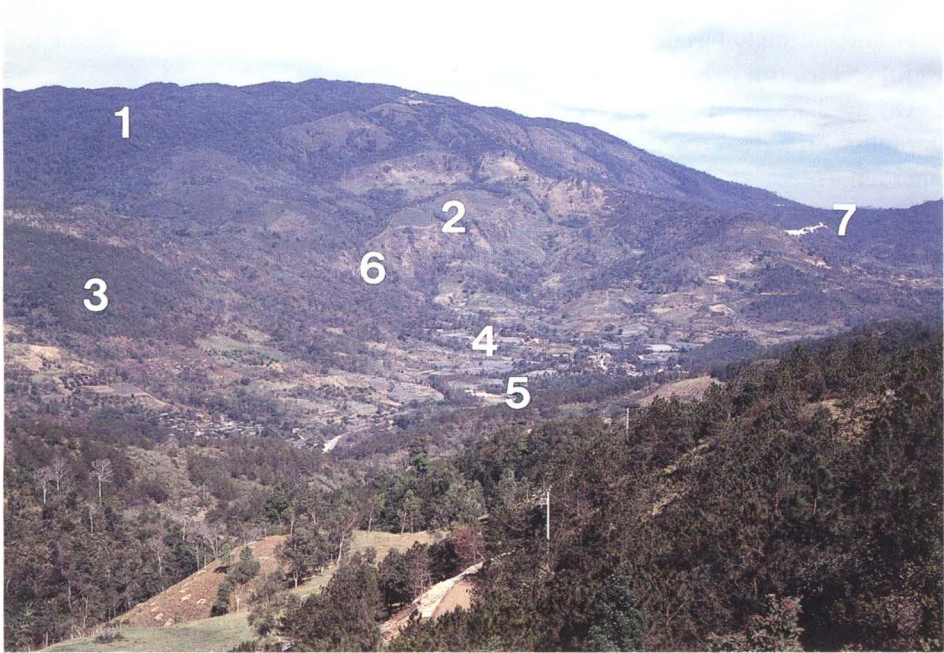


Fig. 3. Forest vegetation and land use of Doi Inthanon observed from the south-eastern middle slope. Detailed explanation is given in the text.

Boundary between the dry *Dipterocarpus* forests and the mountain evergreen broad-leaved ones (Fig. 2–7) was recognized at about 1,000 to 1,100 m on the both eastern and western slopes and the pine forest developed at this altitudinal zone.

We observed the topography and the vegetational conditions on the southeastern slopes of Doi Inthanon including the Park Headquarters at a ridge about 1,500 m in altitude (Fig. 3). In Fig. 3, natural mountain evergreen broad-leaved forest covering higher elevations of main ridge of Doi Inthanon (Fig. 3–1), grassy slopes occupying the central part showing the past opium plantations (Fig. 3–2), plantations of *Pinus kesiya* (Fig. 3–3), cultivated fields for flowers and green houses in hill tribe's Ban Khun Klang village (Fig. 3–4), plaza in the Park Headquarters (Fig. 3–5), the Siri-phum Water Falls (Fig. 3–6), the new road to Khun Wang (Fig. 3–7) etc. were recognized.

Artificial forests were mainly composed of *Pinus kesiya* and there were some *Prunus cerasoides* and *Quercus* spp. as well. These artificial forests have been made at slopes where cultivation of opium had been carried out in the past. Afforestation has been supported by the fund of the Royal Project. The opium fields near the villages have changed to cultivated lands of flowers at present.

### Conclusion

1. A floristic study has been carried out along several new routes, which seem to be useful and fruitful in botany.
2. On the herbarium specimens collected, 116 species including 39 new records to Doi Inthanon were recognized. The list of specimens collected will be published in the other report.
3. The vegetations under both natural and artificial conditions at present were recorded in physiognomy.

### Acknowledgement

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