

## PTERIDOPHYTE FLORA OF KHUN KORN WATERFALL FOREST PARK, CHIANG RAI PROVINCE, THAILAND

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### ABSTRACT

An enumeration of the pteridophytes of Khun Korn Waterfall Forest Park, Chiang Rai Province, is presented. This is the first report for the area, which includes 154 species and 11 infraspecific taxa in 24 families and 64 genera. *Selaginella ciliaris* (Retz.) Spring (Selaginellaceae) and *Dicranopteris linearis* (Burm.f.) Underw. var. *montana* Holttum (Gleicheniaceae) are newly recorded for Thailand. Furthermore, unusual distributions of 14 pteridophyte species are discovered. This forest park, in comparison with the other adjoining protected areas, shows high pteridophyte diversity. However, two endemic fern species originally collected from Chiang Rai Province could not be found. Habitat degradation by humans has probably reduced pteridophyte diversity in the park.

Key words: Chiang Rai Province, *Dicranopteris linearis* var. *montana*, fern survey, new records, pteridophytes, *Selaginella ciliaris*

### INTRODUCTION

Thailand is estimated to have 10,000 species of vascular plants by SANTISUK *ET AL.*, (1991), but as many as 20,000–25,000 species by the NATIONAL BIODIVERSITY UNIT (1992). It is expected that with continued site-specific botanical surveys, many new taxa or new records will be found (OEPP, 1996). Thus, botanical research in many specific areas of Thailand is needed to add new knowledge to the Flora of Thailand Project (SANTISUK *ET AL.*, 1991).

Despite its rich plant diversity, Chiang Rai is rather poorly explored botanically as compared with the neighboring province Chiang Mai. A preliminary survey of Khun Korn Waterfall Forest Park revealed the fern, *Lomagramma grossoserrata* Holttum. This species was hitherto known only from the type collection from Phrae Province (TAGAWA & IWATSUKI, 1988). It is believed that the forest park also houses other Thai endemics, such as *Antrophyum winitii* Tagawa & K. Iwats. which has been found only once in Chiang Rai (TAGAWA & IWATSUKI, 1988). This research project aimed to explore plant diversity at Khun Korn Waterfall Forest Park with specific reference to pteridophyte diversity.

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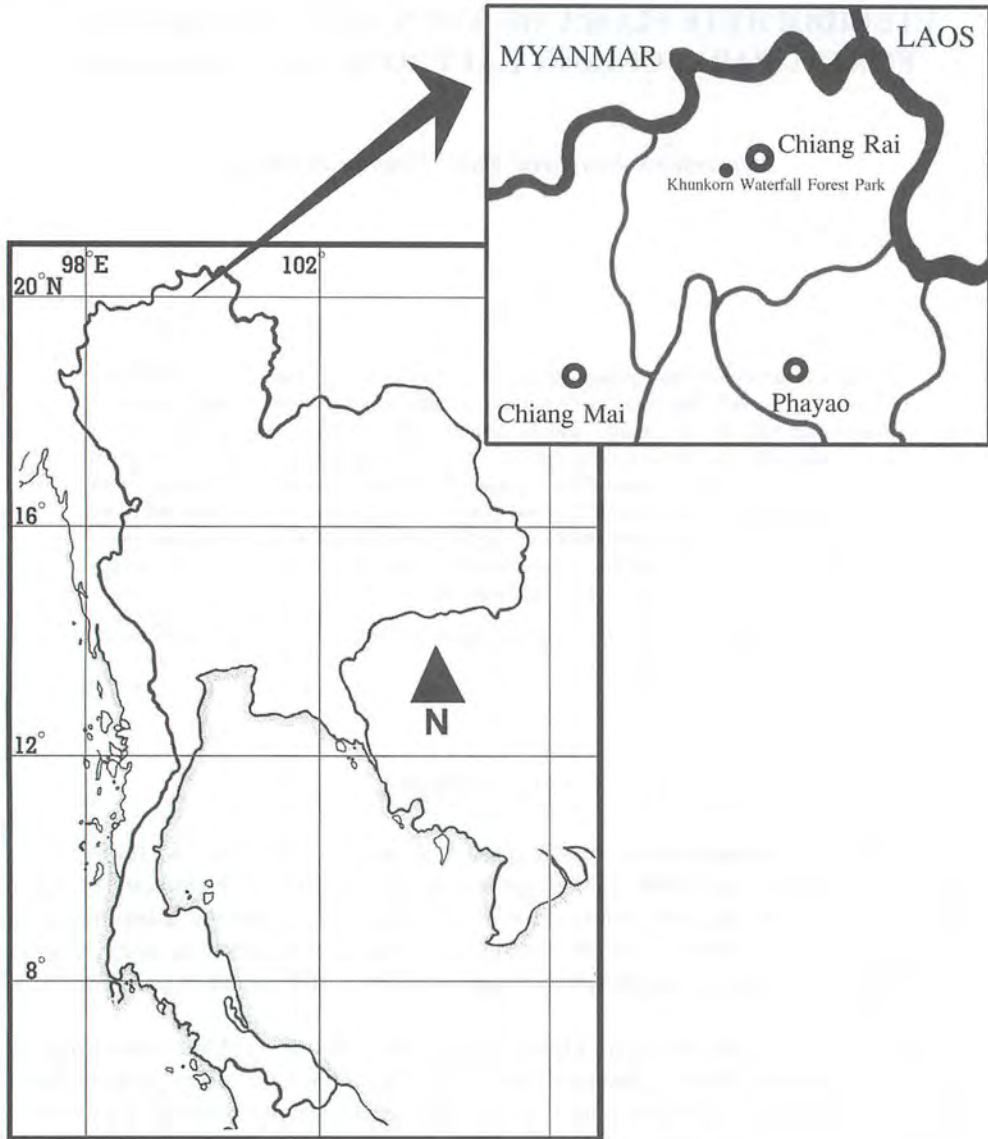


Figure 1. Map of Khun Korn Waterfall Forest Park, Chiang Rai Province.

## THE STUDY AREA

Khun Korn Waterfall Forest Park (19° 51–54' N, 99° 35–39' E) was established in 1979. It is located on the western side of Mae Lao Forest and on the eastern side of Mae Kok Forest in Muang District, Chiang Rai Province (Fig. 1), and is about 26 km northwest of the city center. The forest park occupies parts of Mae Korn and Huai Chomphu subdistricts and has a total area of 18 km<sup>2</sup>. It is bounded on the north by Doi Mae Korn at Ban Pang Takhrai and Ban Pang Khon, on the south by Doi Chang and Doi Mae Mon at Ban Li So Mae Mon, on the east by Huai Ya Dee, and on the northwest by Doi Kia. It is a mountainous area, lying in the continental highlands. PENDELTON (1962) described this physiographic region as a southward extension of the Shan Hills of Myanmar. Its elevation varies from about 625 m above sea level along highway 1208 to 1,635 m at the summit of Doi Kia.

The climate of the area is monsoonal with a strong alternation of wet and dry seasons. The northwest monsoon causes heavy rain during August–September. February is the driest month due to the occurrence of the dry northeast monsoon. The nearest meteorological station is in Chiang Rai at 394 m elevation. Climatological data covering 1970–2000 (Meteorological Department, 2000) show average annual rainfall of 1755 mm, and average annual relative humidity of about 77%, with the highest humidity during August–December of 95%. The average annual temperature is about 24.1°C. The average maximum temperature is about 34.8°C in April, and the average minimum is 12.0°C in January (Fig. 2).

The vegetation of Khun Korn Waterfall Forest Park can be classified into moist upper mixed deciduous forest, dry upper mixed deciduous forest and hill evergreen forest (Royal Forest Department, 1962). Some parts of the forest park, especially the hill evergreen forest, are disturbed by hilltribe people.

## PREVIOUS STUDIES

During 1902–1932, Dr. A. F. G. Kerr was among the first pioneer botanists to explore plant diversity in Thailand. Most of his collections, about 25,000 numbers including several type specimens, were sent to Kew Herbarium for identification. Most of the flowering plants were studied by Dr. W. G. Craib who published his taxonomic work in *Florae Siamensis Enumeratio* (LARSEN, 1979) but ferns were studied by Dr. Eryl Smith.

During 1957–1960, Dr. R. E. Holttum of Kew collaborated in “Studies in the Flora of Thailand”. He examined and identified 157 species of ferns, many of them reported for the first time, and new species were found. It was the first time that fern collections from various parts of Thailand were studied together (SMITINAND, 1962).

During 1965–1966, Dr. M. Tagawa and Dr. K. Iwatsuki from Kyoto University collected more than 7,000 specimens of pteridophytes from all over the country. A total of 633 species belonging to 132 genera and 34 families were enumerated and 25 new species were found, 21 of these endemic to Thailand (TAGAWA & IWATSUKI; 1979, 1985, 1988, 1989).

BOONKARD & POLLAWATN (2000) compiled data from various sources as well as from their own field trips to produce a checklist of ferns and fern allies in Thailand. A total of 671 species, 4 subspecies, and 28 varieties belonging to 139 genera and 35 families were enumerated. This checklist included 27 new records for Thailand.

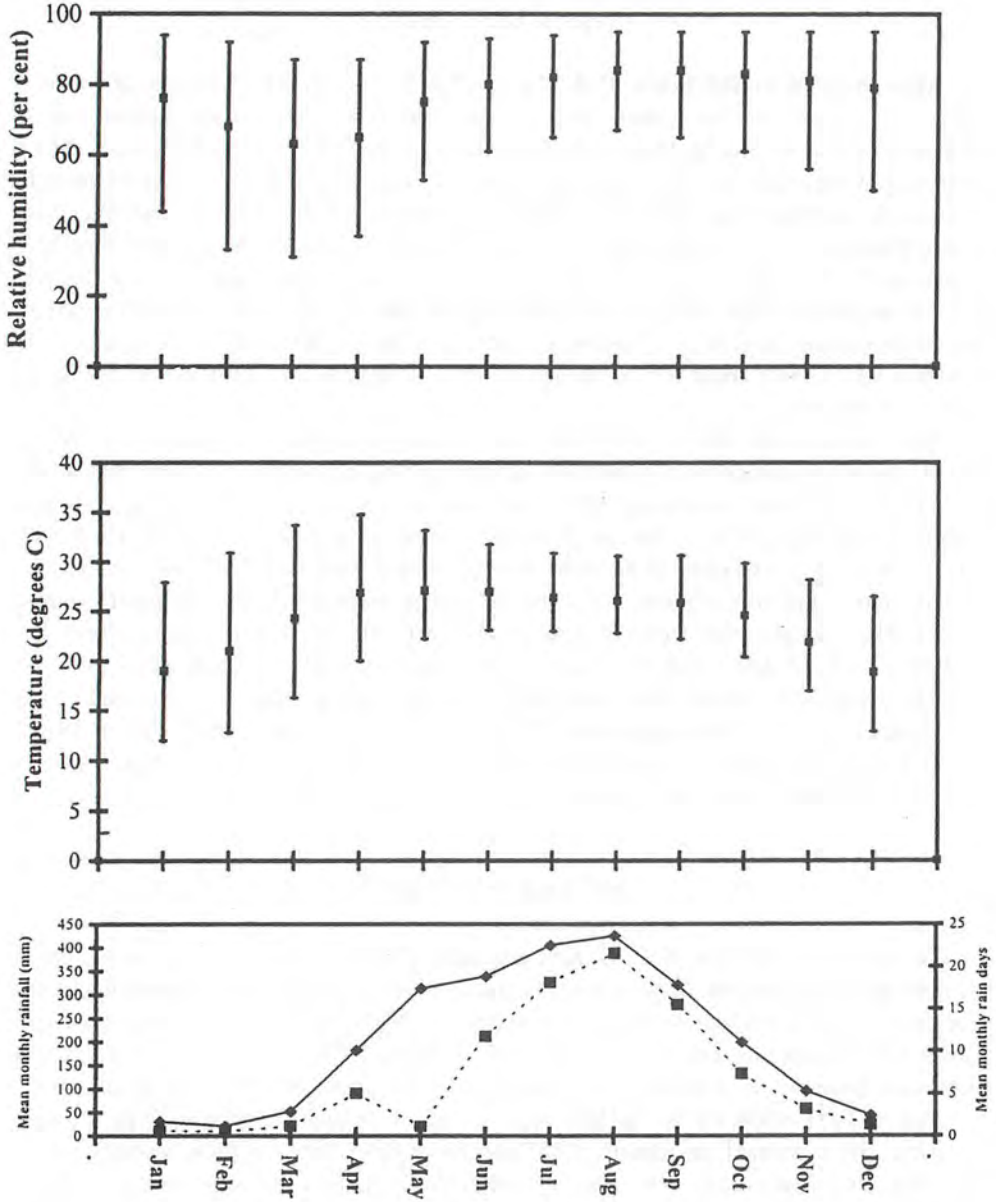


Figure 2. Climatological Data during 1970–2000 from Chiang Rai Station at 394 m above sea level (Meteorological Department, Bangkok, Thailand). ■—■ mean rainfall ■·····■ mean rainy days

Botanical surveys of pteridophytes in Chiang Rai Province, however, have been scarce. More site-specific plant collections are needed to determine the distribution of the pteridophyte flora.

## METHODS

We made botanical surveys and collections from Khun Korn Waterfall Forest Park from October 1997 until October 1999. Attempts were made to visit all habitats and areas every month so as to cover all species distributions. Herbarium specimens were determined using keys to the families, genera and species in TAGAWA & IWATSUKI (1979, 1985, 1988, 1989). For comparison, we examined herbarium specimens deposited at the following herbaria: BCU, BK, BKF, BM, K, L, and P. The families of pteridophytes in this paper are arranged according to BOONKERD & POLLAWATN (2000), with genera listed alphabetically. Herbarium specimens have been deposited at the Professor Kasin Suvatabhandhu Herbarium, Department of Botany, Chulalongkorn University (BCU), and at the Forest Herbarium of the Royal Forest Department (BKF).

## RESULTS

A total of 357 specimens of ferns and fern allies were collected. Appendix 1 enumerates 138 species and 11 infraspecific taxa belonging to 60 genera and 21 families of ferns and 16 species belonging to 4 genera and 3 families of fern allies, together with their habits, habitats, and abundance.

### **Pteridophyte Habitat**

The ferns and their allies in the study area include terrestrial, epiphytic, lithophytic and rheophytic species (Table 1). Among the species collected, terrestrials were the richest in number (96 species), whilst rheophytes were represented only by *Microsorium pteropus* (Blume) Copel. (Polypodiaceae), a medium-size fern growing on rocks in streams or waterfalls. During the rainy season it can withstand flooding for a considerable period of time. It is not surprising that this rheophyte is a common aquarium species worldwide. The distinction between terrestrial and lithophytic species is not always obvious. Lithophytes grow on top of or beside mostly bare rocks. These pteridophytes grow fine, extensive root systems, enabling them to penetrate the rock crevices where humidity is available. Some of the terrestrial species include those growing on soil-covered rocks; for example *Bolbitis heteroclita* (Presl) Ching ex C. Chr., *Bolbitis virens* (Hook. & Grev.) Schott var. *virens* (Lomariopsidaceae), *Oleandra undulata* (Willd.) Ching (Oleandraceae) and *Microsorium cuspidatum* (D. Don.) Tagawa (Polypodiaceae); and also *Selaginella minutifolia* Spring (Selaginellaceae). Apart from the 9 lithophytes, 2 other species of ferns were found in two other substrates: *Lomagramma grossoserrata* Holttum (terrestrial or lithophyte) and *Drynaria bonii* (epiphyte or lithophyte).

Table 1. Number of pteridophytes according to habitat.

Group/Habitat	Terrestrial	Epiphyte	Lithophyte	Rheophyte
Fern allies	14	2	0	0
Ferns	82	49	9	1
Total	96	51	9	1

### Pteridophyte Diversity and Vegetation

Moist upper mixed deciduous forest exists from 650 to 800 m. This type of forest is characterized by seasonally high air humidity, as well as a shady ground environment. Eighty species of pteridophytes were found in this forest type with 59 terrestrial, 9 lithophytic, and 11 epiphytic species. The families best represented were Polypodiaceae (16 species), Thelypteridaceae (13 species), Selaginellaceae (8 species) and Dryopteridaceae (7 species).

Dry upper mixed deciduous forest is found along ridges from 650 to 800 m. The ground vegetation in this type of forest is more frequently affected by fire, especially during January–April. Fifty-two species of pteridophytes were collected; including 39 terrestrial species and 13 epiphytic species. They were mostly members of Polypodiaceae (11 species), Thelypteridaceae (7 species), Adiantaceae (5 species), Dryopteridaceae (4 species) and Selaginellaceae (4 species).

Hill evergreen forest is usually found above 1,000 m. The relative humidity is high, and this type of forest contains more epiphytic species. In all, 80 species of pteridophytes were found including 41 species of epiphytes and 39 terrestrial species. Polypodiaceae (25 species), Dennstaedtiaceae (7 species), Selaginellaceae (6 species), and Davalliaceae (6 species) were the most common families.

### Endemic Species

Of the 154 species of pteridophytes, 3 species endemic to Thailand were found in the study area: *Selaginella lindhardii* Hieron, *Christella siamensis* Tagawa & Iwatsuki., and *Lomagramma grossoserrata* Holttum. *Selaginella lindhardii*, with a restricted distribution in Tak, Bangkok and Ratchaburi (TAGAWA & IWATSUKI, 1979). *Lomagramma grossoserrata*, known only from the type locality of Phrae Province (TAGAWA & IWATSUKI, 1988), thrives along streams or waterfalls from 650 to 800 m in moist mixed deciduous forest. *Christella siamensis* has been collected from Phu Miang in Phetchabun and Phu Luang in Loei Provinces (TAGAWA & IWATSUKI, 1988).

### New Records

Two taxa of ferns and fern allies are newly recorded for Thailand. *Selaginella ciliaris* (Retz.) Spring, known from mainland China, Taiwan, Philippines, India, and Australia (DEVOL, 1975a), is common in Khun Korn Waterfall Forest Park in slightly exposed areas on the mountain slopes at 670–800 m altitude (RACHATA & BOONKERD, 2001). The other new record, *Dicranopteris linearis* (Burm.f.) Underw. var. *montana* Holttum, is known from tropical Africa, Asia, and Australia (DEVOL, 1975b). This variety occurs in soil of mountain ridges in dry forests from altitudes of about 950 to 1,300 m.



Figure 3–6. 3, *Selaginella ciliaris*, a new record for Thailand on hill slopes at 670–800 m altitudes. 4, Strobili of *Selaginella ciliaris*. 5, *Dicranopteris linearis* var. *montana*, a new record for Thailand on mountain ridge at 975 m altitude. 6, Venation and sori of *Dicranopteris linearis* var. *montana*.



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Figure 7–10. 7, A population of wan kai noi, *Cibotium barometz* on hill slopes at 900–1,200 m. 8, *Drynaria parishii* on a fallen mossy log in hill evergreen forest at 1,350 m altitude. 9, *Lomagramma grossoserrata*, an endemic fern along stream from 650–800 m in moist mixed deciduous forest; showing fertile pinnae. 10, *Diplazium muricatum* by stream in moist mixed deciduous forest.



## DISCUSSION

**Expected Species**

A total 155 species of ferns and fern allies are reported from Chiang Rai Province by TAGAWA & IWATSUKI (1979–1989). These include 3 endemic fern species, viz. *Bolbitis tonkinensis* (C. Chr. ex Ching) K. Iwats. (Lomariopsidaceae), *Anthophyllum winittii* Tagawa & K. Iwats. (Vittariaceae), and *Cyathea chinensis* Copel. (Cyatheaceae) only collected from Chiang Rai. These were not found during our surveys. However, *Bolbitis tonkinensis* is rare in Thailand since only one collection has been made in Chiang Rai at 550 m altitude (TAGAWA & IWATSUKI, 1988). *Anthophyllum winittii* also a rare endemic species known only from the type specimen, although ANUSARNSUNTHORN ET AL. (1999) reported this species in Doi Luang National Park, Chiang Rai. *Cyathea chinensis*, a tree fern, is also rare in Thailand, with its southern-most distribution in Chiang Rai (TAGAWA & IWATSUKI, 1979).

Khun Korn Waterfall Forest Park is in a mountainous area where tribal people still practice shifting cultivation and the forests have been severely degraded and modified. Parts of the study area have been deforested, and a consequence, some pteridophytes have probably been extirpated.

**New Information on Pteridophyte Distribution in Thailand**

Among the 154 species and 11 infraspecific taxa studied, 79 taxa have been previously recorded from Chiang Rai Province (TAGAWA & IWATSUKI; 1979, 1985, 1988, AND 1989), whereas 86 taxa have not been recorded previously, including widespread species such as *Bolbitis appendiculata* (Willd.) K. Iwats. (Lomariopsidaceae), *Blechnum orientale* L., (Blechnaceae) and *Tectaria angulata* (Willd.) C. Chr. (Dryopteridaceae).

Fourteen species have never been found in northern Thailand previously (MAXWELL, 2002; TAGAWA & IWATSUKI; 1979, 1985, 1988 AND 1989). These are:

- Aspleniaceae: *Asplenium macrophyllum* Sw., *Asplenium perakense* Mathew & Christ,
- Gleicheniaceae: *Dicranopteris curranii* Copel.;
- Hymenophyllaceae: *Hymenophyllum acanthoides* (van den Bosh) Copel., *Trichomanes bimarginatum* van den Bosch;
- Polypodiaceae: *Belvisia mucronata* (Fée) Copel., *Pyrrosia varia* (Kaulf.) Farw., *Lepisorus suboligolepidus* Ching;
- Pteridaceae: *Pteris tripartita* Sw.;
- Selaginellaceae: *Selaginella wallichii* (Hook. & Grev.) Spring;
- Thelypteridaceae: *Pronephrium glandulosum* (Blume) Holttum;
- Vittariaceae: *Vittaria angustifolia* Bl.;
- Woodsiaceae: *Diplazium petri* Tard., *Diplazium simplicivinium* Holttum.

Four of these 14 species, namely *Asplenium perakense*, *Pronephrium glandulosum*, *Selaginella wallichii* and *Trichomanes bimarginatum*, have previously been recorded only in peninsular Thailand, Malaysia and Indonesia. Their occurrence in Chiang Rai indicates a disjunct distribution (HOLTTUM, 1954; TAGAWA AND IWATSUKI, 1979, 1985, AND 1988).

### Pteridophyte Diversity

Some workers have used the species/genus ratio to assess taxonomic diversity of plants and animals (e.g. BARNOSKY *ET AL.*, 2001; CONGDON, 1982). Accordingly, the pteridophyte diversity found in the park can be compared with that recorded in nearby protected areas in Chiang Mai and Chiang Rai (Table 2). The species/genus ratio for Khun Korn Waterfall Forest Park is 2.33, while the highest and lowest values were from Doi Suthep-Pui and Doi Luang, respectively. The general similarity between Khun Korn Waterfall Forest Park and the other four sites, despite its much smaller size, suggests that this park is particularly rich in pteridophyte diversity. However, more comprehensive studies and intensive surveys of pteridophytes need to be carried out in the other four areas mentioned.

Table 2. Summary of pteridophyte diversity in five northern protected areas.  
WS = wildlife sanctuary, NP = national park

Protected area	Bedrock	Altitude (m)	Total area (km <sup>2</sup> )	Families	Genera	Species	Species/genus ratio
Doi Chiang Dao WS <sup>1,2,3</sup>	Limestone	300–2,225	521	18	46	98	2.13
Doi Inthanon NP <sup>4</sup>	Granite, limestone	300–2,565	272	24	67	171	2.55
Doi Suthep-pui NP <sup>5,6</sup>	Granite	350–1,685	261	27	65	174	2.67
Doi Luang NP <sup>7</sup>	Granite, limestone	400–1,710	1170	21	48	87	1.81
Khun Korn Waterfall Forest Park	Granite, limestone	625–1,635	<b>18</b>	<b>24</b>	<b>66</b>	<b>154</b>	<b>2.33</b>

Notes : <sup>1</sup>NANAKORN (1998); <sup>2</sup>MAXWELL (1992); <sup>3</sup>MAXWELL (1998); <sup>4</sup>KOYAMA (1986); <sup>5</sup>TAGAWA & IWATSUKI (1979, 1985, 1988 AND 1989); <sup>6</sup>MAXWELL & ELLIOTT (2001); <sup>7</sup>ANUSARNSUNTHORN *ET AL.* (1999)

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**Appendix 1.** The Pteridophytes of Khunkorn Waterfall Forest Park.

Habit: T = terrestrial herb, E = epiphytic herb, L = lithophytic herb R= rheophytic herb

Habitat: 1 = Moist Upper Mixed Deciduous Forest 2 = Dry Upper Mixed Deciduous Forest

3 = Hill Evergreen Forest

Abundance: R = rarely found UC = uncommon C = common A = abundant

Family	Species	Habit	Habitat	Abundance
Lycopodiaceae	<i>Huperzia hamiltonii</i> (Spreng.) Trevis.	E	3	UC
	<i>Lycopodiella cernua</i> (L.) Pic. Serm.	T	2	C
Selaginellaceae	<i>Selaginella amblyphylla</i> Alston	T	1	UC
	<i>Selaginella ciliaris</i> (Retz.) Spring	T	1	UC
	<i>Selaginella delicatula</i> (Desv. ex Poir.) Alston	T	3	C
	<i>Selaginella helferi</i> Warb.	T	2, 3	UC
	<i>Selaginella inaequalifolia</i> (Hook. & Grev.) Spring	T	1	UC
	<i>Selaginella involvens</i> (Sw.) Spring	E	3	UC
	<i>Selaginella kurzii</i> Baker	T	2, 3	UC
	<i>Selaginella lindhardii</i> Hieron.	T	1, 3	UC
	<i>Selaginella minutifolia</i> Spring	T	1, 2	UC
	<i>Selaginella monospora</i> Spring	T	1	UC
	<i>Selaginella pennata</i> (D. Don) Spring	T	2, 3	UC
	<i>Selaginella tenuifolia</i> Spring	T	1	UC
	<i>Selaginella wallichii</i> (Hook. & Grev.) Spring	T	1	UC
	Equisetaceae	<i>Equisetum debile</i> Roxb. ex Vauch.	T	1
Marattiaceae	<i>Angiopteris evecta</i> (G. Forst.) Hoffm.	T	1	C
Ophioglossaceae	<i>Botrychium lanuginosum</i> Wall. ex Hook. & Grev.	T	3	R
	<i>Ophioglossum petiolatum</i> Hook.	T	1	C
Hymenophyllaceae	<i>Hymenophyllum acanthoides</i> (Bosch) Roscenst.	L	1	UC
	<i>Hymenophyllum exsertum</i> Wall. ex Hook.	E	3	UC
	<i>Hymenophyllum polyanthos</i> (Sw.) Sw.	E	3	C
	<i>Trichomanes bimariginatum</i> Bosch	L	1	UC
Gleicheniaceae	<i>Dicranopteris curranii</i> Copel.	T	2	UC
	<i>Dicranopteris linearis</i> (Burm.f.) Underw. var. <i>linearis</i>	T	2, 3	C
	<i>Dicranopteris linearis</i> (Burm.f.) Underw. var. <i>montana</i> Holttum	T	2	UC
Schizaeaceae	<i>Lygodium flexuosum</i> (L.) Sw.	T	1, 2, 3	C
	<i>Lygodium polystachyum</i> Wall. ex T. Moore	T	1, 2, 3	C
	<i>Lygodium salicifolium</i> C. Presl	T	1, 2, 3	C

Family	Species	Habit	Habitat	Abundance	
Dennstaedtiaceae	<i>Hypolepis punctata</i> (Thunb.) Mett. ex Kuhn	T	3	UC	
	<i>Microlepia calvescens</i> (Wall. ex Hook.) C. Presl	T	3	C	
	<i>Microlepia speluncae</i> (L.) T. Moore	T	1, 2, 3	C	
	<i>Microlepia strigosa</i> (Thunb.) C. Presl	T	3	C	
	<i>Pteridium aquilinum</i> (L.) Kuhn subsp. <i>aquilinum</i> var. <i>latiusculum</i> (Desv.) Underw. ex A. Heller	T	3	A	
	<i>Pteridium aquilinum</i> (L.) Kuhn subsp. <i>aquilinum</i> var. <i>wightianum</i> (J. Agardh) R.M. Tryon	T	1, 2, 3	C	
	<i>Pteridium aquilinum</i> (L.) Kuhn subsp. <i>caudatum</i> var. <i>yarrabense</i> Domin	T	2, 3	C	
	Dicksoniaceae	<i>Cibotium barometz</i> J. Sm.	T	1, 2, 3	C
	Lindsaeaceae	<i>Lindsaea ensifolia</i> Sw.	T	1, 2, 3	C
<i>Sphenomeris chinensis</i> (L.) Maxon var. <i>divaricata</i> (H. Christ) K.U. Kramer		T	2	R	
Cyatheaceae	<i>Cyathea gigantea</i> (Wall. ex Hook.) Holttum	T	1	UC	
Adiantaceae	<i>Adiantum caudatum</i> L.	T	2	UC	
	<i>Adiantum philippense</i> L.	T	1, 2, 3	A	
	<i>Cheilanthes belangeri</i> (Bory in Belang.) C. Chr.	T	2	C	
	<i>Cheilanthes tenuifolia</i> (Burm.f.) Sw.	T	2	C	
	<i>Pityrogramma calomelanos</i> (L.) Link	T	2	C	
Pteridaceae	<i>Pteris aspericaulis</i> Wall. ex. J. Agardh	T	3	UC	
	<i>Pteris asperula</i> J. Sm.	T	1	UC	
	<i>Pteris biaurita</i> L.	T	1, 2	C	
	<i>Pteris linearis</i> Poiret	T	3	UC	
	<i>Pteris longipes</i> D. Don	T	1	UC	
	<i>Pteris tripartita</i> Sw.	T	3	UC	
	<i>Pteris venusta</i> Kunze	T	2, 3	C	
	<i>Pteris wallichiana</i> J. Agardh	T	1	UC	
	<i>Pteris vittata</i> L.	T	1, 2	C	
Vittariaceae	<i>Antrophyum callifolium</i> Blume	E	1, 2	UC	
	<i>Vittaria angustifolia</i> Blume	E	3	C	
	<i>Vittaria sikkimensis</i> Kuhn	E	3	C	
Aspleniaceae	<i>Asplenium macrophyllum</i> Sw.	L	1	R	
	<i>Asplenium nidus</i> L.	E	1, 2, 3	C	

Family	Species	Habit	Habitat	Abundance
Blechnaceae	<i>Asplenium obscurum</i> Blume	L	1	UC
	<i>Asplenium perakense</i> B. Mathew & H. Christ	T	3	UC
	<i>Asplenium unilaterale</i> Lamk.	L	1	UC
	<i>Asplenium yoshinagae</i> Makino	T	3	C
	<i>Blechnum orientale</i> L.	T	2	R
	<i>Brainea insignis</i> (Hook.) J. Sm.	T	2, 3	C
	<i>Woodwardia japonica</i> (L.f.) Sm.	T	3	R
Lomariopsidaceae	<i>Bolbitis appendiculata</i> (Willd.) K. Iwats. subsp. <i>vivipara</i> (Hamilt. ex Hook.) Hennisman	L	1	C
	<i>Bolbitis heteroclita</i> (C. Presl) Ching	T	1	C
	<i>Bolbitis sinensis</i> (Baker) K. Iwats. var. <i>costulata</i> (Hook.) Tagawa & K. Iwats.	T	1	C
	<i>Bolbitis virens</i> (Wall. ex Hook. & Grev.) Schott var. <i>virens</i>	T	1	A
	<i>Elaphoglossum stelligerum</i> (Wall. ex Baker in Hook. & Baker) T. Moore ex Alston & Bonner	E	3	C
	<i>Elaphoglossum yoshinagae</i> (Yatabe) Makino	E	3	UC
	<i>Lomagramma grossoserrata</i> Holttum	T, L	1	C
Woodsiaceae	<i>Athyrium dissitifolium</i> (Baker) C. Chr.	T	3	UC
	<i>Diplazium esculentum</i> (Retz.) Sw.	T	1	C
	<i>Diplazium leptophyllum</i> Baker ex H. Christ	T	1	UC
	<i>Diplazium muricatum</i> (Mett.) Alderw.	T	1	UC
	<i>Diplazium petri</i> Tardieu	T	1	UC
	<i>Diplazium polypodioides</i> Blume	T	1	UC
	<i>Diplazium siamense</i> C. Chr.	T	1	R
	<i>Diplazium simplicivenium</i> Holttum	T	3	UC
	<i>Kuniwatsukia cuspidata</i> (Bedd.) Pichi-Serm.	T	3	UC
Dryopteridaceae	<i>Arachniodes henryi</i> (H. Christ) Ching	T	2, 3	UC
	<i>Dryopteris cochleata</i> (D. Don.) C. Chr.	T	2, 3	C
	<i>Pteridrys cnemidaria</i> (H. Christ) C. Chr. & Ching	T	1	A
	<i>Polystichum attenuatum</i> Tagawa & K. Iwats.	T	3	R
	<i>Tectaria angulata</i> (Willd.) C. Chr.	T	1	C
	<i>Tectaria devexa</i> (Kunze ex Mett.) Copel.	T	1	UC
	<i>Tectaria fauriei</i> Tagawa	T	1	R
	<i>Tectaria fuscipes</i> (Wall. ex Bedd.) C. Chr.	T	1	UC
	<i>Tectaria impressa</i> (Wall. ex Hook.) C. Chr.	T	1, 2	UC
	<i>Tectaria polymorpha</i> (Wall. ex Hook.) Copel.	T	1, 2, 3	C

Family	Species	Habit	Habitat	Abundance	
Thelypteridaceae	<i>Amphineuron terminans</i> (J. Sm.) Holttum	T	1, 2, 3	C	
	<i>Christella arida</i> (D. Don) Holttum	T	1	UC	
	<i>Christella crinipes</i> (Hook.) Holttum	T	1	UC	
	<i>Christella dentata</i> (Forssk.) Holttum	T	1	C	
	<i>Christella papilio</i> (C. Hope) Holttum	T	1	UC	
	<i>Christella parasitica</i> (L.) H. Lev.	T	2	UC	
	<i>Christella siamensis</i> Tagawa & K. Iwats.	T	3	UC	
	<i>Christella subelata</i> (Baker) Holttum	T	1, 2	UC	
	<i>Cyclosorus hirtisorus</i> (C. Chr.) Ching	T	2, 3	UC	
	<i>Macrothelypteris ornata</i> (J. Sm.) Ching	T	1	UC	
	<i>Macrothelypteris torresiana</i> (Gaudich.) Ching	T	1	UC	
	<i>Pronephrium asperum</i> (C. Presl) Holttum	T	1, 2	UC	
	<i>Pronephrium glandulosum</i> (Blume) Holttum	T	1	UC	
	<i>Pneumatopteris truncata</i> (Poir.) Holttum	T	1	C	
	<i>Pronephrium lakhimpurens</i> (Rosenst.) Holttum	T	1, 2, 3	C	
	<i>Pronephrium nudatum</i> (Roxb.) Holttum	T	1, 2	A	
	Davalliaceae	<i>Araiostegia pseudocystopteris</i> (Kunze) Copel.	E	3	C
		<i>Araiostegia pulchra</i> (D. Don) Copel.	E	3	C
<i>Davallia trichomanoides</i> Blume var. <i>lorrainii</i> (Hance) Holttum		E	3	C	
<i>Davallia trichomanoides</i> Blume var. <i>trichomanoides</i>		E	3	C	
<i>Humata repens</i> (L. f.) J. Small ex Diels		E	2, 3	C	
<i>Leucostegia immersa</i> C. Presl		E	3	UC	
Oleandraceae	<i>Nephrolepis delicatula</i> (Decne.) Pic.-Serm.	E	3	R	
	<i>Nephrolepis falcata</i> (Cav.) C. Chr.	L	1	R	
	<i>Oleandra undulata</i> (Willd.) Ching	T	2, 3	A	
Polypodiaceae	<i>Aglaomorpha coronans</i> (Wall. ex Mett.) Copel.	E	1, 2, 3	UC	
	<i>Arthromeris amplexifolia</i> (H. Christ) Ching	E	3	UC	
	<i>Belvisia mucronata</i> (Fée) Copel.	E	1, 3	UC	
	<i>Belvisia henryi</i> (Hieron. ex C. Chr.) Raymond	E	1, 2	UC	
	<i>Crypsinus cruciformis</i> (Ching) Tagawa	E	3	UC	
	<i>Crypsinus oxylabus</i> (Wall. ex. Kunze) Sledge	E	3	C	
	<i>Drynaria bonii</i> H. Christ	E, L	1	UC	
	<i>Drynaria parishii</i> (Bedd.) Bedd.	E	1, 2, 3	A	
	<i>Drynaria propingua</i> (Wall. ex Mett.) J. Sm. ex Bedd.	E	3	C	
	<i>Drynaria rigidula</i> (Sw.) Bedd.	E	3	R	
	<i>Goniophlebium amoenum</i> (Wall. ex Mett.) J. Sm. ex Bedd.	E	3	UC	
	<i>Goniophlebium argutum</i> J. Sm. ex Hook.	E	3	UC	

Family	Species	Habit	Habitat	Abundance
	<i>Lemmaphyllum carnosum</i> (Hook.) C. Presl	E	1	UC
	<i>Lepisorus contortus</i> (H. Christ) Ching	E	3	UC
	<i>Lepisorus heterolepis</i> (Rosenst.) Ching	E	3	UC
	<i>Lepisorus nudus</i> (Hook.) Ching	E	3	C
	<i>Lepisorus scolopendrium</i> (Buch.-Ham. Ex D. Don) Mehra & Bir	E	3	UC
	<i>Lepisorus subconfluens</i> Ching	E	3	UC
	<i>Lepisorus suboligolepidus</i> Ching	E	3	UC
	<i>Leptochilus decurrens</i> Blume	T	1	C
	<i>Leptochilus ellipticus</i> (Thunb.) Noot.	T	1	UC
	<i>Loxogramme chinensis</i> Ching	E	3	UC
	<i>Loxogramme involuta</i> (D. Don) C. Presl	E	3	UC
	<i>Microsorium cuspidatum</i> (D. Don) Tagawa	T	1	R
	<i>Microsorium membranaceum</i> (D. Don) Ching	E	3	UC
	<i>Microsorium pteropus</i> (Blume) Copel.	R	1	U
	<i>Microsorium punctatum</i> (L.) Copel.	E	1	C
	<i>Microsorium rubidum</i> (Kunze) Copel.	T	1	UC
	<i>Microsorium zippelii</i> (Blume) Ching	E	1	UC
	<i>Platycterium holttumii</i> Joch. & Hennipman	E	1, 2	UC
	<i>Platycterium wallichii</i> Hook.	E	2, 3	C
	<i>Pyrrosia adnascens</i> (Sw.) Ching	E	2	C
	<i>Pyrrosia lingua</i> (Thunb.) Farwell. var. <i>heteractis</i> Hovenkamp	E	3	C
	<i>Pyrrosia lingua</i> (Thunb.) Farwell. var. <i>lingua</i>	E	2, 3	C
	<i>Pyrrosia mannii</i> (Giesenh.) Ching	E	3	UC
	<i>Pyrrosia mollis</i> (Kunze) Ching	E	2	C
	<i>Pyrrosia nuda</i> (Giesenh.) Ching	E	2	C
	<i>Pyrrosia stigmosa</i> (Sw.) Ching	E	1, 2, 3	C
	<i>Pyrrosia tokinensis</i> (Giesenh.) Ching	E	3	UC
	<i>Pyrrosia varia</i> (Kaulf.) Farw.	L	1	UC