

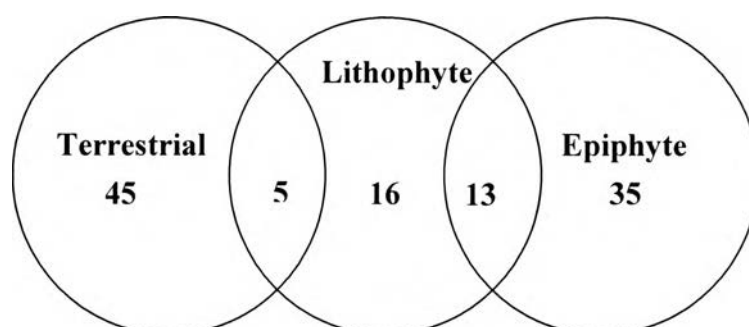
## CHAPTER 6

### DISCUSSION AND CONCLUSION

Taxonomic survey of ferns and fern allies at Phu Hin Rong Kla National Park was investigated from March 2001 to July 2002. Two hundreds and seventeen specimens were collected. A total of 23 families, 55 genera, 112 species and 2 varieties were identified. Among these 21 families, 53 genera, 108 species and 2 varieties are ferns, while 2 families, 2 genera and 4 species are fern allies.

#### 6.1 Habitat and Diversity of Ferns and Fern Allies

Specimen collections were mainly focused on two waterfalls in hill evergreen forest, i.e. Man Daeng Waterfall, Rom Klao-Paradon Waterfall and nearby sites. The altitude of the areas ranging from 1,200 to 1650 m. It is rather fertile forest as compared with the other forest types below these levels. Tree trunk and branches are usually covered with bryophytes and filmy ferns. This forest type has rather deep, humus-rich and high humidity soils. Pteridophytes include common families of ferns, such as Polypodiaceae, Aspleniaceae, Dennstaedtiaceae, Dryopteridaceae and Woodsiaceae. It was found that ferns and fern allies thrive in various habitats, such as terrestrial, on rock (lithophytes) and on tree-branches or tree-trunks (epiphyte). Moreover, some species occur in more than one habitat (Fig. 6.1).



**Fig. 6.1** Number of ferns and fern allies in each habitat

### 6.1.1 Terrestrial plants

It was found that 44 species and 1 variety of ferns were terrestrial plants. Terrestrial habitat includes mountain slopes, shady areas, stream banks and open ground. Common families of ferns, such as Dennstaedtiaceae, Dryopteridaceae, Thelypteridaceae, Pteridaceae and Woodsiaceae are found. Most ferns are observed on mountain slopes. The common species included *Diplazium simplicivenium*, *Microlepia calvescens*, *Didymochlaena truncatula*, *Christella siamensis* and *Pteris tokioi*. These ferns usually occupy humus-rich mountain slopes. Whereas *Microlepia strigosa*, *Arachniodes spectabilis* and *Christella dentata* can be found on rather dry slopes. Along stream banks, where air humidity is rather high, there exist some large terrestrial ferns or tree ferns, such as *Angiopteris evecta*, *Cibotium barometz* and *Cyathea gigantea*. While *Pneumatopteris truncata* and *Coniogramme petelotii* will be found on wet ground, especially along stream banks where sunlight can penetrate to the forest floor. In exposed ground, the two most common terrestrial sun-ferns can be found, i.e. *Pteridium aquilinum* var. *wightianum*, *Dicranopteris linearis* var. *linearis*. They form dense long-persistent thickets in open places and become weedy species. Though the two species are sun-loving ferns, the two do not normally complete together. Because these two ferns have different soil preferences. It was found that *Pteridium aquilinum* prefer well-drained soil, whilst *Dicranopteris linearis* grows on clayey soil (Holttum, 1969).

### 6.1.2 Lithophytes

It was found that 16 species of ferns and fern allies are lithophytes. These species grow on bare rocks, humus-rich rocks, muddy rock, in rock crevices or cliffs. Lithophytes are confined to high humidity areas, such as along stream banks. They usually have long creeping rhizome with numerous clinging roots adhere on rock surface. Some lithophytes are established in muddy rock crevices in partial shade, such as *Adiantum philippense*, *Oleandra undulata*. Whilst some ferns are inhabited on muddy rocks or on moist cliffs by streams, such as *Elaphoglossum stelligerum*, *Asplenium paradoxum*. On moist muddy rock, it can be found *Asplenium cheilosorum*, *Microsorium membranaceum* and *Vittaria sikkimensis*. Whilst *Goniophlebium subauriculatum* can be found on moist mossy-rock. On wet ground or muddy rocks near streams, there occur some medium-sized ferns, for example, *Bolbitis heteroclita*, *Colysis hemionitidea* and *Microsorium dilatatum*. In some exposed bare rocks or cliffs, some ferns, for example *Oleandra undulata* adapt themselves coinciding with the changing of environment, especially in dry season. This fern can survive over the dry summer by shedding their fronds in order to reduce transpiration. Some lithophytes, for example, *Pyrrhosia lingua*, *Oleandra undulata* have long slender creeping rhizomes, these species are usually found on bare rocks in

full sunlight. They can protect the whole plant from water loss by having dense overlapping scales.

### 6.1.3 Epiphytes

It was found those 34 species 1 variety of ferns and fern allies are epiphytes. In general, these pteridophytes grow on tree trunks, on mossy tree-trunks or on branches of trees. It includes common families of ferns, such as Polypodiaceae, Hymenophyllaceae, Aspleniaceae Vittariaceae and Davalliaceae. Examples of common epiphytes are *Huperzia hamiltonii*, *Hymenophyllum exsertum*, *Asplenium ensiforme*, *Vittaria elongata*, *Humata repens*, *Oleandra musifolia*, *Belvisia henryi*, *Lemmaphyllum carnosum* and *Crypsinus rhynchophyllus*. In dry season some epiphytes can adapt to withstand the dry summer months by reducing total surface of frond form transpiration by shrivelling, such as *Asplenium ensiforme*, *Asplenium perakense*, *Loxogramme chinensis* and filmy ferns.

### 6.1.4 Ferns that were found in more than one habitat

It was found that 18 species of ferns and fern allies could be found in more than one habitat (Fig. 6.1). For example, some ferns could be found as epiphytes or lithophytes. They have wide creeping rhizomes and short root system. These ferns grow well either on mossy tree trunks or humus-rich rocks, such as *Asplenium pellucidum*, *Nephrolepis cordifolia*, *Aglaomorpha coronans* and *Pyrrosia lingua* var. *heteractis*. Though some species can be either terrestrial plant or lithophyte, such as *Selaginella siamensis*, *Asplenium normale* and *Bolbitis sinensis* var. *sinensis*. and *Leptochilus decurrens*.

## 6.2 Endemic species

From taxonomic survey of ferns and fern allies, it can be concluded that two endemic species of Thailand occur in the study area.

6.2.1 *Christella siamensis*, was found in the northern provinces of Thailand, such as Chiang Rai (Khun Korn Waterfall), Phetchabun (Phu Miang) and Loei (Phu Luang, type). It occurs on humus-rich mountain slopes in hill evergreen forest at the elevation of 1,400 m (Boonkerd and Rachata, 2002; Tagawa and Iwatsuki, 1988).

6.2.2 *Diplazium siamense* is endemic to northern Thailand. This species grow on humus-rich mountain slopes in hill evergreen forest at the elevation of 1,400 m. It was earlier reported from Chiang Rai (Doi Pacho, Khun Korn Waterfall), Chiang Mai (Doi Suthep, type), Phitsanulok (Phu Rom Rot), Phrae (Mae Sai) and in north-

eastern Thailand, such as Phetchabun (Phu Miang) and Loei (Phu Luang) Provinces (Boonkerd and Rachata, 2002; Tagawa and Iwatsuki, 1988).

### 6.3 New recorded

It is found that *Acrorumohra diffracta* (Baker) H. Itô is a new recorded species for Thailand. It has been reported in China, Taiwan and Indochina. Its present distribution is in agreement with the distribution of the Indo-Chinese element. It occupies humus-rich mountain slopes and usually found along streams banks in some sunlit spots in hill evergreen forest at 1600 m alt. It is rather rare species and can be found only on the forest trail to Man Daeng Waterfall.

### 6.4 Dubious species

In this study, there are three species of ferns that cannot be determined to species level. Though attempts had been made to use key determination from the Flora of Thailand as well as keys from neighbouring countries. Herbarium specimens of related species are also studied from BCU and BKF, but they are still unidentified. They are two species of *Asplenium* and one species of *Diplazium*.

- *Asplenium* sp.1 is an epiphyte on mossy tree-trunks in hill evergreen forest at 1,600 m alt. It is similar to *Asplenium scortechinii* Bedd., but their details of fronds, such as, shape and size of lamina and venation are different.

- *Asplenium* sp.2 is a lithophyte on moist muddy rock in hill evergreen forest at 1300 m alt. It looks like *Asplenium pellucidum* Lam. This *Asplenium* species has short pinnae stalks, toothed leaf margin, lower pinnae not reduced, brownish to dark brown stipes, and bearing narrow scales throughout. These characters are different from *Asplenium pellucidum* Lam.

- *Diplazium* sp. a is terrestrial fern on humus-rich mountain slopes in hill evergreen forest at 1500 m alt. It is a closed to *Diplazium mettenianum* (Miq.) C. Chr. and *Diplazium donianum* (Mett.) Tardieu. However, their frond and sori characters are different.

It is actually essential to consult herbarium and/or type specimens outside Thailand in order to get the right botanical names for these species.

## 6.5 Comparisons with Pteridophytes from the other areas

### Phu Miang, Phitsanulok and Phetchabun Provinces

Due to the perpetual activity of the Thai-Communist party at Phu Hin Rong Kla in the last 30 years, resulted in scanty plant explorations from this area. According to the Flora of Thailand Volume III (Tagawa and Iwatsuki; 1979, 1985, 1988, 1989), 78 species of ferns and fern allies were reported from Phu Miang. Phu Miang is located in Phetchabun mountain ranges in Phitsanulok and Phetchabun Provinces. It is marked out approximately by the geographical coordinates of 16° 51' - 17° 41' north latitude and 100 ° 40' - 101 ° 7' east longitudes. Altitude is ranging from 764 to 1,409 m. Of 112 species of ferns and fern allies from this study, 45 species are found in common with pteridophyte from Phu Miang (Table 6.1).

### Khunkorn Waterfall Forest Park, Chiang Rai Province

Khunkorn Waterfall Forest Park is located in Chiang Rai Province. The park is marked out approximately by the geographical coordinates of 19 ° 51' - 19° 54' north latitude and 99 ° 35' - 99 ° 39' east longitudes. The climate of the area is monsoonal upon a strong alternation of wet and dry season. The annual relative humidity is about 77%, while the high relative humidity during August-December is 95% and the average annual rainfall of 1,755 mm was observed the vegetation includes dry mixed deciduous forest, moist mixed deciduous forest and hill evergreen forest (Boonkerd and Rachata, 2002).

One hundred and fifty-seven species and eleven infraspecific taxa in 24 families and 64 genera were reported from Khunkorn Waterfall Forest Park. It is found that 53 species of ferns and fern allies are in common with the pteridophytes from Phu Hin Rong Kla National Park (Table 6.1).

**Table. 6.1** Comparison of ferns and fern allies diversity from Phu Hin Rong Kla, Phu Miang and Khunkorn Waterfall.

**Note:** ✓ = presence - = absence

Family	Taxon (found in this study)	Phu Miang	Khunkorn Waterfall
Lycopodiaceae	<i>Huperzia hamiltonii</i> (Spreng.) Trevis.	✓	✓
	<i>Huperzia phlegmaria</i> L.	-	-

Family	Taxon (found in this study)	Phu Miang	Khunkorn Waterfall
<b>Selaginellaceae</b>	<i>Selaginella biformis</i> A. Braun ex Kuhn	✓	-
	<i>Selaginella siamensis</i> Hieron.	✓	-
<b>Marattiaceae</b>	<i>Angiopteris evecta</i> (G. Forst.) Hoffm.	-	✓
<b>Ophioglossaceae</b>	<i>Ophioglossum petiolatum</i> Hook.	-	✓
<b>Hymenophyllaceae</b>	<i>Crepidomanes bipunctatum</i> (Poir.) Copel.	-	-
	<i>Crepidomanes birmanicum</i> (Bedd.) K. Iwats.	-	-
	<i>Crepidomanes minutum</i> (Blume) K. Iwats.	-	-
	<i>Hymenophyllum badium</i> Hook. & Grev.	✓	-
	<i>Hymenophyllum barbatum</i> (Bosch) Baker	✓	-
	<i>Hymenophyllum exsertum</i> Wall. ex Hook.	✓	✓
	<i>Hymenophyllum polyanthos</i> (Sw.) Sw.	-	✓
<b>Gleicheniaceae</b>	<i>Dicranopteris linearis</i> (Burm. f.) Underw. var. <i>linearis</i>	-	✓
<b>Dennstaedtiaceae</b>	<i>Microlepia calvescens</i> (Wall. ex Hook.) C. Presl	✓	✓
	<i>Microlepia herbacea</i> Ching & C. Chr. ex C. Chr. & Tardieu	✓	-
	<i>Microlepia hookeriana</i> (Wall. ex Hook.) C. Presl	-	-
	<i>Microlepia platyphylla</i> (D. Don) J. Sm.	-	-
	<i>Microlepia puberula</i> v. A. v. R.	-	-
	<i>Microlepia strigosa</i> (Thunb.) C. Presl	-	✓
	<i>Pteridium aquilinum</i> var. <i>wightianum</i> (J. Agardh) R.M. Tryon	✓	✓
<b>Dicksoniaceae</b>	<i>Cibotium barometz</i> J. Sm.	✓	✓
<b>Lindsaeaceae</b>	<i>Lindsaea ensifolia</i> Sw.	-	✓
<b>Cyatheaceae</b>	<i>Cyathea gigantea</i> (Wall. ex Hook.) Holttum	-	✓
	<i>Cyathea latebrosa</i> (Wall. ex Hook.) Copel.	-	-
<b>Adiantaceae</b>	<i>Adiantum philippense</i> L.	✓	✓
	<i>Coniogramme petelotii</i> Tardieu	-	-
<b>Pteridaceae</b>	<i>Pteris bella</i> Tagawa	-	-
	<i>Pteris longipinnula</i> Wall. ex J. Agardh	-	-
	<i>Pteris tokioi</i> Masam.	✓	-
	<i>Pteris vittata</i> L.	-	✓
<b>Vittariaceae</b>	<i>Antrophyum callifolium</i> Blume	-	✓
	<i>Vittaria angustifolia</i> Blume	-	✓
	<i>Vittaria amboinensis</i> Fee	-	-
	<i>Vittaria flexuosa</i> Fee	✓	-
	<i>Vittaria sikkimensis</i> Kuhn	✓	✓
<b>Aspleniaceae</b>	<i>Asplenium cheilosorum</i> Kunze ex Mett.	✓	-
	<i>Asplenium confusum</i> Tardieu & Ching	-	-
	<i>Asplenium ensiforme</i> Wall. ex Hook. & Grev.	-	-
	<i>Asplenium exisum</i> C.Presl	-	-
	<i>Asplenium nidus</i> L. var. <i>nidus</i>	-	✓
	<i>Asplenium normale</i> D.Don	✓	-

Family	Taxon (found in this study)	Phu Miang	Khunkorn Waterfall
	<i>Asplenium obscurum</i> Blume	-	✓
	<i>Asplenium paradoxum</i> Blume	-	-
	<i>Asplenium pellucidum</i> Lam.	-	-
	<i>Asplenium perakense</i> B. Mathew & H. Christ	-	✓
	<i>Asplenium phyllitidis</i> D. Don subsp. <i>phyllitidis</i>	-	-
	<i>Asplenium scortechinii</i> Bedd.	-	-
	<i>Asplenium yoshinagae</i> Makino	-	✓
	<i>Asplenium</i> sp.1	-	-
	<i>Asplenium</i> sp.2	-	-
<b>Blechnaceae</b>	<i>Blechnum orientale</i> L.	-	✓
<b>Dryopteridaceae</b>	<i>Acrorumohra diffracta</i> (Baker) H. Itô	-	-
	<i>Arachniodes spectabilis</i> (Ching) Ching	✓	-
	<i>Didymochlaena truncatula</i> (Sw.) J. Sm.	-	-
	<i>Dryopteris hirtipes</i> (Blume) Kuntze	✓	-
	<i>Dryopteris polita</i> Rosenst.	-	-
	<i>Dryopteris sparsa</i> (D. Don) Kuntze	-	-
	<i>Polystichum biaristatum</i> (Blume) T. Moore	-	-
	<i>Tectaria impressa</i> (Fee) Holttum	-	✓
	<i>Tectaria simonsii</i> (Baker) Ching	-	-
<b>Lomariopsidaceae</b>	<i>Bolbitis heteroclita</i> (C. Presl) Ching	-	✓
	<i>Bolbitis sinensis</i> (Baker) K. Iwats. var. <i>costulata</i> (Hook.) Tagawa & K. Iwats.	-	✓
	<i>Bolbitis sinensis</i> (Baker) K. Iwats. var. <i>sinensis</i>	✓	-
	<i>Bolbitis virens</i> (Wall. ex Hook. & Grev.) Schott var. <i>virens</i>	-	✓
	<i>Elaphoglossum malayense</i> Holttum	-	-
	<i>Elaphoglossum stelligerum</i> (Wall. ex Baker in Hook. & Baker) T. Moore ex Alston & Bonner	-	✓
<b>Thelypteridaceae</b>	<i>Amphineuron terminans</i> (J. Sm.) Holttum	-	✓
	<i>Christella dentata</i> (Forssk.) Holttum	✓	✓
	<i>Christella siamensis</i> Tagawa & K. Iwats.	✓	✓
	<i>Christella subpubescens</i> (Blume) Holttum	-	-
	<i>Pneumatopteris truncata</i> (Poir.) Holttum	-	✓
	<i>Pronephrium nudatum</i> (Roxb.) Holttum	-	✓
	<i>Trigonospora ciliata</i> (Wall. ex Benth.) Holttum	✓	-
<b>Woodsiaceae</b>	<i>Athyrium mackinnonii</i> (Hope) C. Chr.	✓	-
	<i>Diplazium siamense</i> C. Chr.	✓	✓
	<i>Diplazium simplicivenium</i> Holttum	-	✓
	<i>Diplazium</i> sp.	-	-
<b>Davalliaceae</b>	<i>Davallia trichomanoides</i> Blume var. <i>lorrainii</i> (Hance) Holttum	✓	✓
	<i>Davallia trichomanoides</i> Blume var. <i>trichomanoides</i>	-	✓
	<i>Gymnogrammitis dareiformis</i> (Hook.) Ching ex Tardieu & C. Chr.	✓	-

Family	Taxon (found in this study)	Phu Miang	Khunkorn Waterfall
	<i>Humata repens</i> (L. f.) J. Small ex Diels	✓	✓
	<i>Leucostegia immersa</i> C. Presl	✓	✓
<b>Oleandraceae</b>	<i>Nephrolepis cordifolia</i> (L.) C. Presl	✓	-
	<i>Oleandra musifolia</i> (Blume) C. Presl	✓	-
	<i>Oleandra undulata</i> (Willd.) Ching	-	✓
<b>Polypodiaceae</b>	<i>Aglaomorpha coronans</i> (Wall. ex Mett.) Copel.	-	✓
	<i>Belvisia henryi</i> (Hieron. Ex C. Chr.) Raymond	✓	✓
	<i>Belvisia revoluta</i> (Blume) Copel.	-	-
	<i>Colysis hemionitidea</i> (C. Presl) C. Presl	✓	-
	<i>Colysis pentaphylla</i> (Baker) Ching	✓	-
	<i>Colysis pothifolia</i> (Buch.-Ham. ex D. Don) C. Presl	✓	-
	<i>Crypsinus oxylobus</i> (Wall. ex Kunze) Sledge	✓	✓
	<i>Crypsinus rhynchophyllus</i> (Hook.) Copel.	✓	-
	<i>Goniophlebium argutum</i> J. Sm. Ex Hook.	✓	✓
	<i>Goniophlebium microrhizoma</i> (C.B. Clarke ex Baker) Clarke ex Bedd.	-	-
	<i>Goniophlebium subauriculatum</i> (Blume) C. Presl	✓	-
	<i>Lemmaphyllum carnosum</i> (J. Sm. ex Hook.) C. Presl	-	✓
	<i>Lepisorus contortus</i> (H. Christ) Ching	-	✓
	<i>Lepisorus heterolepis</i> (Rosenst.) Ching	✓	✓
	<i>Lepisorus scolopendrium</i> (Buch.-Ham. ex D. Don) Mehra & Bir	✓	✓
	<i>Lepisorus subconfluens</i> Ching	-	✓
	<i>Leptochilus axillaris</i> (Cav.) Kaulf.	-	-
	<i>Leptochilus decurrens</i> Blume	✓	✓
	<i>Loxogramme chinensis</i> Ching	-	✓
	<i>Microsorium dilatatum</i> (Bedd.) Sledge	-	-
	<i>Microsorium membranaceum</i> (D. Don) Ching	-	✓
	<i>Microsorium pteropus</i> (Blume) Copel.	-	✓
	<i>Microsorium superficiale</i> (Blume) Ching	✓	-
	<i>Neocheiropteris normalis</i> (D. Don) Tagawa	✓	-
	<i>Polypodium manmeiense</i> H. Christ	✓	-
	<i>Pyrrosia lingua</i> var. <i>heteractis</i> (Mett. ex Kuhn) Hovenkamp	✓	✓
<b>Grammitidaceae</b>	<i>Ctenopteris subfalcata</i> (Blume) Kunze	-	-
	<i>Prosaptia khasyana</i> (Hook.) C. Chr. & Tardieu	-	-



**Table 6.2** Taxon of fern and fern allies from Phu Hin Rong Kla National Park, Phu Miang and Khunkorn Waterfall Forest Parks.

Study site	Family	Genus	Species
Phu Hin Rong Kla National Park, Phitsanulok and Phetchabun Provinces	23	55	112
Phu Miang, Phitsanulok and Phetchabun Provinces	16	33	45
Khunkorn Waterfall Forest Park, Chiang Rai Province	24	64	154

Table 6.1 shows comparison of pteridophyte diversity from three study areas. It can be seen that Khunkorn Waterfall Forest Park is the richest in diversity. The discrepancy in number of species from these three study sites may be in part due to the diversity of forest types. This pteridophyte study mainly focused only in hill evergreen forest since the rest vegetations have been severely destructive in the last 30 years. While the diversity of pteridophyte of Khunkorn Waterfall Forest Park has been studied from the whole area of the park which has much more habitat diversity. Unfortunately, detail habitat or vegetation type of Phu Miang is not available from the Flora of Thailand, Volume III (Tagawa and Iwatsuki, 1979, 1985, 1988, 1989) and its diversity of pteridophytes could not be compared. Anyhow, it can be focused on hill evergreen forest of Phu Hin Rong Kla National Park and Khunkorn Waterfall Forest Park. Boonkerd and Rachata (2002) reported 80 species of pteridophytes in hill evergreen forest from Khunkorn Waterfall Forest Park, while 112 species were found from this study. The higher number of species at Phu Hin Rong Kla National Park indicates the fertile hill evergreen forest of this park. This may due in part to the activity of the Thai-Communist party at Phu Hin Rong Kla in the last 30 years. Their activity help to protect the fertile hill evergreen forest from destruction as was happened in the other vegetations of the park.

### 6.6 New information on fern and fern allies distribution

Three species, namely *Amphineuron terminans*, *Angiopteris evecta* and *Tectaria impressa* are commonly found throughout the country. From Flora of Thailand, there are 5 species, which had never been found in northern and northeastern floristic regions before, viz. *Asplenium perakense*, *Christella subpubescens*, *Diplazium simplicivenium*, *Pteris longipinnula*, and *Vittaria angustifolia* (Tagawa and Iwatsuki; 1985, 1988).

- *Asplenium perakense* is an epiphyte. It can be found on tree-trunks usually in hill evergreen forest at 1450 m alt. It was previously from Nakhon Si Thammarat (Khao Luang) (Tagawa and Iwatsuki, 1985).

- *Christella subpubescens* is a terrestrial fern. It can be found on rather dry mountain slopes in hill evergreen forest at 1450 m alt. It was once reported from Chanthaburi (Khao Soi Dao) (Tagawa and Iwatsuki, 1988).

- *Diplazium simplicivenium* is a terrestrial fern. It can be found in moist areas of hill evergreen forest at 1600 m alt. It was earlier reported from Kanchanaburi (Khao Ngi Yai), Uthai Thani (Ban Rai) Surat Thani (Klong Ton), Nakhon Si Thammarat (Khao Luang), Phangnga (Khao Pok), Trang (Khao Chong), Satun and Yala (Muang Wing) (Boonkerd, 1980; Tagawa and Iwatsuki, 1988).

- *Pteris longipinnula* is a terrestrial fern. It can be found on humus-rich mountain slopes in hill evergreen forest at 1300 m alt. It was formerly reported from Surat Thani (Ban Don) and Yala (Bannang Sata) (Tagawa and Iwatsuki, 1985).

- *Vittaria angustifolia* is an epiphyte. It can be found on mossy tree-trunks in hill evergreen forest at 1600 m alt. It was previously reported from Chanthaburi (Khao Soi Dao, Khao Sabap), Nakhon Si Thammarat (Khao Luang), Trang (Khao Chong), Krabi (Phanom Bencha) and Yala (Khao Kalakhiri, Bla Hat) (Tagawa and Iwatsuki, 1985).

Among the 5 species above, 2 species, i.e. *Asplenium perakense* and *Pteris longipinnula* occur only in peninsular Thailand. It is previously noted that *Asplenium perakense* is found only in Malaysia. However, Boonkerd and Rachata (2002) indicated a disjunct distribution of *Asplenium perakense* since it is found at Khunkorn Waterfall Forest Park, Chiang Rai Province. So this study confirms the occurrence of *Asplenium perakense* in northern provinces of Thailand. While, *Pteris longipinnula* occur in S. India and Malesia. Its absence from Northern and Northeastern floristic regions may partly due to lacking taxonomic study from these regions. Its occurrence in northern Thailand is in agreement with its present distribution in south India. So this study also confirms the distribution of this species in northern hemisphere.

## 6.7 Miscellaneous Uses

In this study, 2 species of ferns, namely *Angiopteris evecta* and *Cibotium barometz* are previously used in local medicine, especially silky hairs on buds of *Cibotium barometz* used as styptics. Two species of tree ferns, i.e. *Cyathea gigantea* and *Cyathea latebrosa*, have fibrous trunk used for orchid media. In addition, *Nephrolepis cordifolia* is commonly used as ornamental fern (Tagawa and Iwatsuki, 1979, 1985).

## **6.8 Problems in running this research**

6.8.1 Phu Hin Rong Kla National Park is still a dangerous site due to abandoned land mine from previous fighting. So, specimen collections were still limited.

6.8.2 Due to the time limit and difficulty to access in some studied areas, for example, steep cliffs. Some species may be overlooked.

6.8.3 The studied site is influenced by seasonal monsoons, with a heavy rainfall during the rainy season. It was rather difficult to take a picture during field trips in heavy rain.

6.8.4 The voucher specimens at BCU and BKF are not available in some problematical species, so uncertain determinations were made in some species.

## **6.9 Benefit of This Research**

6.9.1 The fundamental data of species diversity of ferns and fern allies in Phu Hin Rong Kla National Park was known and can be used in conservation and tourism promotion programs.

6.9.2 Key to the genera and species of ferns and fern allies using plant materials collected from Phu Hin Rong Kla National Park can be used for this plant group in adjacent areas.

6.9.3 Total number of voucher species at the Professor Kasin Suvatabhanda Herbarium (BCU), Department of Botany will be increased by the collected specimen from this species.