People Resources and Conservation Foundation

Results of field surveys to locate and collect seed of Conifer and Magnolia species within the Sinh Long Forest Area, Na Hang District, Tuyen Quang Province, Vietnam.

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"*Strengthening community conservation of priority sites within the Ba Be / Na Hang Limestone Forest Complex, northern Vietnam".*

The Ba Be / Na Hang Limestone Forest Complex (BNLFC) holds unique values of high global biodiversity significance, particularly of primates such as the highly threatened Tonkin Snub-nosed Monkey (*Rhinopithecus avunculus*) and the Francois' Langur (*Trachypithecus francoisi*), Conifer and Magnolia species and forms part of the restricted home range of the largely unknown White-eared Night Heron *(Gorsachius magnificus).* The BNLFC is replete with conservation hotspots scattered throughout a landscape, which has undergone degradation of its biodiversity and ecosystem values mainly as a result of shifting cultivation and increasing population density.

The aim of the project is to improve conservation of globally threatened species of primates, the White-eared Night Heron and globally threatened species of conifers and magnolias at sites of high biodiversity interest in the Ba Be / Na Hang Limestone Forest Complex (Tuyen Quang and Bac Kan Provinces).

The project is funded by the Critical Ecosystem Partnership Fund (CEPF) and implemented by the People Resources and Conservation Foundation (PRCF) in partnership with Fauna and Flora International, Centre for Plant Conservation and Vietnam Birdwatching Club. The CEPF is a joint initiative of l'Agence Française de Développement, Conservation International, the Global Environment Facility, the Government of Japan, the MacArthur Foundation and the World Bank. A fundamental goal is to ensure civil society is engaged in biodiversity conservation.

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Acronyms

A.S.L	Above Sea Level
BNLFC	Ba Be / Na Hang Limestone Forest Complex
CPC	Center for Plant Conservation
CR	Critical
DD	Data Deficient
EN	Endangered
FPD	Forest Protection Department
GPS	Global Positioning System
IUCN	International Union for Conservation of Nature
LBFA	Lam Binh Forest Area
LC	Least Concern
LE	Komarov Botanical Institute of the Russian Academy of Sciences
NE	Not Evaluated
NT	Near threatened
PRCF	People Resources and Conservation Foundation
UTM	Universal Transverse Mercator
VNMN	Vietnam National Museum of Nature
VU	Vulnerable

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1. Introduction

The Ba Be / Na Hang Limestone Forest Complex (BNLFC) holds high global biodiversity significance, particularly of primate species, and a wide variety of other taxa. The region is replete with conservation hotspots scattered throughout a landscape that has undergone biodiversity and ecosystem value degradation due to: shifting cultivation, increasing population density, and the construction of the Gam River Dam in Tuyen Quang Province. The latter has had significant impacts on the surrounding forest areas.

The BNLFC specifically, has seen little in-field action focused towards direct in-*situ* conservation of the highest priority biodiversity values since the 2004 completion of the project: "Creating Protected Areas for Resource Conservation using Landscape Ecology" (PARC Project). Threats from forest habitat destruction, degradation, and timber extraction throughout the BNLFC are widely known to affect the viability of populations of threatened endemic tree species i.e. remaining tree stands can now only be found in fragments of the original forest cover. Recognition of anthropogenic threats to trees has been documented in the following:

- The PARC Project's 2004 "Biodiversity Report on the Ba Be/ Na Hang Conservation Complex";
- FFI's 2004 "Vietnam Conifers Conservation Status Review" (specifically for Conifers); and
- The CEPF Indo-Burma Ecosystem Profile as warranting high priority conservation attention.

Nearly half of all conifer species in Vietnam can be found in the NHLPC, including seven globally threatened species including several locally and internationally significant threatened magnolia/conifer species, including *Zenia insignis* and *Fokienia hodginsii* that also coincidentally, are of high economic value. Establishment of site-specific species presence/absence may reveal additional knowledge on the range of some of the target species, of which four are Critically Endangered.

Identifying remaining stands of globally threatened tree species in the Sinh Long / Lam Binh Forest Areas is urgent in order that *in-situ* and *ex-situ* actions to recover tree populations can be implemented before wild populations dwindle to unrecoverable levels. This is of interest to both the CPC and PRCF as this information will be most valuable in assisting us to implement our long-term conservation vision in this forest complex and in particular assist in the planning and development of direct conservation action initiatives during this project and beyond.

The first priority for the survey activity was to establish the presence, status and distribution of populations of globally threatened Magnolia/Conifer species in the Sinh Long Forest Area (SLFA) of Na Hang District of Tuyen Quang Province. Additional information was also gathered on the current threats posed to identified populations.

2. Goals and Objectives

2.1. Goal

Identify and collect specimens and seed of Magnolia and Conifer species of global and of national conservation significance and assess their current level of status.

2.2. Specific Objectives

1) Conduct surveys for threatened Conifer and Magnolias within the Sinh Long Forest Area to establish and update the: (a) Status of target CEPF priority trees; (b) Local biodiversity values; (c) Distribution of relevant taxa; and (e) Present threats, conservation needs, and local awareness levels;

2) Identify threats at sites where Conifers and Magnolias have been identified during surveys within the Sinh Long Forest Area;

3) Collect specimens to be indentified and labelled for the purposes of scientific cataloguing and storage at Herbariums held by the Vietnam National Museum of Nature (VNMN) in Hanoi; and CPC; and Komarov Botanical Institute of the Russian Academy of Sciences (LE).

4) Collect seed from at least six Conifer and six Magnolia priority CEPF species for use during feasibility propagation trials.

3. Description of Location

3.1. Location

The survey sites were located within three villages i.e. Nam Duong, Na Tau and Khuoi Phin of Sinh Long Commune in the north of Tuyen Quang Province (Map 1). The eastern and northern borders of the Sinh Long Forest Area (SLFA) are contiguous with the north-western border of the Na Hang Nature Reserve and Ha Giang Province.

Map 1. Location of Sinh Long Commune, Na Hang District, Tuyen Quang Province (adapted from the territory map for three forest types, Sinh Long Commune, Na Hang District, Tuyen Quang Province).

The region is characterised by a series of isolated mountain ranges extending south-east to north-west, and a steeply sloped limestone massif. The highest elevations in the SLFA are located at Khuoi Phin and Khuoi Phoc about 1,200 m above sea level (a.s.l). The northern most area of the site is located adjacent to Bac Me District of Ha Giang Province.

3.2. Climate and Hydrology

3.2.1. Climate

The climate of the SLFA is strongly influenced by the area's elevation and seasonal wind regimes. Wet season begins in early April and stops by the end of September, whilst the dry season ranges from October to the end of March the following year. In comparison with summer, temperatures in winter are low, with little rainfall. The average rainfall is 200 mm, average temperature is 20^{o}C (10^{o}C – 30^{o}C), and the average humidity is 85%. Night temperatures are lower than daytime, and mist and fog often form in the mornings at locations close to water (Boonratana & Le Xuan Canh, 1998b).

Table 1. Mean monthly Rainfall and Temperature at nearby Na Hang, 1961-85 (Cox, 1994)

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Rainfall (mm)	25.6	28.1	54.4	123.8	275.6	316.9	314.0	281.1	194.0	105.3	54.4	23.2
Temperature (o^{C})	15.2	17.0	20.3	23.7	26.6	27.7	27.8	27.8	26.4	23.5	19.2	16.4

3.2.2 Hydrology

Many streams and small rivers run through the SLFA with two principle rivers: Nang River running from the northeast and Gam River running from the southwest. These two rivers play a key role in shaping the hydrology for the area. The Nang River runs between the SLFA and the Tat Ke Sector of Na Hang Nature Reserve and merges into Gam River which divides the SLFA and the Lam Binh Forest Areas to the southwest. During the dry season, a large number of streambeds are mostly dry with little surface water. Standing bodies of water are rare in the area. The reservoir of the hydropower plant has inundated a large area upstream from the dam wall and transport is largely facilitated by boat.

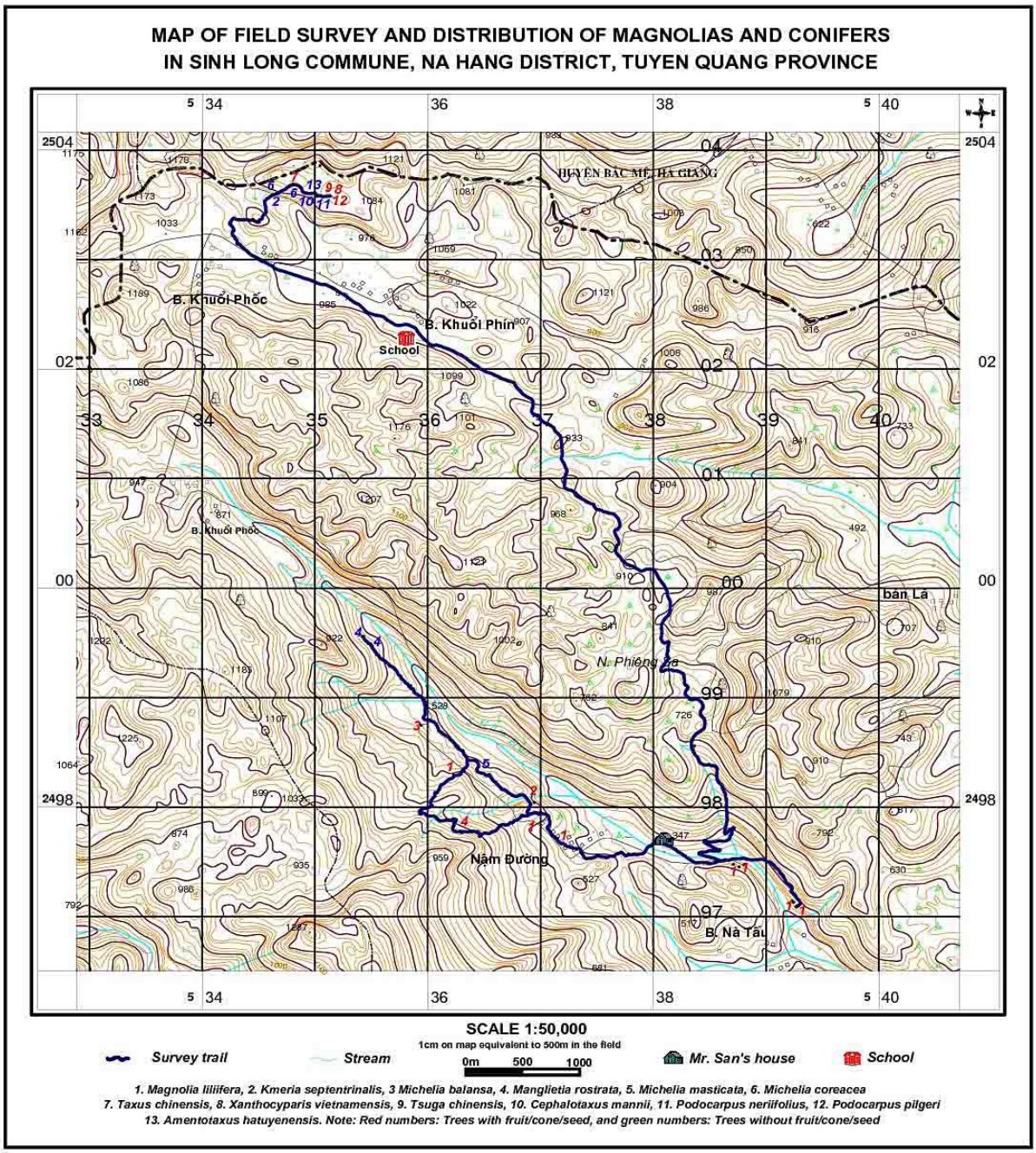
4. Survey Methods

4.1. Selection of Survey Sites

The main survey trails were selected by using a number of complementary methods:

1) Guidance from Na Hang FPD and People's Committee, Yen Hoa FPD Station (Sinh Long Commune) and the Sinh Long People's Committee on local forest, flora and limestone habitat;
2) Advice from interviews with key informants in target villages who assisted in guiding and planning for the survey activities; and
3) Use of a 1:50,000 scale topographic UTM map with which to approximate the target survey areas.

Three villages were selected: Nam Duong, Na Tau and Khuoi Phin within Sinh Long Commune where we intended to focus on Magnolia and Conifer species and other plant biodiversity of conservation interest e.g. orchids (Map 2 below).



4.2. Time and Duration of the Survey

Two survey activities were conducted over a timeframe of 23 days. The first survey mission was conducted over 12 days, from 8th to 19th March, 2011. This survey focussed upon locating and identifying Magnolia and Conifer species. The second was implemented over 11 days, from 26th September to 6th October, 2011. In addition to locating and identifying Magnolia and Conifer species, this trip also sought to document phenological information (i.e. flowering and fruiting times) and to collect fruit/seed where possible. The detailed survey itinerary for both activities is included in Appendix 1.

4.3. Survey Effort

The two field surveys were conducted by the following CPC staff: Nguyen Quang Hieu, Phan Ke Loc, Nguyen Tien Hiep, Nguyen Sinh Khang, Pham Van The, Nguyen Tien Vinh, and Vu Xuan Manh and Ma Van Tong from the Na Hang FPD.

Prior to commencement of survey activities, village leaders assisted us to recruit appropriate guides, porters and tree climbers familiar with the local forest.

During survey activities the survey team was divided into two sub-groups of which one was assigned to survey along trails at the base and lower slopes of the landscape and the other, on the upper slopes and top of the landscape. The division of the survey effort following this methodology relates to an understanding of preferred habitat of each taxa i.e. conifer distribution is normally locate on the upper slopes and ridge tops and magnolia at lower landscape elevations.

Trees were recognized by their morphological characteristics such as bark colour, tree shape, and leaf petiole scars. In addition, we used binoculars to check for flowers or fruit on trees.

4.4. Field Accommodation

During both surveys, we used the house of Mr. Ban Van San at Nam Duong Village, Sinh Long Commune (refer to Map two) as the central point from which to base all survey activities.

4.5. Interviews

Interviews with local key informants were conducted to collect information on target plants and involved showing them either samples of living branches and colour pictures (from CPC pictorial archives) of magnolia and conifer species. Based on this information, these key informants guided the survey team to the forest in areas where they species have been observed or are known to exist. In addition, we requested them to guide us to areas on upper mountain slopes and ridge tops with good forest condition and along hunting trails so we could survey specific areas of habitat.

4.6. Data Collection

Data was collected by using standard tools such as a Global Positioning System (GPS), altimeter, compass and topographic maps (1:50.000). Additional important information on the species composition of plant communities in the survey area were obtained from observations and plant collections made during numerous botanical exploration missions undertaken by CPC within these forest areas including Na Hang Nature Reserve (Tuyen Quang Province), South Xuan Lac Species and Habitat Conservation Area (Bac Kan Province) and the neighbouring provinces of Ha Giang, Bac Kan and Cao Bang. The use of Google maps was also employed to provide an understanding of forest cover and land use.

As trees were encountered along survey trails (also trails frequently used by local people) specimens were collected and allocated a collection number. Each collection number contains at least 6 duplications (herbarium specimens). At each locality habitat characteristics were recorded / described for each collection number.

Four (4) key references were used to both identify and evaluate the conservation status of all specimens collected in the field. They included: IUCN Red List (2007) for the global level; Vietnamese Red Data Book (Part II: Plant) (2007), and Decree 32 (Vietnam Government - 2006) for national level evaluation and Vietnam Conifers: Conservation Status Review 2004.
For the purposes of advanced plant identification, CPC scientists collaborated with specialists from the Kunming Botanical Garden, China to identify the taxonomy of the less commonly known species.

5. Results

5.1. General Description of Each Site

Table 2. Habitat observed at the eight (8) study locations.

Survey Site	Habitat	GPS Coordinates	Altitude (m a.s.l.)
Nam Duong Village	Heavily logged primary closed evergreen broad-leaved lowland forests on stream banks of limestone areas and primary evergreen broad-leaved lowland forests on foots of limestone mountains	$22^0$35'07"N $105^0$22'14"E	344
Xo Lo Che Valley	Heavily logged primary closed evergreen broad-leaved lowland forests on stream banks of sand- and shale-stone areas	$22^0$35'40"N $105^0$21'05"E	495
Khuoi Phin Village	Slightly logged primary closed evergreen broad-leaved lowland forests on slope of limestone mountain	$22^0$35'36"N $105^0$22'23"E	700
Khuoi Phin Village	Heavily logged primary closed evergreen broad-leaved mixed with conifers, lowland forests on ridge and top of limestone mts	$22^0$38'19"N, $105^0$20'26"E	1100 - 1200
Na Khao	Heavily logged primary closed evergreen broad-leaved lowland forests on limestone mountains	22^0 34'27"N $105^0$22'07"E	550
Xo Lo Che site to Doang Village	Heavily logged primary closed evergreen broad-leaved lowland forests on slope of sandy or shale-stone mountains	$22^0$35'58"N $105^0$20'50"E	626
Na Tau Village	Heavily logged primary closed evergreen broad-leaved lowland forests on stream banks of limestone areas	$22^0$34'22"N $105^0$23'25"E	300
Sinh Long Commune	Shale valley of limestone areas	$22^0$32'48" N $105^0$24'24"E	250

5.2. Accounts of Species of Conservation Interest

After two botanical surveys in Sinh Long Commune on March and October, 2011, the Center for Plant Conservation (CPC) collected approximately 700 herbarium specimen vouchers from 200 collection numbers. Among these collections, eight (8) Magnolia and five (5) Conifer species were evaluated for their conservation status.

5.2.1. *Magnoliaceae*

The Magnolia Family is one of the oldest plant families, including about 250 species distributed from the northern temperate to tropical latitude regions. Roughly two thirds of these species are currently distributed in temperate and tropical regions in Eastern to South East Asia. The other third occurs in the New World from temperate eastern North America through to tropical South America as far as Brazil and Bolivia.

The ecology of Magnolia is generally very restricted in its habitat and is therefore often selected as flagship species for conservation of forests (Ze-Long Nie *et al.,* 2008). In addition, the value of timber and seeds is widely known to local people, illegal loggers in Vietnam and to the global conservation community. Interestingly eight species were discovered within the SLFA, all of which except *Manglietia chevalerieri,* are recorded

for the first time in the SLFA. The other seven species include: *Manglietia rostrata, Magnolia kwangsiensis, M. liliifera, M. foveolata, M. masticata, M. gioi, M. balansae* Specimens from four genera including Manglietia, Kmeria, Michelia and Magnolia were collected. Evaluation for each species follows:

5.2.1.1. *Michelia masticata* Dandy

Synonym:
Vietnamese Name: Giổi
Description: Evergreen tree15-25 m tall.
IUCN: NE
Vietnam Red Data Book: NE
Decree 32-Goverment: NE
Collection number: CPC 1278, 1280, 1283, 1339, and 4518.
Flower/Fruit time: No information
Distribution: Vietnam: Tuyen Quang (Nam Duong, Na Tau). Elevation 578-1200 m asl.
Conservation note: Used for timber. Habitat has been badly degraded and now grows/occurs as scattered individuals. Only five individual trees were found within the Nam Duong area. Neither flowers nor fruit were observed during the survey.

5.2.1.2. *Michelia gioi* (A. Chev.) Sima & Hong Yu

Synonym: *Talauma gioi* A. Chevalier, *Magnolia hypolampra* (Dandy) Figlar, *Michelia hedyosperma* Y. W. Law, *M. hypolampra* Dandy.
Vietnamese Name: Giổi.
Description: Top of the only tree observed had its top lopped off.
IUCN: NE
Vietnam Red Data Book: NE
Decree 32-Goverment: NE
Collection Number: CPC 1282.
Flower/Fruit time: No information.
Distribution: Vietnam: Tuyen Quang (Nam Duong, Na Tau). Elevation 300-800 m asl.
Conservation notes: Seed can be used as seasoning in cooking. Habitat has been badly degraded. The only tree located within the Nam Duong area had its top lopped off. No flower and fruits were recorded in the survey trip.

5.2.1.3. *Michelia foveolata* Merr. ex Dandy

Synonym: *Magnolia foveolata* (Merrill ex Dandy) Figlar; *Michelia aenea* Dandy; *M. foveolata* var. *cinerascens* Y. W. Law & Y. F. Wu; *M. foveolata* var. *xiangnanensis* C. L. Peng & L. H. Yan; *M. fulgens* Dandy; *M. longistyla* Y. W. Law & Y. F. Wu; *M. oblongifolia* Hung T. Chang & B. L. Chen.
Vietnamese Name: Giổi
Description: Species is morphologically variable, particularly the leaf size and hairs beneath the leaves.
IUCN: NE
Vietnam Red Data Book: NE
Decree 32-Goverment: NE
Collection Number: CPC 1276.
Flower/Fruit: No information.
Distribution: Vietnam: Tuyen Quang (Nam Duong). Ha Giang. Elevation 500-1000 m asl.
Conservation notes: Habitat has been badly degraded and only one tree was observed in Nam Duong Village.

5.2.1.4. *Michelia balansae* (A.DC.) Dandy

Synonym: *Magnolia balansae* A. DC; *Michelia balansae* var. *appressipubescens* Y. W. Law; *M. balansae* var. *brevipes* B. L. Chen; *M. baviensis* Finet & Gagnepain; *M. tonkinensis* A. Chevalier.
Vietnamese Name: Giổi
Description: Evergreen tree, 15m tall; flower bud covered densely by rusty hairs and fruit green-brown, seed orange or brilliant red.
IUCN: NE
Vietnam Red Data Book: NE
Decree 32-Goverment: NE
Collection number: CPC 1284, 4515.
Flower/Fruit: September to October.
Distribution: Vietnam: Tuyen Quang (Nam Duong, Na Tau).
Conservation notes: Used for timber. Although the habitat has been disturbed, some 2-3 year old tree were observed growing. In addition, a few trees around 20 m tall were bearing fruit, however, no seedlings were found around the tree.

5.2.1.5. *Manglietia rostrata* D. X. Li et R. Z. Zhou in det.

Synonym:
Vietnamese Name: Giổi
Description: Evergreen tree, 20 - 25 m tall, stem bark gray-white; fruit turn from green to red when ripe.
IUCN: NE
Vietnam Red Data Book: NE
Decree 32-Goverment: NE
Collection number: CPC 1269A, 1269B, 1272, 1279, 1334, 1335, 1336, 1340, 4520.
Flower/Fruit: September to October.
Distribution: Vietnam: Tuyen Quang (Nam Duong, Na Tau).
Conservation note: Although the habitat has been disturbed, the species was widely distributed along the survey trail. Fruit was found in three 25 – 30m tall mature trees.

5.2.1.6. *Magnolia lilifera* (L.) Baill. var. liliifera

Synonym:
Vietnamese Name: Giổi
Description: Evergreen tree, 7 m tall; seeds orange to brilliant red.
IUCN: LC
Vietnam Red Data Book: NE
Decree 32-Goverment: NE
Collection number: CPC 1273, 1274, 1275, 1292, 1296, 1297, 1338, 1371, 4501, 4511, 4521, 4522.
Flower/Fruit: September to October.
Distribution: Vietnam: Tuyen Quang (Nam Duong, Na Tau). Ha Giang.
Conservation notes: Widely distributed throughout the SLFA. A large amount of fruit was observed in trees around seven metres in height.

5.2.1.7. *Kmeria septentrionalis* Dandy

Synonym: *Magnolia kwangsiensis* Figlar & Noot, *Woonyoungia septentrionalis* (Dandy) Y.W.Law
Vietnamese Name: Giổi

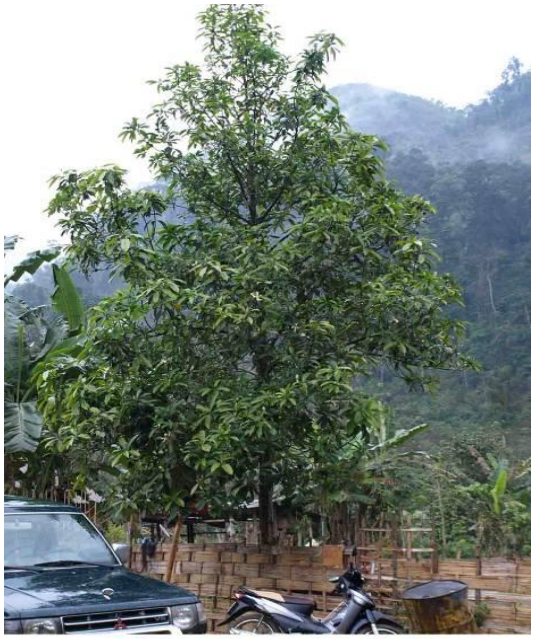
Description: Evergreen tree, 25 m tall; stem bark white-yellow and seeds brilliant red.
IUCN: NE
Vietnam Red Data Book: NE
Decree 32-Goverment: NE
Collection Number: CPC 1271, 1277, 1337, 4514, 4555, 4560
Flower/Fruit: September - October
Distribution: Vietnam: Tuyen Quang (Nam Duong, Khuoi Phin). Ha Giang
Conservation notes: Used for timber. This species is widely distributed throughout the LBFA. Trees 25m tall produced a lot of fruit. Thought to be an endemic to China, however, two localities of the species were recorded during the survey. However, it has been logged very badly within the SLFA. Proposed as a National Grade II Protection for Wild Plants in China (First Group in 1999).

Kmeria septentrionalis Dandy

Figure 1

5.2.1.8. *Manglietia chevalieri* Dandy

Synonym: *Magnolia chevalieri* (Dandy) V.S. Kumar
Vietnamese Name: Vàng tâm, Mỡ
Description: Evergreen tree, 8 m tall, flowers white, seed brilliant red
IUCN: NE
Vietnam Red Data Book: NE
Decree 32-Goverment: NE
Collection number: CPC 1270, 1314, 1315, 1316, 1373, 4571
Flower/Fruit: September to October.
Distribution: Vietnam: Tuyen Quang (Sinh Long)
Conservation notes: Used for timber. The species has been widely cultivated in North Vietnam, and miss identified as *M. glauca* Bl. Collection during the survey was from cultivated plants in villages.



Manglietia chevalieri Dandy

Figure 2

5.2.2. Pinopsida

In the vicinity of Na Tau village we did not locate or collect specimens of any conifer species. During the previous field survey in March 2011 two conifer species i.e. *Calocedrus rupestris* and *Nageia fleuryi* were collected at Khuoi Phin. More recently in September 2011, survey activities focused upon searching for conifers on limestone at around 1,000 m asl in the area bordering Bac Me District, Ha Giang Province. Seven (7) conifer species identified as *Taxus chinenis*, *Amentotaxus hatuyensis*, *Cephalotaxus manii*, *Xanthocyparis vietnamensis*, *Tsuga chinensis*, *Podocarpus neriifolius*, and *Podocarpus pilgeri* were discovered. In total, nine species of conifer were found.

Conifers found in the SLFA are significant for conservation, four (4) of the nine species mentioned are found within the Vietnam Red Book and are legally protected under Government Decree 32/2006/ND-CP and one proposed as VU. These include *Taxus chinenis*, *Calocedrus rupestris*, *Cephalotaxus manii*, *Xanthocyparis vietnamensis*, and *Podocarpus pilgeri*. Each species is evaluated below:

5.2.2.1. *Calocedrus rupestris* Aver., H.T. Nguyen & L.K. Phan

Synonym:
Vietnamese Name: Bách xanh núi đá
Description: Young cone green and mature brown.
IUCN: EN A2cd, C1
Vietnam Red Data Book: EN A2cd, C1
Decree 32-Goverment: IIA
Collection Number: CPC 1318
Cone: September to November.
Distribution: Vietnam: Tuyen Quang (Sinh Long), Son La, Ha Giang, Bac Can, Cao Bang, Hoa Binh.
Conservation notes: The major threats are fragmentation of habitat, fire and overexploitation for timber and resin. There are less than 20 mature individuals accounted for around Khuoi Phin Village. Low regeneration rates also have a significant impact upon their population size which if disturbed have difficulty responding quickly and hence may become locally extirpated.

5.2.2.2. *Cephalotaxus mannii* Hook. f.

Synonym: *Cephalotaxus griffithii* Hook. f. 1888; *Cephalotaxus hainanensis* H. L. Li, 1953; *Cephalotaxus harringtonii* (Knigth ex J. Forbes) K. Koch var. *thailandensis* Silba, 2000.
Vietnamese Name: Đỉnh tùng
Description: Cones brilliant red when mature.
IUCN: **VU** A1d
Vietnam Red Data Book: **VU** A1,c,d, B1+2b,c
Decree 32-Goverment: IIA
Collection Number: CPC 4550
Cone: September to November.
Distribution: Vietnam: Tuyen Quang (Sinh Long), Lao Cai, Ha Giang, Son La, Cao Bang, Hoa binh, Ha Noi (Ba Vi), Thanh Hoa, Nghe An, Thua Thien Hue, Quang Tri, Kon Tum, Gia Lai and Lam Dong,
Conservation notes: This species has been exploited for its timber and medicinal properties throughout its global range. Collecting the bark is fatal to the tree and this type of harvesting is unsustainable. Within Vietnam it is principally threatened by forest fragmentation and conversion of habitat to agricultural use in sub-montane, lowland and some montane forests in non-limestone regions. Where it occurs in the interface between agriculture and montane forest, the forest is liable to degradation. For this species, adequately administered reserves that contain large areas of undisturbed forest may be the only long-term solution. During the September 2011 field survey, we noted that six trees were logged and that no seedlings were regenerating. Conservation is urgently required.

5.2.2.3. *Taxus chinenis* (Pilg.) Rehd

Synonym: *Taxus baccata* L. subsp. *cuspidata* Silb. & Zucc. var. *chinensis* Pilger, 1903; *Taxus wallichiana* var. *chinensis* (Pilg.) Florin, 1948.

Vietnamese Name: Thông đỏ
Description: 5 - 10 m in height with a 30 - 40 cm diameter, and located at elevations around 1000 to 1200 m a.s.l. Young cones are green and when mature brilliant red.
IUCN: LC ver 2.3
Vietnam Red Data Book: **VU** A1a, c, B1+2b, c
Decree 32-Goverment: IIA
Collection Number: CPC 4535
Cone: September to November.
Distribution: Vietnam: Tuyen Quang (Sinh Long). Lao Cai, Son La, Ha Giang, Cao Bang, Hoa Binh, Thanh Hoa.
Conservation notes: Widely distributed throughout South East Asia. This species is only occasionally exploited for its timber. Its habitat is not suitable for agriculture, however, trees are logged for commercial purposes in China. The small size of individual populations and its restricted habitat means that it can be considered as threatened because of habitat disturbance through the logging of species it grows in association with and forest fires. Seedlings and saplings are occasionally removed for ornamental use. During field survey activities 40 individuals were observed. It is estimated that around 1000 individuals remain locally. Conservation effort is urgently required.

5.2.2.4. *Xanthocyparis vietnamensis* Farjon & N. T. Hiep,

Synonym: *Cupressus vietnamensis* (Farjon & Hiep) Silba
Vietnamese Name: Bách vàng
Description: 10 - 20 m tall tree, 30 - 40 cm in diameter. Young cones green and turn brown when ripe.
IUCN: **CR** B2ab(v)
Vietnam Red Data Book: **CR** B1+2b, c, e
Decree 32-Goverment: IA
Collection Number: CPC 4553
Cone: September to November.
Distribution: Vietnam: Tuyen Quang (Sinh Long) and Ha Giang.
Conservation notes: The already small population is primarily threatened by forest fragmentation and selective logging in Ha Giang: Quan Ba and Dong Van and Tuyen Quang (Sinh Long). Trees have been logged for commercial purposes. Regeneration is variable; recent seed collection from specific localities and subsequent germination trials by CPC have not been successful. It is a dominant canopy species found on limestone ridge mountain areas at elevations around 1000 to 1200 m a.s.l. Seven to ten mature healthy individuals were observed within an area of 10 $km^{2.}$. We also estimate observing a further 100 individuals from this vantage point on an adjacent ridge top. Conservation effort is urgently required.

5.2.2.5. *Podocarpus pilgeri* Foxw

Vietnamese Name: Thông tre lá ngắn
Synonym *: Podocarpus brevifolius* (Stapf) Foxw and *P. tixieri* Gaussen
Description: Dioecious tree reaching 5 - 12 m with a diameter MBH of less than 0.5 m. Branches are scattered and often in whorls of five. It is found in the 2^{nd} or 3^{rd} stratum layer of primary closed evergreen tropical /seasonal submontane coniferous forest on the top ridges of highly eroded solid crystalline white limestone mountains.
IUCN: LC ver 2.3
Vietnam Red Data Book: **NE**
Decree 32-Goverment: NE

Collection Number: CPC 4524, 4562
Cone: September to November.
Distribution: Tuyen Quang (Sinh Long), Lao Cai, Son La, Ha Giang, Cao Bang, Hoa Binh, Quang Ninh and Kien Giang.
Conservation notes: The wide distribution in South East Asia means that it is not currently listed as threatened. However, at present, in Ha Giang, Tuyen Quang, Cao Bang, Lao Cai province, this species is largely exploited for its ornamental use and is illegally exported to China. Its habitat is not suitable for agriculture. The small size of individual populations and its restricted habitat means that it can be considered as threatened because of habitat disturbance through the logging of the associated species and forest fires. Proposed Vietnam national conservation status: VU A2ac (Nguyen Tien Hiep *et al*., 2004).

6. Discussion

6.1. Population Status

Table 3 summarises the known status of 13 species recorded during survey activities conducted in both March and September 2011.

Table 3. Current status of various species within the Sinh Long Forest Area, 2011.

No.	Botanical Name	Population Size (observed)	Area of Occupancy	Threat
1	*Kmeria septentrionalis*	Less than 50	Less than 10 km^2	Habitat loss, illegal logging and low regeneration
2	*Magnolia liliifera*	Less than 50	Less than 10 km^2	Habitat loss
3	*Manglietia rostrata*	Less than 50	Less than 10 km^2	Habitat loss and low regeneration
4	*Manglietia chevalieri*	Cultivated	Widely	No threat
5	*Michelia balansae*	Less than 50	Less than 10 km^2	Habitat loss and low regeneration
6	*Michelia masticata*	Less than 50	Less than 10 km^2	Habitat loss, fragmented population and low regeneration
7	*Michelia foveolata*	Less than 50	Less than 10 km^2	Habitat loss, illegal logging and low regeneration
8	*Michelia gioi*	Less than 50	Less than 10 km^2	Habitat loss, population fragmented, illegal logging.
9	*Calocedrus rupestris*	Less than 50	Less than 10 km^2	Habitat loss, illegal logging, and low regeneration
10	*Cephalotaxus mannii*	Less than 50	Less than 10 km^2	Habitat loss, illegal logging, and low regeneration
11	*Taxus chinenis*	Less than 50	Less than 10km^2	Habitat loss, illegal logging, and low regeneration
12	*Xanthocyparis vietnamensis*	Less than 50	Less than 10 km^2	Habitat loss, illegal logging, and low regeneration
13	*Podocarpus pilgeri*	Less than 50	Less than 10 km^2	Habitat loss, illegal logging, and low regeneration

6.2. Relative Value of the Site for Conservation

Orchidaceae is highly diverse in the Khuoi Phin area. At least 50 species were discovered belonging to the Abdominea, Bulbophyllum, Calanthe, Coelogyne, Dendrobium, Epigeneium, Paphipedilium, Phaius and Vanda genera. Of these, at least nine species possess high ornamental and conservation value e.g. *Paphiopedilum hirsutissimum*, *Paphiopedilum malipoensae*, *Paphiopedilum henryanum*, *Dendrobium nobile*, *Coelogyne fimbriatum*, *Phaius mishmensis*, *Phaius tonkinensis* , *Phalaenopsis mannii*, *Vanda brunnea, Vanda fuscoviridis*, and *Vanilla sp.* The first five (5) species are all listed in both the Vietnam Red Data Nook and Decree 32/2006/ND-CP. The discovery of a species *Abdominea minimiflora* (CPC 4512) from the genus Abdominea at the site is extraordinary as this genus is not known to exist anywhere on mainland Asia and previously was restricted to Indonesia and the Philippines.

7. Recommendations

- Tuyen Quang Forest Protection Department, Na Hang People's Committee and other relevant authorities need to promote the conservation benefits for significant species and encourage protection of magnolia and conifer populations by the local community at Khuoi Phin, Na Tau and Nam Duong villages.
- Survey activities resulted in identifying only 60% of the collected taxa due to a lack of phonological information (flowering and fruiting times) Additional botanical surveys are recommended for completion in different seasons so that adequate assessment and collection of specimens may be made.
- The Tuyen Quang Department of Science and Technology and Na Hang FPD need to collaborate with local communities and other scientific institutions to design and plan a project to further assess conservation status and promote conservation benefits for protecting magnolia, conifer, orchids and medicinal plant species of high conservation value. The aim of such a project would be to protect genetic resources in the SLFA.
- Since the SLFA is within the Ba Be / Na Hang Limestone Forest Complex (Tuyen Quang and Bac Kan Provinces), develop policies for tourists and scientists to access and use the botanical resources contained within the area.
- During the recent September 2011 survey conducted by CPC the discovery of a new population of *Xanthocyparis vietnamensis* in the Khuoi Phin area is particularly significant. This discovery expands the known distribution of *X. vietnamensis to* only two locations, the other being located at Quan Ba in Ha Giang Province (Nguyen Tien Hiep *et al.,* 2006). Since 2005, CPC and FFI have been protecting this Critically Endangered species in Ha Giang, so collaboration to protect the species in both locations in different provinces is highly recommended.
- Illegal logging of the small populations of *X. vietnamensis* and their associated forest habitat is of serious concern at the moment and awareness of the species' conservation status is urgently required for both Na Hang FPD rangers working within the SLFA and local communities.
- Some suggested on-ground conservation directly involving the participation of local communities include establishing seed banks, collecting seed, establishing nurseries to propagate important economic species and establishing tree protection programs.

- An understanding of the social-economic value of many of the discovered conifer and magnolia species within local communities is limited. We recommend gaining a greater appreciation of these values to understand the root causes of threats.

8. Conclusions

8.1. Magnoliaceae

This family is little known in Vietnam. Therefore, it is important that we collect more samples in a wide variety of regions within the country in order to conduct a comprehensive study of these species' distribution and floristics (including phenology). At the time of our field activities within the SLFA, we only collected eight species such as *Manglietia rostrata*, *M. chevalieri*, *Magnolia liliifera*, *Michelia balansa*, *M. masticata*, *M. foveolata*, *M. gioi* and *Kmeria septentrionalis* . All of which were collected in Na Tau and Nam Duong.

In addition to validating species previously collected in Na Tau and Nam Duong villages, we discovered new species in areas within Khuoi Phin village, identified as *Michelia coriacea* and *K. septentrionalis*.

Overall the CPC has confirmed the presence of nine species of Magnoliaceae Family from three genera including Manglietia, Magnolia and Michelia. Among the species from the Magnoliaceae Family, we collected seed from four species including: *Manglietia rostrata*, *K. septentrionalis*, *Magnolia liliifera*, *Michelia balansa* and the cultivated species *Manglietia chevalieri*. Unfortunately we weren't able to collect seed from other species because seed (if there was any at the time) was immature.

8.2. Pinopsida

The limestone habitat at Khuoi Phin is in excess of 1000 m asl and is exceptionally diverse in flora diversity and conifer groups in particular. In an area of approximately 1 km^2, at an altitude from 1077 to 1159 m asl, we discovered nine species from four families from a total of 34 conifer species found in Vietnam. Of considerable significance during the most recent trip in September 2011, was the discovery of a population of *Xanthocyparis vietnamensis*. Numbering between 7 – 10 mature individuals. These trees were of reproductive age and were around 20m tall with. From this location we observed perhaps one hundred or more individuals on an adjacent ridge top within the LBFA and southern Ha Giang Province.

This discovery adds a second population of *X. vietnamensis* population in Vietnam and the world. Previously this species was recorded in Quan Ba and Dong Van District of Ha Giang Province. Such a discovery in Tuyen Quang Province is considerably meaningful to evaluating the species' conservation status both domestically and globally. Conifers found in the SLFA are significant to conservation, four of nine species are listed in the Vietnam Red Book and are legally protected under Decree 32/2006/ND-CP.

Some species such *X. vietnamensis*, *Taxus chinensis* and *Podocarpus pilgeri* have been illegally logged for sale. The pictures below demonstrate that Golden Cypress trees with diameters from 50 to 80 cm have been cut down, and the stump of *T. chinensis* and *P. pilgeri* remain in the forest as a reminder of where they once grew (Figure 3).

Figure 3. An illegal logged *Xanthocyparis vietnamensis* tree.

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10. Photographs

Plate 1. Activities (from left to right): Planning at the Sinh Long People's Committee; Dr. Nguyen Tien Hiep in discussions with avillage leader; Lunch time in the forest; Na Hang FPD prepared dinner; Collecting Magnolia and *Magnolia masticata*.

Plate 2. Habitat (from left to right): Around Nam Duong Village; Xo Lo Che; View to Doang Village; Stream bank in Nam Duong; Khuoi Phin top ridge; Khuoi Phin limestone; Doang Village.

Plate 3. Survey team and muddy road.

Plate 4. Magnoliaceae (from left to right): *Manglietia chevalieri, Kmeria septentrionalis, Michelia masticata, Michelia masticata, Manglietia rostrata,* and *Magnolia liliifera*.

Plate 5. Threats

Plate 6. Village life.

Appendix 1: Survey Itineraries

Survey Activity One: March 8th to 19th, 2011

	Date	Itinerary & Camp points	Activities	Elevation (m)	GPS Coordinates
Day 1	8 Mar	South Xuan Lac to Na Hang	Planning with Na Hang People's Committee & Na Hang FPD		
Day 2	9 Mar	Na Hang to Sinh Long, then Nam Duong Village	Planning with Yên Hoa station (Na Hang FPD) & Sinh Long People's Committee		
Day 3	10 Mar	Nam Duong, around point So Lo Che	Survey	430- 510	$22^0$35'06"N, 105^0 21'45"E
					$22^0$35'41"N $105^0$21'05"E
					$22^0$35'40"N, $105^0$21'05"E
Day 4	11 Mar	Nam Duong: around point So Lo Che	Field survey	510	$22^0$35'41"N, $105^0$21'05"E
Day 5	12 Mar	Nam Duong: between direction So Lo Che to Doang & Giang Tri Villages	Field survey	510- 564	$22^0$35'41'N, $105^0$21'05'E
					$22^0$35'54"N, $105^0$20'56"E
Day 6	13 Mar	Nam Duong: Phin Pành and Ta Khao mountain	Field survey	527 - 634	$22^0$34'34"N $105^0$22'00"E
					$22^0$34'23"N, $105^0$21'55"E
					$22^0$34'27"N, $105^0$22'07"E
Day 7	14 Mar	Nam Duong: Phin Pành, Ta Khao mountain	Field survey	549	$22^0$34'27"N, $105^0$22'07"E
Day 8	15 Mar	Nam Duong to Khuoi Phin village	Field survey	700	$22^0$35'36" N, $105^0$25'23"E
Day 9	16 Mar	Khuoi Phin village	Field survey	879	$22^0$37'10"N, $105^0$21'39"E
Day 10	17 Mar	Na Tau Village	Field survey	278- 299	$22^0$34'39"N, $105^0$23'02"E
					$22^0$34'22"N, $105^0$23'25"E
Day 11	18 Mar	Na Hang District	Preapare specimens		
Day 12	19 Mar	Na Hang - Ha Noi	Travel		

Survey Activity Two: 26th September to 6th October, 2011

	Date	Itinerary & Camping Points	Activities	Elevation (m)	GPS Coordinates
Day 1	26 Sept.	Departure from Hanoi to Na Hang	Prepare for survey		
Day 2	27 Sept.	Na Hang and Sinh Long	- Work with Na Hang People's Committee & FPD Na Hang (Mr. Tue) - Meet with Mr. Tuyen, FPD station at Yen Hoa - Obtain work permit for Nam Duong & Khuoi Phin Communes from Sinh Long People's Committee - Travel from Sinh Long to Nam Duong Village		
Day 3	28 Sept.	Nam Duong Village	Magnoliaceae survey & seed collection of *Magnolia liliifera* in Nam Tau Village	282	$22^0$34'48.7"N $105^0$22'32.57" E
Day 4	29 Sep	Nam Duong Village	Magnoliaceae suvey and seed collection of *Magnolia liliifera* & *Kmeria septentrialis* from Nam Duong to Xo Lo Cha valley	512	$22^0$35'16.4"N $105^0$21'32.1"E
				530	$22^0$35'19.3"N $105^0$20'33.9"E
Day 5	30 Sept	Nam Duong Village	Magnoliaceae suvey & seed collection of *Michelia balansa*, *Manglietia rostrata*, *Manglietia rostrata* & *Magnolia liliifera*.	515	$22^0$35'42.5"N $105^0$20'58.8"E
				684	$22^0$36'06.2"N $105^0$20'43.6"E
				710	$22^0$35'11"N $105^0$21'10.9"E
				578	$22^0$35'27.7"N $105^0$21'8.9"E
Day 6	1 Oct., 2011	Khuoi Phin Village	Plant survey & seed collection: *Podocarpus nerifolius*, *P. pilgeri*, *Amentotaxus hatuyensis*, *Taxus chinenis*, *Tsuga chinensis*, *Cephalotaxus manii*, *Xanthocyparis vietnamensis*	1159	$22^0$38'19.7"N $105^0$20'27.0"E
Day 7	2 Oct.	Khuoi Phin Village	Plant survey & seed collection of *Xanthocyparis vietnamensis* & *Taxus chinensis*.	1151	$22^0$38'23.3"N $105^0$20'19.5"E
Day 8	3 Oct.	Khuoi Phin Village	Plant survey & seed collection of *Michelia*	1077	$22^0$38'20.4"N, $105^0$20'13.9"E

			coreacea & Kmeria septentrinalis.		
Day 9	4 Oct.	Phinh Ngai - Na Hang	- Travel. - Seed collection of *Manglietia chevalieri* - Press specimens and clean seeds		
Day 10	5 Oct.	Na Hang	Report and analysis field data		
Day 11	6 Oct.	Na Hang to Hanoi	Travel		

Appendix 2. Plant checklist in the Sinh Long Forest Area

No.	Botanical Name	Voucher Collection Number
1.	**Acoraceae**	
	Acorus gramineus Soland	CPC 1281
2.	**Anacardiaceae**	
	Pegia sarmentosa	CPC 1332
3.	**Annonaceae**	
	Fissistigma sp.	CPC 1301
	Miliusa chinensis Finet & Gagnep.	CPC 1291
4.	**Araceae**	
	Arisaema sp.	CPC 1287
5.	**Araliaceae**	
	Aralia chinensis	CPC 1311
6.	**Begoniaceae**	
	Begonia floribunda	CPC 1354
	Begonia saphoii	CPC 1355
	Begonia sp.	CPC 1304
	Begonia sp.	CPC 1305
	Begonia sp.	CPC 1306
	Begonia sp.	CPC 1323
	Begonia sp.	CPC 1342
	Begonia sp.	CPC 1353
	Begonia sp.	CPC 1363
7.	**Boraginaceae**	CPC 1319
8.	**Celastraceae**	
	Euonymus sp.	CPC 1352
9.	**Cupressaceae**	
	Calocedrus rupestris Aver., H,T,	CPC 1318

	Nguyen & L.K. Phan.	
10.	**Elaeocarpaceae**	
	Elaeocarpus sp.	CPC 1369
11.	**Euphorbiaceae**	CPC 1333
12.	**Gesneriaceae**	CPC 1308
	Gesneriaceae	CPC 1368
13.	**Icacinaceae**	CPC 1370
	Gomphandra sp.	CPC 1302
14.	**Labiatae**	CPC 1350a
15.	**Lauraceae**	CPC 1312
16.	**Leguminosae**- **Papilionoideae**.	
	Aganope thyrsiflora	CPC 1331
17.	**Liliaceae** (**Convallariaceae**)	
	Disporum sp.	CPC 1344
	Polygonatum sp.	CPC 1303
18.	**Magnoliaceae**.	
	Kmeria septentrionalis	CPC 1277, CPC 1271, CPC 1337
	Magnolia liliffera	CPC 1274, CPC 1371, CPC 1273, CPC 1275, CPC 1292, CPC 1338
	Manglietia chevalieri	CPC 1373, CPC 1270, CPC 1314, CPC 1315, CPC 1316
	Manglietia rostrata	CPC 1272, CPC 1334, CPC 1340, CPC 1335
	Michelia crassiflora	CPC 1279
	Michelia balansae	CPC 1284
	Michelia gioii	CPC 1282
	Michelia masticata	CPC 1280, CPC 1278, CPC 1283 CPC 1339
19.	**Malpighiaceae**	
	Aspidopteris sp.	CPC 1372
20.	**Moraceae**	
	Ficus abelii Miq.	CPC 1354
	Malaisia scandens (Lour.) Planch.	CPC 1300
	Malaixia scandens (Lour.) Planch.	CPC 1299
21.	**Orchidaceae**	
	"Phalaenopsis" sp.	CPC 1364
	"Renanthera" citrine.	CPC 1366
	Bulbophyllum sp.	CPC 1357

	Calanthe sp.	CPC 1288
	Cheirostylis yunnanensis	CPC 1360
	Cymbidium sp.	CPC 1328
	Cymborchis veratrifolia	CPC 1345
	Dendrobium sp.	CPC 1324, CPC 1349, CPC 1359
	Epigeneium chapaense Gagnep.	CPC 1307
	Eria amica Rchb.f.	CPC 1269
	Eria sp.	CPC 1367
	Goodyera sp.	CPC 1322, CPC 1343
	Liparis sp.	CPC 1348
	Paphiopedilum hirsutissimum.	CPC 1327
	Phaius sp.	CPC 1286
	Thrixspermum sp.	CPC 1356
	Tropidia sp.	CPC 1358
	Vanda brunnea Rchb.f.	CPC 1341
22.	**Piperaceae**	
	Piper sp.	CPC 1326

23.	**Podocarpaceae**	
	Nageia fleuryi (Hickel) de Laub.	CPC 1317

24.	**Psilotaceae**	
	Psilotum nudum P. Beauv.	CPC 1330

25.	**Ranunculaceae**	
	Clematis sp.	CPC 1313

26.	**Rubiaceae**	
	Wendlandia sp.	CPC 1325

27.	**Rutaceae**	
	Clausena "falcatum"	CPC 1329

28.	**Sterculiaceae**	
	Sterculia lanceolata	CPC 1346

29.	**Theaceae**	
	Camellia sp.	CPC 1361

30.	**Unknown family**	CPC 1351

31.	**Vitaceae**	CPC 1298, CPC 1362

32.	**Vittariaceae**	
	Antrophyum sp.	CPC 1289, CPC 1320