

MAPPING AND ASSESSMENT
of
XANTHOCYPARIS VIETNAMENSIS
in
Cao Bang, Ha Giang and
Lang Son provinces
(Vietnam)

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Mapping and assessment of *Xanthocyparis vietnamensis* subpopulations in Cao Bang, Ha Giang and Lang Son provinces (Vietnam)

SHORT PRELIMINARY REPORT

Basics

Discovery, mapping and assessment of new populations of tertiary relict, critically endangered, strict Vietnamese endemic – Golden Cypress (*Xanthocyparis vietnamensis*, Cupressaceae) on the territory of Cao Bang, Ha Giang and Lang Son provinces of northern Vietnam supported financially from Rufford Small Grant Found (RSG) were fulfilled during year 2014-2015.

Main participants

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Background

This report contains original data of field investigation, which represent succeeded stage of studies initiated by previous RSG grant – “Assessment of *Xanthocyparis vietnamensis* nature protected status in Tuyen Quang province” (Ref: 12585-2). The second circle of the Project investigation program provides original data of field assessment of distribution, habitat conditions and conservation status of newly discovered populations of critically endangered tertiary relict conifer – *Xanthocyparis vietnamensis* (Golden Cypress) in Ha Giang, Cao Bang and Lang Son provinces of the northern Vietnam. The elaboration and improving strategy for Golden Cypress protection in Vietnam is main aim of current investigation.

Golden Cypress is member of taxonomically isolated monotype genus. It represents strict local endemism of rocky limestone areas of northern Vietnam and southern China (Guangxi). The species was known before our RSG studies only by 4 small highly endangered and depleted populations found in the northern Vietnam near Chinese border. Additionally six populations were discovered and studied during our initial RSG investigation (Averyanov et al., 2013). One small population of Golden Cypress was also found recently in central Guangxi (Meng Tao et al., 2013). Current study presents schematic description of primary vegetation, natural conditions, square and size of 3 newly discovered populations in the northern Vietnam, as well as provides basic recommendations for their effective protection to conserve of genetic diversity of this unique species.

Golden Cypress (*Xanthocyparis vietnamensis*) was firstly discovered in the northern Vietnam by N.T.Hiep and L.Averyanov in 1999 on rocky limestone of Bat Dai Son Mountains (Averyanov et al., 2002) near the border with China. It was recognized as alone species of new relict monotype conifer genus with closest relative – genus *Callitropsis* spreading in northern America (Farjon et al., 2002; Farjon, 2010). The plant was one of the most remarkable discoveries in conifer taxonomy of last decades (Farjon, 2010). Meanwhile, 3 populations found at that time in northern part of Ha Giang province in Quan Ba (Bat Dai Son and Can Ty municipalities, Bat Dai Son Mountains) and Yen Minh districts (Sinh Lung and Ho Quang Phin municipalities) were endangered and highly depleted, why species status was reasonably estimated as globally critically endangered (Hiep, 2004; Regalado et al., 2006). Some year later, small population consisting of few depressed mature trees were additionally found in Bac Me district of Ha Giang province. Additionally, important, but still questionable data (not verified by any collections) about species occurrence come from Bao Lam, Bao Lac and Thach An districts (Cao Bang province). These data were verified by our field studies later. Largest population was discovered by Center for Plant Conservation in September 2011 in Na Hang district of Tuyen Quang province. Two year later, six additional populations were discovered and studied during our initial RSG investigation (Averyanov et al., 2013) in Tuyen Quang and Cao Bang provinces. In conditions of very small global population, more extensive field investigations were outstandingly important for discovery of all still existing subpopulations, as well as their mapping and assessment for understanding of real species status and organization of effective conservation activity.

Current Project investigation discovered three additional populations of Golden Cypress in Ha Giang (Bac Me district) and Cao Bang (Thing Nong district) provinces (Fig. 1-5). Additionally, were verified 13 locations where Golden Cypress might be found according to indirect data obtained from local peoples in Ha Giang, Cao Bang and Lang Son provinces. Regrettably, Golden Cypress was not found in these 13 localities, beside existence in studied habitats of all appropriate natural conditions and presence of main usual associates. According to presently updated data, the distribution of Golden Cypress is limited by territories of three provinces: – Ha Giang, Cao Bang and Tuyen Quang. Plant was not found in eastern part of Cao Bang and in Lang Son provinces. Largest part of tentative expectable data about species occurrence in Ha Giang, Cao Bang and Lang Son provinces were wrong or based on another superficially similar conifer species.

Present studies of newly discovered populations of Golden Cypress in Ha Giang and Cao Bang provinces provide important additional original data on vegetation, habitat and natural conditions of

habitats in Ha Giang and Cao Bang provinces. These data present objective picture of native conditions and character of primary environment. Preliminary identification of present conservation status was based on direct observations of specimens, description of population square, population structure and approximate calculation of mature trees in all discovered localities. These data are very significant for trace further population dynamics in coming future.

Additional population newly discovered along the border of Tuyen Quang and Ha Giang provinces (Bac Me / Na Hang districts), undoubtedly, represent largest part of global species population and forms essential pool of species genetic diversity. Being protected these primary woods may be used for any fundamental studies as typical model of globally most endangered primary coniferous endemic forest of karstic rocky limestone of northern Vietnam with their outstandingly rich species composition. Elaborated recommendations are significant for education of local human society and for further sustainable development of the region. Obtained original data of our investigation will contribute to Conservation Status Assessment and Conservation Action Plan IUCN of *Xanthocyparis vietnamensis* in all area of its distribution.

Main Project achievements

Data on 16 possible locations of Golden Cypress in Ha Giang, Cao Bang and Lang Son were obtained on the base of indirect information from local people during wide and extensive talks and interviews in remote mountain regions all over the studied area. All these localities were visited and studied personally (Fig. 1-5).

One population of Golden Cypress was newly discovered in Ha Giang province (Fig. 1, 2, Table 4). Two populations in two close localities were newly discovered in Cao Bang province (Fig. 1, 3, Table 4). Golden Cypress was not found in all other 13 locations with similar habitats in Ha Giang, Cao Bang and Lang Son provinces during personal field investigations (Fig. 1-5).

Mapping and approximate estimation of population square in all three newly discovered populations of Golden Cypress was made. Numerical estimation of specimen numbers and their age was fulfilled very approximately due to steep inaccessible cliffs and time deficit.

It was preliminarily estimated number of trees, population size, population structure, as well as was identified species status for each discovered population as follow:

Population Ha Giang province (voucher number – CPC 7431): more than 100 mature trees 10-15 m tall, about 30-40 cm DBH (Fig. 18-22) / square from 0.5 to 1 km² / no young trees, no visible regeneration / tentative status: endangered.

Population Cao Bang province (voucher number – CPC 7548): about 50 mature trees 10-12 m tall, about 40 cm DBH (Fig. 23-29) / square less than 0.5 km² / few young trees, low regeneration / tentative status: endangered.

Population Cao Bang province (voucher number – CPC 7549): less than 50 mature trees 10-12 m tall, about 20-40 cm DBH (Fig. 30-39) / square less than 0.5 km² / few young trees, low regeneration / high exploitation for timber / tentative status: endangered.

All possible information from local people and local administrations was obtained and personally verified by field observations. However, there is no solid guarantee that locals are always quite honest. Sometime local people keep data about occurrence of Golden Cypress confidentially as such data has certain commercial value and are highly demanded by international dealers having often unlimited financial resources.

Field observations indicate usual isolation of Golden Cypress populations on very small area, commonly on mountain tops. Meanwhile, few small subpopulations of Golden Cypress were observed in one discovered locality, spaced sporadically along edge of mountain ridge (Ha Giang population, voucher number – CPC 7431).

Basic integral description of vegetation and species composition in habitats of Golden Cypress based on voucher herbarium collections is fulfilled. List of species collected as voucher collections in newly discovered *Xanthocyparis* habitats is presented in Table 5. Eight species were discovered in the project field investigations as a new species for science (Averyanov et al., 2015a-c), 3 species were recorded for the flora of Vietnam at first. Integral dotted maps of Golden Cypress and its main associates are compiled on the base of original voucher materials (Fig. 12, 14). Model plots methodology was not used due to steep cliffy landscape not suitable for plot assignment.

Number of trees and their age in discovered populations were calculated very approximately due to steep inaccessible cliffs and time deficit. Structure, “vitality” and expected conservation status are preliminary assessed. Full comprehensive assessment was not possible, as some trees have been observed on inaccessible cliffs or on inaccessible mountain tops, which study needs additional time and special equipment.

Golden Cypress phenology and approximate cone/seed production in discovered populations are studied and identified as well as optimal time for seed collecting in the area, which fits well with earlier observations and descriptions (Averyanov et al., 2013).

Possible strategy for species protection elaborated and discussed with municipal/district authorities and officers of Forest Protection Department. It includes conservation of local habitats of remained subpopulations, seed/cutting propagation, plantation and strong control for illegal exploitation and trade.

Full conservation and protection of remaining samples of *Xanthocyparis vietnamensis* in all discovered localities is extremely important for further propagation and salvation of the species genetic diversity. Well understanding of this problem by FPD and other Vietnamese authorities of different levels meets a certain conflict with local peoples who consider forest in their native area as their property. The timber of the tree is outstandingly valuable for home and other village or farm constructions and was widely used by locals during ages up to now hence it resource become miserable. International dealers, which offer high price for the timber represent additional serious problem for protection of mature trees. Cultivation and plantation of *Xanthocyparis* in such circumstances are most important way for species protection and conservation. Organization of the tree propagation by seeds and cuttings with moderate financial donation to local families for tree plantation in its native area looks alone effective way for species conservation in long-term future. Such plan is actually elaborated and proposed by project team.

Schematic illustrated preliminary report of completed research is presented here. Manuscript of illustrated assessment with main results of investigation is now in processing for preparation for publication.

Short schematic resume of main results and items of activity is presented below in tables 1-5:

Table 1. Schedule, activity and main results

Accepted abbreviations in the text of table: prov. – province, distr. – district, mun. – municipality (commune), vill. – village

Dates 2014	Activity items	Locality	Short results	Voucher collections
Nov. 8	Arrival of Leonid Averyanov to	Hanoi	Arrival and preparation for field works	-

	Hanoi			
Nov. 9-10	Preparation for field works	Hanoi	Preparation for field works	-
Nov. 11-12	Trip Hanoi – Ha Giang prov., Bac Me distr., Phieng Luong Long mun.	Ha Giang prov., Bac Me distr., Phieng Luong mun., Phieng Luong vill.	Registration and processing permissions for field work, works with FPD authorities. Getting permissions and elaborating of field work plan	-
Nov. 13	Field work	Bac Me distr., Phieng Luong mun., Phieng Luong vill. Fig. 2	Preliminary assessment. Collecting of voucher specimens for habitat description (<i>Xanthocypris</i> not found)	CPC 7386-7430
Nov. 14	Field work	Bac Me distr., Phieng Luong mun. Ha Giang prov.), Phieng Luong vill. and Na Hang distr., Sinh Long mun., Phieng Phoc vill. (Tuyen Quang prov.). Fig. 2	Discovery of <i>Xanthocypris</i> population near Phieng Phoc village (Sinh Long mun., outside of Bac Me distr.) Preliminary population assessment. Collecting of voucher specimens for habitat description	CPC 7431-7471 <i>Xanthocypris</i> voucher herbaria number CPC 7431
Nov. 15	Field work	Bac Me distr., Phieng Luong mun., Phieng Luong vill. Fig. 2	Preliminary assessment. Collecting of voucher specimens for habitat description (<i>Xanthocypris</i> not found)	CPC 7472-7493
Nov. 16	Field work	Bac Me distr., Thuong Tan mun. Fig. 2	preliminary assessment. Collecting of voucher specimens for habitat description (<i>Xanthocypris</i> not found)	-
Nov. 17-18	Trip Ha Giang prov. (Bac Me distr.) – Cao Bang prov., Bao Lac distr., Hong An mun.	Cao Bang prov., Bao Lac distr.	Registration and processing permissions for field work, works with FPD authorities. Getting permissions and elaborating of field work plan	-
Nov. 19	Field work	Cao Bang prov., Bao Lac distr., Hong An mun., Mi Lung vill.. Fig. 3	Field explorations of the area for <i>Xanthocypris</i> populations, searches of information among local peoples, studies of typical species	CPC 7494-7503
Nov. 20	Field work	Cao Bang prov., Bao Lac distr., Hong An mun., Mi Lung vill. Fig. 3	Discovery of two <i>Xanthocypris</i> populations, description of habitat, preliminary population assessment. Collecting of voucher specimens for habitat description	CPC 7504-7558 <i>Xanthocypris</i> voucher herbaria numbers CPC 7548 & CPC 7549
Nov. 21	Field work	Cao Bang prov., Bao Lac distr., Hong An mun., Mi Lung vill. Fig. 3	Field explorations of the area for <i>Xanthocypris</i> populations, searches of information among local peoples, studies of typical species. <i>Xanthocypris</i> not finding	CPC 7559-7596
Nov. 22	Field work	Cao Bang prov., Bao Lac distr., Hong An mun., Mi Lung vill. Fig. 3	Field explorations of the area for <i>Xanthocypris</i> populations, searches of information among local peoples, studies of typical species. <i>Xanthocypris</i> not finding	CPC 7597-7602
Nov. 23	Field work	Cao Bang prov., Bao Lac distr., Hong An mun., Mi Lung vill. Fig. 3	Herbaria work in camp Processing of field collections	-
Nov. 24	Field work	Cao Bang prov., Bao Lac distr., Dinh Phung mun., Ban O vill. Fig. 4	Field explorations of the area for <i>Xanthocypris</i> populations, searches of information among local peoples, studies of typical species. <i>Xanthocypris</i> not found	CPC 7603-7654
Nov. 25	Field work	Cao Bang prov., Bao Lac distr., Son Lo and Son Lap mun. Fig. 5	Field explorations of the area for <i>Xanthocypris</i> populations, searches of information among local peoples, studies of typical species. <i>Xanthocypris</i> not found	-
Nov. 26	Trip, Bao Lac distr. to Bao Lam distr. of Cao Bang prov., Thai Son	Cao Bang prov., Bao Lam distr.	Registration and processing permissions for field work, works with FPD authorities. Getting permissions and elaborating of	-

	mun.		field work plan	
Nov. 27	Field work	Cao Bang prov., Bao Lam distr., Thai Son mun. Fig. 5	Field explorations of the area for <i>Xanthocyparis</i> populations, searches of information among local peoples, studies of typical species. <i>Xanthocyparis</i> not found	CPC 7655-7677
Nov. 28	Field work	Cao Bang prov., Bao Lam distr., Thai Son mun. Fig. 5	Field explorations of the area for <i>Xanthocyparis</i> populations, searches of information among local peoples, studies of typical species. <i>Xanthocyparis</i> not found	-
Nov. 29	Trip Cao Bang prov., Bao Lam Distr. - Hanoi	Cao Bang, Bao Lam, Hanoi		-
Nov. 30- -Dec. 2	Hanoi	Hanoi	Documentation, processing of field collections, field observations and field books, preliminary identifications of voucher herbarium specimens	-
Total: 292 collected numbers (about 1300 herbarium specimens)				

Table 2. Project field work time allocation:

Kind of activity	Numbers of days
Trips and processing permissions days:	6
Field work days:	14
Exploration preparation, material processing days:	5
Total days of the project exploration:	25

Table 3. Main field work results

Kind of activity	Figures of results
Discovered and described <i>Xanthocyparis</i> populations:	3
Assessed <i>Xanthocyparis</i> populations:	3
Collected voucher herbarium specimens:	292 (CPC 7386-7677)
Collected plant families	53
Collected plant genera	135
Collected plant species	248

It was discovered and studied 3 Golden Cypress populations in Ha Giang and Cao Bang provinces (Table 4).

Table 4. Discovered and studied of *Xanthocyparis vietnamensis* populations in Ha Giang and Cao Bang provinces

Administrative position	Geographical position	Elevation	Collecting №	Date
1. Ha Giang province				
Border area between Phieng Luong mun. (Ha Giang prov., Bac Me distr.) and Sinh Long mun. (Tuyen Quang prov., Na Hang distr.).	22°38'24.3''N 105°20'21.3''E	1100-1170 m	CPC 7431 Fig. 18-22	14 Nov. 2014
2. Cao Bang province				
Cao Bang prov., Bao Lac distr., Hong An mun., Mi Lung vill.	22°50'03.8''N 105°51'36.5''E	1200-1250 m	CPC 7548 Fig. 23-29	20 Nov. 2014
3. Cao Bang province				
Cao Bang prov., Bao Lac distr., Hong An mun., Mi Lung vill.	22°50'03.8''N 105°51'36.5''E	1200-1250 m	CPC 7549 Fig. 30-39	20 Nov. 2014

Unforeseen difficulties arisen during the project realization and their obliged solution

1. Extremely bad roads and trails in remote mountain area of exploration as well as prolonged rains, which commonly stops in November. / We have been forced pay more money for car lease and maintenance, as well as pay more price for motorbike lease. In addition, we spend more time for travel and exploration routes.
2. High activity of illegal exploration and illegal exploitation of Golden Cypress by international traders and dealers having often unlimited budget to purchase of any parts of this plant (including everything items, from whole trees or cuttings, till pieces of timber, bark or roots, fig. 48). It leads to many falsifications of local people whose seek get money for any information on species occurrences, particularly in remote area needed some days of feet trip. / We have been forced pay more money for local guides and porters, as well as personally check any obtained data.
3. High attention to our Project activity from state administration, police and FPD (Forst Protection Department) due to wide illegal explorations of international traders and dealers and their national agents. / We have been forced include one people from each agency, and pay addition costs for meal and their accommodation. In addition, we have been preparing short special report about all our activity and results for state administration and District FPD office that decrease project time for the actual work.
4. Particularly rocky and cliffy landscape formed deep karstic erosion where some trees of Golden Cypress grows on vertical cliffs and mesae tops inaccessible for direct study without special equipment. / We should use some extrapolation in estimations of whole populations based on direct studies of available representative specimens. This concerns estimation of number, middle age, structure and population square. Model plots methodology was not used due to steep cliffy landscape not suitable for plot assignment.

Further possible conservation program for Golden Cypress in Vietnam

1. Preliminary talks with provincial/district state administration and FPD representatives for possible organization of appropriate territory with adequate natural conditions for Golden Cypress plantation (Bat Dai Son nature reserve, Dong Van Geopark, or other similar sites). Obtaining principal preliminary decision.
2. Selection of concrete suitable area with optimal nature conditions, preliminary identification of the square of plantation. Preliminary talks with municipal and village authorities, to obtain principal preliminary decision. Selection of possible responsible employers (villagers) for organization of propagation nursery and further cutting/seedling cultivation and plantation. It is important that some villagers already have some historical experience for conifers cultivation *ex situ* in their villages (Fig. 51, 52). Additionally, some conifers species are quite capable for regeneration *in situ* in appropriate natural conditions (Fig. 49, 50) in studied area.
3. Searches of financial support for the program realization.
4. Collecting of seeds and cuttings from trees in all existing populations for artificial propagation and plantation. This work should be urgently done for most decreasing populations, which may extinct in the very near future.

5. Cultivation of seedlings and cuttings for 2–3 years and succeeded remove saplings into plantation.

6. Monitoring and control for appropriate conditions of trees plantation.

Proposed program can not only protect global genetic diversity of Golden Cypress, but also will cordially improve fertility and seed production of cultivated plants taken from geographically isolated populations due to their successive cross-pollination in condition of plantation.

Key plant groups collected in habitats of *Xanthocyparis vietnamensis* in studied area

1. New species for science discovered in studied area

Ainsliaea rigidifolia sp. nov. (CPC 7413a, fig. 53, 54), *Aspidistra lancifolia* sp. nov. (CPC 7491, fig. 55), *Begonia arachna* sp. nov. (CPC 7536, CPC 7568, CPC 7391, CPC 7547, fig. 56), *Iris pseudojaponica* sp. nov. (CPC 7532, fig. 57), *Oberonia tatianae* sp. nov. (CPC 7581a, fig. 58, 59), *Ophiopogon fruticulosus* (CPC 7453, CPC 7605, fig. 60, 61), *Sonerila hagiangensis* sp. nov. (CPC 7442), *Tupistra patula* (CPC 7492, fig. 62, 63). Totally 8 species.

2. Plant species newly discovered in the flora of Vietnam

Coelogyne leucantha (CPC 7581b, fig. 64), *Gastrochilus distichus*, *Mussaenda shikokiana*.

3. Gymnosperms

Cupressaceae: *Fokienia hodginsii* (Fig. 50, 51), *Xanthocyparis vietnamensis* (Fig. 18-39); **Pinaceae:** *Pinus henryi*, *Pinus wangii*, *Pseudotsuga sinensis*, *Tsuga chinensis*; **Podocarpaceae:** *Dacrycarpus imbricatus*, *Nageia fleurii*, *Podocarpus annamensis* (Fig. 49), *Podocarpus neriifolius*, *Podocarpus pilgeri*; **Taxaceae:** *Amentotaxus argotaenia*, *Amentotaxus yunnanensis*, *Cephalotaxus mannii* (Fig. 52), *Taxus sinensis*.

4. Globally threatened species

Amentotaxus argotaenia, *Amentotaxus yunnanensis*, *Cephalotaxus mannii* (Fig. 52), *Fokienia hodginsii* (Fig. 50, 51), *Paphiopedilum malipoense*, *Paphiopedilum micranthum* (Fig. 65, 66), *Pinus wangii*, *Pseudotsuga sinensis*, *Taxus sinensis*, *Trachycarpus geminisectus* (Fig. 67), *Tsuga chinensis*, *Xanthocyparis vietnamensis* (Fig. 18-39).

5. Local endemics

Coelogyne malipoensis, *Epigeneium chapaense* (Fig. 68), *Holcoglossum wangii* (Fig. 69), *Liparis averyanoviana*, *Liparis filiformis* (Fig. 70), *Liparis superposita*, *Paphiopedilum malipoense*, *Paphiopedilum micranthum* (Fig. 65, 66), *Phaius wenshanensis* (Fig. 71), *Pholidota missionariorum*, *Pholidota roseans* (Fig. 72), *Polygala tonkinensis* (Fig. 73), *Trachycarpus geminisectus* (Fig. 67).

6. Threatened timber trees widely logging for valuable timber

Amentotaxus argotaenia, *Amentotaxus yunnanensis*, *Buxus* sp., *Cephalotaxus mannii*, *Dacrycarpus imbricatus*, *Euonymus* sp., *Fokienia hodginsii* (Fig. 50, 51), *Kmeria septentrionalis*, *Magnolia fulva*, *Magnolia liliifera*, *Magnolia rostrata*, *Michelia balansae*, *Michelia coriacea*, *Michelia martini*, *Nageia fleurii*, *Pinus henryi*, *Pinus wangii*, *Podocarpus annamensis* (Fig. 49), *Podocarpus*

neriifolius, *Podocarpus pilgeri*, *Pseudotsuga sinensis*, *Taxus sinensis*, *Tsuga chinensis*, *Xanthocyparis vietnamensis* (Fig. 18-39).

7. Non timber threatened species widely collected for sale (mainly as medicinal and ornamental plants)

Cymbidium ensifolium, *Dendrobium longicornu*, *Goodyera hispida*, *Goodyera schlechtendaliana*, *Holcoglossum wangii* (Fig. 69), *Mahonia nepalensis* (Fig. 74), *Nervilia muratana*, *Paphiopedilum hirsutissimum*, *Paphiopedilum malipoense*, *Paphiopedilum micranthum* (Fig. 65, 66), *Paris chinensis*, *Paris polyphylla*, *Phaius mishmensis*, *Phaius wenshanensis* (Fig. 71), *Phalaenopsis manii*, *Tubocapsicum* sp.

Statistics of voucher collection

Families collected:

Acanthaceae, Aizoaceae, Araceae, Araliaceae, Arecaceae, Asteraceae, Balsaminaceae, Begoniaceae, Berberidaceae, Boraginaceae, Buxaceae, Cardiopteridaceae, Celastraceae, Clusiaceae, Convallariaceae, Convolvulaceae, Cupressaceae, Cyperaceae, Elaeagnaceae, Ericaceae, Euphorbiaceae, Flacourtiaceae, Gentianaceae, Gesneriaceae, Hipericaceae, Iridaceae, Lamiaceae, Lauraceae, Loranthaceae, Lycopodiaceae, Magnoliaceae, Melastomataceae, Myrsinaceae, Oleaceae, Orchidaceae, Pinaceae, Pittosporaceae, Podocarpaceae, Polygalaceae, Polypodiaceae s.l., Ranunculaceae, Rosaceae, Rubiaceae, Rutaceae, Scrophulariaceae, Smilacaceae, Solanaceae, Taxaceae, Thymellaeaceae, Trilliaceae, Valerianaceae, Verbenaceae, Violaceae (totally 53).

Genera collected:

Adiantum, *Aeschynanthus*, *Ainsliaea*, *Amentotaxus*, *Anemone*, *Ardisia*, *Arisaema*, *Aspidistra*, *Asplenium*, *Begonia*, *Blumea*, *Boea*, *Boenninghausenia*, *Brassaiopsis*, *Bulbophyllum*, *Buxus*, *Calanthe*, *Calcareaoboea*, *Callicarpa*, *Canthium*, *Cardiopteris*, *Carex*, *Celastrus*, *Cephalantheropsis*, *Cephalotaxus*, *Cheirostylis*, *Cirsium*, *Cleisostoma*, *Clematis*, *Coelogyne*, *Colysis*, *Croton*, *Cryptochilus*, *Cymbidium*, *Cynoglossum*, *Cyrtomium*, *Dacrycarpus*, *Daphne*, *Dendrobium*, *Disporum*, *Elaeagnus*, *Epigeneium*, *Eria*, *Euonymus*, *Fimbristylis*, *Fokienia*, *Garcinia*, *Gastrochilus*, *Goodyera*, *Hipericum*, *Holcoglossum*, *Homalium*, *Huperzia*, *Hydnocarpus*, *Impatiens*, *Inula*, *Iris*, *Jasminum*, *Kmeria*, *Lematosorus*, *Lepisorus*, *Leptochilus*, *Lindsaea*, *Liparis*, *Litsea*, *Loranthus*, *Luisia*, *Lycopodium*, *Maesa*, *Magnolia*, *Mahonia*, *Medinilla*, *Michelia*, *Microsorium*, *Monomeria*, *Mussaenda*, *Nageia*, *Nervilia*, *Neuwiedia*, *Oberonia*, *Onichium*, *Ophiopogon*, *Ophiorrhiza*, *Otochilus*, *Panisea*, *Paphiopedilum*, *Paris*, *Patrinia*, *Peliosanthes*, *Phaius*, *Phalaenopsis*, *Pholidota*, *Phymatosorus*, *Pinus*, *Pittosporum*, *Plectranthus*, *Podocarpus*, *Podochilus*, *Polygala*, *Polygonatum*, *Polystichum*, *Porana*, *Potentilla*, *Primulina*, *Pseudotsuga*, *Psychotria*, *Pyrrosia*, *Rhynchothecum*, *Rohdea*, *Rubus*, *Schysomussaenda*, *Scutellaria*, *Siegisbeckia*, *Smilax*, *Sonerila*, *Strobilanthes*, *Swertia*, *Taxus*, *Tectaria*, *Tetrapanax*, *Trachycarpus*, *Tsuga*, *Tubocapsicum*, *Tupistra*, *Vaccinium*, *Vernonia*, *Viola*, *Xanthocyparis* (totally 135).

Table 5. List of collected plants mentioned in vegetation descriptions

(New species for science discovered during field works are marked with red asterisk – *, numbers of voucher herbarium collection follows the name)

Acanthaceae

Strobilanthes sp. CPC 7663

Gen. sp.1 CPC 7388

Gen. sp.2 CPC 7397

Aizoaceae

Gen. sp. CPC 7660

Araceae

Arisaema franchetii? CPC 7557

Arisaema sp.2 CPC 7435

Arisaema sp.3 CPC 7563

Araliaceae

Brassaiopsis sp. CPC 7567

Tetrapanax papyrifer (Hook.) K.Koch
CPC 7597

Arecaceae

Trachycarpus geminisetus Spanner &
al. CPC 7559

Asteraceae

- *Ainsliaea sp. nov.? CPC 7413a
 Blumea sp.1 CPC 7465
 Blumea sp.2 CPC 7606
 Blumea sp.3 CPC 7653
 Blumea sp.4 CPC 7673
 Cirsium sp.1 CPC 7570
 Cirsium sp.2 CPC 7601
 Gynura sp.1 CPC 7512
 Gynura sp.2 CPC 7641
 Inula sp. CPC 7413b
 Siegisbeckia sp. CPC 7454
 Vernonia arborea Buch.-Ham. CPC 7655
 Vernonia sp.1 CPC 7575
 Vernonia sp.2 CPC 7611
 Vernonia sp.3 CPC 7669
- Balsaminaceae**
 Impatiens sp.1 CPC 7424
 Impatiens sp.2 CPC 7438
 Impatiens sp.3 CPC 7489
 Impatiens sp.4 CPC 7555
 Impatiens sp.5 CPC 7579
 Impatiens sp.6 CPC 7608
- Begoniaceae**
 *Begonia arachna sp. nov.? CPC 7536,
 CPC 7568, CPC 7391, CPC 7547
 Begonia cavaleriei H.Lev. CPC 7566
 Begonia ceratocarpa S.H.Huang &
 Y.M.Shui CPC 7452
 Begonia handellii Irmisch CPC 7672
 Begonia palmata D.Don CPC 7664
 Begonia sp.1 CPC 7436
 Begonia sp.2 CPC 7437
 Begonia sp.3 CPC 7488
- Berberidaceae**
 Mahonia nepalensis DC. CPC 7514
- Boraginaceae**
 Cynoglossum sp. CPC 7583
- Buxaceae**
 Buxus sp. CPC 7407, CPC 7526
- Cardiopteridaceae**
 Cardiopteris lobata Wall. CPC 7604
- Celastraceae**
 Celastrus sp. CPC 7595
 Euonymus sp.1 CPC 7462
 Euonymus sp.2 CPC 7598
 Gen. sp. CPC 7422
- Clusiaceae**
 Garcinia sp. CPC 7560
- Convallariaceae**
 Aspidistra sp.1 CPC 7484
 Aspidistra sp.2 CPC 7654
 *Aspidistra sp. nov.? (A. carnosa
 Tillich aff.) CPC 7491
 Disporum sp. CPC 7589
 *Ophiopogon fruticosus Aver.,
 N.Tanaka et K.S.Nguyen CPC
 7453, CPC 7605
 Ophiopogon sp.1 CPC 7419
 Ophiopogon sp.2 CPC 7433
 Ophiopogon sp.3 CPC 7469
 Ophiopogon sp.4 CPC 7535
 Ophiopogon sp.5 CPC 7561
 Ophiopogon sp.6 CPC 7562
 Ophiopogon sp.7 CPC 7574
 Ophiopogon sp.8 CPC 7582
 Ophiopogon sp.9 CPC 7591
- Peliosanthes grandiflora Aver. &
 N.Tanaka CPC 7490
 Peliosanthes sp.1 CPC 7429
 Peliosanthes sp.2 CPC 7440
 Peliosanthes sp.3 CPC 7467
 Polygonatum sp. CPC 7408
 Rohdea sp.1 CPC 7445
 Rohdea sp.2 CPC 7639
 Tupistra fungilliformis F.T.Wang &
 S.Yun Liang CPC 7464, CPC
 7576, CPC 7640
 *Tupistra patula Aver., N.Tanaka &
 K.S.Nguyen CPC 7492
- Convulvulaceae**
 Porana racemosa Roxb. CPC 7534
- Cupressaceae**
 Fokienia hodginsii (Dunn) A.Henry &
 H.H.Thomas CPC 7521, CPC
 7552, CPC 7581, CPC 7592
 Xanthocyparis vietnamensis Farjon &
 T.H. Nguyen CPC 7431, CPC
 7548, CPC 7549
- Cyperaceae**
 Carex sp. CPC 7646
 Fimbristylis sp. CPC 7657
- Elaeagnaceae**
 Elaeagnus sp.1 CPC 7457
 Elaeagnus sp.2 CPC 7609
 Elaeagnus sp.3 CPC 7667
- Ericaceae**
 Vaccinium petelotii CPC 7515
 Vaccinium triflorum Rehder CPC 7644
 Vaccinium sp. CPC 7416
- Euphorbiaceae**
 Croton sp. CPC 7675
- Flacourtiaceae**
 Homalium sp.? CPC 7603
 Hydnocarpus sp.? CPC 7486
- Gentianaceae**
 Swertia macrosperma (C.B.Clarke)
 C.B.Clarke CPC 7599
- Gesneriaceae**
 Aeschynanthus sp.1 CPC 7458
 Aeschynanthus sp.2 CPC 7441
 Aeshynanthus sp.3 CPC 7468
 Boea sp. CPC 7659
 Calcareofoea coccinea C.Y.Wu CPC
 7612
 Primulina sp.1 CPC 7481
 Primulina sp.2 CPC 7658
 Primulina sp.3 CPC 7661
 Rhychothecum sp. CPC 7389
- Hypericaceae**
 Hypericum sp. CPC 7600
- Iridaceae**
 *Iris sp.nov. (I. japonica aff.) CPC
 7532
- Lamiaceae**
 Plectranthus sp. CPC 7434
- Lauraceae**
 Litsea sp. CPC 7450
- Loranthaceae**
 Loranthus sp. CPC 7461
- Lycopodiaceae**
 Huperzia sp. CPC 7648
 Lycopodium sp. CPC 7474
- Magnoliaceae**
 Kmeria septentrionalis Dandy CPC
 7456
 Magnolia fulva (Hung T.Chang &
 B.L.Chen) Figlar CPC 7533
 Magnolia liliifera Druce CPC 7459
 Magnolia rostrata W.W.Sm. CPC 7602
 Michelia balansae (A.DC.) Dandy
 CPC 7451
 Michelia coriacea Hung T.Chang &
 B.L.Chen CPC 7558
 Michelia martini (H. Lev.) H. Lev.
 CPC 7656, CPC 7504
- Melastomataceae**
 Medinilla sp.1 CPC 7470
 Medinilla sp.2 CPC 7472
 Sonerila sp.1 CPC 7670
 Sonerila sp.2 CPC 7479
 *Sonerila sp. nov.? CPC 7442
- Myrsinaceae**
 Ardisia sp.1 CPC 7584
 Ardisia sp.2 CPC 7596
 Maesa sp. CPC 7594
- Oleaceae**
 Jasminum sp. CPC 7487
- Orchidaceae**
 Bulbophyllum andersonii (Hook.f.)
 J.J.Sm. CPC 7615
 Bulbophyllum hymenanthum Hook.f.
 CPC 7626
 Bulbophyllum macraei (Lindl.) Rchb.f.
 CPC 7651
 Bulbophyllum psychoon Rchb.f. CPC
 7565
 Bulbophyllum reptans (Lindl.) Lindl.
 CPC 7410, CPC 7527
 Bulbophyllum sp. CPC 7620
 Calanthe densiflora Lindl. CPC 7544,
 CPC 7588
 Calanthe lyroglossa Rchb.f. CPC 7463,
 CPC 7478
 Cephalantheropsis longipes (Hook.f.)
 Ormerod CPC 7401
 Cheirostylis chinensis Rolfe CPC 7632
 Cleisostoma simondii (Gagnep.)
 Seidenf. CPC 7630
 Cleisostoma striatum (Rchb.f.) Garay
 CPC 7545
 Coelogyne fimbriata Lindl. CPC 7621
 Coelogyne leucantha W.W.Sm. CPC
 7581b
 Coelogyne malipoensis Z.H.Tsi CPC
 7631
 Cryptochilus lutea Lindl. CPC 7517
 Cymbidium ensifolium (L.) Sw. CPC
 7516, CPC 7543
 Dendrobium longicornu Lindl. CPC
 7428, CPC 7432
 Epigeneium amplum (Lindl.)
 Summerh. CPC 7618
 Epigeneium chapaense Gagnep. CPC
 7409
 Eria carinata Gibson CPC 7624
 Eria coronaria (Lindl.) Rchb.f. CPC
 7400, CPC 7628
 Eria muscicola (Lindl.) Lindl. CPC
 7447, CPC 7460
 Eria scabrilinguis Lindl. CPC 7625

- Eria stricta Lindl. CPC 7399, CPC 7418, CPC 7473
 Gastrochilus distichus (Lindl.) Kuntze CPC 7581b
 Goodyera foliosa (Lindl.) Clarke CPC 7573
 Goodyera hispida Lindl. CPC 7393
 Goodyera schlechtendaliana Rchb.f. CPC 7613
 Holcoglossum wangii Christenson CPC 7412
 Liparis averyanoviana Szlach. CPC 7425, CPC 7446, CPC 7480
 Liparis balansae Gagnep. CPC 7614
 Liparis bootanensis Griff. CPC 7505
 Liparis cordifolia Hook.f. CPC 7482
 Liparis filiformis Aver. CPC 7444, CPC 7477
 Liparis latilabris Rolfe CPC 7577
 Liparis stricklandiana Rchb.f. CPC 7396, CPC 7417
 Liparis superposita Ormerod CPC 7402, CPC 7506
 Luisia sp. CPC 7629
 Monomeria barbata Lindl. CPC 7411
 Nervilia muratana S.W.Gale CPC 7443
 Neuwiedia zollingerii Rchb.f. CPC 7439, CPC 7471
 *Oberonia tatananae Aver., sp. nov. CPC 7581a
 Otochilus fuscus Lindl. CPC 7421
 Panisea uniflora (Lindl.) Lindl. CPC 7652
 Paphiopedilum hirsutissimum (Lindl. ex Hook.) Stein CPC 7617
 Paphiopedilum malipoense S.C. Chen & Z.H. Tsi CPC 7406
 Paphiopedilum micranthum Tang & F.T.Wang CPC 7511, CPC 7627
 Phaius mishmensis (Lindl. & Paxt.) Rchb.f. CPC 7483
 Phaius wenshanensis F.Y.Liu CPC 7466
 Phalaenopsis mannii Rchb.f. CPC 7616
 Pholidota missionariorum Gagnep. CPC 7427, CPC 7578, CPC 7623
 Pholidota roseans Schltr. CPC 7415, CPC 7507, CPC 7546
 Pholidota yunnanensis Rolfe CPC 7622
 Podochilus khasianus Hook.f. CPC 7398, CPC 7619
- Pinaceae**
 Pinus henryi Mast. CPC 7638
 Pinus wangii Hu & W.C.Cheng CPC 7525
 Pseudotsuga sinensis Dode CPC 7635
 Tsuga chinensis (Franch.) Pritz. CPC 7508, CPC 7520, CPC 7541, CPC 7593
- Pittosporaceae**
 Pittosporum sp. CPC 7590
- Podocarpaceae**
 Dacrycarpus imbricatus CPC 7677
 Nageia fleurii? CPC 7485
- Podocarpus annamiensis N.E.Gray CPC 7494, CPC 7522, CPC 7540, CPC 7551
 Podocarpus neriifolius D. Don CPC 7387, CPC 7636
 Podocarpus pilgeri Foxw. CPC 7587
- Polygalaceae**
 Polygala tonkinensis Chodat CPC 7455
 Polygala sp.1 CPC 7497
 Polygala sp.2 CPC 7668
- Polypodiaceae s.l.**
 Adiantum capillus-veneris L. CPC 7665
 Asplenium filiforme Kaulf. CPC 7634
 Asplenium rupestre CPC 7572
 Asplenium rupestre Hope CPC 7650
 Asplenium sp.1 CPC 7395
 Asplenium sp.2 CPC 7475
 Colysis digitata Ching CPC 7423
 Colysis sp. CPC 7647
 Cyrtomium sp. CPC 7643
 Lematosorus sp. CPC 7580
 Lepisorus sp.1 CPC 7571
 Lepisorus sp.2 CPC 7610
 Leptochilus sp. CPC 7554
 Lindsaea orbiculata (Lam.) Mett. ex Kuhn CPC 7676
 Lindsaea sp. CPC 7403
 Microsorium sp. CPC 7420
 Onichium sp. CPC 7633
 Phymatosorus sp. CPC 7528
 Polystichum sp.1 CPC 7392
 Polystichum sp.2 CPC 7404
 Polystichum sp.3 CPC 7414
 Polystichum sp.4 CPC 7495
 Polystichum sp.5 CPC 7496
 Polystichum sp.6 CPC 7499
 Polystichum sp.7 CPC 7642
 Polystichum sp.8 CPC 7649
 Polystichum sp.9 CPC 7662
 Pyrrosia sp. CPC 7503
 Tectaria sp.1 CPC 7501
 Tectaria sp.2 CPC 7666
 Gen. sp.1 CPC 7394
 Gen. sp.2 CPC 7426
- Ranunculaceae**
 Anemone sp. CPC 7510
 Clematis sp. CPC 7524
- Rosaceae**
 Potentilla nilgerrensis (Schltdl. ex J.Gay) Mabb. CPC 7529
 Rubus ochraceus Cardot CPC 7538
 Rubus sp.1 CPC 7523
 Rubus sp.2 CPC 7530
- Rubiaceae**
 Canthium sp.1 CPC 7405
 Canthium sp.2 CPC 7518
 Mussaenda shikokiana Makino CPC 7449
 Mussaenda sp.1 CPC 7448
 Mussaenda sp.2 CPC 7493
 Ophiorrhiza sp.1 CPC 7430
 Ophiorrhiza sp.2 CPC 7513
 Ophiorrhiza sp.3 CPC 7531
 Ophiorrhiza sp.4 CPC 7564
 Psychotria sp. CPC 7390
- Schysomussaenda sp. CPC 7674
- Rutaceae**
 Boeninghausenia albiflora (Hook.) Rchb. CPC 7509
- Scrophulariaceae**
 Scutellaria sp. CPC 7556
- Smilacaceae**
 Smilax sp. CPC 7500
- Solanaceae**
 Tubocapsicum sp. CPC 7607
- Taxaceae**
 Amentotaxus argotaenia (Hance) Pilg. CPC 7386, CPC 7586
 Amentotaxus yunnanensis CPC 7476
 Cephalotaxus mannii Hook.f. CPC 7553, CPC 7585
 Taxus sinensis Knight ex Gordon CPC 7413, CPC 7519, CPC 7539, CPC 7550, CPC 7637
- Thymellaeaceae**
 Daphne sp. CPC 7502
- Trilliaceae**
 Paris polyphylla Sm. CPC 7542, CPC 7537
- Valerianaceae**
 Patrinia scabra Bunge CPC 7569
- Verbenaceae**
 Callicarpa sp.? CPC 7671
- Violaceae**
 Viola sp. CPC 7498

Golden Cypress phytogeographic suite and its distribution of in the northern Vietnam

Following coniferous trees as *Calocedrus rupestris*, *Pinus tabuliformis*, *Pinus wangii*, *Pseudotsuga sinensis*, *Taxus wallichiana* and *Tsuga chinensis* appear as a main coniferous associates of Golden Cypress in northern Vietnam. These trees form first canopy stratum of zonal relictual coniferous forests on karstic rocky limestone in northern Vietnam and allied territories (Fig. 15-17). Globally this is most endangered type of vegetation, which presently almost completely extinct all over its primary area (Fig. 40-47). However, small isolated files of primary coniferous limestone forests still remain in a few remote mountainous areas of the northern Vietnam (Fig. 15-17). Golden Cypress is one of the rarest components of such relictual woods. In fact, it occurs only in few locations of primary coniferous forests, though potentially it may be found in any area of intact woods of such type. The distribution of the main dominants of primary coniferous limestone forest in northern Vietnam was identified and illustrated (Fig. 6-12) on the base of available voucher collections listed in Table 6. One of them (*Taxus wallichiana*) has broad distribution in mainland Asia, as well as in Vietnam (Fig. 10, 13). Two of them (*Calocedrus rupestris* and *Pinus wangii*) have broad distribution in northern Vietnam approaching in their distribution to Laotian border (Fig. 6, 8, 13). Two other, – *Pinus tabuliformis* and *Pseudotsuga sinensis* distributed in northeastern part of northern Vietnam (Fig. 7, 9, 13). Two last species (*Tsuga chinensis* and *Xanthocyparis vietnamensis*) have smallest area in northern Vietnam closely allied to Chinese border (Fig. 11-13). The aggregative dotted map (comprising locations of all main Golden Cypress associates) outlines area of relictual coniferous limestone forests in northern Vietnam (Fig. 14). This is potential area of *Xanthocyparis* distribution at present, and possible its area in the past. At the same time, the verified present area of Golden Cypress distribution is limited by area allied to Chinese border (Fig. 12-14). Phytogeographically it is most close to distribution of *Tsuga chinensis* (Fig. 11, 13) spreading much to the north. Both species may have similar type of distribution pattern. Hence, recent discovery of Golden Cypress in central Guangxi looks not too much surprising (Meng Tao et al., 2013).

Table 6. Locations of conifers forming primary coniferous forests associated with Golden Cypress

***Calocedrus rupestris* Aver., T.H. Nguyen et P.K. Loc**

Bac Kan

1. Bac Kan prov., Na Ri distr., Liem Thuy municipality, 21°56'44"N, 106°05'09"E, 27 May 2004, L.Averyanov, N.T.Hiep, P.V.The, N.T.Vinh HAL 4919
2. Bac Kan prov., Na Ri distr., Liem Thuy municipality, 21°56'44"N, 106°05'09"E, 3 June 2004, P.V.The HAL 5439
3. Bac Kan prov., Na Ri distr., Liem Thuy municipality, 21°56'44"N, 106°05'09"E, 3 June 2004, P.V.The HAL 5440
4. Bac Kan prov., Na Ri distr., Liem Thuy municipality, 21°56'44"N, 106°05'09"E, 3 June 2004, P.V.The HAL 5441
5. Bac Kan prov., Na Ri distr., Liem Thuy municipality, 21°57'06"N, 106°04'41"E, 19 November 2004, S.K. Wu, L.K. Phan, X. Gong, J.Y. Xiang, V.T. Nguyen, K.S. Nguyen WP 464

Cao Bang

6. Cao Bang prov., Bao Lac distr., Dinh Phung municipality, 22°47'N 105°49'E, 18 April 1999, P.K.Loc, P.H.Hoang, L.Averyanov CBL 1515
7. Cao Bang prov., Nguyen Binh distr., Yen Lac municipality, 22°44'N 105°50'E, 16 April 1999, P.K.Loc, P.H.Hoang, L.Averyanov CBL 1462

Ha Giang

8. Ha Giang prov., Meo Vac distr., Pai Lung municipality, 23°15'14"N, 105°22'11"E, 26 May 06, Phan Ke Loc, Nguyen Sinh Khang, Vu Xuan Manh HAL 8668
9. Ha Giang prov., Meo Vac distr., Pai Lung municipality, 23°15'06"N, 105°22'02"E 12 December 2005, L.Averyanov, P.K.Loc, T.V.Thao, P.V.The, N.S.Khang HAL 8548
10. Ha Giang prov., Quan Ba distr., Can Ty municipality, 12 December 2007, P.K. Loc, N.T. Vinh, G.C. Pao HAL 11319
11. Ha Giang prov., Quan Ba distr., Can Ty municipality, 23°05'792N, 105°01'01E, 20 January 2003, Nguyen Tien Hiep, To Quang Thao NTH 5416
12. Ha Giang prov., Quan Ba distr., Can Ty municipality, 23°05'06"N, 105°01'56"E, 14 Oct 2008, N.T. Vinh, G.C. Pao HAL 11912
13. Ha Giang prov., Quan Ba distr., Can Ty municipality, 23°05'09"N, 105°03'23"E, 8 May 2002, P.K.Loc, L.Averyanov, N.T.Vinh HAL 1457

14. Ha Giang prov., Quan Ba distr., Can Ty municipality, 23°05'756N, 105°01'089E, 18 January 2003, To Van Thao, Nguyen Sinh Khang To.VT 021
15. Ha Giang prov., Quan Ba distr., Can Ty municipality, Bat Dai Son NR, 12 May 2008, N.S. Khang HAL 11857A
16. Ha Giang prov., Quan Ba distr., Thai An municipality, 22°59'50"N, 105°05'46"E, 10 May 2002, P.K.Loc, L.Averyanov, N.T.Vinh HAL 1513
17. Ha Giang prov., Quan Ba distr., Thanh Van municipality, 23°05'32"N, 105°00'10"E, 9 May 2002, P.K.Loc, L.Averyanov, N.T.Vinh HAL 1493
18. Ha Giang prov., Quan Ba distr., Thanh Van municipality, 23°07'12"N, 105°00'52"E, 8 May 2002, P.K.Loc, L.Averyanov, N.T.Vinh, HAL 1471
19. Ha Giang prov., Yen Minh distr., Lao Va Chai municipality, 23°07'N 105°08'E, 1 May 1999, P.K.Loc, P.H.Hoang, L.Averyanov CBL 1977

Hoa Binh

20. Hoa Binh prov., Da Bac distr., Doan Ket village, 20°54'01"N, 105°04'19"E, 29 March 2001, N.T.Hiep, L.Averyanov, N.T.Vinh, D.T.Doan HAL 367
21. Hoa Binh prov., Mai Chau distr., Hang Kia municipality, 20°43'39"N, 104°53'43"E, 7 April 2001, N.T.Hiep, L.Averyanov, N.T.Vinh, D.T.Doan HAL 754
22. Hoa Binh prov., Mai Chau distr., Hang Kia municipality, 20°43'43"N, 104°51'21"E, 6 April 2001, N.T.Hiep, L.Averyanov, N.T.Vinh, D.T.Doan HAL 629
23. Hoa Binh prov., Mai Chau distr., Hang Kia municipality, 20°44'21"N, 104°53'57"E, 10 April 2001, N.T.Hiep, L.Averyanov, N.T.Vinh, D.T.Doan HAL 877

Quang Binh

24. Quang Binh prov., Bo Trach distr., Tan Trach municipality, 17°23'32"N, 106°12'46"E, 24 January 2005, L.Averyanov, P.K.Loc, P.V.The, A.Averyanova, N.T.Vinh, N.Q.Vinh, N.T.Binh HAL 6109
25. Quang Binh prov., Bo Trach distr., Tan Trach municipality, 17°23'32"N, 106°12'46"E, 25 January 2005, L.Averyanov, P.K.Loc, P.V.The, A.Averyanova, N.T.Vinh, N.Q.Vinh, N.T.Binh HAL 6164
26. Quang Binh prov., Bo Trach distr., Tan Trach municipality, 17°23'32"N, 106°12'46"E, 26 January 2005, L.Averyanov, P.K.Loc, P.V.The, A.Averyanova, N.T.Vinh, N.Q.Vinh, N.T.Binh HAL 6200
27. Quang Binh prov., Bo Trach distr., Tan Trach municipality, 17°24'24"N, 106°13'08"E, 13 December 2004, S.K. Wu, L.K. Phan, X. Gong, J.Y. Xiang, V.T. Nguyen, K.S. Nguyen WP 1111

Son La

28. Son La prov., Moc Chau distr., Van Ho municipality, 20°46'16''N 104°47'44''E, 29 October 2006, Nguyen Tien Hiep, L.Averyanov, Pham Van The HAL 9352
29. Son La prov., Moc Chau distr., Van Ho municipality, 20°46'18''N 104°47'29''E, 28 October 2006, Nguyen Tien Hiep, L.Averyanov, Pham Van The HAL 9315
30. Son La prov., Yen Chau distr., Muong Lum municipality, 21°00'35''N 104°29'06''E, 1 April 2011, L.Averyanov, N.T.Hiep, T.B.Ngan CPC 1864
31. Son La prov., Yen Chau distr., Muong Lum municipality, 21°01'17''N 104°30'47''E, 3 November 2006, Nguyen Tien Hiep, L.Averyanov, Pham Van The HAL 9447
32. Son La prov., Yen Chau distr., Muong Lum municipality, 4 November 2006, Nguyen Tien Hiep, L.Averyanov, Pham Van The HAL 9514

Tuyen Quang

33. Tuyen Quang prov., Na Hang distr., Sinh Long municipality, 22°35'36"N, 105°22'23"E, 11 Mar 2011 N.Q.Hieu, N.T.Hiep, P.K.Loc, N.T.Vinh CPC 1318
34. Tuyen Quang prov., Na Hang distr., Sinh Long municipality, 22°38'21.9"N, 105°20'43.5"E, 29 September 2013, L.Averyanov, N.T.Hiep, L.M.Tuan, N.S.Khang, D.V.Cuong, N.V.Truong, T.Maisak, L.Osinovetc CPC 5318

***Pinus tabuliformis* Carriere**

Cao Bang

1. Cao Bang prov., Bao Lac distr., Dinh Phung municipality, 22°45'24.8''N, 105°46'47.9''E, 24 November 2014, L.Averyanov, N.T.Hiep, N.S.Khang, T.Maisak, L.Osinovetc CPC 7638

Ha Giang

2. Ha Giang prov., Dong Van distr, Ta Lung municipality, 23°14'50''N, 105°21'34''E, 14 December 2005, L.Averyanov, T.V.Thao, P.V.The HAL 8604
3. Ha Giang prov., Dong Van distr., Thai Phin Tung municipality, 23°15'32''N, 105°17'11''E, 27 May 06, Phan Ke Loc, Nguyen Sinh Khang, Vu Xuan Manh HAL 8679

Tuyen Quang

4. Tuyen Quang prov., Na Hang distr., Vinh Yen municipality, 22°18'368N, 105°26'293 E, 25 December 2002, Hoang Van Chat, Nguyen Manh Hung, Duong Van Xy, Bang Tien Sy HLF 700

***Pinus wangii* Hu et W.C. Cheng, s.l.**

Bac Kan

1. Bac Kan prov., Cho Don distr., Ban Thi municipality, 22°16'58"N, 105°31'20"E, 20 May 2004, L.Averyanov, N.T.Hiep, P.V.The, N.T.Vinh HAL 4708

2. Bac Kan prov., Cho Don distr., Ban Thi municipality, 22°17'29"N, 105°30'50"E, 7 March 2011, N.Q. Hieu, N.T. Hiep, P.K. Loc, P.V. The, N.T. Vinh CPC 1285
3. Bac Kan prov., Cho Don distr., Ban Thi municipality, 22°17'29"N, 105°30'50"E, 7 March 2011, N.Q. Hieu, N.T. Hiep, P.K. Loc, P.V. The, N.T. Vinh CPC 1285
4. Bac Kan prov., Cho Don distr., Ban Thi municipality, 22°17'30"N 105°31'16"E, 25 December 2002, Phan Ke Loc, L.Averyanov, Nguyen Anh Duc, To Van Thao, Mai Van Xinh, Nguyen Tien Vinh HLF 771
5. Bac Kan prov., Cho Don distr., Ban Thi municipality, 22°17'32"N, 105°31'27"E, 26 December 2002, Phan Ke Loc, L.Averyanov, Nguyen Anh Duc, To Van Thao, Mai Van Xinh, Nguyen Tien Vinh HLF 801
6. Bac Kan prov., Cho Don distr., Ban Thi municipality, 22°18'23"N, 105°31'27"E, 5 March 2011, N.Q. Hieu, N.T. Hiep, P.K. Loc, P.V. The, N.T. Vinh CPC 1249
7. Bac Kan prov., Cho Don distr., Ban Thi municipality, 22°18'23"N, 105°31'27"E, 5 March 2011, N.Q. Hieu, N.T. Hiep, P.K. Loc, P.V. The, N.T. Vinh CPC 1249
8. Bac Kan prov., Na Ri distr., Liem Thuy municipality, 21°57'18"N, 106°06'12"E, 28 May 2004, L.Averyanov, N.T.Hiep, P.V.The, N.T.Vinh HAL 4991

Cao Bang

9. Cao Bang prov., Bao Lac distr., Hong An municipality, 22°50'013''N, 105°50'057''E, 20 November 2014, L.Averyanov, N.T.Hiep, N.S.Khang, T.Maisak, L.Osinovetc CPC 7525
10. Cao Bang prov., Ha Lang distr., Dong Loan municipality, 22°46'N, 106°44'E, 25 November 1998, Averyanov L., P.K.Loc, N.X.Tam CBL 660
11. Cao Bang prov., Ha Lang distr., Duc Quang municipality, 22°43'N, 106°40'E, 28 November 1998, Averyanov L., P.K. Loc CBL 748
12. Cao Bang prov., Nguyen Binh distr., Ca Thanh municipality, 22°43'56.4"N, 105°51'16.4"E, 3 October 2013, L.Averyanov, N.T.Hiep, L.M.Tuan, N.S.Khang, T.Maisak, L.Osinovetc CPC 5351
13. Cao Bang prov., Nguyen Binh distr., Ca Thanh municipality, 22°44'N 105°50'E, 19 April 1999, P.K.Loc, P.H.Hoang, Averyanov L. CBL 1564
14. Cao Bang prov., Nguyen Binh distr., Ca Thanh municipality, 22°44'N 105°50'E, 19 April 1999, P.K.Loc, P.H.Hoang, Averyanov L. CBL 1566
15. Cao Bang prov., Nguyen Binh distr., Yen Lac municipality, 22°44'N, 105°50'E, 15 November 1998, Averyanov L., N.T.Hiep, P.K.Loc, N.X.Tam CBL 247
16. Cao Bang prov., Nguyen Binh distr., Yen Lac municipality, 22°45'34"N, 105°51'48.7"E, 5 October 2013, L.Averyanov, N.T.Hiep, L.M.Tuan, N.S.Khang, T.Maisak, L.Osinovetc CPC 5435
17. Cao Bang prov., Tra Linh distr., Co Muoi municipality, 22°51'N, 106°14'E, 12 December 1998, Averyanov L., N.Q.Binh, N.T.Hiep, P.K.Loc, N.X.Tam CBL 1121
18. Cao Bang prov., Tra Linh distr., Quoc Toan municipality, 25-27 May 1997, L. Averyanov, N.T. Hiep VH 4957
19. Cao Bang prov., Trung Khanh distr., Ngoc Khe municipality, 22°54'59"N, 106°31'44"E, 9 June 2004, L.Averyanov, P.K.Loc, P.V.The, N.T.Vinh HAL 5470
20. Cao Bang prov., Trung Khanh distr., Ngoc Khe municipality, 22°54'59"N, 106°31'44"E, 12 June 2004, L.Averyanov, P.K.Loc, P.V.The, N.T.Vinh HAL 5675
21. Cao Bang prov., Trung Khanh distr., Ngoc Khe municipality, 22°54'59"N, 106°31'44"E, 14 June 2004, L.Averyanov, P.K.Loc, P.V.The, N.T.Vinh HAL 5739

Ha Giang

22. Ha Giang prov., Dong Van distr., Ho Quang Phin municipality, 23°16'N, 105°22'E, 28 April 1999, P.K.Loc, P.H.Hoang, Averyanov L. CBL 1792
23. Ha Giang prov., Dong Van distr., Sinh Lung municipality, 23°12'51''N, 105°18'15''E, 25 May 06, Phan Ke Loc, Nguyen Sinh Khang, Vu Xuan Manh HAL 8660
24. Ha Giang prov., Dong Van distr., Ta Lung municipality, 23°14'50''N, 105°21'34''E, 14 December 2005, L.Averyanov, T.V.Thao, P.V.The HAL 8595
25. Ha Giang prov., Quan Ba distr., Can Ty municipality, 23°05'09"N, 105°03'23"E, 8 May 2002, P.K.Loc, L.Averyanov, N.T.Vinh HAL 1450
26. Ha Giang prov., Yen Minh distr., Lao Va Chai municipality, 23°05'55''N, 105°04'10''E, 9 December 2005, L.Averyanov, P.K.Loc, T.V.Thao, P.V.The, N.S.Khang HAL 8449
27. Ha Giang prov., Yen Minh distr., Lao Va Chai municipality, 23°07'N, 105°08'E, 1 May 1999, P.K.Loc, P.H.Hoang, Averyanov L. CBL 1895
28. Ha Giang prov., Yen Minh distr., Lao Va Chai municipality, 23°07'N, 105°08'E, 9 October 1999, N.T. Hiep, N.Q. Binh, L. Averyanov, P. Cribb NTH 3498

Hoa Binh

29. Hoa Binh prov., Mai Chau distr., Hang Kia municipality, 20°44'40"N, 104°52'32"E, 9 April 2001, N.T.Hiep, L.Averyanov, N.T.Vinh, D.T.Doan HAL 823
30. Hoa Binh prov., Mai Chau distr., Pa Co municipality, 20°44'33"N, 104°53'54"E, 2 December 2003, S.G. Wu, L.K. Phan, J.Y. Xiang, X. Gong, V.T. Nguyen, K.S. Nguyen WP-395
31. Hoa Binh prov., Mai Chau distr., Pa Co municipality, 20°44'33"N, 104°53'54"E, 2 December 2003, S.G. Wu, L.K. Phan, J.Y. Xiang, X. Gong, V.T. Nguyen, K.S. Nguyen WP-395

Son La

32. Son La prov., Moc Chau distr., Van Ho municipality, 20°46'35"N, 104°46'31"E, 6 March 2001, P.K.Loc, N.X.Tam, L.Averyanov DKH 7334
33. Son La prov., Moc Chau distr., Van Ho municipality, 20°46'18''N, 104°47'29''E, 28 October 2006, Nguyen Tien Hiep, L.Averyanov, Pham Van The HAL 9309
34. Son La prov., Yen Chau distr., Muong Lum municipality, 20°59'54''N, 104°38'47''E, 4 November 2006, Nguyen Tien Hiep, L.Averyanov, Pham Van The HAL 9499
35. Son La prov., Yen Chau distr., Muong Lum municipality, 21°00'35''N, 104°29'06''E, 1 April 2011, L.Averyanov, N.T.Hiep, T.B.Ngan CPC 1852
36. Son La prov., Yen Chau distr., Muong Lum municipality, 21°00'35''N, 104°29'06''E, 1 April 2011, L.Averyanov, N.T.Hiep, T.B.Ngan CPC 1852

Thanh Hoa

37. Thanh Hoa prov., Ba Thuoc distr., Co Lung municipality, 20°25'56"N, 105°14'12"E, 23 September 2003, L.Averyanov, D.T.Doan, J.Regalado, N.T.Vinh HAL 3283
38. Thanh Hoa prov., Ba Thuoc distr., Co Lung municipality, 20°26'31"N, 105°14'55"E, 17 September 2003, L.Averyanov, D.T.Doan, J.Regalado, N.T.Vinh HAL 3015
39. Thanh Hoa prov., Ba Thuoc distr., Eo Dieu municipality, 20°25'48"N, 105°14'13"E, 13 April 2001, N.T.Hiep, L.Averyanov, N.T.Vinh, D.T.Doan HAL 971

***Pseudotsuga sinensis* Dode**

Bac Can

1. Bac Can prov., Na Ri distr., Kim Hy municipality, 22°17'N, 106°03'E, 19 October 1999, N.T. Hiep, P.K. Loc, L.Averyanov NTH 3650
2. Bac Kan prov., Na Ri distr., Kim Hy municipality, 22°15'36" N, 106°03'12" E, 22 Nov 2004, S.K.Wu, L.K.Phan, X.Gong, J.Y.Xiang, V.T.Nguyen, K.S.Nguyen WP 552
3. Bac Kan prov., Na Ri distr., Liem Thuy municipality, 21°56'44"N, 106°05'09"E, 27 May 2004, L.Averyanov, N.T.Hiep, P.V.The, N.T.Vinh HAL 4917

Cao Bang

4. Cao Bang prov., Bao Lac distr., Dinh Phung municipality, 22°45'24.8''N, 105°46'47.9''E, 24 November 2014, L.Averyanov, N.T.Hiep, N.S.Khang, T.Maisak, L.Osinovetc CPC 7635
5. Cao Bang prov., Ha Lang distr., An Lac municipality, 22°43'N, 106°36'E, 29 November 1998, Averyanov L., P.K. Loc CBL 768
6. Cao Bang prov., Ha Lang distr., Dong Loan municipality, 22°46'N, 106°44'E, 25 November 1998, Averyanov L., P.K.Loc, N.X.Tam CBL 637
7. Cao Bang prov., Ha Lang distr., Duc Quang municipality, 22°43'N, 106°40'E, 28 November 1998, Averyanov L., P.K. Loc CBL 747
8. Cao Bang prov., Ha Lang distr., Thanh Nhat municipality, 22°41'N, 106°40'E, 27 November 1998, Averyanov L., P.K.Loc, N.X.Tam CBL 698
9. Cao Bang prov., Nguyen Binh distr., Ca Thanh municipality, 22°43'56.4"N, 105°51'16.4"E, 3 October 2013, L.Averyanov, N.T.Hiep, L.M.Tuan, N.S.Khang, T.Maisak, L.Osinovetc CPC 5365
10. Cao Bang prov., Nguyen Binh distr., Ca Thanh municipality, 22°44'N 105°50'E, 13 April 1999, P.K.Loc, P.H.Hoang, Averyanov L. CBL 1284
11. Cao Bang prov., Nguyen Binh distr., Ca Thanh municipality, 22°44'N, 105°50'E, 18 November 1998, Averyanov L., P.K.Loc, N.X.Tam CBL 385
12. Cao Bang prov., Nguyen Binh distr., Yen Lac municipality, 22°44'N, 105°50'E, 15 November 1998, Averyanov L., N.T.Hiep, P.K.Loc, N.X.Tam CBL 245
13. Cao Bang prov., Thach An distr., Thuy Hung municipality, 22°30'N, 106°27'E, 4 December 1998, Averyanov L., N.Q.Binh, P.K.Loc, N.X.Tam CBL 909
14. Cao Bang prov., Thong Nong distr., Yen Son municipality, 22°46'53"N, 105°52'58.7"E, 7 October 2013, L.Averyanov, N.T.Hiep, L.M.Tuan, N.S.Khang, T.Maisak, L.Osinovetc CPC 5436
15. Cao Bang prov., Tra Linh distr., Co Muoi municipality, 22°51'N 106°14'E, 12 December 1998, Averyanov L., N.Q.Binh, N.T.Hiep, P.K.Loc, N.X.Tam CBL 1131
16. Cao Bang prov., Tra Linh distr., Quang Vinh municipality 22°51'N 106°14'E, 9 December 1998, Averyanov L., N.Q.Binh, N.T.Hiep, N.X.Tam CBL 994
17. Cao Bang prov., Tra Linh distr., Quang Vinh municipality, 22°51'N 106°14'E, 10 December 1998, Averyanov L., N.Q.Binh, N.T.Hiep, N.X.Tam CBL 1052
18. Cao Bang prov., Trung Khanh distr., Ngoc Khe municipality, 22°54'59"N, 106°31'44"E, 11 June 2004, L.Averyanov, P.K.Loc, P.V.The, N.T.Vinh HAL 5638
19. Cao Bang prov., Trung Khanh distr., Ngoc Khe municipality, 22°54'59"N, 106°31'44"E, 9 June 2004, L.Averyanov, P.K.Loc, P.V.The, N.T.Vinh HAL 5499

Ha Giang

20. Ha Giang prov., Dong Van distr., Sinh Lung municipality, 23°12'38''N, 105°17'24''E, 24 May 06, Phan Ke Loc, Nguyen Sinh Khang, Vu Xuan Manh HAL 8643

21. Ha Giang prov., Dong Van distr., Sinh Lung municipality, 23°12'51''N, 105°18'15''E, 25 May 06, Phan Ke Loc, Nguyen Sinh Khang, Vu Xuan Manh HAL 8665
22. Ha Giang prov., Dong Van distr., Ta Lung municipality, 23°14'50''N, 105°21'34''E, L.Averyanov, T.V.Thao, P.V.The HAL 8586
23. Ha Giang prov., Dong Van distr., Ta Phin municipality, 23°11'N, 105°17'E, 6 October 1999, N.T. Hiep, N.Q. Binh, L. Averyanov, P. Cribb NTH 3374
24. Ha Giang prov., Dong Van distr., Tha Phin municipality, 23°15'32''N, 105°17'11''E, 27 May 06, Phan Ke Loc, Nguyen Sinh Khang, Vu Xuan Manh HAL 8680
25. Ha Giang prov., Dong Van distr., Tha Phin municipality, 23°15'32''N, 105°17'11''E, 27 May 06, Phan Ke Loc, Nguyen Sinh Khang, Vu Xuan Manh HAL 8681
26. Ha Giang prov., Meo Vac distr., Pa Vi municipality, 23°11'05''N, 105°24'04''E, L.Averyanov, P.K.Loc, T.V.Thao, P.V.The, N.S.Khang HAL 8567
27. Ha Giang prov., Meo Vac distr., Pai Lung municipality, 23°15'06''N, 105°22'02''E, 12 December 2005, L.Averyanov, P.K.Loc, T.V.Thao, P.V.The, N.S.Khang HAL 8547
28. Ha Giang prov., Meo Vac distr., Sung Tra municipality, 23°10'12''N, 105°17'39''E, 11 December 2005, L.Averyanov, P.K.Loc, T.V.Thao, P.V.The, N.S.Khang HAL 8506
29. Ha Giang prov., Meo Vac distr., Sung Tra municipality, 23°11'N 105°18'E, 29 April 1999, P.K.Loc, P.H.Hoang, Averyanov L. CBL 1848
30. Ha Giang prov., Quan Ba distr., Bat Dai Son municipality, 23°08'132N, 105°00'777E, 28 February 2003, To Van Thao, Nguyen Sinh Khang VT 075
31. Ha Giang prov., Quan Ba distr., Bat Dai Son municipality, 15 December 2007, P.K. Loc, N.T. Vinh, G.C. Pao HAL 11330
32. Ha Giang prov., Quan Ba distr., Can Ty municipality, 22°05'792N, 105°01'010E, 20 January 2003, Nguyen Tien Hiep, To Quang Thao NTH 5407
33. Ha Giang prov., Quan Ba distr., Can Ty municipality, 22°05'792N, 105°01'010E, 20 January 2003, Nguyen Tien Hiep, To Quang Thao NTH 5411
34. Ha Giang prov., Quan Ba distr., Can Ty municipality, 23°05'06"N, 105°01'56"E, 12 December 2007, P.K. Loc, N.T. Vinh, G.C. Pao HAL 11315
35. Ha Giang prov., Quan Ba distr., Can Ty municipality, 23°05'06"N, 105°01'56"E, 14 December 2007, P.K. Loc, N.T. Vinh, G.C. Pao HAL 11324
36. Ha Giang prov., Quan Ba distr., Can Ty municipality, 23°05'09"N, 105°03'23"E, 8 May 2002, P.K.Loc, L.Averyanov, N.T.Vinh HAL 1474a
37. Ha Giang prov., Quan Ba distr., Can Ty municipality, 23°07'12"N, 105°00'52"E, 11 May 2002, P.K.Loc, L.Averyanov, N.T.Vinh HAL 1548
38. Ha Giang prov., Quan Ba distr., Can Ty municipality, 23°07'12"N, 105°00'52"E, 7 May 2002, P.K.Loc, L.Averyanov, N.T.Vinh HAL 1428
39. Ha Giang prov., Quan Ba distr., Thai An municipality, 22°59'50"N, 105°05'46"E, 10 May 2002, P.K.Loc, L.Averyanov, N.T.Vinh HAL 1538
40. Ha Giang prov., Quan Ba distr., Thai An municipality, 22°59'50"N, 105°05'46"E, 10 May 2002, P.K.Loc, L.Averyanov, N.T.Vinh HAL 1539
41. Ha Giang prov., Quan Ba distr., Thai An municipality, 22°59'50"N, 105°05'46"E, 10 May 2002, P.K.Loc, L.Averyanov, N.T.Vinh HAL 1515
42. Ha Giang prov., Quan Ba distr., Thanh Van municipality, 23°06'564N, 104°59'124E, 25 February 2003, To Van Thao, Nguyen Sinh Khang To.VT 101
43. Ha Giang prov., Quan Ba distr., Thanh Van municipality, 23°06'564N, 104°59'124E, 25 February 2003, To Van Thao, Nguyen Sinh Khang VT 044
44. Ha Giang prov., Yen Minh distr., Lao Va Chai municipality, 23°07'N, 105°08'E, 1 May 1999, P.K.Loc, P.H.Hoang, Averyanov L. CBL 1881

***Taxus wallichiana* Zucc., s.l.**

Cao Bang

1. Cao Bang prov., Bao Lac distr., Dinh Phung municipality, 22°45'24.8''N, 105°46'47.9''E, 24 November 2014, L.Averyanov, N.T.Hiep, N.S.Khang, T.Maisak, L.Osinovetc CPC 7637
2. Cao Bang prov., Bao Lac distr., Hong An municipality, 22°48'45.9''N, 105°51'10.8''E, 20 November 2014, L.Averyanov, N.T.Hiep, N.S.Khang, T.Maisak, L.Osinovetc CPC 7550
3. Cao Bang prov., Bao Lac distr., Hong An municipality, 22°50'01.3''N, 105°50'05.7''E, 20 November 2014, L.Averyanov, N.T.Hiep, N.S.Khang, T.Maisak, L.Osinovetc CPC 7519
4. Cao Bang prov., Bao Lac distr., Hong An municipality, 22°50'03.8''N, 105°51'36.5''E, 20 November 2014, L.Averyanov, N.T.Hiep, N.S.Khang, T.Maisak, L.Osinovetc CPC 7539
5. Cao Bang prov., Nguyen Binh distr., Ca Thanh municipality, 22°43'56.4"N, 105°51'16.4"E, 5 October 2013, L.Averyanov, N.T.Hiep, L.M.Tuan, N.S.Khang, T.Maisak, L.Osinovetc CPC 5420
6. Cao Bang prov., Thong Nong distr., Yen Son municipality, 22°46'53"N, 105°52'58.7"E, 7 October 2013, L.Averyanov, N.T.Hiep, L.M.Tuan, N.S.Khang, T.Maisak, L.Osinovetc CPC 5440

Ha Giang

7. Ha Giang prov., Bac Me distr., Phieng Luong municipality, 22°38'07.1''N, 105°19'22.1''E, 13 November 2014, L.Averyanov, N.T.Hiep, N.S.Khang, T.Maisak, L.Osinovetc CPC 7413
8. Ha Giang prov., Bac Me distr., Phieng Luong municipality, 22°39'29''N, 105°19'35''E, 5 March 2005, L.Averyanov, P.K.Loc, N.T.Vinh, A.Averyanova HAL 6469
9. Ha Giang prov., Dong Van distr., Sinh Lung municipality, 23°12'38''N, 105°17'24''E, 24 May 06, Phan Ke Loc, Nguyen Sinh Khang, Vu Xuan Manh HAL 8642
10. Ha Giang prov., Dong Van distr., Sinh Lung municipality, 23°12'51''N, 105°18'15''E, 25 May 06, Phan Ke Loc, Nguyen Sinh Khang, Vu Xuan Manh HAL 8661
11. Ha Giang prov., Dong Van distr., Ta Phin municipality, 23°11'N, 105°17'E, 6 October 1999, N.T. Hiep, N.Q. Binh, L. Averyanov, P. Cribb NTH 3373
12. Ha Giang prov., Dong Van distr., Thai Phin Tung municipality, 27 May 06, Phan Ke Loc, Nguyen Sinh Khang, Vu Xuan Manh HAL 8685
13. Ha Giang prov., Meo Vac distr, Pa Vi municipality, 23°11'05''N, 105°24'04''E, 13 December 2005, L.Averyanov, P.K.Loc, T.V.Thao, P.V.The, N.S.Khang HAL 8566
14. Ha Giang prov., Meo Vac distr., Sung Tra municipality, 23°11'N, 105°17'E, 5 October 1999, N.T. Hiep, N.Q. Binh, L. Averyanov, P. Cribb NTH 3285
15. Ha Giang prov., Meo Vac distr., Sung Tra municipality, 23°10'12''N, 105°17'39''E, 11 December 2005, L.Averyanov, P.K.Loc, T.V.Thao, P.V.The, N.S.Khang HAL 8483
16. Ha Giang prov., Quan Ba distr., Bat Dai Son municipality, 23°05'788N, 105°01'054E, 5 February 2003, To Van Thao, Nguyen Sinh Khang VT 96
17. Ha Giang prov., Quan Ba distr., Bat Dai Son municipality, 23°08'125N, 105°00'787E, 28 February 2003, To Van Thao, Nguyen Sinh Khang VT 65
18. Ha Giang prov., Quan Ba distr., Bat Dai Son municipality, 23°08'125N, 105°00'787E, 28 February 2003, To Van Thao, Nguyen Sinh Khang VT 71
19. Ha Giang prov., Quan Ba distr., Bat Dai Son municipality, 23°09'128N, 104°59'730E, 3 March 2003, To Van Thao, Nguyen Sinh Khang VT 89
20. Ha Giang prov., Quan Ba distr., Can Ty municipality, 22°05'792N, 105°01'010E, 20 January 2003, Nguyen Tien Hiep, To Quang Thao NTH 5418
21. Ha Giang prov., Quan Ba distr., Can Ty municipality, 23°04'N 104°59'E, 12 October 1999, N.T. Hiep, N.Q. Binh, L. Averyanov, P. Cribb NTH 3596
22. Ha Giang prov., Quan Ba distr., Can Ty municipality, 23°05'06''N, 105°01'56''E, 12 December 2007, P.K. Loc, N.T. Vinh, G.C. Pao HAL 11318
23. Ha Giang prov., Quan Ba distr., Can Ty Municipality, 23°05'06''N, 105°01'56''E, 14 December 2007, P.K. Loc, N.T. Vinh, G.C. Pao HAL 11326
24. Ha Giang prov., Quan Ba distr., Can Ty municipality, 23°05'06''N, 105°01'56''E, 14 October 2008, N.T. Vinh, G.C. Pao HAL 11913
25. Ha Giang prov., Quan Ba distr., Can Ty municipality, 23°05'46.5''N, 105°00'49.8''E, 26 October 2011, Nguyen Sinh Khang, Giang Chi Pao CPC 4622
26. Ha Giang prov., Quan Ba distr., Can Ty municipality, 23°05'46.5''N, 105°00'49.8''E, 26 October 2011, Nguyen Sinh Khang, Giang Chi Pao CPC 4622
27. Ha Giang prov., Quan Ba distr., Can Ty municipality, 23°05'49''N, 105°00'28''E, 7 Dec 2005, L.Averyanov, P.K.Loc, T.V.Thao, P.V.The, N.S.Khang HAL 8368
28. Ha Giang prov., Quan Ba distr., Can Ty municipality, 23°05'48.1"N, 105°01'02.3"E, 25 October 2011, Nguyen Sinh Khang, Giang Chi Pao CPC 4600
29. Ha Giang prov., Quan Ba distr., Can Ty municipality, 23°05'48.1"N, 105°01'02.3"E, 25 October 2011, Nguyen Sinh Khang, Giang Chi Pao CPC 4600
39. Ha Giang prov., Quan Ba distr., Can Ty municipality, 23°05'756N, 105°01'089N, 18 January 2003, To Van Thao, Nguyen Sinh Khang VT 22
31. Ha Giang prov., Quan Ba distr., Can Ty municipality, 23°05'808N, 105°01'020N, 12 January 2003, To Van Thao, Nguyen Sinh Khang VT 2
32. Ha Giang prov., Quan Ba distr., Can Ty municipality, 23°07'12"N, 105°00'52"E, 11 May 2002, P.K.Loc, L.Averyanov, N.T.Vinh HAL 1546
33. Ha Giang prov., Quan Ba distr., Thai An municipality, 22°59'50"N, 105°05'46"E, 10 May 2002, P.K.Loc, L.Averyanov, N.T.Vinh HAL 1519
34. Ha Giang prov., Quan Ba distr., Thanh Van municipality, 23°05'661N, 105°00'604E, 22 February 2003, To Van Thao, Nguyen Sinh Khang VT 33
35. Ha Giang prov., Yen Minh distr., Lao Va Chai municipality, 23°07'N, 105°08'E, 9 October 1999, N.T. Hiep, N.Q. Binh, L. Averyanov, P. Cribb NTH 3562

Hoa Binh

36. Hoa Binh prov., Da Bac distr., to the SW of Doan Ket village, 20°54'01"N, 105°04'19"E, 29 March 2001, N.T.Hiep, L.Averyanov, N.T.Vinh, D.T.Doan HAL 345

37. Hoa Binh prov., Mai Chau distr., Hang Kia municipality, 20°43'43"N, 104°51'21"E, 6 April 2001, N.T.Hiep, L.Averyanov, N.T.Vinh, D.T.Doan HAL 626
38. Hoa Binh prov., Mai Chau distr., Pa Co municipality, 20°44'33"N, 104°53'54"E, 2 December 2003, S.G. Wu, L.K. Phan, J.Y. Xiang, X. Gong, V.T. Nguyen, K.S. Nguyen WP-378
39. Hoa Binh prov., Mai Chau distr., Pa Co municipality, 20°44'33"N, 104°53'54"E, 2 December 2003, S.G. Wu, L.K. Phan, J.Y. Xiang, X. Gong, V.T. Nguyen, K.S. Nguyen WP-378

Son La

40. Son La prov., Moc Chau distr., Long Luong municipality, 20°45'51"N, 104°51'26"E, 8 March 2001, P.K.Loc, N.X.Tam, L. Averyanov DKH 7502
41. Son La prov., Moc Chau distr., Long Luong municipality, 20°45'51"N, 104°51'26"E, 8 March 2001, P.K.Loc, N.X.Tam, L. Averyanov DKH 7503
42. Son La prov., Moc Chau distr., Van Ho municipality, 20°46'18"N, 104°47'29"E, 28 October 2006, Nguyen Tien Hiep, L.Averyanov, Pham Van The HAL 9319
43. Son La prov., Moc Chau distr., Van Ho municipality, 20°46'35"N, 104°46'31"E, 6 March 2001, P.K.Loc, N.X.Tam, L. Averyanov DKH 7340
44. Son La prov., Yen Chau distr., Muong Lum municipality, 20°59'54"N, 104°38'47"E, 4 November 2006, Nguyen Tien Hiep, L.Averyanov, Pham Van The HAL 9522
45. Son La prov., Yen Chau distr., Muong Lum municipality, 21°00'35"N, 104°29'06"E, 1 April 2011, L.Averyanov, N.T.Hiep, T.B.Ngan CPC 1857

Thanh Hoa

46. Thanh Hoa prov., Ba Thuoc distr., Co Lung municipality, 20°25'56"N, 105°14'12"E, 23 September 2003, L.Averyanov, D.T.Doan, J.Regalado, N.T.Vinh HAL 3284

Tuyen Quang

47. Tuyen Quang prov., Na Hang distr., Sinh Long municipality, 22°38'21.9"N, 105°20'43.5"E, 29 September 2013, L.Averyanov, N.T.Hiep, L.M.Tuan, N.S.Khang, D.V.Cuong, N.V.Truong, T.Maisak, L.Osinovetc CPC 5303
48. Tuyen Quang prov., Na Hang distr., Sinh Long Municipality, 22°38'19.8"N, 105°20'26.9"E, 28 September 2011, P.V. The, N.T. Vinh, M.V. Tong CPC 4535

***Tsuga chinensis* (Franch.) Pritz.**

Cao Bang

1. Cao Bang prov., Bao Lac distr., Hong An municipality, 22°50'01.3"N, 105°50'05.7"E, 20 November 2014, L.Averyanov, N.T.Hiep, N.S.Khang, T.Maisak, L.Osinovetc CPC 7508
2. Cao Bang prov., Bao Lac distr., Hong An municipality, 22°50'01.3"N, 105°50'05.7"E, 20 November 2014, L.Averyanov, N.T.Hiep, N.S.Khang, T.Maisak, L.Osinovetc CPC 7520
3. Cao Bang prov., Bao Lac distr., Hong An municipality, 22°50'03.8"N, 105°51'36.5"E, 20 November 2014, L.Averyanov, N.T.Hiep, N.S.Khang, T.Maisak, L.Osinovetc CPC 7541
4. Cao Bang prov., Bao Lac distr., Huy Giap municipality, 22°48'10.2"N, 105°49'24.8"E, 21 November 2014, L.Averyanov, N.T.Hiep, N.S.Khang, T.Maisak, L.Osinovetc CPC 7593
5. Cao Bang prov., Nguyen Binh distr., Ca Thanh municipality, 22°44'N, 105°50'E, 19 April 1999, P.K.Loc, P.H.Hoang, Averyanov L. CBL 1561
6. Cao Bang prov., Nguyen Binh distr., Yen Lac municipality, 22°44'N, 105°50'E, 15 November 1998, Averyanov L., N.T.Hiep, P.K.Loc, N.X.Tam CBL 246
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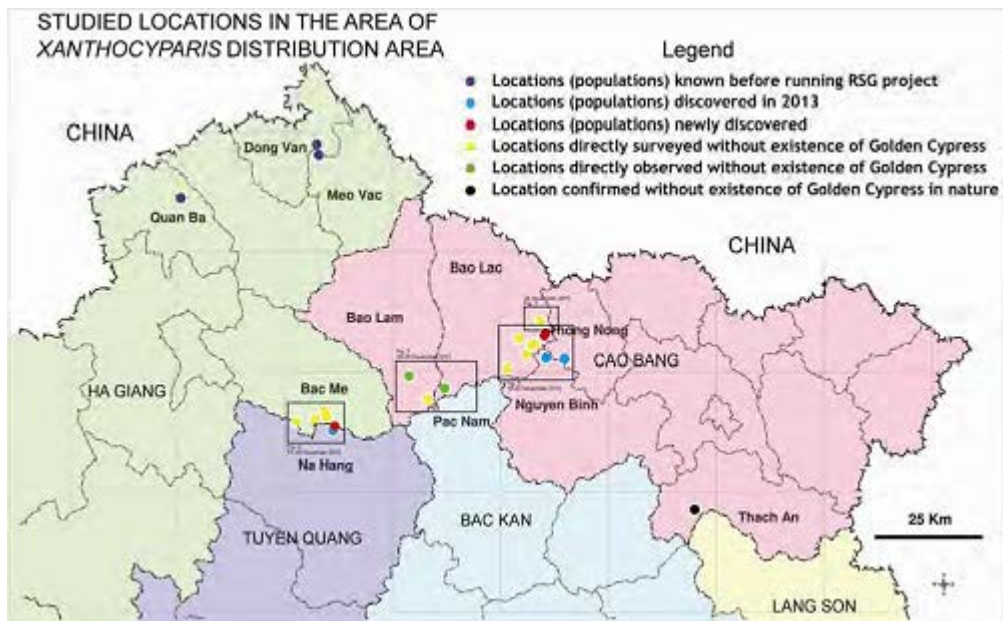


Fig. 1. Locations of all known populations of Golden Cypress in Vietnam including locations of presently discovered and assessed populations.

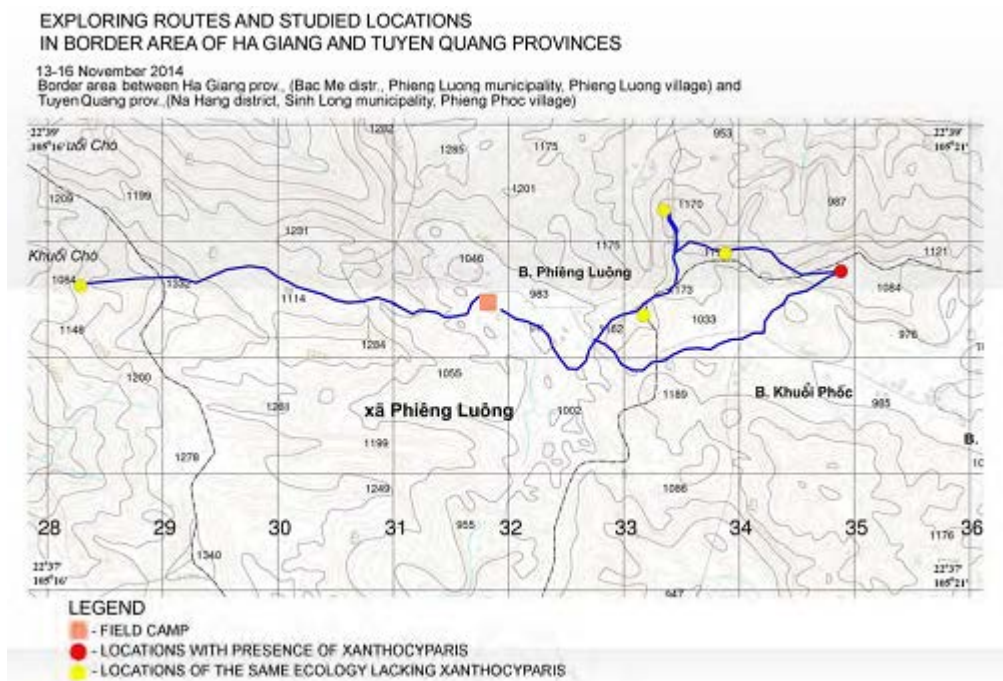


Fig. 2. Exploring routes and studied locations of Golden Cypress in the border area between Ha Giang prov. (Ba Me distr., Phung Luong municipality, Phung Luong village) and Tuyen Quang prov. (Na Hang distr., Sinh Long municipality, Phung Phoc village). 13-16 November 2014.

EXPLORING ROUTES AND STUDIED LOCATIONS
IN CENTRAL PART OF CAO BANG PROVINCE

19-23 November 2014
Central part of Cao Bang prov., (Bao Lac district, Hong An mun., Mi Lung village)

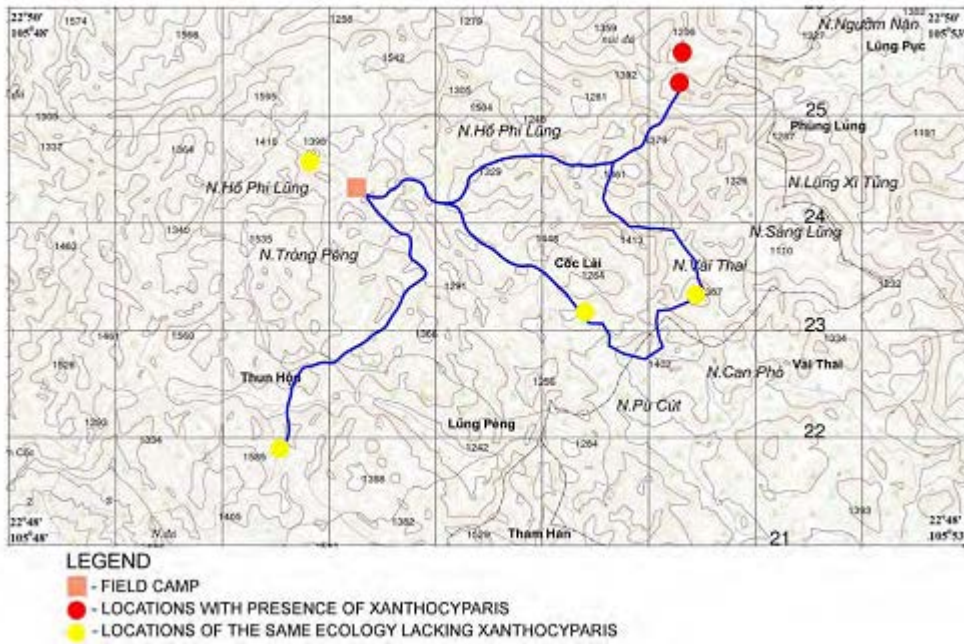


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STUDIED LOCATION IN CENTRAL PART OF CAO BANG PROVINCE

24 November 2014
Central part of Cao Bang prov., (Bao Lac district, Dinh Phung mun., Ban O village)

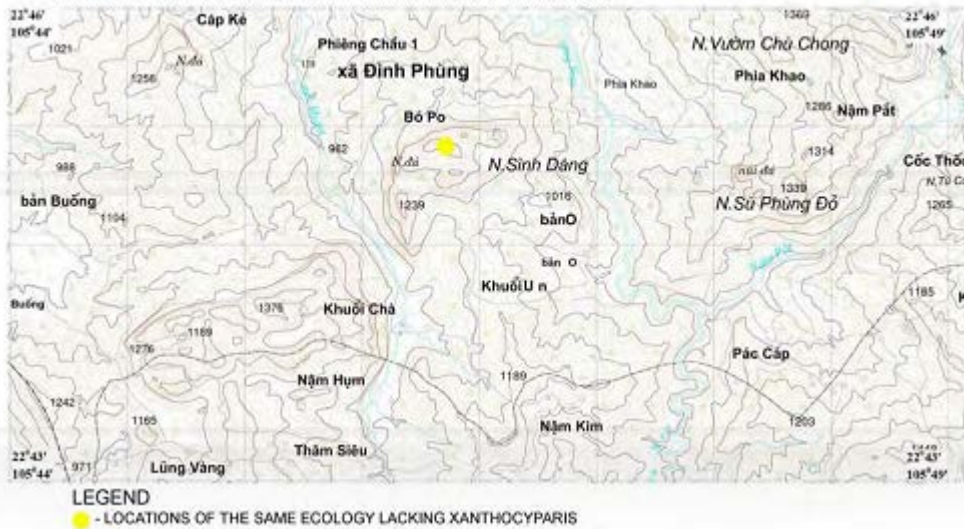


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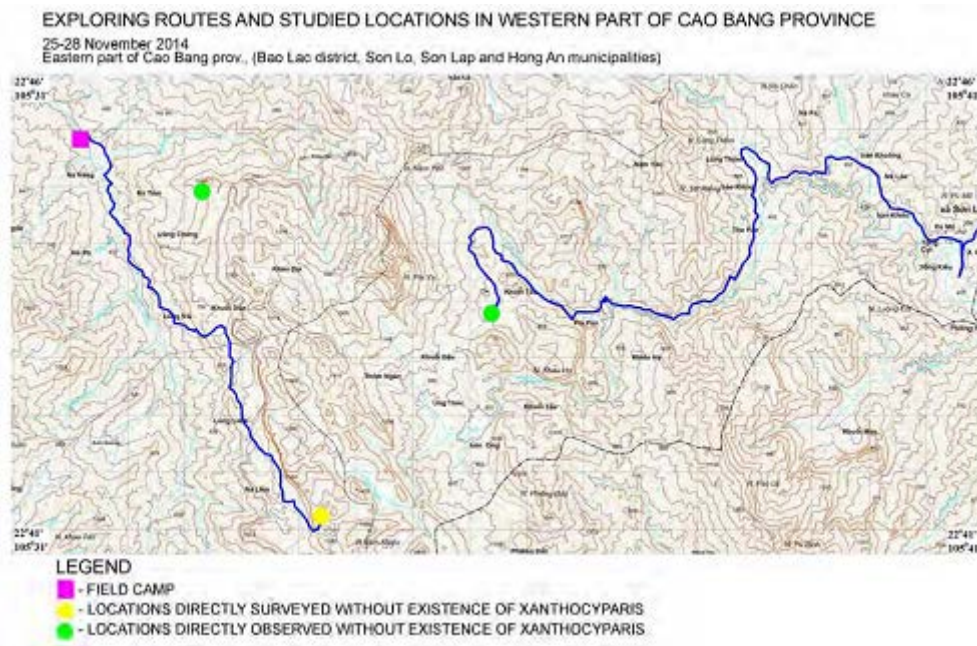


Fig. 5. Exploring of probable locations of Golden Cypress in the eastern part of Cao Bang prov. (Bao Lac distr., Son Lo, Son Lap and Hong An municipalities). 25-28 November 2014.

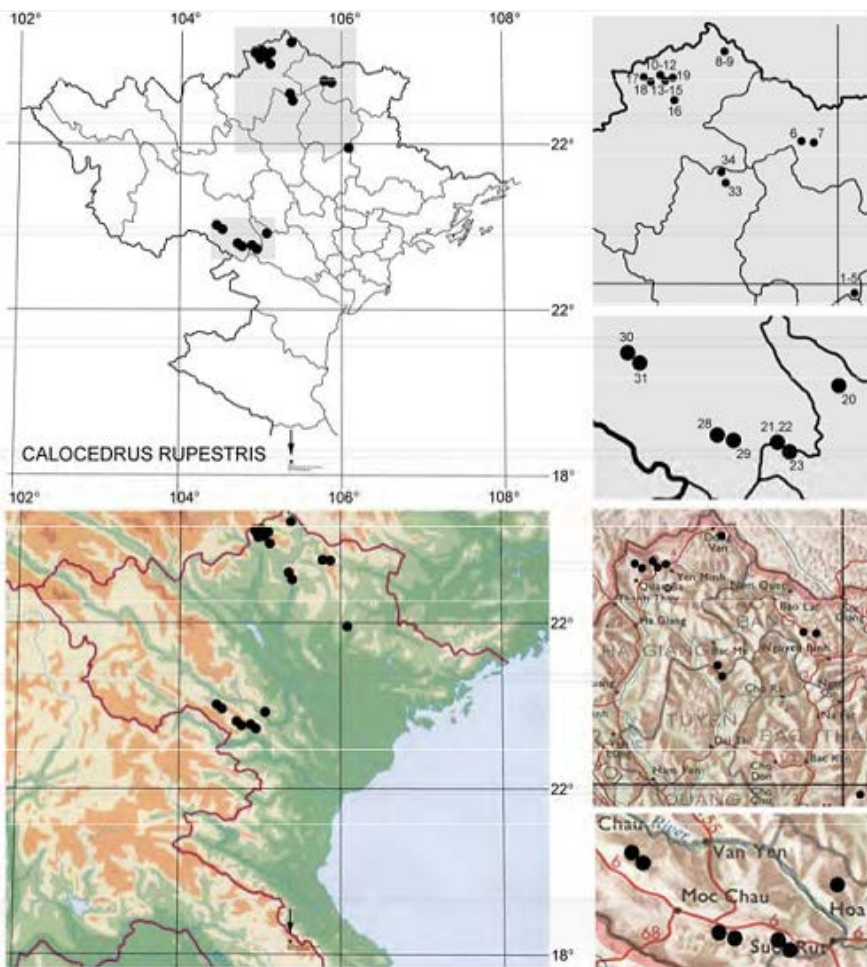


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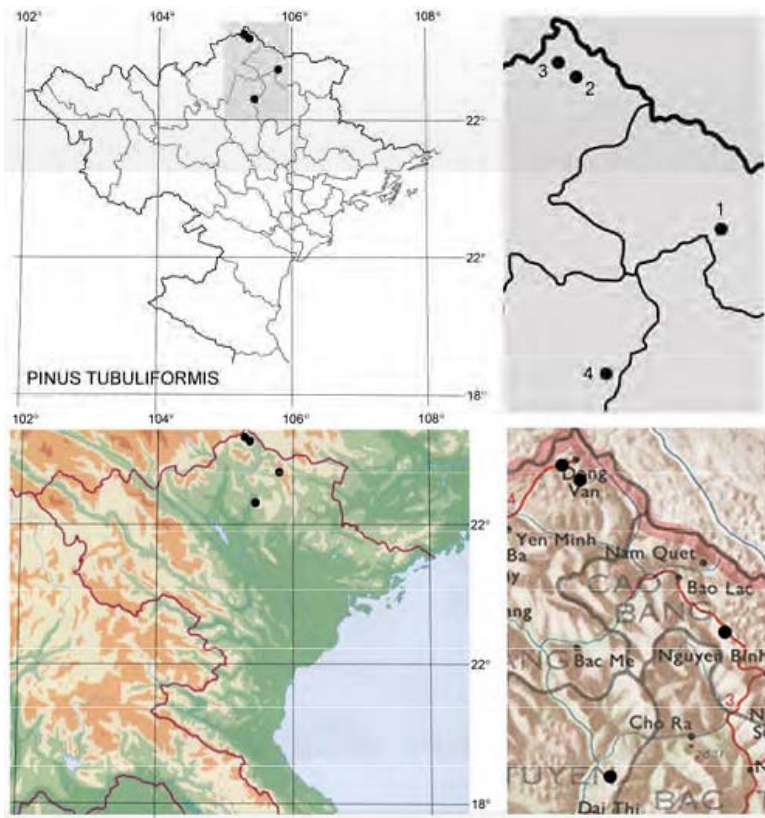


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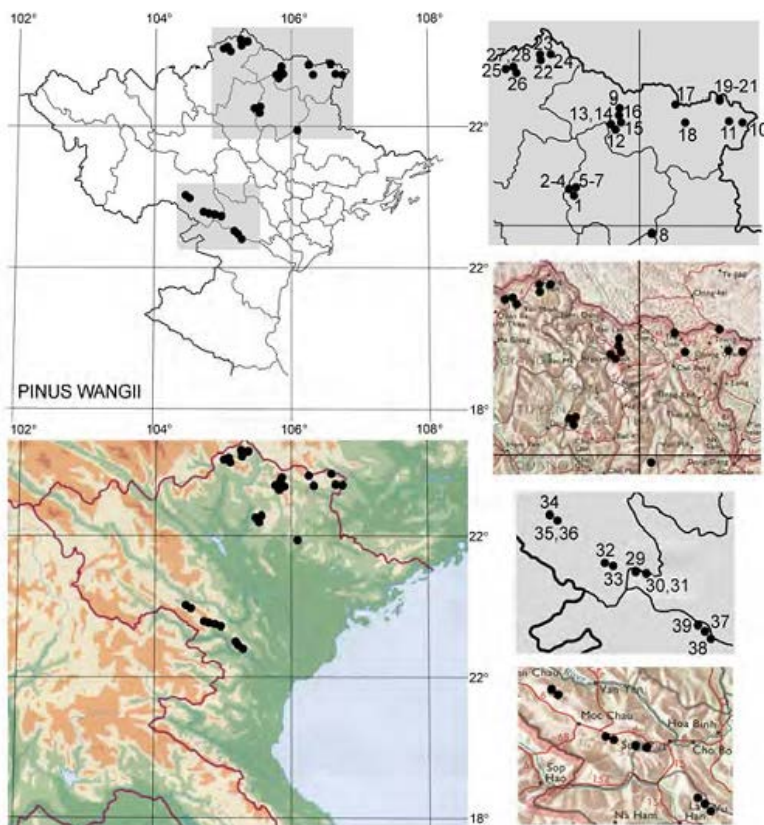


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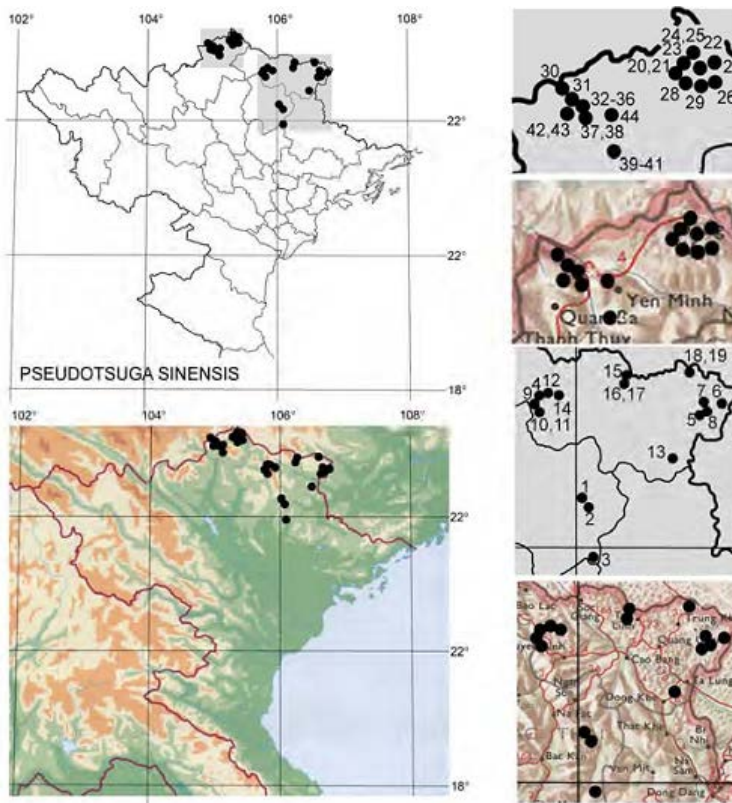


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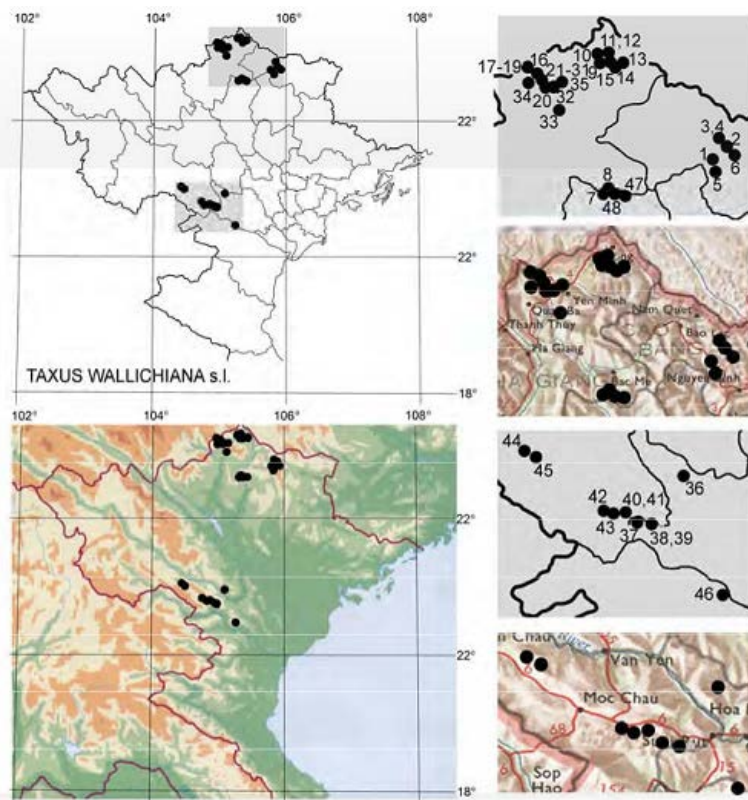


Fig. 10. Distribution of *Taxus wallichiana* s.l. in the northern Vietnam based on voucher herbarium collections (Table 6).

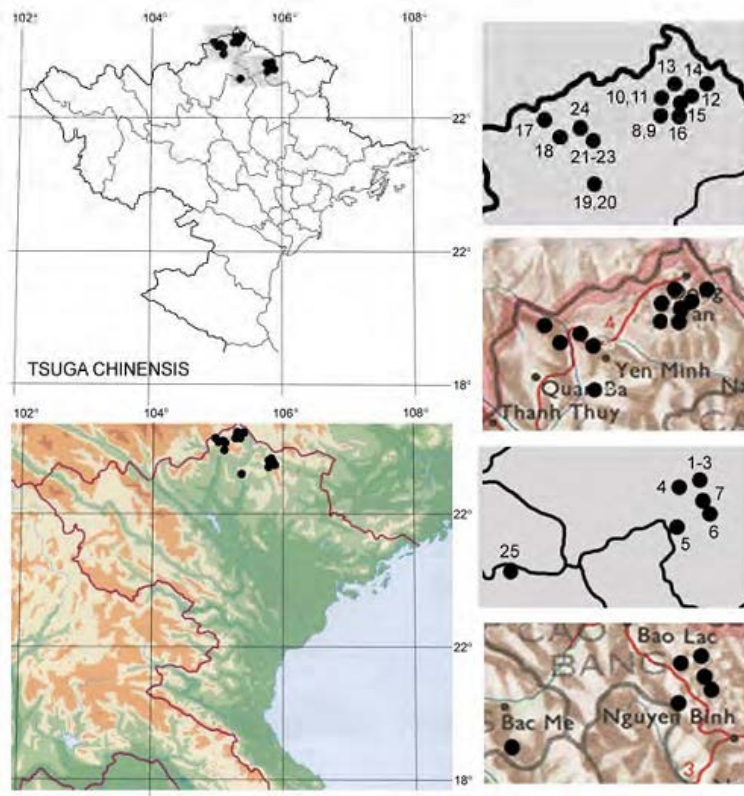


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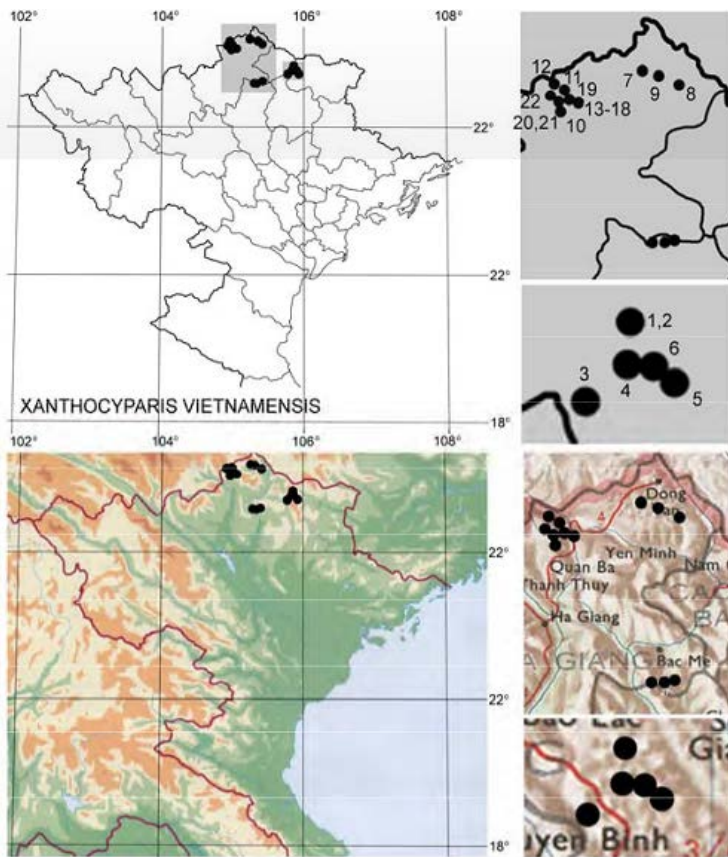


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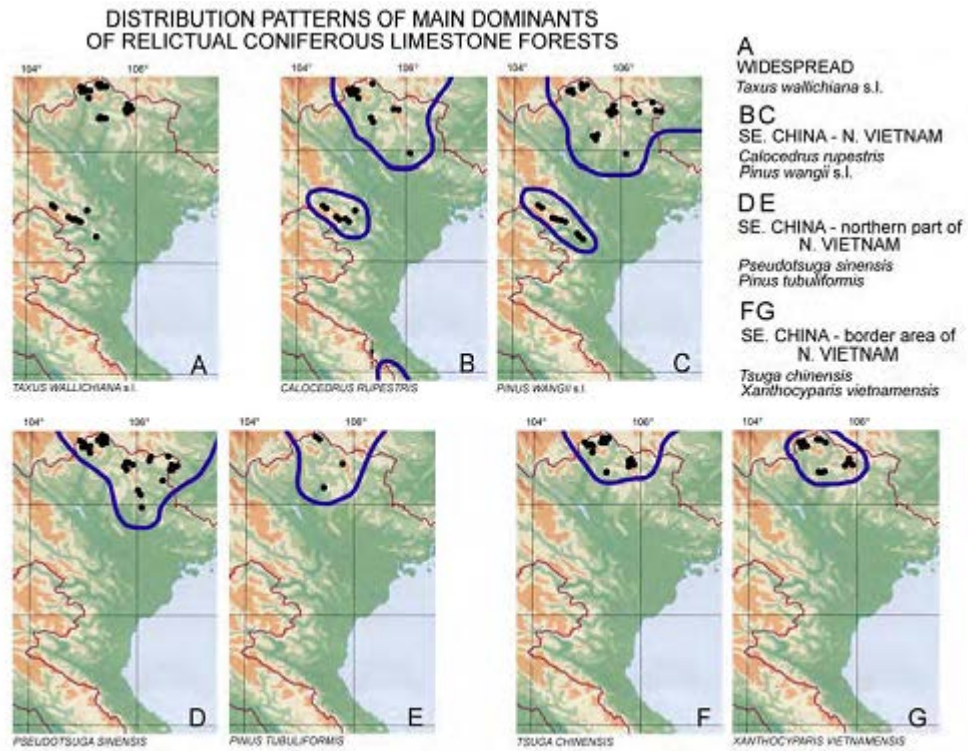


Fig. 13. Distribution patterns of the main dominants of relictual coniferous limestone forests in the northern Vietnam.

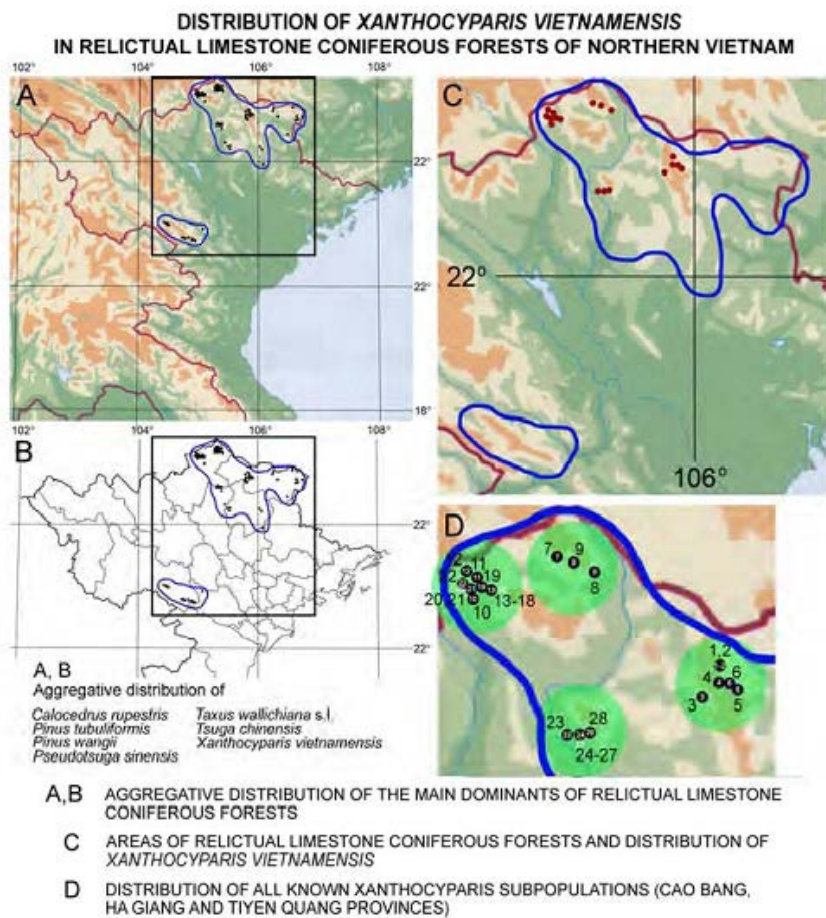


Fig. 14. Area of relictual coniferous limestone forests in the northern Vietnam and distribution of Golden Cypress.



Fig. 15-17. Primary coniferous limestone forest with Golden Cypress at elevations 1100-1200 m a.s.l. between Phieng Luong municipality (Ha Giang prov., Bac Me distr.) and Sinh Long municipality (Tuyen Quang prov., Na Hang distr.). Voucher specimens CPC 7431.



Fig. 18, 19. Golden Cypress in the border area between Phieng Luong municipality (Ha Giang prov., Bac Me distr.) and Sinh Long municipality (Tuyen Quang prov., Na Hang distr.). Voucher specimens CPC 7431.



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Fig. 22. Golden Cypress in the border area between Phieng Luong municipality (Ha Giang prov., Bac Me distr.) and Sinh Long municipality (Tuyen Quang prov., Na Hang distr.). Voucher specimens CPC 7431.



Fig. 23, 24. Primary coniferous limestone forest with Golden Cypress at elevations 1200-1250 m a.s.l. in Cao Bang prov., Bao Lac distr., Hong An municipality, Mi Lung village. Voucher specimens CPC 7548.



Fig. 25, 26. Golden Cypress in Cao Bang prov., Bao Lac distr., Hong An municipality, Mi Lung village. Voucher specimens CPC 7548.



Fig. 27, 28. Golden Cypress in Cao Bang prov., Bao Lac distr., Hong An municipality, Mi Lung village. Voucher specimens CPC 7548.



Fig. 29. Golden Cypress in Cao Bang prov., Bao Lac distr., Hong An municipality, Mi Lung village. Voucher specimens CPC 7548.



Fig. 30. Primary coniferous limestone forest with Golden Cypress at elevations 1200-1250 m a.s.l. in Cao Bang prov., Bao Lac distr., Hong An municipality, Mi Lung village. Voucher specimens CPC 7549.



Fig. 31, 32. Primary coniferous limestone forest with Golden Cypress at elevations 1200-1250 m a.s.l. in Cao Bang prov., Bao Lac distr., Hong An municipality, Mi Lung village. Voucher specimens CPC 7549.



Fig. 33, 34. Golden Cypress in Cao Bang prov., Bao Lac distr., Hong An municipality, Mi Lung village. Voucher specimens CPC 7549.



Fig. 35, 36. Golden Cypress in Cao Bang prov.,
Bao Lac distr., Hong An municipality, Mi
Lung village. Voucher specimens CPC
7549.



Fig. 37, 38. Golden Cypress in Cao Bang prov.,
Bao Lac distr., Hong An municipality, Mi
Lung village. Voucher specimens CPC
7549.



Fig. 39. Golden Cypress in Cao Bang prov., Bao Lac distr., Hong An municipality, Mi Lung village. Voucher specimens CPC 7549.

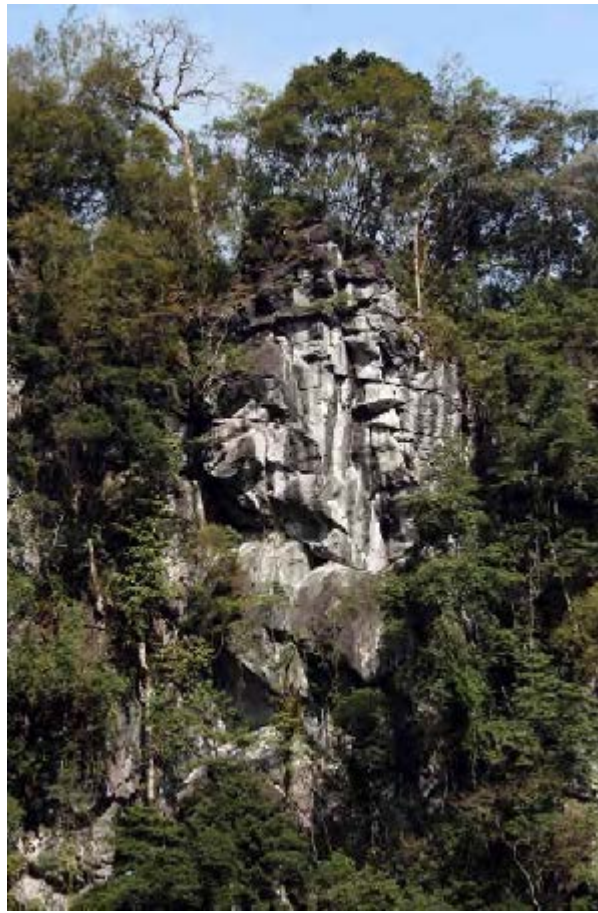


Fig. 40, 41. Degradation of coniferous limestone forests in studied area due to logging.

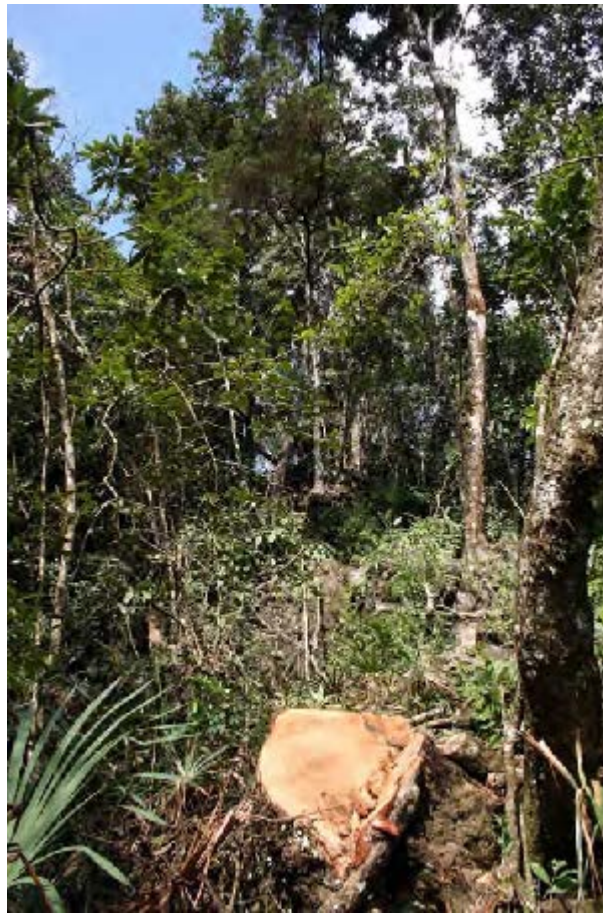


Fig. 42. 43. Illegal selective logging of conifers in studied area.



Fig. 44, 45. Illegal selective logging of conifers in studied area.



Fig. 46, 47. Illegal selective logging of conifers in studied area.



Fig. 48. Exploitation of Golden Cypress for construction timber.



Fig. 49. Regeneration of *Podocarpus annamensis* in coniferous forest after logging of conifer dominants.

Fig. 50. Regeneration of *Fokienia hodginsii* in coniferous forest after logging of conifer dominants.



Fig. 51. Cultivation of *Fokienia hodginsii* in local villages in studied area.

Fig. 52. Cultivation of *Cephalotaxus mannii* in local villages in studied area.



Fig. 53, 54. *Ainsliaea ridifolia*, supposedly new species for science discovered in studied area.



Fig. 55. *Aspidistra lancifolia*, supposedly new species for science discovered in studied area.

Fig. 56. *Begonia arachna*, supposedly new species for science discovered in studied area.



Fig. 57. *Iris pseudojaponica*, supposedly new species for science discovered in studied area.



Fig. 58, 59. *Oberonia tatianaе*, new species for science discovered in studied area.



Fig. 60, 61. *Ophiopogon fruticosus*, new species for science discovered in studied area.



Fig. 62, 63. *Tupistra patula*, new species for science discovered in studied area.



Fig. 64. *Coelogyne leucantha*, new species in the flora of Vietnam discovered in studied area.



Fig. 65, 66. *Paphiopedilum micranthum*, globally threatened species discovered in studied area.



Fig. 67. *Trachycarpus geminisectus*, globally threatened species discovered in studied area.

Fig. 68. *Epigeneium chapaense*, local endemic species discovered in studied area.



Fig. 69. *Holcoglossum wangii*, local endemic species discovered in studied area.

Fig. 70. *Liparis filiformis*, local endemic species discovered in studied area.



Fig. 71. *Phaius wenshanensis*, local endemic species discovered in studied area.

Fig. 72. *Pholidota roseans*, local endemic species discovered in studied area.



Fig. 73. *Polygala tonkinensis*, local endemic species discovered in studied area.

Fig. 74. *Mahonia nepalensis*, threatened species widely collected in studied area as medicinal plant used in oriental medicine.



Fig. 75, 76. Expedition team activity during field works in studied area. Interviews and talks with local people in remote mountain area about Golden Cypress occurrence.



Fig. 77. Expedition team activity during field works in studied area. Interviews and talks with local people in remote mountain area about Golden Cypress occurrence.

Fig. 78. Expedition team activity during field works in studied area. Team group (Nguyen Sinh Khang and two local peoples) discovered first Golden Cypress population in Ha Giang area (CPC 7431).



Fig. 79. Expedition team activity during field works in studied area. L.Averyanov during field survey, collecting rare endemic palm - *Trachycarpus geminisectus* (CPC 7559).

Fig. 80. Expedition team activity during field works in studied area. L.Averyanov process voucher herbarium specimens as documentation of field survey.



Fig. 81. Expedition team activity during field works in studied area. T.Maisak and L.Osinovetc prepare collected plant specimens for herbarization.

Fig. 82. Expedition team activity during field works in studied area. L.Averyanov and T.Maisak make photos of new species for science - *Tupistra patula* (CPC 7492) discovered by N.S.Khang.