Vietnamese conifers and some problems of their sustainable utilization

Phan Ke Loc [1, 2], Nguyen Tien Hiep [2], Nguyen Duc To Luu [3], Philip Ian Thomas [4], Aljos Farjon [5], L.V. Averyanov [6], J.C. Regalado, Jr. [7], Nguyen Sinh Khang [2], Georgina Magin [8], Paul Mathew [8], Sara Oldfield [9], Sheelagh O'Reilly [8], Thomas Osborn [10], Steven Swan [8] and To Van Thao [2]

[1] University of Natural Science, Vietnam National University, Hanoi; [2] Institute of Ecology and Biological Resources; [3] Vietnam Central Forest Seed Company; [4] Royal Botanic Garden Edinburgh; [5] Royal Botanic Gardens, Kew; [6] Komarov Botanical Institute; [7] Missouri Botanical Garden; [8] Fauna & Flora International; [9] Global Trees Campaign; [10] Independent Consultant

Introduction

Vietnam is now recognized as one of the top ten global conifer conservation 'hotspots', as defined by the Conifer Specialist Group of the World Conservation Union (IUCN). Vietnam's conifer flora has approximately 34 species that are indigenous to the country, making up about 5% of conifers known worldwide. Although conifers represent only less than 0.3% of the total number of higher vascular plant species of Vietnam, they are of great ecological, cultural and economic importance. Most conifer wood is prized for its high value in house construction, furniture making, etc. The decline of conifer populations in Vietnam has caused serious concern among scientists. Threats to conifer species are substantial and varied, ranging from logging (both commercial and subsistence), land clearing for agriculture, and forest fire. Over the past twelve years (1995-2006), Vietnam Botanical Conservation Program (VBCP), a scientific cooperation between the Missouri Botanical Garden in Saint Louis and the Institute of Ecology and Biological Resources in Hanoi, has conducted various studies on this important group of plants in order to gather baseline information necessary to make sound recommendations for their conservation and sustainable use.

Materials and Methods

Over the past twelve years, international botanical teams have conducted surveys in more than 90 sites, on limestone and non-limestone mountains. Nearly 700 numbers of conifer specimens were collected.

Results

As a result of gathering and study the new collections, our knowledge on the conifer flora of Vietnam has been expanded by a number of new records for the country together with discoveries of new taxa for science. Currently, there are 34 conifer species that indigenous to Vietnam. New taxa described are one genus *Xanthocyparis* (Farjon *et al*. 2002), and 3 species: *X. vietnamensis* (Farjon *et al*., 2002)*, Amentotaxus hatuyenensis* (Nguyen & Vidal 1996) and *Calocedrus rupestris* (Averyanov *et al.* 2004)). New occurrences for the flora are 3 genera: Pseudotsuga,Tsuga (Nguyen 2000) and Taiwania (Nguyen *et al*. 2002), and 7 species: *Pinus kwangtungensis, Pinus tabuliformis, Pseudotsuga sinensis, Tsuga chinensis, Keteleeria davidiana, Taxus chinensis* and *Taiwania cryptomerioides*.

In 2004, an international group of both world and national authorities on botany and conservation biology evaluated the conservation status of indigenous Vietnamese conifers, both on a global and on a national scale, using IUCN 2001 criteria (Nguyen *et al.* 2004). Over 40% (14/34) of Vietnamese conifer species are listed as globally threatened; nearly 90% (30/34) have been assessed as threatened at the national level (including LC); only two conifer taxa are currently not listed as threatened (Table 1).

FAMILY/SPECIES	**GLOBAL STATUS**	**NATIONAL STATUS**
CEPHALOTAXACEAE		
Cephalotaxus mannii	VULNERABLE A1d	VULNERABLE A2c,d B1ab(i-v), B2ab(i-v), C1
CUPRESSACEAE		
Calocedrus macrolepis	VULNERABLE B1+2b	ENDANGERED A2acd, A3c,d, B2ab(i-v) C2a(i)
Calocedrus rupestris	ENDANGERED A2cd, C1	ENDANGERED A2cd, C1
Cunninghamia konishii	ENDANGERED A1c	ENDANGERED A2c, B2ab(i-v)
Cupressus sp.	NOT EVALUATED	DATA DEFICIENT
Fokienia hodginsii	LOWER RISK, NEAR-THREATENED	ENDANGERED A2cd
Glyptostrobus pensilis	ENDANGERED B1ab (i, iv), B2ab (i, iv), D	CRITICALLY ENDANGERED A2c, B1ab(i-v), B2ab(i-v) C1
Taiwania cryptomerioides	VULNERABLE A1d	CRITICALLY ENDANGERED A2c, B1ab(i-v), B2ab(i-v), C2a(ii)
Xanthocyparis vietnamensis	CRITICALLY ENDANGERED B1a, b(ii-v), 2 a, b(ii-v)	CRITICALLY ENDANGERED B1ab(ii-v), 2ab(ii-v)
PINACEAE		
Abies delavayi	VULNERABLE D1	VULNERABLE D1
Keteleeria davidiana	LOWER RISK, LEAST CONCERN	ENDANGERED A2cd, B1ab(iii), B2ab(ii) D
Keteleeria evelyniana	LOWER RISK, LEAST CONCERN	VULNERABLE A2cd
Pinus dalatensis	VULNERABLE B1+2c	VULNERABLE B1ab(iii, v), 2ab(iii, v)
Pinus kesiya	LOWER RISK, LEAST CONCERN	LOWER RISK, LEAST CONCERN
Pinus krempfii	VULNERABLE	VULNERABLE

FAMILY/SPECIES	**GLOBAL STATUS**	**NATIONAL STATUS**
	B1a,b (i-iii), 2a, b(i-iii)	B1ab(i-iii), 2a,b(i-iii)
Pinus kwangtungensis	LOWER RISK, NEAR-THREATENED	VULNERABLE A2acd, C1
Pinus latteri	LOWER RISK, NEAR-THREATENED	ENDANGERED A2cd
Pinus tabuliformis	NOT EVALUATED	NOT EVALUATED
Pinus wangii	ENDANGERED B1+2bd	DATA DEFICIENT
Pseudotsuga sinensis	VULNERABLE B1+2c	VULNERABLE A2acd
Tsuga chinensis	LOWER RISK, LEAST CONCERN	ENDANGERED C1
Tsuga dumosa	LOWER RISK	VULNERABLE A3c, B1ab(iii), B2ab(iii), D2
PODOCARPACEAE		
Dacrycarpus imbricatus	LOWER RISK, LEAST CONCERN	VULNERABLE A2cd
Dacrydium elatum	LOWER RISK, LEAST CONCERN	VULNERABLE A2cd
Nageia fleuryi	DATA DEFICIENT	VULNERABLE A2ac, B1ab(iii,v), B2ab(iii,v), C1, C2a(i)
Nageia wallichiana	LOWER RISK, LEAST CONCERN	VULNERABLE A2ac, B1ab(iii,v), B2ab(iii, v), C1, C2a(i)
Podocarpus neriifolius	LOWER RISK, LEAST CONCERN	LOWER RISK, LEAST CONCERN
Podocarpus pilgeri	LOWER RISK, LEAST CONCERN	VULNERABLE A2ac
TAXACEAE		
Amentotaxus argotaenia	VULNERABLE A1c	VULNERABLE A2c**,** B1a, b(i-v)
Amentotaxus hatuyenensis	ENDANGERED A2c	ENDANGERED B1ab(iii)
Amentotaxus poilanei	VULNERABLE A2c	VULNERABLE D1
Amentotaxus yunnanensis	ENDANGERED A1c	VULNERABLE B1ab(i-v)
Taxus chinensis	LOWER RISK, LEAST CONCERN	VULNERABLE A2ac, B2a(i-v),b(i-v).
Taxus wallichiana	LOWER RISK, LEAST CONCERN	ENDANGERED C1

Table 1: Indigenous Vietnamese conifer species and their proposed conservation statuses at global and national levels

The Vietnam Conifers Conservation Status Review 2004 (Nguyen *et al.* 2004), and the actions proposed therein, made significant contributions to national and international biodiversity conservation commitments of Vietnam Government. Knowledge of the conservation statuses of many conifer species has contributed to updating the Government Decree No 32/2006/ND-CP on the management of threatened plant and animal species. Conifers represent one half (7/15) of plant species and groups of plants cited in Appendix IA- *Strict prohibition of exploitation and use for commercial purposes* and a quarter (9/37) of species and groups of species cited in Appendix IIA- *Limit of exploitation and use for commercial purposes.*

The work outlined in the Vietnam Conifers: Conservation Status Review 2004 (Nguyen *et al.* 2004) demonstrates that Vietnam is now at the forefront of an integrated effort to conserve its conifers. Knowledge of the conservation statuses of conifer species has stimulated the establishment of new protected areas such as Bat Dai Son Nature Reserve (for the protection of *Xanthocyparis vietnamensis*) or new proposed protected areas such as Nui Voi-Duc Trong for *Taxus wallichiana*, Van Ban for *Taiwania cryptomerioides*. Park officials are reviewing the occurrence and distribution of threatened conifers in their protected areas, such as Phong Nha-Ke Bang, Pu Mat and Bi Doup-Nui Ba National Parks.

A new project "*Conservation of five priority threatened conifer species in Vietnam*" has just started. The project aims to secure the immediate future and protection of the unique genetic resources of five priority species of conifer through the establishment of a national Conifer Conservation Center (CCC), and to improve the status of the wild population of each species through enrichment planting programs in protected areas, using local stock. This work is being carried out under the auspices of the Hoang Lien Son Project of Fauna & Flora International (FFI) with funding from the *Flagship Species Fund* of the UK Government's Department of Food, Environment and Rural Affairs, Global Trees Campaign, UK, Institute of Ecology and Biological Resources, Basic Research Program in Life Sciences and Vietnam Botanical Conservation Program. The Center would form the hub of conifer conservation activities in Vietnam. The Center will focus on five priority flagship species *Taiwania cryptomerioides*, *Xanthocyparis vietnamensis*, *Calocedrus rupestris, Glyptostrobus pensilis and Cupressus sp*. Local ethnic households will be involved in the care and maintenance of the planted-out trees. Using expertise from the Center, satellite nurseries would later be established at two other locations to propagate *Taiwania cryptomerioides* and *Glyptostrobus pensilis* closer to their natural area of occurrence.

Conclusion

The studies of conifers in Vietnam are being continued and expanded in various fields, from taxonomy, phytogeography, ecology, conservation and forest restoration. Both national and international collaborative efforts are essential to fulfill these goals.

References

Averyanov, L., Nguyen, H., Phan, L. & Pham, T. 2004, '*Calocedrus rupestris* (Cupressaceae): a new relict conifer species from limestone areas of northern Vietnam', *Proceedings of the 3rd National Conference in Life Sciences*, Thai Nguyen, Vietnam, pp. 40-44 (in Vietnamese with English summary).

Farjon, A., Nguyen, H, Harder, D., Phan, L. & Averyanov, L. 2002, 'A new genus and species in Cupressaceae (Coniferales) from northern Vietnam, *Xanthocyparis vietnamensis*', *Novon*, vol. 12, no. 2, pp.179-189.

Nguyen, H. & Vidal, J. 1996, *Flore du Cambodge, du Laos et du Vietnam, Vol. 28. Gymnospermae*, Muséum National d'Histoire Naturelle, Paris.

Nguyen, H, Phan, L. & Averyanov, L. 2000, Some new species for the flora of Vietnam collected from the limestone mountains of Caobang province, *J. Biol.* (Hanoi), vol. 22, no. 4, pp. 1-11 (in Vietnamese).

Nguyen, H., Do, D. & Phan, L. 2002, The diversity of the flora of Vietnam 9. *Taiwania* Hayata and *T. cryptomerioides* Hayata (Taxodiaceae): new genus and species for the flora, *Journal of Genetics & Applications*, vol. 1, pp. 32-40. (in Vietnamese with English summary).

Nguyen, H., Phan, L., Nguyen, L., Thomas, P., Farjon, A., Averyanov, L. & Regalado, J. 2004, *Vietnam Conifers: Conservation Status Review 2004*, Fauna & Flora International Vietnam Programme, Hanoi.