

## CONSERVATION OF GYMNOSPERM SPECIES IN YEN TU NATIONAL FOREST, QUANG NINH PROVINCE

Phan Thanh Lam<sup>1</sup>, Hoang Van Sam<sup>2</sup>, Dao Cong Anh<sup>3</sup>, Nguyen Thi Tuyet<sup>4</sup>,  
Nguyen Phuong Thao<sup>5</sup>, Tran Khanh Nhu<sup>6</sup>, Tobias Matusch<sup>7</sup>

<sup>1</sup>Northeast Agriculture and Forestry College

<sup>2,3,4,5,6</sup>Vietnam National University of Forestry

<sup>7</sup>Deutsche Gesellschaft fuer Internationale Zusammenarbeit Vietnam

### SUMMARY

This paper surveys the Gymnosperm species in Yen Tu National Forest, Quang Ninh province. A total of 15 Gymnosperm species were found in Yen Tu National Forest belonging to the 5 families Podocarpaceae, Cupressaceae, Cycadaceae, Pinaceae and Gnetaceae. Gymnosperm species in Yen Tu National Forest have a high conservation value with all 15 species listed in IUCN (2015), 02 species in Viet Nam red data book (2007) and 03 species are listed in Decree 32/2006 of the Vietnamese government. The majority of gymnosperms species at Yen Tu National Forest are distributed from 200 to 600m above sea level. *Juniperus chinensis* L. and *Juniperus squamata* Buch. - Ham. are distributed up to 800m; *Podocarpus chinensis* (Roxb.) Wall. and *Podocarpus pilgeri* Foxworthy are distributed up to 1000m. Only *Nageia fleuryi* (Hickel) de Laub are distributed at lower than 400m above sea level. This research also provides the morphological and ecological characteristics of *Podocarpus pilgeri* Foxworthy and *Dacrydium elatum* (Roxb.) Wall. ex Hook in the research area.

**Keywords:** Conservation, *Dacrydium elatum* (Roxb.) Wall. ex Hook, Gymnosperms, *Podocarpus pilgeri* Foxworthy, Yen Tu National Forest.

### I. INTRODUCTION

Yen Tu National Forest is located in Quang Ninh province and consists of 2 Communes: Thuong Yen Cong and Phuong Dong, Uong Bi city, Quang Ninh Province and covers 2,783 ha. Yen Tu have known as a Buddhism centre of Viet Nam and famous for Truc Lam Yen Tu. Besides it, Yen Tu also possesses a high biodiversity, especially in Gymnosperms. Many species have not only a scientific value, but cultural values such as *Dacrydium elatum* that attaches to the origin of Truc Lam Yen Tu. However, by supporting economic development, especially due to tourism activities and mining, the Gymnosperms species have been damaged seriously in recently years. Accordingly, this study conducted necessary research on species composition, conservation status and proposed solutions to remain the value of Gymnosperms species in Yen Tu Nation Forest.

### II. CONTENT AND METHODOLOGY

#### Content:

- Research on species composition and natural conservation status of Gymnosperms species in Yen Tu National Forest.

- Research on morphological and ecological characteristics of selected Gymnosperms species in Yen Tu National Forest.

#### Methodology:

- Design 10 transects in the study site with total transects length of 30 km. Additionally, we establish 30 plots with a plot size of each 40\*50 m. In each transect, we record all Gymnosperm species and collect the specimen as well as take a picture of each species. Specimens were retained and stored in the Herbarium of Viet Nam National University of Forestry (VNF)

- The conservation situation and criteria of species were identified by using the Viet Nam Red data book (2007), Red List of IUCN (2015), and Decree 32 of the Vietnamese government in 2006.

- Interviewing local people, forest rangers, and local authorities in the research area about

the natural distributed of Gymnosperms, the current situation as well as existing threats of Gymnosperms in Yen Tu National Forest was analysed.

### III. RESULTS AND DISCUSSION

#### 3.1. Diversity of Gymnosperm in Yen Tu National Forest

A total of 15 Gymnosperm species were found in Yen Tu National Forest belonging to the 5 families Podocarpaceae, Cupressaceae, Cycadaceae, Pinaceae and Gnetaceae. Podocarpaceae has the highest diversity with 6 species (*Dacrydium elatum* (Roxb.) Wall, *Podocarpus neriifolius* D. Don, *Podocarpus pilgeri* Foxworthy, *Nageia fleuryi* (Hickel) de Laubenfels, *Dacrycarpus imbricartus* (Blume) de Laub; Cupressaceae with 4 species (*Calocedrus macrolepis* Kurz, *Juniperus*

*chinensis* L., *Juniperus squamata* Buch. - Ham. *Platycladus orientalis* (L.) Franco); Cycadaceae with 2 species (*Cycas revoluta* Thumb, *Cycas balansae* Warb; Pinaceae with 2 species (*Pinus massoniana* Lamb and *Pinus merkusii* Junghuhn & de Vriese) and Gnetaceae with 1 species (*Gnetum montanum* Margf.).

#### 3.2. Conservation status and distribution of Gymnosperm species in Yen Tu National Forest

A total of 15 Gymnosperms species were found in Yen Tu National Forest. All species are listed in the IUCN Red List (2015), 02 species are listed in the Vietnam Red Data Book (2007) and 03 species are listed in Decree 32 of the Vietnamese government in 2006. An overview is given by table 01.

**Table 1. Conservation status of Gymnosperms species at Yen Tu National Forest**

TT	Latin name	Vietnamese name	Status of conservation			Elevation level (m)
			IUCN, 2015	RDB of Vietnam 2007	Decree 32/CP/2006	
	CUPRESSACEAE	HỌ HOÀNG ĐÀN				
1	<i>Calocedrus macrolepis</i> Kurz	Bách xanh	EN	NT	IIA	300-600
2	<i>Juniperus chinensis</i> L.	Tùng xà		LC		400-800
3	<i>Juniperus squamata</i> Buch. - Ham.	Tùng vảy		LC		400-800
4	<i>Platycladus orientalis</i> (L.) Franco	Trắc bách diệp		NT		300-600
	CYCADACEAE	HỌ TUẾ				
5	<i>Cycas balansae</i> Warb.	Thiên tuế balansa	VU	NT	IIA	200-600
6	<i>Cycas revoluta</i> Thumb	Vạn tuế		LC	IIA	200-600
	GNETACEAE	HỌ DÂY GẮM				
7	<i>Gnetum montanum</i> Margf.	Dây gắm		LC		200-600
	PINACEAE	HỌ THÔNG				
8	<i>Pinus massoniana</i> Lamb	Thông đuôi ngựa		LC		200-600
9	<i>Pinus merkusii</i> Juss et de Vries	Thông nhựa		VU		200-600
	PODOCARPACEAE	HỌ KIM GIAO				

TT	Latin name	Vietnamese name	Status of conservation			Elevation level (m)
			IUCN, 2015	RDB of Vietnam 2007	Decree 32/CP/2006	
10	<i>Dacrycarpus imbricatus</i> (Blume) de Laub.	Thông nạng		LC		300 - 600
11	<i>Dacrydium elatum</i> (Roxb.) Wall. ex Hook	Hồng tùng		LC		300 - 700
12	<i>Nageia fleuryi</i> (Hickel) de Laub	Kim giao		NT		100 - 400
13	<i>Podocarpus chinensis</i> (Roxb.) Wall.	Tùng la hán		LC		300 - 1000
14	<i>Podocarpus neriifolius</i> D. Don.	Thông tre		LC		200 - 600
15	<i>Podocarpus pilgeri</i> Foxworthy	Thông tre lá ngắn		LC		500 - 1000

**Note:** EN: Endangered; VU: Vulnerable; LC: Least concern; NT: Near threatened; IIA: Restricting exploitation and use for commercial purpose

Most gymnosperms species at Yen Tu National Forest are distributed between 200 to 600m above sea level. *Juniperus chinensis* L. and *Juniperus squamata* Buch. - Ham. are located up to 800 m and only 2 species *Podocarpus chinensis* (Roxb.) Wall. and *Podocarpus pilgeri* Foxworthy reach elevations up to 1000 m. *Nageia fleuryi* (Hickel) de Laub was the first time recorded as naturally distribution in Yen Tu National Forest and is located at elevations lower than 400 m above sea level.

### 3.3. Ecological characteristics of selected Gymnosperms species in Yen Tu National Forest

#### 3.3.1. *Dacrydium elatum* (Roxb.) Wall. ex Hook

##### Morphology

**Tree:** up to 30 m with a DBH up to 80 cm. **Habit:** upright tree with clear bole and ascending branches forming a small dome. **Bark:** red, rough with vertical fissures, peeling in strips. **Foliage:** juvenile foliage on young trees and some small branchlets is thin, linear-lanceolate, spreading but curved forward, keeled on four sides, up to 1.6 cm long. On older trees and older branches, shoots are cord like with small triangular

leaves pressed to the stem. Some shoots may have both types of leaves. **Cones:** female cones terminal, solitary, consisting of seed lying at an angle on top of 1 – 2 mm elongated bracts; male cones solitary, terminal and cylindrical. **Seed:** solitary seed is 4 - 4.5 mm long 3 mm wide, black when ripe.

##### Ecology and distribution

*Dacrydium elatum* (Roxb.) Wall. ex Hook are naturally distributed in sub-tropical rainforest on slopes and ridges on either granite or limestone derived soils up to 2000 m above sea level. *Dacrydium elatum* are usually associated with other conifer species such as *Pinus krempfii*, *Podocarpus neriifolius*, *Fokienia hodginsii*, *Dacrycarpus imbricatus*. They can be found in Lao, Cambodia, Thailand, Malaysia, and Indonesia. In Vietnam this species is domestic in several provinces from North to Highland centre of Vietnam, such as in Bach Ma National Park (Thua Thien Hue province) and Pu Mat National Park (Nghe An province).

A total of 237 trees of *Dacrydium elatum* (Roxb.) Wall. ex Hook was found Yen Tu National Forest. It is one of the most famous

tree species in Vietnam, related to King Tran Nhan Tong (1278-1293) when he moved from Hanoi to Yen Tu and established Thien Vien Truc Lam. During the study we did not find

any naturally regeneration of this species in the research area, additionally several trees were found dead because of their high age.



**Figure 01. *Dacrydium elatum* (Roxb.) Wall. ex Hook in Am Duoc area**



**Figure 02. *Dacrydium elatum* (Roxb.) Wall. ex Hook road in Yen Tu**

### **3.3.2. *Podocarpus pilgeri* Foxworthy**

#### **Morphology:**

*Tree*, up to 15 m high and 80 cm in diameter. *Habit*: Branches scattered, often in whorls of five. *Bark*: Red or brown, shallowly fissured, peeling in vertical strips, inner bark pale brown. *Foliage*: Linear lanceolate or elliptic, usually clustered at the ends of the branch, usually 1.5 - 8 cm long and 1.2 cm wide; leaf apex rounded, sometimes mucronate, often with glaucous underside, new growth red. Terminal buds ovoid, 3 – 4 mm by 4 mm, with triangular bracts, branchlets terete. *Cones*: dioecious. Female seed bearing structure solitary, axillary, peduncle 0.3 – 1.3 cm long, receptacle red-purple. Seed: purple, glaucous, ellipsoid-ovoid, 0.8 - 0.9 by 0.6 cm.

#### **Ecology and distribution:**

*Podocarpus pilgeri* Foxworthy is distributed in conifer dominated forests on ridges and slopes, usually on limestone derived soils up to 1800m above sea level. *Podocarpus pilgeri* Foxworthy usually is associated with other conifer species: *Pinus kwangtungensis*, *Pseudotsuga sinensis*, *Xanthocyparis vietnamensis*, *Fokienia hodginsii*, *Taxus chinensis*. The species is additionally distributed in India, Bangladesh, China, and Southeast Asia. In Vietnam this species can be found in the provinces Lao Cai, Ha Giang, Cao Bang, Son La, Hoa Binh, Quang Ninh.

We found 11 trees of *Podocarpus pilgeri* Foxworthy with an average diameter of approximately 22 cm in Yen Tu National

Forest. They were scarcely distributed from Hoa Yen to An Ky Sinh (600 to 1000 m above sea level). Similar to *Dacrydium elatum* (Roxb.)

Wall ex Hook, during the assessment not any naturally regeneration were found.



**Figure 03. Podocarpus pilgeri Foxworthy in An Ky Sinh area**



**Figure 04. Specimen of Podocarpus pilgeri Foxworthy**

**IV. CONCLUSION**

A total of 15 Gymnosperm species were found in Yen Tu National Forest, belonging to the 5 families Podocarpaceae, Cupressaceae, Cycadaceae, Pinaceae and Gnetaceae. Gymnosperm species in Yen Tu National Forest have a high conservation value. All 15 species are listed in IUCN Red List (2015), 02 species in Viet Nam red data book (2007) and 03 species are listed in Decree 32/2006 of the Vietnamese government. The majority of gymnosperms species at Yen Tu National Forest are distributed from 200 to 600m above sea level. *Juniperus chinensis* L. and *Juniperus squamata* Buch. - Ham. are located up to 800m; *Podocarpus chinensis* (Roxb.) Wall. and *Podocarpus pilgeri* Foxworthy reach elevation levels up to 1000m. Only *Nageia fleuryi* (Hickel) de Laub are distributed at

lower elevations than 400m above sea level. In total 237 trees of *Dacrydium elatum* (Roxb.) Wall. ex Hook were recorded in Yen Tu National Forest. They are threatened with extinction because natural regeneration is missing and a large portion of the population already reached a high age and will perish soon. Only 11 trees of *Podocarpus pilgeri* Foxworthy were recorded in Yen Tu. They are also threatened by extinction due to large impacts of tourism and missing natural regeneration.

**REFERENCES**

1. Ban. NT. (Ed.) 2007. *Vietnam Red Data Book, Part II - Plants..* Natural Science and Technology Publishing House, Hanoi.
2. Farjon, A. 2010. *A Handbook of the World's Conifers.* Koninklijke Brill, Leiden.
3. Government of Vietnam. 2006. Decree NO. 32/2006IND-CP. *Management of endangered, precious and rare forest plants and animals.* Ministry of

Agriculture and Rural Development, Hanoi.

3. IUCN, 2015 Red List of Threatened species TM, International Union for the Conservation of Nature and Nature Resources.

4. Nguyen, T.H., Phan, K.L., Nguyen, D.T.L., Thomas, P.I., Farjon, A., Averyanov, L. & Regalado Jr., J. 2004. *Vietnam Conifers: Fauna & Flora International*, Vietnam, Hanoi.

5. Sam H.V, Dung D.T. 2013. *Diversity and conservation status of Gymnosperm in Pu Luong Nature*

*Reserve, Nghe An*, Journal of Science and Forestry Technology No1. 40-47

6. Sam H.V & Quyen N.T. 2013. *Diversity and conservation status of Gymnosperm in Pha Phang forest, Thanh Hoa province*. Journal of Agricultural and Rural Development. No 5: 88-93

7. Sam H.V 2009. *Uses and conservation of plant diversity in Ben En National Park, Vietnam*. National herbarium of the Netherlands, the Netherlands.

## **BẢO TỒN THỰC VẬT NGÀNH HẠT TRẦN TẠI RỪNG QUỐC GIA YÊN TỬ, TỈNH QUẢNG NINH**

**Phan Thanh Lâm<sup>1</sup>, Hoàng Văn Sâm<sup>2</sup>, Đào Công Anh<sup>3</sup>, Nguyễn Thị Tuyết<sup>4</sup>,  
Nguyễn Phương Thảo<sup>5</sup>, Trần Khánh Như<sup>6</sup>, Tobias Matusch<sup>7</sup>**

<sup>1</sup>*Trường Cao đẳng Nông lâm Đông Bắc*

<sup>2,3,4,5,6</sup>*Trường Đại học Lâm nghiệp*

<sup>7</sup>*Tổ chức Hợp tác Quốc tế Đức*

### **TÓM TẮT**

Bài báo là kết quả nghiên cứu thành phần và hiện trạng bảo tồn các loài thực vật ngành hạt trần tại rừng Quốc Gia Yên tử, Tỉnh Quảng Ninh. Kết quả nghiên cứu cho thấy rừng quốc gia Yên Tử khá đa dạng về thực vật hạt trần với 15 loài được ghi nhận. Thực vật Hạt trần tại Yên Tử không chỉ đa dạng về thành phần loài mà còn có giá trị bảo tồn cao với 15 loài trong danh lục đỏ IUCN 2015, 02 loài thuộc sách đỏ Việt Nam 2007 và 03 loài trong Nghị định 32/CP của Chính Phủ Việt Nam năm 2006. Thực vật Hạt trần tại Yên Tử được ghi nhận phân bố chủ yếu ở đai cao 300 – 600 m trên mực nước biển. Có 02 loài phân bố trên đai cao lên tới 800 m là Tùng xà - *Juniperus chinensis* L và Tùng vẩy - *Juniperus squamata* Buch. - Ham.; 02 loài phân bố ở đai cao 1000 m là Thông tre lá ngắn - *Podocarpus pilgeri* Foxworthy và Tùng la hán - *Podocarpus chinensis* (Roxb.) Wall.; 01 loài phân bố dưới 400m là Kim giao - *Nageia fleuryi* (Hickel) de Laubenfels. Nghiên cứu cung cấp thông tin về đặc điểm hình thái, sinh thái của 02 loài Thông tre lá ngắn và Tùng yên tử. Cả hai loài này đều không ghi nhận có tái sinh tự nhiên tại khu vực nghiên cứu và đây cũng là thách thức cho công tác bảo tồn và phát triển 02 loài thực vật quý hiếm và đặc trưng này tại Yên Tử.

**Từ khóa:** Bảo tồn, Quảng Ninh, rừng Quốc gia Yên Tử, thực vật hạt trần.

**Reviewer** : Assoc. Prof. Dr. Vu Quang Nam

**Received** : 02/8/2016

**Revised** : 31/8/2016

**Accepted** : 15/9/2016