Forest vegetation cover in Bu Gia Map National Park, Vietnam

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Thảm thực vật rừng tại Vườn quốc gia Bù Gia Mập, Việt Nam

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ABSTRACT

Understanding the composition of tree species is essential for establishing conservation priorities. Bu Gia Map National Park is in the tropical rainforest zone of Southeast Vietnam. This paper is to analyse and assess tree species composition and biodiversity conservation in Bu Gia Map National Park. The diversity of plant species in Bu Gia Map National Park was studied to provide baseline information for conservation and sustainable management processes that will prolong the life of National Park. The results obtained from the study conducted on the plant species composition and forest vegetation in this national park revealed a total of 786 species, spanning 430 genera and 132 families, across three divisions of vascular plants: Polypodiophyta, Pinophyta, and Magnoliophyta. Among these are 300 species of timber plants, 270 species of medicinal plants, 62 species of edible plants, 74 species of ornamental plants, 40 species of industrial plants, 28 species of fiber plants, and 12 species of plants with unknown use. Notably, during the investigation period, Goniothalamus vietnamensis Ban and Myxopyrum smilacifolium Blume were newly recorded in the forest vegetation of Bu Gia Map National Park. The study also describes a variety of forest vegetation in the area, identifying two major forest vegetation types within Bu Gia Map National Park.

***Từ khóa**:*
Tài nguyên thực vật, thảm thực vật, thành phần loài, thực vật rừng, thực vật thân gỗ.

TÓM TẮT

Vườn quốc gia Bù Gia Mập nằm trong vùng rừng mưa nhiệt đới phía Đông Nam của Việt Nam. Nắm được thành phần của các loài thực vật rừng là điều cần thiết để xác định công tác bảo tồn tại khu vực. Bài báo này nhằm phân tích, đánh giá thành phần loài và bảo tồn đa dạng sinh học tại Vườn quốc gia Bù Gia Mập. Kết quả thu được từ nghiên cứu thành phần các loài thực vật và thảm thực vật rừng ở Vườn quốc gia đã xác định được 786 loài, 430 chi và 132 họ thuộc 3 ngành thực vật có mạch. Chúng bao gồm các lớp: Polypodiophyta, Pinophyta và Magnoliophyta. Loài có giá trị sử dụng gồm 786 loài phân loại được liệt kê bao gồm: 300 loài cây lấy gỗ, 270 loài cây làm thuốc, 62 loài cây ăn được, 74 loài cây cảnh, 40 loài cây sử dụng trong công nghiệp, 28 loài cây lấy sợi và 12 loài có công dụng khác. Trong quá trình điều tra, loài Bổ béo đen (Goniothalamus vietnamensis Ban) và Sâm xuyên đá (Myxopyrum smilacifolium Blume.) mới được ghi nhận ở thảm thực vật rừng Vườn quốc gia Bù Gia Mập. Các thảm thực vật rừng trong khu vực nghiên cứu đã được mô tả. Trong nghiên cứu này, hai kiểu thảm thực vật chính của rừng đã được mô tả ở Vườn quốc gia Bù Gia Mập.

1. INTRODUCTION

Bu Gia Map was included on Decision No. 194/CT of the Chairman of the Council of Ministers, dated 9 August 1986, which proposed establishing a 16,000 ha nature reserve for the conservation of "Fabaceae and

Lagerstroemia conservation forest, abundant birds and mammals." An investment plan was prepared for Bu Gia Map Nature Reserve in 1994 [1] and was approved by the former Song Be Provincial People's Committee in 1995. Bu Gia Map was upgraded to national park status following Decision No. 170/TTg of the Prime Minister, dated 27 November 2002. The total area of Bu Gia Map National Park (BGM NP) is 26,032 ha, comprising a strict protection area of 18,100 ha, a rehabilitation area of 7,832 ha, and an administration area of 100 ha. According to the Prime Minister's Decision, the current area of the buffer zone is 15,200 ha, comprising 7,200 ha in Binh Phuoc province and 8,000 ha in Dak Lak province (Figure 1).

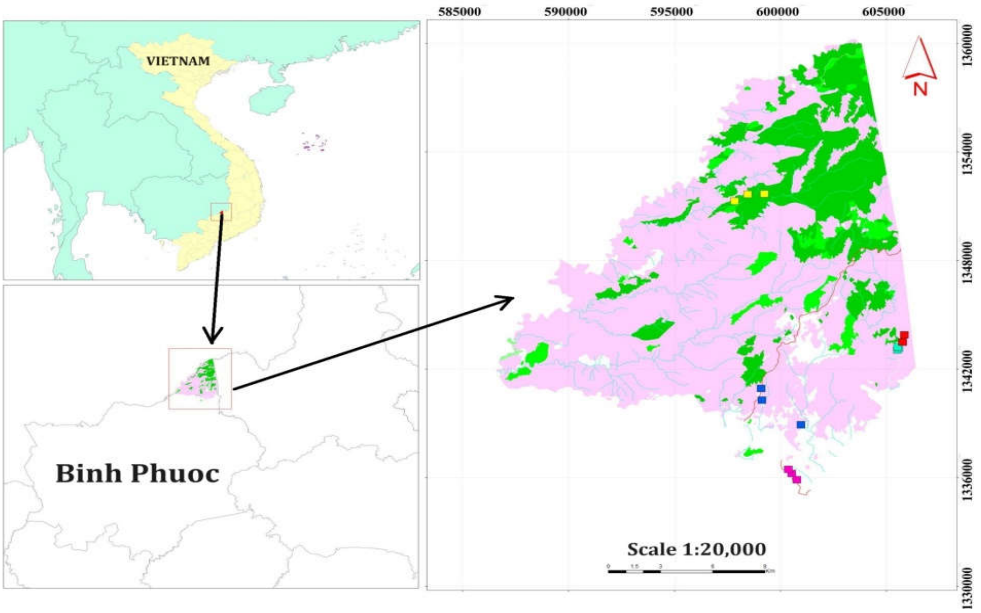

Figure 1. Bu Gia Map National Park location in Southern Vietnam

BGM NP is the only remaining natural forest of the Dipterocarpaceae family, located on the coast of Southern Vietnam. Rare, valuable, and endemic species of flora and fauna, listed in the Red Book of Vietnam and the International Union for Conservation of Nature (IUCN), live in BGM NP. However, in recent years, the structure of forest vegetation cover in BGM NP has changed [2]. This led to a change in the habitat of plants and animals; the number of individuals decreased, and many rare and endangered species were threatened. Therefore, forest conservation in BGM NP plays an important role.

2. RESEARCH METHODS

2.1. Materials

The objects of this study were the forest ecosystems within the territory of BGM NP. An ecological and geographical analysis of the species composition of forests in the reserve indicates specific connections between regions and environmental conditions, revealing their environmental specificity.

2.2. Methods

A geobotanical and floristic study was conducted in the five plots (20 m × 50 m) covering the entire surface area of BGM NP through the establishment of seven transects totaling approximately 20 km in length. Within each transect, all species were identified, and specimens of unidentified plants were collected. Additional plants were collected outside the plots and transects to ensure the inventory was representative of the entire area. Voucher specimens were sent to the Herbarium of the Vietnam National University of Forestry in Dong Nai province and other specialists for identification, using "An Illustrated Flora of Vietnam" as a reference [3].

The vegetation types of BGM NP were classified according to Thai Van Trung (1998) [4]. Human disturbance levels were determined by noting the number of tree stumps and footpaths in the plots.

From 2023 to 2024, the research team conducted numerous surveys in Bu Gia Map, Dak O, and Quang Truc villages in BGM NP. Field research included discussions and interactions to gain a comprehensive understanding of the local population. Primary data was collected through household interviews based on questionnaires, Rapid Rural Appraisal (RRA), and the "walk in the woods" method.

2.3. Identify the species name

Complete the scientific name, the Vietnamese name (local name), and the ethnic language of the species. Conduct scientific name identification and list medicinal plants according to Brummit (1992) [5]. The list is ordered alphabetically: A, B, C, etc. Assessing the species diversity and life-forms of medicinal plants: According to the method of Nguyen Nghia Thin (2007) [6]. Assesses of parts used, distribution of medicinal plants according to the habitat and experience of using medicinal plants: based on interviews and surveys under the people's instruction. Assessment of threatened medicinal plants: Based on the Vietnam Red Data Book (2007) [7], the Red List of IUCN (2024) [8].

3. RESULT AND DISCUSSION

3.1. Vegetation types in BGM NP

The vegetation of BGM NP is dominantly lowland forest type with the highest peak level of about 738 m. Among the natural vegetation of BGM NP, there is a significant dichotomy between the evergreen forests on lowland types and other types of formations. The composition of the vegetation in BGM NP is identified by 2 major types: tropical evergreen broad-leaved deciduous and tropical evergreen broad-leaved semi-deciduous (Figure 2).

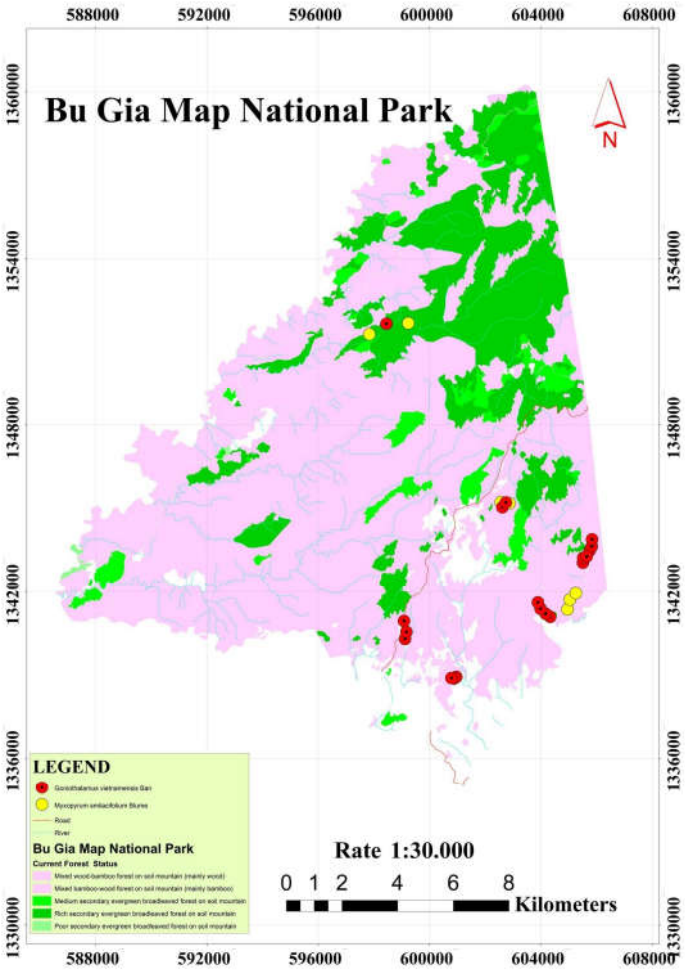

Figure 2. Forest vegetation types in BGM NP

Tropical evergreen broad-leaved deciduous forest: Dominant families are Myrtaceae, Lauraceae, Sapindaceae, Sterculiaceae, Anacardiaceae, Poaceae, etc... The forest structure is simple with three layers: The canopy layer is composed mainly of *Syzygium cochinchinensis* (Gagn.) Merr. & Perry Perry, *Syzygium oblatum* (Roxb.) A.M.& JM. Cowan Cowan, *Syzygium syzygioides* (Miq.) Amsh., *Syzygium zeylanicum* (L.) DC., *Litsea pierrei* Lec, *Litsea myristicaefolia* (Meissn.) Hook.f., *Phoebe pallida* Nees, *Dehaasia caesia* Bl., *Cinnamomum bejolghota* (Buch.-Ham.) Sweet., *Cinnamomum damhaensis* Kost., *Xerospermum noronhinum* (Bl.) Bl., *Nephelium melliferum* Gagn., *Paviesia annamensis* Pierre., *Mischocarpus sundaicus* Bl., *Schleichera oleosa* (Lour.) Oken, *Heritiera cochinchinensis* (Pierre) Kost., *Pterospermum diversifolium* Bl., *Scaphium macropodium* (Miq.) Beumee., *Sterculia cochinchinensis* Pierre, *Sterculia stigmarota* Pierre, *Helicteres angustifolia* var. *glaucoides* Pierre., *Canarium album* (Lour.) Raeusch. ex DC., *Mangifera minutifolia* Evr., *Semecarpus cochinchinensis* Engl., *Swintonia floribunda* Griff., *Spondias pinnata* (Koenig & L.f.) Kurz. Kurz., etc… The shrub layer is composed of many species, with as dominant ones *Goniothalamus vietnamensis* Ban, *Hedyotis microcephala* Pierre ex Pit., *Ixora chinensis* L., *Ixora heryi* Levl., *Mussaenda hoaensis* L, *Psychotria adenophylla* Wall., *Randia cochinchinensis* Merr., *Saprosma inaequilongum* Pierre. Expit., *Clerodendrum cochinchinensis* P. Dop, *Gmelina philippensis* Cham., *Callicarpa candicans* (Burmf.) Hochr., *Dracaena angustifolia* Roxb., *Dracaena elliptica* Thunb., etc... The herb layer is composed mainly of species are *Kaempferia angustifolia* Rosc., *Kaempferia galanga* L., *Zingiber cochinchinensis* Gagn., *Zingiber zerumbet* (L.) J.E. Sm., *Peliosanthes teta* Andr. ssp. *humilis* (Andr.) Jess., *Homalomena occulta* (Lour.) Schott., *Globba globulifera* Gagn., *Ardisia colorata* Roxb. and some other species.

Tropical evergreen broad-leaved semi-deciduous forest: Dominant families are Fagaceae, Dipterocarpaceae, Lythraceae, Myrtaceae, Sterculiaceae, etc... The forest structure is simple with three layers: The canopy layer is composed mainly of *Castanopsis pyriformis* (Seem.)Hick. & Cam.., *Castanopsis indica* (Roxb.) A.DC., *Lithocarpus annamensis* (Hick.&Cam.) Cam., *Lithocarpus microspermus* A. Cam., *Lithocarpus vestitus* (Hick. & Cam.) A. A. Cam., *Dipterocarpus alatus* Roxb., *Dipterocarpus dyeri* Pierre., *Dipterocarpus costatus* Gaertn., *Dipterocarpus turbinatus* Gaertn.f., *Hopea odorata* Roxb., *Hopea recopei* Pierre, *Shorea roxburghii* G.Don., *Shorea siamensis* Miq., *Vatica cinerea* King., etc... The shrub layer is composed of many species, with as dominant ones *Aporusa planchoniana* H.Baill. ex Muell., *Antidesma eberhardtii* Gagn., *Croton dongnaiensis* Pierre ex Gagn., *Mallotus lanceolatus* (Gagn.) A.-Shaw., *Phyllanthus elegans* Wall. ex Müll.Arg., *Gonocaryum lobbianum* (Miers.) Kurz., *Barringtonia marostachya* (Jack.) Kurz., ... The herb layer is composed mainly of species are *Arisaema balansae* Engler., *Pothos balansae* Engle., *Begonia harmandii* harmandii Gagn., *Ophiopogon peliosianthoides* W. & Arn., *Lycopodium phlegmaria* (L.) Roth., *Stephania venosa* (Bl.) Spreng., *Pavetta tonkinensis* Brem., *Costus speciosus* (Koenig) Smith. and some other species.

3.2. Floristic diversity in BGM NP

During our investigations, 786 vascular plant species belonging to 430 genera and 122 families were identified in BGM NP, as seen in Table 1. During this period, two species of plants were newly recorded in the literature devoted to the flora of Vietnam, named *Camellia bugiamapensis* Orel, Curry, Luu & Q. D. Nguyen (2014) [9], and *Curcuma leonidii* Skornick. The present study recorded two new species in BGM NP, named *Goniothalamus vietnamensis* Ban and *Myxopyrum smilacifolium* Blume.

Table 1. Summary on the floristics of BGM NP

No.	Taxa	Family	Genus	Species
1.	Polypodiophyta	4	8	18
2.	Pinophyta	2	1	1
3.	Magnoliophyta	126	421	767
	Total	**132**	**430**	**786**

Of the investigated 786 species, 18 endemic species in Vietnam were also included. Many plant species are endemic to Vietnam (the species were first recorded in Vietnam, and scientific names take the places of Vietnam) and endemic plants of local (the first records of species in BGM NP) such as *Camellia bugiamapensis* Orel, Curry, Luu & Q. D. Nguyen (2014) [9].

In BGM NP, useful plants of 786 species listed consist of 300 species (38.17%) of timber plants (Ti), 270 species (34.35%) of medicinal plants (Me), 62 species (7.89%) of edible plants (Ed), 74 species (9.41%) of ornamental plants (Or), 40 species (5.09%) of industrial plants (In), 28 species (3.56%) of fiber (Fi) and 12 species (1.53%) of unknown use plants (Un), respectively in Table 2.

Table 2. Usefulness of plant resources in BGM NP

Uses	Ti	Me	Ed	Or	In	Fi	Un
Species	300	270	62	74	40	28	12
%	38.17	34.35	7.89	9.41	5.09	3.56	1.53

The plant resources of BGM NP are valuable not only because of their great diversity but also because they have have significant environmental importance. As part of the flora of BGM NP, 18 species of 786 plant species were listed in the Red book of Viet Nam (2007) [7]. In the Red Book of IUCN (2024)[8], 1 species was classified as critically endangered (CR), 5 species were classified as endangered species (EN), 1 species was classified as vulnerable species (VU), and 2 species were classified as least concern (Table 3).

Table 3. List of endangered and rare plants in BGM NP

No.	Scientific name	VRDB (2007)	IUCN (2024)
1	*Afzelia xylocarpa* (Kurz) Craib.	EN	EN
2	*Anisoptera costata* Korth.	EN	
3	*Callicarpa bracteata* Dop.	CR	CR
4	*Dalbergia oliveri* Gamble ex Prain	EN	EN
5	*Dendrobium bilobulatum* Seidenf.	EN	
6	*Dendrobium chrysotoxum* Lindl.	EN	
7	*Dendrobium heterocarpum* Lindl.	EN	
8	*Dipterocarpus dyeri* Pierre.	VU	EN
9	*Drynaria bonii* Christ.	VU	
10	*Drynaria fortunei* (Kunze ex Mett.) J. Sm.	EN	
11	*Gnetum montanum* Margf.		LC
12	*Hopea pierrei* Hance.	EN	VU
13	*Hydnophytum formicarum* Jack.	EN	
14	*Mangifera minutifolia* Evr.	EN	EN
15	*Markhamia stipulata* (Wall.) Schum. var. *pierrei* (Dop.) Sant.	VU	
16	*Pterocarpus macrocarpus* Kurz.	EN	
17	*Sindora siamensis* Teysm. ex Miq.	EN	LC
18	*Zingiber monophyllum* Gagnep.		EN

Note:

VRDB - Vietnam Red Data Book (2007); IUCN - Global conservation status (2024); CR - Critically endangered; EN - Endangered; VU - Vulnerable; LC - Least Concern.

4. CONCLUSION

BGM NP is characterized by two major vegetation types of forest: tropical evergreen broad-leaved deciduous and tropical evergreen broad-leaved semi-deciduous.

The diversity of plant species in BGM NP was studied to provide baseline information for conservation and sustainable management processes that will prolong the life of the reserve. A total of 786 species of vascular plants are recorded in BGM NP, belonging to 430 genera and 132 families. The indicated species *Goniothalamus vietnamensis* Ban and *Myxopyrum smilacifolium* Blume are new record species for the flora in BGM NP.

The valuable plant resources were divided into seven groups as follows: timber plants with 300 species, medicinal plants with 270 species, edible plants with 62 species, ornamental plants with 74 species, industrial plants with 40 species, fiber plants with 28 species, and unknown use plants with 12 species.

Besides this survey, the forest areas were explored, concentrating on the useful plants and it was recorded that BGM NP has 18 species subject to global-level and national-level conservation.

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