CONSERVATION STATUS OF TREE SPECIES IN HIMCHARI NATIONAL PARK OF COX'S BAZAR, BANGLADESH

Hossen, S. and M. K. Hossain

Institute of Forestry and Environmental Sciences, University of Chittagong, Chittagong-4331, Bangladesh

Abstract

Himchari National Park (HNP) was declared as a Protected Area (PA) in 1980 under the section 23(II) of Bangladesh Wildlife Preservation Act 1974 of the Government of the People's Republic of Bangladesh. The total area of the HNP is about 1,729 ha (4,271.15 acres) under the jurisdiction of Cox's Bazar South Forest Division, Cox's Bazar district. Once the forest was very rich in flora and fauna, but many of the species have disappeared due to habitat destruction, over-exploitation, habitat fragmentation, fire hazard, encroachment, indiscriminate harvesting of tree species and Non-Timber Forest products. The study was conducted through extensive whole area survey and quadrat survey methods. A total of 117 tree species (having ≥ 5 cm dbh) belonging to 37 families was recorded from the HNP. Moraceae family possesses the highest species (14) followed by Mimosaceae (8), Euphorbiaceae (7), Myrtaceae (6) and 5 species each by Anacardiaceae, Caesalpiniaceae, Meliaceae and Verbenaceae. A total of 69 tree species (59%) was found as Least Concern (LC) representing maximum tree species among all the categories. Vulnerable, Endangered, Near Threatened and Critically Endangered tree species were represented by 16 species (14%), 4 species (3%), 2 species (2%) and 2 species (2%), respectively. It is necessary to take effective measures for the protection, sustainable management, proper utilization and conservation of tree species in an aim to conserve the forest genetic resources of the Himchari natural forests.

Key words: National park, conservation, native tree species, forest genetic resources, threatened.

INTRODUCTION

Bangladesh vegetation is a part of the Indo-Myanmar region, which is one of the ten global hot spot areas for biodiversity (Mittermeier *et al.* 1998) and rich biological diversity due to its unique geo-physical location (Hossain 2001, Barua *et al.* 2001, Chowdhury 2001, Nishat *et al.* 2002). The country has a rich biological heritage containing about 3,611species of angiosperms (Khan *et al*. 2007), of which 2,260 species are reported from Chittagong region alone (Heinig 1925, Khan *et al*. 2007). The diversity of trees is fundamental to total tropical forest biodiversity, because tree provides resources and habitats for almost all other forest species (Huston 1994, Canon *et al.* 1998, Hall and Swaine 1976). The extent of biodiversity loss in Bangladesh is not exactly known due to very poor data base and often based on scarce information (Hossain *et al*. 2004). According to Rahman *et al.* (2000) and Hossain (2001) the depletion of native species is also accelerating at an alarming rate through rapid loss and degradation of forests in Bangladesh.

Biodiversity is surveyed for the conservation and management of natural habitat (Pielou 1995). Conserving biodiversity in an ecosystem is important since it is not always evident which species and what quantities of those species are necessary to maintain the ecosystem normal functioning (Burton *et al.* 1992). Information on the composition of a forest is essential for its wise management in terms of economic value and regeneration potential (Wyatt-Smith 1987), but very scanty information is available on the composition of this forest. Inventorying or assessment is essential for better understanding of the levels, distribution and dynamics of tree species of a particular forest. Presence of systematic records of the flora of a forest and its regeneration will help in formulating any plan to preserve its biodiversity. To achieve good conservation and management of our natural resources, we should have gone to know the status and structure of biological resources long before, especially of the tree species (Hossain *et al.* 2017).

In Bangladesh, it is an urgent need to protect and manage the existing natural forests effectively for future generation (Hossain *et al.* 2017). Quantitative floristic inventories are fundamental to an understanding of the ecology of tropical forest and for developing national forest management strategies (Campbell *et al*. 1986, Reddy *et al.* 2011). The HNP, located in the southeastern region of Bangladesh comprising an area of 1,729 ha, was gazetted in 1980 and is very important due to its proximity to Cox's Bazar tourist city. Biodiversity assessment and evaluation is essential for taking effective conservation measures of this protected area immediately. Therefore, the study was envisaged to assess the diversity and conservation status of tree species in the Himchari National Park, Cox's Bazar district.

MATERIAL AND METHODS

Study area

The Himchari National Park is located ($21^0$35` to $21^0$44`N and $91^0$98` to $92^0$05` E) on the outskirts of Cox's Bazar city extending from Lighthouse para on the north to Rejhukhal on the south with an expansion of around 17 km^2. It consists of three unions, namely South Mithachari, Jhilongja and Khuniapalong union. In exercise of the power conferred by the section 23(II) of Bangladesh Wildlife Preservation Act 1974 the Government of the People's Republic of Bangladesh proclaimed the park measuring about 1729 ha (4,271.15 acres) to be a National Park on 15th February 1980. It was proclaimed as National Park under three forests block named Bhangamura Reserve Forest (872 ha), part of Chainda Reserve Forest (62 ha), and part of Jhilongja Protected Forest (795 ha). These three blocks at present cover four forest beats, namely Kolatoli, Chainda, Jhilongja and Link Road. The total landscape area of the Protected Forest (PF) is about 10,849 ha of which 1,729 ha core zone, 5,247 ha buffer zone and 3,873 ha private land. It is under the jurisdiction of Cox's Bazar South Forest Division within Cox's Bazar district (Fig. 1).

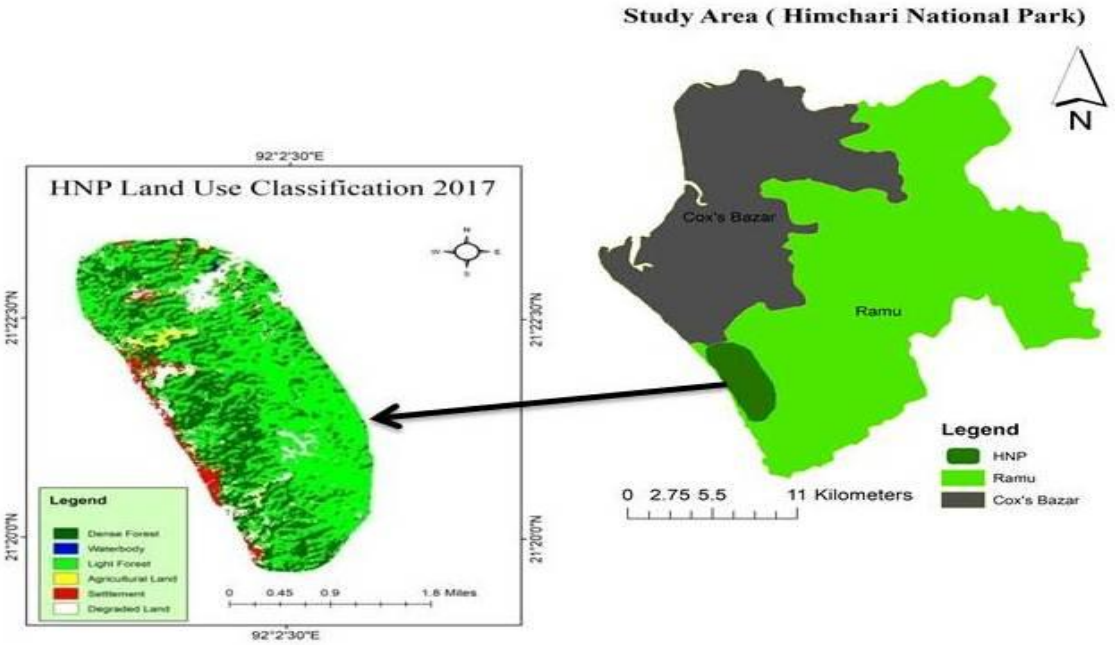

Fig.1. Map of Himchari National Park (Core and buffer Area)

Reconnaissance survey

The researchers visited the HNP to have an idea of tree species composition of the whole forest prior

to selection of sampling procedure. A thorough field visit was conducted in the whole forest at the onset of the field work. A formal discussion was held with the concerned forest officials and some experienced forest villagers. A base map of the area was collected from the Forest Department. Detail information about the geography, land uses, plantations and present management systems were also collected from respective authority. Two transact walks (one from North to South and the other from East to West) across the forest were made with the help of the field assistants to familiarizing with the vegetation community, designing sampling design, planning accessibility and field works and to get an idea about the vegetation in the study area.

Tree species status, composition, diversity and conservation status

The study was conducted from January 2017 to May 2018. The composition and diversity of the tree species in the HNP were assessed through stratified random quadrat survey applied separately for tree species following Roy *et al*. (1993) and Rahman and Hossain (2002). The whole HNP was divided into four broad areas (blocks) considering beat area, namely Chainda, Jhilanga, Kalatali and Link Road. Total fifty one (51) plots in four experimental locations were taken by using simple random sampling. The number of quadrats was fixed considering the sample plot size (20 m x 20 m) to have a sampling intensity of more than 0.231% for quantitative and qualitative measurement of the tree species throughout the sites. All trees having ≥ 5 cm dbh were identified, counted by individuals and measured in the quadrats.

RESULTS AND DISCUSSION

The conservation status of all the 117 tree species of the HNP was determined following the Encyclopedia of Flora and Fauna of Bangladesh (Ahmed *et al*. 2008). All the recorded trees were represented by 10 conservation categories, viz. Conservation Dependent (CD), Data Deficient (DD), Least Concern (LC), Not Evaluated (NE), Not Evaluated but seems to be rare (NE but seems rare), Near Threatened (NT), Vulnerable (VU), Lower Risk (LR), Endangered (EN) and Critically Endangered (CR). Out of a total of 117 species, 69 species (59%) was found as Least Concern (LC) which represents maximum tree species among all the categories (Table 1). Whatsoever, Vulnerable, Endangered, Near Threatened and Critically Endangered tree species were represented by 16 species (14%), 4 species (3%), 2 species (2%) and 2 species (2%), respectively (Table 1 and Fig. 2).

Table 1. Tree species composition and conservation status of the Himchari National Park

Family	Species No	Local Name	Scientific Name	Conservation Status
Anacardiaceae	1	Jialbhadi	*Lannea coromandelica* (Houtt.) Merr.	LC[1]
	2	Aam	*Mangifera indica* L.	LC[1]
	3	Uri Aam	*Mangifera sylvatica* Roxb.	CR[2]
	4	Civit	*Swintonia floribunda* Griff.	VU[1]
	5	Kaju Badam	*Anacardium occidentale* L.	LC[1]
Annonaceae	6	Debdaru	*Polyalthia longifolia* (Sonn.)	NE but seems rare[1]
	7	Ata	*Annona reticulata* L.	LC[1]
Apocynaceae	8	Chatim	*Alstonia scholaris* (L.)	LC[1]
	9	Kuruch	*Holarrhena antidysenterica* (L.) Wall.ex Decne	LC[1]
Arecaceae	10	Tal	*Borassus flabellifer* L.	LC[1]
	11	Narikel	*Cocos nucifera* L.	LC[1]
	12	Supari	*Areca catechu* L.	LC[1]
	13	Oil palm	*Elaeis guineensis* Jacq.	NE[1]

Bignoniaceae	14	Koida arsol	*Stereospermum suaveolens* (Roxb.)	LR[1]
	15	Dharmara	*Stereospermum colais* (Buch.-Ham. ex Dillw)	NE but seems rare[1]
	16	Bon Tula	*Bombax insigne* Wall.	NE but seems rare[1]
Burseraceae	17	Gutgotiya	*Protium serratum (*Wall. ex. Colebr.) Engl.	VU[2]
	18	Sil Bhadi	*Garuga pinnata* Roxb.	LC[1]
	19	Dhup	*Canarium resiniferum* Brace ex king	CR[2]
Caesalpiniaceae	20	Krishnachura	*Delonix regia* Rafin.	LC[1]
	21	Tentul	*Tamarindus indica* L.	LC[1]
	22	Radhachura	*Caesalpinia pulcherrima* (L.)	LC[1]
	23	Sonalu	*Cassia fistula* L.	LC[1]
	24	Minjiri	*Senna siamea* (Lamk.)	LC[1]
Casuarinaceae	25	Jhau	*Casuarina equisetifolia* Forst.	LC[1]
Clusiaceae	26	Kao	*Garcinia cowa* Roxb. ex DC.	VU[2]
	27	Badujja gola	*Garcinia lanceaefolia* Roxb.	NE[1]
	28	Nagesswar	*Mesua ferrea* L.	LC[1]
Combretaceae	29	Arjun	*Terminalia arjuna* (Roxb. ex Dc.) Wight & Am.	VU[1]
	30	Kath Badam	*Terminalia catappa* L.	LC[1]
	31	Haritaki	*Terminalia chebula* Retz.	VU[1]
	32	Bohera	*Terminalia bellirica* (Gaertin.) Roxb.	LC[1]
Dilleniaceae	33	Hargeza	*Dillenia scabrella* Roxb. ex Wall	VU[2]
Dipterocarpaceae	34	Telia Garjan	*Dipterocarpus turbinatus* Gaertin.	LC[1]
	35	Sal	*Shorea robusta* Roxb. ex Gaertin. f.	LC[1]
	36	Telsur	*Hopea odorata* Roxb.	LC[1]
	37	Boilam	*Anisoptera scaphula* (Roxb.)Pierre	CD[1]
Ebenaceae	38	Bongab	*Diospyros montana* Roxb.	LC[1]
Elaeocarpaceae	39	Jalpai	*Elaeocarpus tectorius* (Lour.)Poir	EN[2]
	40	Titpai	*Elaeocarpus floribundus* Blume	EN[2]
Euphorbiaceae	41	Amloki	*Phyllanthus emblica* L.	LC[1]
	42	Bura	*Macaranga denticulata* (Bl.) Muell.-Arg.	LC[1]
	43	Moricha	*Suregada multiflora* (A. Juss.) Bail.	NE[1]
	44	Castoma	*Aporosa wallichii* Hook.f.	NE[1]
	45	Sindur	*Mallotus philippensis* (Lamk.). Muell.-Arg.	CD[1]
	46	Nunia Bura	*Macaranga indica* Wight	VU[1]
	47	Chitki	*Phyllanthus reticulatus* Poir.	LC[1]
Fabaceae	48	Palash	*Butea monosperma* (Lamk.) Taub.	LC[1]
	49	Mandar	*Erythrina variegata* L.	LC[1]
	50	Sisso	*Dalbergia sissoo* Roxb.	LC[1]
Fagaceae	51	Kali Batna	*Lithocarpus elegans var.elegans* (Blume) Hatus.ex Soepad	EN[2]
	52	Dholi Batna	*Lithocarpus acuminata* (Roxb.)Rehder	EN[1]
	53	Batna	*Lithocarpus polystachya* (Wall. ex A.DC.) Rehder	NT[1]
Juglandaceae	54	Jhumka Bhadi	*Engelhardtia spicata* Leschen ex Blume	VU[2]
Lauraceae	55	Menda	*Litsea glutinosa* (Lour.) C.B. Robinson	LC[1]
	56	Manda	*Litsea monopetala* (Roxb.) Pers.	NE[1]
	57	Modanmosta	*Actinodaphne angustifolia* Nees	NE[1]

	58	Tez-Bohu	*Cinnamomum iners* Reinw. Ex Blume	VU[2]
Lythraceae	59	Jarul	*Lagerstroemia speciosa* (L.) Pers.	LC[1]
Magnoliaceae	60	Champa	*Michelia champaca* L.	VU[2]
Meliaceae	61	Chickrassi	*Chukrasia tabularis* A. Juss.	VU[2]
	62	Mahagoni	*Swietenia mahagoni* Jacq.	LC[1]
	63	Neem	*Azadirachta indica* A. Juss	LC[1]
	64	Toon	*Toona ciliata* Roem.	CD[1]
	65	Pitraj, Royna	*Aphanamixis polystachya* (Wall.) Parker.	VU[2]
Mimosaceae	66	Sada Koroi	*Albizia procera* (Roxb.) Benth.	LC[1]
	67	Akashmoni	*Acacia auriculiformis* A. Cunn. ex Benth. & Hook.	LC[1]
	68	Mangium	*Acacia mangium* Willd.	LC[1]
	69	Kala Koroi	*Albizia lebbeck* (L.) Benth. & Hook.	LC[1]
	70	Raintree	*Samanea saman* (Jacq.) Merr.	LC[1]
	71	Loha Kath	*Xylia xylocarpa* Roxb. Taub.	LC[1]
	72	Ipil Ipil	*Leucaena leucocephala* (Lamk.) de Wit	LC[1]
	73	Chakua Koroi	*Albizia chinensis* (Osb.) Merr.	LC[1]
Moraceae	74	Dumur	*Ficus hispida* L.f.	LC[1]
	75	Boro Dumur	*Ficus lanceolata* Buch.-Ham. ex Roxb.	VU[1]
	76	Kanthal	*Artocarpus heterophyllus* Lamk.	LC[1]
	77	Lal Dumur	*Ficus auriculata* Lour.	LC[1]
	78	Bot	*Ficus benghalensis* L.	LC[1]
	79	Chapalish	*Artocarpus chama* Buch.-Ham.	NE but seems rare[1]
	80	Jigbot	*Ficus lamponga* Miq.	LC[1]
	81	Borta	*Artocarpus lacucha* Buch.-Ham	LC[1]
	82	Jogya Dumur	*Ficus racemosa* L.	LC[1]
	83	Jiribot	*Ficus benjamina* L.	LC[1]
	84	Puti Bot	*Ficus microcarpa* L.f.	NE but seems rare[1]
	85	Asswat	*Ficus religiosa* L.	LC[1]
	86	Dol Dumur	*Ficus conglobate* King	NE[1]
	87	Churkigola	*Ficus semicordata* Buch.-Ham. ex Smith	NE[1]
Myrsinceae	88	Maesa	*Maesa indica (*Roxb.) A. DC.	CD[1]
Myrtaceae	89	Peyara	*Psidium guajava* L.	LC[1]
	90	Puti Jam	*Syzygium fruticosum* DC.	DD[1]
	91	Dhaki Jam	*Syzygium firmum* Thw.	LC[1]
	92	Kalo Jam	*Syzygium cumini* (L.) Skeels	LC[1]
	93	Eucalyptus	*Eucalyptus camaldulensis* Dehnhardt.	NE[1]
	94	Noli Jam	*Syzygium claviflorum* (Roxb.) A.M. Cowan & J.M. Cowan	LC[1]
Oxalidaceae	95	Kamranga	*Averrhoa carambola* L.	LC[1]
	96	Belumbo	*Averrhoa bilimbi* L.	LC[1]
Rhamnaceae	97	Boroi	*Ziziphus mauritiana* Lamk.	LC[1]
Rubiaceae	98	Kadam	*Neolamarckia cadamba* (Roxb.) Bosser	LC[1]
	99	Dakuram	*Mitragyna parvifolia* (Roxb.) Korth	CD[1]
	100	Kom	*Neonauclea sessilifolia (*Roxb.) Merr.	CD[1]
Rutaceae	101	Jambura	*Citrus maxima* (Burm.) Merr.	LC[1]
	102	Bonjamir	*Acronychia pedunculata* (L.) Miq.	NE[1]
	103	Kamini	*Murraya paniculata* (L.) Jack	LC[1]
Sabiaceae	104	Utailla	*Meliosma simplicifolia* (Roxb.) Walp.	NT[1]
Sapindaceae	105	Harina	*Lepisanthes rubiginosa* (Roxb.) Leenh	LC[1]
Sapotaceae	106	Bokul	*Mimusops elengi* L.	LC[1]
Sterculiaceae	107	Mostali	*Sterculia guttata* Roxb.	LC[1]

	108	Udal	*Sterculia villosa* Roxb. ex Smith	LC[1]
Thymeliaceae	109	Agar	*Aquilaria agallocha* Roxb.	LC[1]
Tiliaceae	110	Moos	*Brownlowia elata* Roxb.	VU[1]
	111	Assargola	*Grewia nervosa* (Lour.) Panigrahi	LC[1]
	112	Naricha	*Grweia serrulata* DC.	LC[1]
Verbenaceae	113	Gamar	*Gmelina arborea* Roxb.	LC[1]
	114	Segun	*Tectona grandis* L.f.	LC[1]
	115	Bormala	*Callicarpa arborea* Roxb.	NE but seems rare[1]
	116	Goda	*Vitex peduncularis* Wall. ex Schauer in A.DC.	VU[2]
	117	Horina arsol	*Vitex pinnata* L.	VU[2]

(Sources: 1- Ahmed *et al*. (2008); 2- Field Observation/Experience)

The tree species recorded were represented in different conservation categories, viz. Conservation Dependent (CD), Data Deficient (DD), Least Concern (LC), Not Evaluated (NE), Lower Risk (LR), Not Evaluated but seems to be rare (NE but seems rare), Near Threatened (NT), Vulnerable (VU), Endangered (EN) and Critically Endangered (CR) (Fig. 2).

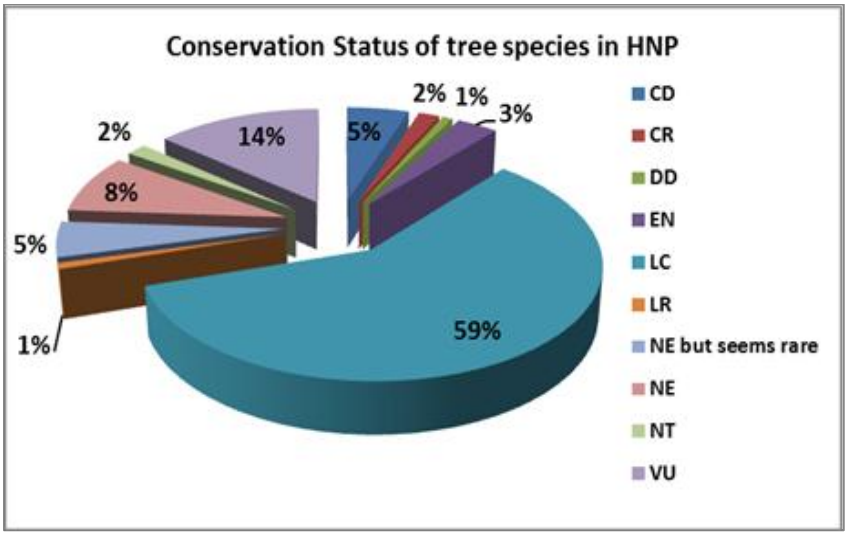

Fig. 2. Percentage of the recorded tree species under different conservation categories.

[*CD = Conservation Dependent, DD = Data Deficient, LC = Least Concern, NE = Not Evaluated, NE but seems rare =Not Evaluated but seems to be rare, NT = Near Threatened, VU = Vulnerable, LR = Lower Risk, EN =Endangered and CR = Critically Endangered*.]

A total of 88 tree species belonging to 64 genera and 37 families was recorded from the quadrats. On the other hand, 117 tree species belonging to 87 genera and 37 families recorded from both the quadrat and transacts study (Table1). Moraceae family possesses the highest species (14) followed by Mimosaceae (8), Euphorbiaceae (7), Myrtaceae (6), and having five species each by Anacardiaceae, Caesalpiniaceae, Meliaceae and Verbenaceae (Fig. 3).

The present study revealed the Himchari National Park as a diverse natural forest being represented by 117 tree species. The tree composition of the HNP (117 tree species under 87 genera and 37 families) is quite greater than 85 tree species reported from the Bamu reserve forest of Cox's Bazar (Hossain *et al.* 2004); 92 tree species from the Chunati Wildlife Sanctuary (Rahman and Hossain 2002); 102 tree species from the Boroitoli forest (Rahman *et al.* 2004); 62 tree species from the Tankawati Natural forest (Motaleb and Hossain 2011); 77 tree species from the Dudhpukuria Natural forest (Hossain *et al.*

2012). But, it is quite lower in comparison to the 153-tree species reported from the tropical forests of Eastern Ghats, India (Reddy *et al.* 2011); 162 tree species from the primary forests of Garo Hills, India (Kumar *et al.* 2006).

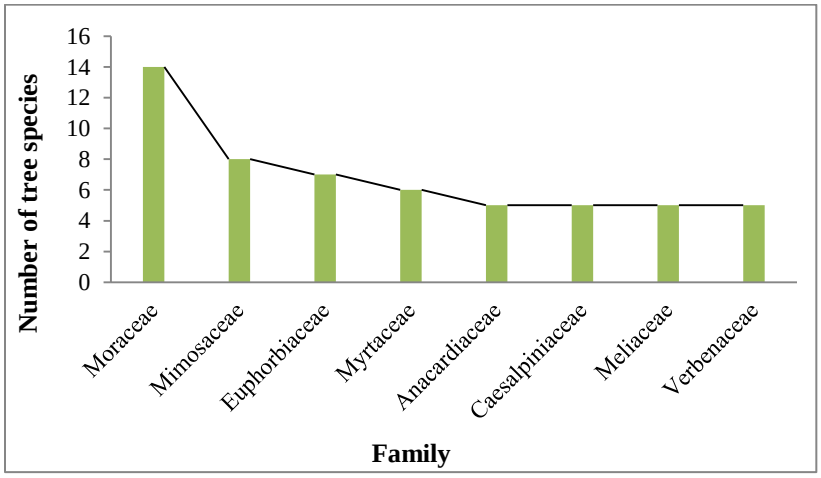

Fig. 3. Top eight families at the Himchari National Park with maximum tree species.

The extraction of all kinds of forest products and trespassing, that disturbs the natural habitat, are prohibited in the HNP. Community Forest Workers (CFW) are also helping the Forest Department (FD) personnel in patrolling forest resources from all illegal activities and extraction. As a result, the surrounding people who are generally used to cut and collect timber, fuel wood, bamboos, fence posts, agricultural implements and house posts from the forests are not allowed to do the same by their own community. However, the existing threats in conserving biodiversity of the HNP are also immense.

The main issues in the loss of tree diversity in the HNP are degradation of habitat, e.g. change in land use, conversion of forest lands to agricultural lands, haphazard introduction and priority of alien invasive species, expansion of road networks and other anthropogenic activities that have damage most of the forest resources of the HNP. Over exploitation of resources, e.g. collection of resources, fire hazard, illicit felling, encroachment, indiscriminate harvesting of tree species and Non-Timber Forest products exerts a significant negative impact on the biodiversity of the HNP. The process of conserving tree species can be divided into three phases: i) identification-determining which species are in danger of extinction, ii) protection-determining and implementing the short term measures necessary to halt species from extinction, iii) recovery-determining and implementing the long-term measures necessary to rebuild the population of the species to the point at which it is no longer in danger of extinction.

Although some natural regeneration was coming up, the cutting of seedlings and saplings particularly by fuel wood collectors and betel leaf cultivators impose threats on new recruitments. Many local people living in and around the national park area are dependent on the forests for their livelihood and daily necessary goods. Conflicts regarding land need to be resolved to protect trees and natural regeneration. At the same time periodic monitoring is needed to identify what changes are taking place on the composition, structure and diversity of tree species. Finally, it can be noted that the condition of the forest is poor, but still there is some hope as shown by the rich regeneration and potential of rehabilitation in the remnant natural forest. If it is possible to protect the National Park in the current state with effective measures of diverting the forest dependent people towards non forest related livelihood alternatives or reducing dependency on the forest, there is a greater possibility of this forest to develop into a better quality forest ecosystem with native tree species.

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