

Bridging Livelihoods and Forest Conservation in Protected Areas: Exploring the role and scope of non-timber forest products

Field experience from Satchari National Park, Habiganj, Bangladesh

A dissertation paper submitted for the partial fulfillment of B.Sc. (Honors) in Forestry

Submitted by
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May, 2007

**Bridging Livelihoods and Forest Conservation in Protected Areas:
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Research Paper

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Certification

This is to certify that this paper entitled, '**Bridging Livelihoods and Forest Conservation in Protected Areas: Exploring the role and scope for non-timber forest products**' is an original paper prepared by Registration no. **2001631031** (Session 2001- 02) based on his field study at **Satchari National Park**, Habiganj, Bangladesh for the partial fulfillment of his B.Sc. (Hons.) in Forestry degree at Shahjalal University of Science and Technology, Sylhet, Bangladesh. He has completed the work under my supervision and I do hereby approve the style and contents of this paper.

A.Z.M. Manzoor Rashid
Assistant Professor
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Declaration

This is to declare that, it is an original paper prepared by myself based on my one year field investigations at **Satchari National Park**, Habiganj, Bangladesh; to submit as a requirement for the partial fulfillment of **B. Sc. (Hons.)** degree in the Department of Forestry at School of Agriculture and Mineral Sciences of Shahjalal University of Science and Technology, Sylhet, Bangladesh. This paper has not been submitted or considered elsewhere for achieve any other degrees. I also confirmed that, the author of this paper is fully responsible for its contents and views expressed in this paper do not necessarily reflected those of Department of Forestry of SUST or of the other funding. Finally, I authorize the reproduction or citation¹ of the publication for educational or other non-commercial purpose provided the source is fully acknowledged.



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Author
May, 2007

Dedication

Dedicated to my beloved parents
and lovely brother, Munim;
whose love and patience sustains me
to conduct the work.

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Acronyms

AIG	-	Alternating / Alternative Income Generation
CBD	-	Convention on Biological Diversity
CBNRM	-	Community Based Natural Resource Management
FAO	-	Food and Agricultural Organization of the United Nations
FBSSE	-	Forest Based Small Scale Enterprises
FD	-	Forest Department
HHs	-	Households
IGA	-	Income Generating Activities
IUCN	-	International Union for Conservation of Nature and Natural Resources (The World Conservation Union)
KI	-	Key informant
MPs	-	Medicinal Plants
NBSAP	-	National Biodiversity Conservation Strategy and Action Plan
NGO	-	Non Government Organization
NP	-	National park
NTFP	-	Non Timber Forest Products
PA's	-	Protected Areas
SNP	-	Satchari National Park
Tk.	-	Taka (Bangladeshi currency)
RF	-	Reserved Forest

Abstract

Literally, within a protected area everything is prohibited unless permitted. However this rule is rarely maintained in most developing countries like Bangladesh, since people's living in and around the forests of this region historically maintained their livelihoods depending on various forest products, particularly through non-timber forest products. The present paper tries to explore the role of non-timber forest products in sustaining livelihoods living in and around a protected area named Satchari National Park and analyzing local people's perceptions on forest conservation and non-timber forest products exploitation. An exploratory study was conducted for a one year period in between January, 2006 to January, 2007. During the study a total of 97 households were interviewed through a stratified random sampling exercise. Study reveals that, NTFPs play a crucial role in local livelihoods of the area. During the course of study, a total of 14 major NTFP were identified which were found to be collected by the people's both from the reserved forest and the national park. From the study it reveals that, 27% households of the area received at least some cash benefit from the collection, processing and selling of NTFPs, which constituted primary occupation for about 18% of the households. It was also found that, people's dependency on nearby forest for various NTFPs varies with their socio-economic condition as well as with their distance from the forest. It was also found that although the NTFP collectors of the area hold very poor perceptions on sustainable forest resource exploitation but they have very clearer concept about NTFP collection over forest conservation and they thought NTFP collection suitable or less destructive for forest conservation. Data were also gathered regarding present threats and potentials of the community based management of the protected area in Satchari. Finally, the study concludes that, providing local people the legal rights for extraction of NTFPs from the park by fixing an allowable or sustainable limit of resource collection for each forest dependent households may bring some positive result both for local livelihoods and the national park.

Chapter | | |----------| | 1 | |----------|

Introduction

Introduction

Study context

Forests cover almost 25% of the world's land and are critical in meeting human needs for water, food, shelter, medicine, fuelwood, fodder and timber. They also provide a wide range of environmental services which mainly include biodiversity conservation, watershed protection, protection of soil, mitigation of global climate change etc (Hirakuri, 2003; Landell-Mills & Porras, 2002). In last several decades, deforestation and biodiversity loss became a common event throughout the globe. This phenomenon is much more frequent in developing countries like Bangladesh. During the last two or three decades the forest cover of the country decreased from nearly 20% to 9%. Of late as a signatory of various regional and international conventions, treaties and protocol government has taken various initiatives to address the situation and to ensure the conservation of remaining floral and faunal diversity (Brown and Durst, 2003). Protected Area is one amongst them which introduced mainly to conserve biodiversity in its natural context.

Ideally, protected areas should help to conserve the forest and biodiversity. Again, peoples living in or near forests traditionally rely on various forest products from the forests designated as PA for centuries. Declaration of protected area however, imposes some restriction on the access and utilization of forest products to local livelihoods that they have enjoyed customarily. Therefore conflicts occur between PA managers and local indigenous and traditional people. Such misunderstanding is one the most influential factors of poor and inefficient management of protected areas.

In last days, non-timber forest products attracted the attention of practitioners, researchers, educators and policy makers amongst various forest products; due to their great potentiality for poverty alleviation (Ruiz Pérez, 2005; Belcher *et. al.* 2005; Arnold & Ruiz Pérez, 1999). They also create opportunities to development of forest based small scale enterprises (FBSSE) and it is widely recognized that, increasing their commercial value will contribute to an increased appreciation of forests, therefore contributing both poverty alleviation and forest conservation (Clay, 1992). Again exploitation of NTFPs is less ecologically destructive than timber harvesting and therefore provides a sounder basis for sustainable forest management (Peters *et. al.* 1989).

In Bangladesh declaration PA for biodiversity conservation is rather a new concept and till now the country has only eighteen notified protected areas representing a tiny 11.08 percent of Bangladesh forests (Mukul, 2007). Again, in Bangladesh, by definition a protected area is an area where everything is prohibited unless permitted. Such definition implies that the forest is practically free from all public activities (i.e., all types of commercial harvesting of timber and non- timber forest products). However due to poor socio-economic background such definition turns to a hypothetical conception and traditionally people living in or near Bangladesh protected areas exploit various forest resources from the park for their subsistence. Due to recent consciousness on protected areas peoples are now not limitedly allowed for such practice which eventually leads misapprehension among PA managers and local inhabitants.

Again, non-timber forest products reside in the livelihood of people living in most forest dominant areas in Bangladesh and play a vital role in their subsistence as well as in income. According to a previous statistics; the collection, processing and selling of NTFPs provide major employment opportunities to a rural people of about 300,000 and contribute approximately Tk.1.3 billion annually to the Bangladesh economy (GOB, 1993; Basit, 1995). In the present study it was assumed that, non- timber forest products still conspicuously contributing to the livelihoods of people living in and adjacent the protected areas of the country and hold a great potentiality for improved livelihoods and enhanced conservation in PA management, if exploited properly without hampering the ecology. To check the assumption I have conducted my study in Satchari National Park; one of the newest PA of the country and one amongst the four protected area situated in north-eastern part of the country. Data regarding people's dependency on protected area, various NTFPs and their source (i.e., PA or RF), perception of people on the impacts of harvesting of various NTFP and their conservation values were collected.

Rationale of the study

As said earlier that the new dimension of biodiversity conservation and natural resources management is getting momentum because of their efficacy at least at the initial stage of implementation. The following specific problems and questions associated with protected area management especially in regard of HHs non-timer forest products dependency and their conservation potentials were kept in mind when the study was conducted.

The objectives were:

1. To explore the role and importance of non-timber forest products in sustaining rural livelihoods even after declaration of Satchari National Park as a protected area.
2. To understand the potentials of NTFPs in forest conservation in PA through assessing local perception and beliefs regarding NTFP collection.
3. To identify the threats and challenges of national park management.
4. To realize the future of co-management in the area; especially in PAs.
5. To draw some recommendation for the conservation and better management of national park as well as for securing the well being of forest relied livelihoods living in and around the national park.

Chapter | | |----------| | 2 | |----------|

Literature Review

Literature Review

Forests and rural livelihoods

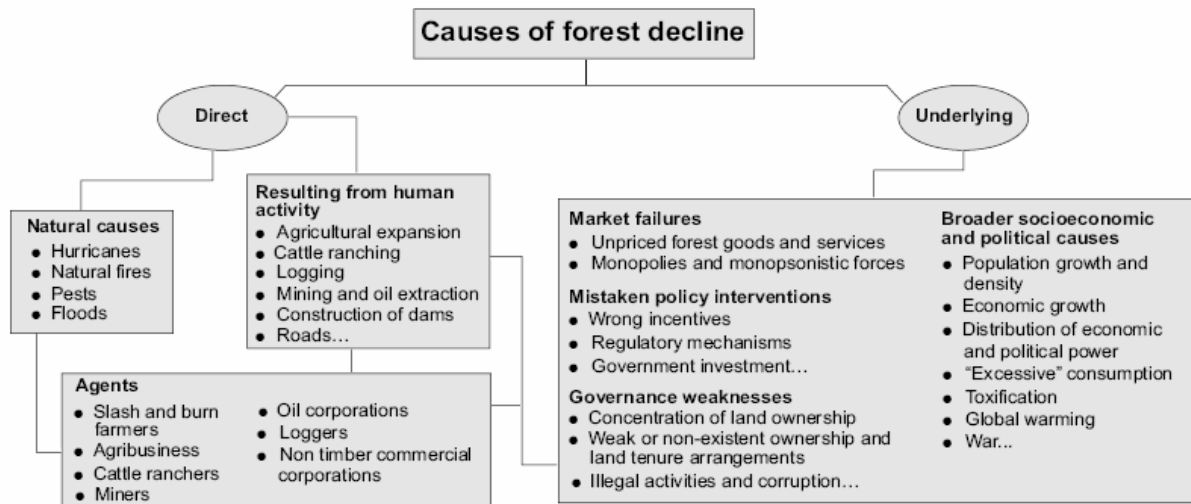
Forests are among the most diverse and widespread ecosystems on earth and millions of people living in most tropical countries derive a significant part of their livelihoods from various forest products for centuries. These products also play a vital role to the livelihoods of people living in or adjacent to forests. According to the World Bank (2002), more than 1.6 billion people throughout the world relying heavily on forests for their livelihoods and some 350 million people depends only on forest both for their subsistence and income. Over two billion people, a third of the world's population, use biomass fuels, mainly firewood, to cook and heat their homes, and billions rely on traditional medicines for their ailment harvested from the forests. In some 60 developing countries, hunting and fishing on forested land supplies a significant amount of the protein requirements' (Mery *et. al.* 2005). Over the last two decades, the significant role of various forest products for household's food and livelihood security is increasingly recognized and the main emphasis was given on the Non-Timber Forest Products (NTFPs). In fact, for a large number of peoples of the world, NTFPs are more important forest resources than timber. Some estimates suggests that, part of South East Asia's tropical forest promote up to 50 US\$ per month per hectare to local people from exploiting forest resources, without considering the commercial timber values (Sedjo, 2002; Caldecott, 1988).

Deforestation and diminishing global biodiversity

According to the World Resources Institute (WRI), the world has lost about half of its forest cover from 62 million km² to 33 million km² (Sundrlin *et. al.* 2005; Contreras-Hermosilla, 2000a; 2000b; Kaimowitz and Angelson, 1998). The magnitude of global biodiversity situation is undoubtedly threatened million times higher than any time of its history. Over 15 million ha of natural forest are lost in the tropic every year which is more than the area of Nepal or Arkansas in the United States (FAO, 2006), again the present rate of species extinction is estimated to be between 1000 and 10,000 times the historical (pre 10,000 years BP) rate (Wilson, 1988). According to '2004 IUCN Red List' currently 15,589 species are threatened with extinction; 12% of world's known birds, 23% of mammals, and 32% of amphibians are also threatened (Baillie *et. al.* 2004). Most recent form of deforestation takes

place in developing countries, particularly in tropical areas. Deforestation and forest degradation directly threatens the life and living of 400 million people out of which 50 million are forest indigenous people- who depend on forests for subsistence. The underlying causes of forest decline are diverse and include a variety of reasons (Figure 2.1).

Figure 2.1. The underlying causes of deforestation



Interestingly, most of the world’s biodiversity have been hold by majority of the economically poorest countries (Koziell, 2001; Blockhus *et. al.* 1992) where the people depend most immediately upon local ecosystems for their livelihoods are somehow responsible for the degradation of biodiversity and will mostly affected by the consequence of this biodiversity loss (CBD, 2006 and 2007). Biodiversity conservation is however essential to improve and alter this crisis.

Biodiversity conservation through environmental sustainability (Goal 7) is one of the prime objectives of Millennium Development Goals (Box 2.1) which strongly linked with its first objective, i.e., eradication of poverty and hunger. To date, various international treaties and conventions with intergovernmental bodies have been formed to work on biodiversity issues in national, regional and international level.

BOX 2.1. Millennium Development Goals
<p>GOAL 1: Eradicate extreme poverty and hunger GOAL 2: Achieve universal primary education GOAL 3: Promote gender equality and empower women GOAL 4: Reduce child mortality GOAL 5: Improve maternal health GOAL 6: Combat HIV/AIDS, malaria and other diseases GOAL 7: Ensure environmental sustainability GOAL 8: Develop a Global Partnership for Development</p>
<p>Source: IPGRI (2006)</p>

Protected Areas: A means of biodiversity conservation

Protected areas have long been the most effective and widespread measure for conserving forests and biodiversity (Lewis, 1996). According to IUCN (1994) a protected area (PA) is;

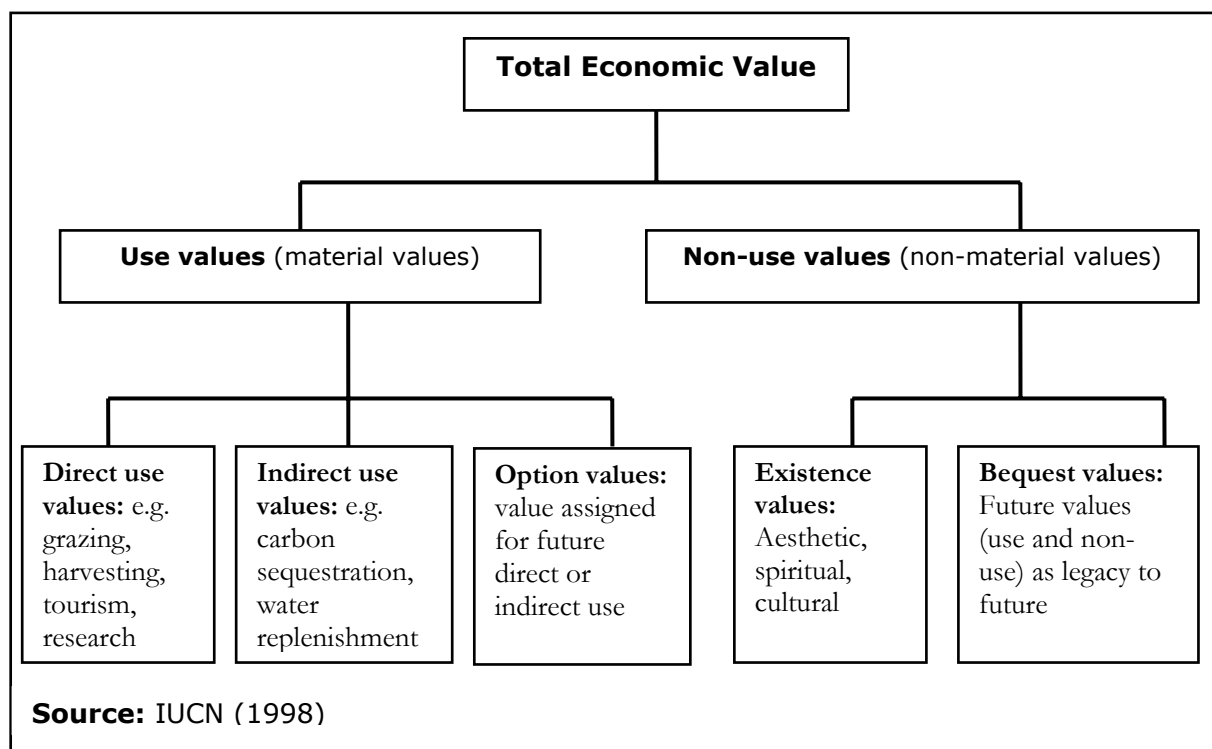
‘areas especially dedicated to the protection and maintenance of biological diversity and associated cultural resources, and managed through legal or other effective means’.

They cover various situations, ranging from managed resources areas, protected watersheds, national parks and strictly protected reserves, to sacred forest groves. Again, Convention on Biological Diversity (CBD) has defines protected area as,

‘a geographically defined area which is designated or regulated and managed to achieve specific conservation objectives’ (Mulongoy and Chape, 2004).

Globally the number of protected areas (PAs) has been increasing significantly over the last few decades due to their enormous material and non-material values (Scherr *et. al.* 2004) (Figure 2.2) Already around 12% of all forests are officially protected for conservation values under different IUCN management categories (Box 2.2) - 7 percent in IUCN categories I to IV, and 4 percent in categories V and VI (Chape *et. al.* 2003; Bull, 2003; Tuxill *et. al.* 2001).

Figure 2.2. The economics of PA



BOX 2.2. IUCN Protected Area Management Categories

Category Ia: Nature reserve

Strict nature reserve/wilderness protection area managed mainly for science or wilderness protection – an area of land and/or sea possessing some outstanding or representative ecosystems, geological or physical features and/or species, available primarily for scientific research and/or environmental monitoring.

Category Ib: Wilderness area

Protected area managed mainly for wilderness protection – large area of unmodified land or sea, retaining its natural characteristics and influence, without permanent or significant habitation, which is protected and managed to preserve its natural condition.

Category II: National park

Protected area managed mainly for ecosystem protection and recreation – natural area of land and/or sea designated to (a) protect the ecological integrity of one or more ecosystems for present and future generations, (b) exclude exploitation or occupation inimical to the purposes of designation of the area, and (c) provide a foundation for spiritual, scientific, educational, recreational and visitor opportunities, all of which must be environmentally and culturally compatible.

Category III: Natural monument

Protected area managed mainly for conservation of specific natural features – area containing specific natural or natural/cultural feature(s) of outstanding or unique value because of their inherent rarity, representativeness, aesthetic qualities or cultural significance.

Category IV: Habitat/species management area

Protected area managed mainly for conservation through management intervention – area of land and/or sea subject to active intervention for management purposes as to ensure the maintenance of habitats to meet the requirements of specific species.

Category V: Protected landscape/seascape

Protected area managed mainly for landscape/seascape conservation and recreation area of land, with coast and sea as appropriate, where the interaction of people and nature over time has produced an area of distinct character with significant aesthetic, ecological and/or cultural value, and often with high biological diversity. Safeguarding the integrity of this traditional interaction is vital to the protection, maintenance and evolution of such an area.

Category VI: Managed resource protected area

Protected area managed mainly for the sustainable use of natural ecosystems – an area containing predominantly unmodified natural systems, managed to ensure long-term protection and maintenance of biological diversity, while providing at the same time a sustainable flow of natural products and services to meet community needs.

Source: IUCN, 1994

Global threats to Protected Areas

Although during past few decades a remarkable amount of forest all over the world has brought and protected under different IUCN management categories but nearly half of these legally PAs are heavily used (usually illegally) for agriculture and forest product extraction (McNeely, 2005; McNeely and Scherr, 2003). The underlying causes of the threats to protected area are however difficult to separate from the underlying causes of biodiversity loss and are diverse (Dudley and Stolton, 1999; MacKinnon *et. al.* 1986) (Figure 2.3).

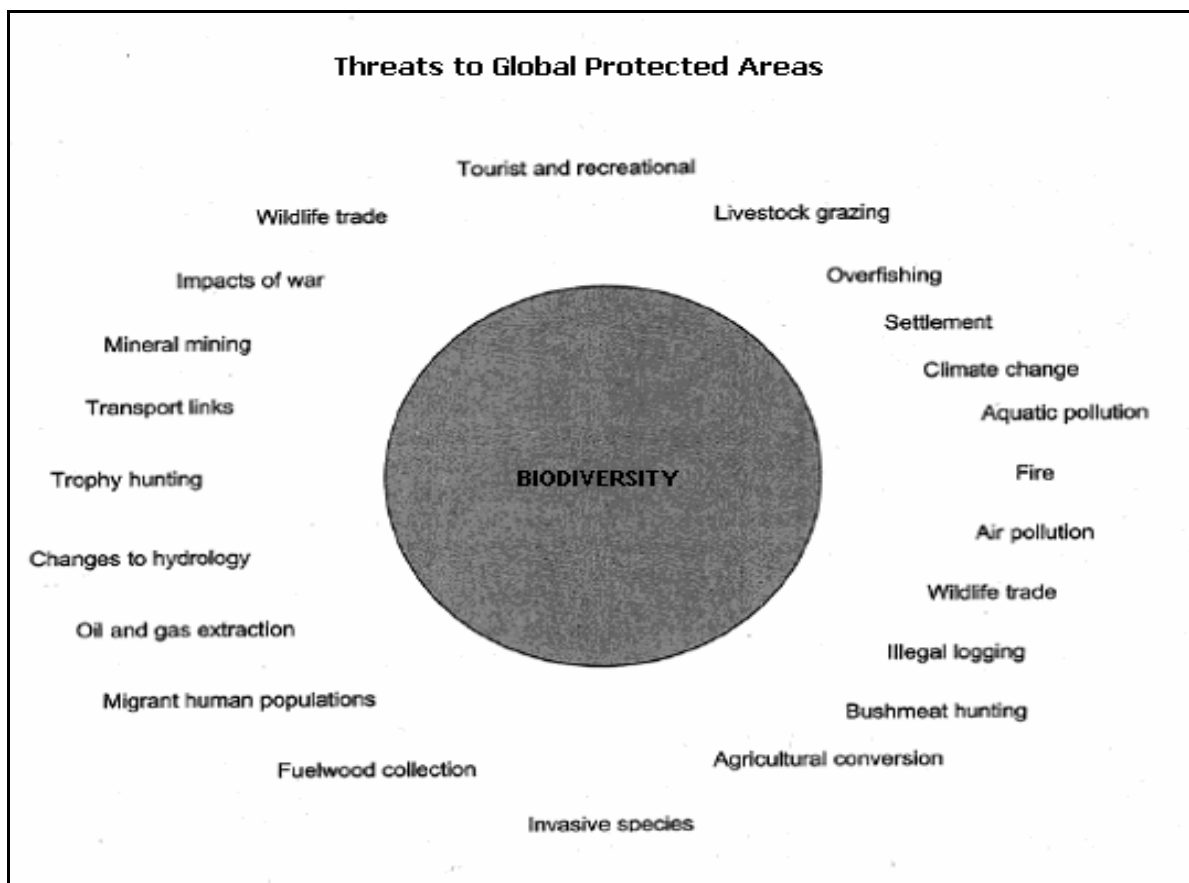


Figure 2.3. The diverse threat to world's protected areas (Source: TBI, 2001)

Subsistence and commercial use of forests outside protected areas is high and is growing in much of the low-income developing world. In such areas, environmental threats to forests must be addressed through legal and institutional frame works that provide incentives to local people to manage natural forests in ways that enhance conservation (Bazett *et. al.* 2004). The following are some major threats to protected area as described by Mulongoy and Chape (2004) and CBD (2004);

1. Direct threats

- Individual elements removed from the PA without alteration to the overall structure (e.g., plant, animal or marine species).
- Overall impoverishment of the ecology of the protected area (e.g., through encroachment, grazing, air pollution damage, persistent poaching and illegal logging).
- Major conversion and degradation (e.g., through removal of vegetative cover, construction of roads and settlements or mining).
- Isolation (through major conversion of adjacent lands).
- Invasive species.

2. Indirect threats

- Inappropriate land allocation and land use decisions.
- Unclear legal status of lands and waters and conflicts.
- Weak and inconsistent enforcement of laws and regulations.
- Rural poverty, unemployment and landlessness.
- Revenue needs of central or local governments.

State of Bangladesh forests

Ecologically the natural forests of Bangladesh covers three major vegetation types occurring in three distinctly different land types of the country, i.e., hill forest (evergreen to semi-evergreen); plain land *sal* forest and mangrove forest. Although, once these public forests were remarkably wealthy, but during the last few decades they have been degraded heavily due to various socio-political and management problems. Geographically, the country has a large tract of evergreen to semi-evergreen hill forests in its eastern part; once very rich in biodiversity, in south-western part it harbors the world's largest continuous mangrove forests; Sundarbans, besides in north-eastern part of the country there are many wetland areas; locally called *haors* which harbors a huge number of plants, migratory birds (water fowls) and freshwater fish species. In Bangladesh, much of the land (over 80%) area does not generally exceed 40m ASL, making the country's landscape the single largest flood-basin in South Asia (Hofer and Messerli, 2006). The entire country is biogeographically a transition between the Indo-Gangetic plains and the eastern Himalayas and in turn part of the Indo-Chinese sub region of the Oriental realm (IUCN, 2004).

There are some contradictions about the actual forests coverage of the country. Although, according to FD and some other sources (see for example, Khan *et. al.* 2007; Mukul *et. al.* 2006 and Hossain, 2005) it is nearly about 2.53 million ha representing approximately 17.5% of the country’s total surface area (Table 2.1; Figure 2.4) but according to FRA- 2005 this figure is only about 0.871 million ha (FAO, 2006 and 2007). Officially, Bangladesh Forest Department (FD) manages 1.53 million hectares of forest land of the country.

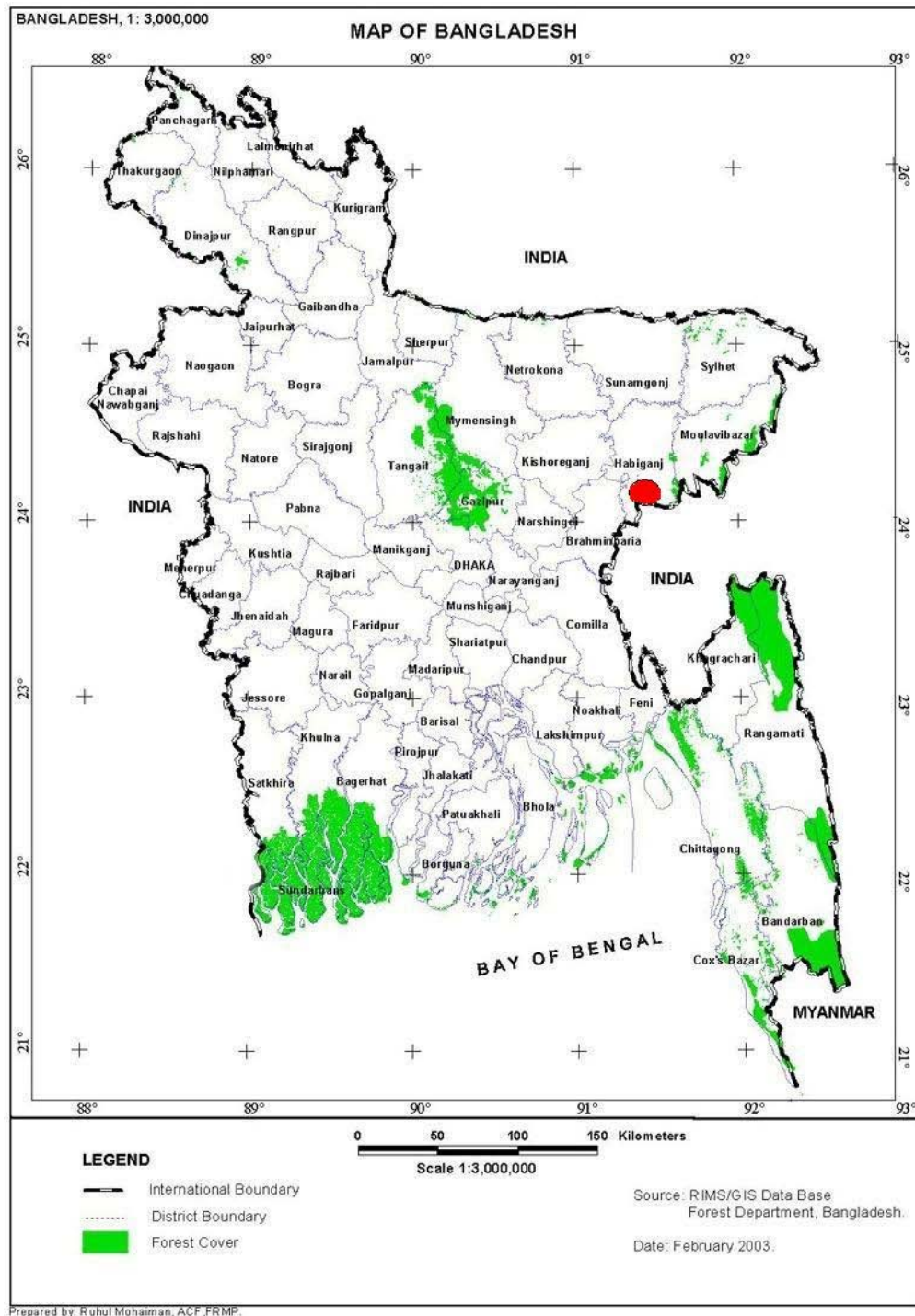


Figure 2.4. Map showing the distribution of forests in Bangladesh

Table 2.1. Forest types (ecosystem diversity) and areas in Bangladesh

Forest type	Location	Area (million ha)	Remarks
Hill forest			
Managed reserved forest (evergreen to semi-evergreen)	Eastern part of the country (Chittagong, Chittagong Hill Tracts and Sylhet)	0.67	Highly degraded and managed by the Forest Department.
Unclassed state forest (USF)	Chittagong Hill Tracts	0.73	Under the control of district administration and denuded mainly due to faulty management and shifting cultivation. Mainly scrub forest.
Plain land forest			
Tropical moist deciduous forest	Central and north-western region (Dhaka, Mymensingh, Tangail etc.)	0.12	Mainly <i>Sal</i> forest but now converting to exotic short rotation plantations. Managed by the Forest Department.
Mangrove			
Sundarbans	Southwest (Khulna, Satkhira)	0.57	World's largest continuous mangrove forest and including 0.17 million ha of water.
Coastal forest	Along the shoreline of twelve districts	0.10	Mangrove plantations along the shoreline of 12 districts. Managed by Forest Department.
Village forest	Homestead Forests all over the country	0.27	Diversified productive system. Fulfill majority of country's domestic timber, fuelwood and bamboo requirements.
Plantation in tea and rubber gardens	Chittagong Hill Tracts and Sylhet	0.07	Plantations of various short rotation species (mainly exotics).
Total forest		2.53	17.49 % of country's total landmass

Source: Mukul *et. al.* (2006); Hossain (2005)

Besides, 0.73 million ha of unclassified state forests (USF) are under the jurisdiction of district administration (Roy, 2005).

The annual deforestation rate in Bangladesh is 3.3% which is highest among the south-east Asian countries (Poffenberger, 2000). Contribution of the forestry sector to Bangladesh GDP is 3.3% at current prices and about 2% of the country's labor forces are employed in this sector (Siddiqi, 2001).

Biodiversity of Bangladesh: An overview

Bangladesh, the world largest deltaic region lies in the northeastern part of South Asia between 20°34' and 26°38' North latitude and 88°01' and 92°41' East longitude (Hossain, 2001). The majority of country's land is formed by river alluvium from the Ganges and the Brahmaputra and their tributaries which, consists mostly of flood plains (80%) with some hilly areas (12%), with a sub-tropical monsoon climate (Islam, 2003). Geographically, Bangladesh falls near the Indo-Burma region which is one of the ten global prime spot areas and supposed to have 7000 endemic plant species (Mittermeier *et. al.* 1998). Due to its unique geo-physical location Bangladesh is exceptionally characterized by a rich biological diversity (Nishat *et. al.* 2002; Hossain, 2001; Barua *et. al.* 2001; Chowdhury, 2001). An estimated 5,700 species of angiosperms alone, including 68 woody legumes, 130 fiber yielding plants, 500 medicinal plants, 29 orchids, three species of gymnosperms and 1700 pteridophytes have been recorded from Bangladesh (Figure 2.5) (Firoz *et. al.* 2004; Khan, 1977; Troup, 1975). Again, in Bangladesh, some 2,260 species alone have been reported from the hilly regions of the country (i.e., Chittagong and CHT), which falls between two major floristic regions of Asia (Anon, 1993).

Subsequently, Bangladesh possesses a rich faunal diversity. The country has approximately 113 species of mammals, more than 628 species of birds (both passerine and non passerine), 126 species of reptiles, 22 species of amphibians, 708 species of marine and freshwater fish, 2,493 species of insects, 19 species of mites, 164 species of algae (or seaweed) and 4 species of echinoderms with many others (Figure 2.6) (IUCN, 2000; Islam *et. al.* 2003).

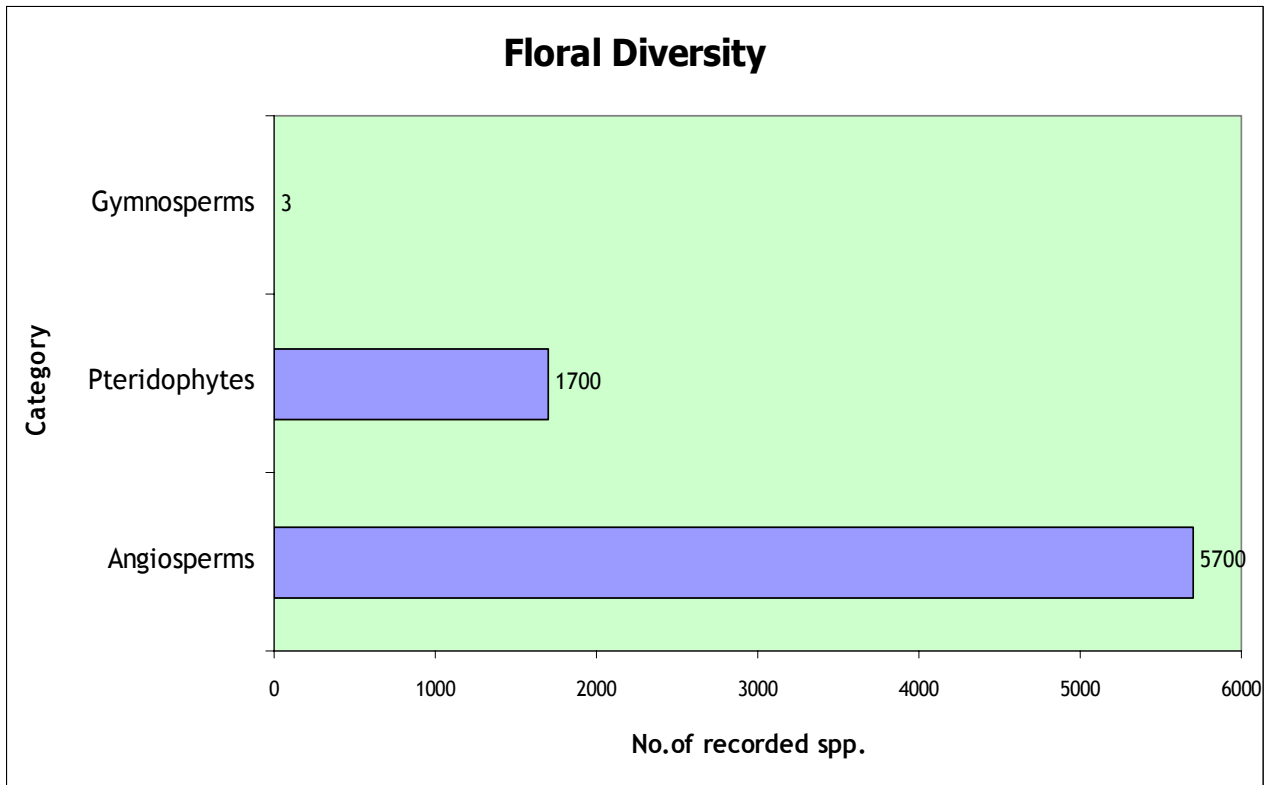


Figure 2.5. Floral diversity of Bangladesh

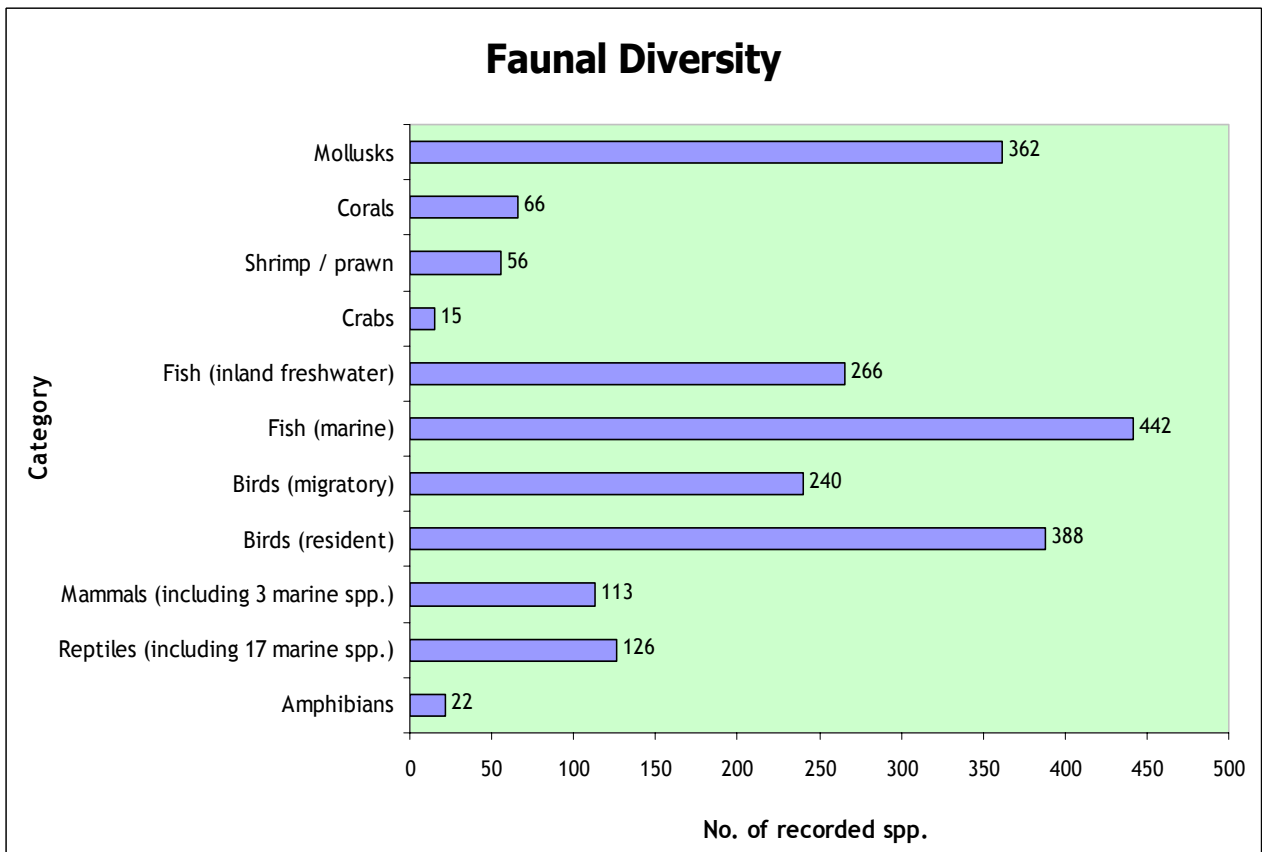


Figure 2.6. Faunal diversity of Bangladesh

Threatened biodiversity of Bangladesh

Unfortunately, due to country's enormous deforestation rate a lot of mammals, birds, and reptiles are now under tremendous pressure. Already, several important wild lives have extinct from the country (Rahman, 2004) (Table 2.2). IUCN (2000) has listed a total of 40 species of inland mammals, 41 species of birds, 58 species of reptiles and 8 species of amphibians under various degrees of risks in the country (Table 2.3). Unfortunately reliable information regarding threatened floral diversity is not available in the country. It has been assumed that 10% flora of the country have already extinct. Earlier, Bangladesh National Herbarium reported 106 vascular plant species under the risks of various degrees of extinction in the country (Khan *et. al.* 2001). Besides, Dey (2006) has prepared a list of 167 plant species as vulnerable or endangered in Bangladesh.

Table 2.2. Animal species extinct from Bangladesh at recent past

Wildlife class	Common name	Scientific name
Mammals	Great one-horned rhinoceros	<i>Rhinoceros unicornis</i>
	Javan rhinoceros	<i>Rhinoceros sondaicus</i>
	Asiatic two-horned rhinoceros	<i>Didermocerus sumatrensis</i>
	Blue bull /nilgai	<i>Boselaphus tragocamelus</i>
	Wild buffalo	<i>Bubalus bubalis</i>
	Gaur	<i>Bos gaurus</i>
	Banteng	<i>Bos banteng</i>
	Swamp deer /barosinga	<i>Cervus duvauceli</i>
Birds	Marbled cat	<i>Canis lupus</i>
	Pink headed duck	<i>Rhodonessa caryophyllacea</i>
Reptiles	Common peafowl	<i>Pavo cristatus</i>
	Marsh crocodile	<i>Crocodylus palustris</i>

Source: Rahman (2004)

Table 2.3. Present status of inland and resident vertebrates (species diversity) of Bangladesh

Group	Total no. of living species	Extinct	Threatened			
			Critically endangered	Endangered	Vulnerable	Total
Amphibians	22	0	0	3	5	8
Reptiles	109	1	12	24	22	58
Birds	388*	2	19	18	4	41
Mammals	110	10	21	13	6	40
Total	629	13	52	48	38	147

Source: IUCN (2000)
birds

* Excluding migratory

Protected Areas of Bangladesh

Since, protected areas have long been a widely accepted measure for conserving nature and natural resources; however declaration of PAs for biodiversity conservation is rather a new conception in Bangladesh. Earlier, in 1974 Bangladesh Wildlife Preservation Act defined three types of PA under different IUCN protected area management categories in the country (Kothari *et. al.* 2000). These were,

- **Wildlife Sanctuary:** an area maintained as an undisturbed breeding ground for wild fauna and where the habitat is protected for the continued well-being of the resident or migratory fauna.
- **National Park:** a comparatively large area of natural beauty to which the members of the public have access for recreation, education and research, and in which the wildlife is protected.
- **Game Reserve:** normally comprises a relatively isolated area meant for protection of wildlife in general and to increase the population of specified species.

Presently, there are 18 notified protected areas (i.e., ten national parks, seven wildlife sanctuaries and one game reserve) in Bangladesh (NSP, 2006b) (Table 2.4). In contrast to other region of the world this figure is still very poor. The PAs of Bangladesh covers nearly 1.7% of total landmass of the country, which is second lowest per capita area under PAs in any country (Sharma *et. al.* 2005). Besides, PAs of Bangladesh do not effectively represent all its ecosystems, habitats and species important for conservation. Just now, the PAs of the country covers 11.08% of total forest area of the country and represents the hill forests, sal forests and mangrove forest at the percentage of 5.22%, 11.24% and 23.3% respectively (Mukul, 2007) (Figure 2.7).

Again, in Bangladesh protected areas (Figure 2.8) are the part of Reserved Forests and have been notified as PA after severe ecological degradation and destruction. The following are some major challenges concerning to sound PA management in the country,

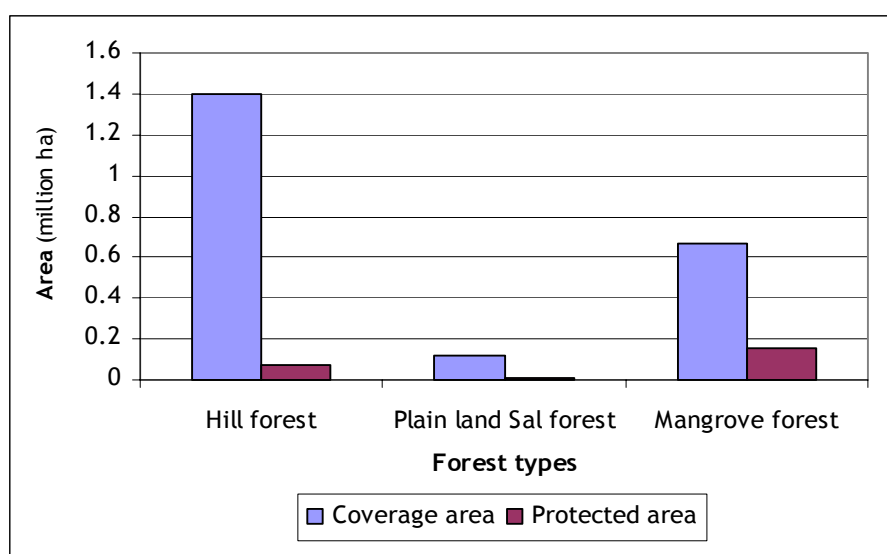
- Rural poverty and high unemployment rate in the surrounding of protected areas.
- Conflict between Forest Department and local forest dependent people's due to ignoring local people's customary resource use practices.
- Fuelwood collection, illegal poaching and overexploitation of other non-timber forest resources.

- Poor and inefficient management facilities due to shortage of trained personnel, modern equipments and budget deficiency.
- Absence of proper monitoring body and inadequate implementation of law.
- Lack of people's awareness.

Table 2.4. List of Bangladesh protected areas

Sl.	Protected Areas	Forest types	Location	Area (ha)	Established (Extended)
A. NATIONAL PARKS (IUCN category V)					
01.	Modhupur NP	Sal forest	Tangail	8,436	1962(1982)
02.	Bhawal NP	Sal forest	Gazipur	5,022	1974 (1982)
03.	Himchari NP	Hill forest	Cox's Bazar	1,729	1980
04.	Lawachara NP	Hill forest	Maulvibazar	1,250	1996
05.	Kaptai NP	Hill forest	Rangamati	5,464	1999
06.	Ramsagar NP	Sal forest	Dinajpur	27.75	2001
07.	Nijhum Dweep NP	Coastal mangrove	Noakhali	16,352.23	2001
08.	Medha Kachapia NP	Hill forest	Cox's Bazar	395.92	2004
09.	Satchari NP	Hill forest	Habiganj	242.82	2005
10.	Khadimnagar NP	Hill forest	Sylhet	679	2006
B. WILD LIFE SANCTUARIES (IUCN category IV)					
11.	Sundarban (East) WS	Natural mangrove	Bagerhat	31,226.94	1960 (1996)
12.	Pablakhali WS	Hill forest	Rangamati	42,087	1962 (1983)
13.	Char Kukri Mukri WS	Coastal mangrove	Bhola	40	1981
14.	Chunati WS	Hill forest	Chittagong	7,761	1986
15.	Rema-Kalenga WS	Hill forest	Habiganj	1,795.54	1996
16.	Sundarban (South) WS	Natural mangrove	Khulna	36,970.45	1996
17.	Sundarban (West) WS	Natural mangrove	Satkhira	71,502.13	1996
C. GAME RESERVE					
18.	Teknaf GR	Hill forest	Cox's Bazar	11,615	1983

Source: Mukul (2007); NSP (2006b)

**Figure 2.7.** Ecological representations of Bangladesh protected areas

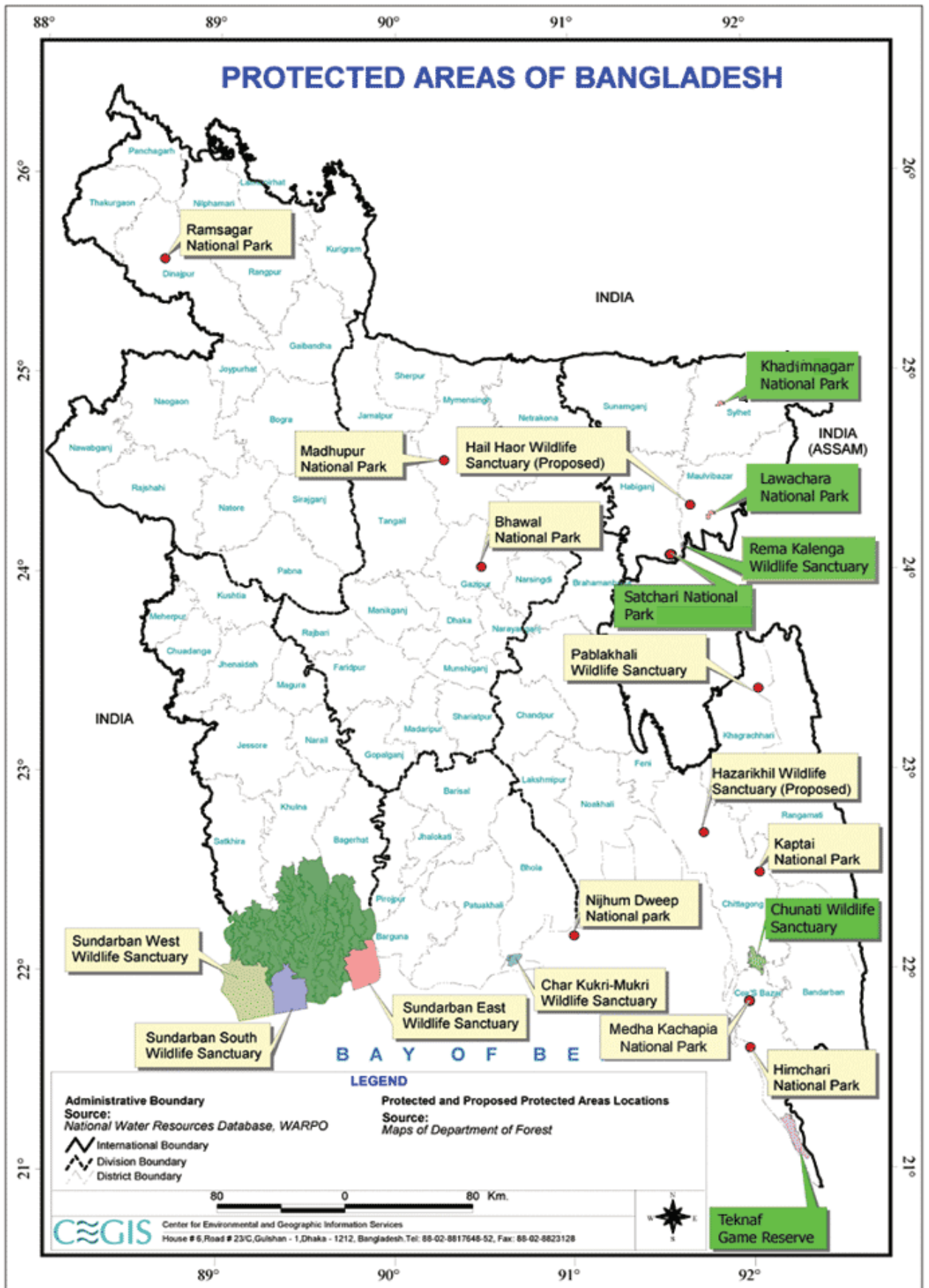


Figure 2.8. Map showing the distribution of PAS in Bangladesh

Non-Timber Forest Products: A potential element for PA management

Communities living in or around the forests have been collecting various forest products mainly non-timber forest products (NTFPs), for their subsistence as well as for commercial use (FAO, 1993). Selling of NTFPs has been the most widespread ways of earning cash income of such communities and they add to people's livelihood security, especially for the livelihoods of forest-dependent people and create new opportunities for entrepreneurship development (Cocks and Wiersum, 2003; Walter, 2003; Posey 1999). Estimation shows that, smallholders living in forest margins in diverse parts of the world earn between 10 and 25 percent of their household income from non-timber forest products (Wunder, 2000; Ndoye *et al.* 1999).

NTFPs may account for as much as 16 percent of total income of households in India; in Orissa, Madhya Pradesh, Himachal Pradesh, and Bihar States, as much as 17 percent of the landless depend on NTFPs to secure daily wage work, and 39 percent are involved in NTFP collection as a subsidiary income source (Mallik, 2000). In parts of Nepal, up to a quarter of the total household income is derived from the sale of non-wood forest products (Malla, 2000). In southern Ghana, 10 percent of the population generated some cash income from forest product activities in the early 1990s. Only a minority reported that it was a major source of income. But more than 70 percent stated that it was important in helping them meet particular needs, either because of its timing, or in absolute terms (Townson, 1995).

Again, NTFPs play a crucial role as a source of cash income during periods of unemployment or crop failure. An assessment of the impact of the East Asian economic crisis of the late 1990s found that forest assets helped to mitigate poor communities by providing supplemental income through sales of forest products, as well as a reserve of cultivable land for food production (Pagiola, 2001). Income from collection and processing of *babacu* palm kernels in northeast Brazil has been shown to account for 39 percent of cash income and 34 percent of total household income during the seasonal slack period in agriculture. Many of the poorer farmers were dependent on this cash for purchasing seed and other inputs for the new season's planting (May, 1985). Hence, the potential contributions of NTFPs can be visualized in three distinct category in our life and living i.e., subsistence, supplement income or emergency supports.

Nowadays, it is indisputable that, non-timber forest products play a critical role to the quality and even survival of life of very large numbers of rural poor in most tropical developing countries (Pimentel *et. al.* 1997; Arnold and Ruiz Pérez 1996). Asia is undoubtedly the world's largest producer and consumer of NTFPs (Vantomme *et. al.* 2002). According to de Beer and McDermott (1996) about 27 million people in Southeast Asia rely on the use of non-timber forest products.

The defined areas of Non-Timber Forest Products

There are a lot of contradictions about the term and definition used for non-timber forest products and their defined areas (Belcher, 2003). Literally, although non-timber forest products, includes all products other than timber that come from forests. However, de Beer and McDermott (1996), in their groundbreaking publication on the economic value of NTFPs in South East Asia, proposed the following definition for Non-Timber Forest Products:

The term 'Non-Timber Forest Products' (NTFPs) encompasses all biological materials other than timber, which are extracted from forests for human use.

Again, FAO have been used the term Non-wood forest products (NWFPs) instead of NTFPs and it consists all goods of biological origin other than wood (commercial timber), derived from forests, other wooded land and trees outside forests (FAO, 1999). For the present study NTFP comprises the resources based on de Beer and McDermott (1996) definition. Examples include fruits, firewood, bamboo, rattans, medicinal plants, spices, wildlife and wildlife products.

Non-Timber Forest Products and forest conservation

It has now increasingly recognized that the collection and use of NTFPs is ecologically less destructive than timber harvesting and have encouraged the belief that more intensive management of forests for such products could contribute to both development and conservation objectives. The following are some arguments on the potentials of NTFPs for forest conservation:

Arguments	Author(s)/ Source
'....NTFP collection (e.g., tapping chicle or harvesting fruits) tends to be less destructive than logging. As it affects the forest canopy less and uses no heavy machinery, therefore viewed as a better means to conserve biodiversity.'	Bass <i>et. al.</i> (2001)
'.....NTFP harvesting is ecologically more benign than alternative forest or non-forest uses.'	Peters <i>et. al.</i> (1989)
'....the use of NTFP is less ecologically destructive than timber harvesting and therefore provides a sounder basis for sustainable forest management.'	Arnold & Ruiz Pérez (2001), CBD (2003)
'.....development of non-timber forest products combated deforestation by benefiting the poor forest dwellers.'	Dove (1993)
'.....NTFP harvests have lower impacts on forest ecosystems than other uses, and are potentially compatible with efforts to integrate the use and conservation of biodiversity.'	Shanley <i>et. al.</i> (2002)
'....NTFP production is a more benign way to use tropical forests than most land use alternatives, allowing for the conservation of key forest values.'	Myers (1988), Nepstad & Schwartzman (1992)
'....forest management based upon non-timber products provides a mechanism for creating incentives for the maintenance of extensive areas of forest.'	Sayer (1991)
'.....poor rural communities may be less inclined to clear forest if they are able to derive more material benefit from maintaining the forest for the various goods and services that it can yield.'	Oldfield (1988)
'....NTFP have been heralded as a means of slowing forest destruction by increasing the overall worth of the forest and by shifting the emphasis of forest exploitation from trees to products whose harvest is believed to be less ecologically destructive.'	Anderson (1990); Plotkin & Famolare (1992)

NTFPs and rural livelihoods in Bangladesh

As the economy of Bangladesh is predominantly agricultural and about 90 percent of the population live in rural areas, forests play an important role in supplying fuelwood for cooking and timber for house construction, agricultural implements, boats, carts, furniture, etc (Zashimuddin, 2004). Again amongst different forest products NTFPs play the important role in the daily life and rural economy of Bangladesh and provide off-farm employment and income to rural population living in or near forest. The collection, processing and selling of NTFPs provide major employment opportunities to the ultra thin rural poor of about 300,000 in Bangladesh (Basit, 1995) and contribute approximately Tk.1.3 billion annually to the

country's economy (GOB, 1993). Government earn an estimated Tk. 717 million (US\$ 17.9) annually only from the Sundarbans and one third of the population living around this forest were assessed to be dependent on these forest for a substantial part of their income either directly or indirectly (Poffenberger, 2000; Basit, 1995).

In Bangladesh NTFPs provide many vital forest resources such as food, medicine, honey, essential oil, spice, resin, gum, latex, fiber and floss, bamboo and cane, broom-grass, sun-grass, mushroom, tamarind, silk cocoon, lac, khoer (catechu), along with fuelwood and timber. At the moment, a comprehensive and well-articulated 'forest policy' is vital for the development of NTFPs in the country. Such a policy would specify the relative role of NTFPs in supporting conservation and management, the level and nature of resource use and management, product development and promotion, entrepreneurship development, socioeconomic development and poverty reduction. However the previous forest policies of Bangladesh neglected the conservation and management of NTFPs (Zashimuddin, 2004). The clear-felling followed by artificial regeneration system in the hill forest management severely degraded the NTFPs. Again, the monoculture of *Tectona grandis* was not found to favorable for the natural regeneration of NTFPs.

Since nowadays NTFPs hold both conservation and economic potentials the government should emphasize on the proper utilization on this opportunities particularly for sustainable forest resource management and conservation. Provisions should be made to use this chance in protected area management as the simple declaration of protected area couldn't prohibit people from the collection of forest products from the PA which they have enjoyed for generations!

Chapter **3**

Materials and Methods

The Study Area

3.1.1 History and background of the area

The word “Satchari” comes from “seven streams” (locally called ‘*chara*’) and refers to the streams that flow through the forest. The park (i.e., Satchari National Park) is a recent addition to the Protected Areas of Bangladesh and is notified in 2006. The park was established in the year 2005 to protect and preserve the remaining patch of natural forests within the forest of Raghunandan Hill Reserve. In 2004, the park was selected as one of the five pilot sites for co-management under the Forest Department’s Nishorgo Program. The park is, in addition one of the four PAs located in north-eastern part of Bangladesh (i.e., *Lawachara National Park; Rema-Kalenga Wildlife Sanctuary; Satchari National Park* and *Khadimnagar National Park*). The area of the park is about 242.82 ha (600 acres) which comprises the forests of Raghunandan Hills Reserve within the Satchari Range (NSP, 2006a).

Administratively, Satchari National Park is located in Chunarughat Upazilla of Habigonj District and situated nearly 130 km north east of Dhaka, and about 60 km south west of Srimongol. The northwestern part of the park is bordered by Raghunandan hill reserved forest and the southern boundary of the forest is bounded by Indian border line (Figure 3.1). Other adjacent areas are covered by tea estates, rubber and agar plantations and paddy fields. Fossils remain in the forest floors of the park evident of forest from millions of years ago.

3.1.2 Vegetation type

The forests of the park originally supported an indigenous types of vegetation cover comprised tropical evergreen to semi-evergreen forests that once covered the Sylhet divisions and ran down to the Chittagong Hill Tracts. Currently the forest has turned to a secondary forest because of the substantial alteration of the original forest except 200 ha of natural forest.

3.1.3 Bio-ecological zone

According to Nishat *et. al.* (2002), the park falls under the Bio-ecological Zone-9b with broad zone “Sylhet Hills”. According to Bangladesh agro ecological zoning, this area belongs to ‘Region 29: “Northern and Eastern Hills”, sub-region 29c: “Low Hills and Piedmont Plains” (FAO, 1988) subjected to massive flash floods. The soil texture in general is supposed to be

sandy loam to silty clay and more acidic than the adjoining ecological zones (Choudhury *et al.* 2004).

3.1.4 Climate and Topography

The area of the national park is undulating with slopes and hillocks, locally called *tilla*, ranging from 10-50 m and are scattered in the forest. The forest is drained by a number of small, sandy bedded streams, all of which dry out following the end of rainy season in October-November. The total annual average rainfall of the area is 4162 mm. July is being the wettest having an average of about 1250 mm of rain, while December is the driest virtually having no or very little rainfall. May and October are the hottest months having an average maximum temperature around 32⁰C, while January is the coldest when the minimum temperature drops to about 12⁰C. The relative humidity is about 74% during December while it is over 90% during July-August.

3.1.5 Biodiversity

The park is very rich in flora (about 241 species) as well as in fauna (*see*; Annex 1 & 2). Identified species include 24 mammals (including 6 species of non-human primates) (Figure 3.2- 3.5), 149 birds, 6 amphibians, 18 reptiles (NSP, 2006b). Key mammals include Hoolock Gibbon (*Hylobates hoolock*), Capped Langur, Fishing Cat, Wild Boar and Barking Deer. It is, in addition one of the last habitat of Hoolock Gibbons and one of rare bird species Hooded Pitta (*Pitta sordida*) in Bangladesh.

Complete survey information on the floral composition of SNP is not available till now. Formerly a study was conducted by IUCN Bangladesh and according to the report, the major timber trees are represented by Jarul (*Lagerstroemia speciosa*), Chapalish (*Artocarpus chaplasha*), Shegun (*Tectona grandis*), Lohakath (*Xylia dolabriformis*), Kadam (*Anthocephalus chinensis*), Shimul (*Bombax ceiba*), Kanthal (*Artocarpus heterophyllus*), Champa (*Michelia champaca*), Chikrashi (*Chickrassia tabularis*), Koroï (*Albizia procera*), Garjan (*Dipterocarpus spp.*), Dewa (*Artocarpus lakoocha*), Gamar (*Gmelina arborea*), Jam (*Syzygium spp.*), Sundhi (*Michelia oblonga*), Bohera (*Terminalia bellerica*) etc. Among exotic short-rotational trees, Acacia hybrid (*Acacia sp.*), Mangium (*Acacia mangium*), Malacanna (*Albizia falcataria*), Eucalyptus (*Eucalyptus camaldulensis*), Akashmoni (*Acacia auriculilormis*), are common in plantation areas. Moreover, in mid seventies an oil-palm (*Elaeis guineensis*) plantation was raised in a sizeable amount of area in this park with huge investment (Choudhury *et al.* 2004). But now they are considered to be one of the major

threats to that park as they don't bear any commercial value nor provide foods to wild animals. There are many types of bamboo such as *Jai bansh* (*Bambusa burmanica*), *Muli bansh* (*Melocanna baccifera*) and various cane like *Jali bet* (*Calamus guruba*), *Golla bet* (*Daemonorops jenkinsianus*) in the national park. Besides, there are many types of climbers, vines, herbs and shrubs.

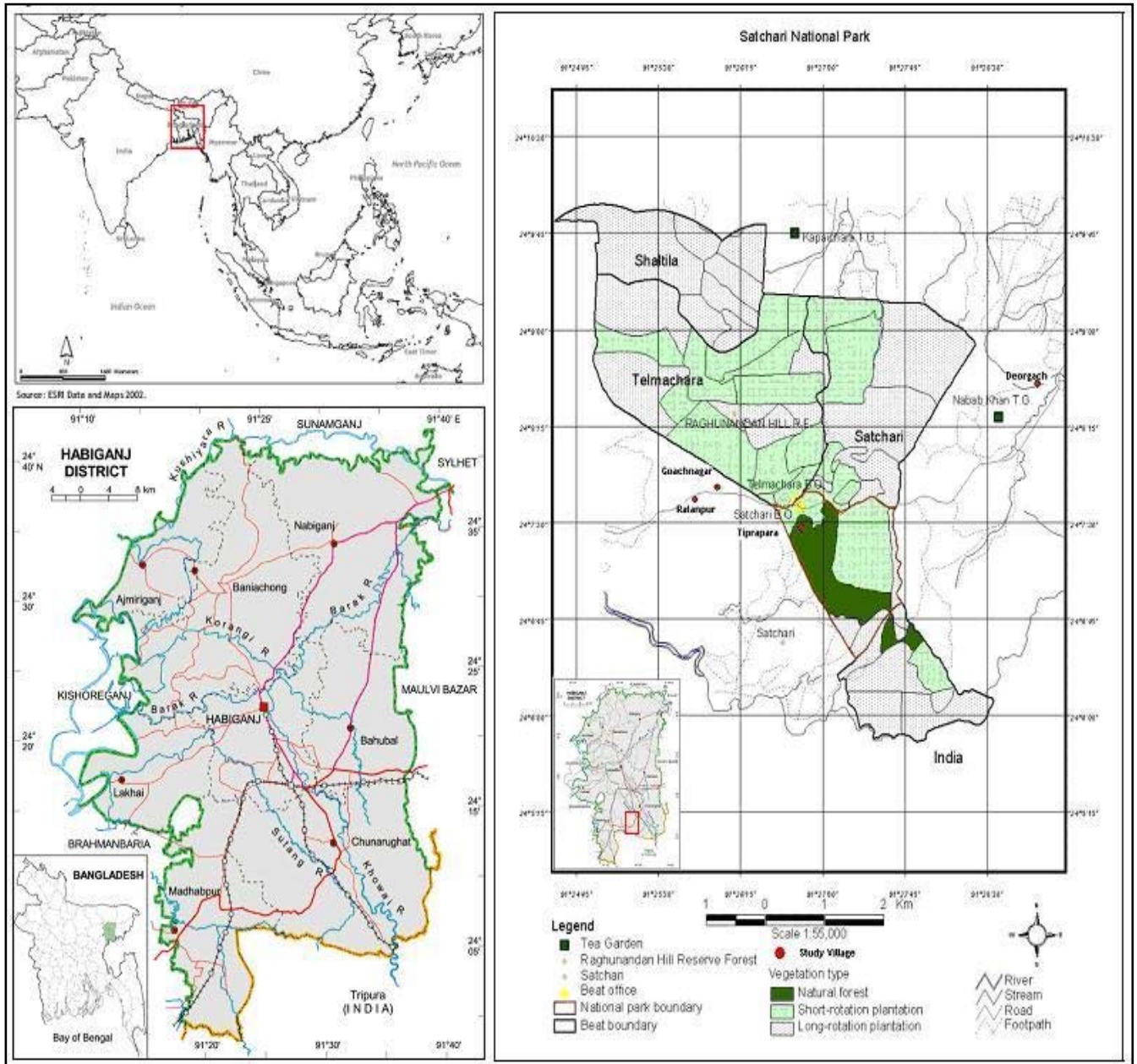


Figure 3.1. Location Map of Satchari National Park



Figure 3.2. A juvenile **Hoolock Gibbon** (*Hylobates hoolock*) in Fig tree
(Photo courtesy: Sirajul Hossain)

Figure 3.3. A curious **Rhesus Macaque** (*Macaca mulatta*) in Satchari
(Photo: Author)



Figure 3.4. Female and infant Hoolock Gibbon in Chalita tree
(Photo courtesy: Sirajul Hossain)

Figure 3.5. A contented Hoolock Gibbon Family!
(Photo courtesy: Sirajul Hossain)



Methodology

The study process can be simply divided into two parts, viz, data collection and analysis. Both secondary and primary data were collected and verified. The overall study method is briefly discussed in below.

3.2.1 Data Collection

For the study both primary and secondary information were collected. An in-depth data collection process is provided in details in below.

3.2.1.1 Collection of Secondary Information

Available information (i.e., demographic structure, ethnic groups, socio-economic conditions, climatic and physiographic conditions, existing land use pattern and management system of the forest etc.), the maps and relevant information of Satchari National Park were collected from various literature, organizations (e.g., FD, IUCN, Nishorgo, RDRS etc.) internet and through personal contact.

3.2.1.2 Collection of Primary Information

a) Selection of sample villages

In Satchari area, local people traditionally dependent on national park and adjacent reserve forest for the collection of various forest resources. A previous study by Mollah *et. al.* (2004) identified a total of 19 villages having varied degree of interests with the national park. Among the villages only one village is located within the national park and inhabited by an ethnic community; the *Tripura* tribe. The other villages that have stakes with the national park are located about 3-8 km away from the park. *Tiprapara*(the only village inside the national park jurisdiction), *Deorgach*, *Ratanpur* and *Goachnagar* were randomly selected for the present study from each of the first four forest dependency categories (i.e., major; medium to major; medium and minor to medium) as identified by Mollah *et. al.* (2004); (Table 3.1). However after the field observation a ranking change was done between in *Deorgach* and *Ratanpur*. Any village with only minor dependency on the park was not selected for the study as they have least or not dependency on the national park.

Table 3.1. Villages located in and near the SNP and their level of stakes with the park

Level of stakes	Name of the villages
Major	<i>Tiprapara</i>
Medium to major	Gazipur, <i>Deorgach</i>
Medium	Kalishiri, Ghanoshyampur, Doulatkhabad, <i>Ratanpur</i>
Minor to medium	Baghbari, Teliapara, <i>Goachnagar</i> , Ektiarpur, Marulla, Nayani Bongaon
Minor	Shanjanpur, Rasulpur, Promnandapur, Bhaguru, Enatbad, Holholia

Source: Mollah *et. al.* (2004); Names of the study villages are Italicized

b) Selection of the key informant

I have selected one key informant for each village. As key informant I have considered the person who was familiar with the local peoples and had a broad and in-depth knowledge about his village as well as its households.

c) Focus group discussion (FGD)

After selecting key informant some participant group meetings were held in the study villages with the local villagers, settlement heads, local influential leaders and age old experienced persons with the active help from key informant for developing community profile, community map and institutional profile and for obtaining additional information about the threats and potentials of our hypothesis. With the help and assistance of the local participants, villagers were grouped into category depending on the income class viz., rich (monthly income is 7500 Tk. to above), medium to poor (income is below 7500 but above 2000 Tk. /month) and extremely poor (monthly income below 2000 Tk.) and three dependency level namely; totally or most dependent, moderately dependent and less dependent.



A focus group discussion and community mapping exercise held at *Ratanpur*

d) Observation / Transect walk

After community mapping some field visits were arranged in the study sites by choosing transects, based on the community map to observe and verify the information collected

during the community mapping exercise. During the course of the transect walks various species available in the locality was also prepared (i.e., NTFPs, medicinal plants, homestead spp., invasive alien spp. etc.).



Figure 3.6. A community map prepared through FGD at Ratanpur village

e) Selection of the households

For households survey I have considered the dependency status of the House Holds (HHs) on the national park which was constructed during the course of community mapping exercise. HHs for the survey was selected randomly from each dependency class with the assistance of my respective Key Informant. A similar sampling intensity was followed for each class.

f) Sampling intensity

Household survey was conducted with a 10% sample intensity from each dependency class (i.e., totally or most dependent, moderately dependent and less dependent) from the study site. In case of *Tiprapara*, sampling intensity was 100% as they are totally dependent on the SNP for their life and living.

g) Field survey

A semi-structured questionnaire was used to collect data (Annex 3) where the details about the HHs, their relation or stakes with the forest, resources exploited from the forest and quantity and frequency of exploitation of resources, traditional using pattern of the resources, households perceptions on NTFP extraction and forest conservation, major threats and causes of forest destruction and HHs perception on the participatory management (co-management) of the national park were recorded. Additional data were also gathered on the market potential of different NTFPs available in the locality and their probable contribution to household's socio-economic upliftment. On each topic the respondent was free to express his/her views.

h) Estimation of HHs forest dependency and related income

Various authors have developed numerous methods for assessing the income and dependency of household's on forest (see, Vedeld *et. al.* 2004; IIED, 2003; Wollenberg, 2000; Wollenberg and Nawir, 1998). During the study I have classified the households within each village into three forest dependency classes: totally or most dependent, moderately dependent and less dependent. To measure a household's forest dependency, annual cash contribution of forest to household's livelihoods was considered. Incomes from the forest of above three forest dependency categories were found respectively; 54, 000 Tk to above, 24, 000 Tk to below 54, 000 Tk and below 24, 000 Tk. Incomes from other non-forest activities were also recorded to make comparison between forest based income and non forest income. For estimating a household's forest income I have modified the formula used by Ambrose-Oji (2003):

Net Forest Income: Direct cash benefits from selling of all harvested forest products (revenue) + Market value of the consumed forest products which they may have otherwise purchased from the market (savings) – investment cost / opportunity cost.

i) Study period

The study was carried out within a time span of one year ranging from February, 2006 to February 2007. Multi-visits were made during the collection of necessary data. Normally 9 a.m. to 7 p.m. survey time was followed.

3.2.2 Data Analysis and Synthesis

After accumulating numerous data and information, a draft report was prepared based on the field survey. For the purpose of convenience and better presentation, the findings (i.e. demographic and socio-economic information's, exploited forest products, purpose of collection, marketing procedure, economic gain, perception on NTFP collection and forest conservation etc.) from the site visits were clustered as texts, tables, maps and pictures after analyzing and synthesize the field data using different statistical package.

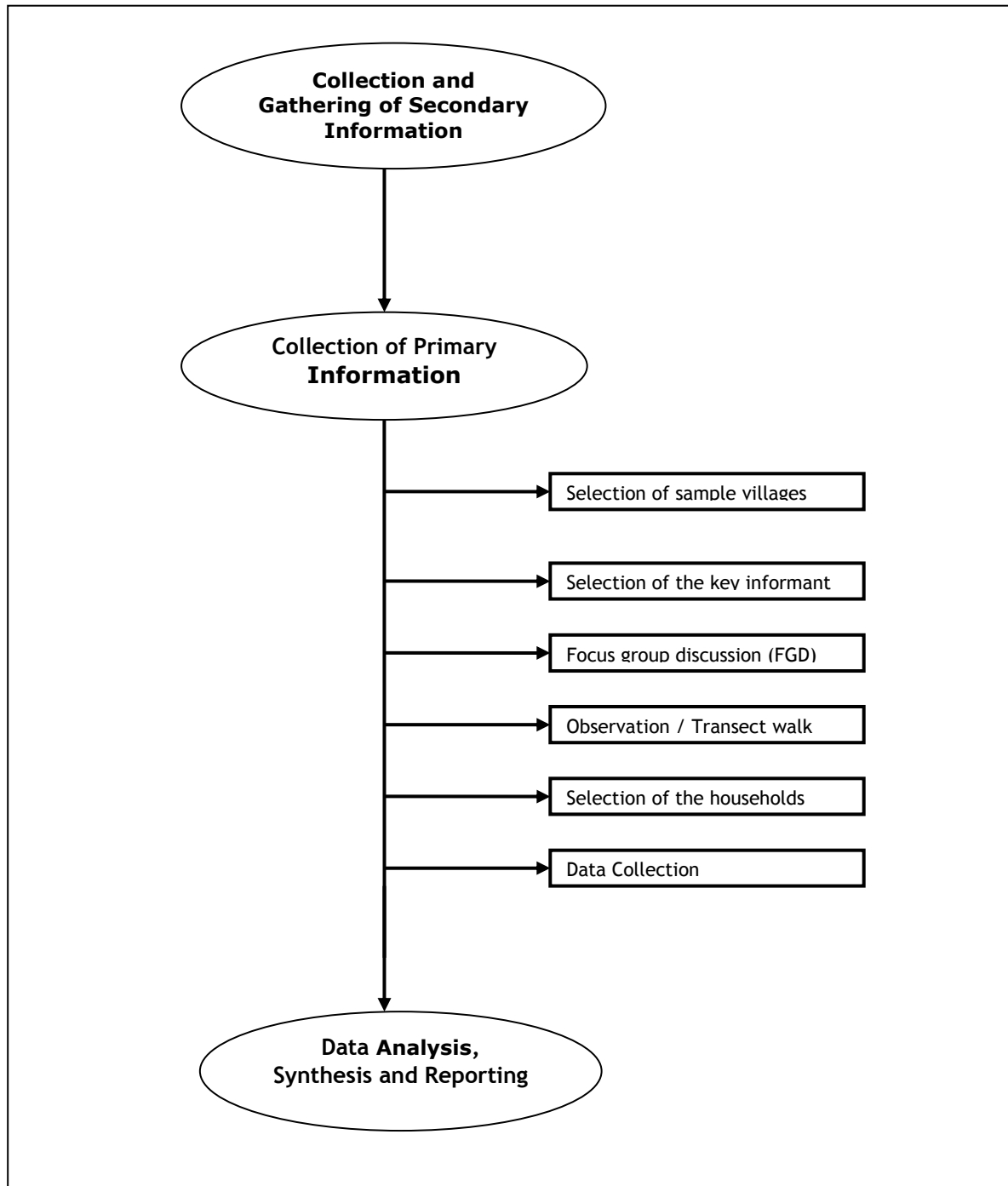


Figure 3.7. Flow chart of the overall study process

Chapter **4**

Results

Results

1. Life and Living in Satchari National Park

A total of 19 villages having varied degree of stakes with the national park have been identified, of which Tiprapara is located inside and the rest are located outside of the forest in the range of 5-8 km away from the national park. Among the villages, Tiprapara has major stakes with the forest. Two villages, namely Gazipur and Deorgach have medium to major stakes with the forest. Four villages (i.e., Ratanpur, Kalishiri, Ghannoshyampur, and Doulatkhabad) have medium stakes with the forest. Six villages have minor-medium stakes (i.e., Goachnagar, Baghbari, Teliapara, Ektiarpur, Marulla and Nayani Bongaon), while five villages (Shahjanpur, Rasulpur, Promanandapur, Bhagaru, Enatabad and Holholia) have minor stakes. From secondary information it has been found that, majority of the fuelwood collectors mainly come from Goachnagar, Baghbari and the illegal feller mainly come from Ratanpur, Kalishiri, Ghannoshyampur, Teliapara, Goachnagar, Deorgach and seasonally from Gazipur. Among my four sample village it was found that Ratanpur has greater stakes with the national park than that of Deorgach, therefore it has been considered as having medium to major stakes with the national park and vice versa. A summary of information of the selected villages are given in Table 4.1.

Table 4.1. Summary information of the selected villages having stakes with Satchari National Park

Name of the village	HH No. (approx.)	Location and Distance	Union	Level of stake	Forest practices
Tiprapara (Forest village)	22	Inside (0 km)	Paikpara	Major	Collect fuelwood, house building materials, fruits and other NTFPs, cultivate lemon and others
Ratanpur	156	Outside (2 km)	Sahajanpur	Medium to major	Mainly involved with illegal tree felling, and majority of HHs collects fuelwood
Deorgach	316	Outside east (3 km)	Deorgach	Medium	Mainly collect fuelwood, some involved with illegal tree felling
Goachnagar	328	Outside west (4 km)	Sahajanpur	Minor-Medium	As above

1.1. Demographic structure

Demographically, the stakeholders of the SNP fall into four categories, viz. forest villagers, local poor people, tea estates labor and moholders. In the study areas (i.e., Tiprapara, Ratanpur, Deorgach and Goachnagar) among 824 HHs, about 101 HHs having 597 HH members (including 48.93% female member) were interviewed. The classification of HHs members based on their age distribution is given in Table 4.2.

Table 4.2. Classification of HHs members based on their age distribution

Age class (Years)	Total HHs member	Percentage (%)
00-10	97	16.25
10-20	123	20.60
20-30	108	18.09
30-40	133	22.28
40-50	74	12.40
50-60	38	06.36
60>	24	04.02
Total	597	100

1.2. Educational status

Education makes a man aware about his/her social responsibilities and thus awakens his consciousness about the conservation of natural resources for the welfare of our planet as well as for human being. To assess the level of education of the selected HHs of this study, it has been categorized into: I) Illiterate, and ii) literate which is further classified into followings, a. Primary education, b. Secondary education and c. Higher secondary and above. From the investigation it appears that, the literacy rate is not unsatisfactory (53.94%) in the sample villages but most of the literates are children studying in primary level (33%) (Table 4.3).

Table 4.3. Distribution of HH members in the study area according to their educational status

Educational status	Level of Education	Number of HH members	Percent (%)
Illiterate		275	46.06
Literate (53.94%)	Primary education	197	33.00
	Secondary education	84	14.07
	Higher secondary and above	41	6.87
Total		597	100

1.3. Socio-economic condition of the HHs

During the study time the primary occupation in the study villages were found as; agriculture (37%), mainly paddy cultivation, followed by NTFP extraction (18%), timber poaching (18%), day labor (15%), small business (5%), service in government agencies or NGO's (4%) and overseas employment (2%) (Figure 4.1). The scenario was different in case of Tiprapara where there were no agricultural lands compared to other study villages thus the main income generating activities observed there was day labor (38.5%) followed by firewood collection (32%). Forest patrolling was the main service done by the *Tripura's*. Day laborers also found to be collected fuelwood on their off days.

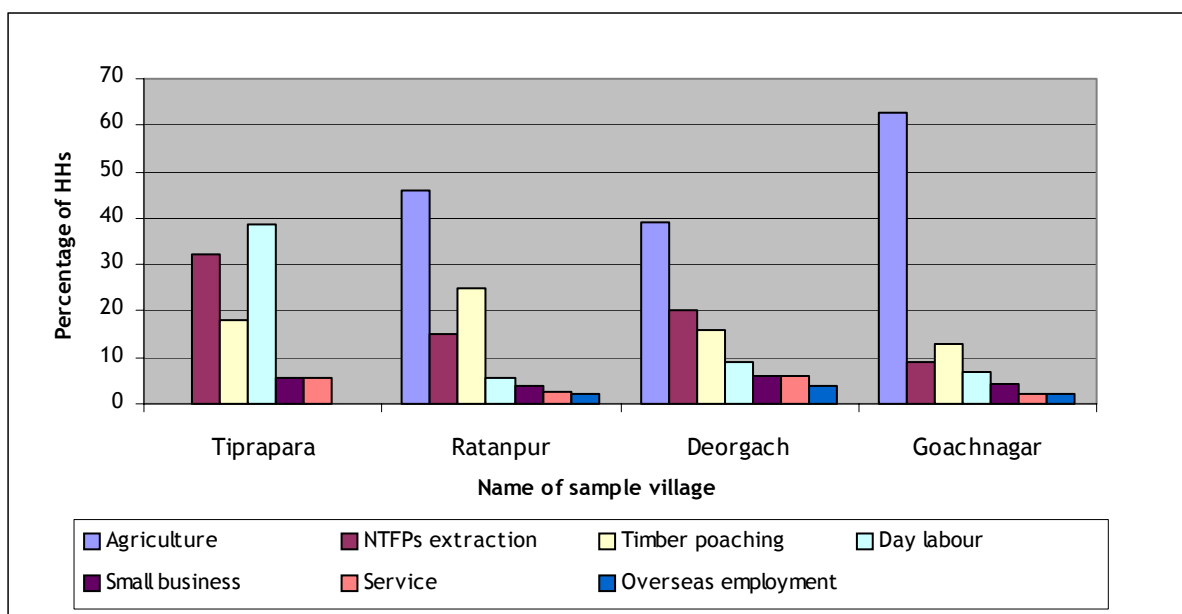


Figure 4.1. Household's involvement in various livelihood activities in Satchari

For economic categorization I have divided the HHs based on their income level (i.e., monthly income). I have classified the HHs into three income level viz., rich (monthly income; 7,500 Tk to above), medium to poor (income below 7,500 but above 2,000 Tk/month) and extremely poor (monthly income below 2,000 Tk). Based on the HH survey, it reveals that, majority of the people (36.43%) of the area are extremely poor, followed by medium to poor (32.15%) and rich (31.42%) (Figure 4.2). This picture is almost different in the only tribal community, there about 38.89% HHs are extremely poor and 50% are medium to poor and the rest belong to rich (11.11%).

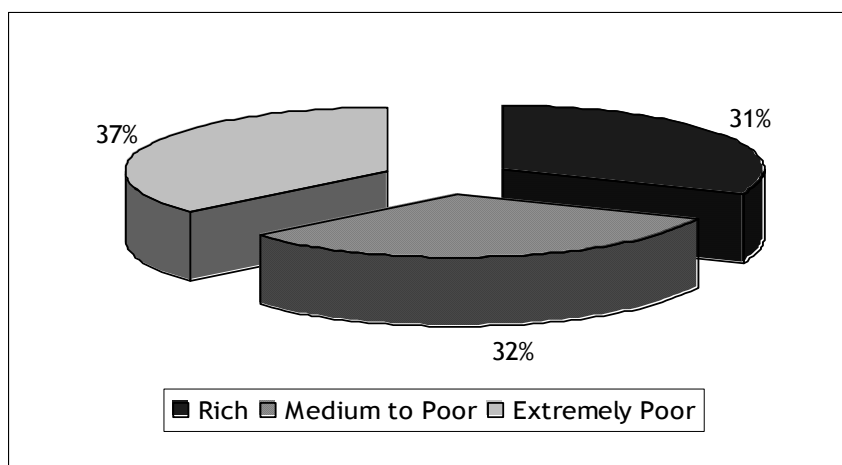


Figure 4.2. Economic classification of the HHs

2. Forest - Human Relationship

Study revealed that, about 13% of households of sampled villages were totally dependent on the forest for their livelihoods, whereas, the remaining HH were found to be moderately or leastly dependent on the forest. The dependency rate of the study villages, however, varies with their distance (Table 4.4) from the Reserved Forest, therefore it can be hypothesized that the dependency of the villagers on forest is correlated with its distance from the forest. Again, in Satchari area a strong link between poverty and dependence on forest was observed and it was also clearly found that forests are more important to low-income than to high-income people.

Table 4.4. Forest Dependency of the villages

Name of the Village	Totally/ Most Dependent		Moderately Dependent		Less Dependent	
	HHs	Percent	HHs	Percent	HHs	Percent
Tiprapara	12	66.67	3	16.67	3	16.67
Ratanpur	34	21.7	46	29.4	76	48.7
Deorgach	33	10.4	39	12.3	244	77.2
Goachngar	27	8.23	42	12.81	259	78.96
Total	106	12.96%	130	15.89%	582	71.15%

Besides, in Satchari forests were found to contribute in various aspects of rural life from food, fodder, fuel, medicines, building materials, and materials for all sorts of household items to many intangible benefits whose values can't be measured in terms of money. During the field survey it was observed that, many households, especially the poor were fully or

partially dependent on the collection of various NTFPs with limited amount of timber from the RF. All of households of Tiprapara were dependent on the forest for their energy requirements. They also cultivated lemon in a confined area of the national park. Figure 4.3 illustrates the forest dependency of the households in my four study villages.

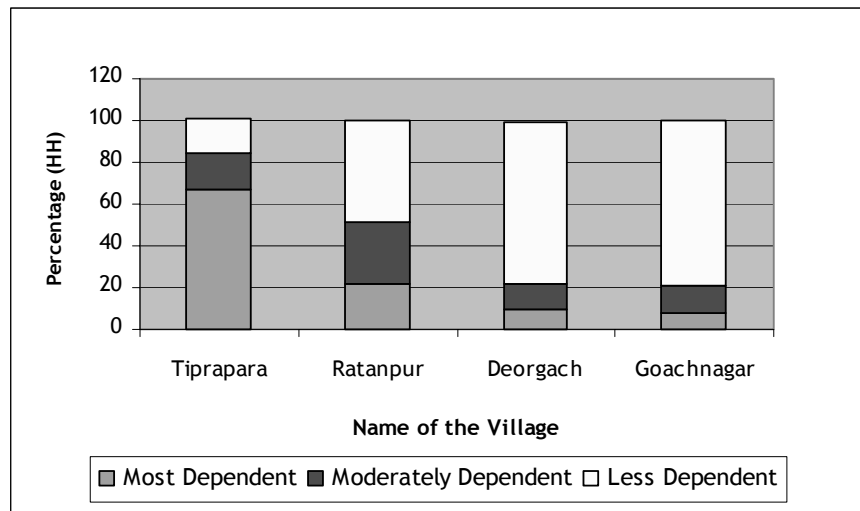


Figure 4.3. Forest Dependency of the villages by households

3. The dependency of households on NTFPs

During the time of household survey, respondents cited atleast 14 NTFP,s which they mainly harvested from the nearby forest both for their own consumption and selling (Table 4.5). However, only a few of these make a significant contribution to households' incomes. Study revealed that, mainly five NTFPs—firewood, bark of *menda*, *taragota*- a substitute of cardamom, *kumbi* leaves which is used to wrap tobacco and bamboo —account for more than 90% of NTFP-based income in Satchari (Box 4.1).

Table 4.5. Different NTFPs exploited from the SNP and adjacent forest by local households

Products	Origin
Bamboo	<i>Bambusa vulgaris</i> Schard. <i>Melocanna baccifera</i> Roxb.
Broomsticks	<i>Thysanolaena maxima</i> Roxb.
Bushmeat	-
Firewood	All woody species
Forage and fodder	-
Fruits	<i>Artocarpus heterophyllus</i> Lamk. <i>Artocarpus chaplasha</i> Roxb. <i>Artocarpus lakoocha</i> Roxb. <i>Citrus limon</i> L. <i>Syzygium spp.</i>
Honey	<i>Apis florae</i> <i>Apis dorsata</i>
Kumbi leaf	<i>Careya arborea</i> Roxb.

Medicinal plants	-
Menda bark	<i>Litsea monopetala</i> (Roxb.) Pers.
Rattan	<i>Calamus guruba</i> Ham.
	<i>Daemonorops jenkensianus</i> Mart.
Sand	-
Sun grass	<i>Imperata cylindrica</i> L.
Taragota	<i>Ammomum aromaticum</i> Roxb.

However, collections of these NTFPs in the studied village were not uniform. Households of Tiprapara found fully dependent on forest for firewood on the other hand this dependency was about 60%, 55% and 56% respectively for Ratanpur, Deorgach and Goachnagar. Besides taragota and menda bark was mostly collected by the villagers of Ratanpur and Deorgach respectively. From the study it also revealed that people’s dependency on various forest resources varies with their socio-economic condition (negatively correlated) and their distance from the forest (Figure 4.4) and (Figure 4.5).

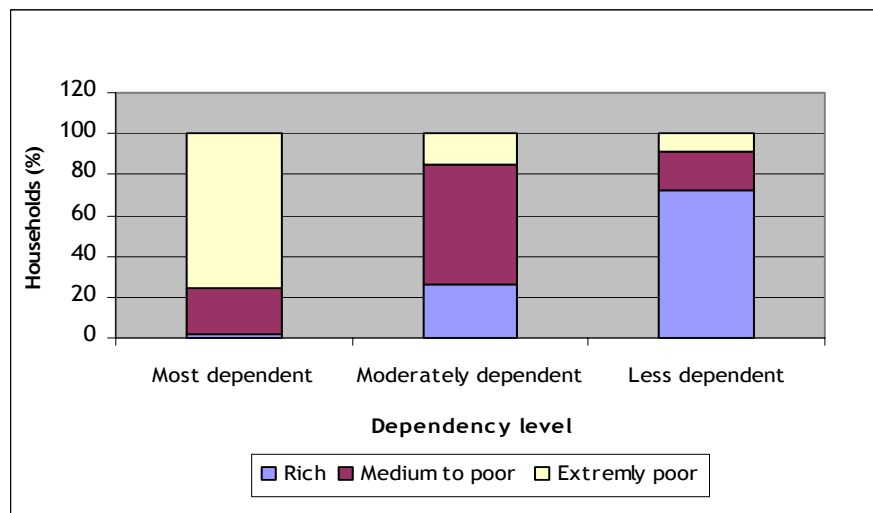


Figure 4.4. Relationship between income category and forest dependency in Satchari

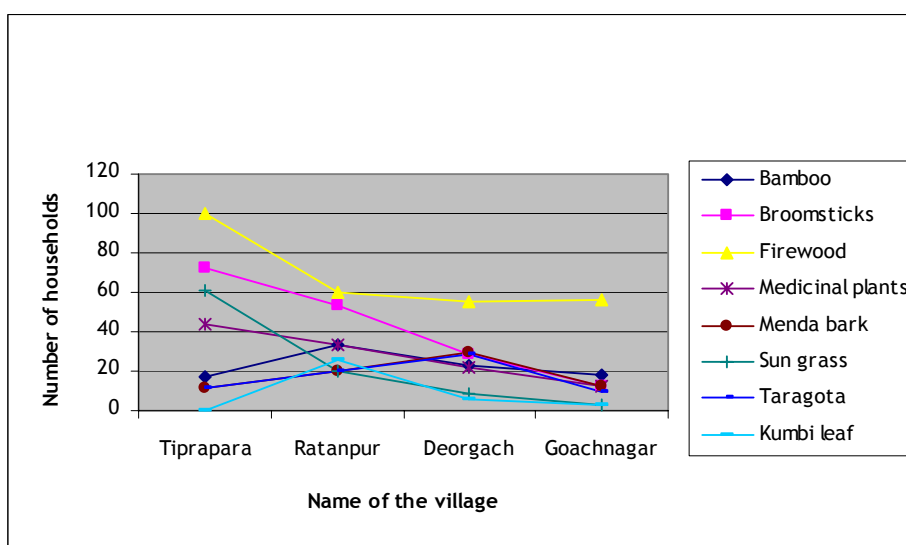


Figure 4.5. Household’s involvement in major NTFPs collection in Satchari

BOX 4.1. Major NTFPs having significant contribution to local livelihoods in Satchari area



Fuelwood (woody portion of most tree species)

In Satchari, villagers are entirely or moderately depend on the surrounding RF forest and national park for their daily firewood needs and selling of firewood from the forest provided the first cash income in this area. Most of the people, majority of which are women and children from the study villages are engaged in collection and selling of firewood. Study also reveals that, one can earn approximately 40-120 Tk per day from selling firewood. However this price varies with the season, quality and sometimes gender of the firewood collector.



Menda bark (gummy bark of *Litsea monopetala*)

Four menda-based small-scale processing factories have been found in Satchari area and these factories uses *menda* bark as a constituent to make mosquito repellent. All of the factories are located in Deorgach. Approximately fifty to sixty laborers work in these factories and the majority of them are women (53%) followed by children (27%) and men (20%). The average wage rate for men is Tk.100/day, for women is Tk.50/day and for children is Tk.40/day. Work in these factories is entirely seasonal; the factories only operate when there is enough *menda* bark from the adjacent forests. People from other areas are generally involved with the collection of *menda* bark from the national park as well as from adjacent reserve forests, and they sell the bark at the rate of Tk.25 per kg to local factories.



Taragota (Seeds of *Cardamom species*)

Taragota is a common species in the study areas, which is used as an alternative for cardamom as well as for manufacturing *unani* (a branch of herbal medicine). About 32% of people in the sampled villages collect *taragota*, both for their own consumption as well as for saling in the market. Usually people collect *taragota* during the onset of the monsoon. The price of dried *taragota* in the local market is worth Tk. 60/kg, while fresh taragota sells for Tk.18/kg.



Bamboo (*Bambusa* spp.)

Bamboo collection and selling provides employment opportunity to a large extent in Satchari area. People in the area mainly collect *Melocanna baccifera* (Muli bans) and *Bambusa vulgaris* from the forest. It was found that a bamboo collector collects bamboo 4 – 6 days in a week and can sell a bundle of bamboo for 120-150 Tk. This amount however, varies with the maturity, quality, height and number of bamboo per bundle (usually 8-24). Women, although involved in this activity but their income gain is comparatively low than that of people (55-80 Tk).



Kumbi pata (Leaves of *Carya arborea*)

In Satchari, a number of local people collect *kumbi* leaves (*Carya arborea*), which are used to wrap tobacco to produce a kind of cigarette known locally as *biri*. I have found that people usually collect *tendu* leaves twice a week and supply it to the nearby Teliapara market, which yields about Tk. 500 per week. If properly managed "*Biri*" manufacture can also create some employment opportunity in Satchari area as the leaves are available in the local forests.

Study revealed that, collections, processing and sale of NTFPs constitute primary occupation for approximately 18% of households in Satchari area; among which 76% were poor to extremely poor. Another important thing however, observed in Satchari was rich households were benefited mostly (i.e., get maximum returns from their investments) from the trading of NTFPs or NTFP based products, although they were not directly involved in NTFP collection and gathering. Furthermore, in economic hardships or in case of emergency of the household, NTFPs were found to play as an important buffer.

From my study it also appears that, among the NTFPs, medicinal plants possess a great diversity in Satchari and approximately 25% households of the area traditionally used certain medicinal plants for treating various common ailments (Figure 4.6). During the study, I observed a total of 40 medicinal plant species belongs to 29 families and distributed in 37 genera which have been collected by the local inhabitants both for commercial purpose (63%) and self consumption (37%) (*see*, Mukul and Uddin, 2007 for a detail information) (Annex 4).



Figure 4.6. *C. gigantea*, *A. vasica* and *A. cardamomum* (clock wise); three widely used medicinal plants in the study area

Table 4.6. Various sources of NTFPs, their purpose and conditions of collection in Satchari

NTFPs	HHs involved (%)	Source of collection			Condition for collection			Purpose of collection		
		RF	NP	Others*	Permit	Illegal	Others	Sell	Consumption	Others
Fuelwood	61.46	√	√	√	√	√	-	√	√	-
Bamboo	13.54	√			√	-	-	√	√	-
Fruits	22.92	√	√	√	-	√	-	√	√	-
Menda bark	12.50	√	√	-	-	√	-	√	-	-
Taragota	32.29	√	√	-	-	√	-	√	-	-
Sun grass	17.71	√	-	√	√	-	-	√	√	-
Forage and fodder	26.04	√	√	√	-	√	-	-	√	-
Herbal remedy	05.21	√	√	√	-	√	-	-	√	-
Rattan	02.08	√	-	-	√	√	-	√	-	-
Broom	26.04	√	√	-	-	√	-	√	√	-
Kumbi leaf	02.08	-	√	-	-	√	-	√	-	-
Sand	05.21	√	√	-	-	√	-	√	√	-
Honey	02.08	√	√	-	-	√	-	√	-	-
Bushmeat	03.13	-	√	-	-	√	-	-	√	-
Others (i.e., land)	18.75	-	√	-	√	-	-	-	√	-

*e.g., tea estates



Figure 4.7. Various types of fuelwood loads having varying price have been brought from Satchari to local market

4. NTFP collection and forest conservation: understanding people's perceptions and beliefs in Satchari

During the study about 77% of the NTFP collectors of in my study villages were found to hold some sound (or clear) understanding on NTFP collection over forest conservation. Although most of the NTFP collector were found illiterate and without any concept of sustainable harvesting but their indigenous conceptions were amazingly scientific and somehow similar to the predictions of experts in this regard. The following quote from some local informants highlights the perceived role of NTFP collection in forest conservation:

.....We have collected NTFPs from Satchari since prehistoric times, but it doesn't damage the forest ecosystem as illegal felling does. Moreover we collect NTFPs

seasonally, so it has enough time to recover” (Ratanpur village, personal communication, February 2006).

According to villagers in Tiprapara, “NTFP collection keeps the forest safe from sudden fire and also destroys harmful organisms. It also accelerates the growth of seedlings and saplings by reducing the competition for nutrition” (personal communication, June 2006).

Again, although people’s of the Satchari area noticed a list of 14 different NTFPs collected regularly from the forest but during the study it was observed that, very few of them (living plant species) involved complete removal of species. In case of majority NTFPs the harvested part belongs to leaves or fruit or a mature part of a tree which is not vital for their existence. Again, in most cases NTFP extraction was found to be season dependent. e.g., most of the fuelwood is collected during the dry season due to easy access and mobility inside the forest, bamboo extraction also takes place mainly in the drier months to meet local needs for house construction at that time of the year. It is therefore can be said that, since there is a time interval between two consequent harvesting species gets enough time to recovery.

People’s in Satchari also mentioned that, among the 14 NTFPs only two (i.e., fuelwood and sand) might have some harmful effects. People also noticed that, the rest 12 NTFP creates medium to negligible effect on the forest when collected. Again according to the local inhabitants, although the stocks of *menda* bark and honey has compacted but stocks of remaining 12 NTFPs are still not unsatisfactory. Table 4.7 summarizes people’s perceptions on the extent of collection, present stock and probable future risk of this NTFP harvesting on forest.

Table 4.7. Perceptions of amounts, impacts and risks of collection of various NTFPs

NTFPs	Extent of collection/use			Present stock/Availability			Impact on forest/ Future risk*		
	High	Medium	Negligible	High	Medium	Low	High	Medium	Negligible
Fuelwood	√	-	-	√	-	-	√	-	-
Bamboo	√	-	-	-	√	-	-	√	-
Fruits	-	√	-	-	√	-	-	-	√
Menda bark	√	-	-	-	-	√	-	√	-
Taragota	√	-	-	-	√	-	-	-	√
Sun grass	√	-	-	√	-	-	-	-	-
Forage and fodder	-	√	-	-	√	-	-	√	-
Herbal remedy	-	√	-	√	-	-	-	-	√
Rattan	-	√	-	-	√	-	-	√	-
Broom	√	-	-	-	√	-	-	√	-
Kumbi leaf	-	√	-	-	√	-	-	-	√
Sand	-	√	-	√	-	-	√	-	-
Honey	-	-	√	-	-	√	-	-	√
Bushmeat	-	-	√	-	√	-	-	√	-
Others (i.e., land)	-	√	-	√	-	-	-	-	√

*Based on local people's perception

5. Forest resources depletion in Satchari- The insights

During my study I have identified a diverse set of problems in the study area that directly or indirectly responsible for indiscriminate resource extraction and forest resources depletion in the Satchari area. For better convenience and well understanding the problems have further divided into three major category based on three different aspects (viz., socio-economic, bio-physical and institutional) which I have found both through household survey and personal observations.

5.1 Problems related to socio-economic features

5.1.1. Poverty and unemployment: Poverty and unemployment are the most common problems in and around SNP. About 37% of the populations in the study area were extremely poor and without any stable income or occupation. Though both poverty and unemployment are correlated but 63% of my respondents cite poverty as the main threat to the forest destruction as well as unsustainable resource extraction and 42% of them think unemployment is one of the major problems causing unsustainable resource exploitation from the protected area.

5.1.2. Fragile socio-economic conditions in adjoining areas: In Satchari area there are eight tea estates which surround the national park (Table 4.8). Laborers of these tea estates earn very low wages for their subsistence and the rate of unemployment is very high among tea estate families. Most of the tea laborers collect their daily fuelwood and housing materials from the nearby national park and reserve forest which eventually threaten the national park.

Table 4.8. Tea Estates surrounding the Satchari National Park and their level of impacts on the park

Sl. no.	Name of the tea estate	Location	Impact
01.	Chaklapunji Tea Estate	East-South, adjacent	Minor
02.	Chandpur Tea Estate	North-East, adjacent	Major
03.	Kapaichora Tea Estate	North, adjacent	Major
04.	Laskarpur Tea Estate	North-East, adjacent	Major
05.	Nababkhan Tea Estate	East, adjacent	Minor
06.	Satchari Tea Estate	West-South, adjacent	Major
07.	Surma Tea Estate	West, adjacent	Major
08.	Teliapara Tea Estate	West, adjacent	Medium

5.2 Problems related to bio-physical features

5.2.1. Invasive alien species: Invasive alien species (IAS) have spread dramatically as a result of the increased mobility and trade of people, goods and species across the planet, and are now recognized as one of the greatest threats to the stability and diversity of ecosystems, second only to habitat loss (Barber *et. al.* 2004). In fact, such species are introduced for their rapid growth, efficient dispersal capabilities, large reproductive output and tolerance to a broad range of environmental condition (Campbell, 2005). During my intensive field survey I have recorded a total of 19 alien plant species belonging to 12 different families in Satchari area (Figure 4.8), 15 of which have been found to reported as IAS from various literature (See Mukul *et. al.* 2006 for more information). Species were mostly found under the family *Fabaceae* (26%) followed by the family *Asteraceae* (11%), *Meliaceae* (11%) and *Verbenaceae* (11%). Undoubtedly these species have some negative impacts on the ecosystems of Satchari area. Due to limited effort data regarding invasive animal species were not possible to collect.



Figure 4.8. Some common IA plant species of Satchari (clockwise: *lantana*; *oil palm*; *siam weed* and *water hyacinth*)

5.2.2. Replacement of natural forests through large scale plantation of fast growing exotic species (monoculture): Although once Satchari harbors a remarkable amount of wild and natural forest patches but during last days most of them have degraded. Last few years FD enriches and replaces these denuded forest area by planting fast growing and short rotation tree species by practicing monoculture. However, such practices make the forest unsuitable for wild animals since in most cases (e.g., *Acacia* spp.) their fruits or leaves are not palatable to them. Again in some cases their leaves don't or slowly degraded in the soil when falls which discourage the development of undergrowth vegetations.

5.2.3. Sawmills and brickfields: A total of 18 sawmills were noticed in Satchari during the study period mainly utilizes timber coming from the SNP. According to the local peoples voice it is one of the major causes of forest destruction in Satchari. Local people illegally collect timber poles from the SNP and sell it to the nearby saw mills at a minimum price. Again, for the availability of illegal timber and their low price people's from other parts of the country also contacts with these sawmills for their timber needs. Fifteen timber merchants of the area were reported to supply timber products to different areas of the country including Dhaka based on the timber of this forest (i.e., national park and reserve forests) (NSP, 2006a). Presences of several brickfields have also been noticed in close proximity of the national park, using fuel wood for burning bricks. The presence of these brickfields encourages (or drives) local poor people to extract fuelwood illegally from the national park to supply it to the brickfields.



Figure 4.9. A sawmill located just in the edge of Satchari National Park

5.2.4. Fragmentation of forest and easy accessibility: In last few decades a considerable change is occur in country's transportation sector. Governments have been worked for an efficient transportation networks throughout the country. Although, such efforts makes people's life comfortable but sometimes causes harm to forests of the country since in much cases these activities done within forest lands after clearing its vegetation. This enhances forest fragmentation which isolates the wild animals and decreases their genetic quality by increasing inbreeding activities. In Satchari area forest also fragmented by transportation networks which was sometimes found to responsible for accidental death of wild animals while crossing the road. Again, these roads were found to enhance illegal logging activities by providing easy transportation of illegal log from the forest to sawmill or other destination. In Figure 4.10 a local people illegally brought timber from the national park by using the trails within tea gardens for transport it to nearby sawmills through local buses (by providing a high charge to bus conductors). During my study time, people even from 50-60 km distance from the park area were also found to come to illegally resource collect from Satchari.



Figure 4.10. People illegally brought timber from the national park by using the trails within tea gardens and transport it to nearby sawmills through local buses

5.3 Problems related to Institutional features

5.3.1. Inadequate personnel and resources of Forest Department: Unfortunately, Forest Department holds a negative image in Satchari like other region of the country, since it is reported as one of the highly corrupted sectors of our country. However, in some cases it was found that, FD staffs have nothing to do as they have a shortage of skilled

staffs, modern equipments and arms to protect the forest designated as PA. Sometimes the use of highly equipped arms, instruments and political patronization to the illegal poacher discourages FD staffs to take any action against the illegal loggers.

5.3.2. Improper law enforcement: It was visualized from the study that, FD staffs are likely to enforce their power only against the poor peoples who have no income options other than forest, which further aggravated the situation as the illegal practitioners repeatedly do the same practices to bear the legal expenses of the case which have made earlier by the Forest Department against them.

5.3.3. Lack of people's awareness: Since a significant part (about 44%) of the people of Satchari area is illiterate therefore a few of them have a clear understanding about protected area or sustainable resource utilization.

6. Co-management of national park – A new approach for PA management in Satchari

Co-management is a rapidly approaching means / paradigm for protected area (or natural resource) management all over the world. Poor recognition of local people's traditional way of life while declaring PAs is one of the main reasons behind unsuccessful PA system which also leads to conflict among forest users and PA managers. The co-management practice in this regard enables local park manager to manage the park effectively by ensuring the equity of local people in decision making and benefit sharing. In Satchari, Nishorgo; a FD project financed by USAID tries to develop a co-management structure in the area. Already they formed some co-management committee to involve local community members in decision-making process by taking representative from each social class and forest stakeholders. Members have been taken from local political elites (who sometimes were supposed to be the godfather of the illegal loggers), former illegal loggers, local influential persons, and administrative staffs from upazila head quarters, FD officials etc. Some formal meetings are now held regularly to approve new decisions and evaluating effectiveness of the present management regimes.

BOX 4.2. Some Nishorgo initiatives for socio-economic upliftment in Satchari area

The following are some Nishorgo initiatives undertaken to change the local people's socio-economic condition and attitude towards PA system in Satchari,

- a) Provide training on nursery raising, fisheries, home gardening, livestock and poultry rearing and provide initial support in terms of goods (i.e., for nursery; poly bag, seeds, fertilizer etc, for livestock rearing cattle, pig etc.).
- b) Rehabilitate former illegal poachers by involving them in forest patrolling.
- c) Forming co-management committee taking representative from local elites, forest relied livelihoods and administrative staffs from government sectors.
- d) Trained local educated youths as eco-tour guide for its emerging eco-tourism prospects.
- e) Arrange field tours in other PAs having an exemplary management system.
- f) Awareness creation through stage show, cultural show, group discussion, essay and art competitions in school level etc.

6.1. People's response towards co-management: some empirical findings

Although, peoples under various beneficial schemes in Satchari area are still very limited but the preliminary results of these efforts were found to be encouraging. According to local peoples, 'people's involvement in various forest practices like illegal logging, fuelwood collection, NTFP harvesting etc. in the studied villages are significantly reduced compared to earlier'. Again since, Nishorgo with some other NGO's have been worked to create some alternative income generating (AIG) opportunities among the primary forest stakeholders in Satchari, their dependency on forest for livelihood income has found to be compacted. Again as the people came to an understanding about the necessity of conserving forest for their survival and to secure their future generations, now they change their mind, earn money in clear and authorized ways. During the study several former illegal poachers were found to contribute to the betterment of their society by involving in various environmental regeneration activities like tree planting (Case Study 4.1).

CASE STUDY 4.1. **SHAFIQL ISLAM ABUL: From illegal logger to tree grower**



Proud *Abul* standing within his nursery with a changing view.

Abul a 25 years old youth of Ratanpur was one of the badly skilled illegal loggers of the area since January, 2006 when NISHORGO gave him training on nursery raising and financed (in a form of raw materials) him for the nursery. His yearly turnover from the nursery is now 50,000 Tk/year. He and his family members are now occupied with this nursery and FD has come to an agreement with him to supply seedlings for their annual plantation programme. He is now a role model to the motivated youths of the Satchari.

Although the result of the study suggests a slow change in the local people's perceptions, conventional forest practices but certainly it indicates a steady change in the overall situation of the area, i.e., local livelihood pattern and their attitudes towards a collaboratively managed PA management system. However, since the approach is still in its progressive stage, there I have found a lot of thing still to work.

Chapter **5**

Discussion

Discussion

NTFPs and livelihoods

Literally although a protected area should free from every type of public activities (i.e., logging or NTFP collection) without prior permission of proper authority but in Satchari area a large extent of people were found to depend on NTFP to sustain their life and living and they were also found to extract them both from the national park and the reserved forest. Although, to date very few studies have conducted on PA on this aspect (see, Das, 2005 as example) but certainly, the study results don't stand only for Satchari area but also for other regions having the same ecosystem, mainly forest adjacent communities living in most developing and underdeveloped countries. The observations of the study simply indicates that, NTFPs are critically important to local forest users as a primary, supplementary or emergency source of income and was found to contribute an estimated average of 19% of household's cash annual income. Such observation indicates that although Satchari has recently been declared as a national park but people still maintain their livelihoods in their former way. Furthermore, 27% households of the study area were found to receive at least some cash income from the collection, processing and selling of NTFPs, majority of which were poor to ultra poor. Such findings obviously signify a commanding role of forest to local livelihoods and similar phenomena in other regions were also observed and mentioned by Arnold & Ruiz-Pérez (2001 and 1996); Pimentel *et. al.* (1997) and Fox (1995). Again, the dependency of poorest people on NTFP based income is also evident from the study of Cavendish (2000) and Malhotra *et. al.* (1991). The study result is also comparable to the finding of Das (2005), who also found a great extent of people of 'Buxa Tiger Reserve' dependent on NTFPs after declaration it as a protected area.

Besides, in the present study 18% households primarily dependent on NTFPs and NTFP based occupation that they collect legally or illegally from the national park and reserve forest for their subsistence income; characterizes a strong future and opportunity of NTFPs in community development in the area. Although agriculture was the most income generating activity in the area but most of the agricultural lands were owned by the rich HHs, poorer HHs worked there as a day labour on payment basis. During the study it was also understood that, people's dependency on forest for NTFP based income decreases with the increase in distance from the forest which delineates a positive correlation between distance and forest

dependency. On the other hand, dependency on NTFP based income decreases with the change in HHs socio-economic status which denotes a negative correlation between these two variables. However, such observation is also evident and agreed by various authors who have also found the greater importance and dependence on NTFPs of low-income people than to high-income people (see, Angelsen and Wunder, 2003; Neumann and Hirsch, 2000; Cavendish, 1997; Pimentel *et. al.* 1997 and Falconer, 1992 for example).

Again, in some situations, it has been observed that, even the poorest people of the area can not be benefited from the sell and extraction of NTFPs properly, as they have limited access to technology, capital and better market facilities necessary for optimum turnover. Such limitations is one of the main reasons why poor NTFP collectors doesn't paid sufficiently for their labour and are also mentioned by several authors (see, Shackleton & Shackleton, 2004; Arnold & Ruiz-Perez, 2001). Finally, it can be said that, in Satchari area NTFPs widening the opportunity of poorer people and act as a saving deposit since, it favors household's in their harsh conditions. Such an observation was also recognized and felt by Sunderlin *et. al.* (2005) and Arnold & Ruiz-Perez (2001). Table 5.1 shows the comparison in regards to extent of contribution of NTFPs to people's cash income in various regions of the world.

Table 5.1. The extent of contribution of NTFPs to people's cash income: **some experiences**

Country	Estimates of contribution	Author(s)
Orissa, India	19%	Mahapatra <i>et. al.</i> (2005)
Jharkhand, India	11%	-
Cameroon	15%	Ambrose-Oji (2003)
Zimbabwe	22%-35%	Cavendish (2000)
Tamil Nadu, India	24%	Ganesan (1993)
Sri Lanka	21%	Gunatillike <i>et. al.</i> (1993)
West Bengal, India	17%	Malhotra <i>et. al.</i> (1991)

NTFPs and forest conservation

Data analysis reveals that, the purpose of collection of most NTFPs in Satchari area is self consumption; only few of the NTFP hold the true opportunity to generate income to HHs livelihoods. It was also found that the extents of collection of various NTFPs are mainly medium in the area and their stocks are also noteworthy. Beside it was understood that, based

on peoples perception the impact of collection of various NTFPs are medium to negligible in Satchari area. Peoples also noticed that in most times they do not necessarily extract the whole part of a plant species which does not hampers the existence and regeneration of the respective species.

People in addition reported that, they usually collected dead, over mature, fallen and low quality tree as fuelwood which doesn't change the forest ecosystem considerably. Again, bamboos were collected only when they became mature and attain a usable height. The *kumbi* leaves collection couldn't make any sizeable change in the tree and harvested leaves got recovered very soon by the tree. *Taragota* exploited yearly, in the monsoon and since only the fruit (seed) are collected from near the base of the tree without uprooting the full individual, they got enough intervals for another fruiting season. The collection of *menda* bark is somehow proved harmful to the forest since the tree is very limitedly found in wild and there is an existing demand for its bark for the local processing industries. This situation is however predicted earlier by Belcher & Kusters (2004) who stated that, 'increased commercial value of NTFPs may lead to resource depletion'.

Again, in Satchari area; the various perception and beliefs of local people over NTFP collection were found to be very scientific, supportive and comparable to the argument and prediction done by various popular author on the role of NTFPs in forest conservation (see for example; CBD, 2003; Laird, 2002; Shanley *et. al.* 2002; Bass *et. al.* 2001; Arnold & Ruiz Pérez, 2001; Dove, 1993; Nepstad & Schwartzman, 1992; Plotkin & Famolare, 1992; Sayer, 1991; Anderson, 1990; Peters *et. al.* 1989; Myers, 1988; Oldfield, 1987 etc.).

Such findings firmly indicate that, NTFP embrace a great opportunity of forest conservation and livelihood enhancement of poorer people in Satchari area and other regions and this chance will be broaden if government legalized this activity in protected area under a strict monitoring system.

Beside, the problems and challenges regarding PA management as well as the future of community management which I observed in Satchari area during my field visits are more or less similar and comparable to earlier studies with approximately same objectives (e.g., McNeely, 2005; Durst *et. al.* 2005; Barber *et. al.* 2004; Borrini- Feyeraband *et. al.* 2004; Scialabba and Williamson, 2004; Colfer, and Byrone, 2001 etc.) conducted all over the world.

Chapter **6**

Conclusion

Conclusion

The diminishing and depleting natural resources in the developing countries like Bangladesh will surely be replenish if the concept of protected area management is properly executed. It is now essential to conserve the country's vanishing natural forests by bringing them under a well defined PA network system, ensuring a fair representativeness of all vegetation types. Again, in our country simply creating PAs under the provision of law and exclusion of forest-dependent people did not produce positive conservation results as expected, since people consider such efforts ignoring their traditional rights on forest which they have enjoyed for generations. Government therefore needs to focus on co-management system. Besides, government should immediately look into the following things to achieve a long-term and effective PA management system. This includes:

- Taking poverty reduction strategies around PAs through developing alternative income generating (AIG) activities and by providing micro-credit facilities to the rural people.
- Create opportunities to develop ecotourism based on protected areas.
- Restore and manage buffer zones as an alternative resource utilization zone as well as fixing an allowable resource use limit from the PAs that offers both ecological and economical sustainability to local environment and livelihoods.
- Formulate a separate institutional body for the management and monitoring of PAs in line with NBSAP
- Capacity building of the management personnel through designing specialized courses on conservation and management aspects of PA.
- Generate scopes for materializing internal income sources (e.g., selling entry tickets, permissions for photograph, souvenir etc) for sustainable financing of protected areas.

From the present study, it is clearly understood that PAs if managed professionally considering all the physical, environmental and socio-economic factors could be a real source of livelihood to the inhabitants residing in and around the PA apart from its significant role in conserving biodiversity on sustainable basis. Again, although previously NTFPs were collected by people mostly for their self consumption but now with the increasing demand of NTFPs for urban as well as local consumption and with the development of modern communication and transportation system many people living in or around the forests relies

partially or fully on NTFPs for their subsistence and livelihood. The value must be recognized and realized by the managers for ensuring sustainability of the PA.

To do so it is important to make necessary changes in the definition and utilization of PA system in the country. Local people should be provided with the legal permission for extraction of NTFPs from the park by fixing an allowable or sustainable limit of resource collection based on their economic needs and the ecological tolerance of the local environment. This limit also needs to be strictly maintained and supervised by local organization (i.e., PA managers). Beside, to ensure maximum benefit from non-timber forest products the following steps needs to be taken

- Ensuring sustainable flow of raw materials by the introduction of promising NTFP species in buffer zone management practice as well as domestication in the homesteads or other vacant and under utilized areas;
- Harvesting NTFPs maintaining the silvicultural and harvesting prescriptions
- Improvement of post-harvest care to confirm optimum qualitative and quantitative value
- Introduction of recent processing technologies
- Improvement of storage facilities
- Develop strong marketing infrastructure and channel to create strong networking among producers, traders and companies

The sustainable management approach keeping in mind the co-management techniques will certainly create a new path for the better and effective administration of the protected area viz. Satchari National Park

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ANNEXES

ANNEX 1: Flora of Satchari Forest (Choudhury et. al. 2004)

SI. No.	Species	Family	Habit	Occurrence
1.	<i>Abrus precatorius</i>	Papilionaceae	Climber	Not very common
2.	<i>Acacia auriculiformis</i>	Mimosaceae	Tree	Planted
3.	<i>Acacia mangium</i>	Mimosaceae	Tree	Planted
4.	<i>Actinodaphne angustifolia</i>	Lauraceae	Tree	Common
5.	<i>Ageratum conyzoides</i>	Asteraceae	Herb	Common
6.	<i>Aglaonema hookerianuin</i>	Araceae	Herb	Not very common
7.	<i>Albizia chinensis</i>	Mimosaceae	Tree	Planted
8.	<i>A. lebeck</i>	Mimosaceae	Tree	Planted
9.	<i>A. odoratissima</i>	Mimosaceae	Tree	Planted
10.	<i>A. procera</i>	Mimosaceae	Tree	Planted
11.	<i>Allophylus cobbe</i>	Sapindaceae	Shrub	Common
12.	<i>Alpinia galanga</i>	ingiberaceae	Herb	Very Common
13.	<i>A. nigra</i>	Zingiberaceae	Herb	Very common
14.	<i>Alstonia scholaris</i>	Apocynaceae	Tree	Not common
15.	<i>Amoora wallichii</i>	Eliaceae	Tree	Not common
16.	<i>Anisomeies ovata</i>	Amiaceae	Herb	Common
17.	<i>Anona reticulata</i>	Annonaceae	Tree Planted	
18.	<i>Anthocephalus chinensis</i>	Rubiaceae	Tree Planted	
19.	<i>Antidesma bunius</i>	Euphorbiaceae	Tree	Common
20.	<i>A. ghaesembilla</i>	Euphorbiaceae	Tree	Common
21.	<i>Aphania danura</i>	Sapindaceae	Shrub	Common
22.	<i>Aphanomixis polystachya</i>	Meliaceae	Tree Common	
23.	<i>Aporusa dioica</i>	Euphorbiaceae	Tree Common	
24.	<i>Aquillaria agallocha</i>	Thymeliaceae	Tree	Planted
25.	<i>Ardisia solanacea</i>	Myrsinaceae	Tree	Common
26.	<i>Aristolochiatagal</i>	Aristolochiaceae	Climber	Common
27.	<i>Artocarpus chaplasha</i>	Moraceae	Tree	Very Common
28.	<i>Artocarpus heterophyllus</i>	Moraceae	Tree	Planted
29.	<i>Artocarpus lacucha</i>	Moraceae	Tree	Not very common
30.	<i>Atalantia monophylla</i>	Rutaceae	Shrub	Not common
31.	<i>Averrhoa carambola</i>	Averrhoaceae	Tree	Planted
32.	<i>Bauhinia purpurea</i>	Caesalpinaceae	Tree	Not very common
33.	<i>B. variegata</i>	Caesalpinaceae	Tree	Not very common
34.	<i>Bischofia javanica</i>	Euphorbiaceae	Tree	Common
35.	<i>Bixa orellana</i>	Bixaceae	Tree	Common
36.	<i>Blumea lacera</i>	steraceae	Herb	Common
37.	<i>Bombaxinsigne</i>	Bombacaceae	Tree	Common
38.	<i>Bridelia stipularis</i>	Euphorbiaceae	Shrub	Common
39.	<i>Buettneria pilosa</i>	Sterculiaceae	Climber	Common
40.	<i>Butea monosperma</i>	Papilionaceae	Tree	Common
41.	<i>Caesalpinia crista</i>	Caesalpinaceae	Shrub	Very common
42.	<i>Calamus viminalis</i>	Arecaceae	Climber	Not very common
43.	<i>Callicarpa longifolia</i>	Verbenaceae	Shrub Common	
44.	<i>Cornelia sinensis</i>	Theaceae	Shrub	Cultivated
45.	<i>Canarium benghalense</i>	Burseraceae	Tree	Rare
46.	<i>Carallia brachiata</i>	Rhizophoraceae	Tree	Not common
47.	<i>Careya arborea</i>	Lecythidaceae	Tree	Not very common
48.	<i>Caryota urens</i>	Palmae	Tree	Sporadic
49.	<i>Cassia siamea</i>	Caesalpinaceae	Tree	Common
50.	<i>Costanopsis tributoides</i>	Fagaceae	Tree	Scattered
51.	<i>Cayratia japonica</i>	Vitaceae	Climber	Common
52.	<i>Centetla asiatica</i>	Hydrocotylidaceae	Herb	Common
53.	<i>Centotheca lappacea</i>	Poaceae	Herb	Common
54.	<i>Chaetocarpus castanocarpus</i>	Euphorbiaceae	Tree	Not common
55.	<i>Chickrassia tabularis</i>	Meliaceae	Tree	Common
56.	<i>Chrysopogon adculatus</i>	Poaceae	Herb	Common
57.	<i>C/ssus adnata</i>	Vitaceae	Climber	Common
58.	<i>C. repanda</i>	Vitaceae	Climber	Common
59.	<i>Clausena heptaphylla</i>	Rutaceae	Shrub	Common

60.	<i>Clerodendrum viscosum</i>	erbenaceae	Shrub	Common
61.	<i>Cnesmone javanica</i>	Euphorbiaceae	Shrub	Common
62.	<i>Cocculus hirsutus</i>	Menispermaceae	Climber	Rare
63.	<i>Commelina benghalensis</i>	Commelinaceae	Herb	Common
64.	<i>Costus speciosus</i>	Costaceae	Herb	Common
65.	<i>Crotalaria pallida</i>	Fabaceae	Shrub	Common
66.	<i>Curcuma amada</i>	Zingiberaceae	Herb	Not very common
67.	<i>Dalbergia stipulacea</i>	Fabaceae	Tree	Common
68.	<i>D. tomarandifolia</i>	Fabaceae	Tree	Common
69.	<i>Delima sarmentosa</i>	Dilleniaceae	Climber	Common
70.	<i>Dendrophoe falcata</i>	Loranthaceae	Parasite	Common
71.	<i>Derris elliptica</i>	Fabaceae	Climber	Common
72.	<i>D. robusta</i>	Fabaceae	Tree	Not very common
73.	<i>Desmos chinensis</i>	Annonaceae	Shrub	Common
74.	<i>Digittaria sanguinalis</i>	Poaceae	Herb	Common
75.	<i>Ditlenia indica</i>	Dilleniaceae	Tree	Planted
76.	<i>Dillenia pentagyna</i>	Dilleniaceae	Tree	Not very common
77.	<i>Dioscorea glabra</i>	Dioscoreaceae	Climber	Common
78.	<i>Diospyros lancaefolia</i>	Ebenaceae	Tree	Not common
79.	<i>Dipterocarpus turbinalis</i>	Dipterocarpaceae	Tree	Planted
80.	<i>Dracaena spicata</i>	Liliaceae	Herb	Very common
81.	<i>Duabanga grandiflora</i>	onneratiaceae	Tree	Rare
82.	<i>Elaeocarpus floribundus</i>	Elaeocarpaceae	Tree	Common
83.	<i>Elaeocarpus robusta</i>	Elaeocarpaceae	Tree	Not very common
84.	<i>Eteusine indtca</i>	Poaceae	Herb	Common
85.	<i>Engelhardtia spicata</i>	Juglandaceae	Tree	Not very common
86.	<i>Entada phaseoloides</i>	Mimosaceae	Climber	Common
87.	<i>Erythrina orientalis</i>	Fabaceae	Tree	Common
88.	<i>E. variegata</i>	Fabaceae	Tree	Common
89.	<i>Eucalyptus camaldulensis</i>	Myrtaceae	Tree	Planted
90.	<i>Eupatorium odoratum</i>	Asteraceae	Shrub	Common
91.	<i>Euphorbia hirta</i>	Euphorbiaceae	Herb	Common
92.	<i>Ficus benghalensis</i>	Moraceae	Tree	Not very common
93.	<i>F. benjamina</i>	Moraceae	Tree	Common
94.	<i>F. geniculata</i>	Moraceae	Tree	Common
95.	<i>F. hirsuta</i>	Moraceae	Tree	Common
96.	<i>F. hispida</i>	Moraceae	Tree	Common
97.	<i>F. obtusi folia</i>	Moraceae	Tree	Common
98.	<i>F. racemosa</i>	Moraceae	Tree	Common
99.	<i>F. semicordata</i>	Moraceae	Tree	Common
100.	<i>Flacourtia jangomas</i>	Flacourtiaceae	Tree	Common
101.	<i>Garcinia cowa</i>	Cluceaceae	Tree	Not very common
102.	<i>Gardenia coronaria</i>	Rubiaceae	Tree	Common
103.	<i>Garuga pinnata</i>	Burseraceae	Tree	Not very common
104.	<i>Gelonium multiflorum</i>	Euphorbiaceae	Tree	Common
105.	<i>Glochidion lanceolarium</i>	Euphorbiaceae	Tree	Common
106.	<i>G. multiloculare</i>	Euphorbiaceae	Tree	Common
107.	<i>Glycosmis arborea</i>	Rutaceae	Shrub	Common
108.	<i>Gmelina arborea</i>	Verbenaceae	Tree	Common
109.	<i>Gnaphalium luteoalbum</i>	Asteraceae	Herb	Rare
no.	<i>Gomphostemma parviflora</i>	Lamiaceae	Shrub	Common
in.	<i>Goniothalamus sesquipetalis</i>	Annonaceae	Shrub	Rare
112.	<i>Gouania tiliifolia</i>	Rhamnaceae	Shrub	Rare
113.	<i>Grewia denticulata</i>	Tiliaceae	Shrub	Not very common
114.	<i>G. serrulata</i>	Tiliaceae	Shrub	Not very common
115.	<i>Habenaria sp.</i>	Orchidaceae	Herb	Common
116.	<i>Haplophragma adenophyllum</i>	Bignoniaceae	Tree	Common
117.	<i>Hedyotis scandens</i>	Rubiaceae	Climber	Not very common
118.	<i>Hemidesmus indicus</i>	Asclepiadaceae	Shrub	Not very common
119.	<i>Heteropanax fragrans</i>	Araliaceae	Tree	Common
120.	<i>Hevea brasiliensis</i>	Euphorbiaceae	Tree	Planted
121.	<i>Holarrhena antidysenterica</i>	Asclepiadaceae	Shrub	Common
122.	<i>Hoiigarna longifolia</i>	Anacardiaceae	Tree	Not common
123.	<i>Homalonema ammatica</i>	Araceae	Herb	Common
124.	<i>Hoya parasitica</i>	Asclepiadaceae	Climber	Common
125.	<i>Hydnocarpus kurzii</i>	Flacourtiaceae	Tree	Rare
126.	<i>Ichnocarpus frutescens</i>	Apocynaceae	Climber	Common

127.	<i>Ixora parviflora</i>	Rubiaceae	Shrub	Common
128.	<i>Ixora spectabilis</i>	Rubiaceae	Shrub	Common
129.	<i>Ixora undulata</i>	Rubiaceae	Shrub	Common
130.	<i>Jasminum subtriplinerve</i>	Oleaceae	Climber	Common
131.	<i>Lagerstroemia speciosa</i>	Lythraceae	Tree	Not very common
132.	<i>Lantana coromandelica</i>	Anacardiaceae	Tree	Not common
133.	<i>Lantana camara</i>	Verbenaceae	Shrub	Common
134.	<i>Lantana indica</i>	Verbenaceae	Shrub	Common
135.	<i>Leea acuminata</i>	Leaceae	Shrub	Common
136.	<i>Leea mbusta</i>	Leaceae	Shrub	Common
137.	<i>Lsambusina</i>	Leaceae	Shrub	Common
138.	<i>Lophatherum gracile</i>	Poaceae	Herb	Common
139.	<i>Lepidagathis hyalina</i>	Acanthaceae	Herb	Common
140.	<i>Lepisanthes rubiginosa</i>	Sapindaceae	Tree	Common
141.	<i>Utsea glutinosa</i>	Lauraceae	Tree	Common
142.	<i>L. tandfolia</i>	Lauraceae	Shrub	Not very common
143.	<i>L. monopetala</i>	Lauraceae	Tree	Not very common
144.	<i>Lycopodiella cernua</i>	Lycopodiaceae	Herb	Not very common
145.	<i>Macaranga denticulate</i>	Euphorbiaceae	Tree	Common
146.	<i>Macropanax undulatus</i>	Araliaceae	Tree	Not very common
147.	<i>Maesa indica</i>	Myrsinaceae	Tree	Common
148.	<i>Mallotus albus</i>	Euphorbiaceae	Tree	Not very common
149.	<i>M. philippinensis</i>	Euphorbiaceae	Tree	Not very common
150.	<i>Mangifera indica</i>	Anacardiaceae	Tree	Planted
151.	<i>M. sylvatica</i>	Anacardiaceae	Tree	Rare
152.	<i>Melastoma malabathrium</i>	Melastomaceae	Shrub	Common
153.	<i>Melocanna bacdfera</i>	Poaceae	Tree	Common
154.	<i>Melodorum rubiginosum</i>	Annonaceae	Climber	Not common
155.	<i>Merremia umbellata</i>	Convolvulaceae	Climber	Very common
156.	<i>Microcos paniculate</i>	Tiliaceae	Tree	Common
157.	<i>Micromelum minutum</i>	Rutaceae	Tree	Common
158.	<i>Microsolen cochinchinensis</i>	Loranthaceae	Parasite	Common
159.	<i>Mikania scandens</i>	Asteraceae	Climber	Very common
160.	<i>Mimosa pudica</i>	Mimosaceae	Herb	Common
161.	<i>Moghania congesta</i>	Fabaceae	Shrub	Common
162.	<i>Morinda angustifolia</i>	Rubiaceae	Shrub	Not very common
163.	<i>Mucuna imbricata</i>	Fabaceae	Climber	Common
164.	<i>M. monosperma</i>	Fabaceae	Climber	Common
165.	<i>Murdannio nudiflora</i>	Commelinaceae	Herb	Not very common
166.	<i>Musa ornata</i>	Musaceae	Herb	Not very common
167.	<i>Myrianeuron nutans</i>	Rubiaceae	Shrub	Not very common
168.	<i>Nelsonia canescens</i>	Acanthaceae	Herb	Common
169.	<i>Ophiorrhizamungos</i>	Rubiaceae	Herb	Rare
170.	<i>Oroxylum indicum</i>	Bignoniaceae	Tree	Common
171.	<i>Oxalis corniculata</i>	Oxalidaceae	Herb	Not very common
172.	<i>Pandanus odoratissimus</i>	Pandanaceae	Shrub	Common
173.	<i>Pandanui tecrorius</i>	Pandanaceae	Shrub	Common
174.	<i>Pajaniella tongifolia</i>	Bignoniaceae	Tree	Rare
175.	<i>Peperomia peiludda</i>	Piperaceae	Herb	Common
176.	<i>Phlogacanthus thyrsoiflorus</i>	Acanthaceae	Shrub	Not very common
177.	<i>Phlogacanthus tubiflorus</i>	Acanthaceae	Shrub	Not very common
178.	<i>Phrynium imbricatum</i>	Marantaceae	Herb	Rare
179.	<i>Phoebe arrenuata</i>	Lauraceae	Tree	Common
180.	<i>Piper longum</i>	Piperaceae	Climber	Common
181.	<i>Piper rhytidocarpum</i>	Piperaceae	Climber	Not very common
182.	<i>Piper syvestre</i>	Piperaceae	Climber	Not very common
183.	<i>Pithecellobium angustata</i>	Mimosaceae	Tree	Not very common
184.	<i>Premna corymbosa</i>	Verbenaceae	Tree	Common
185.	<i>Psidium guajava</i>	Myrtaceae	Tree	Planted
186.	<i>Psychotria adenophylla</i>	Rubiaceae	Shrub	Common
187.	<i>Psychotria colucarpa</i>	Rubiaceae	Shrub	Common
188.	<i>Psychotria fulva</i>	Rubiaceae	Shrub	Common
189.	<i>Pterigota alata</i>	Sterculiaceae	Tree	Common
190.	<i>Pterospermum acerifolium</i>	Sterculiaceae	Tree	Not very common
191.	<i>Pterospermum semisegetatum</i>	Sterculiaceae	Tree	Common
192.	<i>Quercus spicata</i>	Fagaceae	Tree	Common
193.	<i>Randia dumetorum</i>	Rubiaceae	Shrub	Common
194.	<i>Raphidophora glauca</i>	Araceae	Climber	Common

195.	<i>Saccharum spontaneum</i>	Poaceae	Herb	Common
196.	<i>Sopium baccatum</i>	Euphorbiaceae	Tree	Not very common
197.	<i>Schima wallichii</i>	Ternstroemiaceae	Tree	Sporadic
198.	<i>Selena terristis</i>	Cyperaceae	Herb	Common
199.	<i>Scoparia dulcis</i>	Scrophulariaceae	Herb	Common
200.	<i>Scurruta gracilifolia</i>	Loranthaceae	Parasite	Not common
201.	<i>Semecarpus anacardium</i>	Anacardiaceae	Tree	Common
202.	<i>Shorea robusta</i>	Dipterocarpaceae	Tree	Planted
203.	<i>Smitax macrophila</i>	Smilacaceae	Climber	Common
204.	<i>Smilax prolifera</i>	Smilacaceae	Climber	Common
205.	<i>Solanum torvum</i>	Solanaceae	Herb	Common
206.	<i>Spatholobus roxburghii</i>	Fabaceae	Climber	Not very common
207.	<i>Spondias pinnate</i>	Anacardiaceae	Tree	Not very common
208.	<i>Sterculiavilosa</i>	Sterculiaceae	Tree	Common

ANNEX 2. Fauna of Satchari Forest (Choudhury *et. al.* 2004)

Amphibians

SL. No	Order	Family	Scientific Name	English Name	Local Name	IUCN Bangladesh Category	IUCN Global Category	CITES Schedule
1.	Anura	Bufo	<i>Bufo melanostictus</i>	Common Toad	Kuno Bang	NO	-	-
2.	Microhylidae		<i>Kaloula pulchra</i>	Painted Bull Frog	Venpu Bang	VU	-	-
3.			<i>Microhyla ornata</i>	Ornate Microhylid	Cheena Bang	VU	-	-
4.			<i>Microhyla rubra</i>	Red Microhylid	LalCheena Bang	VU	-	-
5.		Ranidae	<i>Euphlyktis cyanophlyctis</i>	Skipper Frog	Kotkoti Bang	NO	-	-
6.			<i>Hoplobatmchus tigerinus</i>	Bull Frog	Kola Bang	NO	II	-
7.			<i>Limnonectes limnocharis</i>	Crickit Frog	Jhi-jhi Bang	NO	-	-
8.		Rhacophoridae	<i>Polypedates leucomystax</i>	Tree Frog	Dorakata Gecho Bang	NO	-	-
9.			<i>Polypedates macuiatus</i>	Maculated Tree Frog	Gecho Bang	NO	-	-

Reptiles

SL. No	Order	Family	Scientific Name	English Name	Local Name	IUCN Bangladesh Category	IUCN Global Category	CITES Schedule
1.	Testudines	Testudinidae	<i>Indotestudo elongata</i>	Elongated Tortoise	Halud Pahari Kasim	CR	VU	-
2.			<i>Manouria emys</i>	Asian Giant Tortise	Pahari Ksim	CR	-	-
3.		Trionychidae	<i>Aspideretes gangeticus</i>	Ganges Shoftshell Turtle	Khalua Kasrm	EN	-	-
4.		Gekkonidae	<i>Gekko gekko</i>	Wall Lizard	Tokkhak	VU	-	-
5.			<i>Hemidactyus brookii</i>	House Lizard	Tiktiki	NO	-	-
6.			<i>Hemidactyus fkaviviridis</i>	Common House Lizard	Tiktiki	NO	-	-
7.		Agamidae	<i>Calotes jerdoni</i>	Garden Lizard	Sabuj Rokto-chosha	DD	-	-
8.			<i>Calotes rouxii</i>	Forest Calotes	Rokto-chosha	VU	-	-
9.			<i>Calotes versicolor</i>	Common Garden Lizard	Rokto-chosha	NO	-	-
10.		Scincidae	<i>Mabuya carinata</i>	Common Skink	Anjon	NO	-	-
11.			<i>Mabuya dissimilis</i>	Stripped Skink	Anjon	VU	-	-
12.		Varanidae	<i>Varanus bengalensis</i>	Bengal Monitor	GuiShap	VU	-	I
13.			<i>Varanus flavescens</i>	Yellow Monitor	Shona Gui	EN	-	I
14.	Serpentes	Typhlopidae	<i>Ramphotyphiops braminus</i>	Common Worm Snake	Dumukha Shap	NO	-	-
15.			<i>Typhlops diardii</i>	Diard's Worm Snake	Dumukha Shap	DD	-	-
16.			<i>Typhlops porrectus</i>	Slender Worm Snake	Dumukha Shap	DD	-	-
17.		Boidae	<i>Python molurus</i>	Rock Python	Ajagar	EN	LR	I
18.		Colubridae	<i>Ahaetuila nasutus</i>	Common Vine Snake	Laodoga	Shap	VU	-
19.			<i>Boiga cyanea</i>	Green Cat Snake	Sabuj Phonimonosha	VU	-	-
20.			<i>Boiga triginatus</i>	Common Cat Snake	Phonimonosha	DD	-	-
21.			<i>Chysopelea ornate</i>	Ornate Flying Snake	Kalnagini	EN	-	-
22.			<i>Colubermucosus</i>	Rat Snake	Daraj	VU	-	II
23.			<i>Coluber nigromarginatus</i>	Green Rat Snake	Daraj	VU	-	-
24.			<i>Dendrelaphis pictus</i>	Painted BronzebackTree Snake	GechoShap	VU	-	-
25.			<i>Elaphe Helena</i>	Common Trinket Snake	Dudhraj	EN	-	-
26.			<i>Elaphe radiata</i>	Copper HeadTrinket Snake	Dudhraj	EN	-	-
27.			<i>Liopeltis calamaria</i>	Lesser Stripe-necked Snake	-	DD	-	-
28.			<i>Lycodon aulicus</i>	Common Wolf Snake	Gharginni Shap	VU	-	-
29.			<i>Oligodon arnensis</i>	Common Kukri Snake	-	DD	-	-
30.			<i>Oligodon dnereus</i>	Black-barred Kukri Snake	-	DD	-	-
31.			<i>Oligodon dorsalis</i>	Spot-tailed Kukri Snake	Kukri	VU	-	-
32.			<i>Pareas monticalu</i>	Assam Snail Eater	Shamuk-Khor	DD	-	-
33.			<i>Psammodynastes pulverulentus</i>	Mock Viper	Pahari Shap	DD	-	-

34.			<i>Rhabdophis subminiatus</i>	Red-necked Keelback	Laldhora Shao	VU	-	-
35.			<i>Xenochrophis cerasogaster</i>	Dark-bellied Marsh Snake	Kalo Mete Dhora Shap	VU	-	-
36.			<i>Xenochrophis piscator</i>	Checkered Keelback	Dhora Shap	NO	-	-
37.		Elapidae	<i>Bungarus caeruleus</i>	Common Krait	Kal Keotey	EN	-	-
38.			<i>Bungarus fassdatus</i>	Banded Krait	Shankini Shap	EN	-	-
39.			<i>Callophis melanurus</i>	Slender Coral Snake	PathorShap	DD	-	-
40.			<i>Naja kaouthia</i>	Monocellate Cobra	Gokhra Shap	VU	-	-
41.			<i>Naja naja</i>	Binocellate Cobra	Khoia Gokhra	EN	-	II
42.			<i>Ophiophagus</i>	Hannah King Kobra	Raj Gokhra	EN	-	II
43.		Viperidae	<i>Ovophis monticola</i>	Blotched Pit Viper	-	DD	-	-
44.			<i>Trimeresurus albolabris</i>	Bamboo Pit Viper	-	DD	-	-
45.			<i>Vipera russellii</i>	Russell's Viper	Chandrobora	CR	-	-

Birds

SL. No.	Order	Family	Scientific Name	English Name	Local Name	Resident/ Migratory	IUCN Bangladesh Category	IUCN Global Category
1.	Galliformes	Phasianidae	<i>Arborophila atrogularis</i>	White-cheeked Partridge	-	R	DD	LR
2.			<i>Coturnix chinensis</i>	Blue-breasted Quail	-	R	DD	-
3.			<i>Francolinsu gularis</i>	Swamp Francolin	Kea/ Jolar Titir	R	CR	VU
4.			<i>Francolinsu francolinsu</i>	Black Francolin	Kalo Titir/Sheikh Farid	R	CR	-
5.			<i>Gailus gallus</i>	Red Jungle fowl	Bon Morog/Murgi	R	NO	-
6.			<i>Dendrocygna bicolor</i>	Fulvous Whistling-duck	Baro Shorali	R	NO	-
7.	Anseriformes	Dendrocygnidae	<i>Dendrocygna javanica</i>	Lesser Whistling-duck	Sharali/Gecho-Hans	R	NO	-
8.	Piciformes	Picidae	<i>Btythipicus pyrrhotis</i>	Bay Woodpecker	-	R	DD	-
9.			<i>Celeus brachyurus</i>	Rufous Woodpecker	Lalchey Kaththokra	R	NO	-
10.			<i>Dendrocopos canicapillus</i>	Grey-capped Pygmy Woodpecker	Dhushar Matha Baman Kaththokra	R	NO	-
11.			<i>Dendrocopos macei</i>	Fulvous-brested Woodpecker	Pakra Kaththokra	R	NO	-
12.			<i>Dendrocopos mahrettemis</i>	Yellow-fronted Pied Woodpecker	Pakra Kaththokra	R	DD	-
13.			<i>Dendrocopos nanus</i>	Brown-capped Ptgmy Woodpecker	Bana Kaththokra	R	DD	-
14.			<i>Jynx torquilla</i>	Eurasian Wryneck	Metho Kaththokra	M	-	-
15.			<i>Dinopium benghaiense</i>	Black-rumped Flameback	Kaththokra	R	NO	-
16.			<i>Dinopiumjavanense</i>	Common Flameback	-	R	NO	-
17.			<i>Dinopium shorii</i>	Himalayan Flameback	-	R	DD	-
18.			<i>Gecinulus grantia</i>	Pale-headed Woodpecker	-	R	DD	-
19.			<i>Mulleripicus pulverulentus</i>	Great Slaty Woodpecker	-	R	DD	-
20.			<i>Picus canus</i>	Grey-headed Woodpecker	-	R	NO	-
21.			<i>Picas chlorophus</i>	Lesser Yellow/nape	-	R	NO	-
22.		Megalaimidae	<i>Megalaima haemacephala</i>	Coppersmith Barbet	Choto Basanta Bauri	R	NO	-
23.			<i>Megalaima asiatica</i>	Blue-throated Barbet	Basanta Bauri	R	NO	-
24.			<i>Megalaima lineate</i>	Lineated Barbet	Gurkhod/Beghbou	R	NO	-
25.	Upupiformes	Upupidae	<i>Upupa epops</i>	Common Hoopoe	Hudhud/Solaiman Pakhi	R	NO	-
26.	Coraciiformes	Coraciidae	<i>Caracas benghalensis</i>	Indian Roller	Nilkantha	R	NO	-
27.		Alcedinidae	<i>Alcedo atthis</i>	Common Kingfisher	Choto Maachranga	R	NO	-
28.			<i>Halcyon capensis</i>	Stork-billed Kingfisher	Megh-hao	R	NO	-
29.			<i>Halcyon smyrnensis</i>	White breasted Kingfisher	Maachranga	R	NO	-

30.		Meropidae	<i>Merops ieschenauttia</i>	Chestnut-headed Bee-eater	-	R	NO	-
31.			<i>Merops orientalis</i>	Green Beeeater	Suichora/Banspati	R	NO	-
32.			<i>Nyctyornis athertoni</i>	Blue-bearded Bee-eater	Baro Suichora/Pahari Suichora	R	DD	-
33.	Cuculiformes	Cuculidae	<i>Cacomontis merulinus</i>	Plaintive cuckoo	Chatak/Sorgom	R	NO	-
34.		Centropodidae	<i>Centropus sinensis</i>	Greater Coucal	Kanakua/Coucal	R	NO	-
35.			<i>Chrysococcyx maculatus</i>	Asian Emerald Cuckoo	-	R	DD	-
36.			<i>Clamator jacobinus</i>	Pied Cuckoo	Papiya	R	NO	-
37.			<i>Cuculus micropterus</i>	Indian Cuckoo	Bou-Katha-Kao Pakhi	R	NO	-
38.			<i>Eudynamys scolopacea</i>	Asian Cuckoo	Kokil/Kukil	R	NO	-
39.			<i>Hierococcyx varius</i>	Common Hawk Cuckoo	Chokhgeto Pakhi	R	NO	-
40.			<i>Phaenicophaeus</i>	feschenaulti Sirkeer Malkoha	-	R	EN	-
41.			<i>Phaenicophaeus tristis</i>	Green-billed Malkoha	Sabuj Kokil	R	NO	-
42.	Psittaciformes	Psittacidae	<i>Loriculus vernalis</i>	Vernal Hanging Parrot	Lotkan	R	NO	-
43.			<i>Psittacula finschii</i>	Grey-headed Parakeet	KalomathaTia	R	DD	-
44.			<i>Psittacula roseate</i>	Roseringed Parakeet	Tia	R	NO	-
45.			<i>Psittacula roseate</i>	Blossom-headed Parakeet	LalmathaTia/Hiram on	R	NO	-
46.	Apodiformes	Apodidae	<i>Cypsiurus balasiensis</i>	Asian Palm Swift	Nakkati	R	NO	-
47.	Strigiformes	Tytonidae	<i>Tyto alba</i>	Barn Owl	Laxmi Pencha	R	NO	-
48.		Strigidae	<i>Athene brama</i>	Spotted Owlet	Khuruley Pencha	R	NO	-
49.			<i>Bubo bengalensis</i>	Rock Eagle Owl	Hutum Pencha	R	NO	-
50.			<i>Glauddium radiatum</i>	Jungle Owlet	R	NO	-	-
51.			<i>Ketupa zeylonensis</i>	Brown Fish Owl	Bhutum Pencha	R	VU	-
52.			<i>Ninox scutulata</i>	Brown Hawk Owl	Kupokh	R	NO	-
53.			<i>Otus lempiji</i>	Collared Scops Owl	Nimpokh	R	NO	-
54.			<i>Otus scops</i>	Eurasian Scops Owl	Nimpokh	R	NO	-
55.			<i>Otus spilocephalus</i>	Mountain Scops Owl	R	DD	-	-
56.		Batrachostomidae	<i>Batrachostomus hodgsoni</i>	Hodgson's Frogmouth	R	DD	-	-
57.		Caprimulgidae	<i>Caprimulgus affinis</i>	Savanna Nightjar	R	DD	-	-
58.			<i>Caprimulgus asiaticus</i>	Indian Nightjar	Choto Ratchara	R	NO	-
59.			<i>Caprimulgus macrurus</i>	Large-tailed Nightjar	Ratchara	R	NO	-
60.	Columbiformes	Columbidae	<i>Chalcophaps</i>	Emerald Dove	Sabuj Ghughu	R	NO	-
61.			<i>Columba livia</i>	Rock Pigeon	Jalali Kabutor	R	NO	-
62.			<i>Ducula aenea</i>	Green Imperial Pigeon	Dhumkol	R	DD	-

63.			<i>Ducula badia</i>	Mountain Imperial Pigeon	Dhumkol	R	DD	-
64.			<i>Streptopelia chinensis</i>	Spotted Dove	Tila Ghughu	R	NO	-
65.			<i>Streptopelia decaocta</i>	Eurasian Collared Dove	Raj Ghughu Ghughu/Dhobal Ghughu	R	NO	-
66.			<i>Streptopelia tranquebarica</i>	Red Collared Dove	Lal Ghughu Ghughu/Jongla Ghughu	R	NO	-
67.			<i>Treron apicauda</i>	Pin-tailed Green Pigeon	Horial/Horikol	R	CR	-
68.			<i>Treron bicincta</i>	Orange-breasted Green Pigeon	Horial/Horikol	R	NO	-
69.			<i>Treron curvirostra</i>	Thick-billed Green Pigeon	-	R	DD	-
70.			<i>Treron phoenicoptero</i>	Yellow-footed Green Pigeon	Horial/Botkol	R	NO	-
71.			<i>Treron pompadora</i>	Pompadour Green Pigeon	Choto Horial	R	NO	-
72.			<i>Streptopelia orientalis</i>	Oriental Turtle Dove	Ghughu	M	-	-
73.			<i>Treron sphenura</i>	Wedge-tailed Green Pigeon	Horial	M	-	-
74.	Gruiformes	Rallidae	<i>Amourornis phoenicurus</i>	White-breasted Waterhen	Dahuk	R	NO	-
75.			<i>Gallicrex cinerea</i>	Watercock Kura	R	NO	-	-
76.			<i>Rallus aquaticus</i>	Water Rail	Jalchari Rail	M	-	-
77.	Ciconiiformes	Rostratulidae	<i>Rostratuia bengalemis</i>	Greater Painted-snipe	RongilaChaga	R	NO	-
78.		Jacaniidae	<i>Metopidius indicus</i>	Bronze-winged Jacana	Jolpipi/Pipi	R	NO	-
79.			<i>Vanellus duvaucetii</i>	River Lapwing	Hot-titi	R	EN	-
80.		Charadriidae	<i>Vaneilus indicus</i>	Red-wattled Lapwing	Lal-lotika Hot-ti-ti	R	NO	-
81.		Accipitridae	<i>Accipiter badius</i>	Shikra	Turki Baj	R	NO	-
82.			<i>Avicsda leuphotes</i>	Black Baza	Kalo Baj	R	NO	-
83.			<i>Aviceda jerdoni</i>	Jerdon.s Baza	Baro Baza	R	OD	-
84.			<i>Circaetus gaiiicus</i>	Short-toed Snake Eagle	-	R	DD	-
85.			<i>Elanus caeruleus</i>	Black-shouldered Kite	-	R	NO	-
86.			<i>Gyps bengalensis</i>	White-rumped Vulture	-	R	NO	LR
87.			<i>Haliastur indus</i>	Brahminy Kite	Shankho Chil/ Lal Chil	R	NO	-
88.			<i>Milvus migrans</i>	Black Kite	BhubonChil	R	NO	-
89.			<i>Spilornis cheela</i>	Crested Srepent Eagle	Tila Baj/ Shap kheko Baj	R	NO	-
90.			<i>Falco severus</i>	Oriental Hobby	-	R	DD	-
91.			<i>Falco peregrinus</i>	Peregrine Falcon	-	M	-	1
92.			<i>Falco tinnunculus</i>	Common Kestrel	-	M	-	-
93.		Podicipedidae	<i>Tachybaptus ruficollis</i>	Little Grebe	Duburi/Dubalu	R	NO	-
94.		Phalacrocoraci dae	<i>Phalacrocomx niger</i>	Little Cormorant	Paan-kowri	R	NO	-
95.		Ardeidae	<i>Ardeola grayii</i>	Indian Pond Heron	Kani Bok/Kana Bok	R	NO	-
96.			<i>Botaurus stealaris</i>	Great Bittern	-	M	-	-
97.			<i>Bubukus ibis</i>	Cattle Egret	Go-bok	R	NO	-

98.			<i>Egretta garzetta</i>	Little Egret	Choto Bok	R	NO	-
99.			<i>Ixobrychus connamomeus</i>	Cinnamon Bittern	Lal Bok	R	NO	-
100.			<i>Ixobrychus sinensis</i>	Yellow Bittern	Holdey Bok	R	NO	-
101.			<i>Mesophoyx intermedia</i>	Intermediate Egret	Maijla Bok	R	NO	-
102.			<i>Nycticorax nycticorax</i>	Black-crowned Night Heron	Waak/Nishi Bok	R	NO	-
103.		Scolopacidae	<i>Actitis hypoleucos</i>	Common Sandpiper		M	-	-
104.			<i>Gallinago gallinago</i>	Fantail Snipe	Kada-khochha	M	-	-
105.			<i>Tringa totanus</i>	Common Redshank	Lal-pa Pi-oo	M	-	-
106.	Passeriformes	Pittidae	<i>Pitta cyanea</i>	Blue Pitta	-	R	DD	-
107.			<i>Pitta moluccensis</i>	Blue-winged Pitta	-	R	DD	-
108.		Irenidae	<i>Chloropsis aurifrons</i>	Golden-fronted Leafbird	Pata Bulbuli	R	NO	-
109.			<i>Chloropsis cochinchinensis</i>	Blue-winged Leafbird	Sabuj Bulbuli	R	NO	-
110.			<i>Chloropsis hardwickii</i>	Orange-bellied Leafbird	-	R	DD	-
111.		Laniidae	<i>Lanius schach</i>	Long-tailed Shrike	BaghaTiki	R	NO	-
112.			<i>Lanius collurioides</i>	Burmese Shrike	Koshai Pakhi	M	-	-
113.			<i>Lanius cristatus</i>	Brown Shrike	Badami Koshai Pakhi	M	-	-
114.			<i>Lanius tephronotus</i>	Greatbacked Shrike	Koshai Pakhi	M	-	-
115.		Corvidae	<i>Corvus macrorhynchos</i>	Jungle Crow	DanrKak	R	NO	-
116.			<i>Corvus splendens</i>	House Crow	Pati Kak/Kaua	R	NO	-
117.			<i>Dendroditta formosae</i>	GreyTreepie	-	R	NO	-
118.			<i>Dendroditta vagabunda</i>	RufusTreepie	Hanrichacha/Kutum	R	NO	-
119.			<i>Aegithina tiphia</i>	Common lora	Towfik/Fatikjal	R	NO	-
120.			<i>Oriolus oriolus</i>	Eurasian Golden Oriole	Beney Bou	R	DD	-
121.			<i>Oriolus xanthomus</i>	Black-headed Oriole	Holdey Pakhi	R	NO	-
122.			<i>Dicrurus aeneus</i>	Bronzed Drongo	Choto Fingey	R	NO	-
123.			<i>Dicrurus macrocercus</i>	Black Drongo	Fingey	R	NO	-
124.			<i>Artamus fuscus</i>	Ashy Woodswallow	Latora	R	NO	-
125.			<i>Coracina macei</i>	Large Cuckooshrike	Gudhuka	R	NO	-
126.			<i>Coracina melanoptera</i>	Black-headed Cuckooshrike	-	R	DD	-
127.			<i>Hemipus picatus</i>	Bar-winged Flycatcher-shrike	-	R	NO	-
128.			<i>Pericrocotus cinnamomeus</i>	Small Minivet	Sat Saili	R	NO	-
129.			<i>Pericrocotus flammeus</i>	Scarlet Minivet	Lai Satsaili	R	NO	-
130.			<i>Pericrocotus Solaris</i>	Grey-chinned Minivet	-	R	DD	-
131.			<i>Tephrodornis pondicerianus</i>	Common Woodshrike	-	R	NO	-
132.			<i>Tephrodornis guiaris</i>	Large Woodshrike	-	R	NO	-
133.			<i>Hypothymis azurea</i>	Black-napped Monarch	-	R	NO	-
134.			<i>Rhipidura albicollis</i>	White-throated Fantail	Lejnachani	R	NO	-
135.			<i>Rhipidura aureola</i>	White-browed Fantail	Lejnachani	R	DD	-
136.			<i>Dicrurus leucophaeus</i>	Grey Drongo	-	M	-	-
137.			<i>Coracina melaschistos</i>	Black-winged Cuckoo	-	M	-	-

				Shrike				
138.			<i>Pericrocotus ethologus</i>	Long-tailed Minivet	-	M	-	-
139.		Muscicapidae	<i>Copsychus saularis</i>	Oriental Magpie Robin	Doel/Doinachani	R	NO	-
140.			<i>Culidcapa ceylonensis</i>	Grey-headed Canary Flycatcher	-	R	NO	-
141.			<i>Cyornis poliogenys</i>	Pale-chinned Flycatcher	-	R	NO	-
142.			<i>Enicurus immaculatus</i>	Black-backed Forktail	-	R	NO	-
143.			<i>Saxicola caprata</i>	Pied Bushchat	-	R	NO	-
144.			<i>Cyornis tickelliae</i>	Tickell's Blue Flycatcher	-	M	-	-
145.			<i>Eumyias thalassina</i>	Verditer Flycatcher	-	M	-	-
146.			<i>Ficedula parva</i>	Red-throated Flycatcher	Lalbook Chotok	M	-	-
147.			<i>Ficedula sapphira</i>	Sapphire Flycatcher	-	-	-	-
148.			<i>Lusdunia brunnea</i>	Indian Blue Robin	-	M	-	-
149.			<i>Luscinia calliope</i>	Siberian Ruby Throat	-	M	-	-
150.			<i>Lusdunia cyane</i>	Siberian Blue Robin	-	M	-	-
151.			<i>Lusdunia svecica</i>	Blue throat	-	M	-	-
152.			<i>Monticola solitarius</i>	Block Rock Thrush	-	M	-	-
153.			<i>Muscicapa dauurica</i>	Asian Brown Flycatcher	Badami Chotok	M	-	-
154.			<i>Muscicapa sibirica</i>	Dark-sided Flycatcher	-	M	-	-
155.			<i>Saxicola torquata</i>	Common Stonechat	-	M	-	-
156.			<i>Tarsiger hypogrythrus</i>	Rufous-breasted Bush Robin	-	M	-	-
157.			<i>Turdus dissimilis</i>	Black-breasted Thrush	-	M	-	LR
158.			<i>Turdus unicolor</i>	Tickell's Thrush	-	M	-	-
159.			<i>Zoothera dtrina</i>	Orange-headed Thrush	-	M	-	-
160.			<i>Zoothera dauma</i>	Scaly Thrush	-	M	-	-
161.			<i>Acridotheres fuscus</i>	Jungle Myna	Jhuti Shalik	R	NO	-
162.			<i>Acridotheres tristis</i>	Common Myna	Bhat Shalik	R	NO	-
163.			<i>Aplonis panayensis</i>	Asian Glossy Starling	Kalo Shalik	R	DD	-
164.			<i>Gracula religiosa</i>	Hill Myna	Moyna	R	NO	-
165.			<i>Sturnus contra</i>	Asian Pied Starling	Gobrey Shalik/Gu Shalik	R	NO	-
166.			<i>Sturnus malabaricus</i>	Chestnut-tailed Starling	Kath Shalik	R	NO	-
167.		Hirundinidae	<i>Hirundo daurica</i>	Red-rumped Swallow	Ababil	M	-	-
168.			<i>Hirundo rustica</i>	Barn Swallow	Ababil	M	-	-
169.			<i>Hirundo striolata</i>	Striated Swallow	-	M	-	-
170.		Paridae	<i>Parus major</i>	Great Tit	-	R	NO	-
171.			<i>Hirundo smithii</i>	Wire-tailed Swallow	-	R	DD	-
173.		Pycnonotidae	<i>Pycnonotus articeps</i>	Black-headed Bulbul	Kalo Bulbul	R	NO	-
174.			<i>Pycnonotus cafer</i>	Red-vented Bulbu	Bulbuli	R	NO	-
175.			<i>Pycnonotus jocosus</i>	Red-whiskered Bulbul	Sipahi Bulbuli	R	NO	-
176.		Cisticolidae	<i>Prinia rufescens</i>	Rufescent Prinia	-	R	DD	-
177.			<i>Prinia sodalis</i>	Ashy Prinia	-	R	DD	-
178.		Zosteropidae	<i>Zosterops palpebrosus</i>	Oriental White-eye	Shet-ankhi	R	NO	-

179.		Sylviidea	<i>Garrulax gularis</i>	Rufous-vented Laughingthrush	-	R	DD	-
180.			<i>Garrulax leucolophus</i>	White-crested Laughingthrush	-	R	DD	-
181.			<i>Garrulax moniliger</i>	Lesser Necklaced Laughingthrush	Panga	R	NO	-
182.			<i>Malacocincla abbotti</i>	Abbot's Babbler	-	R	NO	-
183.			<i>Megaurus palustris</i>	Striated Grassbird	-	R	DD	-
184.			<i>Orthotomus sutorius</i>	Common Tallorbird	Tuntuni / Tuni	R	NO	-
185.			<i>Petlorneum tickelli</i>	Buff-breasted Babbler	-	R	NO	-
186.			<i>Pomatorhinus horsfieldii</i>	Indian Scimitar Babbler	-	R	NO	-
187.			<i>Pomatorhinus hypoleucos</i>	Large Scimitar Babbler	-	R	DD	-
188.			<i>Turdoides caudat</i>	Common Babbler	-	R	DD	-
189.			<i>Turdoides earlei</i>	Striated Babbler	-	R	NO	-
190.			<i>Turdoides striatus</i>	Jungle Babbler	Sat bhai	R	NO	-
191.			<i>Acrocephalus dumetorum</i>	Blyth,s Reed Warbler	-	M	-	-
192.			<i>Bradypterus</i>	luteoventris Brown Bush Warbler	-	M	-	-
193.			<i>Phylloscopus affinis</i>	Tickell's Leaf Warbler	-	M	.	-
194.			<i>Phylloscopus inomatus</i>	Plain Leaf Warbler	-	M	-	-
195.		Alaudidae	<i>Alauda gutgula</i>	Oriental Skylark	Bharat Pakhi	R	NO	-
196.			<i>Mirfra erythroptera</i>	Indian Bushlark	-	R	DD	-
197.		Nectariniidae	<i>Anthreptes singaiensis</i>	Ruby-cheeked Sunbird	-	R	NO	-
198.			<i>Arachnothera</i>	longirostra Little Spiderhunter	-	R	NO	-
199.			<i>Nectarinia asiatico</i>	Purple Sunbird	Niltuni/ Madhuchushki	R	NO	-
200.			<i>Nectarinia zeylonica</i>	Purple-rumped Sunbird	Moutushi	R	NO	-
201.			<i>Dicaeum cruentatum</i>	Scarlet-backed Flowerpecker	-	R	NO	-
202.			<i>Dicaeum erythrorhynchus</i>	Pale-billed Flowerpecker	Fuljhuri	R	NO	-
203.		Passeridae	<i>Lonchura malabarica</i>	Indian Silverbill	-	R	NO	-
204.			<i>Lonchura malacca</i>	Black-headed Munia	Kalomatha Munia	R	NO	-
205.			<i>Lonchura punctulata</i>	Scaly-breasted Munia	Tila Munia	R	NO	-
206.			<i>Passer domesticus</i>	House Sparrow	Charui	R	NO	-
207.			<i>Ploceus philippinus</i>	Baya Weaver	Babui/Baoi	R	NO	-
208.			<i>Anthus rosearus</i>	Rosy Pipit	-	M	-	-
209.			<i>Anthus rufulus</i>	Paddyfield Pipit	-	M	-	-
210.			<i>Dendronanthus indicus</i>	Forest Wagtail	Ban Khonjan	M	-	-
211.			<i>Motadlla alba</i>	White Wagtail	-	M	-	-
212.			<i>Motadlta cinerea</i>	Grey Wagtail	Khonjan	M	-	-

Mammals

SL. No	Order	Family	Scientific Name	English Name	Local Name	IUCN Bangladesh Category	IUCN Global Category	CITES Schedule
1.	Insectivora	Soricidae	<i>Suncus murinus</i>	Grey Musk Shrew	Chika	NO	-	-
2.		Talpidae	<i>Talpa micrura</i>	Eastern Mole	-	DD	-	-
3.	Chiroptera	Pteropodidae	<i>Pteropus giganteus</i>	Flying Fox	Badur	NO	-	-
4.			<i>Rousettus leschenaulti</i>	Fulvous Fruit Bat	Kola Badur	DD	-	-
5.		Emballonuridae	<i>Taphozous longimanus</i>	Sheath-tailed Bat	-	DD	-	-
6.		Megadermatidae	<i>Megaderma lyra</i>	False Vampier	Daini Badur	NO	-	-
7.		Rhinolophidae	<i>Rhinolophus subbadius</i>	Horseshoe Bat	-	DD	-	-
8.		Hipposideridae	<i>Hipposideros galeritus</i>	Leaf-nosed Bat	-	DD	-	-
9.			<i>Hipposideros larvatus</i>	Leaf-nosed Bat	-	DD	-	-
10.		Vespertilionidae	<i>Hespemtenus tickelti</i>	Tickell's Bat	-	DD	-	-
11.			<i>Myotis formosus</i>	Hodgson's Bat	-	DD	-	-
12.			<i>Pipistrellus ceylonicus</i>	Kelaart's Pipistrelle	-	DD	-	-
13.			<i>Pipistrellus coromandra</i>	Indian Pipistrelle	-	NO	-	-
14.			<i>Scotophilus kuhlii</i>	Asiatic Lesser Yellow Bat	-	NO	-	-
15.	Primates	Loridae	<i>Nycticebus coucang</i>	Slow Loris	Lojjawati Banor	CR	-	-
16.		Cercopithecidae	<i>Macaca assamensis</i>	Assamese Macaque	Ashami Banor	DD	VU	-
17.			<i>Macaca mulatta</i>	Rhesus Macaque	Banor	VU	LR	-
18.			<i>Macaco nemestrina</i>	Pig-tailed Macaque	Ultoleji Bnaor	CR	VU	-
19.		Colobidae	<i>Trachypithecus phayrei</i>	Phayre's Langur	Chosmapora Hanuman	CR	DD	-
20.			<i>Trachypithecus piieatus</i>	Capped Langur	Mukhpora Hanuman	EN	VU	I
21.		Hylobatidae	<i>Hylobates hoolock</i>	Hoolock Gibbon	Ulluk	CR	DD	I
22.	Carnivora	Canidae	<i>Cams aureus</i>	Jackal	Pati Shial	VU	-	-
23.			<i>Vuipes bengalensis</i>	Bengal Fox	KhekShial	VU	DD	-
24.		Felidae	<i>Felis chaus</i>	Jungle Cat	Ban Biral	EN	-	II
25.			<i>Prionailurus bengalensis</i>	Leopard Cat	Chita Biral	DD	-	I
26.			<i>Prionailurus viverrinus</i>	Fishing Cat	Mecho Biral	EN	LR	II
27.		Herpestidae	<i>Herpestes auropunctatus</i>	Small Indian Mongoose	Benji	NO	-	-
28.			<i>Herpestes edwardsi</i>	Common Mongoose	Bara Benji	VU	-	-
29.		Mustelidae	<i>Lutra lutra</i>	Common Otter	Ud	CR	-	I
30.		Ursidae	<i>Ursus thibetanus</i>	Asiatic Black Bear	Kalo Bhalluk	EN	VU	I
31.		Viverridae	<i>Arctictis binturong</i>	Binturong	Gecho Bhalluk	CR	-	-

32.			<i>Paradoxurus hermaphrodites</i>	Common Palm Civet	Gandho Gokul	VU	-	-
33.			<i>Viverra zibetha</i>	Large Indian Civet	Bagdash	EN	-	-
34.			<i>Viverricula indica</i>	Small Indian Civet	Khatash	VU	-	-
35.	Artiodactyla	Suidae	<i>Sus scrofa</i>	Wild Boar	Buno Suka	NO	-	-
36.		Cervidae	<i>Muntiacus muntjak</i>	Barking Deer	Maya Harin	EN	-	-
37.	Pholidota	Manidae	<i>Manis crassicaudata</i>	Indian Pangolin	Banrui	CR	LR	-
38.	Rodentia	Sciuridae	<i>Collosciurus erythraeus</i>	Palla's Squirrel	-	DD	-	-
39.			<i>Callosciurus pygerythrus</i>	Irrawaddy Squirrel	Badami Kathbirali	NO	VU	-
40.		Muridae	<i>Bandicota bengalensis</i>	Indian Mole Rat	Indur	NO	-	-
41.			<i>Bandicota indica</i>	Bandicoot Rat	Bara Indur	NO	-	-
42.			<i>Millardia meltada</i>	Metad Rat	-	DD	-	-
43.			<i>Mus booduga</i>	Indian Field Mouse	Metho Indur	NO	-	-
44.			<i>Mus musculus</i>	House Mouse	Nengti Indur	NO	-	-
45.			<i>Rattus ram/5</i>	Common House Rat	Indur	NO	-	-
46.			<i>Vandeteuria oleracea</i>	Long-tailed Tree Mouse	-	DD	-	-
47.		Hystriidae	<i>Atherurus macrourus</i>	Brush-tailed Porcupine	Shojaru	DD	-	-
48.			<i>Hystrix indica</i>	Indian Crested Porcupine	Shojaru	EN	-	-
49.	Lagomorpha	Leporidae	<i>Lepus nigricollis</i>	Rufous-tailed Hare	Khargosh	EN	-	-

ANNEX 3. Questionnaire used in Household Survey

Questionnaire for Household Survey

Date:

Households General Information

Name of the village/community/para:

Code:

Name of the respondent:

Sex:

Age:

Religion:

Occupation:

Household size by age:

Age Class	Male	Female	Earning Members	Occupation	
				Primary	Secondary
0-10					
10-20					
20-30					
30-40					
40-50					
50-60					
60>					
Total					
Grand Total					

Educational status:

Educational level		Respondent	Wife/Husband	Sons	Daughters	Others
Illiterate						
Literate	Primary					
	Middle					
	Secondary					
	Intermediate					
	Graduate					
	P. Graduate					
Others						

HHs land holding and ownership pattern:

Land type	Ownership			Conditions of lease
	Self-owned	Lease	Others	
Homestead				
Agriculture				
Others				

HHs monthly income with their sources:

Monthly expenditure:

Housing condition:

Building	Semi-building	Tin shed	Sun grass/Bamboo	Mud	Others

Animal resources in the homestead:

Sl.no.	Types	Ownership pattern	Quantity	Use
01.	Cow			
02.	Bull			
03.	Goat			
04.	Pig			
05.	Chicken			
06.	Duck			
07.				

Available livelihood activities in the locality:

01. Agro farming	06. Sawmilling	11. Brick Field L.	16.
02. Fuel wood collection	07. Oil production	12.	17.
03. Nursery	08. Coir production	13.	18.
04. Sand Collection	09. Fishing	14.	19.
05. T. Grass Collection	10. Grocer	15.	20.

HHs Livelihoods and Forest Dependency

Terms of access in the adjacent forest:

- a. Conditional b. Open access c. Shared arrangement
d. Others

Resources used by the household members from forest

- a. Land b. Water c. Livestock d. Timber
e. NTFPs f. Others

Sources of the resources and quantity collected/exploited per day/Month**Purpose of collection**

- a. Own consumption b. Selling c. Others

Non-timber forest products used by the households

Sl. no.	Items	Source	Uses
01.			
02.			
03.			
04.			
05.			
06.			
07.			
08.			
09.			
10.			

Threatened plants and animals in the forest and the major threats behind it

Species	Threats	Species	Threats

Annual activity calendar

Month	Work	Working place and type of work
January		
February		
March		
April		
May		
June		
July		
August		
September		
October		
November		
December		

Gender role in different HH activities

Activities	Only male	Only female	Male and female	Children

Financial supports or technical assistance available in the locality, providers (micro credit, NGOs support etc) and agreements

Types of support	Provider	Agreement	Remarks

Other skills, capacity, knowledge or expertise having different household members

Sl. no.	
01.	
02.	
03.	
04.	

Major threats to the forest according to the local peoples

01.	06.
02.	07.
03.	08.
04.	09.
05.	10.

Major livelihood problems in the locality

01.	04.
02.	05.
03.	06.

Links of the household with other households or individuals in the community

- a. Kinship b. Social group c. Membership of organizations
d. Political contacts e. Patronage f. Others

Potential sectors & sub-sectors available in the locality

Potential sectors		Sub-sectors	

HHs Homestead Condition

Existing homestead management practice of the HHs**Buffer zone management practice in the locality (if any)****Species produced in homesteads**

Timber	Vegetable	Fruit spp.	Spices	Others

Purpose of production

- a. Own consumption b. Selling c. Others

Source of planting materials

- a. Own b. From market c. From neighbors d. Others

Economic benefits from the products (Tk / Month or Year)

Others Alternating Income Generating Activities

Available AIG activities in community

Sl. no.	Activities	Raw materials used	Source of raw materials	Income/month
01.				
02.				
03.				

Articles produced

Sl. no.	Articles	Sl. no.	Articles

Gender role in different AIG activities

Purpose of production

a. Own consumption

b. Selling

c. Others

Marketing channel

a. Direct sell

b. Middle man

c. Whole sell

d. Others

Major constraints regarding these AIG activities

Recommendations (of local people) for better future

ANNEX 4. Medicinal Plants and their traditional uses in and around SNP

Family	Botanical name	Local name	Parts used	Therapeutic use	Habit	Occurrence	Remarks
Acanthaceae	<i>Adhatoda vasica</i> Nees	Basak	Fresh green leaves	Cough, cold ailments and asthma	Sh	C	W
Apiaceae	<i>Centella asiatica</i> (L.) Urban	Adamoni	Whole plant	Dysentery, diarrhoea, gastric pain	H	C	W
Apocynaceae	<i>Alstonia scholaris</i> (L.) R. Br.	Chatim	Leaves	Fever	Tr	R	D
Arecaceae	<i>Cocos nucifera</i> L.	Narikel	Tender fruit	Hair falls, burns	Pa	C	W
Araceae	<i>Alocasia indica</i> (Lour.) Spach.	Harinpay a	Whole plant	Stomach trouble	H	R	W
Aslepiadaceae	<i>Calotropis gigantea</i> (L.) Ait. f.	Akanda	Leaves, latex	Joint pain, cut and wounds	Sh	C	W
Asteraceae	<i>Chromolaena odorata</i> (L.) King & H.E. Robins	Uzaru	Green leaves	Cut and wounds	H	C	W
	<i>Mikania scandens</i> (L.) Willd.	Assam lata	Green leaves	Cut and wounds	Cl	C	W
Bromeliaceae	<i>Ananas comosus</i> (L.) Merr.	Anaras	Fruit	Jaundice, intestinal worm	H	FC	D
Caricaceae	<i>Carica papaya</i> L.	Pepe	Fruit	Stomach trouble	Sh	C	D
Combretaceae	<i>Terminalia arjuna</i> W & A	Arjun	Bark	Heart disease, cold ailments, cough	Tr	R	W
	<i>Terminalia belerica</i> Roxb.	Bohera	Fruit	Constipation, stomach trouble, eye disease, loss of appetite	Tr	FC	W
	<i>Terminalia chebula</i> (Gaertn.) Retz.	Horitaki	Fruit	Constipation, fever, heart disease, cough, urinary problems, loss of appetite	Tr	FC	W
Convolvulaceae	<i>Ipomoea fistulosa</i> Roxb.	Donkalos	Whole plant	Cold ailments	Sh	C	W
Cucurbitaceae	<i>Coccinia cordifolia</i> Linn.	Telkuchapata	Green leaves	Cold ailments, diabetes	Cl	FC	W
Dilleniaceae	<i>Dillenia indica</i> Linn.	Chalta	Fruit	Hair falls	Tr	FC	D
Euphorbiaceae	<i>Phyllanthus emblica</i> Linn.	Amoloki	Fruit	Dysentery, skin diseases, hair falls, indigestion	Tr	FC	D
	<i>Trewia nudiflora</i> Linn.	Chagal ledi	Leaves	Fever	Tr	R	W
Fabaceae	<i>Cassia fistula</i> Linn.	Sonalu	Fruit, bark	Constipation	Tr	R	W
Lamiaceae	<i>Ocimum tenuiflorum</i> L.	Tulsi	Fresh green	Cough, cold ailments, cut and	H	FC	D

			leaves	wounds			
Lauraceae	<i>Litsea monopetala</i> (Roxb.) Pers.	Menda	Fresh green leaves and bark	Amoebic dysentery, diarrhoea, constipation	Tr	C	W
Meliaceae	<i>Azadirachta indica</i> Adr. Juss.	Neem	Fresh green leaves and seed	Skin diseases, chicken pox, fever, dysentery, diabetes, intestinal worm	Tr	FC	D
	<i>Melia azedarach</i> Linn.	Bokain	Green leaves	Skin diseases	Tr	FC	D
Mimosoideae	<i>Mimosa pudica</i> Linn.	Lazzabati	Roots	Not-specified	H	C	W
Moringaceae	<i>Moringa oleifera</i> Lamk.	Sajna	Bark	Cold ailments	Tr	C	D
Orchidaceae	<i>Cymbidium aloifolium</i> (L.) Sw.	Kuntus pata	Leaves, seeds	Ear ache, cut and wounds	H	C	W
Piperaceae	<i>Piper betel</i> Linn.	Paan	Fresh green leaves	Indigestion, loss of appetite	Cl	C	D
Poaceae	<i>Cymbopogon citratus</i> (DC. ex Nees) Stapf	Lemon ghass	Leaves	Not-specified	H	FC	W
	<i>Cynodon dactylon</i> (L.) Pers.	Durba ghass	Tender leaves	Tooth ache, cut and wounds	H	C	W
Polygonaceae	<i>Polygonum hydropiper</i> L.	Biskatali	Green leaves	Insect bites	H	C	W
Rutaceae	<i>Aegle marmelos</i> (L.) Corr. Serr.	Bel	Fruit	Weakness, colitis, diarrhoea	Tr	FC	D
	<i>Citrus acida</i> (Linn.)	Jambura	Fruit	Jaundice	Tr	C	D
	<i>Citrus limon</i> (Linn.) Burm. f.	Lebu	Fruit, Leaf	Indigestion	Sh	FC	D
	<i>Glycosmis pentaphylla</i> (Retz).	Fatikgila	Green leaves	Fever	Sh	C	W
Sterculiaceae	<i>Abroma augusta</i> (L.) Lf.	Ulatkambal	Bark, root	Female disorders	Sh	R	W
Theaceae	<i>Camellia sinensis</i> (L.) O. Kuntze	Chaa	Tender leaves	Heart disease, cold ailments, cough	Sh	C	Cu
Verbenaceae	<i>Vitex negundo</i> Linn.	Nimunda	Green leaves	Tooth ache	H	C	W
Zingiberaceae	<i>Ammomum aromaticum</i> Roxb.	Taragota	Seed	Cough, cold ailments	Sh	C	W
	<i>Curcuma longa</i> Linn.	Holud	Rhizome	Skin diseases	Sh	FC	Cu
	<i>Zingiber officinale</i> Roscoe	Ada	Rhizome	Cough, cold ailments	Sh	FC	Cu

Key words: **Cl**-climber, **H**-herb, **Sh**-Shrub, **Tr**-tree, **Pa**-palm
C-common, **FC**-fairly common, **R**-rare
Cu-cultivated, **D**-domesticated, **W**-wild