



# Comparing the Impacts of Local People and Rohingya Refugees on Teknaf Game Reserve

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## **Abstract**

*This paper compares the dependency, livelihood activities, and impacts of local people with those of Rohingya refugees on Teknaf Game Reserve (TGR). An exploratory survey was conducted in two villages, inhabited by both local people and Rohingya refugees, during February to June 2006. We collected primary information through community profiles and household interviews using a semi-structured questionnaire focusing on socio-demographic, livelihood activities and overall impacts on TGR. A total of 106 households out of 686 were interviewed, within which 70 households were local people and 36 households were Rohingya refugees. Data analyses show that overall, 57% of households, including all Rohingya refugees are totally dependent on forest for their livelihoods. We explored 21 livelihood activities in which both local people and Rohingya refugees were engaged. Four of these activities namely fuelwood collection, sungrass collection, illicit felling, and brickfields have major impacts on the game reserve and pose a high risk to it, while five have medium impacts. Results indicate that Rohingya refugees are comparatively more dependent on the forest than local people. Both local people and Rohingya refugees desperately need alternative income generation activities; and both groups want to collaborate with national and international organizations to resolve the refugee situation in a timely and congenial manner and to repatriate Rohingya refugees to their country. We found one case where local people who were given opportunities in participatory forestry programs successfully produce rich and productive forest gardens. To restore the game reserve, the co-management system at TGR should incorporate suitable policies that will involve more landless local people in joint forest management.*

## **Introduction**

People all over the world depend on forests for their livelihoods. Refugees and the

rural poor are no exception. When people are forced to live in crowded and possibly unfamiliar situations - not of their own making or choice - they often are left with no option but to depend directly on natural resources for their livelihood activities. These activities place forests under threat. If we do not restrict such activities or find alternative solutions, low-level resource gathering activities can quickly turn into wide-scale, often irrevocable, forest degradation.

Protected areas are increasingly subject to human occupation by refugees of wars, civil conflicts, and natural disasters. In Rwanda for example, approximately 50% of the civilian population was displaced during a civil war into camps within the eastern regions of the Republic of Congo. Of these, approximately 860,000 refugees were concentrated in the vicinity of Virunga National Park, with another 332,000 encamped in Kahuzi-Biega National Park (Prunier 1995). Migrations of refugees and local inhabitants into protected areas have several impacts: greatly increased rates of elephant poaching and habitat encroachment; widespread environmental degradation and habitat destruction; forest degradation by fuelwood over-harvesting (Fell and Bader 1997, Formoli 1995, Hart and Hall 1996, Hall et al. 1997, Said et al. 1995). Over the past several years, the wildlife populations of reserves (e.g. Garamba National Park, Kahuzi-Biega National Park, Okapi Wildlife Reserve) have been severely depleted as the result of poaching by refugees (Plumptre *et al.* 2000).

The United Nations Environmental Program formally recognizes that a broad range of environmental disasters can also generate refugees (Westing 1992). Such refugees are the victims of long-term mismanagement of nature by humans, including soil erosion; global warming; toxic contamination of air, water, soil and the food chain; deforestation and desertification (Kreimer and Munashinghe 1991, Gadgil and Guha 1995, Leiderman 1995).

We define "refugees" as persons who are forced to live outside the country of their nationality or native region (within country) because of war, civil conflicts, or environmental disasters (Goodwin-Gill, 1983). The term "livelihood" refers to peoples' way of living and working, as well as the conditions under which they live, produce and reproduce. Livelihood is a complex concept and is constantly being discussed and reformulated. However, a commonly used definition that finds favor with policy makers is: "A livelihood comprises the capabilities, assets (including both materials and social resources) and activities required for a means of living" (Carney 1998). The livelihoods of millions of people living in rural areas



depend on accessing forest products and services. These actions can have positive or negative impacts on forests and their conservation. For this reason it is important to understand forest dwellers' livelihoods, their perceived needs, and their development strategies.

We conducted our study in Ledha and Kerontoly, two villages within the Teknaf Game Reserve in southern Bangladesh. We explored the various livelihood activities of local peoples and Rohingya refugees and compared their overall impacts on the game reserve. Rohingyas are Arakanese Muslims who were forced to migrate from Myanmar to Bangladesh in 1991 by the Myanmar army (Mollah *et al.* 2004). Local Bengali people and Rohingya refugees inhabit both our study villages. They use forests for various purposes such as subsistence, livestock rearing, fuelwood collection and as a source of goods to sell in the market. These communities place various and different pressures on forests for maintaining their livelihoods, depending on the nature of the forest area and the economic resources available to them. Their impacts on the game reserve consequently vary according to their resource-use patterns. This study seeks to improve our understanding of the situation and to provide insights that would be useful to the Forest Department and relevant non-government organizations (NGOs) in their efforts to support forest dependent people and reduce pressures on Teknaf Game Reserve.

## Background

The Teknaf Game Reserve (TGR) is located within the Teknaf peninsula in the southeastern part of Bangladesh, bordered on the east by the Naf River and on the west by the Bay of Bengal (Fig. 1). The northern end of the reserve lies 48 km south of Cox's Bazar District headquarters. The reserve measures roughly 28 km north to south and 3 to 5 km east to west, and lies between 20°52' - 21°09' N latitude and 92°08' - 92°18' E longitude (Rosario 1997). The current reserve is part of the former Teknaf Reserve Forest, and was formally established through a gazette notification in 1983 under the Wildlife Act of 1973. It covers a comparatively large area of 11,615 ha (Mollah *et al.* 2004). The reserve was established purposely to preserve a habitat for a large diversity of wildlife (Bari and Dutta 2004).

The Teknaf Game Reserve lies in the hilly range that forms the backbone of the narrow Teknaf peninsula, located in the far southeastern corner of the country, adjacent to Myanmar. It encompasses three representative geological series - Surma Series, Tipam Series and Dupi Tila Series (Choudhury 1969). Soils are

primarily clay loam on level grounds and from sandy loam to coarse sand on hilly land. The climate of the game reserve may be classified into three seasons: spring (March to April), monsoon (May to October) and winter (November to February). Rainfall is frequent and heavy during the monsoon season (May to October) ranging between 130 mm to 940 mm. Temperature associated with the three climatic seasons ranges from 15°C (average minimum) to 32°C (average maximum). Humidity ranges from 27% (average minimum) to 99% (average maximum) (Bangladesh Meteorological Department 2004).

Cox's Bazaar South Forest Division manages the Teknaf Game Reserve, which consists of three forest ranges namely Teknaf, Whykong and Shilkhali. These are divided into 11 forest beats. Approximately 40 Forest Department staff members are responsible for the area. This includes an Assistant Conservator of Forest (ACF), a range officer, and two forest department laborers based at the Teknaf Range Office. The reserve is managed with routine silvicultural management practices - i.e., clear felling followed by artificial regeneration of valuable species on long rotation (40 years) and short rotation (18 years) and very short rotation (6 years). Bamboo appears either as pure stands or as understory and is managed under the culm selection system with a felling cycle of 3 to 4 years.

Teknaf Game Reserve consists of 115 settlements or villages, locally called paras within 5 Unions of Teknaf Thana, namely, Baharchara, Hnilla, Sabrang, Teknaf and Whykong (Mollah et al. 2004). Teknaf and Ukhia are the most important thanas (smallest administrative unit) of the reserve, consisting of 274,071 people. Approximately 52% of the population is male and 48% female. By age group, the population break-down is 19% children (5-9 yrs), 12% youth (10-17 yrs), and 69% adults (18 + yrs). The large adult population provides a viable source of labor for the game reserve's development projects. The percentage of literacy is 17% and the level of education is also low. Only about 9% of the population have attended school through the primary level; while 3% have completed secondary education and less than 2% have received a higher secondary education. Most people living on the Teknaf peninsula are poor to very poor. Nearly 70% of the households have a total income in the range of Tk 15,000-45,000 per year, which is equivalent to about USD 288-865 per household, or USD 50-150 per capita (Bari and Dutta 2004). There are 14 major Rohingya villages inside the reserve; among these villages Ledha and Kerontoly are most important. Ledha is located in Mosuni Forest Beat in Teknaf Range within the reserve, and is comprised of 597 households or about 4,000 people. Kerontoly is in Teknaf Sadar Beat, and is comprised of 89 households



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or about 800 people. The local (meaning Bengali) people of these two villages have been living there since time immemorial. Rohingyas migrated from Rakhine State in Myanmar to Bangladesh in the early sixties (Mollah et al. 2004). By 1993 about 233,000 Rohingyas had been resettled in Myanmar and some 30,000 remained in Cox's Bazar, most of them in Teknaf (Bari and Dutta 2004). At present, about 22,000 refugees were reported waiting at Kutupalong and Nayapara camps in Cox's Bazar district for repatriation. There are two camps (Nayapara refugee camps 1 and 2) located inside the reserve, which support a population of 12,617 Rohingyas (Ashad 29th May 2006). Large populations of Rohingyas also live outside the camp in the south and southeastern parts of the country. Representatives of non-governmental organizations place the figure at anything between 100,000 to 350,000 people (Sajjad 2003). They are not recognized as refugees and are seen by the UNHCR and the government of Bangladesh as illegal immigrants (Sajjad 2003).

The largest Rohingya exodus from Burma occurred in 1972 and 1991-1992 when large numbers fled to Bangladesh. Experts believe that many among this non-camp population returned to Bangladesh after being repatriated to Burma. The Rohingya who came to Bangladesh after the large exodus of the early 1990s have been denied entry to the camps and are not recognized as refugees by the government. These Rohingya refugees have settled in various villages and have encroached on forestlands. Most local people consider the Rohingyas to be a burden because they share in every aspect of their livelihood activities and job markets. A villager of Ledha said, "without any barrier Rohingyas have entered our country, move freely and do what they want" (Ashad, personal communication, 2006). Local people do not tolerate them and do not employ them if there is any alternative. So there are many unwanted conflicts between local and Rohingya people. Mollah et al. (2004) reported a number of Rohingya settlements, mostly located in Jahajpura, Shamlapur and Teknaf. Rohingyas are perceived to be totally dependent on forest areas for their livelihood.

NGOs including those specializing in microcredit finance have direct links with people living in Ledha and Kerontoly. The major NGOs and banks that operate in these localities include Bangladesh Rural advancement Committee (BRAC), Society for Health Extension and Development (SHED), Coastal Association for Social Transformation (COAST), Association for Social Advancement (ASA) and Grameen Bank. NGO activities concentrate on education, health, micro-credit for women, and alternative income generating activities. NGO banks provide micro-credit to local people to promote their livelihood activities, including agricultural activities,

small business, poultry, livestock etc. Credit services are mainly targeted toward women. In the study site community-based organizations (CBOs) such as local clubs were found in Uttar Ledha. NGO activities are insufficient to support the livelihoods of the people. Micro-credit activities have not been very successful because there is a lack of willingness among group members to return credit on time. It should be noted that micro-credit is not an income generating activity in itself, but a means for promoting of other income generating activities, based on agricultural production, NTFPs, value-added products, etc. We also found a lack of coordination and motivation by the NGOs working in the locality. More alternative income generating activities are essential for better support of the villagers in and around the study site.

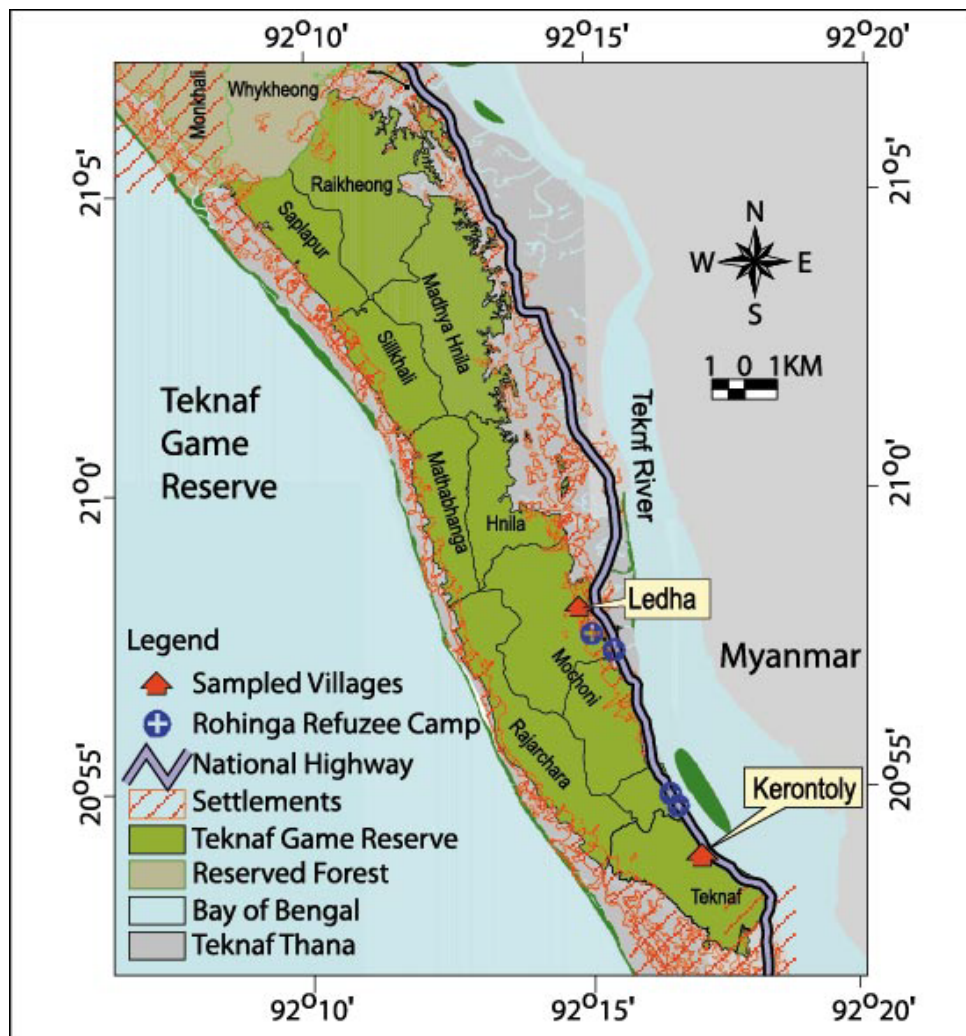


Figure 1: Map of the Study Area (Source: Nishorgo Support Project 2007)



## Methodology

We conducted our exploratory survey during February to June 2006. Out of 14 villages inside the Game Reserve inhabited by both local and Rohingya refugees, we purposely selected two villages -- Ledha and Kerontoly. We initially selected only Ledha because we believed there were many Rohingya refugees. We later learned that Rohingyas represented only about 18% of the population in Ledha and hence we also selected Kerontoly where Rohingyas represent about 88% of the population. We began our study by preparing community profiles to learn details of the two communities. We then collected primary information from key informants, drew community maps, conducted transect walks, and engaged in focus group interviews. We conducted five focus group discussions to learn about the livelihoods and social conditions of both Rohingya refugees and local people. Out of 686 households within the two villages, we selected 106 households for interviews. We used a semi-structured questionnaire in our household interviews that focused mainly on livelihood activities, age, income, education, dependency on the forest, collection of forest products, land holding patterns and impacts on forests, etc. A brief outline of our households' selection method is given in Table 1.

**Table 1: Location of the Villages and Numbers of Households (HHs) Sampled.**

Village	Location	Total HHs Present	Number of Households Sampled
Ledha	Inside game reserve	Local HHs = 487 Rohingya = 110	Local HHs = 59 Rohingya = 23
Kerontoly	Inside game reserve	Local HHs = 11 Rohingya = 78	Local HHs = 11 Rohingya = 13
Total:	-	686	106

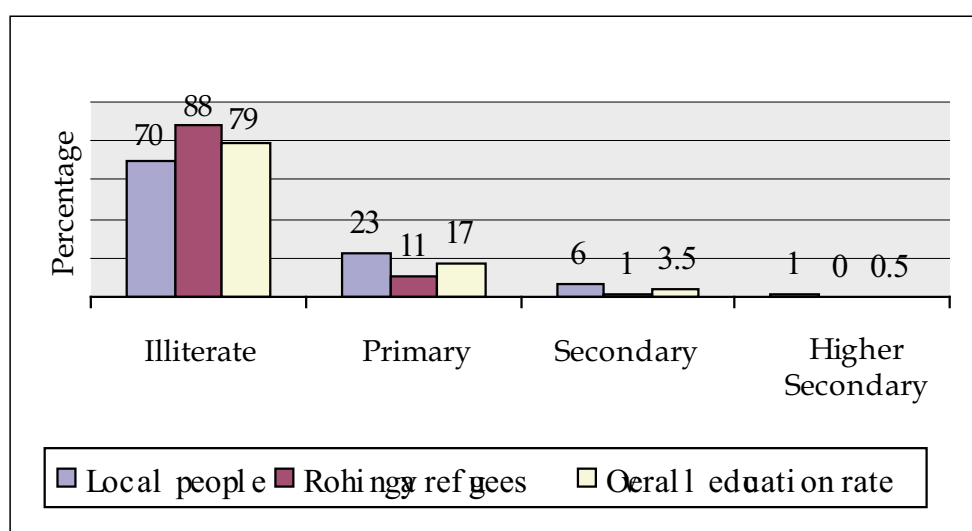
## Results and Discussion

Our research revealed that the total number of households in our study site was 686. Local people and Rohingya refugees live in both villages. The status of households for these two villages is given in Table 2. Family sizes were comparatively big, from two to fourteen people, since most of the families were combined (brothers, sisters and their families living in one household). Average household size of local people and Rohingya refugees was eight and six people, respectively. We found the literacy rate to be 21%. One reason is that parents do not send their children to school during working hours. Parents keep children home to work and help provide for the household's livelihoods. Among people who have

some schooling, the highest percentage is primary level (17%) followed by secondary (3.5%) and higher secondary (0.5%) (Fig. 2).

**Table 2: Local vs. Rohingya Refugee Household Number and Average Size**

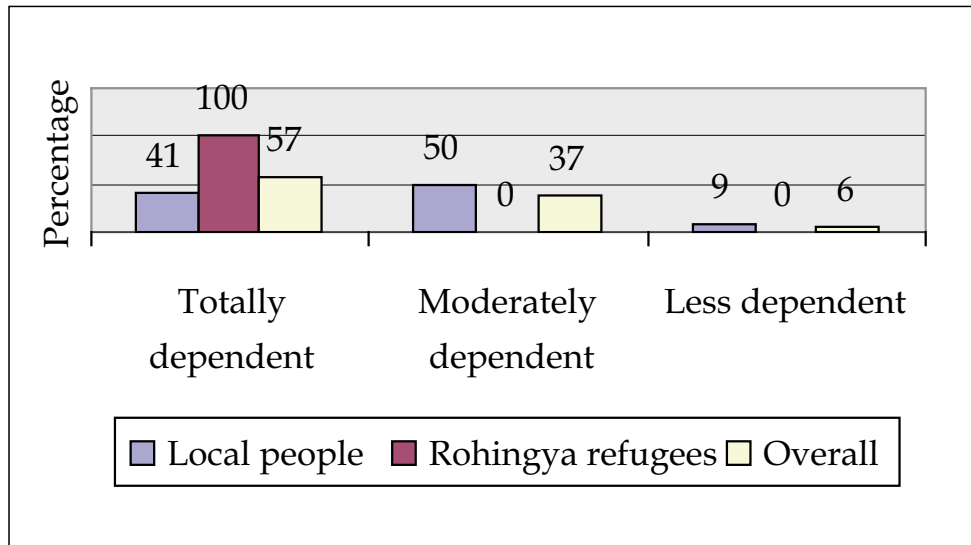
Community	Household	Average household size
Local people	498	8
Rohingya refugees	188	6



**Figure 2: Household Education Status**

Local people and Rohingyas depend on forests for their livelihoods. On the basis of the community profiles and household interviews, we classified villagers according to their degree of forest dependency: totally dependent, moderately dependent, less dependent. We found 57% of the people to be totally dependent, 37% to be moderately dependent, and 6% to be less dependent (Fig. 3). Comparing local people and Rohingyas, Figure 3 suggests that 41% of local people and 100% of Rohingya refugees are totally dependent on forest resources. Of the remaining local people, 50% are moderately dependent and 9% are less dependent. All of the households living within and on the margins of the game reserve depend on the forest directly or indirectly for fuel wood, house building materials, fruits, vegetables, bamboo, cane, medicinal plants, fodder, and other products. We found that they depend on forests for many daily household needs and that they also rely on forest products as a source of additional income.





**Figure 3: Comparative Dependency Study**

It was revealed that 100% of Rohingya refugees and 60% of the local people are landless. Most of the local people and Rohingya refugees live in areas that are officially part of the game reserve. Some local people have even encroached on preserve land and then leased it to newly arrived Rohingya refugees. Approximately 25% of local people have their own agricultural land. Among local people who farm, the average household has 0.22 ha of land that they own legally, and 0.45 ha of encroached land. Among Rohingya refugees who farm, the average household has only 0.09 ha of encroached land (refugees arriving between 1960 and 1970 were able to encroach land), and 0.06 ha of encroached land that they lease from local people (Table 3). Among people that farm, we found that 55% of local people and 17% of Rohingya refugees grow one crop per year.

**Table 3: Land Holding Pattern among the Households (Hectares Per Household).**

Community	Self-Owned	Encroached	Rent
Local	0.22	0.45	-
Rohingyas	-	0.09	0.06

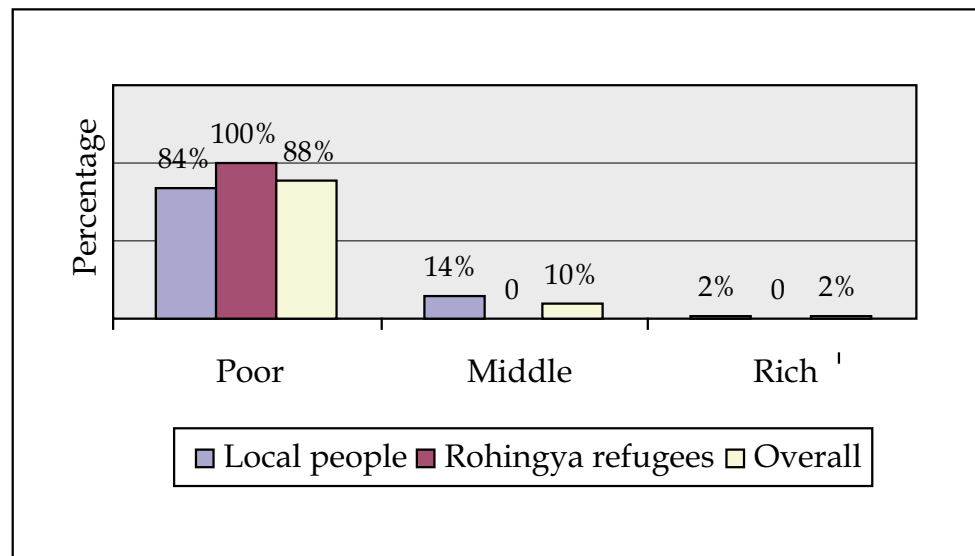
People in our study sites make their homes from tin, mud, bamboo, sun grasses, and other products. We classified housing into five patterns (Table 4). Most homes of both local people and Rohingyas were made of sun grass and bamboo, 32% and 40% respectively. In our study we found that local people and Rohingya refugees preferred (5-10 years ago) to make their homes with sungrass and bamboo. But in

recent times local people and Rohingya refugees preferred category no.2 and category no. 3 respectively.

**Table 4: Housing Pattern Among the Households**

No	Category	Local people	Rohingya refugees
1	Tin shed + mud	21%	8%
2	Tin shed + bamboo	26%	15%
3	Sun grass + mud	16%	33%
4	Sun grass + bamboo	32%	40%
5	<b>Other</b>	5%	4%
<b>Total</b>		100%	100%

Most of the households in our study site are poor to very poor. We divided households into three categories - poor, middle and rich - according to their income. We then asked respondents about their income from different activities, and calculated the monthly income of each household. We came up with categories for poor households (monthly income range Tk 1,500-4,000), middle households (Tk 4,001-8,000) and rich households (Tk 8,000+). We found that overall 88% of people in the study villages were poor, including 100% of Rohingyas and 84% of local people. Furthermore, approximately 14% and 2% of local households were classified as middle and rich, respectively (Fig. 4). Furthermore, household interviews indicated that for most people, monthly expenditures exceeded income.



**Figure 4: Economic Status of Households**



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## **Comparative Study of Livelihood Activities of Local People and Rohingya Refugees**

Forest-related activities are an integral part of villager's livelihood activities and strategies. Both local and Rohingyas are engaged in various livelihoods activities such as fuelwood collection and extraction of NTFPs. During our study most of the older local people said that previously they were totally dependent on forest for their subsistence income, but they now depend on the forest, river and sea when they have no work. Rohingya refugees, however, depended solely on the forest for their livelihoods. A seasonal calendar of different livelihood activities in the study is given in Appendix 1.

Both local people and Rohingya refugees engage in diversified livelihood activities in our study area, but there are differences in their livelihood patterns. We found local people and Rohingya refugees engage in 19 and 17 livelihood activities respectively. Overall we found that 52% of households are engaged in fuelwood collection, 34% in sun grass collection, and 18% in illicit felling. These activities as well as brickfield operations have major impacts on the game reserve and we classify these as having high risk. We further found that 17% of households collect bamboo and extract cane, 14% collect building materials, 9% graze livestock and collect fodder, and 5% cultivate betel leaves and conduct other agro farming activities on forest lands. We ranked these activities as having medium risk. We considered collecting medicinal plants as well as various types of green and dry leaves, extracting fruits and vegetables, hunting, and honey collecting as having low risk (Table 5).

We found that 87% of Rohingya refugees and 35% of local people collect fuelwood. We also found that Rohingya households are more active than local people in collecting sun grass (47%), providing day labor (45%), collecting fruits and vegetables (25%), extracting bamboo and cane (22%), catching shrimp fry (20%), and collecting medicinal plants and house building materials (17%). Local households are more engaged in agro-farming (55%), salt production (46%) (from September to March each year), fishing and small businesses (25%), illicit felling (20%), and cattle grazing (15%). We found that Rohingya refugees are not engaged in cattle grazing, betel leaf cultivation, or salt production. A schematic diagram of livelihood activities and their environmental impacts is provided in Fig. 5.

**Table 5: Comparison of Livelihood Activities of Local and Rohingya Households**

No.	Livelihood Activity	Local People (%)	Rohingya Refugees (%)	Overall Households (%)	Level Of risk	
01	Fuelwood collection	35	87	52	+++	
02	Sun grass collection	27	47	34	+++	
03	Illicit felling	20	15	18	+++	
04	Brickfield owner	3 in Ledha (8 in Teknaf GR)			+++	
05	Grazing and fodder collection	15	-	9	++	
06	Bamboo and cane extraction	15	22	17	++	
07	House building materials collection	13	17	14	++	
08	Betel leaf cultivation	8	-	5	++	
09	Medicinal plant collection	6	17	9	+	
10	Green and dry leaves collection	4	13	7	+	
11	Fruits and vegetables	12	25	16	+	
12	Hunting	2	12	5	+	
13	Honey collection	2	5	3	+	
14	Agro farming	Own land	25	-	41	-
		Encroached land	30	17		++
15	Rickshaw pulling	-	8	3	-	
16	Grocer	10	5	7	-	
17	Fishing	25	16	23	-	
18	Shrimp fry catching	17	20	18	-	
19	Small business	25	13	22	-	
20	Day labor	23	45	30	-	
21	Salt production <sup>1</sup>	46	-	30	-	

Note: "+++" = High, "++" = Medium, "+" = Less, "-" = No risk

<sup>1</sup>Mid September to March each year a large number of local people are engaged in salt production. During this period local people do not go to the game reserve and the pressure on the forest declines.

**Box 1: Livelihood Activities with High Impact on Teknaf Game Reserve)**

***Fuelwood collection***

Fuelwood collection is a major and very visible activity in the game reserve. Fuelwood collection provides primary and secondary occupation for many households. Fuelwood is collected for household consumption and also for commercial purposes. The mean fuelwood consumption is 6 kg/family/day. Overall, 52% of households collect fuel wood from Teknaf Game Reserve; the others meet their demands from buying and from collecting in their home gardens. Fuelwood collectors usually work individually but sometimes they



go in groups. Local people claim that sometimes fuelwood collectors pay Tk. 5 to Tk. 10 as levy to Forest Department staff members to enter the forest. Each household made 2 to 10 trips per week to the game reserve to collect fuelwood, and the trips lasts from 2 to 6 hours; they collect one headload or approximately 23 kg per trip. Our observations suggest that 45% of the fuelwood collected from the game reserve is green wood and the rest is dry. Only 12% of the dry wood is naturally dried; collectors leave the felled trees on the forest floor, and then carry the wood out when it is dry. Fuelwood is collected all year round, but major extraction occurs during the dry season. The collectors of both communities include children and adults, both male and female (see plate 1 and 2). Most collectors supplement their income by selling fuelwood. In our household interviews, people suggested that children, women, and men sold bundles of fuelwood weighing approximately 10-15 kg, 20-25 kg, and 30-35 kg respectively. The average price of fuelwood is Tk. 2 per kg. No rules or regulations govern collectors and fuelwood collection remains unrestricted. Fuelwood extraction from the reserve is for both household consumption and sale in the market. Household interviews suggest that overall 42% of the households sell fuelwood in the local market. We confirmed this by field observations and visits to local market. Middlemen transport large quantities of fuelwood to other areas (see plate 3); local brickfields burn substantial quantities; and local tea stalls and restaurants also burn fuelwood. In most cases middlemen buy fuelwood from the local market and carry it to the market for sale.

#### *Sungrass collection*

Both local poor people and Rohingyas collect sun grass as a building material for commercial purposes and for household consumption. Overall 34% of households collect sun grass during the months of March to June, with the highest percentage collected in May. Poor people, especially young men and women, are the main collectors of sun grass.

#### *Illicit felling*

Widespread illicit felling was carried out in the past at Teknaf Game Reserve and continues to date. Many people living inside and outside of the game reserve, including a number of Rohingya refugees as well as members of armed gangs, are directly involved in the illegal extraction of timber from the

forest. Overall 18% of the households we interviewed are directly employed in illegal felling as day laborers (see plate 4). This activity provides cash income of Tk. 100-300 per day per person. Some trees are also felled for building homes. Most of the time this activity is carried out during the rainy season, government holidays, or at night. However, in some cases influential tree fellers dare to cut trees during the daytime in the dry season. Both legal and illegal timber is sold in the local market.

### ***Brickfields***

Eight brickfields are located in and around the Teknaf Game Reserve; of these three are located in Ledha (see plate 5). Each brickfield consumes a huge amount of fuelwood every day during the seven to eight months that they operate annually. The operation of such brickfields violates the Forest Act. These brickfields purchase fuelwood from the local market. Sometimes Rohingya refugees and people from poor local households are hired as day laborers to collect fuelwood for these brickfields.

## **Box 2: Livelihood Activities with Moderate Impact on Teknaf Game Reserve**

### ***Livestock grazing and fodder collection***

About 15% of local people graze their livestock in the game reserve. Grazing cattle, buffalo, goats and sheep kills seedlings and prevents natural regeneration in the game reserve. Local villagers, especially young boys, collect grasses and fodder for their livestock from the forest during the dry season. Rohingya refugees do not graze livestock or collect fodder.

### ***Bamboo and cane extraction***

Overall 17% of households collect bamboo and cane to supplement their income. In addition to their use as raw materials in home construction, bamboo and cane support many cottage industries in and around the game reserve. The natural regeneration of bamboo and cane has become limited and their future viability is threatened due to over-exploitation.

### ***House building materials***

Overall 14% of households collect house-building materials from the forest to



use as fencing, poles, and posts. They also collect sand and stone illegally from the game reserve in the dry season, to be sold for use in commercial road and building construction.

#### *Agro-farming on encroached land*

Sixty percent of local peoples and 100% of Rohingya are landless. As reported in Table 3, an average local household farms approximately 0.45 ha of encroached land and a refugee household farms approximately 0.15 ha of encroached land.

#### **Betel leaf cultivation**

Betel leaf cultivation is the newest form of land encroachment in the reserve. This activity provides the only source of cash income for 5% of the households we interviewed; other households cultivate betel leaves to supplement their income. Betel leaf cultivators cut small trees and bamboo, especially *molibansh* (*Melocanna baccifera*), and other young plants to erect fences that provide shade and support for betel vines to grow on. Farmers burn the undergrowth for preparation of the betel vine beds. After the vines are grown they burn and fence the covered areas to protect them from weeds.



**Plate 1: Sungrass and fuelwood collection by Rohingya women and children in Ledha.**

### **Box 3: Livelihood Activities Which Have Low Impact on Teknaf Game Reserve**

#### ***Medicinal plants collection***

We identified a total of 34 plant species belonging to 28 families (Appendix 2) including herbs, shrubs, trees and climbers as medicinal plants. Approximately 6% of local peoples and 17% of Rohingya refugees use medicinal plants for curing ailments. Local traditional healers (known as boiddah, kabiraj or hakim) collect these plants.

#### ***Green and dry leaves collection***

Overall 7% of households collect dry and green leaves from the game reserve. They collect dry leaves mainly for consumption as biomass fuel. Green leaves are used for packing various goods, transporting fish and giving shade to houses. Sometimes Rohingya households sell dry and green leaves in the local market at the rate of Tk. 8-12 per sack.

#### ***Fruits and vegetables collection***

Local people and Rohingyas, especially women and children, collect wild fruits and vegetables (Appendix 3) from the forest. A few people sell these products to their neighbors or in markets for additional income. About 16% of the households are involved in this activity.

#### ***Hunting***

Hunting was a common practice in the game reserve in the recent past. Now, however, hunting occurs on a very limited scale. A few wildlife species from the game reserve are hunted by about 5% of the households (Appendix 3).

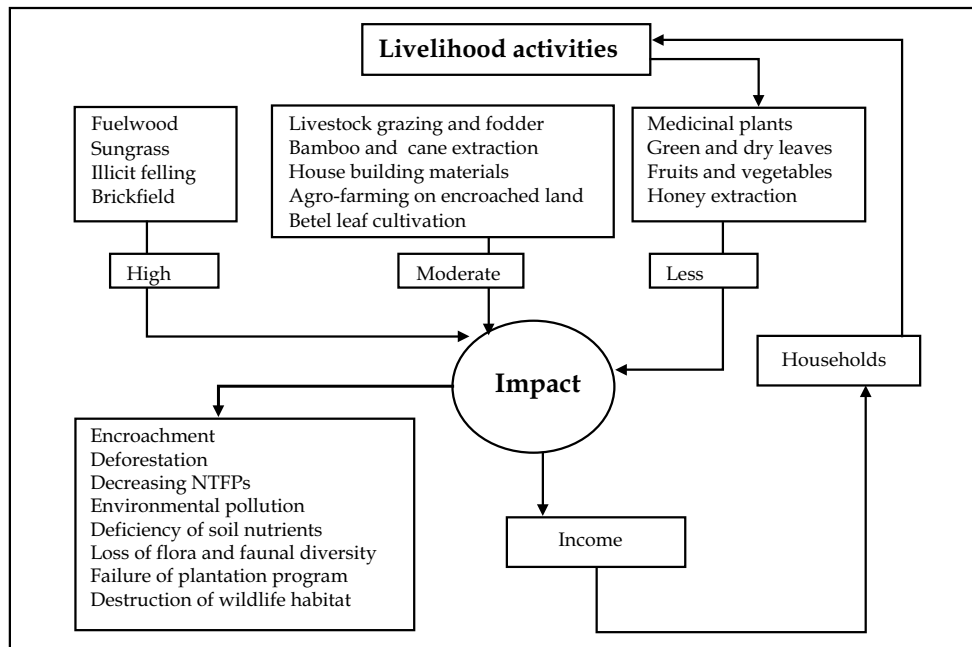
#### ***Honey extraction***

Overall, 3% of households collect honey from the forest. Honey is used as food and medicine, and is collected for commercial and domestic consumption. Sometimes honey collectors damage young plants at the time of extraction. Honey collectors also carry fire to ward off bees, which can cause forest fires.

### **Evidence of Forest Destruction**

The Teknaf range had almost 100% forest cover in 1980. By 1990 it had dropped to 55%. Current data shows only 8% of natural forest remaining in the reserve (Nishorgo 2006). In contrast, the Whykong Range still has 65% natural forest cover.





**Figure 5: Schematic diagram of livelihood activities and impacts**

Previously, the game reserve supported the highest biodiversity in the country 290 plant species, 55 species of mammals, 286 species of birds, 56 species of reptiles, 13 species of amphibians, and 8 of the 10 primates living in the country (Nishorgo 2006). In our study, we asked villagers about extinct and threatened floral species in the reserve. According to these villagers, threatened floral species include baitta garjan (*Dipterocarpus scaber*), jam (*Syzygium spp.*), telia garjan (*Dipterocarpus turbinatus*), shimul (*Salmalia malabarica*), dhuila garjan (*Dipterocarpus alatus*), bandarhola (*Duabhangra sonneratiodes*), bailum (*Anisoptera glabra*), batna (*Quercus spp.*), shil koroi (*Albizia procera*), champa (*Michelia champaca*), koroi (*Albizia lebeck*), kadam (*Anthocephalus chinensis*), chakua koroi (*Albizia odoratissima*), gamar (*Gmelina arborea*), chapalish (*Artocarpus chaplasha*), jarul (*Lagerstoemia speciosa*), telsure (*Hopea odorata*), bahera (*Terminalia beleric*), chandul (*Tetrameles nudiflora*), harina (*Vitex glabrata*), pitraj (*Ammora wallici*), goda (*V. pinnata*), and toon (*Cedrela toona*).

The main objective of game reserve management is to conserve wildlife, but due to human interferences this has become difficult. One villager noted, "Once Teknaf Game Reserve was famous for Asian elephants (*Elephas maximus*), but now Asian elephants are few in number" (Ashad, personal communication 2006). From the study, we found that local people and Rohingya households are well aware of the decline in wildlife populations in the area. They reported that a large number of

wildlife could be seen in the recent past, but that many species are now gone. According to villagers, the following species have now disappeared: python (*Python molurus*), wild pig (*Sus scrofa*), monitor lizard (*Varanus bengalensis*), rhesus monkey (*Macaca mulatta*), kingfisher (*Alcedo atthis*), squirrel (*Calloscirus erythracus*), little egret (*Egretta alba*), sambar deer (*Muntiacus muntjak*), hornbill (*Anthracoceros albirostris*), rabbit (*Caprimulgus hispidus*), dove (*Streptopelia chinensis*), common langur (*Presbytis entellus*), black drongo (*Dicrurus adsimilis*), jungle cat (*Felis chaus*), magpie robin (*Copsychus saularis*), fox (*Vulpes bengalensis*), woodpecker (*Blythopicus pyrrhotis*), porcupine (*Hystrix hodgsonii*), jungle fowl (*Gallus gallus*), cobra (*Naja naja*), lapwing (*Vanellus vanellus*), common mongoose (*Herpestis edwardsi*), myna (*Acridotheres tristis*), and mud turtle (*Trionyx nigricans*).

From our study, we found that 100% of the Rohingya refugees and 60% of the local people are landless and are forced to encroach upon land in the game reserve (see plate 6). On average, local people and Rohingya refugees' encroach on 0.45ha and 0.15 ha of the reserve per household, respectively. We also found that 7% of local people engage in betel-leaf cultivation on encroached forest land.

Many of the households we surveyed collect NTFPs in the reserve. They collect primarily bamboo, cane, medicinal plants, honey, sun grass, fruits, vegetables, fodder and various house-building materials. These NTFPs are decreasing at an alarming rate in the game reserve due to unsustainable collection rates and practices. Through the study, we found that, a few years ago, all kinds of NTFPs were available within a short distance from most households, but now people have to collect these products at a longer distance, inside the reserve.

#### **Box 4: Minor Forms of Forest Destruction**

The forest floor should be rich in humus and mineral nutrients when complete cycling of nutrients occurs. However, women and children from both local and refugee families collect litter from the forest floor, preventing this natural process from occurring. Removal of litter has no immediate effect upon site quality, but in the long run it lowers the quality of the site and ultimately leads to a decrease in soil nutrients and tree growth.

Both local people and Rohingya refugees cultivate root crops such turmeric and ginger in the forest. In addition, they sometimes burn whole areas after collecting sun grass. These activities cause serious soil erosion during the rainy season, which removes topsoil and further degrades the site (see plate 7).



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### Hope for the Future

In 2001, the Forest Department started a participatory forestry program in Kerontoly village where department staff members and local people jointly planted 15 ha of land with cane and bamboo. In 2004 and 2005 Forest Department staff members again involved local people in a participatory tree plantation program covering 10 ha, where every participating household was allocated 1 ha. We found 36 households in the two villages that managed their allocated plantations very well; the plantations were undisturbed and growing well. Participants manage and protect their plantations by working as a team. Outside of the participatory plantations and some other patches near the range office, we saw no other examples of successful plantations during our research. Therefore, involving local people in game reserve management can have significant positive results.

## Recommendations

Based on our research and findings, we can make the following recommendations for enhancing management of wildlife reserves such as Teknaf:

- Poor and forest dependent people need to be identified and diverted from forest degradation. Their livelihood activities need to be monitored through close interaction, capacity building, community mobilization and motivation. Existing NGOs should be involved in awareness creation and community mobilization.
- Forest Department and the local people should jointly manage the forest resources under agreement. Accordingly, co-management models need to be developed with suitable policies to involve local people in joint forest management. People are interested in participatory forestry programs.
- The unregistered Rohingya refugees should be repatriated to their home land through a bilateral agreement jointly with international organizations. The United Nations High Commissioner for Refugees (UNHCR) should be allowed immediate and complete access to newly arrived refugees who are staying in villages in the game reserve. Without UNHCR access, refugees will not be able to have their protection needs assessed and will not be able to receive humanitarian assistance.
- Encroachment is a major problem in the game reserve. Forestlands are being encroached upon by influential people, and it is impossible to regain all of the

encroached land from local elites. The Forest Department should introduce community forestry on this land. Encroachers accept community forestry, because community forestry promotes sustainability, and utilization of land through combining agricultural and forest crops.

- Illegally established brickfields near the forest remain the main threat to the viability of forests and wildlife populations. Legal actions need to be taken against the owners to remove brickfields from the game reserve.
- Illicit felling is another major problem. Armed criminals often enter the forests in groups and commit illegal felling. In such cases, field patrols are difficult without the assistance of the military or police force. This creates problems for effective and rapid action against the illicit fellers. Administrative decentralization of the Forest Department may help to resolve this problem.
- Alternative income generation activities are needed, such as the cultivation of bamboo, cane, and *murtha* plantations; participatory agro-forestry activities in the buffer zone; development of small scale enterprises such as nurseries, the cultivation, collection and processing of medicinal plants, beekeeping and honey processing, fishing, poultry farming, dairy farming and goat farming.
- Teknaf is famous for tourism in Bangladesh, due to its natural beauty. The reserve has immense scope to develop eco-tourism in the long series of hills along the Naf River. Eco-tourism can be a development tool for the region that could not only provide benefits for nature conservation, but also pave the way for revenue generation and the creation of more job opportunities.

## Conclusion

This article summarizes a comparative study of the diversified livelihood activities of both local people and Rohingya refugees, which have impacts on the Teknaf Game Reserve (Appendix 4 provides photographs of the study site). These impacts are affected by seasonal fluctuations in climate, by the availability of natural resources, and by various environmental, socio-economic and political shocks and stresses. Though the Rohingya refugees are involved in various destructive activities, they have no other clear options for income generating activities. Local people do not support the Rohingya, as they are perceived as an unwanted burden. Both local people and Rohingya refugees desperately need alternative income generating activities. Both groups want to collaborate with national and



international organizations to resolve the refugee situation in a timely and congenial manner, and to repatriate Rohingya refugees to their country. By dividing the game reserve into various management units, local people can become involved in co-management systems. Our research suggests that local people who have been given an opportunity to be involved in participatory forest plantations have managed their plantation well and have produced rich and productive forest gardens. Our study of two villages is a small sample of livelihood activities and their impacts on the game reserve. There is a great need to study the other villages both within and outside the reserve in order to explore their impacts, because livelihoods and impacts vary from village to village. We highly recommend further research to better understand the actual situation, and to highlight new forms of co-management that may help to save Teknaf Game Reserve.

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## Appendix 1 : Schematic diagram of livelihood activities and impacts

Livelihoods	Bai	Jai	Ash	Sra	Bha	Asw	Kat	Agr	Pau	Mag	Fal	Cho
<b>General livelihoods</b>												
Agro farming		Y	Y	Y	Y	Y	Y					
Salt production Betel leaf cultivation					Y	Y	Y	Y	Y	Y	Y	Y
Brick field	Y	Y						Y	Y	Y	Y	Y
Rickshaw pulling	Y	Y	Y	Y	Y	Y						
Day labor	Y	Y					Y	Y	Y	Y	Y	Y
Grocer	Y	Y			Y	Y	Y	Y	Y	Y	Y	Y
Fishing	Y	Y	Y				Y	Y	Y	Y		
Shrimp fry catching	Y		Y	Y	Y			Y	Y	Y		
Small business	Y	Y			Y	Y	Y	Y	Y	Y	Y	Y
Livestock grazing and fodder collection	Y	Y					Y	Y	Y	Y	Y	Y
Illicit felling			Y	Y	Y	Y	Y	Y				
Hunting							Y	Y				
House building materials collection								Y	Y	Y	Y	Y
Sun grass collection	Y	Y									Y	Y
Fuel wood collection	Y	Y					Y	Y	Y	Y	Y	Y
Medicinal plants collection	Y	Y									Y	Y
Bamboo and cane extraction			Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Honey collection	Y											Y
Green and dry leaves collection			Y	Y	Y			Y	Y	Y		
Fruits and vegetables collection	Y	Y	Y	Y	Y							

**Notes:** Bai = Baisak (April 14-May 14), Jai = Jaistha (May 15-June 14), Ash = Ashar (June 15-July 15), Sra = Sraban (July 16-Aug 15), Bha = Bhadra (Aug 16-Sept15), Asw = Ashwin (Sept 16-October15), Kar = Kartik (Oct 16-Nov14), Agr = Agrahayan (Nov 15-Dec14), Pau = Paush (Dec15-Jan13), Mag = Magh (Jan 14-Feb12), Fal = Falgun (Feb13-Mar 14), Cho = Choitra (Mar15-Apr13)

## Appendix 2: Medicinal Plants in the Teknaf Game Reserve and Their Use

Local Name	Botanical Name	Family	Parts used	Traditional use	Habit
Assam pata	<i>Mikania cordata</i> Rob.	Compositae	Green leaves	Anti-hemorrhoid	Sh
Assam lata	<i>Eupatorium odoratum</i> L.	Compositae	Green leaves Flowers	Anti-hemorrhoid, narcotic, influenza, fever, cough and diabetes	Cl
Arjun	<i>Terminalia arjuna</i> Bedd.	Combretaceae	Bark	Heart disease, dysentery, diarrhea, piles, bone fracture and cough	Tr
Ada	<i>Zingiber officinale</i> Roxc.	Zingiberaceae	Rhizome	Cough, cold, constipation, diarrhea, vomiting, tonsil, Teeth ache and ailments	H
Amoloki	<i>Phyllanthus emblica</i> L.	Euphorbiaceae	Fruit	Dysentery, cough, cold, vomiting, jaundice, dyspepsia, skin diseases, hair falls, digestive problem	Tr
Anaras	<i>Ananas sativus</i> L.	Bromeliaceae	Fruit	Jaundice	H
Akanda	<i>Calotropis calycinum</i>	Asclepiadaceae	Leaf, latex	Gout pain, Constipation, cough, worms, asthma, fever, urinal problem	H
Bohera	<i>Terminalia bellerica</i> Roxb.	Combretaceae	Fruit, bark	Constipation, anemia, hepatitis, cough, stomach trouble, dysentery, rheumatism, astringent and eye disease	Tr
Bel	<i>Aegle marmelos</i> L.	Rutaceae	Fruit	Weakness, colitis, diarrhoea	Tr
Bakul	<i>Mimusops elengi</i> L.	Sapotaceae	Fruit, bark	Chronic dysentery, astringent, tonic and fever	Tr
Basak	<i>Adhatoda vasica</i> Nees.	Acanthaceae	Fresh green leaves	Cough, cold ailments, malaria, asthma, bleeding of piles and phthisis	Tr
Banana	<i>Musa sapientum</i> L.	Musaceae	Root, fruits	Dysentery, Diarrhea and stomach trouble	H
Chatim	<i>Alstonia scholaris</i> Br.	Apocynaceae	Leaf, bark	Fever, astringent, tonic, anthelmintic, febrifuge and antiperiodic	H
Durba grass	<i>Cynodon dactylon</i> L.	Gramineae	Tender leaves	Tooth ache, cut and wounds	H
Donkalos	<i>Leucas aspera</i> Spreng	Labiatae	Whole plant	Cold ailments, snake bite, chronic, skin disease and rheumatism	H
Gila lata	<i>Derris trifoliata</i> Lour.	Papilionaceae	Whole body	Not specified	Cl
Harzora	<i>Vitex quadrangularis</i> Wall.	Vitaceae	Whole plant	Bone fracture	h
Horitaki	<i>Terminalia chebula</i> Retz.	Combretaceae	Fruit	Dysentery, headache, painful menstruation, jaundice, constipation, fever, heart disease, cough, urinary problems	Tr





Holud	<i>Curcuma longa</i> L.	Zingiberaceae	Rhizome	Skin ailments	H
Jambura	<i>Citrus acida</i> L.	Rutaceae	Fruit	Jaundice	Sh
Keora	<i>Sonneratia apetala</i> Buch.Ham.	Sonneratiaceae	Leaves, bark	Fever, stomach problem	Tr
Lebu	<i>Citrus limon</i> (L) Burm. f.	Rutaceae	Fruit, Leaf	Digestive, fever, appetizer, cough and bronchitis	Sh
Mendi	<i>Lawsonia inermis</i> L.	Lythraceae	Leaves, bark, seed and flower	Skin disease, jaundice, spleen disease, headache, hair falling and rheumatism	Sh
Narikel	<i>Cocos nucifera</i> L.	Arecaceae	Tender fruit	Refresher and hair falls	Pa
Neem	<i>Azadirachta indica</i> A. Juss.	Meliaceae	Leaves, seed, bark	Skin diseases, chicken pox, antiseptic, eczema, ulcer, fever, dysentery, diabetes	Tr
Nishinda	<i>Vitex negundo</i> L.	Verbenaceae	Leaves	Skin disease, rheumatism, cough, intestinal worms and headache	H
Papeya	<i>Carica papaya</i> Linn.	Caricaceae	Fruit, latex and seed	Stomach trouble, asthma and skin disease	Sh
Paan	<i>Piper betle</i> Linn.	Piperaceae	Green leaves, roots	Constipation, sex stimulant, digestive, ear disease, diarrhoea, fever and stomachache	Cl
Shegon	<i>Tectona grandis</i> L.f.	Verbenaceae	Roots, flowers, fruits	Hair growth, urinary problems	Tr
Sajna	<i>Moringa oleifera</i> Lamk.	Moringaceae	Bark, leaves, roots	Paralysis, intermittent fever, epilepsy, hysteria, rheumatism, articular pains, cold ailments, affection of liver and spleen	Tr
Shimul	<i>Bombax ceiba</i> L.	Bombacaceae	Bark, roots	Diarrhoea, dysentery, cough, leucorrhoea and fever	Tr
Supari	<i>Areca catechu</i> L.	Palmae	Fruit, leaves	Ulcer, rheumatism, sex stimulant, constipation, digestive, teeth disease	Tr
Thankuni	<i>Centella asiatica</i> L.	Hydrocotylaceae	Whole plant	Dysentery, brain tonic, cardiac tonic and diarrhoea, gastric	H
Ulatkambal	<i>Abroma augusta</i> L.	Sterculiaceae	Bark, root	Dysmenorrhea	H

Note: Tr-Tree, H- Herbs, Sh- Shrubs, and Cl-Climbers.

### Appendix 3: List of Vegetables, Fruit and Wildlife Collected from Teknaf Game Reserve

Vegetables	Bamboo shoots, arum, dekhishak, haichhashak, tarashak, maminnashak, terishak, etc.
Fruits	Lata mangoes, litchi, olive, banana, cowgola, chapalish, kanthat, dewa, bakumgola, chalta, amloky, hartoki, bohera, etc.
Wildlife (hunted)	Mammals: deer, elephant, black deer, monkey, tiger, wild dog, wildfowl, wild boar, goyal, wild cow, etc. snakes (reptiles): python, daras, kalantor, kachupaitta, ain hap, dudraj, cobra, monitor lizard, etc. Birds: dove, parrot, myna, cuckoo, heron, kingfisher, nightjar, vulture, wild fowl, hornbill, peacock etc.

**Appendix 4: Photographs**



**Plate 2: A local fuelwood collector.**



**Plate 3: Fuelwood, sungrass transportation.**



**Plate 4: A local illicit feller coming from the game reserve.**



**Plate 5: A typical brickfield inside the game reserve in Ledha.**



**Plate 6: A forestland encroached by Rohingya refugees**



**Plate 7: Degraded forestland in Teknaf Game Reserve**