



# **Secondary Data Collection for Pilot Protected Areas: Lawachara National Park**

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## **Secondary Data Collection for Pilot Protected Areas: Lawachara National Park**

*Prepared for:*  
International Resources Group (IRG)

Prepared by:

**Dr. Abdur Rob Mollah**  
**Shital Kumar Nath**  
**Md. Anisur Rahman**  
**Md. Abdul Mannan**  
Nature Conservation Management (NACOM)



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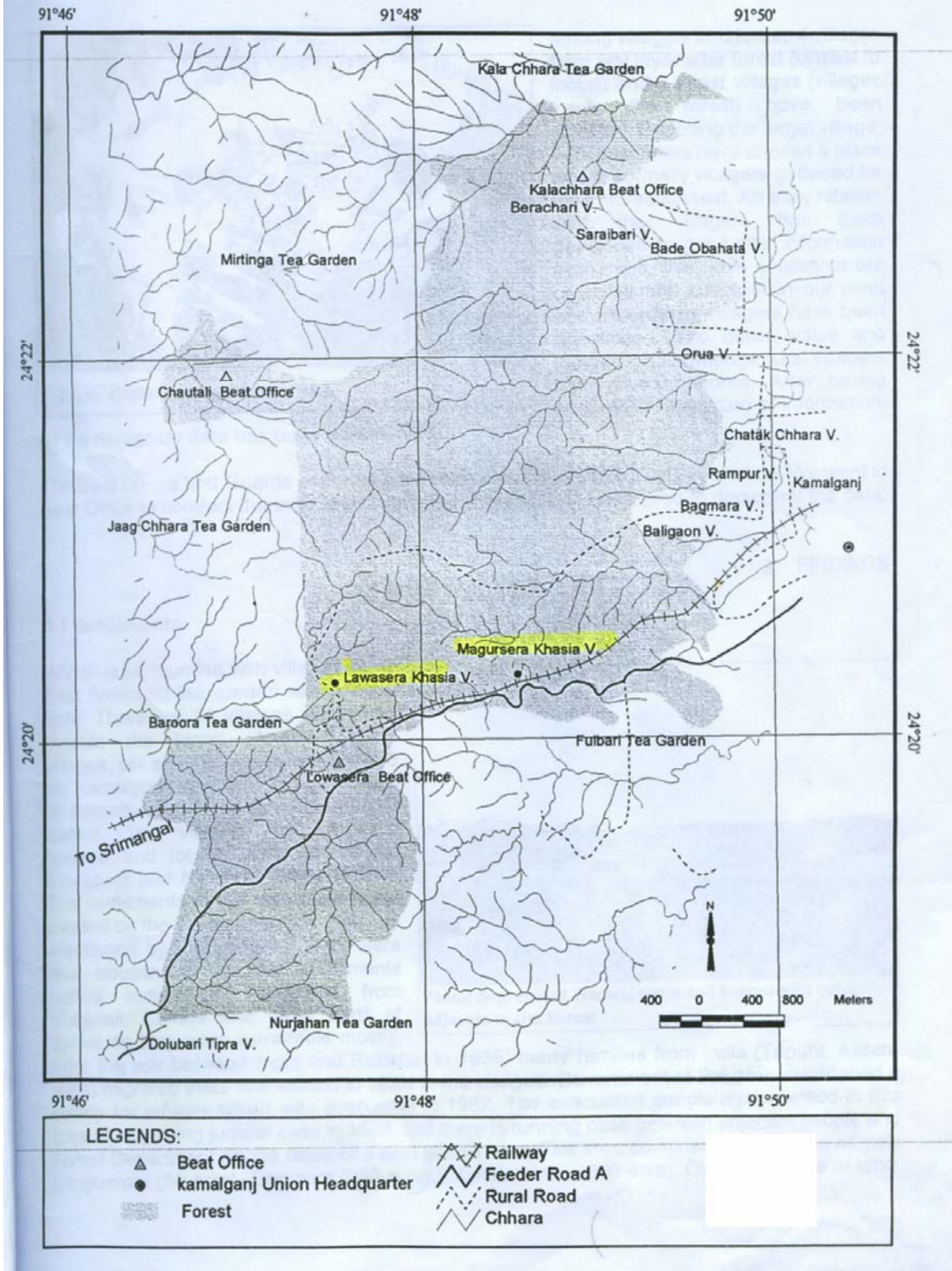
**With partners: CODEC, NACOM & RDRS**



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# West Vanugach Reserve Forest



## SECONDARY INFORMATION ON LAWACHARA NATIONAL PARK

Official Name	: Lawachara National Park
Previous Name	: West Bhanugach Reserved Forest
Protection Status	: National Park
Forest Type	: Semi-evergreen and mixed deciduous forest (Champion <i>et. al.</i> 1965, Feeroz and Islam (2000), and Ahsan 2000)

### **1. Location**

#### 1.1. Civil administrative location

Mouza	: West Bhanugach Hill Forest
Union	: Kamalgonj
Upazila	: Kamalgonj
District	: Moulavibazar

#### 1.2. Forest administrative location

Forest beats	: Lawachara, Chautali and Kalachara
Forest range	: Moulavibazar Forest Range
Forest Division	: Sylhet Forest Division

1.3 GPS location : 24<sup>0</sup>30'-24<sup>0</sup>32' N and 91<sup>0</sup>37'-91<sup>0</sup>39'E (Feeroz *et al.* 1994)  
: 24<sup>0</sup>32'N and 91<sup>0</sup> 47E (Ahsan 2000)

1.4. Bio-ecological zone : 9b-Sylhet Hills (Nishat *et al.* 2002)

### **2. History of establishment**

Lawachara National Park (NP) is a part of the West Bhanugach Reserved Forest. The reserved forest was established through an order under the Forest Act. The

current national park was established through a Gazette Notification ( PBM (S-3) 7/96/367 on 07 July 1996). Further proposal was made for extension of the park as per recommendation of Forestry Master Plan (GoB 1992) and feasibility study carried out by FRR and DU (1996).

### **3. Area**

Current notified area of the park covers an area of 1250 ha and the proposed area includes 281 ha of West Bhanugach Reserved Forest. The total area thus stands at 1531 ha which has been considered for inclusion in the Forestry Sector Project Management Plan (FSP 2000a).

### **4. Boundary**

As stated in the gazette notification, the land within Block 3 and 4 (established in 1921 and 1927) are included in the Lawachara National Park. The exact boundary is however mentioned in the gazette notification of the park.

Detailed boundary specification is provided in the gazette notification (No. PBM (S-3)7/96/367; dated 7.7.1996). As stated in the notification, the FD marked pillar, situated at the southwest corner of West Bhanugach Reserved Forest at the junction of Balishira Hill Mouza (Block 3), Bharaura Tea garden Mouza and West Bhanugach reserved Forest Mouza at the 11 km marked mile pillar of the Srimongal-Bhanugach road of the Road and Highways Department, is deemed as the Station No.1. The line connecting the Stations 2, 49, 61, 63, 64, 72, 73, 76, 84, 91, 102, 117, and again Station 1 form the boundary line of Lawachara National Park.

### **5. Legal status and special regulatory provisions**

The Lawachara National Park was established under the provision of Article 23 (3) of the Bangladesh Wildlife (Preservation) Order, 1973 (President's Order No. 23 of 1973) as amended by the Wildlife (Preservation) (Amendment) Act, 1974 (Act XVII of 1974). As stated in the order, any type of hunting, killing or capturing of

wildlife or making any disturbances to the wildlife is prohibited within the park as well as within 1 mile radius area from the outer boundary of the park. The Act also prohibits cutting of trees, gathering of other forest products, extraction of barks or causing any harm to the plants. Similarly, the forest or any part of it can't be cleared for mining or for any other purposes or for cultivation etc. The Act also prohibits fishing or polluting stream/rivers flowing through the park. However, such activities may be allowed to some extent by the government only when it is deemed necessary for its improvement, beautification or for any scientific reasons.

#### **6. Topography/physiography**

The soils of Lawachara are brown, sandy clay loam to clay loam of Pliocene origin (Hussain *et. al.* 1989). The area is undulating with slopes and hillocks, locally called tilla, ranging from 10-50 m and are scattered in the forest. Numerous streams flow through the forest. The south east, south and east sides are boarded by tea gardens and the west by coffee plantation. Numerous trails and tracks are found within the forest, created by the local people for collecting wood from the forest (Feeroz and Islam 2000).

The forest of Lawachara do not fall markedly under one recognized type, but as semi-and /or mixed evergreen, where tall trees are deciduous and the under storey evergreen (Ahsan 2000). The forest originally supported a indigenous vegetation cover of mixed tropical evergreen forest (Alam 1988). However, almost all of the original forest cover has been removed or substantially altered and thus has turned into a secondary forest. The old plantations (around 1920's) are of primarily native species (but many of them are exotic to the forest) which have developed a multi-storied structure, including regrowth of creepers and naturally occurring trees and undergrowth species. In the oldest of these areas, the vegetation cover has taken on the structure of natural forest, and evolution towards a natural structure (FSP 2000b and Chemonics 2002). Only some small remnant patches of rich primary forest remain, most significantly including an 8.6 ha, unlogged BFRI research plot, but also including small patches of natural forest cover within the old plantations areas.

Other areas of natural forest cover (approx. 130 ha) are utilized for betel leaf cultivation (Alam and Mohiuddin, 1995).

The forest is semi-evergreen (Craig 1991). The canopy height varies from 10 –30 m. The top canopy comprises *Tectona sp.*, *Ariocarpus chaplasha*, *Tetrameles sp.*, *Hopea odorata.*, *Toona ciliata*, *Pygenum sp.* etc. The second canopy comprises *Quercus spp.*, *Syzygium sp.*, *Gmelina sp.*, *Dillenia sp.*, *Grewia sp.*, *Ficus sp.* etc. The underneath includes *Bambusa spp.*, *Alsophila sp.* *Geodorum sp.*, *Eupatorium odoratum* etc. and several ferns and epiphytes. (Islam and Feeroz, 1992 and Feeroz and Islam 2000).

#### 7. Existing infra-structural facilities

FSP (2000a) provides a detail list of the existing infra-structural facilities available in the forest area and is summarized below:

<b>Location</b>	<b>Facilities available</b>
Lawachara Beat Office	:Shyamoli Resthouse (3 bedrooms, 3 bathrooms, 1 dining room, 1 sitting room and 1 varandah. Used by guests :One Beat officers’ quarters. Used by FD staff :BFRI quarters. Used by BFRI people :Wildlife Scout Quarters. Used by Ecologist’s and Social Scientist’s Offices. :Wildlife Training Centre. Used as Park Office. :Beat Office. Used by none. :Guard Quarters (3 buildings). Used by none. :Forestry School Barracks. Used by none.
BFRI Complex	:Staff Quarters. Used as Environmental Education Officer’s quarters. :Laboratory/Office Building. Used as Environmental Education Centre.



	:Guard Quarters. Used by BFRI people.
	: Nurseries. Used by BFRI.
Janakichara Nursery	: Hilltop Viewpoint. Used as Picnic Shelter.
/Rest Spot/Picnic Area	: Wildlife Enclosure. Used as Picnic Shelter.
	: Public Toilet. Used by none.
	: Mail Quarters (4). Used by none.
	:Nursery. Used as nursery for framework and planting species.
Bhagmara Guard Camp	: Single Guard Quarters. Used by foresters.
	: Double Guard Quarters. Used by foresters.
Chautali Beat Office	: Beat Office/Residence. Used by none.
	: Guard Quarters (3). Used by none.

## 8. Settlements

Altogether, there are **14 villages**, of which two are located within the park and the rest lie on the boundary of park and/or just at the outskirts of the park (Table 1) and all have stake with the forest (CNRS 2000). The settlement history dates back to early 1940's with the people who were employed for logging and/or plantation in the forest. The largest inside village, **Magurchara punji**, was established around 1950 and presently consists of 40 households (HHs) and is inhabited by Khasia people. After Magurchara gas field explosion a number of households has been shifted to a nearby place within the forest. The other inside village, **Lawachara punji**, was established in the 1940's and currently consists of 23 HHs (FSP 2000a and Chemonics 2002).

There is another village, called **Dolubari**, a long established Tripura (tribal) settlement of 75 HHs at the hill foot flat at the south-west boundary of the park. The villagers largely depend on the resources of the park and also regarded as one of the intensively used sites of the park (FSP 2000a).

The **rest of the villages** (11 villages) are located along the northeastern boundary, inhabited by migrants from Noakhali, Comilla and neighbouring India and major influx of people occurred about 50 years ago and converted the low lying forest areas to paddy cultivation. Homesteads are located outside of the park, but adjacent to plantation areas of the forest and people depend on subsistence use of forest resources and livestock grazing in the forest. The settlers in these outside villages are Bangalee and almost all of them are Muslims, of them approximately 50% families came from Assam, Tripura etc. in 1965, approx. 30% families migrated from Comilla and Noakhali and elsewhere of the country and the rest approx. 20% are local. The number of total HHs is reported to be 4000-4500 (CNRS 2000).

The park and the proposed extension area are bordered on the north, west, south and southeastern part largely by **7 tea estates** (Table 2). The estates provide refuge a large number of their labourers and their dependants. These people have also stake with the forest to some extent as they enter the forest of and then (CNRS 2000). These estates also support some secondary vegetation which forms continuation of the wildlife habitat of the park (FSP 2000a).

FRR and DU (1996) identified the mouzas/villages those have stake with the Bhanugach Forest and suggested to include those settlements in the Management Plan (Table 1).

**Table 1. Information on the settlements inside and adjacent to the Lawachara NP.**

Sl. No.	Name of the village	Mouza	Location	Household nos.	Forest villagers nos. (HHs)**	Population	Identified stake with the park
1	Lawasera Punji	West Vanugach hill	Inside the park	23	23		Collection of fuelwood and building materials, agricultural activities within the park, hunting, extraction other forest product, betel leaf production in the park.
2	Magursera Punji	West Vanugach hill	Inside the park	40	40		Do
3	Dalubari	Baliserah Pahar Block-3	South-West of park	72	-		Pineapple & lemon cultivation (70% HHs) at hill slope, fuelwood and building materials collection, etc.
4	Languarpar	Kamra Kapan	East of park				Collection of fuel wood & timber poaching, grazing by cattle and fodder collection, etc.
5	Baligaon	Kamra Kapan	East of park	1300	-		Do
6	Bagmara	Kamra Kapan	East of park	200	-		Do
7	Rajtila	Kamra Kapan	East of park				Do
8	Chatakchhra	Rampasha	East of park				Do
9	Bangaon	Rampur	-				Do
10	Orua	Rampur	-				Do
11	Berachhari	Haribari	North-East of the park				Do
12	Saraibari	Haribari	North-East of park				Do
13	Badeobahata	Badeobahata	North-East of park				Do
14	Kalachhara	Kalachhara	North-East of park	20	20		Do
				Total HHs 4000-4500			
				700	Total	34	

Note: Adapted from CNRS (2000) with further information from FSP (2000)

\*\* Forest villagers are those HHs who are registered with the Forest Department (FD) and are recognized by the FD as forest villagers. Actual number could be more.

**Table 2. Information on the surrounding Tea Estates of Lawachara National Park.**

Sl. No.	Name of the Tea Estate	Mouza	Location	Stake with the park
1	Nurjahan Tea Estate	Nurjahan Tea Garden	South of park	Dependants of the labourers of the estate collect fuelwood and other forest products from the park, has secondary vegetation in the estate from continuation of habitat of many wildlife.
2	Fulbari Tea Estate	Fulbari Tea Garden	South-East of park	Do
3	Mirtinga Tea Estate	Mirtinga Tea Garden	North-West of park	Do
4	Jerin Tea Estate	Balisera Pahar Block-3	South-West of park	Do
5	Baroora Tea Estate	Baroora Tea Garden	West of park	Do
6	Jaagchhara Tea Garden	Gila chhara Tea Garden	West of park	Do
7	Sonaichhara Tea Garden	Narayanchhara	West of park	Do

Source: Adapted from CNRS (2000) with additional information from FSP (2000).

## 9. Land use cover and cropping pattern

Table 4 shows the forest and land use cover in Lawachara National Park. The major coverage of natural primary forest is represented by 8.6 acres of land in the extension area allocated for FRI and also by unconverted betel leaf plots of the forest villagers and also some small patches of forest within the planted areas. The long rotation plantation (teak, jarul, chaplash, garjan etc.) covers an area of about 1110 ha and short rotation plantation about 187 ha. Bamboo and cane plantation covers an area of about 25 ha. Of the forest village area of 129 ha, about 110 ha are covered by betel vines area and the rest are homestead lands. Agricultural activities within the park carried out by tribal khasia people. The long-rotation plant plots supports some indigenous trees and also has relatively rich plant species diversity FSP (2000a).

**Table 3. Land use cover in Lawachara National Park and its proposed extension area**

Cover Type	Notified Area		Proposed Extension		Total	
	Area (ha)	Present	Area (ha)	Present	Area (ha)	Present
Natural forest <sup>1</sup>	0.0	0.0	0.0	0.00	0.0	0.0
Long-rotation plantation	363.2	29.7	0.0	0.00	363.2	24.2
-1940s	119.4	9.8	0.0	0.00	119.4	7.9
-1950s	120.7	9.9	16.1	507	136.8	9.1
-1960s	122.8	10.1	142.7	50.8	265.5	17.8
-1970s	0.0	0.0	30.5	10.9	30.5	2.0
-1980s	4.7	0.4	0.0	0.0	4.7	0.3
-1990s	120.0	9.8	0.0	0.0	120.0	8.0
-2000	0.0	0.0	61.8	22.0	61.8	4.1
Short-rotation plantation <sup>3</sup>	170.7	14.0	0.0	0.0	170.7	11.4
Failed plantation	0.0	0.0	16.3	5.8	16.3	1.1
Bamboo plantation	17.8	1.5	4.0	1.4	21.8	1.4
Cane	3.4	0.3	0.0	0.0	3.4	0.2
Forest Village	129.8	10.6	0.0	0.0	129.8	8.6
Agriculture	18.5	1.5	0.0	0.0	18.5	1.2
Forest Research Institute area	11.3	0.9	8.6	3.1	19.9	1.3
FD Beat Offices and Camps	4.0	0.3	1.0	0.4	5.0	0.3
Transportation/utility corridors	14.8	1.2	0.0	0.0	14.8	1.0
<b>Total</b>	<b>1221.2</b>	<b>100</b>	<b>281.0</b>	<b>100</b>	<b>1502.2</b>	<b>100</b>

<sup>1</sup>much of the 129.8 ha designated as Forest Village is natural forest modified for betel leaf cultivation (lower limbs and undergrowth removed). An additional 8.6 ha designated as FRI area in the proposed extension is mature natural forest.

<sup>2</sup>long-rotation plantations are primarily teak (*Tectona grandis*) and jarul (*Lagerstroemia speciosa*), with chapalish (*Artocarpus chaplasha*), kadam (*Anthocephalus chinensis*) and other species, including natural regrowth.

<sup>3</sup>short-rotation species include moluccana (*Albizia (Paraserianthes) falcataria*), eucalyptus (*Eucalyptus spp.*), akashmoni (*Acacia auriculiformis*), mangium (*Acacia mangium*) and kadam (*Acacia mangium*) and kadam (*Anthocephalus chinensis*).

Source: FSP (2000a), prepared based on RIMS data.

*Cropping pattern:* PRA conducted by CNRS (2000) in Baligaon, Bagmara, Rajtila, Berachari and Saraibari shows that over 60% land in these outside villages are crop land and 40% is covered by settlements and tillas. The tillas are covered with natural vegetation as well as planted trees. Khasia villagers also cultivate rice in about 10 ha land in between the tillas nearby their villages.

Most of the agricultural land outside the forest are under double cropping, alternating Aus and Aman. Aus is planted in April-may, followed by Aman planted in July-August. Aman paddy covers 100% flat land during respective season, while 40-50% land near available water source is usually used for boro rice during winter. Water from the chara (streams) is used for irrigating HYV (CNRS 2000).

## **10. Land tenure/land encroachment**

Forest Department allotted 1.2 ha land to each registered villagers of the inside villages for betel plantation. However, they are using much more than that. The allocation was made in exchange of participation in plantation management activities and enforcement patrols (FSP 2000a and Chemonics 2002). The inside villagers also established about 19 ha (10 ha ?) of agricultural lands in low laying areas between the hills adjacent to their villages. Another, about 10 ha of the National park has been converted into agricultural land by the outside villagers.

An area of about 556 acres of forest land outside the Park was reported to be encroached by Languarpar, Bagmara, Chatakchara villagers. Out of 556 acres of land, about 300-320 acre land are still illegally enjoyed by villagers. In Paschim Bagmara about 73 HHs are on the disputed land occupying 250 acres. The encroachers were evacuated once in 1982 but they are resettled in 1988 by winning a judicial pronouncement (CNRS 2000).

## **11. Information on the socio-economics of the local people**

Information on the socio-economic aspects of the people in and around the NP are almost lacking. CNRS (2000) provides some information on the socio-economic status of the local people based on their limited PRA findings. FRR and DU (1996) compiled some information (Source: Bangladesh Population Census-1991) on the population number and occupation of some settlements (Table 4).

### *11.1. Occupation and economic activities inside and outside villagers*

The main income of the inside village HHs (khasia) comes from betel leaf cultivation, followed by rice cultivation. They also collect fuelwood to supplement their family income. In other tribal village (Tripura) about 70% HHs depend on the cultivation of lemon and pineapple at the hill slope and the rest 30% households are day labourer. The khasia women mainly sort betel leaf while tripura women weave cloths and do household work and sometimes they work in the lemon and pineapple farm (CNRS 2000).

The outside village HHs have diverse occupational pattern. About 30% HHs depend on the collection of fuelwood for their livelihood, about 30% HHs again largely subsit on agriculture, and about 30% subsit on agriculture as well as on forest products. About 10% have other occupations including small business, service, day labourers etc (CNRS 2000). As per Bangladesh Population Census-1991 (compilation by FRR and DU 1996), the total population in 6 mouzas and 5 Tea Estates in and around the park are about 27414. Occupation wise distribution of the population is shown in Table 4.

**Table 4. Population of village/mouza and Tea estate in and around West Bhanugach Forest.**

Mouza/TG	HHs	Populatio n	Farmer	Agric. lab	Non- agric. lab	Business	Employee	Others
Bade Bahata	199	1193	31	9	52	00	00	8
Sharaibari	163	942	46	23	17	00	00	14
Rampasha	414	942	29	32	5	22	00	12
Kumarkapa	1968	10690	29	12	14	16	7	22
Fulbaria TG	509	2026	00	00	00	00	58	42
Bhanugach Forest	141	759	22	52	13	00	00	13
Kalachara	101	627	50	36	2	00	00	12
Gillachara TG	227	1299	00	00	00	00	2	98
Bharaura and Kaichara TG	897	4229	00	00	00	00	52	48

Fulchara and Kakaichara TG	669	3054	00	00	00	00	21	79
Narayanchara TG	39	212	00	00	00	00	33	67

Source: 1991-Bangladesh population census, Moulavibazar (Adapted from FRR and DU 1996).

## 12. Information on biological resources of the park (surveys/taxonomic studies)

### 12.1 Summary of past studies

#### 12.1.1. Plants:

A floristic survey was carried out by Leech and Ali (1997) and recorded 107 species of plants. They provided quantitative estimation of the trees and was based on 6 sample points and 18 sampling plots. This quantitative data are available on RIMS. While studying food and feeding habit of monkeys, langurs and hoolock gibbon in Lawachara Forest, Feeroz *et al.* (1994) recorded 40 species of plants. Ahsan (1995) while discussing the human impact on non-human primates of Lawachara mentioned the names of 8 species of plants. Similarly, Feeroz and Islam (2000) while analyzing threats to primates in Lawachara Forest mentioned the names of 19 plants.

Das (1968) reported that West Bhanugach Reserved Forest was planted with 8 species of plants (*viz. Tectona grandis, Xylia dolabriformis, Cinnamomum cecicodaphane, Michelia champaca, Aquilaria agallocha, Gmelia aarborea, Lagerastomia speciosa, Terminalia tomentosa*). He also recorded 14 tree species in natural forest. The also mentioned that while one species of native bamboo (*Bambusa tulda*) occurs in the forest, 2 species of exotic bamboo species (*viz. Thyrosostachys oliveri and Bambusa anundinaceae*) were introduced in the forest.

Ahsan (2000) and Feeroz and Islam (2000) reported that the tree density in Lawachara was 203 trees/ha and 271 trees/ha (< 10 dbh), respectively.



### 12.1.2 Animals

**Amphibians and reptiles:** Leech and Ali (1997) recorded 4 species of amphibians and 4 species of reptiles. Tecsalt Group (FSP 2000b) during their field trip made observation on two additional species of reptiles of the forest.

**Birds:** Thompson and Johnson (1999) studied the avifauna in 19 sites in Bangladesh including Lawachara NP and recorded 237 spp. of birds from there. The authors also recorded the sightings of each individual bird species and used the data in calculating their relative abundance. Thompson and Johnson (2003) further made new records of 4 species of birds from the forest.

**Mammals:** Feroz and Islam (2000) recorded 6 species of non-human primates, viz. one species of slow loris (*Nycticebus bengalensis*), Rhesus macaque (*Macaca mulatta*), pig-tailed macaque (*M. nemestrina leonina*), capped langur (*Trachypithecus pileatus*), Phyre's leaf monkey (*T. phayrei*), hoolock gibbon (*Hoolock hoolock*). Lawachara National Park. Among them, *Macaca mulatta* was relatively common (17.1/km<sup>2</sup>) with larger group size (51 indiv./group) in the forest while *Trichypithecus pileatus* was less abundant (0.41 individual/Km<sup>2</sup>). The densities for *Macaca nemestrina leonina*, *Trichypithecus pileata* and *Hylobates hoolock* were estimated to be 3.8, 2.6 and 1.2 indiv./km<sup>2</sup>, respectively. The authors identified 12 major threats to the wildlife in the forest and suggested a management plan for the forest. The author also identified about 23 fruit species that are shared with human by the non-human primates.

Feeroz (2000) made a population survey of non-human primates in 17 forested areas of Bangladesh, including Lawachara forest. Seven species of non-human primates were recorded. The overall populations of primates surveyed were higher in Lawachara than the other forests surveyed. The density data are summarized below:

Species	No. group observed	Group size (mean)	Range	Density (no. group/km <sup>2</sup> )	No. indiv./km <sup>2</sup>
<i>Macaca mulatta</i>	9	51.1	43-78	0.33	17.1
<i>Macaca nemestrana</i>	5	20.6	15-24	0.19	3.8
<i>Trachypithecus pileatus</i>	11	6.4	4-9	0.41	2.6
<i>Hylobates hoolock</i>	10	3.1	1-5	0.37	1.2

Leech and Ali (1997) reported 6 species of mammals, while Ahsan (1995) described two species of non-human primates from the forest. Feeroz *et al* (1994) reported 6 species of non-human primates, Khan (1982) sighted 1 species of leopard, while Lockwood (1998) reported 6 non-human primates from the forest. Siddiqui and Faizuddin (1981) reported 7 species of mammals and Thompson and Johnson (1996) reported 8 species of mammals from the forest.

**Insects:** Chowdhury (2000) surveyed Odonate insects in Lawachara and recorded 17 species of Odonates, belonging to 14 genera under 4 families (Annex 5).

### ***12.2 Present state of floral and faunal resources in the park***

Survey of available literature shows that biological resource inventories for the Lawachara NP are incomplete, inadequate and therefore are misleading. FSP (2000b) compiled lists for animal and plant resources based on several sources. These data are also available on RIMS. Only few new additions could be added to the list during current review of literature (Ahsan 1995b and Feeroz and Islam 2000). The later studies were not intended for any faunal or floral surveys, however, recorded the name of plants and animals only relevant to their intended studies.

The compiled lists for plants, amphibia and reptiles, birds and mammals based on the above studies are given in Annexures 1, 2, 3 and 4, respectively. The findings are summarized below:

Plants	167 species
Amphibians	4 species

Reptiles	6 species
Birds	246 species
Mammals	20 species
Odonate insects	17 species

### 13. Summary of biological studies on animals

Islam and Feeroz (1992) studied the activity period, activity budget, activity pattern, ranging behavior, movement, food and feeding behavior of hoolock gibbon in West Bhanugach Forest Reserve during the period February 1990-January 1991. The author reported that the gibbon live in groups of 2-5 individuals, maintain territory in a home range of 30-35 ha. The day range varies from 600m to 1600m. The gibbon spends 39% of the day time in feeding, 25% in moving, 26% in resting, 4% in calling and 6% in other social activities. *Tectona sp.*, *Artocarpus chaplasha* and *Aquilaria agallocha* were found to be used by the gibbon for sleeping. Feeding activity is highest in October and lowest in July, usually decreases during May to July. The author recorded about 40 food trees of hoolock gibbon in West Bhanugach Reserved Forest and in Chunati. The author commented that there won't be more than a population of 200 hoolock gibbon in the above mentioned two forests.

Feeroz et al. (1994) studied the food and feeding behaviour of *Hoolock hoolock* and *Macaca nemestrina* and *Presbytis pileatus* in Lawachara Forest Reserve during February 1990 and February 1991. Sixty three plant species were recognized as the food of these primates, of which 40 were eaten by gibbons, 44 by langurs and 33 by pig-tailed macaque (Annexure 6). Hoolock gibbon spent 39% of their active time in feeding, langur 34% and pig-tailed macaque 27%. Hoolock gibbons were frugivorous (89% fruits and figs). Capped langurs feed both on fruits (67%) and leaves (20%) and pig-tailed macaques ate a variety of plant parts as their food.

Feeroz (2000a) reported the grooming behaviour of pig-tailed macaque in Lawachara National Park. Four types of grooming sequences were recognized in pig-tailed macaque during social grooming; unilateral grooming (76.8%), mutual grooming (12.6%),

reciprocal grooming (2.9%). The adult male was the main recipient of grooming (35%) and swollen female was the main groomer (33%).

Feeroz (2000b) reported the height and substrate use by pig-tailed macaque (*Macaca nemestrana*) in Lawachara NP on the basis of his field study during May 1996 and September 1997. The feeding and foraging heights varied significantly between different age-sex classes. Juveniles used larger vertical areas (1-28 m) and the adult female with infant used the smallest vertical areas (3-19 m). The group spent more than 85% of their feeding and foraging time on the middle canopy (5-13 m). The use of different substrates during feeding and foraging also varied significantly between different age-sex classes, the adult male used a wide range of substrates while the juveniles and infant-2 spent most of their feeding and foraging time in the twigs and thin peripheral branches.

Feeroz (2003) reported the breeding activities of the pig-tailed macaque (*Macaca leonina*) in West Bhanugach Forest Reserve, including Lawachara National Park. The author studied the sexual activities, copulation and birth of the species. During the period June 1996-June 1997, 62% adult female gave birth and 16 new born infants were recorded. The gestation period was estimated to be 160 days.

Ahsan (1994) extensively studied aspects of behavioural ecology of hoolock gibbon in Lawachara and Chunati forests. The studied gibbons are frugivorous, eating a variety of fruits, especially figs, with smaller being the most preferred. The author also studied the home range, travel range, habitat preference, time allocation for daily activities, territoriality, and calls of the animals and other social and ecological behavior of the species. The author found plantation of short rotation trees and extraction of forest resources as the major causes for the habitat losses for the wildlife, gibbons in particular.

Ahsan (1995a) studied the fighting behaviour of hoolock gibbon in Lawachara National Park. The author described the history of the episode, sequences and consequences of fighting. The management implication of such fighting is discussed.

Ahsan (2000) made an exhaustive report on the socio-ecology of the hoolock gibbon (*Hylobates hoolock*) of Lawachara forest. The author studied the social organization (including group structure, group cohesion, group dispersion, interindividual spacing, inter-group spacing, travel order sequence, grooming behaviour, sexual behaviour, group formation etc.), ranging behavior (day range length, night position shift, night position distance, maximum radius, activity period, home range and pathway, core area, territory site, night sleeping trees, maintenance of territory etc.), time budget and activity pattern (start of activity period, end of activity period, time spent in different activities, age/sex classes variation in activity budget, monthly activity pattern, daily activity pattern), diet and feeding (food source, feeding and foraging height, feeding time, monthly variation food choice, diurnal variation in food choice, fecal analysis etc.), song and singing behaviour (variation in the units of song bout, distribution of song bout, starting time of the 1<sup>st</sup> call of the day, frequency of singing, amount of time spent in singing, duration of song bouts, singing sites, counter singing, functions of hoolock gibbon songs etc.), Territoriality and monogamy (territorial behaviour, song, inter group encounters, frequency of territorial disputes, duration of territorial disputes, monogamy, availability of opposite sex etc.)

#### **14. Information on resource exploitation**

**14.1 Exploitation of plant resources:** Lawachara has long been heavily used by subsistence and small scale woodcutter and other NTFP harvesters. The inside village HHs are completely dependant on the forest resources for their entire fuelwood and house building material demands (FSP 2000a). About 100% HHs collect firewoods from the forest (CNRS 2000). In addition to their subsistence needs they also collect fuelwood to supplement their income. But, they primarily exploit the betel vines areas of the forest (FSP 2000a).

In addition to resident villagers, the Park is also widely used by the people of adjacent villages, residents of neighbouring tea estates, some poor from urban areas. The common and widespread use of the Park appears to be subsistence harvest of fuelwood. The collection of firewood is found in all beats of the forest. Both inside and outside villagers

collect some less-valued trees, eg. *Garuga pinnata*, *Microcos paniculata*, *Listea sebifera*, *Garcinia spp.*, *Vitex spp.* for building frameworks (Ahsan 1995b).

Usually women and children collect sticks and dead branches and dried herbs, the adult and adolescent boys harvest standing trees, chop and bundle measured lengths for marketing. According to an approximation made by FD local staff every day from Srimongal and Kamalgonj side (east) about 100-140 people enter into the forest for firewood collection. This activity to some extent is organized and commercialized (FSP 2000a).

One women or children can earn Taka 30-60 /day by selling a bundle of fuelwood depending on size and selling place. Fuelwoods are sold at Bhanugach, Srimangal and Kalapur bazaar. Collection of firewood is higher in dry season (CNRS 2000).

The collection of dead branches/trees as fuel wood for subsistence use is not illegal and any one can do this by paying a monthly royalty of Tk. 10/month. (Feeroz and Islam 2000). However, this has been increased manifold unofficially in the recent years (Ahsan 1995b). As reported by CNRS (2000) that the FD staff imposes an illegal levy of Tk. 5.00 on the persons who collect fuelwood for selling and this money is not duly deposited to the treasury.

Ahsan (1995a) reported that during 1988-89 an estimated 170 people collected fuelwood daily from Lawachara beat area only. Ahsan (1995b) further estimated that from Lawachara beat alone about 1206.5 mt fuelwood is removed annually.

A survey by Feeroz and Islam (2000) shows that in average 233 people were found to carry fuel wood along the railway line on non-market days and 337 people on market days. They estimated that in average about 5.13 mt fuelwood/non-market day and 7.42 mt fuelwood/market day are harvested from the forest.

*Bamboos:* Bamboos are also widely harvested within the Park area and proposed extension, presumably both for subsistence and small scale commercial use (FSP 2000a).

*Fruits:* Local people collect 23 species of fruits that are shared by non-human primates in the forest. Some people collect these fruits for home consumption as well as for selling. The species that are intensively collected include *Artocarpus heterophyllus*, *A. chaplasha*, *A. lacuch* and *Garcinia cowa* (Feeroz and Islam 2000).

Some vines and creeping plants are also collected intensively for making baskets and other household materials (CNRS 2000).

Collection of medicinal plants have also been reported (FSP 2000a, CNRS 2000, Chemonics (2002) but no qualitative and quantitative information are available at present.

Feeroz and Islam (2000) and Ahsan (1995b) reported cattle grazing in the park but the damage caused by grazing has not been quantified. Browse and grazing mainly takes place in dry months when the cattle enter interior in to the forest. According to the above authors, grazing on seedling/saplings may reduce the natural regeneration of the forest.

*Tree bark:* A small number of people are also engaged in extracting tree bark from a number of trees and sell it to local agents. The bark is used in mosquito coil manufacture. The tree species chosen for extracting bark includes mainly *Litsea sebifera*, *Dillenia pentagyna* and to lesser extent *Garcinia spp.* *Microcos paniculata* and others. This extraction method leads to the death of trees (Ahsan 1995b).

***Illegal felling of timber trees:*** There is strong evidence that illegal felling of trees does exist in the park. However, there is no hard data available on this. Felling is carried out at night by large, often armed gangs. This may be attributed to inadequate staff levels, poor patrol logistics and equipment and low staff morale (Ahsan 1995b, Feeroz and Islam 2000, and FSP 2000a).

Feeroz and Islam (2000) indicated that some local timber merchants persuade poor people to do it and they mix those illegally collected logs with legal ones to increase their profit.

CNRS (2000) quoting the villagers reports that that wood logs are stolen from the forest at night with direct help of helper and guards of the forest. Organized stealing is happening with the help of influential people of Srimangal and Bhanugach town. Money from stolen logs is distributed among the forest officials and thieves. Local FD staff also admits illicit harvest of timber. The smuggled wood logs are passed through villages during dawn.

Feeroz and Islam (2000) reported that illegal harvest of trees mainly consists of teak (*Tectona grandis*) and chaplaish (*Artocarpus chaplasha*) and some other valuable trees.

Quoting the forest guards and local people CNRS (2000) reports that the people of Bagmara and Baligaon are mostly involved with extraction of resources from the forest.

***Court cases against illegal harvest of forest resources:*** As revealed by RRA conducted by CNRS (2000) that there haven a hundreds of court cases lodged by FD staff against poachers and are under judgment. It was reported by the people of Bagmara that about 30-40% HHs of the locality are convicted by court cases and sometimes innocent people are harassed.

#### 14.2 Exploitation of wildlife resources

No quantitative data are available on hunting of wildlife. However, several authors tried to correlate disappearance of some large mammals, including tigers, leopards, bears, wild dogs, samber etc., from the park to combined effects of hunting and habitat fragmentation. Feeroz and Islam (2000) report that still some monkeys, mainly the rhesus, and wild boars are sought for hunting for consumption by khasia tribes of inside village. Sometimes, monkeys are trapped by local people and sold to interested people (Ahsan 1995b). People still haunt for sambar (barking deer) in the forest (Ahsan 1995b).



The later author met a number of hunter groups armoured with guns in the forest during his work in 1991. The other wildlife haunted in the park is jungle fowl and kalij pheasant and other birds. But this is not common. In winter hunters from adjacent areas come to the forest for hunting fowls and some other birds (CNRS 2000).

**Wildlife and human conflict:** It is reported that monkeys and wild boars damage the crops at the forest edge and vegetables and pineapple gardens of nearby areas. Local people therefore drive them away by making sounds, chase them and/or kill them by trapping or spearing (CNRS 2000 and Feeroz and Islam 2000, Ahsan 1995b).

### 15. Plantation and Production Forestry of FD

In order to boost economic benefit plantation program in the forest was started as early as 1923 with establishment of reserve forest. Since then plantation took place till 1984. Yearwise information on the plantation of the forest is available in FD (1997). Table 5 shows the summary of plantation by area coverage during the past showing in an interval of 10 years (RIMS data based on FD records). Initial strategies for the plantation program included plantation of long –rotational plantation with native as well as exotic (exotic to Lawachara forest) species, like tick, mehgoni, gamari shal, raktan, champa agor as well as local species like chapalish, chikrashi, garjan, etc. Later plantation of long-, medium and short rotational plantation strategies was adopted. In most cases, plantations were done with exotic rapid growing plants. The medium and short rotation trees included exotic trees like Acacia, mangium, eucalyptus, akshmoni, moluccana, etc. (FSP 2000a, CNRS 2000 and Feeroz and Islam 2000, FD 1997). Monoculture of eucalyptus, maluccana and akashmnoi has been done in several blocks and about 50% plantation has been done with acacia, mangium, eucalyptus and moluccana. (Feeroz and Islam 2000).

**Table 5. The plant composition in different plantation areas.**

Forest patch	Dominant species	Year of plantation	Natural species	Planted: Natural species
Teak forest	Tectona grandis	1940-1960	Most of the evergreen and	75 : 25

			deciduous species found in the forest patch	
Jarul forest	Lagerstroemia spiciosa	1920-1940	-do-	65 : 35
Loha forest	Xylia kerril	1920s	-do-	50 : 50
Kadam forest	Anthocephalus chinensis	1930-1940	-do-	60 ; 40
Garjan forest	Dipterocarpus spp.	1920-1930	-do-	70 : 30
Sal forest	Shorea robusta	1930s	-do-	75 : 25
Moluccana forest	Albizia spp.	1980s	Only some climber	95 : 5
Acacia forest	Acacia spp.	1980-1990	Very few undergrowth	99 : 1
Palm forest		1970s	No other trees	100 : 00

Source: Feeroz and Islam (2000)

Bamboo, cane/ratan and murtha are planted as undergrowth and these were planted in the forest under BCN project (FD staff-quoted by CNRS. 2000). No area coverage data are available. RIMS data show that bamboo and cane plantations cover areas of 21.8 and 3.4 ha, respectively.

Plantation practice: Prior to plantation clear felling and removal/burning of original undergrowth is done which facilitates plantation activities and better growth and survival of planted saplings (FSP 2000a).

## 16. Visitors

Tourism potential of Lawachara NP is well recognized, although it is visited by a limited number of tourists and visitors (Chemonics 2002, FSP 2000a, Feeroz and Islam 2000, FRR and DU 1996). Currently, the most tourist groups visit Janakichara Nursery. Visitors facilities previously developed at the Jonakichara Nursery (a hilltop view point/picnic

shelter, toilet and mini zoo), but has fallen into despair. Most official visitors use FD guest house Shaymoli). Dolabari village is occasionally visited by school groups. Bangladesh Parjaton Corporation also organizes some tour programs (FSP, 2000a, Chemonics 2002). Some visitors use DFID rest house and hotels at Srimongal.

An estimate by Feeroz and Islam (2000) shows that during December to February, in average, 300 buses and minibuses/month visit the park. According to them, the visitors stay throughout the day and leave in the evening. According to Ahsan (1995b), during winter, every day 2-5 groups of visitors come to park by buses and micro-buses, comprising about 15-100 people/group. Smaller groups also visit the park. Most of the larger groups come for picnic. People for nature tour are not many.

Unplanned tourism at present is causing various threats to the animals. The visitors play music at full volume and random inside the forest, and chase any large animals they encounter. Environmental threats also include littering of non-biodegradable wastes, harm to some fruit trees, polluting the stream source of drinking water etc. (Ahsan 1995b, Feeroz and Islam 2000).

### **17. Traffic**

The park provides two corridors: a metalled motorway and a railway line, both runs east-west direction linking Dhaka-Sylhet. The corridors are moderately used. As mentioned in FSP (2000a) shows that, in average, about 25 vehicles/hour use the highway and 24 train movements take place every day. The forest itself has some walkways across the forest (FSP 2000a)

### **18. NGO activities**

The presence of some NGOs, like BRAC, ASA, RUSA and Heed-Bangladesh in the area has been mentioned by CNRS (2000). Major activities of the NGOs are however concentrated on micro-credit and only limited to poor groups developed by them. Micro-credit programs mainly support small business, rickshaw transport, agriculture etc. In addition, BRAC also program on literacy and Heed-Bangladesh on health and sanitation.

It may be mentioned that Heed-Bangladesh is situated on the FD land allocated by the department.

### **19. Alternative income generation opportunity**

CNRS (2000) identified the following sectors for alternate income generation opportunity in the area: small trading, grocery shops, vending, rickshaw and van pulling, poultry, beef fattening and emphasized on providing technical training.

### **20. Impact of Magurchara gas field explosion on Lawachara NP**

Feeroz and Islam (2000) gave a brief account of the damage caused to the forest due to Magurchara gas field explosion. A gas field was established at the edge of the south-east part of the forest, after clearing of 10 ha area. Accidentally, the gas field exploded in June 1997 and a crater of about 200m formed. A column of flame of about 75m height was formed and burnt for about 15 days. As a result about 5 ha forest area in the north of the field was completely burnt. On the open side of the field, bushes and scattered trees also burnt. One forest village was also affected and the inhabitants were shifted to a new place in the forest. The primate population moved away to the safer part of the forest and their ranging area was also affected. Further three areas were cleared for the site of the proposed new rig.

### **21. Gaps in knowledge/comments/ suggestions for further study**

i. Plant list is incomplete and could be considered as very preliminary. More than 600 plant species have been reported from Rema-Kalenga Wildlife Sanctuary/Reserved Forest. At least a similar number of plants could be expected to occur in Lawachara NP as well and therefore a complete inventory of plants needs to be developed. Quantitative data through a well designed survey methodology should be sought.

ii. Amphibian, reptilian and mammalian lists are also incomplete. Common animals like snakes, turtle, bats, rats etc. which could be expected from the park are missing. Additional survey with more attributes and quantification provision needs to be carried out. The survey should also include some major invertebrate groups of animals, like butterflies and molluscs.

iii. Socio-economic profile of the local people are almost lacking. The project should concentrate on collection of detail socio-economic data of project relevance.

iv. A special study on the nesting and breeding of local birds should be conducted.

v. Aspects of forest dynamics have not been studied at all. In particular, natural vegetation regeneration processes should be studied.

vi. Other than fuelwood collection, no study was carried out on the resource exploitation, regeneration and utilization pattern and practices on local resources.

vii. Detail descriptions of various landscapes within and around the park are lacking. From the project perspective, detail information on social and scientific elements of various landscapes will be required. The potential for improvements of the landscapes should also be evaluated.

viii. Studies on the ecology and biology and population parameters are confined only to two species of non-human primates. Similar studies should be extended to other conspicuous and flagship species for developing models to be used for the formulation of management plans.

ix. Locally threatened plant and animal species have not been identified. Project should make efforts to identify, categorize and prioritize threatened plant and animals of the park and assess the potential ecological and anthropological threats to them. Ecological requirements for important and threatened wildlife and plant species should also be studied.

x. Some information on the land use cover of the forest is available. However, detail information on the land use and cropping patterns in the park as well as in the buffer zones should be documented.

xi. Survey of non-traditional NTFP of the park and potential for their value addition should be explored.

## **22. Threats to the forest resources and ecosystem integrity**

A number of studies made attempt to identify and analyze the threats to the forest ecosystem and its resources. Based on the following reports and studies the identified threats are compiled here: Ahsan 1994, Ahsan 1995b, Ahsan 2000, Feeroz and Islam 2000, FSP 2000a, Chemonics 2002, Das *et al.* 2003.

***Fuelwood collection by the inside and outside villagers:*** A substantial amount of young plants are removed in the cover of dead trees and branches. This reduce the regeneration of trees and contribute to thinning of the forest and remove the underneath plants. Thus threatening the plant species diversity.

***Illicit timber extraction:*** the large trees are selectively removed and destroy the habitat of important wildlife species.

***Plantation/monoculture/exotic species (production forestry):*** The plantation history has been the major tragedy in Lawachara NP. Plantation practices in Lawachara have brought several consequences on the forest ecosystem.

- Plantation has changed the species composition and their original abundance.
- Plantation involved clear felling and burning of undergrowth thus destroying the entire ecosystem and its biodiversity.
- Monoculture of exotic trees had led to the habitat fragmentation and degradation to biodiversity.
- Care and maintenance involves the removal of undergrowth thus reducing the biodiversity and habitat for animals

***Betel leaf cultivation:*** betel leaf cultivation practice involves the weeding of the forest each year and lopping of lower branches of the trees and thus affects the forest ecosystem. Activities in the farm area drive the wild species of animals away from the farm area.

***Modification of underneath/removal of undergrowth:*** The plantation of new undergrowth plants like ratan (cane) and weeding of original undergrowth has severely affected the habitat of animals and plants.

***Hunting/trapping of animals:*** Although, this is not done at a large scale, yet it poses threat to the important wildlife, like jungle fowl, sambar, rhesus monkey etc.

***Unplanned tourism:*** Tourism in Lawachara is unmanaged. People enter into the forest, chase wildlife, play music with high volume, leave wastes. These sorts of activities are unfriendly to environment and as well as to wildlife.

Habitat destruction, tourism and gas exploration has been linked to the decline of hoolock gibbon in West Bhanugach Reserve Forest (Ahsan 2003). The other threats include cattle grazing, fodder collection, hunting, army training, fruit collection, bark collection etc.

### **23. Suggestions for ecosystem/resource improvement and management**

Ahsan (2000) suggested the following:

- i. Plantation of short rotation exotic species should be stopped or at least be selective
- ii. Timber poaching must be stopped
- iii. Commercial exploitation of firewood must be stopped
- iv. Ensure protection in reality
- v. Public awareness about forest and wetland program should be extended to a grass root level
- vi. Wildlife Circle of FD must be revived with sufficiently trained man power as separate entity from the forest department

Feeroz and Islam (2000) made the following recommendations:

- i. All factors accelerating habitat destruction should immediately be stopped all types of fuel wood extraction should be banned. Systematic timber logging as well as illegal logging should be stopped. Expansion of betel-leaf cultivation, crop cultivation and introduction of exotic tree species should be monitored.

- People living around the reserve should be encouraged in social forestry which will meet their fuel wood demand and reduce forest destruction
- ii. Care should be taken for not to wipe out any fruit producing plant species specially the figs (*Ficus* spp.), which provide food to primates and other wildlife species.
  - iii. Unplanned picnicking should be stopped. All form of army training should be stopped. Controlled eco-tourism programmes can be undertaken which would relieve pressure on forests.
  - iv. No more gas field excavation in and around the reserve should be allowed New plantation, especially fruit yielding plants, should be undertaken in the affected areas.
  - v. A buffer Zone should be established around the reserve. Any form of forest extraction should be stopped from the core areas.

#### **24. Management Plan**

Government efforts for the management of the forest initiated with the process of declaration of Lawachara NP and feasibility study was carried out with the help of Fountain Renewable Resources (FRR) and Desh Upodesh. The agencies prepared a Management Plan (MP) in 1996 for the then Lawachara NP. The key elements of the Plan include:

- i. Zoning and detailed management plan
- ii. Boundary definition, marking and regulations
- iii. Staff development, upgrading existing facilities
- iv. Restoration of habitats in the National Park
- v. Participatory buffer zone management
- vi. Participatory management of buffer zone plantations

A further Management Plan (MP) for the Lawachara NP was developed under the Forestry Sector Project of GoB (FSP 2000a and 2000b). The major broad elements of the MP are;

- i. Administrative program



- ii. Resource management and protection program
- iii. Land use management (Ecosystem and Habitat management)
- iv. Activity specific management measures
- v. Habitat management and monitoring
- vi. Visitor use and visitor management
- vii. Development program

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# **ANNEXURES**

## Annexure –1

### List of plant species of Lawachara National Park

The following list of plant species reported from the Lawachara Forest area is based on the following sources:

1. Leech, J. and S. S. Ali. 1997. Extended Natural Resources Survey: Part IV-plant and animal species lists. GoB/WB Forest Resources Management Project, Technical Assistance Component. Mandala Agricultural Development Corporation, Dhaka, Bangladesh.
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5. Feeroz, M. M. and M. A. Islam. 2000. Primates of the West Bhanugach Forest Reserve: major threats and management plan. In: *Bangladesh Environment 2000*, (M. Feroze Ahmed, ed.). BAPA Bangladesh Poribesh Andolon. pp. 239-253.

Sl. No.	Scientific Name	Source
1	<i>Acacia chinensis</i>	(2)
2	<i>Acacia falcata</i>	(2)
3	<i>Acacia mangium</i>	(1)
4	<i>Acacia moniliformis</i>	(1)
5	<i>Acanthus ilicifolius</i>	(1)
6	<i>Acronychia pedunculata</i>	(5)
7	<i>Actinodaphne angustifolia</i>	(1)
8	<i>Ageratum conyzoides</i>	(1)
9	<i>Albizia moluccana</i>	(1)
10	<i>Allophllus cobbe</i>	(2)
11	<i>Alpinia malaccensis</i>	(1)
12	<i>Alsophila sp.</i>	(3)
13	<i>Alstonia scholaris</i>	(1, 2)
14	<i>Amoora wallichii</i>	(1, 2)
15	<i>Amorphophallus companulatus</i>	(1)
16	<i>Amorphophallus dubius</i>	(1)
17	<i>Anthocephalus cadamba</i>	(1)
18	<i>Anthocephalus chinensis</i>	(2)
19	<i>Aphanamixis polystachya</i>	(1)
20	<i>Aporusa spp.</i>	(4)
21	<i>Aquilaria agallocha</i>	(1, 2, 3)
22	<i>Ardisia solanacea</i>	(1)

Sl. No.	Scientific Name	Source
23	<i>Artocarpus chaplasha</i>	(1, 2, 3, 5)
24	<i>Artocarpus heterophyllus</i>	(5)
25	<i>Artocarpus lacucha (lakoocha)</i>	(1, 2, 5)
26	<i>Axonopus compressus</i>	(1)
27	<i>Azadirachta indica</i>	(1)
28	<i>Baccaurea sapida</i>	(2)
29	<i>Bambusa tulda</i>	(1, 3, 5)
30	<i>Belamcanda chinensis</i>	(1)
31	<i>Blumea lacera</i>	(1)
32	<i>Bursera serrata</i>	(1, 2)
33	<i>Calamus tenuis</i>	(1)
34	<i>Callicarpa arborea</i>	(1)
35	<i>Canna indica</i>	(1)
36	<i>Carallia brachiata</i>	(2)
37	<i>Cassia fistula</i>	(1, 2)
38	<i>Cassia siamea</i>	(1)
39	<i>Cassia sophera</i>	(1)
40	<i>Cassia tora</i>	(1)
41	<i>Castanopsis indica</i>	(2)
42	<i>Castanopsis tribuloides</i>	(2)
43	<i>Chromolaena odorata</i>	(1)
44	<i>Cinnamomum sp.</i>	(2)
45	<i>Clerodendrum viscosum</i>	(1)
46	<i>Coccinia cordifolia</i>	(1)
47	<i>Cocos sp.</i>	(5)
48	<i>Colocasia esculenta</i>	(1)
49	<i>Colocasia nymphaefolia</i>	(1)
50	<i>Commelina benghalensis</i>	(1)
51	<i>Connarus paniculatus</i>	(2)
52	<i>Cordia sp.</i>	(2)
53	<i>Curcuma aromatica</i>	(1)
54	<i>Cuscuta reflexa</i>	(1)
55	<i>Dalbergia rimosa</i>	(1)
56	<i>Dendrocalamus giganteus</i>	(1)
57	<i>Digitaria granularis</i>	(1)
58	<i>Dillenia pentagyna</i>	(2, 3, 4)
59	<i>Dioscorea bulbifera</i>	(1)
60	<i>Dipterocarpus turbinatus</i>	(1)
61	<i>Dracaena spicata</i>	(1)
62	<i>Enada sp.</i>	(2)
63	<i>Eucalyptus camaldulensis</i>	(1, 5)
64	<i>Eugenia fruticosa</i>	(1)
65	<i>Eugenia iambolana</i>	(1)
66	<i>Eupatorium odoratum</i>	(1, 2, 3)

Sl. No.	Scientific Name	Source
67	<i>Ficus bengalensis</i>	(1, 2)
68	<i>Ficus benjamina</i>	(2)
69	<i>Ficus comosa</i>	(2)
70	<i>Ficus hispida</i>	(2)
71	<i>Ficus infectoria</i>	(1)
72	<i>Ficus religiosa</i>	(2)
73	<i>Ficus rumphii</i>	(2)
74	<i>Ficus semicordata</i>	(1)
75	<i>Ficus spp.</i>	(5)
76	<i>Firmiana colorata</i>	(1)
77	<i>Fiscus gibbosa</i>	(5)
78	<i>Garcinia cowa</i>	(2, 4)
79	<i>Garcinia sp.</i>	(4, 5)
80	<i>Garuga pinnata</i>	4
81	<i>Geodoum sp.</i>	(3)
82	<i>Gmelina arborea</i>	(1, 2, 3)
83	<i>Grewia asiatica</i>	(2)
84	<i>Hedyotis scandens</i>	(1)
85	<i>Heterophragma adenophyllum</i>	(1)
86	<i>Holarrhena antidysenterica</i>	(1)
87	<i>Holigarna caustica</i>	(5)
88	<i>Hopea odorata</i>	(3)
89	<i>Imperata arundinacea</i>	(5)
90	<i>Imperata cylindrica</i>	(1)
91	<i>Lantana camara</i>	(1)
92	<i>Lauranthus sp.</i>	(2)
93	<i>Lawsonia inermis</i>	(1)
94	<i>Leea crispa</i>	(2)
95	<i>Lissea glutinosa</i>	(1)
96	<i>Litsea sebifera</i>	4
97	<i>Logerstroemia speciosa</i>	(1, 2)
98	<i>Mallotus sp.</i>	(2)
99	<i>Mangifera indica</i>	(5)
100	<i>Mangifera sylvatica</i>	(2)
101	<i>Melastoma malabathrica</i>	(1)
102	<i>Melilotus indica</i>	(1)
103	<i>Melocanna baccifera</i>	(1)
104	<i>Melocanna bambusoides</i>	(5)
105	<i>Memordia cochinchinensis</i>	(1)
106	<i>Mezoneuron enneaphyllum</i>	(2)
107	<i>Microcos paniculata</i>	(4)
108	<i>Mikania cordata</i>	(1)
109	<i>Mikania scandens</i>	(1)
110	<i>Mimosa pudica</i>	(1)



Sl. No.	Scientific Name	Source
111	<i>Mucuna imbricata</i>	(1)
112	<i>Musa sapientum</i>	(1)
113	<i>Mussaenda roxburghii</i>	(1)
114	<i>Naravelia zeylanica</i>	(1)
115	<i>Oroxylum indicum</i>	(2)
116	<i>Oxytenanthera nigrocilinta</i>	(5)
117	<i>Passiflora foetida</i>	(1)
118	<i>Phyllanthus embelica</i>	(1, 2)
119	<i>Plumeria acutifolia</i>	(1)
120	<i>Polyalthia longifolia</i>	(1)
121	<i>Protium serratum</i>	(5)
122	<i>Psilotrichum ferrugineum</i>	(1)
123	<i>Pterospermum acerifolium</i>	(1)
124	<i>Pygeum sp.</i>	(2)
125	<i>Quercus spp.</i>	(3, 5)
126	<i>Randia sp.</i>	(2)
127	<i>Sacrolobus globosus</i>	(1)
128	<i>Sapium baccatum</i>	(2)
129	<i>Sarcolobus globosus</i>	(1)
130	<i>Schima wallichii</i>	(1)
131	<i>Semecarpus anacardium</i>	(2)
132	<i>Setaria italica</i>	(1)
133	<i>Shorea robusta</i>	(1)
134	<i>Smilax macrophylla</i>	(2)
135	<i>Smilax roxburghiana</i>	(1)
136	<i>Sonneratia caseolaris</i> <sup>3</sup>	(1)
137	<i>Spatholobus sp.</i>	(2)
138	<i>Spilanthes acmella</i>	(1)
139	<i>Stereospermum chelonoides</i>	(1)
140	<i>Stictocardia macalusoii</i>	(1)
141	<i>Streblus asper</i>	(1)
142	<i>Swietenia mahogoni</i>	(1)
143	<i>Swintonia floribunda</i>	(1)
144	<i>Syzygium cumini</i>	(2)
145	<i>Syzygium fruticosum</i>	(1, 2)
146	<i>Syzygium grande</i>	(1)
147	<i>Syzygium jambos</i>	(1)
148	<i>Syzygium sp.</i>	(5)
149	<i>Tapiria hirsuta</i>	(1)
150	<i>Taxus baccata</i>	(1)
151	<i>Tectona grandis</i>	(1, 2, 3)
152	<i>Teinostachyum dulloa</i>	(5)
153	<i>Terminalia arjuna</i>	(1)
154	<i>Terminalia belirica</i>	(1, 2)

<b>Sl. No.</b>	<b>Scientific Name</b>	<b>Source</b>
155	<i>Terminalia catappa</i>	(2)
156	<i>Tetrameles nudiflora</i>	(3)
157	<i>Thespesia lampas</i>	(1)
158	<i>Thunbergia grandiflora</i>	(2)
159	<i>Toonia ciliata</i>	(3)
160	<i>Trewia polycarpa</i>	(1)
161	<i>Vallisneria spiralis</i>	(1)
162	<i>Vitex peduncularis</i>	(1)
163	<i>Vitex spp.</i>	(4)
164	<i>Xanthophyllum alatum</i>	(1)
165	<i>Xylia dolabriformis</i>	(1)
166	<i>Zanthoxylum rhetsa</i>	(1)
167	<i>Zizyphus rugosa</i>	(1)

## Annexure – 2

### List of Amphibian and Reptilian Species of Lawachara National Park:

The list of Amphibian and Reptilian is based on the following sources:

1. Leech, J. and S. S. Ali. 1997. Extended Natural Resources Survey: Part IV – plant and animals species lists. GoB/WB Forest Resources Management Project, Technical Assistance Component. Mandala Agricultural Development Corporation, Dhaka, Bangladesh.

Note: species list derived from RIMS database.

2. Information from local villagers May-December 1999 (Field observation by Tecult Group).

#### Amphibian:

Sl. No	Common name	Scientific name	Source	Remarks
1	Common Toad	<i>Bufo melanostictus</i>	(1)	
2	Skipper frog	<i>Rana cyanophlyctis</i>	(1)	
3	Bull Frog	<i>Rana tigrina</i>	(1)	
4	Tree Frog	<i>Rhacophorus Leucomystax</i>	(1)	

#### Reptiles:

Sl. No	Common name	Scientific name	Source	Remarks
1	Wall Lizard	<i>Gekko gekko</i>	(1)	
2	House Lizard	<i>Hemidactylus brookii</i>	(1)	
3	Common Skink	<i>Mabuya carinata</i>	(1)	
4	Agama (?)	<i>Oriocalotes paulus</i>	(1)	
5	Monitor Lizard	<i>Varanus sp.</i>	(2)	
6	Python	<i>Python sp.</i>	(2)	

The list is very incomplete and additional survey work is required.

**Annexure – 3**

**List of Birds of Lawachara National Park:**

<b>Sl. No</b>	<b>Common name</b>	<b>Scientific name</b>	<b>Status/ Relative abundance</b>	<b>Reference</b>
1	White-cheeked Partridge	<i>Arborophila atrogularis</i>	uncommon	1
2	Red Junglefowl	<i>Gallus gallus</i>	common	1
3	Kalij Pheasant	<i>Lophura leucomelanos</i>	uncommon	1
4	Speckled Piculet	<i>Picumnus innominatus</i>	uncommon	1
5	White-browed Piculet	<i>Sasia ochracea</i>	uncommon	1
6	Grey-capped Pygmy Woodpecker	<i>Dendrocopos canicapillus</i>	rare	1, 2
7	Fulvous-breasted Woodpecker	<i>Dendrocopos macei</i>	rare	1
8	Rufous Woodpecker	<i>Celeus brachyurus</i>	common	1
9	Lesser Yellownape	<i>Picus chlorolophus</i>	common	1
10	Greater Yellownape	<i>Picus flavinucha</i>	common	1
11	Grey-headed Woodpecker	<i>Picus canus</i>	common	1
12	Himalayan Flameback	<i>Dinopium shorii</i>	rare (1)	1
13	Greater Flameback (Goldenback)	<i>Chrysocolaptes lucidus</i>	common	1
14	Lineated Barbet	<i>Megalaima lineata</i>	common	1
15	Blue-throated Barbet	<i>Megalaima asiatica</i>	common	1
16	Blue-eared Barbet	<i>Megalaima australis</i>	uncommon	1
17	Coppersmith Barbet	<i>Megalaima haemacephala</i>	rare	1
18	Oriental Pied Hornbill	<i>Anthracoceros albirostris</i>	uncommon	1
19	Great Hornbill	<i>Buceros bicornis</i>	rare (1)	1
20	Common Hoopoe	<i>Upupa epops</i>	rare	1
21	Red-headed Trogon	<i>Harpactes erythrocephalus</i>	uncommon	1
22	Indian Roller	<i>Coracias benghalensis</i>	rare	1
23	Dollarbird	<i>Eurystomus orientalis</i>	rare	1
24	Common kingfisher	<i>Alcedo atthis</i>	uncommon	1
25	Oriental Dwarf Kingfisher	<i>Ceyx erithacus</i>	rare (2)	1
26	White-throated Kingfisher	<i>Halcyon smyrnensis</i>	uncommon	1
27	Blue-bearded Bee-eater	<i>Nyctyornis athertoni</i>	uncommon	1
28	Blue-tailed Bee-eater	<i>Merops philippinus</i>	rare	1
29	Chestnut-headed Bee-eater	<i>Merops leschenaulti</i>	common	1
30	Pied Cuckoo	<i>Oxylophus jacobinus</i>	rare	1
31	Chestnut-winged Cuckoo	<i>Clamator cromandus</i>	rare	1
32	Large Hawk Cuckoo	<i>Hierococcyx Sparverioides</i>	rare (5)	1

Sl. No	Common name	Scientific name	Status/ Relative abundance	Reference
33	Common Hawk Cuckoo	<i>Cuculus Varius</i>	rare	1
34	Indian Cuckoo	<i>Cuculus micropterus</i>	uncommon	1
35	Eurasian Cuckoo	<i>Cuculus canorus</i>	rare	1
36	Oriental Cuckoo	<i>Cuculus saturatus</i>	rare (1)	1
37	Lesser Cuckoo	<i>Cuculus Poliocephalus</i>	rare (1)	1
38	Banded Bay Cuckoo	<i>Cacomantis sonneratii</i>	uncommon	1
39	Plaintive Cuckoo	<i>Cacomantis merulinus</i>	uncommon	1
40	Asian Emerald Cuckoo	<i>Chrysococcyx maculatus</i>	rare	1
41	Violet Cuckoo	<i>Chrysococcyx xanthorhynchus</i>	rare (3)	1
42	Drongo Cuckoo	<i>Surniculus lugubris</i>	common	1
43	Asian Koel	<i>Eudynamys scolopacea</i>	rare	1
44	Green-billed Malkoha	<i>Phaenicophaeus tristis</i>	common	1
45	Greater Coucal	<i>Centropus sinensis</i>	uncommon	1
46	Lesser Coucal	<i>Centropus bengalensis</i>	uncommon	1
47	Vernal Hanging Parrot	<i>Loriculus vernalis</i>	rare	1
48	Rose-ringed Parakeet	<i>Psittacula krameri</i>	rare	1
49	Blossom-headed Parakeet	<i>Psittacula roseata</i>	rare	1
50	Red-breasted Parakeet	<i>Psittacula alexandri</i>	common	1
51	Asian Palm Swift	<i>Cypsiurus balasiensis</i>	uncommon	1
52	House Swift	<i>Apus affinis</i>	rear	1
53	Oriental Scops Owl	<i>Otus sunia</i>	common	1
54	Collared Scops Owl	<i>Otus bakkamoena</i>	common	1
55	Spot-bellied Eagle Owl	<i>Bubo nipalensis</i>	rare (1)	1
56	Dusky Eagle Owl	<i>Bubo coromandus</i>	rare (1)	1
57	Brown Fish Owl	<i>Ketupa zeylonensis</i>	rear (2)	1
58	Brown Wood Owl	<i>Strix leptogrammica</i>	rare (1)	1
59	Asian Barred Owlet	<i>Glaucidium cuculoides</i>	common	1
60	Jungle Owlet	<i>Glaucidium radiatum</i>	uncommon	1, 2
61	Spotted Owlet	<i>Athene brama</i>	uncommon	1
62	Brown Hawk Owl	<i>Ninox scutulata</i>	common	1
63	Grey Nightjar	<i>Caprimulgus indicus</i>	rare (1)	1
64	Large-tailed Nightjar	<i>Caprimulgus macrurus</i>	common	1
65	Pale-capped pigeon	<i>Columba punicea</i>	rare (3)	1
66	Oriental Turtle Dove	<i>Streptopelia orientalis</i>	common	1
67	Spotted Dove	<i>Streptopelia chinensis</i>	uncommon	1
68	Emerald Dove	<i>Chalcophaps indica</i>	common	1
69	Orange-breasted Green Pigeon	<i>Treron bicincta</i>	rare	1
70	Pompadour Green Pigeon	<i>Treron pompadora</i>	common	1
71	Thick-billed Green Pigeon	<i>Treron curvirostra</i>	uncommon	1
72	Yellow-footed Green Pigeon	<i>Treron phoenicoptera</i>	uncommon	1

Sl. No	Common name	Scientific name	Status/ Relative abundance	Reference
73	Pin-tailed Green Pigeon	<i>Treron apicauda</i>	rare (1)	1
74	Green Imperial Pigeon	<i>Ducula aenea</i>	rare	1
75	White-breasted Waterhen	<i>Amaurornis phoenicurus</i>	rare	1
76	Wood Snipe	<i>Gallinago nemoricola</i>	rare (1)	1
77	Jerdon's (Blyth's) Baza	<i>Aviceda jerdoni</i>	rare	1
78	Black Baza	<i>Aviceda leuphotes</i>	uncommon	1
79	Oriental Honey-buzzard	<i>Purnis ptilorhynncus</i>	uncommon	1
80	Black (Pariah) Kite	<i>Milvus migrans</i>	rare	1
81	White-rumped Vulture	<i>Gyps bengalensis</i>	uncommon	1
82	Crested Serpent Eagle	<i>Spilornis cheela</i>	common	1
83	Eurasian Marsh Harrier	<i>Circus aeruginosus</i>	rare (1)	1
84	Pied Harrier	<i>Circus melanoleucos</i>	rare	1
85	Crested Goshawk	<i>Accipiter trivirgatus</i>	rare	1
86	Besra	<i>Accipiter virgatus</i>	rare	1
87	Eurasian Sparrowhawk	<i>Accipiter nisus</i>	rare	1
88	Common Buzzard	<i>Buteo buteo</i>	rare	1
89	Changeable Hawk Eagle	<i>Spizaetus cirrhatus</i>	uncommon	1
90	Little Egret	<i>Egretta garzetta</i>	rare	1
91	Grey Heron	<i>Ardea cinerea</i>	rare	1
92	Great Egret	<i>Casmerodeus alba</i>	rare	1
93	Indian Pond Heron	<i>Ardeola grayii</i>	uncommon	1
94	Black-crowned Night Heron	<i>Nycticorax nycticorax</i>	rare	1
95	Malayan Night Heron	<i>Gorsachius melanolophus</i>	rare (3)	1
96	Asian Openbill	<i>Anastomus oscitans</i>	rare	1
97	Blue-naped Pitta	<i>Pitta nipalensis</i>	common	1, 2
98	Blue Pitta	<i>Pitta cyanea</i>	rare (2)	1
99	Eared Pitta	<i>Pitta phayrei</i>		2
100	Hooded Pitta	<i>Pitta sordida</i>	common	1
101	Silver-breasted Broadbill	<i>Serilophus lunatus</i>	uncommon	1
102	Asian Fairy Bluebird	<i>Lrena puella</i>	common	1
103	Blue-winged Leafbird	<i>Chloropsis cochinchinensis</i>	uncommon	1
104	Golden-fronted Leafbird	<i>Chloropsis aurifrons</i>	common	1
105	Rufous-tailed Shrike	<i>Lanius isabellinus</i>	rare (1)	1
106	Brown Shrike	<i>Lanius cristatus</i>	uncommon	1
107	Long-tailed Shrike	<i>Lanius schach</i>	uncommon	1
108	Grey-backed Shrike	<i>Lanius tephronotus</i>	common	1
109	Red-billed Blue Magpie	<i>Urocissa erythrorhyncha</i>	rare (1)	1
110	Common Green Magpie	<i>Cissa chinensis</i>	uncommon	1
111	Rufous Treepie	<i>Dendrocitta vagabunda</i>	rare	1
112	Grey Treepie	<i>Dendrocitta formosae</i>	common	1
113	Large-billed (Jungle) Crow	<i>Corvus macrorhynchos</i>	uncommon	1

Sl. No	Common name	Scientific name	Status/ Relative abundance	Reference
114	Ashy Woodswallow	<i>Artamus fuscus</i>	uncommon	1
115	Black-naped Oriole	<i>Oriolus chinensis</i>	rare	1
116	Black-hooded Oriole	<i>Oriolus xanthornus</i>	abundant	1
117	Maroon Oriole	<i>Oriolus traillii</i>	uncommon	1
118	Large Cuckooshrike	<i>Coracina macei</i>	uncommon	1
119	Black-winged Cuckooshrike	<i>Coracina melaschistos</i>	common	1
120	Rosy Minivet	<i>Pericrocotus roseus</i>	common	1
121	Brown-rumped Minivet/Swinhoe's Minivet	<i>Pericrocotus cantonensis</i>	rare	1, 2
122	Small Minivet	<i>pericrocotus cinnamomeus</i>	rare (2)	1
123	Long-tailed Minivet	<i>Pericrocotus ethologus</i>	rare	1
124	Scarlet Minivet	<i>Pericrocotus flammeus</i>	common	1
125	Bar-winged Flycatcher- shrike	<i>Hemipus picatus</i>	common	1
126	White-throated Fantail	<i>Rhipidura albicollis</i>	rare (1)	1
127	Black Drongo	<i>Dicrurus macroceru</i>	rare	1
128	Ashy Drongo	<i>Dicrurus leucocephalus</i>	common	1
129	Crow-billed Drongo	<i>Dicrurus annectans</i>	rare (1)	1
130	Bronzed Drongo	<i>Dicrurus aeneus</i>	common	1
131	Lesser Racked-tailed Drongo	<i>Dicrurus remifer</i>	common	1
132	Spangled Drongo	<i>Dicrurus hottentottus</i>	common	1
133	Greater Racked-tailed Drongo	<i>Dicrurus paradisenus</i>	common	1
134	Black-naped Monarch	<i>Hypothymis azurea</i>	abundant	1
135	Asian Paradise-flycatcher	<i>Terpsiphone paradisi</i>	uncommon	1
136	Common Iora	<i>Aegithina tiphia</i>	common	1
137	Large Woodshrike	<i>Tephrodornis gularis</i>	common	1
138	Common Woodshrike	<i>Tephrodornis pondicerianus</i>	rare	1
139	Blue Whistling Thrush	<i>Myophonus caeruleus</i>	rare	1
140	Orange-headed Thrush	<i>Zoothera citrina</i>	uncommon	1
141	Dark-sided Thrush	<i>Zoothera marginata</i>	rare (1)	1, 2
142	Black-breasted Thrush	<i>Turdus dissimilis</i>	rare	1
143	Grey-winged Blackbird	<i>Turdus boulboul</i>	rare (2)	1
144	Eyebrowed Thrush	<i>Turdus obscurus</i>	rare (3)	1, 2
145	Dark-throated Thrush	<i>Thrdus ruficollis</i>	rare	1
146	Lesser Shortwing	<i>Brachypteryx leucophrys</i>	rare	1, 2
147	White-browed Shortwing	<i>Brachypteryx montana</i>	rare (2)	1
148	Red-throated Flycatcher	<i>Ficedula parva</i>	common	1
149	Snowy-browed Flycatcher	<i>Ficedula hyperythra</i>	uncommon	1, 2

Sl. No	Common name	Scientific name	Status/ Relative abundance	Reference
150	Little Pied Flycatcher	<i>Ficedula westermanni</i>	uncommon	1
151	Slaty-blue Flycatcher	<i>Ficedula tricolor</i>	rare (1)	1, 2
152	Sapphire Flycatcher	<i>Ficedula sapphira</i>	rare (2)	1
153	Verditer Flycatcher	<i>Eumyias thalassina</i>	uncommon	1
154	Small Niltava	<i>Niltava macgrigoriae</i>	rare (1)	1
155	Rufous-billied Niltava	<i>Niltava sundara</i>	rare(1)	1
156	Palr-chinned (Brook's) Flycatcher	<i>Cyornis poliogenys</i>	common	1
157	Pale Blue Flycatcher	<i>Cyornis unicolor</i>	rare(1)	1, 2
158	Blue-throated Flycatcher	<i>Cyornis rubeculoides</i>	rare(3)	1
159	Tickell's Blue Flycatcher	<i>Cyornis tickelliae</i>	rare (3)	1
160	Grey-headed Canary Flycatcher	<i>Culicicapa ceylonensis</i>	common	1
161	Brown-breasted Flycatcher	<i>Muscicapa muttui</i>		2
162	Indian Blue Robin	<i>Luscinia brunnea</i>	rare (1)	1
163	Rufous-breasted Bush Robin	<i>Tarsiger hyperythrus</i>	rare (1)	1
164	White-brown Bush Robin	<i>Tarsiger indicus</i>		2
165	Oriental Magpie Robin	<i>Copsychus saularis</i>	common	1
166	White-rumped Shama	<i>Copsychus malabaricus</i>	common	1
167	White-capped Water Redstart	<i>Chaimarrornis leucocephalus</i>	rare (1)	1
168	White-tailed Robin	<i>Myiomela leucura</i>	uncommon	1
169	Black-backed Forktail	<i>Enicurus immaculatus</i>	uncommon	1
170	Slaty-backed Forktail	<i>Enicurus schistaceus</i>	rare	2
171	White-crowned Forktail	<i>Enicurus leschenaulti</i>	rare (1)	1
172	Common Stonechat	<i>Saxicola torquata</i>	rare	1
173	Grey Bushchat	<i>Saxicola ferrea</i>	rare (1)	1
174	Asian Glossy Starling	<i>Aponis panayensis</i>	rare (1)	1
175	Chustnut-tailed Starling	<i>Sturnus malabaricus</i>	common	1
176	Asian Pied Starling	<i>Sturnus contra</i>	rare	1
177	Common Myna	<i>Acridotheres tristis</i>	rare	1
178	Jungle Myna	<i>Acridotheres fuscus</i>	uncommon	1
179	Hill Myna	<i>Gracula religiosa</i>	common	1
180	Velvet-fronted Nuthatch	<i>Sitta frontalis</i>	uncommon	1
181	Barn Swallow	<i>Hirundo rustica</i>	common	1
182	Wire-tailed Swallow	<i>Hirundo smithii</i>	rare (1)	1
183	Red-rumped Swallow	<i>Hirundo daurica</i>	rare	1
184	Black-headed Bulbul	<i>Pycnonotus atriceps</i>	uncommon	1
185	Black-crested Bulbul	<i>Pycnonotus melanicterus</i>	common	1
186	Red-whiskered Bulbul	<i>Pycnonotus jocosus</i>	abundant	1
187	Red-vented Bulbul	<i>Pycnonotus cafer</i>	common	1
188	White-throated Bulbul	<i>Alophoixus flaveolus</i>	common	1



Sl. No	Common name	Scientific name	Status/ Relative abundance	Reference
189	Olive Bulbul	<i>Iole viridescens</i>	uncommon	1
190	Ashy Bulbul	<i>Hemixos flavula</i>	common	1
191	Rufescent Prinia	<i>Prinia rufescens</i>	rare (1)	1
192	Grey-breasted Prinia	<i>Prinia hodgsonii</i>	uncommon	1
193	Oriental White-eye	<i>Zosterops palpedrosus</i>	common	1
194	Chestnut-headed Tesia	<i>Tesia castaneocoronata</i>	rare (1)	1
195	Slaty-bellied Tesia	<i>Tesia olivea</i>	rare (1)	1, 2
196	Grey-bellied Tesia	<i>Tesia cyaniventer</i>	common	1
197	Asian Stubtail	<i>Urosphena squameiceps</i>	rare (1)	1, 2
198	Common Tailorbird	<i>Orthotomus sutorius</i>	common	1
199	Dark-necked Tailorbird	<i>Orthotomus atrogularis</i>	rare	1
200	Common Chiffchaff	<i>Phylloscopus collybita</i>	rare	1
201	Dusky Warbler	<i>Phylloscopus fuscatus</i>	rare	1
202	Tickell's Leaf Warbler	<i>Phylloscopus affinis</i>	rare	1
203	Inornate (Yellow-browed) Warbler	<i>Phylloscopus inornatus</i>	common	1
204	Greenish Warbler	<i>Phylloscopus trochiloides</i>	common	1
205	Western Crowned Warbler	<i>Phylloscopus occipitalis</i>	uncommon	1
206	Blyth's Leaf Warbler	<i>Phylloscopus reguloides</i>	common	1
207	Yellow-vented Warbler	<i>Phylloscopus cantator</i>	uncommon	1
208	Golden-spectacled Warbler	<i>Seocercus burkii</i>	common	1
209	Grey-hooded Warbler	<i>Seicercus xanthoschistus</i>	rare (2)	1
210	White-spectacled Warbler	<i>Seicercus affinis</i>	rare (2)	1
211	Lesser Necklaced Laughingthrush	<i>Garrulax monileger</i>	uncommon	1
212	Greater Necklaced Laughingthrush	<i>Garrulax monileger</i>	common	1
213	Rufous-nacked Laughingthrush	<i>Garrulax ruficollis</i>	rare	1
214	Abbott's Babbler	<i>Malacocincla abbotti</i>	common	1
215	Buff-breasted Babbler	<i>Pellorneum tickelli</i>	uncommon	1
216	Spot-throated Babbler	<i>Pellorneum albiventre</i>	rare (2)	1
217	Marsh Babbler	<i>Pellorneum palustre</i>	rare (1)	1
218	Puff-throated (Spotted) Babbler	<i>Pellorneum ruficeps</i>	common	1
219	Large Scimitar Babbler	<i>Pomatorhinus hypoleucos</i>	rare	1
220	White-browed Scimitar Babbler	<i>Pomatorhinus schisticeps</i>	uncommon	1
221	Rufous-fronted Babbler	<i>Stachyris rufifrons</i>	uncommon	1
222	Grey-throated Babbler	<i>Stachyris nigriceps</i>	common	1
223	Striped Tit Babbler	<i>Macronous gularis</i>	abundant	1
224	Brown-cheeked Fulvetta	<i>Alcippe poioicephala</i>	common	1

Sl. No	Common name	Scientific name	Status/ Relative abundance	Reference
	(Quaker Babbler)			
225	Nepal Fulvetta	<i>Alcippe nipalensis</i>	common	1
226	Long-tailed Sibia	<i>Heterophasia picaoides</i>	rare (1)	1, 2
227	White-bellied Yuhina	<i>Yuhina zantholeuca</i>	common	1
228	Greater Rufous-headed Parrotbill	<i>Paradoxornis ruficeps</i>	rare (1)	1
229	Rufous-winged Bushlark	<i>Mirafra assamica</i>	rare	1
230	Thick-billed Flowerpecker	<i>Dicaeum agile</i>	rare (4)	1
231	Yellow-vented Flowerpecker	<i>Cicaeum chrysorreum</i>	uncommon	1
232	Yellow-bellied Flowerpecker	<i>Dicaeum melanoxanthum</i>	rare (2)	1, 2
233	Pale-billed (Tickell's) Flowerpecker	<i>Dicaeum erythrorhynchos</i>	common	1
234	Plain Flowerpecker	<i>Dicaeum concolor</i>	uncommon	1
235	Scarlet-backed Flowerpecker	<i>Dicaeum cruentatum</i>	abundant	1
236	Ruby-cheeked Sunbird	<i>Anthreptes singalensis</i>	common	1
237	Purple-throated Sunbird	<i>nectarinia sperata</i>	common	1
238	Purple Sunbird	<i>Nectarinia asiatica</i>	rare	1
239	Mrs Gould's Sunbird	<i>Aethopyga gouldiae</i>	rare (1)	1
240	Green-tailed Sunbird	<i>Aethopyga nipalensis</i>	rare (1)	1
241	Crimson Sunbird	<i>Aethopyga siparaja</i>	common	1
242	Little Spiderhunter	<i>Arachnothera longirostra</i>	abundant	1
243	Forest Wagtail	<i>Dendronanthus indicus</i>	uncommon	1
244	Olive-backed Pipit	<i>Anthus hodgsoni</i>	common	1
245	White-rumped Munia	<i>Lonchura striata</i>	uncommon	1
246	Scaly-breasted Munia	<i>Lonchura punctulata</i>	uncommon	1

The above bird's list is based on:

1. Thompson, P. M. and D. L. Johnson. 1999. Checklist of birds recorded at 19 sites in Bangladesh. Updated to 1 February 1999. Unpublished Report.
2. Thompson, P. M. and D. L. Johnson. 2003. Further notable bird records from Bangladesh. *FORKTAIL* 19: 85-102.

Frequency/abundance categories are defined as:

- rare (1-5): number of sightings of rare species since 1977, where known;
- rare: 5+ sightings since 1977; unlikely to be seen during a visit;
- uncommon: can expect to be seen on a single visit;
- abundant: seen on every visit; usually many seen.

#### Annexure – 4

##### List of Mammals of Lawachara National Park:

Sl. No	Common name	Scientific name	Source
1	Slow Loris	<i>Nycticebus coucang</i>	(2, 4, 5)
2	Pig-tailed Macaque	<i>Macaca nemestrina</i>	(2, 4, 5, 7, 10)
3	Rhesus Macaque	<i>Macaca mulatta</i>	(2, 4, 5, 6)
4	Assamese Macaque	<i>Macaca assamensis</i>	(5, 6, 7)
5	Capped Langur	<i>Presbytis pileatus</i>	(2, 4, 6, 7, 10)
6	Phayre's Leaf-monkey	<i>Presbytis phayrei</i>	(2, 5, 6, 7)
7	Hoolock Gibbon	<i>Hylobates hoolock</i>	(2, 4, 5, 6, 7, 8, 9, 10)
8	Jackal	<i>Canis aureus</i>	(1, 8)
9	Wild Dog <sup>1</sup>	<i>Cuon alpinus</i>	(9)
10	Sloth Bear <sup>1</sup> and/ or	<i>Melursus ursinus</i>	(9)
11	Himalayan Black Bear <sup>1</sup>	<i>Ursus thibetanus</i>	
12	Yellow-throated Marten	<i>Martes flavigula</i>	(7)
13	Tiger <sup>1</sup>	<i>Panthera tigris</i>	(9)
14	Leopard	<i>Panthera pardus</i>	(3, 9)
15	Fishing Cat	<i>Felix viverrina</i>	(7)
16	Leopard Cat	<i>Felix bengalensis</i>	(7)
17	Wild Pig	<i>Sus scrofa</i>	(6, 9)
18	Sambar	<i>Cervus unicolor</i>	(9)
19	Barking Deer	<i>Muntiacus muntjac</i>	(1, 6, 8, 9)
20	Indian Giant Squirrel	<i>Ratufa indica</i>	(4, 10)

<sup>1</sup> Ahsan, M. F., Feeroz, M. M., M. A. Islam and M. M. Kabir reported totally extinct.

The following mammals list based on:

Ahsan, M. F. 1995. Human impact on 2 forests of Bangladesh: a preliminary case study. *International Wildlife Management Congress*: 368-372.

Feeroz, M. M., M. A. Islam and M. M. Kabir. 1994. Food and feeding behaviour of hoolock gibbon (*Hylobates hoolock*), capped langur (*Presbytis pileata*) and pigtailed macaque (*Macaca nemestrina*) of Lawachara. *Bangladesh J. Zool.* 22(2): 123-132.

Khan, M.A.R. 1982. On the distribution of the mammalian fauna of Bangladesh. Pages 560-575, in: proc. of the Second National Forestry Conference, Bangladesh-1982. Dhaka, Bangladesh, 21-26 January 1982.

Leech, J. and S. S. Ali. 1997. Extended Natural Resources Survey: Part IV – plant and animals species lists. GoB/WB Forest Resources Management Project, Technical Assistance Component. Mandala Agricultural Development Corporation, Dhaka, Bangladesh.

Note: species list derived from RIMS database.

Lockwood, I. 1998. Bangladesh's declining forest habitat. *Sanctuary Asia XVIII*: 22-33.

Siddiqui, N. A. and M. Faizuddin. 1981. Distribution and population status of some mammals in Bangladesh. *Bano Biggyan Patrika* 10 (1 and 2): 1-6.

Thompson, P. M. and D. L. Johnson. 1996. Bird watching areas. Lawachara Forest and Srimangal area, Bangladesh. Oriental Bird Club Bulletin Number 24: 25-29.

Information from local Forest Department staffs, May-December 1999.

Information from BDR, May-December 1999.

Observation by the FSP Biodiversity Conservation and Management Specialists, May-December 1999.

## Annexure - 5

### List of Odonata of Lawachara National Park

Sl. No.	Family	Genus	Species	
	Coenagriidae	Agriocnemis	<i>A. lecteola</i> Selys	
		Agriocnemis	<i>A. naia</i> Fraser	
		Caconeura	<i>C. botti</i> Fraser	
		Disparoneura	<i>D. campioni</i> Fraser	
		Copera	<i>C. marginipes</i> (Ramber)	
		Copera	<i>C. assamensis</i> Laidlaw	
		Coelliccia	<i>C. bimaculata</i> Laidlaw	
		Calicnemis	<i>C. eximia</i> Selys	
		Agriidae	Libellago	<i>L. lineata indica</i> (Fraser)
			Vestalis	<i>V. smaragdina</i> Selys
		Gomphidae	Ictinogomphus	<i>I. rapax</i> (Rambur)
			Macrogomphus	<i>M. robustus</i> Selys
		Libellulidae	Orthetrum	<i>O. chrysis</i> Selys
	Aethrecista		<i>A. brevipennis brevipennis</i> (Rambur)	
	Lathrecista		<i>L. asiatica asiatica</i> (Fabricius)	
	Cratilla		<i>C. lineata</i> (Brauer)	
	Cratilla		<i>C. metallica</i> (Brauer)	

**Annexure - 6**

**List of hoolock gibbon's food trees in Bangladesh**

<b>Family</b>	<b>Species</b>	<b>Part eaten</b>
Sapindaceae	<i>Allophyllus cobbe</i>	flowers (1, 2)
Rubiaceae	<i>Anthocephalus chinensis</i>	flowers (1, 2)
Miliaceae	<i>Aphanamixis sp.</i>	seeds (1, 2)
Moraceae	<i>Artocarpus chaplasha</i>	fruits (1, 2), flowers(1, 2)
Moraceae	<i>Artocarpus lakoocha</i>	fruits (1, 2)
Burseraceae	<i>Bursera serrata</i>	Fruits (1, 2)
Lauraceae	<i>Cinnamomum sp.</i>	fruits (1)
Rhizophoraceae	<i>Carallia brachiata</i>	fruits (1, 2)
Cordiaceae	<i>Cordia sp.</i>	fruits (1, 2)
Dilleniaceae	<i>Dillenia pentagyna</i>	fruits (1, 2),flowers(1, 2)
Dioscoraceae	<i>Dioscorea sp.</i>	fruits (1, 2)
Dipterocarpaceae	<i>Dipterocarpus turbinatus</i>	flower (2)
Leguminosae	<i>Entada sp.</i>	flowers (1, 2)
Moraceae	<i>Ficus benjamina</i>	fruits (1, 2)
Moraceae	<i>Ficus comosa</i>	fruits (1, 2)
Moraceae	<i>Ficus benghalensis</i>	fruits (1, 2)
Moraceae	<i>Ficus hispida</i>	fruits (1, 2)
Moraceae	<i>Ficus racemosa</i>	fruits (1, 2)
Moraceae	<i>Ficus religiosa</i>	fruits (1, 2)
Moraceae	<i>Ficus rumphii</i>	fruits (1, 2)
Moraceae	<i>Ficus spp. (3 unidentified species)</i>	fruits (1, 2)
Gutiferae	<i>Garcinia cowa</i>	fruits (1, 2)
Tilliaceae	<i>Grewia asiatica</i>	fruits (1, 2)
Lythraceae	<i>Lagerstroemia speciosa</i>	flowers (1, 2)
Leeaceae	<i>Leea crispa</i>	fruits (1, 2)
Anacardiaceae	<i>Mangifera sylvatica</i>	fruits (1, 2)
Compositae	<i>Mikania sp.</i>	petioles/shoots(2)
Euphorbiaceae	<i>Phyllanthus embelica</i>	fruits (1, 2)
Euphorbiaceae	<i>Pygeum sp.</i>	fruits (1)
Euphorbiaceae	<i>Sapium baccatum</i>	fruits (1, 2)
Anacardiaceae	<i>Semecarpus anacardium</i>	fruits (1, 2), flowers (2)
Myrtaceae	<i>Syzygium cumini</i>	fruits (1, 2)
Myrtaceae	<i>Syzygium fruticosum</i>	fruits (1, 2)
Myrtaceae	<i>Syzygium spp. (3 unidentified species)</i>	fruits (1, 2)
Combretaceae	<i>Terminalia belerica</i>	fruits (1, 2)
Unidentified	<i>Unidentified spp. (3)</i>	leaves, petioles, fruits and seeds (2)

**Food Species of primates That are also Used by Human** (T=tree, L=liana; C=Crop; rf=ripe fruit; se=seed; fl=flower; bd= bud; yl=young leaf; yfr=young fruit)

Family	Plant species in transact	Local name	Life habitat	Part eaten by primates*
Anacardiaceae	<i>Holigarna caustica</i>	Varalla	T	rf
	<i>Spondias pinnata</i>	Amra	T	rf
	<i>Mangifera indica</i>	Am	T	rf
Apocynaceae	<i>Willughbeia sp.</i>	Lata am	L	rf
Combretaceae	<i>Terminalia sp.</i>	Bahera	T	rf, se
Dilleniaceae	<i>Dillenia indica</i>	Chalta	T	fl, bd, rf
Dioscoreaceae	<i>Dioscorea sp.</i>	Bon alu	L	yl, yfr
Elaeocarpaceae	<i>Elaeocarpus floribundus</i>	Ban jalpai	T	yfr, rf
Euphorbiaceae	<i>Phyllanthus emblica</i>	Amlaki	T	rf
Geraniaceae	<i>Averrhoa carambola</i>	Kamranaga	T	yf, rf
Guttiferae	<i>Garcinia cowa</i>	Lal kao	T	rf
Moraceae	<i>Artocarpus heterophyllus</i>	Khathal	T	rf
	<i>Artocarpus lacucha</i>	Dewa	T	rf
	<i>Artocarpus chaplasha</i>	Chapalish	T	rf
	<i>Ficus glomerata</i>	Jaga dumur	T	fig
Myrtaceae	<i>Syzygium cumini</i>	Kalo jam	T	yfr, rf
	<i>Psidium guava</i>	Guava	T	rf
Papilionaceae	<i>Derris robusta</i>	Phuka tetul	T	yfr,
Rhamnaceae	<i>Ziziphus jujuba</i>	Boroi	T	rf
	<i>Musa sapentum</i>	Kala	C	rf
Crops		Pineapple	C	rf
	<i>Vigna cinensis</i>	Bean	C	yfr
	<i>Carica papaya</i>	Papaya	C	rf

\*only the fruits of all these species were eaten by human

**Food trees of hoolock gibbon, capped langur and pigtailed macaque**, H = Hoolock; L = Langur; P = Pigtailed; Fr = Fruit; Fl = Flower; L = Leaves; P = Petioles; Sh = Shoots; Se = Seed.

Food species	Family	Part eaten				
		Fr	Fi	Fl	Le/Pe/Sh	Se
<i>Acacia chinensis</i>	Leguminosae	L				
<i>A. facataria</i>	Leguminosae				L	
<i>Albizzia sp.</i>	Leguminosae	LP			L	
<i>Allophyllus cobbe</i>	Sapindaceae			H		
<i>Alstonia scholaris</i>	Apocyanaceae			L	L	
<i>Anthocephalus chinensis</i>	Rubiaceae	LP		H	L	
<i>Aphanamixis sp.</i>	Miliaceae			L		H
<i>Amoora wallichii</i>	Miliaceae	L				
<i>Artocarpus chaplasha</i>	Moraceae	HLP		H		
<i>A. lakoocha</i>	Moraceae	HIP				
<i>Aquilaria agallocha</i>	Thynelaceae	LP				
<i>Baccaurea sapida</i>	Euphorbiaceae	L				
<i>Bursera serrata</i>	Burseraceae	HLP				
<i>Cassia fistula</i>	Leguminosae	L		P		
<i>Castanopsis indica</i>	Fagaceae	L				
<i>Castanopsis tribuloides</i>	Fagaceae	L				
<i>Cinnamomum sp.</i>	Lauraceae	H				L
<i>Carallia brachiata</i>	Rhizophoraceae	H				
<i>Connarus paniculatus</i>	Connaraceae					L
<i>Cordia sp.</i>	Cordiaceae	HL				
<i>Dillenia pentagyna</i>	Dilleniaceae	HLP		HP		
<i>Dioscorea sp.</i>	Dioscoreaceae	HL				
<i>Entada sp.</i>	Leguminosae			HP		



Food species	Family	Part eaten				
		Fr	Fi	Fl P	Le/Pe/Sh	Se
<i>Eupatorium odoratum</i>						
<i>Ficus bejamina</i>	Moraceae		H			
<i>F. comsa</i>	Moraceae		HLP			
<i>F. bengalensis</i>	Moraceae		HP			
<i>F. hispida</i>	Moraceae		HLP			
<i>F. racemosa</i>	Moraceae		HLP			
<i>F. religiosa</i>	Moraceae		H			
<i>F. rumphii</i>	Moraceae		H			
<i>Ficus sp.</i>	Moraceae		HLP			
<i>Ficus sp.</i>	Moraceae		H			
<i>Ficus sp.</i>	Moraceae		H			
<i>Garcinia cowa</i>	Guttiferae	HP				
<i>Grewia asiatica</i>	Tilliaceae	HP		P	L	
<i>Gmelina arborea</i>	Verbenaceae	L				
<i>Lagterstroemia speciosa</i>	Lythraceae			H	L	
<i>Lauranthus sp.</i>						P
<i>Leea crispa</i>	Leeaceae	HLP				
<i>Mallotus sp.</i>	Euphorbiaceae	L				
<i>Mangifera sylvatica</i>	Anacardiaceae	HP				
<i>Mezoneuron enneaphyllum</i>	Leguminosae					LP
<i>Mikania sp.</i>	Compositae				L	
<i>Oroxylum indicum</i>	Bignonaceae				LP	
<i>Phyllanthus embelica</i>	Euphorbiaceae	H				
<i>Pygeum sp.</i>		HP				
<i>Randia sp.</i>	Rubiaceae	L				
<i>Sapium baccatum</i>	Euphorbiaceae	HLP				
<i>Semecarpus anacardium</i>	Anacardiaceae	HP				
<i>Smilax macrophylla</i>	Smilacaceae	LP				
<i>Smilax sp.</i>	Smilacaceae	L				
<i>Spatholobus sp.</i>	Leguminosae	L			LP	

Food species	Family	Part eaten				
		Fr	Fi	Fl	Le/Pe/Sh	Se
<i>Syzygium cumini</i>	Myrtaceae	HLP				
<i>S. fruticosum</i>	Myrtaceae	HLP				
<i>Syzygium sp.</i>	Myrtaceae	H				
<i>Syzygium Sp.</i>	Myrtaceae	H				
<i>Syzygium sp.</i>	Myrtaceae	H				
<i>Tectona grandis</i>	Verbenaceae				L	
<i>Terminalia belerica</i>	Combretaceae	HLP				
<i>T. catappa</i>	Combretaceae				LP	
<i>Thunbergia grandiflora</i>	Acantheceae	L				
<i>Vitex sp.</i>	Verbenaceae	L				