

**Management of Aquatic Ecosystem through Community Husbandry  
(MACH)**

**Baseline Report  
(Sherpur)**

**On**

**Fisheries, Vegetation, Wildlife and Protein Consumption**

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## Executive Summary

Management of Aquatic Ecosystem through Community Husbandry (MACH), USAID funded project reached 3<sup>rd</sup> year from the inception. Since inception various activities including ecological assessment, physical interventions, community mobilization and management interventions are going on to reach the set goal.

The overall goal of the MACH project is to "*Promote ecologically sound management of floodplain resources (fisheries and other wetland products) for the sustainable supply of food to the poor of Bangladesh*".

The Center for Natural Resource Studies (CNRS), a partner for implementing the project has a large role in project impact monitoring. Accordingly CNRS has established baseline on biological parameters including fish catch, vegetation, wildlife and protein consumption considering the period between April 1999 to March 2000 for Hail Haor (HH) site and Turag-Bangshi (TB) site. The baseline is meant to use as basis for capturing changes in the biological parameters selected as indicator of success due to the project interventions (Physical and management). The monitoring of the biological parameters however continues since the beginning of the monitoring. April 2000 onwards will be considered as impact period for *Hail Haor at Moulvibazar and Turag-Bangshi floodplain at Gazipur and Tangail*. April 2000 to March 2001 has been considered as 1<sup>st</sup> year of impact period.

This report concentrates on the findings of the biological parameters during the 1<sup>st</sup> year of impact period and comparison with the baseline situation in this regard.

The monitoring locations selected for fisheries during the baseline considering spatial variation, habitat and fisher community dependence has also been maintained during the impact assessment. In order to accommodate the additional intervened beels in HH site Agari beel, Kajura beel and Sananda beel has been included as monitoring locations. Parameters monitored during the baseline have also been monitored during the impact study. The parameters are; Fishing gear type and number, length, height, width and mesh. Fisher type, sex, age, village and distance from fishing ground. Fishing start time, end time, duration of fishing, species by number and weight and fishing rights. Same sampling protocol as in case of baseline has been used which includes sampling intensity, selection and sampling of the operated gears, spatial and temporal coverage of the observed gears and the counting of the operated gear within the monitoring locations/habitats.

Data has been analyzed considering season, fishing gears, fishing intensity and duration of fishing, Catch per Unit of Effort (CPUE), Catch per Unit of Area (CPUA), catch composition and species diversity following exactly same procedures and algorithms as baseline.

Findings show that Turag-Bangshi site is continuing offering open access to fisher. In Hail Haor open access to resources have been reduced to 36% which was over 50% during the baseline. The access against payment increased from 39% to 59%.

In Hail Haor 13 types of gears recorded during baseline was also recorded during impact and in addition harpoon was recorded. In addition to the 26 types of gears used during baseline 3 types were recorded in the Turag-Bangshi site.

Seasonal variation in fishing intensities prevails as in case of baseline. Most heavily operated "*current jal*" during the baseline was found decreased in HH site and the shift was found to trap. In TB site however the use of "*current jal*" increased. Fishing duration was found decreased compared to baseline in TB site imaging the increased fish availability in the site. In the Hail Haor site the duration of fishing decreased for Seine net.

Catch per unit of Area (CPUA) has been increased to 191 kg/ha/year, which was at 164 kg/hectare/year within the Hail Haor. The increase was possibly due to a combination of the hydrological regime changes and project

interventions. CPUA for the Turag site has been increased tremendously from baseline at 51 Kg/hectare/year to 124 Kg/hectare/year during the 1<sup>st</sup> impact year. The increase was due to the establishment of 9 sanctuaries, fishing management and also for the hydrological changes.

Catch per unit of effort (CPUE) of the commonly operated gears increased in both the sites, which is expected. CPUE of "current jal" however decreased in TB site.

Small fish in both the sites with a bit better situation in TB site dominated the Catch Composition during the base line. The dominance of the small fish in the catch of the HH site has been found reduced and TB site maintained similar dominance during the impact study as it was during the baseline.

Detrimental fishing practice dewatering is prevailing in Hail Haor as reported during the baseline. However a total of 5 beels has been brought under RMOs which shall be managed wisely and there will be no dewatering. The RMO coverage is intended to expand in coming future. *Pagar katha* fisheries are there both in the Turag and Hail Site. Dewatering fishing is not practiced in TB site.

The species diversity increased from 68 to 70 in HH site and remained same at 83 in TB site. Though there are new species recorded during the impact year and few species that was recorded during the baseline was not recorded during the impact year.

The household protein consumption monitoring among 490 selected households from 14 villages in the HH site and 280 households from 8 villages in Turag-Bangshi site are continuing maintaining the same protocol by local enumerators as it was during the baseline. Baseline monitoring included September 1999 to March 2000 in Hail Haor and from October 1999 to March 2000 in Turag-Bangshi site. The 1<sup>st</sup> year of impact however includes from April 2000 to March 2001 for both the sites. Fish consumption has been documented along with other consumed protein including meat, egg, milk and pulse. Overall fish consumption for the Hail Haor site per person per day was about 46g during baseline which has been found increased to 50g during the impact year. TB site maintains at 26g as it was during baseline. However if same time frame of baseline is considered then the consumption is 27g.

Wildlife of MACH Project sites has been surveyed following transect-quadrat method and covering different habitats both for Hail Haor and *Turag-Bangshi* site as it was during the baseline. A total of 159 wildlife has been found in the Hail Haor which was 165 during the baseline site while 136 wildlife was recorded during the impact year which was 144 during the baseline in the Turag-Bangshi.

A cumulative total of 94 hydrophyte species was observed in Hail Haor through out the 1<sup>st</sup> impact year, which were 106 during baseline. A cumulative total of 48 species of aquatic vegetation observed at Turag-Bangshi site all over the year while during baseline it was 52.

A total of 130 species of terrestrial plants observed at Hail Haor over the impact year, which were 55 during the baseline. A total of 56 species has been recorded in the Lowachhara forest, which was not included in the baseline. Taking the enhanced area and their recorded species in to consideration a total of 19 species were found increased in HH site during 1<sup>st</sup> impact year out of which 9 species was introduced by MACH project. A total of 107 species of terrestrial plants observed at Turag-Bangshi all over the year, which was 83 during the baseline.

This report presents following sections;

Section A: Fish Catch

Section B: Household Protein Consumption

Section C: Wildlife

Section D: Vegetation

# Section A

## Fish Catch

## 1. Introduction

MACH project is being implementing in to three different floodplain ecosystems—the Hail Haor basin in Moulvibazar (March 1999), the Turag-Bangshi basin in Gazipur and Tangail district (April 1999) and in the Kongshaw-Malijhi basin in Sherpur (August 2000).

### 1.1 Goals and Objectives

The overall goal of the MACH project is to promote ecologically sound management of floodplain resources for the sustainable supply of food to the poor of Bangladesh.

Specific objectives of the projects are:

- To maintain or recover the selected natural floodplain ecosystem and associated fisheries
- To promote community and local government systems of co-management of floodplain resources
- To promote equitable access by the local population to the natural resources of the floodplain
- To identify alternative income generating activities that will result in reducing the ecological impact on the floodplain fisheries
- To raise awareness at the community and government levels of the importance and potential of natural floodplain processes in order to secure food and income for the poor people of Bangladesh

In order to capture the changes due to the project activities incorporating the physical and management interventions in the MACH sites indicator of success has already been set. Accordingly baseline has been established for the Hail Haor site and Turag-Bangshi site both for biological and socioeconomic parameters.

This report concentrates on the biological parameters including fisheries, Vegetation, Wildlife and Household Protein Consumption for the 1<sup>st</sup> year of impact of the project interventions. Data used for this report is being collected through biological monitoring of the project and household protein consumption monitoring that is being continuing from the inception and shall continue till the tenure of the project.

This report intends to present the findings on the selected parameters (as in case of the baseline) during the 1<sup>st</sup> year of impact. The comparison of the findings on the parameters with the baseline situation to review the changes has also been attempted in this report.

## 2. Methodology

In order to assess the impact of the project interventions (Physical and management) on fishery yield and species diversity the comprehensive fish catch assessment program that had been developed and implemented to establish the baseline has been adopted. To compare the fisheries scenario and to measure the changes in the value of fisheries parameters established during baseline, the fish catch assessment program is continued and considered one year after the baseline period as 1<sup>st</sup> year of impact. The analytical tools utilized to establish the baseline viz. the habitat stratification, monitoring site selection, data collection protocols and standardization of catch efforts were also used during the impact assessment and in this report. Similar to that of the baseline data was also collected through fish catch assessment monitoring and for this purpose same structured questionnaire was used (Appendix 1). Data collected from April 2000 to March 2001 has been considered for the 1<sup>st</sup> year of impact of interventions.

## 2.1 Habitat Stratification

"Biological productivity is a function of the ecological condition of the habitat which is governed by the landscape and hydrological regime of the area. The spatial and temporal variation in the project areas is high and fishing and gear techniques vary considerably at the different habitat locations. In order to portray a fish catch scenario that represents the project area the habitats have been stratified into rivers, canals, beels and floodplains. The selection criteria also included the geographical distribution over the project site, water flow, inundation regime and biological zone of the area. The baseline conditions will be used in some cases to measure parameter changes after appropriate interventions and future implementation of fisheries management. The changes expected will be both local (in a specific habitat) and global (throughout the project site areas). Accordingly a number of locations and habitats were selected and are being monitored. Both a "test" area inside the project and a control area outside the project have been identified and monitoring will continue in both." (MACH, Baseline report on fisheries, vegetation, wildlife and household protein consumption)

## 2.2 Monitoring Site Selection

The site selected during baseline study following the wetland inventory and resource mapping exercise conducted by MACH has also been selected for the impact assessment and same criteria as in case of baseline was followed. Potential intervention sites for impact monitoring were chosen by the MACH project and by a Participatory Community planning group made up of local people during the baseline has been maintained in the impact assessment. In order to accommodate the changes in the physical interventions location in the Hail Haor required adjustment has been made in the monitoring locations in the study. These sites are Jethua Beel, 62-Beel Complex, Balla Beel and the Rustompur floodplain, Agari beel, Kajura beel Sananda Beel and Gopla river in the Hail Haor basin. Mokash Beel North, Mokash Beel South, Kali-daha Beel, Mokash Khal, Aowla Beel, and Aowla Khal in the Turag-Bangshi study area are the monitoring locations for the impact assessment which are exactly the same as baseline.

### 2.2.1 Hail Haor

**Table 1: Location, Area and Habitat Types of the Monitoring Sites at the Hail Haor Site**

Monitoring Locations	Sampling Areas (ha)	Habitat Types
Jethua Beel	67.95	Beel, Canal, Floodplain
Gopla River	41.23	River
Boulashir floodplain	234.38	Floodplain
Cheruadubi Beel	30.40	Beel
Sananda Beel	92.03	Beel
62-Beel Complex	165.22	Beel, Floodplain
Rustompur Beel Complex	123.00	Beel, Canal, Floodplain
Kazura Beel	33.16	Beel
Koraiya Doba	20.24	Beel
Agari Beel	13.44	Beel
Balla Beel	159.09	Beel, Floodplain

In addition to the sampling locations of the baseline year in the Hail Haor three locations have been added to accommodate the intervened beels in the area. There were 8 monitoring locations during the baseline year. Now there are 11 locations (Table 1). Agari beel, Kajura beel and Sananda beels have been intervened both physical (Re-excavation) and management (RMO activities). In order to capture interventions location specific changes

these *beels* have been included in the monitoring which shall enrich the extrapolation of the findings globally (over the Haor basin) as well. Koraiyadoba beel was supposed to be intervened and accordingly included instead of Alniberi beel. However, the Koraiyadoba beel was not intervened but monitoring continues to have better coverage over the Haor basin (Map 1).

### 2.2.2 Turag-Bangshi Site

"The Turag-Bangshi site is ecologically different from the Hail Haor site. The site includes a reach of river Turag and Bangshi (Turag and Bangshi is the same river having different names at reaches) and the associated floodplains on both sides of the river including *beels*. The site area is a part of Modhupur tract having Sal forest in and around. The Beel floodplain complex has *Hijol* (wetland tree) abundance on the land and water interface" (MACH, Baseline report on fisheries, vegetation, wildlife and protein consumption).

Same monitoring locations covering river, *beel*, floodplain and canal as in case of baseline has been used for the impact assessment in the Turag-Bangshi site (Table 2) (Map 2).

**Table 2: Location of Monitoring Sites in Turag-Bangshi with Area**

Sites	Locations	Sampling Areas (ha)	Habitat
1	Mokash Beel (South)	100	<i>beel</i>
2	Floodplain (Mokash Beel North)	100	floodplain
3	Kali-daha Beel	50	<i>beel</i>
4	Mokash Khal/Solhati Khal	0.70	canal
5	Turag-Bangshi River Section	14	river
6	Aowla Khal	1.02	canal
7	Aowla Beel	100	<i>beel</i>
8	Bangshi River Section	17	river

*Sampling protocol, monitoring parameters and data analysis used for the impact assessment is exactly the same as in case of baseline.*

### 2.3 Sampling Protocol

"Floodplain fisheries, with their spatial and temporal variations in fish and water abundance, are as complex and dynamic as the fishing practices. The type of fishing gear used affects a fisher's catch within a specific habitat. A sample unit was considered to be one set of gear used for a catch attempt. The effectiveness of the fishers and their motivations are also significant in setting parameters for recording sample units. The selection of sample fishing units while recording catch data is crucial and it requires the judgement of the fisheries biologist. Accordingly, attempts have been made to be consistent so that the best possible estimates can be made from the collected data.

To offset any bias from the spatial distribution of fishing gear used the field biologist collected data from different locations at the monitoring locations. For each gear type at least three fishing units were monitored. If there were more than 30 fishing units of one particular gear type operating in a day data was collected from not less than 10 percent of the operating fishing units. Irrespective of catch data from individual fishing gear use all fishing units in operation were counted during the catch monitoring day.

This is the effort for that day. At the end of the day a list of fishing units by gear type was prepared. In order to accommodate for possible temporal variations in a single month the sampling intensity was set at a 10 days interval and accordingly data was collected three times a month from the selected locations. Gear of the same type with differing dimensions were standardized in the survey to 100 feet" (MACII, Baseline report on fisheries, vegetation, wildlife and protein consumption).

#### 2.4 Monitoring Parameters

Fish catch assessment monitoring collects data on fishing intensity, species diversity, catch composition, fishers by category and fishing gear. The data gathered on these parameters will act as a benchmark for future measures, for floodplain production and for information on fisheries bio-diversity. The terminology may be defined as follows:

##### Fishing gear and fishers:

- fishing gear type and number, net area and mesh size
- fishers type, sex, age, village and distance from fishing ground

##### Time and duration of fishing:

- fishing starting and ending times
- probable fishing duration

##### Fish catch:

- species by number and weight

##### Fishing rights:

- the fisher's access to the fishing ground

#### 2.5 Data Analysis

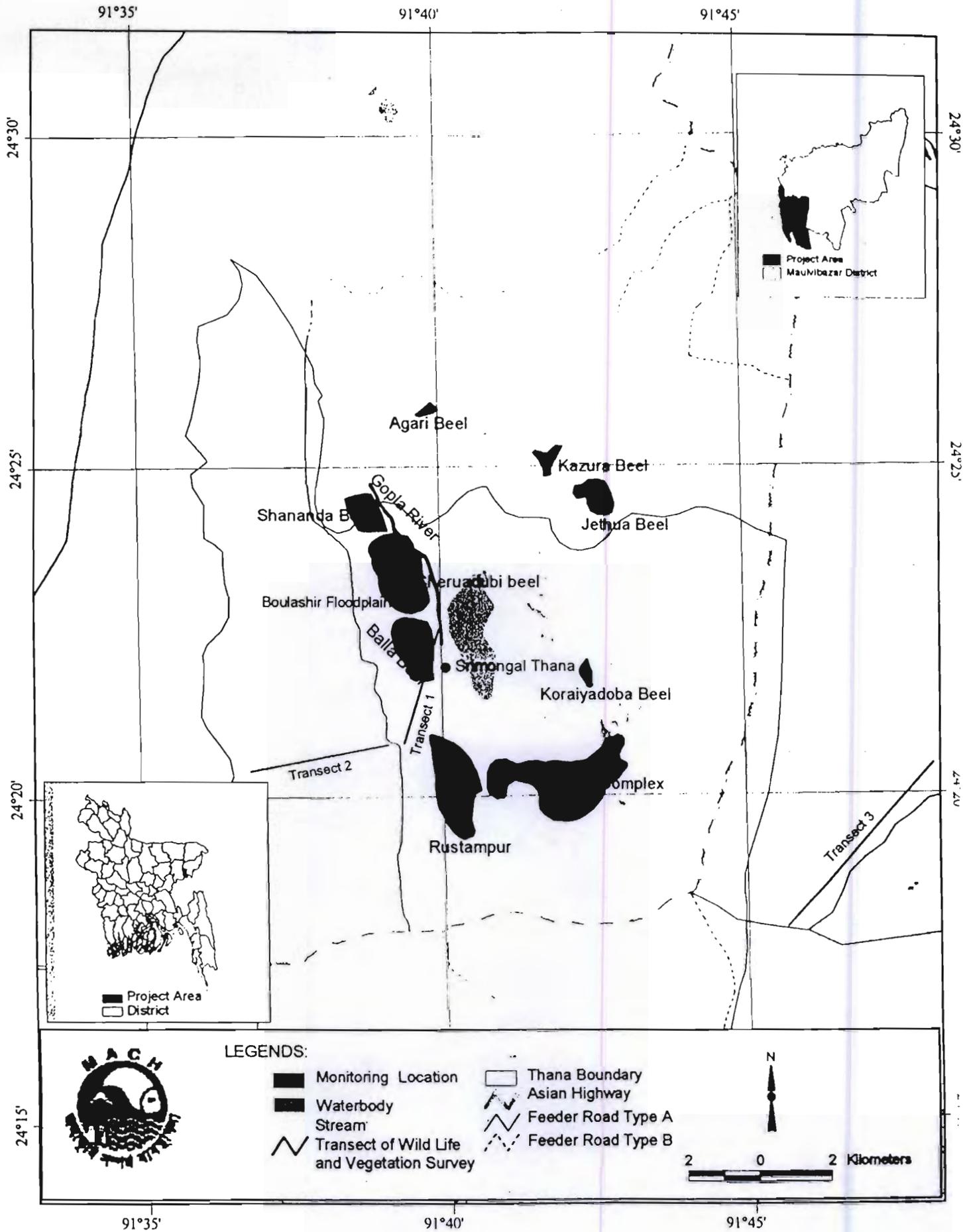
The fish catch can vary spatially, temporally, and on the basis of the ecological condition of the habitat. In order to incorporate these variations and to monitor parameters the collected data has been analyzed on the basis of the monitoring locations, monitoring habitats, types of gear, types of fishers and seasonal variation. As stated above, fishing intensity, duration of fishing, total catch, catch by species, and the number of species with their abundance have been analyzed. In addition, the Catch per Unit of Effort (CPUE) and the Catch per Unit Area (CPUA) have been determined. Formulas and definitions are provided below.

**Seasonal variation:** For the study the year was divided into four seasons. These are Pre-Monsoon (April-June), Monsoon (July-Sept.), Post-Monsoon (Oct.-Dec.) and Dry (Jan.-March).

**Fishing gear:** The types of fishing gear found in operation during the monitoring year were recorded with their dimensions. Current *jal* and *Ber jal* Gear of the same type with differing dimensions were

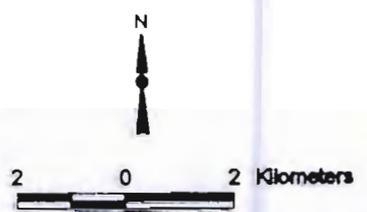
Map - 1

Fish Catch Monitoring Locations in Hail Haor Site

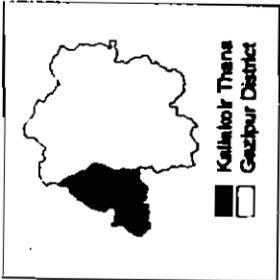
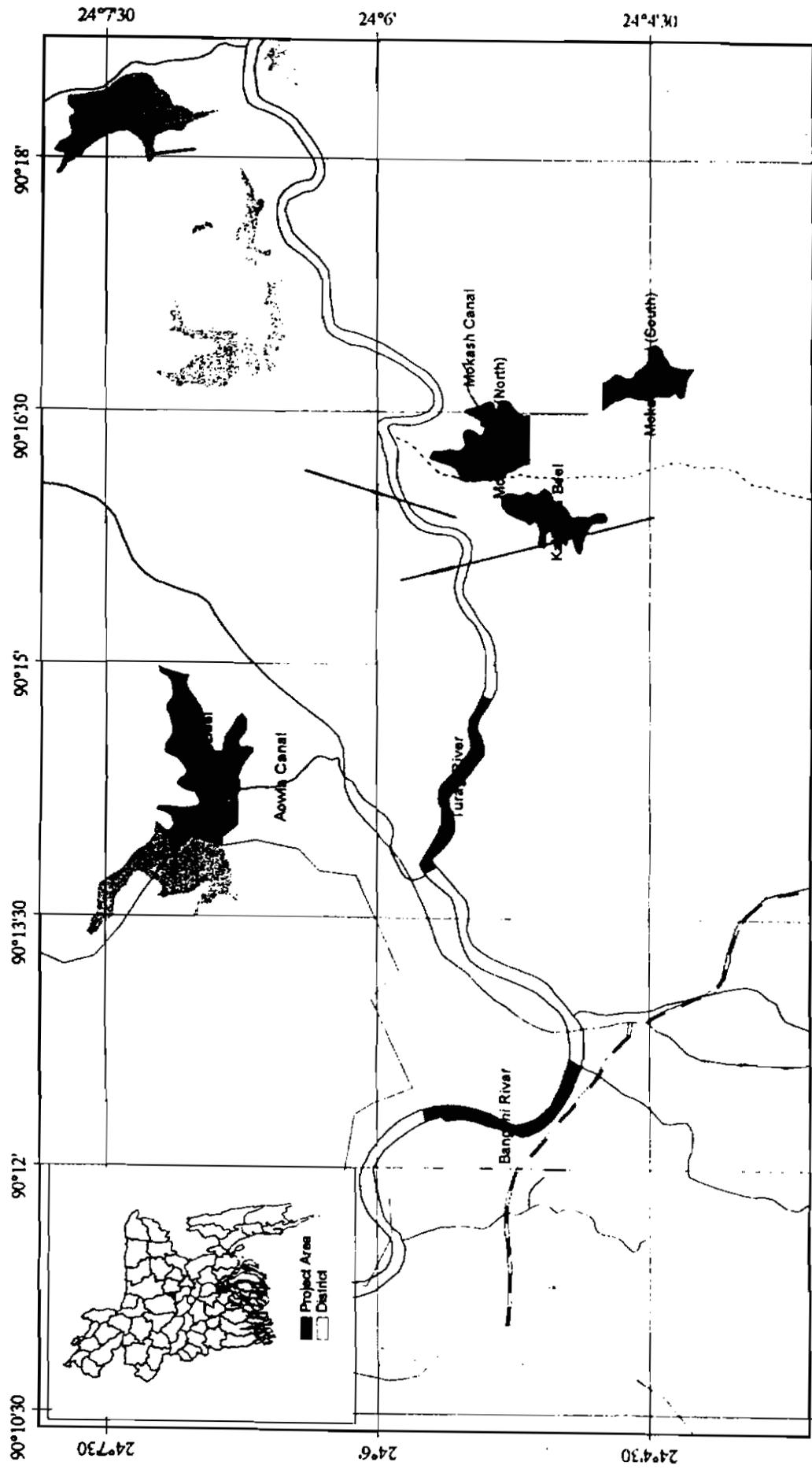


LEGENDS:

- Monitoring Location
- Waterbody
- Stream
- Transect of Wild Life and Vegetation Survey
- Thana Boundary
- Asian Highway
- Feeder Road Type A
- Feeder Road Type B

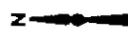


Map - 2  
Fish Catch Monitoring Locations in Turag-Bangshi Site



**LEGEND:**

- Monitoring Location
- Thana Boundary
- Waterbody
- Transect of Wildlife and Vegetation Survey
- Canal
- Asian Highway
- National/Regional Highway
- Feeder Road Type A
- Feeder Road Type B



standardized to 100 feet to include in the analysis for Catch per Unit of Effort (CPUE).

**Fishing intensity and duration of fishing:** Fishing intensity describes the amount of gear used relative to the amount of gear available during the monitored day. This has been calculated from an average of three sampling days. Gear numbers of all types are counted and then extrapolated for that month. Fishing duration was recorded for all the operated gear and the average duration of fishing was calculated for each specific gear type.

**Catch per Unit of Effort (CPUE):** The average catch in kilograms per gear per hour of operation. A number was recorded for each gear type and location. One hour is the standard unit of time used.

**Catch per Unit of Area (CPUA):** The total catch of all gear per unit area over a year extrapolated from sample data.

**Catch composition:** The catch composition was analyzed in percentage for the obtained species and the total catch of a specific habitat.

**Species diversity:** The observed species diversity for each monitoring location and their habitats is considered as the  $\alpha$  diversity. The zonal species diversity is considered as the  $\beta$  diversity (e.g. either Hail Haor or Turag-Bangshi). Different biodiversity indices have been calculated using species frequency and an appropriate formula.  $\gamma$  diversity represents species diversity within a region; e.g. the Northeast region of Bangladesh.

**Biodiversity Indices:** Biodiversity indices measure the abundance of species and their individuals and their contribution to a biological community. They also express the number of species and individuals present in terms of probability.

### 3. Hail Haor Fisheries

#### 3.1 Fishing

##### 3.1.1 Fishers

**Table 3: Distribution of Fisher by Type and Season at Hail Haor Site**

Season	Professional		Seasonal Professional		Subsistence	
	No.	%	No.	%	No.	%
Pre-monsoon	284	94.98	-	-	15	5.02
Monsoon	620	99.20	-	-	5	0.80
Post-monsoon	717	85.66	83	9.92	37	4.42
Dry	313	77.67	17	4.22	73	18.11
<b>All Season</b>	<b>1,934</b>	<b>89.37</b>	<b>100</b>	<b>4.62</b>	<b>130</b>	<b>6.01</b>

The fish catch data under analysis are mainly from the locations where physical and management interventions have been under taken and or plane to Physical interventions include re-excavation of beels, establishment of sanctuaries and reintroduction of locally threatened fish species. The management interventions

include restriction on harmful gears, fishing regulations and time closure implemented by the Resource Management Organizations (RMOs). Over all fishing pressure has been reduced from 2,158 fishing days during the baseline year (1999-00) to 1,934 fishing days (observed) during the 1<sup>st</sup> year period of impact

(Table-3). Percentage of professional fisher were decreased from 95.57% to 89.37% which might be due to shifting of professional to seasonal professional and subsistence fishers. Data shows that seasonal professional and subsistence fishers were increased from baseline situation of 0.18 % and 4.5 % to 4.62 % and 6.01 % respectively during 1<sup>st</sup> year situation of impact period. The changes could be due to the restriction on fishing by the BRMOs for professional fishers during a part of the year whereas the subsistence and seasonal professional fishers were allowed fishing in the intervened *beels*. Accordingly, the distribution of the fishers type over the season changes keeping the similar trend over the seasons for specific fisher type as in case of baseline situation.

### 3.1.2 Fishing Rights

In the past, access to fishers in *beels* and *haor* were open or flexible by the nearby community. However, in course of time access became limited for different reasons. Leasing out of *Jolmohhals* to highest bidders is one of the major reasons for limiting the access. Among the waterbodies in the Hail Haor several *beels* are leased out and a sort of fishing restriction was there since then. Officially in a leased *beel* the access is only limited to the lessee and their designated persons or the parties take sub-lease (unofficial) under different arrangements and conditions. At the same time traditional access of the subsistence fishers at least during a part of the year was maintained for long. Open access in the locations under monitoring in the 1<sup>st</sup> impact year was found decreased to 36.03 % which was 58.3 % in the baseline

**Table 4: Percentage Distribution of Fishing Rights at the Hail Haor Site**

	Professional		Seasonal Professional		Subsistence		All Fishers	
	Baseline	Impact	Baseline	Impact	Baseline	Impact	Baseline	Impact
Leased	2	3	0	2	1	2	2	3
Sub-leased	40	66	33	54	9	2	39	59
Open access	57	29	67	40	89	95	58	36
Other	1	2	0	4	0	1	1	2
Total	100	100	100	100	100	100	100	100

year. Subsequently subleased fishing rights during the impact year were found increased from 38.67 % at the baseline to 59.24 % irrespective of fishers type. The open access of the subsistence fisher has been increased while the open access of the professional fisher has been decreased substantially from 57 % during baseline to 29 % during the 1<sup>st</sup> impact year. Open access for seasonal professional fisher has also been reduced (Table-4). Fishing access by gear and season shown in Appendix 17.

A shift in the fisher type from professional to seasonal professional has also been noticed (previous section). There are complaints received regarding the accessibility of the fisher in the 62-beel area, which is controlled by a strong lessee. BRMO also controlled fishing access for the professional fisher in Sannada and Jethua beel. It is mentioned that the reduction in the fishing pressure and divert the fishers in alternative occupations through AIG support is one of the objectives of the project.

### 3.1.3 Fishing Gear and intensities

The fishing gears in the Hail Haor during the 1<sup>st</sup> impact year is almost similar compared to that of Baseline year. Only difference is recording of

**Table 5: Fishing Efforts**

Gear	Recorded #
Veshal jal	172
Ber jal	132
Current jal	9,032
Thela jal	209
Traps	14,427
Hooks	748
Others	307
Total	25,027

harpoon during the 1<sup>st</sup> impact year. A total of 17 types of gears has been recorded in the monitoring location (Appendix 2). Number of hooks in long lines remains more or less same as found in the baseline year. Out of 17 gears, only few are commonly used. According to the mode of operation, dimension and structure of the gear, they are categorized as seine nets, gill nets, push nets, cast nets, lift nets, traps, hooks, spears and others. In the Hail Haor use of cast nets, lift nets and spears are insignificant.

The percentage distribution of the commonly used gears show shifting gear use and abundance than of baseline in the monitoring locations or in project intervened waterbodies. The remarkable shift is from the Current *jal* to the traps. The number of gears operated on the observed days has been reduced substantially from 47,019 during baseline year to 25,027 during 1<sup>st</sup> impact year. The reduction is mainly in current *jal* (almost one-third). Logically percentage wise distribution has also been changed significantly. Use of *Vashal jal* (Fixed lift net) were found increased from 0.44 % to 0.77 %, *Ber jal* (seine) 0.32 % to 0.53 % and trap 36.15 % to 57.59 %. Use was decreased current *jal* (Gill net, mono-filament nylon) from 44 % to 34.09 % and *thela jal* from 1.65 % to 0.83 % (Figure 1).

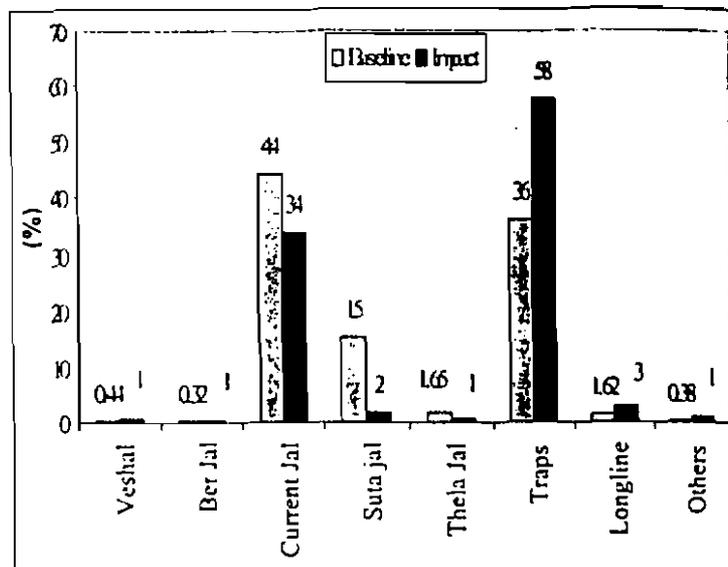


Figure 1: Percentage distribution of observed gears in HH site

Distribution of *thela jal* among different types of fisher has been analyzed. During the baseline year, professional fishers used almost 80% of *thelafafa jal*. On the other hand it was only 50% during the 1<sup>st</sup> impact year as many professional fisher gave up using *thela jal* following the reduced access in different *beels*. Fishing efforts of different gears over the months shows seasonal variation as usual due to operability and fish catchability at different hydrological regimes (Figure 2). Gears and month wise fishing effort and fishing hours shown in Appendices 3 and 4 respectively.

### 3.2. Fish Catch

Fish catch data has been presented in different forms like catch by different gears (Figure 3), seasonal catch variation (Table 4) and CUPA (Table 6). Furthermore, the catch composition has been presented in Figure 4 and CPUE (Catch per unit of effort) has also been presented in Figure 5. Details catch data is presented in the tabular form in Appendix 5.

3.2.1 Gear Wise Catch

Distribution of fish catch over the commonly used gears during the 1<sup>st</sup> impact year corresponds the percentage distribution of gears used. Percentage distribution of the caught fish shows shift from the baseline situation. Contribution of *Veshal jal* in over all catch has been increased to 7.85 % during the 1<sup>st</sup> impact year compared to baseline year (5.15%), for *ber jal* to 22.76 % from 14.73 % and 3.76 % to 10.63 % for traps (Figure 3). Catch contribution of traps was found increased following the increased use of traps instead of current *jal*. Use of current *jal* has been reduced substantially to one third compared to the baseline situation.

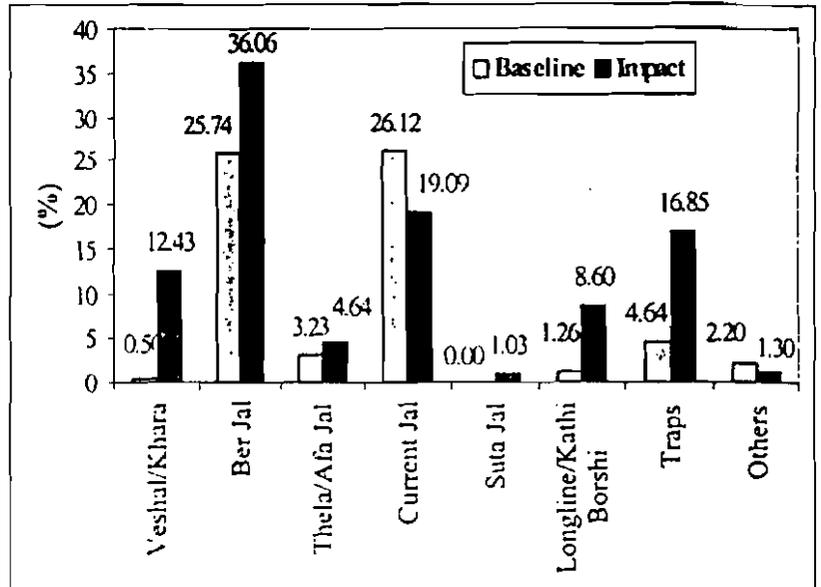


Figure 3: Contribution of Catch by Different Gears

Accordingly, fish catch by current *jal* also reduced to almost one third to 12.70 % during the 1<sup>st</sup> impact year from 37% during the baseline year. It could be assumed that the reduction of the use of current *jal* perhaps enhanced the trap use as both are passive gears and is reflected in the gear use distribution.

3.2.2 Seasonal catch by habitats: Habitat wise fish catch follows the similar trend for the beel and flooded lands as observed in the baseline year. Contribution of the floodplain catch during the 1<sup>st</sup> impact year increased to 41.40 % (baseline 39.75 %) and river catch to 10.23 % (baseline 7.54 %). Slight

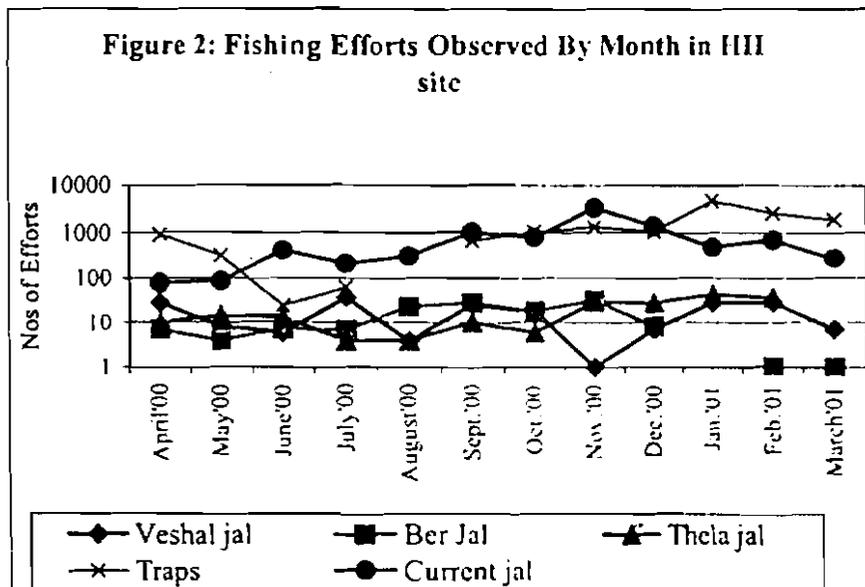


Figure 2: Fishing Efforts Observed By Month in HII site

decreased in the contribution of *beel* and canal catch was observed in 1<sup>st</sup> impact year then that of baseline situation. 49.08 % in the baseline year to 48.90 % in 1<sup>st</sup> impact year and 3.63% to 0.46 % respectively. The catch in the river increased possibly due to restriction on fishing in many *beels* and in order to maintain the fishing, fishers fished more on to the river for fishing. As the river catch increased and the floodplain and *beel* catch

is almost same the reduction in contribution is visible in case of canals.

Table 6: Seasonal Fish Catch by Habitat at the Hail Haor Site (%)

Season	Month	Beel	Floodplain	River	Canal	All Habitats
	April '00	0.79	0.26	1.09	0.04	2.18
	May'00	0.13	0.53	0.08	0.00	0.74
	June'00	1.30	1.87	0.00	0.00	3.16
<b>Pre-monsoon</b>		<b>2.21</b>	<b>2.65</b>	<b>1.17</b>	<b>0.04</b>	<b>6.08</b>
	July'00	0.55	4.74	0.00	0.00	5.30
	August'00	1.31	9.26	0.00	0.00	10.57
	September'00	0.52	6.04	0.00	0.00	6.56
<b>Monsoon</b>		<b>2.39</b>	<b>20.04</b>	<b>0.00</b>	<b>0.00</b>	<b>22.43</b>
	October'00	2.03	2.62	1.11	0.00	5.75
	November'00	1.94	5.44	0.03	0.00	7.41
	December'00	3.02	3.43	0.46	0.21	7.12
<b>Post-monsoon</b>		<b>6.99</b>	<b>11.49</b>	<b>1.60</b>	<b>0.21</b>	<b>20.29</b>
	January '01	18.17	3.63	2.87	0.00	24.67
	February'01	15.34	1.61	3.76	0.21	20.92
	March'01	3.81	0.98	0.82	0.00	5.61
<b>Dry Season</b>		<b>37.32</b>	<b>6.22</b>	<b>7.45</b>	<b>0.21</b>	<b>51.20</b>
<b>All Seasons</b>	<b>All Months</b>	<b>48.90</b>	<b>40.41</b>	<b>10.23</b>	<b>0.46</b>	<b>100.00</b>

**3.2.3 Khata Fisheries and Pagar Catch:** During the 1<sup>st</sup> year of impact the Jethua beel, Gopla River, Boulashir Floodplain and Cheruadubi beel a total of 65 *Khata*s were found of while fishing were recorded for 19 *kathas* during the catch assessment. A total of 6,849 kg. of fish were recorded for 19 *kathas*. There are 88 *pagars* in the Jethua, Sananda and Kajura Beels and catches of 17 sample *pagars* were recorded at 8,775 kg.

**3.2.4 Hydrology:** The fisheries yield depends on a number of factors including the inundation extent, inundation depth, timing of first flooding (relates directly to the recruitment and subsequently grazing duration), duration of flooding extent. These factors ultimately impact the productivity and the catch ability of various gears. The seasonality thus may shift. The baseline year begins with pre-monsoon i.e. April, May and June of 1999 and carried the hydrological legacy of Jan, Feb & Mar of 1999 which was absolutely dry. Which might have impacted the fisheries regime of the Hail Haor in many ways. Due to less water dry season refuge was less and catches ability increased tremendously. On the other hand due to less water regime weed boom was there. Following the harsh dry season there was a sharp rise of water level during pre-monsoon (April, May & June) i.e. beginning of baseline year allowed the survivors to spawn. During the pre-monsoon due to recent past dryness there was a weed boom in the Haor that provided habitat and shelter for new born. It is reflected in the catch of pre-monsoon which was less. During the baseline monsoon there was another sharp rise in the water level following a deep during June and the higher water level was maintained through October. Consequently maximum catch (% over the year) concentrated during monsoon and post monsoon during the baseline year. Then as usual fall during the dry season of 2000, which is the baseline dry season but maintained almost 2 meters higher than the dry season of 1999. The dry season of 2000 yielded less % of catch over the baseline year. The impact year begins from the April 2000 and takes a sharp rise and reached peak and maintained for longer period than baseline year. The peak was less in the impact year, but duration was almost double resulted perhaps higher production but the catch shifted to the dry season in terms of percentage over the impact year. The dry season of the Impact year was during January, February & March 2001 and the water level was lower than the baseline year and catch ability increased. Sharp rise in water table followed by longer duration possibly mean spawning in time and then longer grazing period during the impact year could have added in to the higher production among other factors.

### 3.3 CPUA

Fish catch per unit of area (CPUA) by monitoring location incorporating different habitats increased at all locations during 1<sup>st</sup> impact year (Table-7). The increase is possibly due to a combination of factors, which are as under:

- Natural annual variation in the fisheries production
- Hydrological changes between the years
- Project management and physical interventions

Catch per Unit of Area (CPUA) in this instance has been

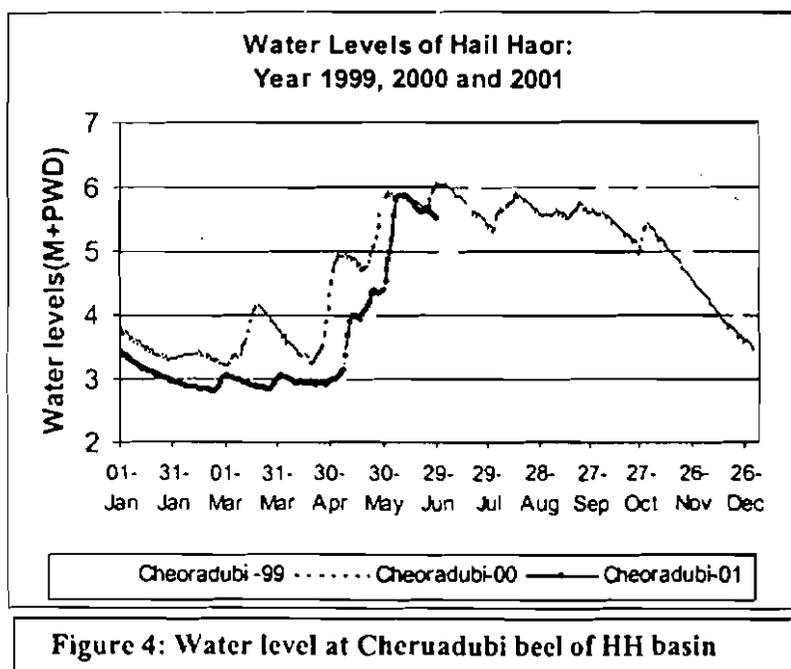
estimated as kg of fish caught from one hectare of wetlands over the year. The seasonal variation and the variation among different monitoring locations have also been analyzed. CPUA of Hail Haor has been estimated through weighted average per hectare of wetlands from the catch recorded from all the monitoring locations. The CPUA of 62-beel complex has been increased by almost two folds compared to baseline situation. The increase could be due to heavy fishing by the lessee. Weighted average of fish catch per unit area (CPUA) of the Hail Haor during the 1<sup>st</sup> impact year has been increased to 191.60 kg/ha compared to 163.95 kg/ha during baseline year (Table 7).

**Table 7: Catch Per Unit of Area (kg/ha) by Location in Hail Haor**

Location	Season				Yearly
	Pre-Monsoon (Apr-Jun'00)	Monsoon (Jul-Sep'00)	Post-Monsoon (Oct-Dec'00)	Dry (Jan-Mar'01)	
Jethua Beel	16.45	31.64	12.15	130.31	190.55
Gopla River (Beel)	53.47	35.14	37.61	339.51	465.73
Boulashir Floodplain	12.27	25.11	19.57	21.06	78.01
Cheruadubi Beel	54.93	18.02	87.64	162.37	322.97
62-Beel Complex	12.19	136.05	71.25	223.09	442.58
Rustampur Beel Complex	7.53	51.77	68.89	47.86	176.04
Shananda Beel	-	42.85	16.06	89.49	148.40
Kazura Beel	-	22.44	32.71	42.70	97.85
Koraiya Doba	-	-	-	18.03	18.03
Balla Beel	3.86	-	20.89	62.40	87.15
Agari Beel	-	-	66.23	55.24	121.47
<b>Weighted Average</b>					<b>191.60</b>

### 3.4 CPUE

Catch per unit of effort (CPUE) has been estimated for commonly used gears over the seasons for all monitoring locations (Figure 5). The CPUE has also been estimated monthly and over the seasons by



**Figure 4: Water level at Cheruadubi beel of HH basin**

habitats (Appendix 5). However CPUE of most common gears over the monitoring sites and estimated for whole year shows increase compared to that in the baseline year. CPUE of seine net increased to 11.68 kg from 6.9 kg/day, for 7.39 kg from 5.34 kg for *vashal jal*, 1.96 kg from 1.51 kg for *thela jal*, 0.12 from 0.06 for traps and for *suta jal* 0.19 kg from 0.16 kg. The increase is however, expected as the number of efforts reduced substantially yet CPUE increased.

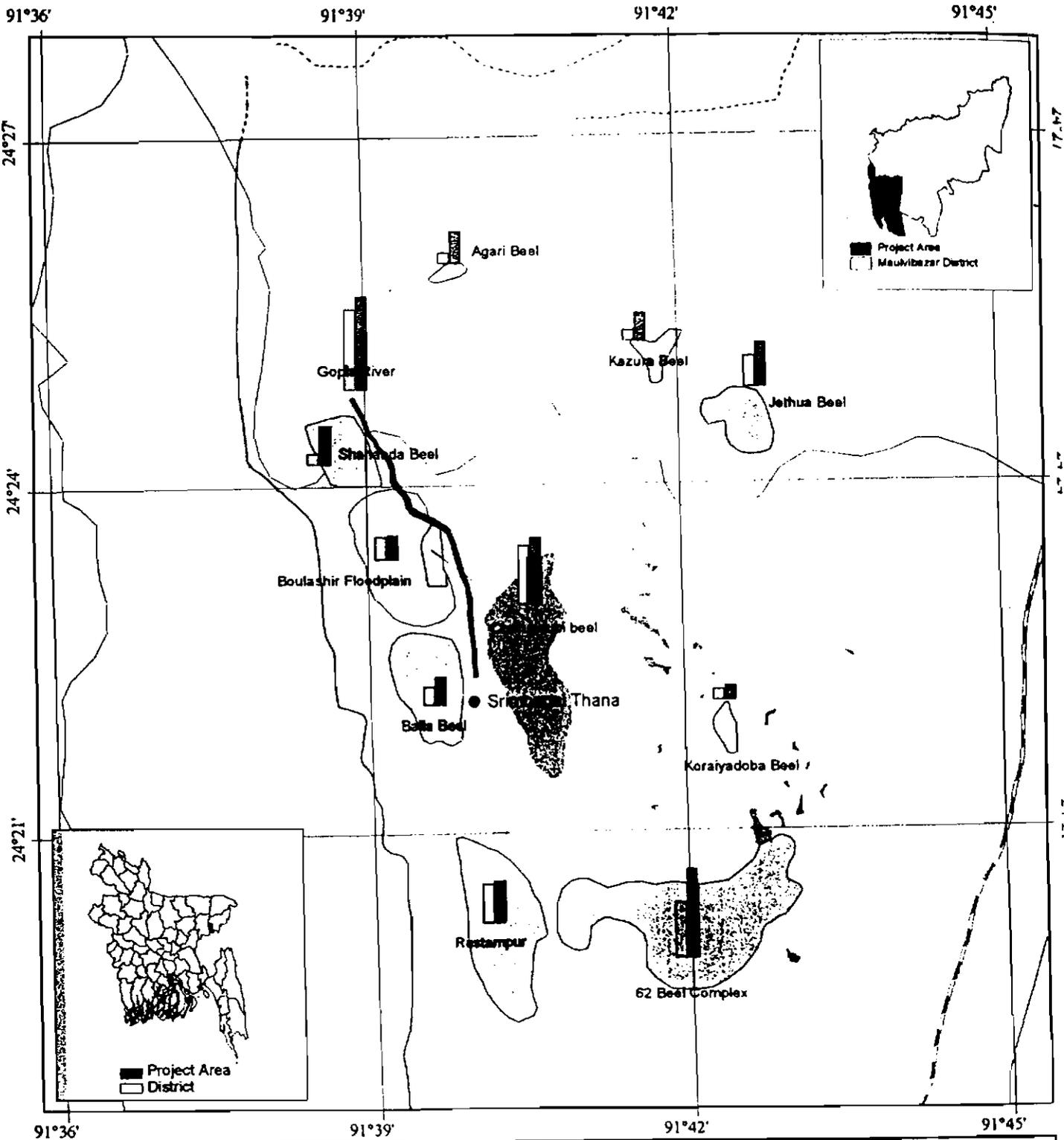
During the impact monitoring, information has been collected on the numbers of current *jals* and traps used by one person. The CPUE has been estimated for one trap and one current *jal* and shown in the tables and figures. But one should take into consideration that one *Ber jal* is being operated by more than one fishers on the other hand one fisher operates more than one gears in case of traps and current *jals*. On an average it was observed that one fisher used 24 current *jals* and 43 traps (Data collected from October'00 to March' 01).

### 3.5 Catch Composition

Contribution of small fish species found the bulk of the catch in all types of habitats. Small fish species was observed contributed 55.85 % in *beel* and 59.72 % in river during 1<sup>st</sup> year monitoring (Figure-6). It was 64.71 % in *beel* habitat and 70.28 % in river in the baseline situation. Seasonal variation was also found in both *beels* and rivers. Monsoon and post monsoon small fish catch was observed 79.16 % and 71.03 % in *beel* habitat. This composition was 46.54 % during pre monsoon and 52.08 % in dry season during the baseline. This trend was also found in river but small fish more than that of *beel* habitat. Contribution on major carps in the over all catch has been increased from the baseline situation. During baseline, contribution of the major carp was insignificant (less than 1 %) in all habitats while at the 1<sup>st</sup> impact year it is 2.35% in *beel*, 6.76 % in River, 2.75% in canal and in floodplain less than 1%. The increase could be for a number of reasons. There might have been more hatchlings in the source river Kushiara and could have managed immigration through the ill channels and or through Kamarkhali (Possibly open during the recruitment period). Another reasons could be the inundation of the aquaculture pond in the Hail Haor area. Fishing people in the haor confirmed the fact of inundation of aquaculture ponds and escape of stocked carps to the haor. Detail catch composition by guild and by species has been presented in Appendix 6 and Appendix 7 respectively.

It is not realistic to draw any conclusion from the data analyzed regarding the catch composition changes between the baseline and 1<sup>st</sup> impact year. It indicates that the contribution of small fish is less over the impact year in *beel* habitat compared to baseline year, which could be good indication in terms of the stock. Keen observation and trend analysis would be done with time series in this regard.

Map - 3 Catch per Unit of Area (Kg/hectare) at Different Monitoring Locations in Hail Haor Site





**LEGENDS:**

<p>Fish Catch(Kg/Hec)</p> <ul style="list-style-type: none"> <li> Baseline Catch (2000-2001)</li> <li> Impact Catch (2000-2001)</li> <li> Monitoring Location</li> </ul>	<ul style="list-style-type: none"> <li> Waterbody</li> <li> Stream</li> <li> Thana Boundary</li> <li> Asian Highway</li> <li> Feeder Road Type A</li> <li> Feeder Road Type B</li> </ul>
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N



1 0 1 Kilometers

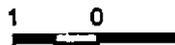
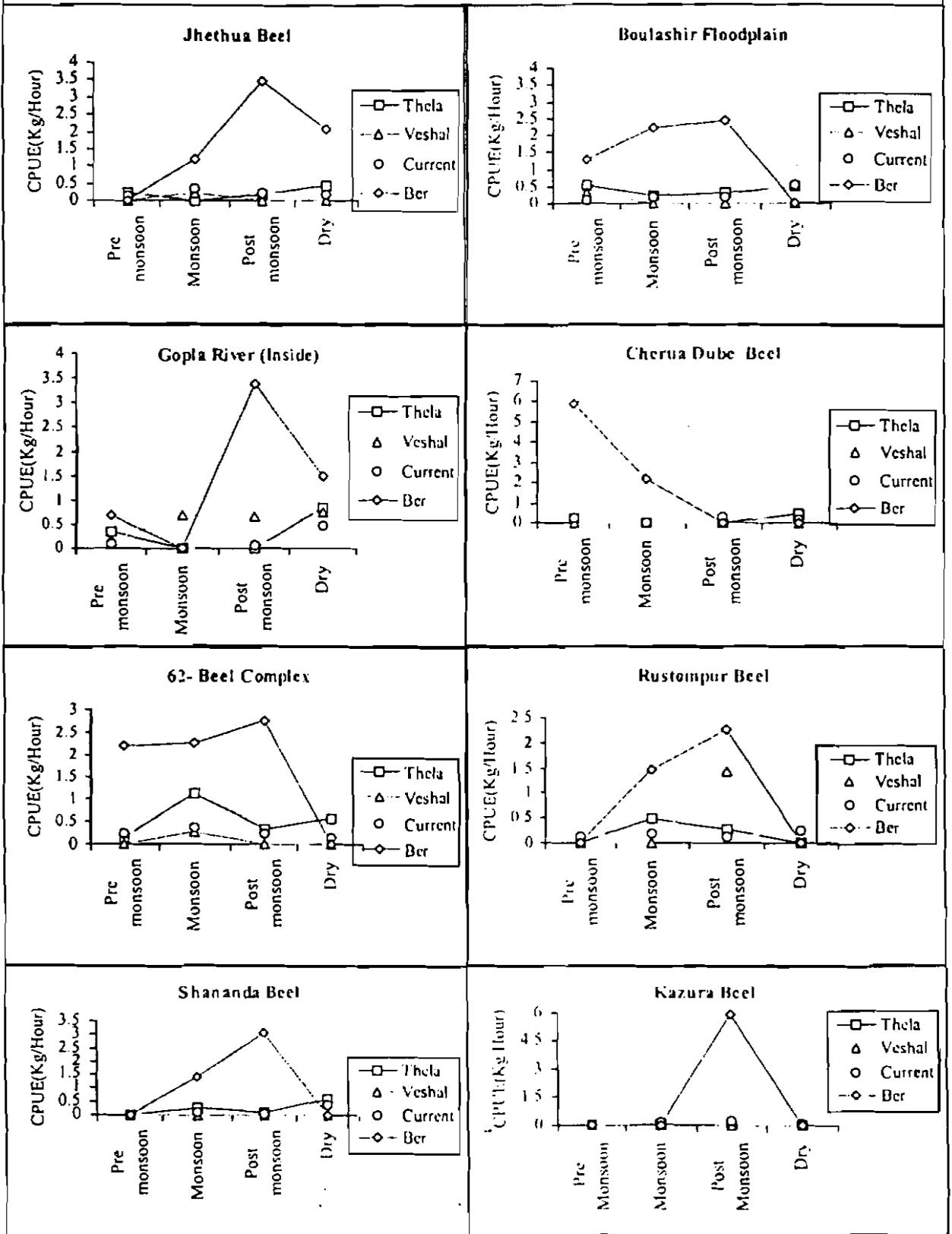
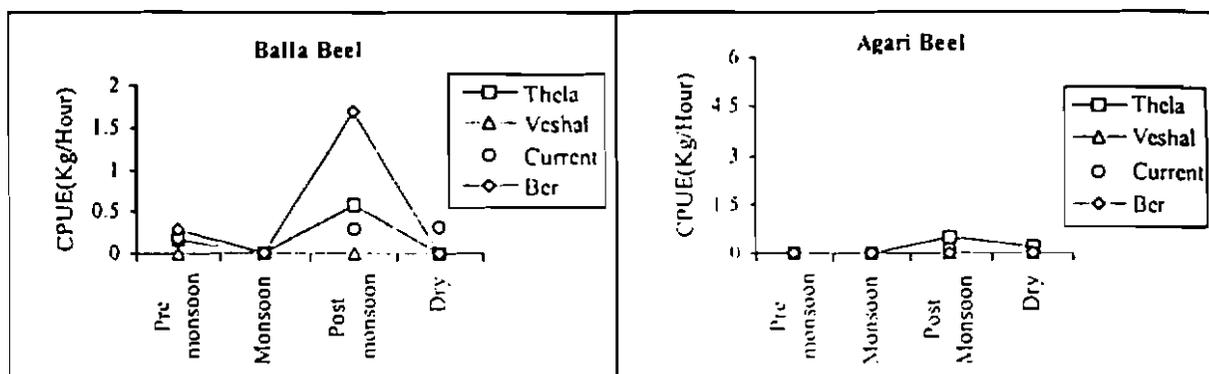


Figure 5: CPUE of Common Gears Used at Hail Haor April'00 - March'01





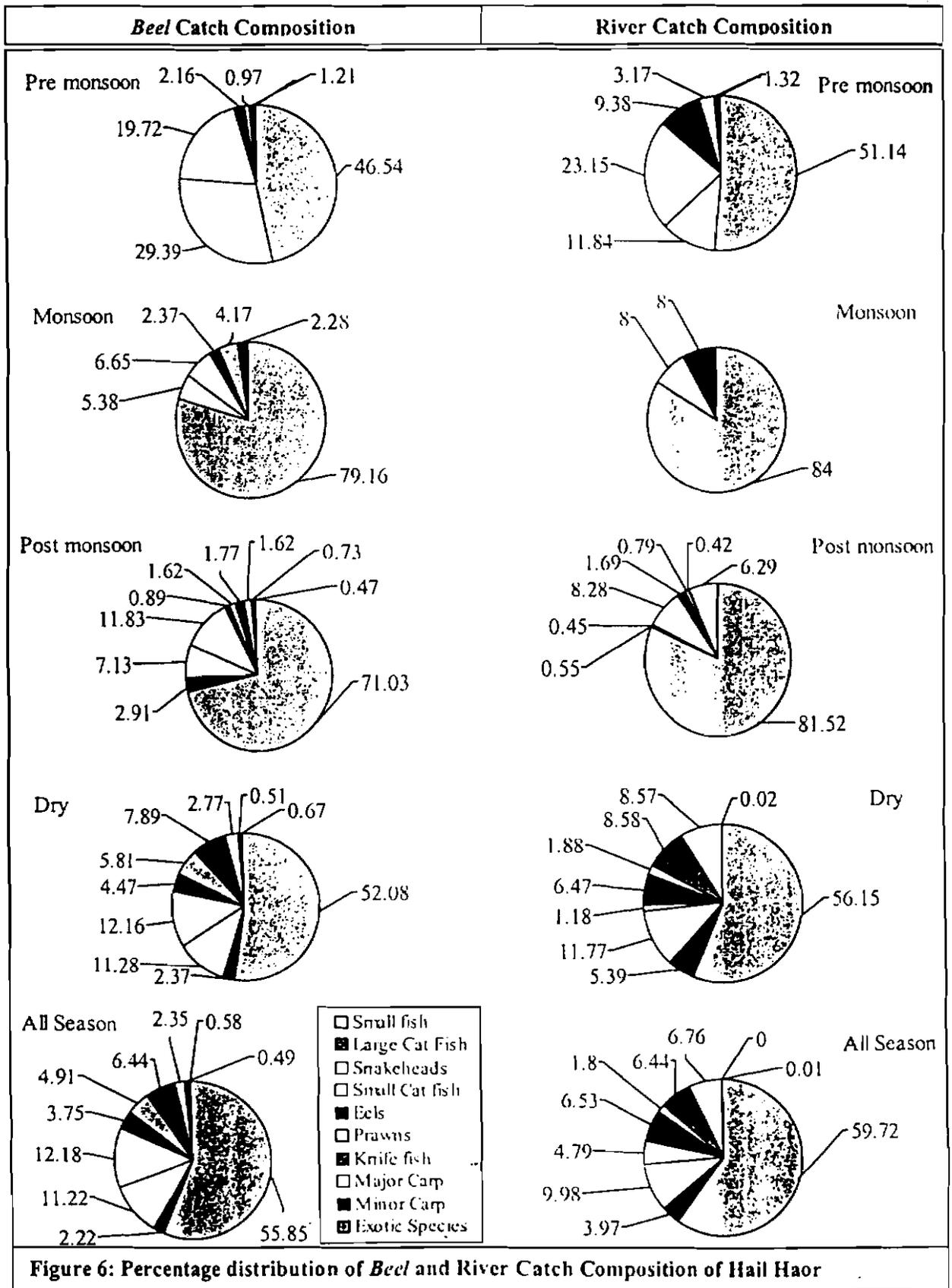


Figure 6: Percentage distribution of *Beel* and River Catch Composition of Hail Haor

### 3.6 Species diversity

The occurrence and abundance of fish species was recorded at each of the monitoring sites. The habitat preference of the species recorded and shown in Appendix 16. The species diversity in the Hail Haor during the 1<sup>st</sup> impact year increased to 72 compared to baseline year which was 68 (Appendix 8). The species diversity of the monitoring locations also increased. Species diversity (Richness) was increased by 11, 1, 5, 4, 2 and 6 numbers during the 1<sup>st</sup> impact year compared to baseline in Jethua beel, Boulashir floodplain, Cheruadubi beel, 62-Beel complex, Rustompur beel complex and Balla beel respectively (Table-8). However, species diversity in Gopla river found decreased compare to baseline period. On the other hand the species diversity by habitat shows increase in the beel and floodplain habitat and decrease in the river and canal. Seasonal variation in species occurrence prevails as usual (Table-9). Considering all habitat and monitoring

**Species recorded during 1<sup>st</sup> year impact but not during baseline**

- *Buth Koi*
- *Tatkini*
- *Poa*
- *Bata*
- *Senia (Ysufi)*
- *Moa*

locations, species diversity was increased from 68 to 72 as mentioned but it includes African Magur, Silver carp, Mirror Carp and Common Carp. These species are possibly the escapees from the aquaculture ponds and are kept aside while calculating the biodiversity indices and also for the Jaccard's similarity. Though the number of species become same if

the escapees are excluded again there are 6 new species recorded during the impact year which were not recorded during the baseline year. On the other hand there were 6 species recorded during the baseline are not recorded during the impact year. However, only few individuals of these species were recorded during the baseline year. It is therefore relevant to mention that the occurrence may vary year to year for various reasons and it is logical to analyze time series regarding the abundance and occurrence of species.

**Species recorded during baseline (no.) but not during 1<sup>st</sup> impact year**

- *Elong* (1)
- *Vangra* (1)
- *Kecho Baim* (2)
- *Kachki* (8)
- *Ghaura* (1)
- *Boiragi Icha* (3)

**Table 8:  $\alpha$  Diversity by Monitoring Location**

Location	Diversity
Hail Haor	(# of fish species)
Jethua Beel	48
Gopla River	44
Boulashir Floodplain	51
Cheruadubi Beel	44
Sananda Beel	46
62-Beel Complex	59
Rustompur Beel Complex	51
Kazura Beel	31
Koraiya Doba	25
Agari Beel	37
Balla Beel	55
All	72

**Table 9: Seasonal Variation in Species Diversity at the Hail Haor Site**

Seasons	Beel	Flood-plain	River	Canal	All
Pre-Monsoon	40	44	35	9	46
Monsoon	38	51	10	No catch	51
Post Monsoon	58	53	28	21	62
Dry Season	60	43	38	24	61
Year	70	58	44	28	72

### 3.7 Biodiversity indices

"In a natural harmonic situation and without human interference, diverse and complex ecosystems are likely to be more stable and able to recover from disruptions. A healthy, robust ecosystem is characterized by a large number of species, none of which are over-represented in terms of individuals. A number of indices are used to describe species diversity of a habitat. Species diversity indices usually employ measures of the number of species present and the number of individuals per species in relation to the community of the observed water bodies/habitats/locations. Since these measures also imply the probability of encountering an individual of a given species, they express the number of species present in terms of probability. In other words the index is a ratio of the contribution of a species to the community" (MACH baseline report on fisheries, vegetation, wildlife and household protein consumption).

The complexity is however beyond the statement. The contribution is estimated from the catch recorded. For example the biodiversity indices calculated during the baseline situation included individuals of species and community by specific water body irrespective of the fishing gear used or fishing practice. Due to change in the hydrological regime the fishing practice changes as also the fish population. On the other hand fishing practice is persuaded to bring positive changes regarding conservation as a prime project activity. Consequently the probability of being caught for an individual also changes. Individuals of species caught through prevailing unwise fishing practices do not ensure the representation of the populations and hence the indices calculated could not be considered as the reflection of the contribution of the population. In this regard self-conducted sampling would be acceptable to determine the healthiness of the water bodies in terms of the species occurrence and abundance and stability of the species. Commercial catches however would be fair enough and workable while a sustained fishing practice is established through persuasion and management. In a natural state where there are no interventions (Physical & management) could give us changes in the indices eliminating the biases in different years. In the MACH project sites however, a time series after a stable fishing practice is established would be of use in this regard. Table 10 shows the indices estimated from the fish catch recorded during the 1<sup>st</sup> impact year.

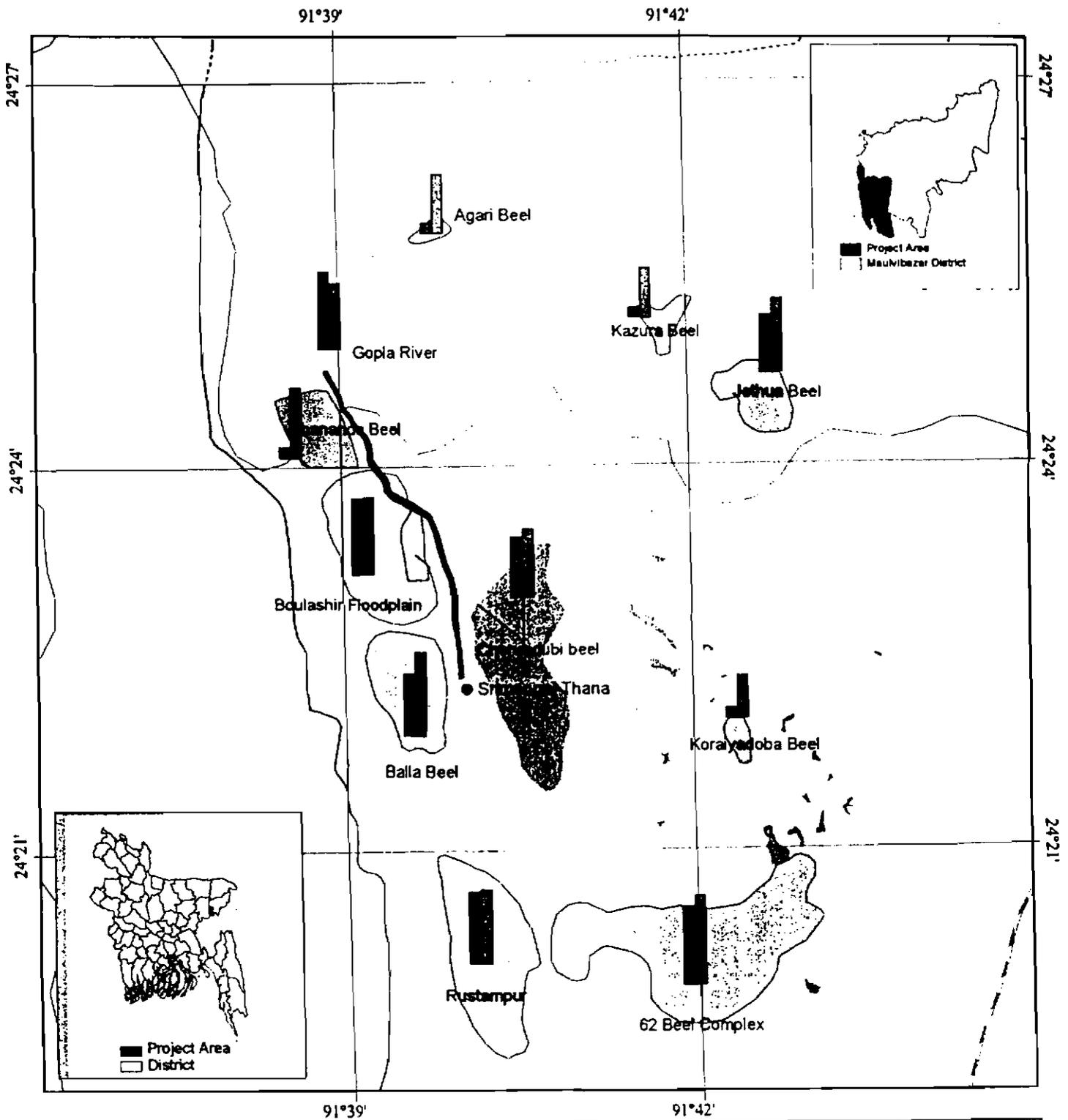
Table 10: Species Diversity Indices in Hail Haor Site

Index	Jethua Beel	Gopla River	Boulashir	Cheruadubi	62- Beel	Rustompur	Shananda	Kazura	Balla	Agari
Simpson's index	0.88	0.89	0.87	0.79	0.67	0.81	0.85	0.40	0.87	0.85
Shanon Equality	0.67	0.70	0.62	0.60	0.47	0.60	0.63	0.34	0.65	0.68

### 3.8 Habitat Similarity

Similarities between the habitats in terms of species occurrence and abundance are of importance in the management point of view. Geographically close, and or connected habitats might have similar species inhibition depending on the niche. Similarities could provide scope for enhancement of species occurrence through establishing connectivity and improving habitat quality. Jaccard's similarity is an index used in this regard, which could also be used for selection of habitats for long time monitoring.

Map - 4 Species Richness at Different Monitoring Locations in Hail Haor Site





**LEGENDS:**

Fish Species Diversity (No)

- Baseline Species (2000-2001)
- Impact Species (2000-2001)
- Monitoring Location

- Waterbody
- Stream
- Thana Boundary
- Asian Highway
- Feeder Road Type A
- Feeder Road Type B



N



1 0 1 Kilometers

The Jaccard's similarity is the reflection of the species diversity similarity between two habitats/locations. The increase in similarity would mean that either of the habitat increases or decreases and become closure to the species diversity of the compared one. The findings could have been used to increase the diversity of one location making a functional connectivity with the other. In this regard care should be taken while comparing regarding the geographical position of both the locations. If it is geographically close and practically possible to connect then the species occurs in one locations could be brought to the other and vice versa and in this way species richness of both the locations could be enhanced. Location specific comparison accommodating the geographical positions and the species similarity in occurrence (Not only numbers but also the specific species) should be taken in to consideration to formulate the interventions (Specifically connectivity and habitat creation). The baseline and the 1<sup>st</sup> year impact findings in this regard should be analyzed separately and critically to develop the plan in this regard.

It is seen comparing the similarity indices of the baseline year and 1<sup>st</sup> year for Jethua associated pair that the similarity index increases indicating more closeness in the species occurrence. It is logical as the Jethua beel has been intervened and possibly due to the BRMO catches (dry out catch) the species richness reflected as higher and thus it became closure to Gopla River. The habitat improved through re-excavation of the Jethua Khal that has connection to the Gopla River through Jainkha River might have added to the better situation. The bold figures that indicate better (Table 11) similarity compared to the base line situation. The similarity could have been achieved due to various reasons including the interventions and again time series data will be required along with qualitative information on the habitats to decide on the similarity factors and status.

**Table 11: Jaccard's Similarity Indices of Hail Haor**

	Jethua Beel	Gopla River	Boulashir Floodplain	Cheruadubi Beel	62- Beels	Rustompur	Shananda Beel	Kazura Beel	Balla Beel	Agari Beel
Jethua Beel		0.81	0.82	0.77	0.75	0.82	0.77	0.52	0.73	0.76
Gopla River	0.81		0.77	0.75	0.77	0.77	0.78	0.53	0.78	0.77
Boulashir F.plain	0.82	0.77		0.76	0.75	0.92	0.69	0.47	0.76	0.71
Cheruadubi Beel	0.77	0.75	0.76		0.67	0.80	0.70	0.56	0.78	0.81
62- Beels	0.75	0.77	0.75	0.67		0.78	0.64	0.41	0.73	0.63
Rustompur	0.82	0.77	0.92	0.80	0.78		0.73	0.47	0.79	0.71
Shananda Beel	0.77	0.78	0.69	0.70	0.64	0.73		0.55	0.67	0.76
Kazura Beel	0.52	0.53	0.47	0.56	0.41	0.47	0.55		0.50	0.66
Balla Beel	0.73	0.78	0.76	0.78	0.73	0.79	0.67	0.50		0.72
Agari Beel	0.76	0.77	0.71	0.81	0.63	0.71	0.76	0.66	0.72	

#### 4. Turag-Bangshi Fisheries

##### 4.1 Fishing

Fishing intensity has been increased compared to the baseline situation. The professional fishers fishing man-days were increased from 1,003 (baseline, 1999-2000) to 1,867 during 1<sup>st</sup> year (2000-2001) of impact period (Table-12). Seasonal professional and subsistence fishers fishing were also increased from 81 to 132 and 432 to 870 respectively. Subsistence fishing was almost double. The fisher intensity has been increased possibly due to increased fish availability in the area following the interventions of the MACH project (Sanctuaries, time closure during breeding season and management). The increase of fish availability has also been reflected in the fish yield. The message was spread over the area through the fisher that there is good fishing scope. The second point was that the people in the area have noticed a substantial increase in the *Chapila* fish abundance primarily due to external factor, which is also revealed in catch data.

Table 12: Percentage Distribution of Fisher Type at Turag-Bangshi Site by Season

Seasons	Professional		Seasonal Professional		Subsistence	
	No.	%	No.	%	No.	%
Pre-Monsoon	377	67.68	6	1.08	174	31.24
Monsoon	328	65.21	5	0.99	170	33.80
Post-Monsoon	777	62.11	97	7.75	377	30.14
Dry	385	69.00	24	4.30	149	26.70
<b>All Seasons</b>	<b>1,867</b>	<b>65.07</b>	<b>132</b>	<b>4.60</b>	<b>870</b>	<b>30.32</b>

Seasonal variation also found that fishing intensity was increased during pre monsoon, monsoon and post monsoon but decrease in dry season for professional fishers. Percentage of professional fisher persons were decreased from 66.16% to 65.07% which may shifted to subsistence fishing.

##### 4.2 Fishing Gears

Operational gears recorded during the 1<sup>st</sup> year (2000-2001) of impact period were increased to 10,435, which were 6,142 during the baseline (1999-2000) in the TB site. *Current jal* (Gill net) *thela jal* and *jhaki jal* use in the area increased significantly. The professional fisher uses *Ber jal* and a group of fisher is required to operate a *Ber jal*. In the Turag-Bangshi site the number of *Ber jal* increased through new groups. The reason was possibly increased fish availability in the area being noticed by the professional fishers. Increase in the *Current jal* use has a different story. Before MACH grounded in

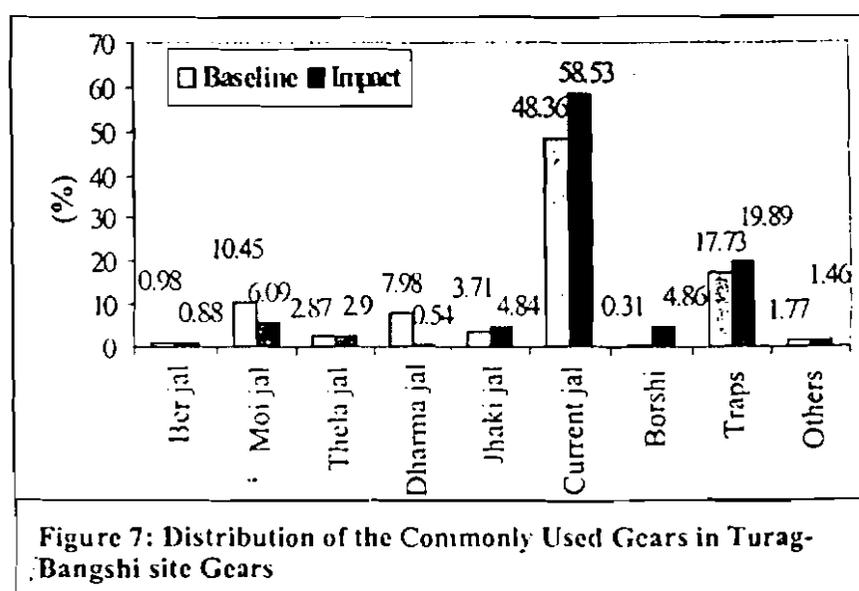


Figure 7: Distribution of the Commonly Used Gears in Turag-Bangshi site Gears

Turag-Bangshi site, the then TFO regularly visited the area and tried to stop fishing through current *jal* and imposed 45 mm mesh size bar. In the reality the fisher were afraid off because either they had to loose their gear or convince the TFO any way. Resulting in to less numbers of current *jal*. After MACH intervened in the area and previous TFO transferred, the vigilance was not there but people were still in worry and use of current *jal* were still limited. In the following year that is 1<sup>st</sup> year of impact the use of the current gears has increased subsequently. However, RMOs trying to reduce the number of current *jal* having small mesh size and almost limited the current *jal* below 25-mm.-mesh size. RMO targets to eliminate the current *jal* having mesh size below 45 as per GoB rule through motivation. *Dharma jal* was decreased significantly possibly due to frustration of the user during baseline that they could not harvest bigger size fish and gave up trying with *Dharma Jal*. There were 26 types of gear found in the baseline situation, which increased into 29 types (Appendix-9) in the monitoring locations of TB site. *Akra*, *Naar jal* and *Polo* were not found in the baseline situation but 1<sup>st</sup> year of impact period. The subsistence fishers mainly use these fishing traps.

#### 4.3 Fishing Effort/Intensity

Increased numbers of operational fishing gears was recorded during the 1<sup>st</sup> year of impact period. During the baseline year (1999-2000) a total of 6,142 was observed operational which has been found increased to 10,435 during the 1<sup>st</sup> year of impact period (Table 13). Commonly used gears were found increased but *Dharma jal* during the 1<sup>st</sup> impact year (2000-2001) compared to the baseline situation (1999-2000). *Current jal* were found increased in Mokesh beel (south), Kaliadaha, Alua beel and Bangshi river. On the other hand it was found decreased in Mokesh beel (north), Turag river and Alua khal (Appendix-10). Fishing duration of *thela jal* was decreased during pre-monsoon and monsoon but increased during post-monsoon and dry season in the *beel* habitat during the 1<sup>st</sup> impact year (Appendix-11) compared to the baseline year. *Current jal* and *jhaki jal* fishing duration was found decreased in the *beel* habitat. Fishing duration for *ber jal* was maintained almost same compared to the baseline year. Fishing duration also found decreased in river and canal. Fishing duration in the floodplain during the 1<sup>st</sup> impact year in the TB site maintained more or less same trend as in case of beels. Decreasing fishing duration for subsistence fishers indicate that fish availability enhanced so that the fisher could harvest desired amount in less time.

Table 13: Fishing Effort

Gears	Recorded #
<i>Veshal</i>	20
<i>Ber jal/Kathi jal</i>	92
<i>Moi/Dore/Masuri</i>	636
<i>Thela jal/Jali</i>	303
<i>Dharma jal</i>	56
<i>Jhaki jal</i>	505
<i>Current jal</i>	6,108
<i>Borshi/Gara borshi</i>	507
<i>Longline/Kathi (Unit)</i>	43
<i>Traps</i>	2,075
<i>Others</i>	90
<b>Total</b>	<b>10,435</b>

#### 4.4 Fish Catch

##### 4.4.1 Fish Catch by Gears

*Vashal jal*, *ber jal*, and *jhaki jal* catches were increased significantly. *Dharma jal* catches were decreased in accordance with the less intensity of the gear. Among observed catch 26.12 % was from *current jal* during baseline period

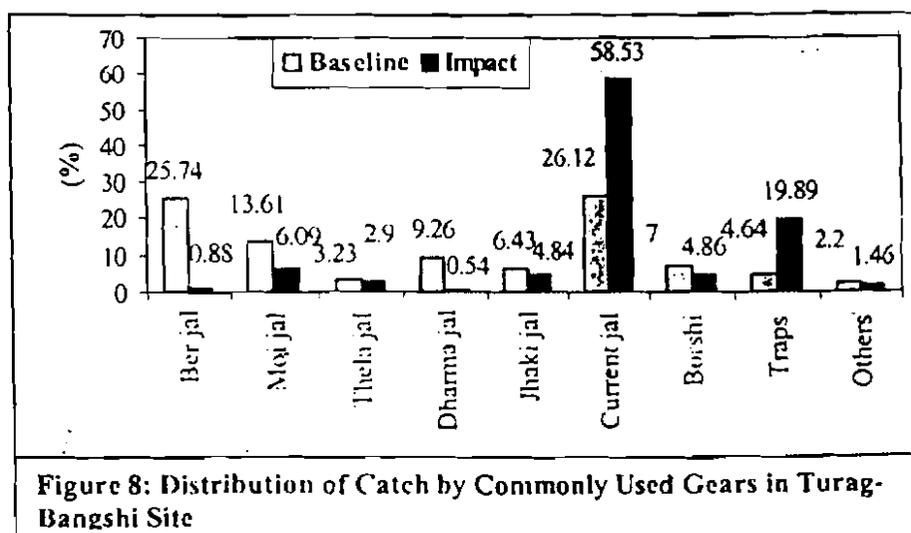


Figure 8: Distribution of Catch by Commonly Used Gears in Turag-Bangshi Site

which decreased to 12.73 % during 1<sup>st</sup> year of impact period (Figure 8). Number of operational current *jals* was increased but catch by current *jal* decreased meaning catch per unit of effort decreased. The reason could be the increased current *jal* operators are from subsistence fisher and bought current *jal* after a whim and following the information of increased fish availability. But the temperament of these fishers was less and they really operated far less time than the others. It is revealed from the duration analysis of the gears during baseline and impact years. Average duration for the current *jal* during the 1<sup>st</sup> impact year was 4.40 hours whereas during the baseline it was 5.66 hours.

Maximum fish catch of 42.12 % was observed during 1<sup>st</sup> impact year by *ber jal*, the drag net used by the professional fishers, which was 25.74 % during the baseline year. The increased percentage of fish catch by *ber jal* is possibly due to increased CPUE (1.92 to 3.88) and total number of observed gears increased from 60 during baseline to 92 during 1<sup>st</sup> impact year.

**4.4.2 Hydrology:** The baseline year water regimes seems to be a normal flooding year. It is to be noted that the dry year or wet year is considered following the dry season water regime. The baseline year begins in April 1999 and continues till March 2000. In this regard the baseline covers pre-monsoon, monsoon and post monsoon of 1999 and dry season of 2000. In this respect the baseline year seems to be a normal flooding year though the legacy of the driest dry season during the 1999 which is not included in the study period are however carried over to the study period. The dry season of 2000 which is included in the baseline year had considerable water depth and inundation, compared to the 1<sup>st</sup> impact year dry season (Dry season of 2001). Driest dry season would mean less and or delayed recruitment impacting the forth coming monsoon and following seasons productivity. Thus the driest dry season of 1999 have impacted the production and subsequent yield during the baseline year. On the other hand reasonable water depth and inundation during the dry season of 2000 would have impacted positively the productivity of the 1<sup>st</sup> impact year. However, the water regime is not the only factor. The brood stock could have survived the hash driest season getting refuge (sanctuaries, deep holes etc.) and catch ability could be limited for other reasons (For example, water hyacinth abundance, less fishing for skin irritation and others). There could be sharp and early rise in the water level during pre-monsoon (Spawning period for most of the *beel* resident fish species) then perhaps recruitment would not be hampered or delayed. The water accumulation could be different in different *beels* during the dry season, as the elevation is different. It is also true for getting the refuge, as there are different depth at the lowest pockets within the *beel* and among the *beels*. In accordance with the hydrology of the area, water discharge through the Source River and recruitment from the river and from the *beel* have significant impact on the catch/yield/production. Depending on the hydrological regime the characteristics of the season's shifts and subsequently the production/yield/catch ability varies.

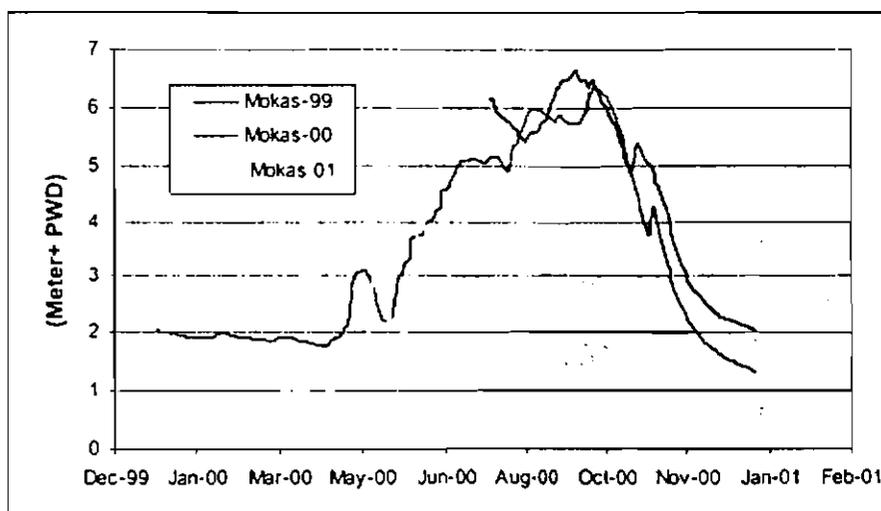


Figure 9: Water level at Mokesh beel

**4.4.3 Seasonal variation:** Catch has been found decreased substantially during the dry season in terms of percentage in case of 1<sup>st</sup> impact year (2000-2001) compared to baseline year. The reason possibly was water hyacinth abundance reducing the operability of the most of the gears. The water pollution during

the impact year dry season, resulting in to skin irritation of the fisher that reduced the fishing duration and numbers of gears resulting in to less catch. (Table 14).

**4.4.4 Catch variation by habitat:** The catch contribution in terms of percentage has been increased in the floodplain habitat substantially that has basically changed contribution of other habitats. The increase in the floodplain catch was possibly due to the enhanced water regime including duration and depth. These factors reduced the catch ability in the *beel* and increased catch ability in the floodplain. Which is logical as during the monsoon while there are huge water in the deeper pockets (*Beels*) the catch ability and accordingly the intensity also shifted to the less deeper floodplain areas.

**Table 14: Seasonal Fish Catch by Habitat at the Turag-Bangshi Site (%)**

Season	Months	Beel	Floodplain	River	Canal	All Habitats
	April '00	4.12	0.41	0.57	0.04	5.15
	May	3.32	0.54	0.44	0.20	4.50
	June	0.82	0.35	0.24	0.08	1.50
<b>Pre-monsoon</b>		<b>8.27</b>	<b>1.30</b>	<b>1.25</b>	<b>0.31</b>	<b>11.15</b>
	July	1.06	1.08	0.12	0.06	2.32
	August	1.87	1.35	0.44	0.13	3.79
	September	1.87	0.27	0.41	0.29	2.85
<b>Monsoon</b>		<b>4.81</b>	<b>2.69</b>	<b>0.96</b>	<b>0.48</b>	<b>8.96</b>
	October	10.88	1.03	2.94	2.48	17.37
	November	15.89	6.22	6.14	1.65	29.95
	December	4.29	7.42	5.09	1.53	18.36
<b>Post Monsoon</b>		<b>31.06</b>	<b>14.67</b>	<b>14.17</b>	<b>5.66</b>	<b>65.69</b>
	January '01	4.32	2.11	1.43	0.13	8.00
	February	2.22	0.29	0.85	0.04	3.41
	March	1.90	0.62	0.38	0.06	2.98
<b>Dry</b>		<b>8.44</b>	<b>3.03</b>	<b>2.66</b>	<b>0.23</b>	<b>14.39</b>
<b>All Months</b>		<b>52.58</b>	<b>21.69</b>	<b>19.05</b>	<b>6.69</b>	<b>100</b>

#### 4.5 CPUA

Catch per Unit of Area (CPUA) has been considered as the indicator for enhanced yield in the area that covers fish caught throughout the year per unit of area and expressed as kg of fish per hectare in this instance. *CPUA (kg/ha) has been increased substantially during the 1<sup>st</sup> year of impact period to 124.86 kg/ha compared to the baseline year which was 51.24 kg/ha in TB site.* CPUA has been increased in all monitoring locations (Table-15). Kaliadoha beel CPUA was found highest at 141.93 kg/ha among the *beel* habitats monitoring locations. CPUA of Kalidoha beel was 55.60 kg/ha during baseline year. CPUA of Alua khal and Mokesh khal increased by about 2 folds and 3 folds respectively during the 1<sup>st</sup> year of impact period compared to the baseline year. Bangshi river yielded tremendous increase from 90 kg/ha during baseline (1999-2000) to 354 kg/ha during 1<sup>st</sup> impact year (2000-2001). Turag river also yielded more than that of baseline year. There are also seasonal variations as usual in case of CPUA during the impact year and among the habitats and or locations (Table 15). In the pre-monsoon CPUA has been increased at all monitoring locations same as in case of post monsoon but Bangshi river. Comparison of the monsoon catch shows that the Mokesh area monitoring locations have yielded more catch compared to that of the baseline year but the Alua locations yielded less which is understandable as the total Alua area is comparatively lower elevation and accumulated more water limiting the catch ability. It is noted that canal's per unit area fish catch is high because canal is the passage of fish for migration from habitat to habitat. So, catch per unit area of the canal does not mean total productivity of canal.

The tremendous increase of fish yield in the area is possibly due to project interventions implemented in the area. The establishment of a total of 9 sanctuaries contributed in providing enhanced dry season refuge, protection for broods and higher recruitment which could be considered as the basis for higher production in the floodplain complexes. Time closure during the crucial period of the year was another major management intervention that helped survival of the broods and consequently added in to the overall yield through more recruitment of beel resident fish species. Establishment of connectivity between the Turag river and the Kalidaha beel could be considered as enhanced riverine hatchlings recruitment in to the floodplain complex that added to the better yield.

Comparatively higher water level during the dry season of 2000 helped survival of the parent stock, which aided in the yield of the 1<sup>st</sup> impact year. The rise of water in time during the pre-monsoon facilitated the spawning of the beel resident fish species. At the same time influx of riverine hatchlings could enter in to the complex in time. All these factor along with the care of the RMOs i.e. communities yielded higher fish catch in the area.

**Table 15: Catch Per Unit of Area (kg/ha) in Different Locations and Habitats at the Turag-Bangshi Site**

Monitoring locations	Pre-Monsoon (Apr-June)'00	Monsoon (Jul-Sep)'00	Post-Monsoon (Oct-Dec)'00	Dry season (Jan-Mar)'01	All Seasons
Mokash Beel (south)	7.40	8.39	66.18	15.25	97.23
Mokash Beel (north)	6.21	12.88	70.09	14.46	103.63
Kaliadaha Beel	20.09	12.38	80.29	29.16	141.93
Mokash Khal (canal)	151.84	212.30	1,878.87	156.58	2,399.58
Turag River	15.52	5.50	153.14	45.72	219.88
Alua Khal (canal)	42.55	79.46	1,363.29	-	1,485.30
Alua Beel	22.05	8.38	42.10	10.51	83.05
Bangshi River	22.47	22.58	272.21	37.18	354.43
<b>Weighted Average</b>					<b>124.86</b>

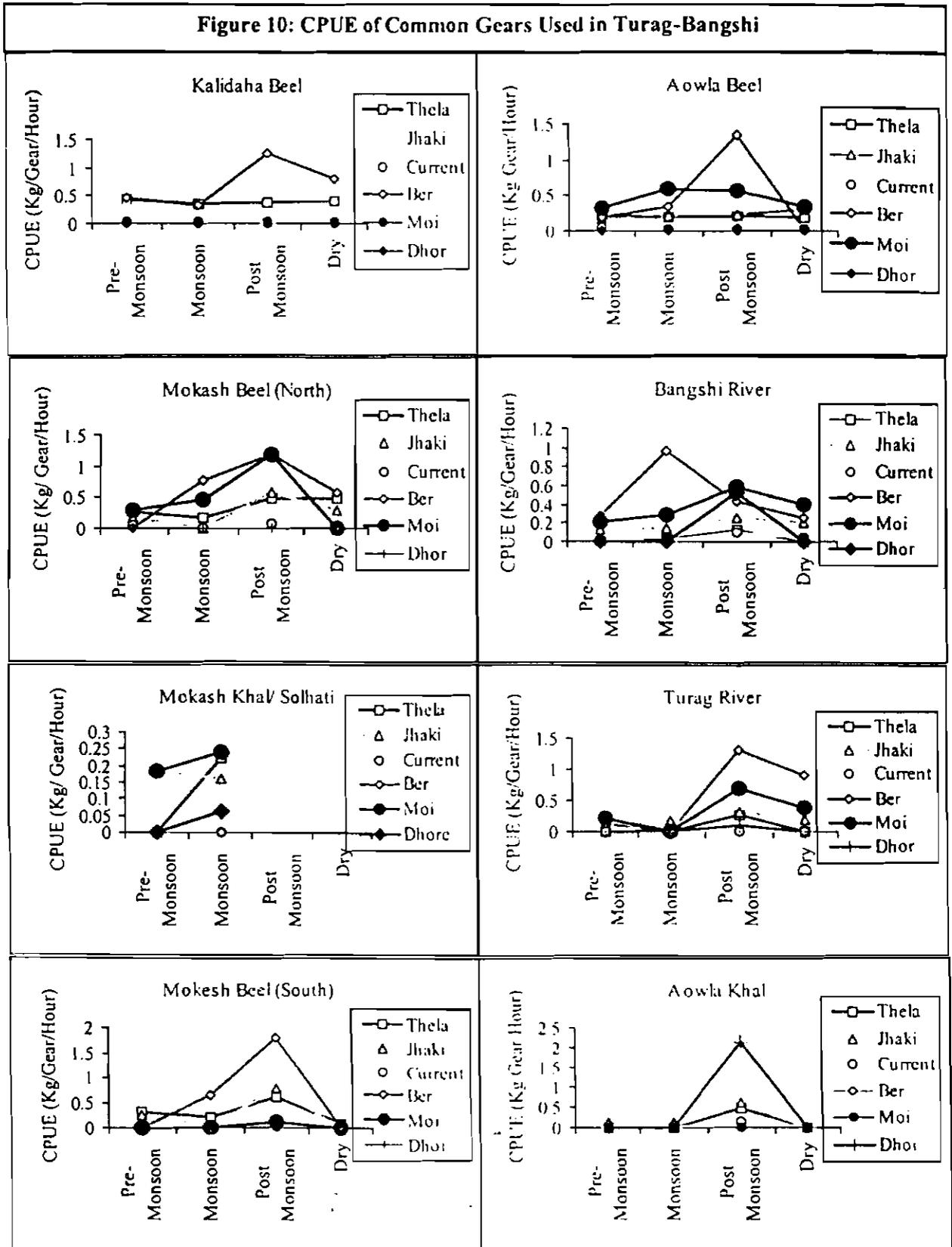
#### 4.6 CPUE

CPUE of *thela jal* was increased during post monsoon and dry season and *jhaki jal* round the year in beel habitats (Appendix-13). CPUE of *current jal* found decreased round the year in all monitoring locations. The reason possibly was increased numbers of subsistence fisher using *current jal* having less time in operation i.e. duration was less compared to the baseline situation (reduced to 4.4 hours during 1<sup>st</sup> impact year from 5.66 hours during the baseline year). CPUE of *ber jal* was found increased in all monitoring locations. Over the site and year the CPUE of *ber jal*, *moi jal*, *jhaki jal* has been increased compared to that of baseline situation. On the other hand the CPUE for *current jal* and *thela jal* was decreased during the 1<sup>st</sup> year of impact period compared to that of baseline situation. Duration for all the gears has been decreased but *dore jal*.

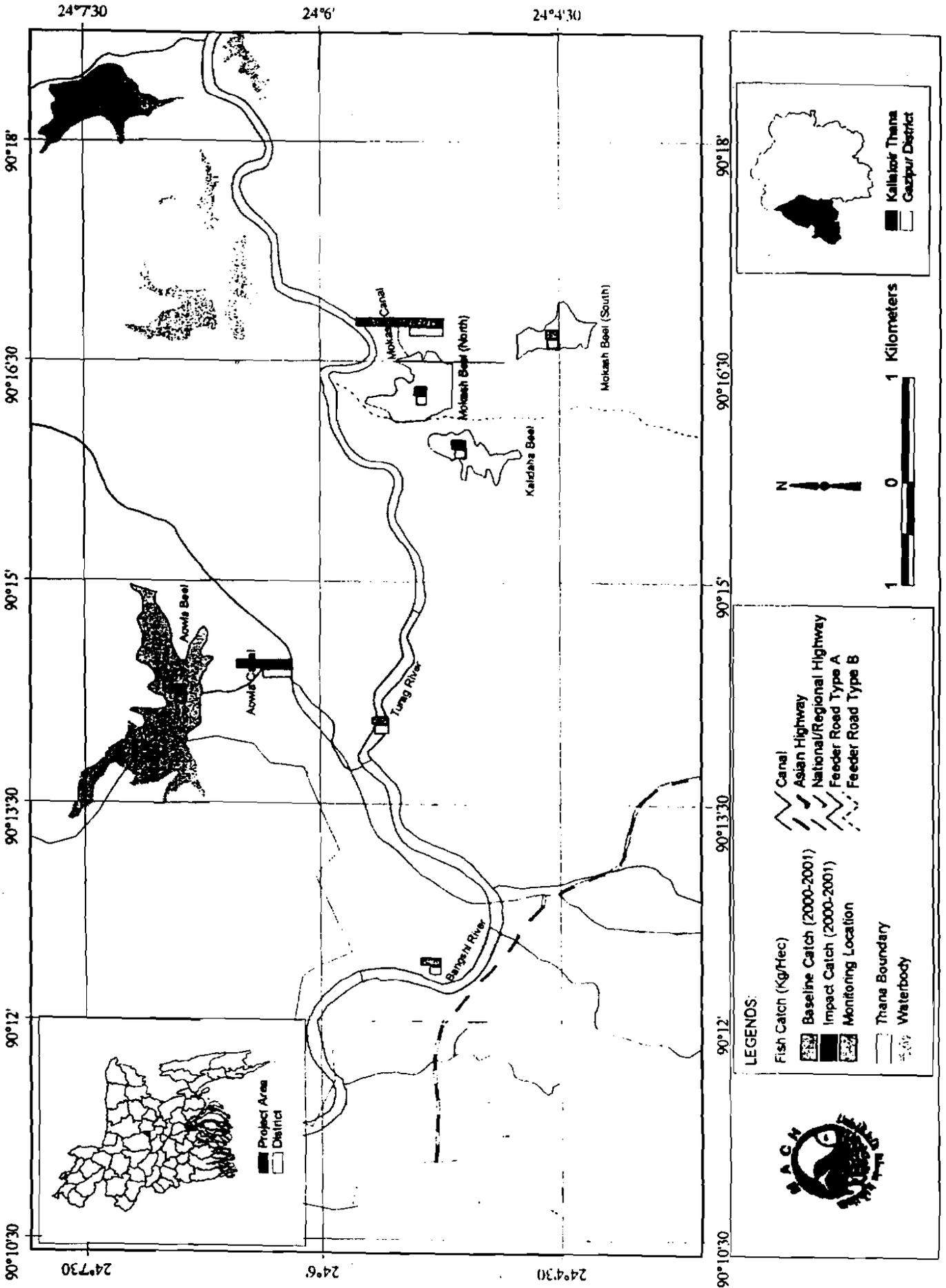
Data collected during August '00 to March '01 shows that in an average one fisher is using 17 *current jals* and 26 traps during the 1<sup>st</sup> year of impact period.

CPUE		
Gear	Baseline	Impact
<i>Ber jal</i>	1.92	3.88
<i>Moi jal</i>	1.56	1.65
<i>Jhaki jal</i>	0.50	0.68
<i>Current jal</i>	0.03	0.01
<i>Thela jal</i>	0.37	0.78
<i>Dore jal</i>	0.04	5.87

Figure 10: CPUE of Common Gears Used in Turag-Bangshi



Map - 5 Catch per Unit of Area (Kg/hectare) at Different Monitoring Locations in Turag-Banshi Site



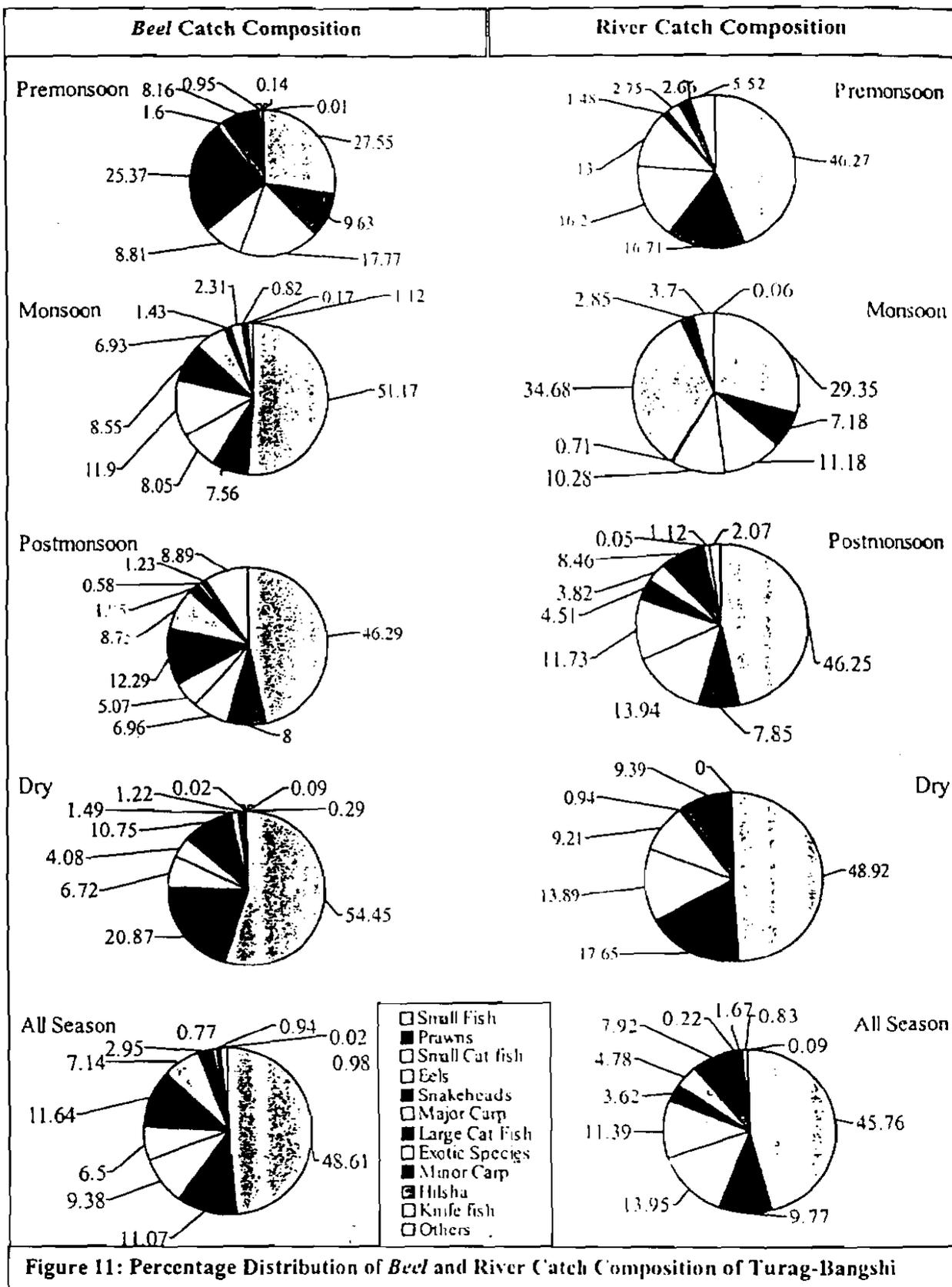


Figure 11: Percentage Distribution of Beel and River Catch Composition of Turag-Bangshi

#### 4.7 Catch Composition

The relative abundance of fish in kilograms of the overall estimated catch at the monitoring locations is shown in Appendices 12 and 14 by species and by guild respectively. The data shows that 83 species were observed during the 1<sup>st</sup> year of impact period and that the highest catches were observed during the Post-Monsoon and the Dry season months in the beels and in the floodplain. Fewer species were observed in the Pre-Monsoon months. The dominance of small fish in the catch composition similar to that of baseline year situation prevails during the 1<sup>st</sup> year of impact period. However the contribution of small prawns in the catch has been found reduced compared to that of the baseline year that might indicate enhancement of the habitat quality. Figure 11 shows Catch composition of the River and *beel* habitat by guild.

#### 4.8 Species Diversity

Fish species diversity in Turag-Bangshi site remains same during the 1<sup>st</sup> year of impact period compared to baseline situation. However, fish species richness at different monitoring locations was found increased compared to that of the baseline year which reflects connection among habitat reestablished (through physical intervention and enhanced hydrological regime during the 1<sup>st</sup> impact year) and create opportunity to mixing fish species among the habitats (Table 16). Though the richness is same but there is difference in the occurrence of the species (Appendix 15). There are few escapees from the aquaculture recorded during the 1<sup>st</sup> impact year. These are Mirror carp, Grass carp and African Magur besides the Silver carp recorded during the baseline year as well. Again there were few species recorded during the baseline studies are not recorded during the 1<sup>st</sup> impact year and there are few species recorded during the 1<sup>st</sup> impact year were not recorded during the baseline year. The change in the species occurrence are however limited to the aquaculture escapees and riverine species which is understandable and beyond the control of the project activities.

Table 16:  $\alpha$  Diversity by Monitoring Location of Turag-Bangshi Site

Location	Diversity
Mokash Beel	72
Turag River	55
Aowla Beel	67
Bangshi River	72
Over all	83

species recorded during the baseline studies are not recorded during the 1<sup>st</sup> impact year and there are few species recorded during the 1<sup>st</sup> impact year were not recorded during the baseline year. The change in the species occurrence are however limited to the aquaculture escapees and riverine species which is understandable and beyond the control of the project activities.

Seasonal variation of species diversity found as usual. The richness was found highest during post monsoon followed by monsoon. On the other hand the diversity was found highest in river followed by *beel* and increased during post monsoon and dry season. The trend is almost same as in case of baseline. Remarkable change is observed during the pre-monsoon. During the baseline year the pre-monsoon carried the legacy of driest dry season of 1999 and only 28 species were recorded against 62 recorded during pre-monsoon of 1<sup>st</sup> impact year which was after dry season of 2000 having considerably higher water level (Table 17).

##### Species recorded during the 1<sup>st</sup> year impact and not during baseline

- Tengra (Balasio)
- Gojar
- Meni/Bhe
- Mamoli Chapila

##### Species recorded during baseline and not during the 1<sup>st</sup> year impact

- Guzi Air
- Fesha
- Gang Chela
- Chep Chela
- Futani Puti
- Naftani
- Putul

Table 17: Seasonal Variation in Species Diversity by Habitat and Season in Turag-Bangshi site

Season	Month	Beel	Floodplain	River	Canal	All Habitats
	April	32	13	25	10	42
	May	42	22	31	26	53
	June	29	23	29	22	43
<b>Pre-Monsoon</b>		<b>47</b>	<b>27</b>	<b>40</b>	<b>32</b>	<b>62</b>
	July	40	21	26	17	51
	August	51	29	26	20	58
	September	45	24	37	27	53
<b>Monsoon</b>		<b>57</b>	<b>33</b>	<b>43</b>	<b>29</b>	<b>67</b>
	October	46	36	52	43	69
	November	48	40	57	32	66
	December	46	45	50	22	66
<b>Post Monsoon</b>		<b>57</b>	<b>53</b>	<b>67</b>	<b>47</b>	<b>77</b>
	January	41	34	38	17	56
	February	35	17	28	8	45
	March	33	14	36	10	47
<b>Dry</b>		<b>44</b>	<b>36</b>	<b>47</b>	<b>18</b>	<b>64</b>
<b>All Season</b>		<b>69</b>	<b>56</b>	<b>73</b>	<b>55</b>	<b>83</b>

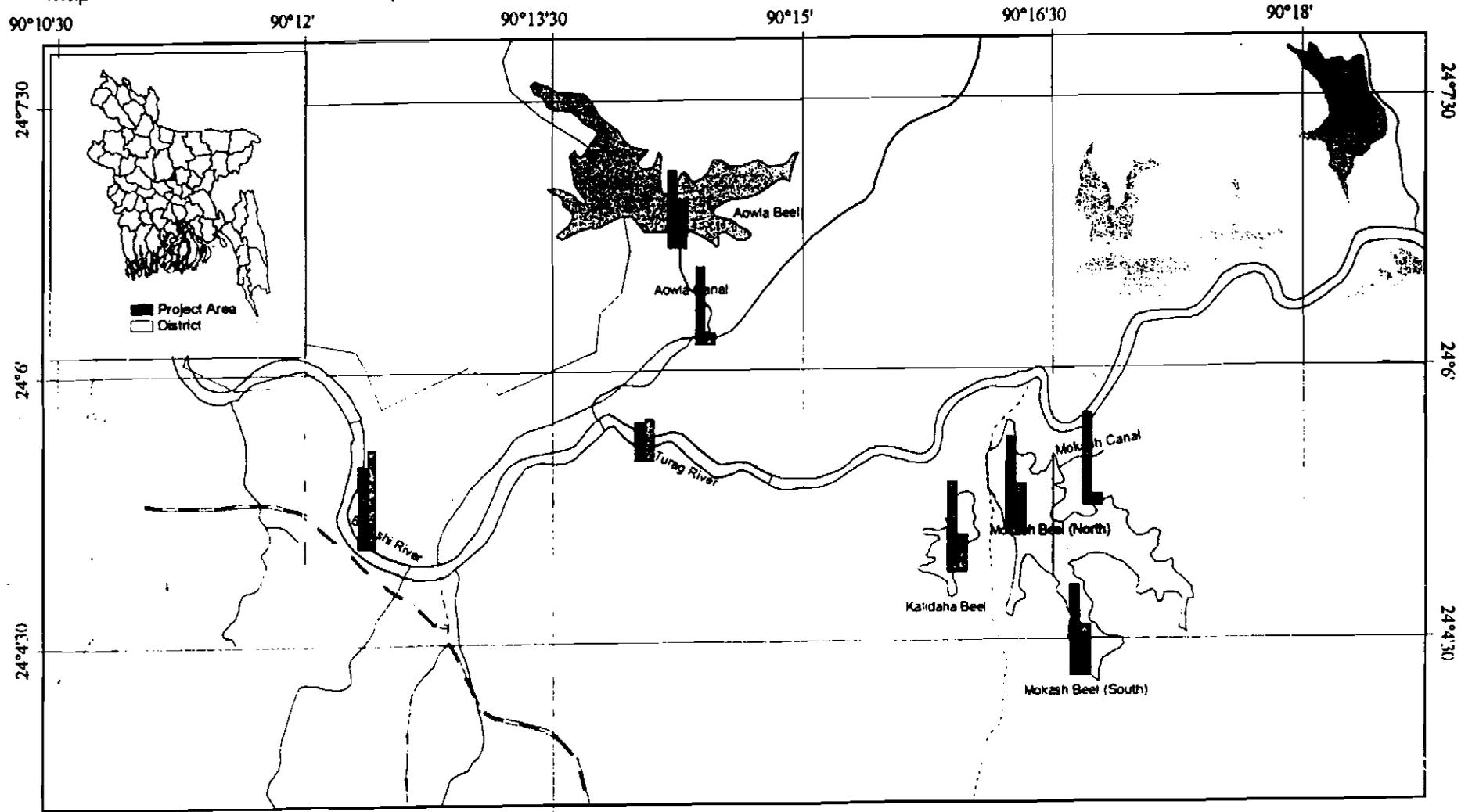
Species diversity indices accommodating the abundance have been analyzed as in case of the Hail Haor. The biodiversity indices have also been established as benchmark during the baseline studies. As mentioned in the baseline report comparison of the species richness over the years will be made and trend analysis will be done after accumulating time series in this regard. Habitat similarity will also be compared after having the time series.

Table 18: Species Diversity Indices at the Turag-Bangshi Site

Index	Mokash Beel (South)	Mokash Beel (North)	Kalida-ha Beel	Mokash Khal	Turag River	Bangshi River	Alua Khal	Alua Beel
Simpson's Index	0.91	0.87	0.73	0.78	0.85	0.90	0.54	0.80
Shanon Equality	0.71	0.68	0.56	0.52	0.65	0.69	0.36	0.60

Map - 6

Species Richness at Different Monitoring Locations in Turag-Banshi Site



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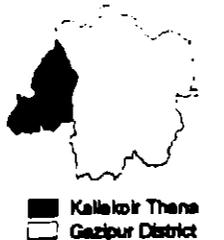
	<b>LEGEND:</b>				
	<b>Fish Catch (Kg/Hec)</b> ■ Baseline Catch (2000-2001) ■ Impact Catch (2000-2001) ■ Monitoring Location	--- Canal --- Asian Highway --- National/Regional Highway --- Feeder Road Type A --- Feeder Road Type B			

Table 19: Jaccard's Similarity Indices of Turag-Bangshi Site

Monitoring locations	Mokash Beel (South)	Mokash Beel (North)	Kaliadaha Beel	Mokash Khal	Tutag River	Alua Khal	Alua Beel	Bangshi River
Mokash Beel (South)		0.78	0.72	0.60	0.57	0.58	0.74	0.63
Mokash Beel (North)	0.78		0.72	0.60	0.57	0.58	0.74	0.63
Kaliadaha Beel	0.72	0.72		0.59	0.54	0.54	0.79	0.66
Mokash Khal	0.60	0.60	0.59		0.71	0.67	0.58	0.62
Tutag River	0.57	0.57	0.54	0.71		0.74	0.53	0.74
Alua Khal	0.58	0.58	0.54	0.67	0.74		0.54	0.57
Alua Beel	0.74	0.74	0.79	0.58	0.53	0.54		0.65
Bangshi River	0.63	0.63	0.66	0.62	0.74	0.57	0.65	

## 5. Special Features

### 5.1 Fishing by Dewatering

Extremely detrimental fishing practices is the fishing by dewatering of waterbodies at the pre monsoon has been reported in the baseline report all the *beels* in Hail Haor site. However, the practice does not occur at Turag-Bangshi site. There is no leased *beels*.

It was reported during the baseline that collection of information on the practice is very difficult and often risky. However, field staff worked closely with the community during last two years and developed a relationship with the lessee. It is known from the lessee that though the practice is illegal but they are compelled to do so due to increased lease fee every year. The lease is for three years and the lessee harvest by dewatering at the last year of the lease tenure.

A total of 5 *beels* have been brought under the RMO management so far where dewatering as a means of fishing is expected not be used in the coming years. Awareness raising at different levels is going on to stop or reduce the practice. MACH intends to expand RMO management coverage bringing more *beels* either establishing more RMOs and or Union level RMO or expanding the command area for the existing RMOs. Policy advocacy to change the revenue-oriented *beel* leasing system to sustainable resource management oriented system is highly recommended.

### 5.2 Threatened Species

The World Conservation Union (IUCN) has listed 54 threatened fish species in Bangladesh. 12 species categorized as critically endangered, 28 as endangered and 14 as vulnerable (IUCN Red Book-2000). It is not known how many species have become extinct locally. Table 23 of baseline report of MACH, February, 2001 provided the status of threatened fish species in the MACH sites as recorded during the baseline year. In the Hail Haor *Vangra (Labeo boga)* and *Ghaura (Clupisoma garua)* species (Only one individual of each species) were recorded during the baseline year and not recorded in the 1<sup>st</sup> impact year. On the other hand *Bata (Labeo bata)* and *Tatkini (Crossocheilus latius)* have been recorded during 1<sup>st</sup> impact year of which are critically endangered and were not recorded during the baseline year.

In the Turag Bangshi site *Meni (Numidus numidus)* were not recorded during baseline but recorded during impact. The reason is straight that MACH reintroduced the species in the area. *Chepcheha (Chela labruca)* and *Putul (Botia lohachata)* were recorded during baseline and are not recorded during the impact year. It should be mentioned here that the occurrence of the species may vary year to year and to draw conclusion time series data is necessary and shall accordingly be analyzed in time.

### 5.3 Fishing Practices and Environmental Considerations

"Various factors determine the soundness of the aquatic ecosystem. Hydrology and the landscape govern aquatic ecosystems. The average and seasonal rainfall, the temperature and functionality of land and water systems and human interaction are crucial factors that determine the soundness of the ecosystem. Due to natural and man-made causes the aquatic ecosystems in Bangladesh are being continuously degraded. Increasing population pressure, deforestation in the upper catchment, and massive erosion are degrading the topsoil and silting up the wetland habitats, waterways and channels. The closure of rivers and channels in order to increase rice production has disrupted waterway connectivity resulting in the disruption of the entire ecosystem. Degraded habitats fail to support a diverse population and can support only the resident species. Aquatic vegetation at the habitats has also been reduced" (MACH, Baseline report on fisheries, vegetation, wildlife and protein consumption), which required the diversity of habitats, micro-habitats in aquatic environment.

In order to ensure wise fishing practice for sustainable production. MACH is conducting awareness raising campaigns at all the sites. So far, a total of around 40,000 people have been reached with the awareness messages from the MACH that basically disseminated over all environmental status, actions, consequences and better management and harvest practices. A total of 13 community organizations have been formed and oriented for wise management of the water bodies. A total of 40 communities are now practicing best management in to the water bodies of the MACH sites. The best management refers not to use harmful gears, not dewatering the water bodies, not harvesting fry/broods and not fishing in the sanctuaries and maintain a time closure in the over all management areas. To improve the aquatic habitat a total of 125 ha of area have been converted to perennial water bodies so far and at the same time 49 small scale sanctuaries (20.78 ha) have been established to provide dry season refuge and facilitate spawning in time. Further more to develop the habitat swamp trees have been planted in to 4 ha. (Spread over and more are planned), riparian zone have been regenerated in to 24 kilometers of stream banks.

The wise harvesting and wise management of the water bodies has been initiated and to be there have to go a long way. Intention of the MACH project is to provide the community a feeling of belongingness of the resources and aware and train them so that they could and shall manage their resources in a sustained fashion.

## 6. Discussions

Fisheries monitored parameters during the baseline was also monitored during the impact and comparison was made in the report. The differences in the values of the parameters are the changes occurred temporally between the two years. The changes are however attributed both by the project interventions and or due to the external factors that includes the hydrological regime along with the others. One of the ideas to eliminate the external influences in the impact is to use control site findings in both the years and then calculate a factor to raise the findings of the impact and then compare with the base line situation. It is extremely difficult to find a suitable control site in case of biological parameters. However we intended to use Boro Haor as a control site for the Hail Haor area and recorded the fisheries parameters. But the findings of the Boro Haor show unnatural differences in the catch of the baseline and impact year by almost three folds. The reason is the lessee manages the Boro Haor and the baseline year was the first year of lease and the lessee harvested few during that year. In the 2<sup>nd</sup> year of lease the lessee harvested moderately resulting in the tremendous difference in the catch. The difference is however expected to show further raise during the next year as it will be the final year of lease and the lessee shall harvest everything through any means. In this circumstances the Boro Haor could not be considered as the control site. The secondary control site i.e. Cheruadubi beel is within the Hail Haor system and got connected with all other water bodies during the monsoon. At the same time the intervened Sanada beel is close to the Cheruadubi beel. It can not also be used as control site.

Another way of dealing with the matter is to keep track of the hydrological regime including inundation extent, depth and duration and correlate the biological parameters with the hydrological parameters. MACH has recorded the information on the hydrological regime and trend analysis after acquiring a time series shall be done along with the correlation analysis.

# Section B

## Household Protein Consumption

## 1. Introduction

The goal of the MACH project is to provide ecologically healthy management of wetland resources (i.e. fisheries and other wetland products) to provide a sustainable supply of food to the rural poor. Baseline biodiversity monitoring of fisheries, vegetation, birds and wildlife is being conducted at the project sites. In addition to biodiversity monitoring, fish and other protein consumption at the household level have been monitored from sample households in selected villages in the MACH project sites.

Based on local situation and community consensus various physical and management interventions are being implemented at each by the MACH sites to reach the MACH goal. Indicators for measuring changes due to present interventions have been set from the beginning since then regular monitoring is being continued. A comprehensive baseline is also established on socioeconomic and biological parameters for the MACH sites. Monitoring of biological parameters and the protein consumption is being carried out on regular basis to capture the changes to compare with the baseline situation in this regard.

This section of the report concentrates on the fish and other protein consumption at household level. Data used to analyze the consumption at various scales has been gathered through the project staff as in case of the baseline. The methodology, data analysis and the reporting format used is same to that of the baseline.

This part of the report intends to present the household protein consumption findings during the 1st year of impact (April' 00 to March 01) and comparison with the baseline situation for Hail Haor and Turag-Bangshi sites.

## 2. Findings

### 2.1 Hail Haor Site

#### 2.1.1 Per Capita Protein Consumption

People of the Hail Haor site consumed more fish during the 1<sup>st</sup> impact year compared to the baseline year. Per capita fish consumption in the sample monitoring villages has been found increased from 46 g/day

**Table 20: Per Capita Fish and Protein Consumption by Land Holding Classes during Baseline and Impact Year-1 (April'00 to March'01) in Hail Haor.**

Land Class	Fish (g)		Meat (g)		Egg (#)		Milk (g)		Pulses (g)	
	Baseline	Impact	Baseline	Impact	Baseline	Impact	Baseline	Impact	Baseline	Impact
Landless	44.98	49.30	4.43	4.98	0.06	0.05	3.90	4.54	11.46	10.53
Marginal	45.92	50.93	4.79	6.02	0.07	0.06	8.82	9.12	12.61	12.06
Small	46.62	48.50	5.00	6.83	0.07	0.07	14.32	8.42	13.54	13.11
Medium	49.02	55.64	6.74	9.41	0.11	0.05	8.66	7.21	11.96	11.40
Large	51.50	54.23	4.44	6.82	0.03	0.04	5.28	2.07	12.29	14.17
<b>All Class</b>	<b>45.98</b>	<b>50.31</b>	<b>4.78</b>	<b>5.87</b>	<b>0.06</b>	<b>0.05</b>	<b>6.55</b>	<b>6.07</b>	<b>12.00</b>	<b>11.37</b>

during baseline to 50 g/day during 1<sup>st</sup> impact year considering all land holding classes. Large and medium farmers consumed highest quantity of fish compared to other categories of households that also resembles the baseline situation. During the baseline situation however, the people of landless categories consumed lowest quantity of fish per capita at 45 g/day, which has increased to 49 g/day during 1<sup>st</sup> impact year. Small farmers during the impact year consumed lowest at 48.5 g/day, which were 46.62 in the baseline year. However, fish consumption for all categories of households has been found increased in the 1<sup>st</sup> impact year compared to that of the baseline situation. The increase in fish consumption is also supported by the increased catch in the site in the 1<sup>st</sup> impact year compared to the baseline situation.

The impact monitoring data also reveals increased meat consumption in the area. They had 4.78 g of meat per capita during the baseline year, which has been increased to 5.87 g per capita during the 1<sup>st</sup> impact year. The meat consumption was found increased for all land categories of households in the surveyed villages. Consumption of egg, milk and pulses are however found slightly decreased from 0.06 to 0.05 nos, 6.55 g to 6.07 g and 12.00 g to 11.46 g per capita respectively (Table-20).

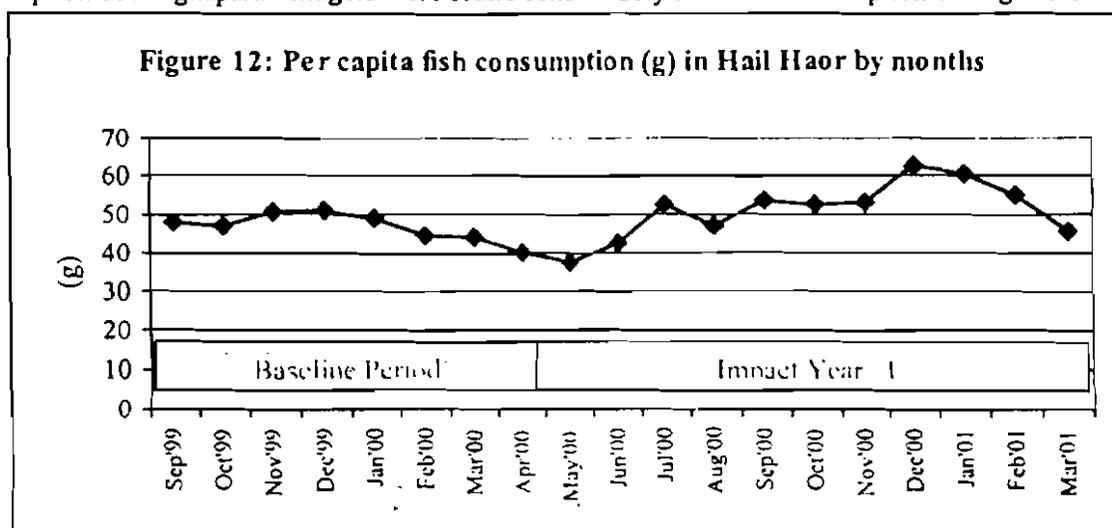
### 2.1.2 Village Comparisons

Village wise per capita fish consumption was found highest at 76.30 g/day among people of Hazipur and

**Table 21: Per Capita Fish and Protein Consumption by Village during Baseline and Impact Year-1 (April'00 to March'01) in Hail Haor.**

Village	Fish (g)		Meat (g)		Egg (#)		Milk (g)		Pulses (g)	
	Baseline	Impact	Baseline	Impact	Baseline	Impact	Baseline	Impact	Baseline	Impact
Sholipur	51.07	50.35	6.78	4.63	0.03	0.03	3.66	6.26	7.45	4.53
Mirzapur (Namapara)	47.60	47.68	4.82	3.04	0.05	0.10	4.04	7.92	6.68	10.18
Boulashir (Namapara)	48.91	47.58	1.73	1.87	0.03	0.04	14.32	13.29	11.70	14.05
Vimshi (Namapara)	45.77	40.94	0.85	1.95	0.05	0.09	12.18	11.85	18.89	21.02
Bade Alisha	23.87	23.17	1.99	1.73	0.03	0.06	1.18	0.52	17.44	15.78
Rustompur	40.18	45.50	1.32	1.75	0.02	0.04	9.20	4.01	20.85	13.97
Dighapara	39.57	28.18	1.75	1.31	0.03	0.05	4.39	15.08	13.96	8.93
Laibag	53.50	66.95	9.91	12.48	0.08	0.12	1.09	2.45	5.63	8.18
Paschim Varaura	57.47	70.58	8.77	12.21	0.08	0.08	1.00	8.82	10.10	11.96
Hazipur	51.88	76.30	2.78	12.46	0.05	0.06	9.37	3.12	6.20	5.96
Baruna (Migherhati)	34.24	50.92	11.55	9.64	0.02	0.03	5.44	8.32	11.60	11.24
Baruna (Borobari)	49.16	47.88	3.54	2.48	0.01	0.01	2.43	1.88	12.61	12.73
Baruna	52.85	47.39	7.44	5.30	0.02	0.04	1.56	0.95	6.99	8.86
Bobasara	52.68	58.24	4.90	9.12	0.02	0.03	11.05	0.76	8.33	13.42
<b>All Villages</b>	<b>45.98</b>	<b>50.31</b>	<b>4.78</b>	<b>5.87</b>	<b>0.06</b>	<b>0.05</b>	<b>6.55</b>	<b>6.07</b>	<b>12.00</b>	<b>11.37</b>

lowest at 23.17 g/day in Bade Alisa. The villagers consumed more fish during the baseline year was also found enjoyed more during the 1<sup>st</sup> impact year. In almost all the villages however, found higher per capita consumption but Dighapara villagers were found considerably reduced consumption during the 1<sup>st</sup> impact



year (28.18 g/d) compared to the baseline situation (39.57 g/d). Meat consumption was found lowest at

1.31 g/day among the people of Dighapara and highest at 12.47 g/day among the people of Lalbag (Table-21). The Dighapara people however, consumed more milk compared to the baseline situation though fewer pulses. Over all protein consumption for the Dighapara people was found less compared to that of the baseline situation.

### 2.1.3 Seasonal variations in Consumption

There are seasonal variations in fish consumption in the area that was expected. Fish consumption found lower during April, May and June and increase there in after and reached peak during December, January and February and decreases from March (Figure-12). The fish consumption trend in the area is similar to that of the baseline situation and corresponds the fish catch as well.

### 2.1.4 Sources of Consumed Fish

Source of fish for consumption shows variations in terms of percentage. Bought source was found increased from 66.30 % during baseline to 68.97 % during 1<sup>st</sup> impact year. Caught fish as source for consumed fish slightly decreased from 31.56 % during baseline to 28.98 % during 1<sup>st</sup> year of impact (Table-22). All the categories bought more fish compared to the baseline situation but landless.

**Table 22: Percentage Distribution of Consumed Fish by Source during Baseline and Impact Year-1 (April'00 to March'01) in Hail Haor Site.**

Land Holding Class	Sources of Consumed Fish (%)					
	Caught		Bought		Gift	
	Baseline	Impact	Baseline	Impact	Baseline	Impact
Landless	32.44	32.42	65.34	65.10	2.21	2.49
Marginal farmers	34.05	27.83	63.48	70.41	2.48	1.76
Small farmers	26.09	21.49	71.82	76.94	2.10	1.57
Medium farmers	29.69	23.66	68.79	75.47	1.52	0.86
Large farmers	26.49	22.59	72.38	75.56	1.13	1.85
<b>All Classes</b>	<b>31.56</b>	<b>28.98</b>	<b>66.30</b>	<b>68.97</b>	<b>2.14</b>	<b>2.05</b>

### 2.1.5 Species Composition (Group wise) of Consumed Fish

The species composition of consumed fish also shows changes. The villagers consumed less small fish during the 1<sup>st</sup> impact year and were 46.66 %, which was 58.24 % during the baseline situation. The catch composition also reveals fewer percent of small fish in the catch during the 1<sup>st</sup> impact year compared to the baseline situation in the Hail Haor area. Snake head consumption found increased during the 1<sup>st</sup> impact year (from 14.12 % to 17.26 %) and in the catch composition of the River it was found higher contribution of the snake heads during the impact year (Table-23). *Hilsha* consumption percentage has been increased during the 1<sup>st</sup> impact year compared to the baseline situation that reveals the national *Hilsha* abundance scenario during the 1<sup>st</sup> impact year. Reduction in the dry fish percentage in the consumption is possibly due to the increased fish availability during the impact year.

**Table 23: Species Composition (Group wise) of Consumed Fish during Baseline and Impact Year-1 (April'00 to March'01) in Hail Haor**

Species Group	Consumed Fish		%	
	Baseline	Impact	Baseline	Impact
Small fish	4,257	5,632	58.24	46.66
Snake heads	1,032	2,083	14.12	17.26
Small cat fish	653	1,203	8.94	9.96
Prawns	258	746	3.53	6.18
Dry fish	284	595	3.88	4.93
<i>Hilsha</i>	137	408	1.88	3.38
Major Carp	201	367	1.94	3.04
Exotic species	142	349	2.75	2.89
Large cat fish	117	213	1.60	1.76
Knife fish	57	172	0.78	1.43
Minor Carp	78	156	1.07	1.29
Eels	93	138	1.27	1.14
Other	1	4	0.02	0.03
<b>Total</b>	<b>7,310</b>	<b>12,070</b>	<b>100.00</b>	<b>100.00</b>

## 2.2 Turag-Bangshi Site

### 2.2.1 Per Capita Protein Consumption

- The monitored households in Turag-Bangshi site consumed more or less similar quantities of fish during the 1<sup>st</sup> impact year compared to that of the baseline year. The fish consumption has been monitored only from October to April during the baseline year and per capita consumption was estimated. If same time frame is taken for the 1<sup>st</sup> impact year then the consumption is higher at 27.03 g/day compared to 25.26 g/day during the baseline year. The fish catch in the site has however, been increased to 124 kg/ha from 51 kg/ha but consumption has not been increased in accordance with the increase of the catch. This is possibly due to a combination of factors. The professional fisher do not sell fish at local bazars rather they export the fish to the distant bazars even to Dhaka to get more price. Conflicts prevailed in this regard between the villagers and the fishers in the area. The villager wanted that the fishers should sell their catch in the village. During the baseline year the landless people had more fish which has been reduced possibly be due to the fact that in the impact year, analysis included the lean period for fish availability when the price of the fish was higher. It is noted that lean period was not included in the baseline

**Table 24: Per Capita Fish and Protein Consumption by Land Holding Classes during Baseline and Impact Year-1 (April'00 to March'01) in Turag-Bangshi**

Land Class	Fish (g)		Meat (g)		Egg (#)		Milk (g)		Pulses (g)	
	Baseline	Impact	Baseline	Impact	Baseline	Impact	Baseline	Impact	Baseline	Impact
Landless	30.06	25.27	6.65	7.89	0.05	0.04	12.71	13.56	13.87	9.17
Marginal	28.79	23.92	10.47	9.55	0.04	0.05	17.35	21.43	15.33	9.35
Small	28.34	26.71	8.37	11.07	0.04	0.03	15.37	31.75	16.47	10.51
Medium	29.84	29.15	13.30	14.51	0.04	0.05	32.19	36.40	16.98	10.49
Large	25.30	24.73	10.42	10.50	0.03	0.03	28.05	36.59	14.38	9.32
<b>All Class</b>	<b>25.26</b>	<b>25.47</b>	<b>8.64</b>	<b>9.42</b>	<b>0.04</b>	<b>0.04</b>	<b>17.07</b>	<b>20.90</b>	<b>14.83</b>	<b>9.49</b>

assessment. The Turag-Bangshi villagers are consumed other protein compared to the Hail Haor villagers, which was also found in baseline situation. During the 1<sup>st</sup> impact year the consumption of meat has been increased further for all categories of villagers. Milk consumption has also been increased substantially during the impact year to 20.90 g per capita compared to 17.07 g during the baseline situation. The egg consumption over all in the area remained same with slight variations among the categories. The consumption of pulses is however reduced significantly from 15g per capita in baseline to 9.5 g per capita in the impact year -1 (Table 24).

### 2.2.2 Village Comparisons

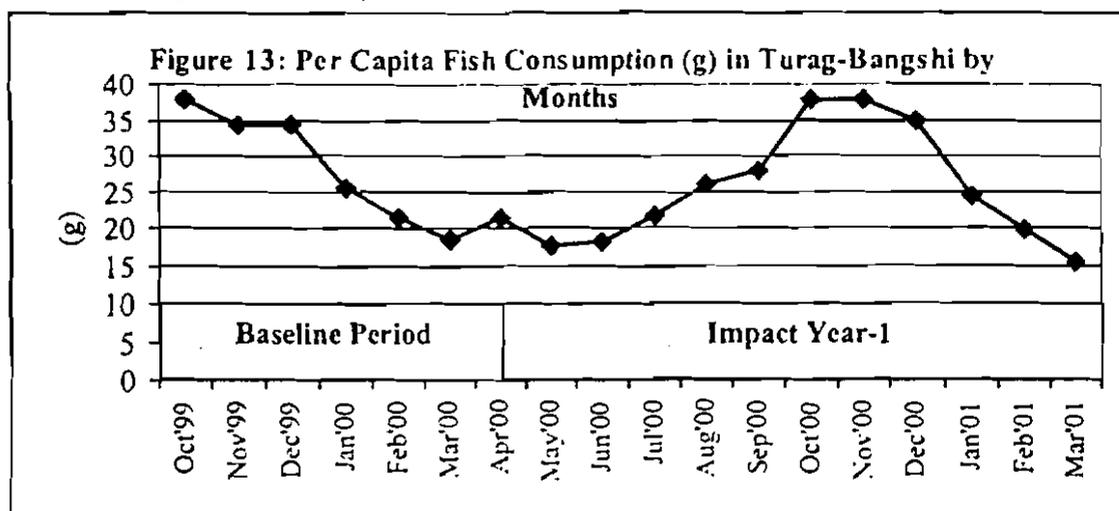
**Table 25: Per Capita Fish and Protein Consumption by Village during Baseline and Impact Year-1 (April'00 to March'01) in Turag-Bangshi**

Village	Fish (g)		Meat (g)		Egg (#)		Milk (g)		Pulses (g)	
	Baseline	Impact	Baseline	Impact	Baseline	Impact	Baseline	Impact	Baseline	Impact
Majukhan	22.92	28.70	7.08	9.63	0.08	0.07	7.70	19.70	17.49	5.47
Taltoli	17.57	23.75	3.47	7.03	0.02	0.02	15.20	36.54	25.30	10.96
Bashtoli	25.28	22.64	14.79	9.73	0.04	0.03	19.26	21.83	18.54	10.25
Kaliadoho	32.67	27.05	12.12	13.74	0.03	0.03	9.67	22.35	16.37	5.76
Sholhati	28.22	20.55	3.32	2.47	0.04	0.02	16.91	20.32	17.53	7.60
Gopinpur	20.25	24.88	3.75	6.56	0.01	0.03	13.23	15.54	8.59	10.89
Boroibari	24.35	23.32	10.37	12.15	0.04	0.05	13.10	8.71	0.52	11.51
Medi Ashulai	37.44	34.49	13.62	14.82	0.08	0.08	23.06	23.07	35.50	13.66
<b>All Villages</b>	<b>25.26</b>	<b>25.47</b>	<b>8.64</b>	<b>9.42</b>	<b>0.04</b>	<b>0.04</b>	<b>17.07</b>	<b>20.90</b>	<b>14.83</b>	<b>9.49</b>

Medi Asulai villagers consumed more fish, meat, egg, pulses and milk as they did in baseline year. Bastoli villagers had lowest fish during the 1<sup>st</sup> impact year. Taltoli villagers had lowest in baseline year. Meat consumption was 2.47 g for Sholhati and 14.82 g for Medi Ashulai (Table-25).

### 2.2.3 Seasonal Variations in Consumption

Per capita fish consumption also shows seasonal variations. Fish consumption rate found higher during post monsoon season (October to January). Gradually it was decreased in dry season (Figure 13) which was the trend during the baseline year as well. The fish consumption trend however follows the fish



availability trend in the area.

### 2.2.4 Sources of Consumed Fish

The source of fish consumed varies slightly compared to the baseline situation. The villagers bought slightly less fish for consumption (68.82 %) compared to the baseline year (69.08 %). The landless people caught little more fish in impact year (32.82 %) compare to the baseline year (31.57 %) (Table 26). Medium and large farmers bought more fish for consumption that poor farmers and landless. Reverse

**Table 26: Source of Consumed Fish during Baseline and Impact Year-1 (April'00 to March'01) in Turag-Bangshi**

Land Holding	Sources of Consumed Fish (%)					
	Caught		Bought		Gift	
	Baseline	Impact	Baseline	Impact	Baseline	Impact
Landless	31.54	32.82	63.49	62.70	3.95	4.46
Marginal farmers	26.00	21.45	69.54	72.90	3.58	5.64
Small farmers	20.31	22.56	75.93	74.47	3.49	2.91
Medium farmers	17.21	18.07	79.50	78.31	2.61	3.62
Large farmers	17.16	20.25	75.83	77.61	5.72	2.14
<b>All Classes</b>	<b>27.11</b>	<b>26.84</b>	<b>69.08</b>	<b>68.82</b>	<b>3.81</b>	<b>4.32</b>

situation is found overlying the quantity of fish caught for consumption. It shows that poor people higher percentage of fish consumed by poor and caught by them compared to that of rich farmer.

### 2.2.5 Species Composition (Group wise) of Consumed Fish

The species composition of consumed fish shows changes from that of the baseline situation. The villagers consumed less small fish during the 1<sup>st</sup> impact year (41.17 %) compared to baseline year (48.24 %). The percentage of *Hilsha* consumed among others reveals abundance of *Hilsha* in the market compared to that of the baseline year. The catch composition shows that contribution of major carp has been increased from 1% in the baseline year to 5 % in 1<sup>st</sup> impact year. The increased availability of major carps is reflected in the consumption for this year too. Major carp consumed in the area during the impact year was 17% compared to the baseline year which was 12% (Table 27).

**Table 27: Species Group wise Composition of Consumed Fish during Baseline and Impact Year-1 (April'00 to March'01) in Turag-Bangshi**

Species Group	Consumed Fish			
	Weight (kg)		%	
	Baseline	Impact	Baseline	Impact
Small Fish	604	1,406	48.24	41.17
Major Carp	149	586	11.97	17.16
Exotic Species	159	417	12.73	12.22
Prawns	103	306	8.23	8.95
Snake heads	48	165	3.85	4.83
Large Cat Fish	37	163	2.95	4.78
<i>Hilsha</i>	18	157	1.43	4.60
Small Cat Fish	51	107	4.11	3.13
Eels	64	71	5.09	2.07
Dry Fish	7	21	0.53	0.63
Knife Fish	3	8	0.27	0.25
Minor Carp	7	6	0.57	0.17
Other	1	2	0.03	0.05
<b>Total</b>	<b>1,251</b>	<b>3,415</b>	<b>100.00</b>	<b>100.00</b>

Section C  
Wildlife

## 1. Introduction

The project activities and interventions are so planned and designed that would not harm the wildlife diversity in the project area rather should bring positive changes in their diversity and in abundance. In order to monitor the changes, indicators has already been set and accordingly a baseline has been established on selected parameters.

This section of the report concentrates on the wildlife status in Hail Haor and Turag-Bangshi sites of the MACH project and presents the findings regarding the wild life parameters in the 1<sup>st</sup> year of impact as well as draws a comparison with the baseline situation.

Data used for this report has been collected during the wet season and dry season surveys for the wildlife species occurrence in Turag-Bangshi site and Hail Haor site. Wet season surveys have been conducted during 2 to 8 August' 2001 in Turag-Bangshi site and during 12 to 28 July' 2001 in Hail Haor site. Dry season surveys have been conducted during 17 to 20 January 2001 and 11 to 18 Feb 2001 in Turag-Bangshi site and Hail Haor site respectively.

## 2. Methodology

The following methods were used to draw the baseline and the same followed during the impact study. Presence or absence was determined in both general surveys and transects during the two major seasons, winter (dry) and summer (wet) as in case of baseline.

- Transect lines were drawn across the delineated representative the habitats
- Record the occurrence of the species along both the sides of transects (Belt transects)
- Droppings counts for mammals and predatory birds
- Flashing for nocturnal birds
- Photography, call, and trap collection of specimens for taxonomic confirmation
- Interviews with local people such as fishers, boatmen, forest wood collectors and other professionals

The assessment of the habitat types in each of the site conducted before conducting the baseline study. Transects drawn covered all habitat types during the baseline have also been followed in the impact study. The habitats in Hail Haor included *beels*, paddy fields, homestead areas and riparian vegetation, lemon gardens, tea gardens, natural forest, rubber plantations, forest plantations and natural forests.

A transect from the main landing east of Beri beel to a palm tree at Bhunabir included two types of habitats—*beel* and paddy field. Transect 2 (from Foyzabad hill's Wood bridge to Bridge on paved road in Bhunabir) included the homestead areas, riparian areas, lemon gardens and tea gardens. Transect 3 (from West of Magurchhara Khasia-punji to the south of #10 section of Burburi-Chhara tea garden) contained the rubber plantations, natural forest and forest plantations (Map 1).

In Turag-Bangshi site, three transects were drawn covering all the major habitats viz. *Beel*, River, Floodplain, Sal forest, Riparian zone, Paddy field and settlements. Transect 1 covers from Bastali village (North of Turag River) to West of Sinabaha bazar. Transect 2 covers from west of Baraibari bazar to Kalidaha Bridge. Transect 3 covers from Boalia village to Turag riverside.

## 3. Findings

Dry season wildlife survey in Hail Haor basin, a total of 158 species including 5 Amphibians, 19 Reptilians, 22 Mammalians and 112 Birds were recorded. While the wet season survey recorded a total of 140 species consisting of 5 Amphibians, 17 Reptilian, 96 Birds species and 22 Mammalian (Appendix 19). A cumulative total of 158 species including 5 Amphibian, 19 Reptilian, 112 Bird and 22 Mammalian species was recorded in the Hail Haor site during the 1<sup>st</sup> impact year. During the baseline year In the Turag-Bangshi site the dry season survey recorded a total of 128 species including 5 Amphibian, 16 Reptilian, 89 Birds 18 and Mammalian species. The wet season survey recorded a total of 5 Amphibian, 15 Reptilian, 17 Mammalian and 77 Birds species (Appendix 21). A cumulative total of 145 wildlife species including 5 Amphibian, 16 Reptilian, 95 Bird and 19 Mammalian species was recorded in the Turag Bangshi site during the impact survey (Appendix 22).

### 3.1 Comparison with the Baseline

*While listing cumulative wildlife species during the baseline by mistake 145 bird species was mentioned instead of 139 and 7 species of amphibian was mentioned instead of 6 and thus cumulative total for wildlife is 189 instead of 196 mentioned in the baseline.*

A cumulative total of 169 wildlife species has been recorded through out the impact year in both Hail Haor site and Turag Bangshi site that includes 5 Amphibian, 19 Reptilian, 120 Birds and 25 Mammalian species (Appendix 23). Which was 189 including 6 Amphibian, 20 Reptilian, 139 Birds and 24 Mammalian species during the baseline. It shows decline in bird observation by 19 and amphibian and reptilian by 1 each and an increase of 1 mammal. Comparison of the dry and wet season records both in Hail Haor & Turag Bangshi site recorded more species of all categories of wildlife during the impact year but it has reduced in cumulative figures (Table 28). There are 45 species recorded during the baseline did not found during the impact year which includes 1 amphibian, 2 reptilian, 39 bird species and 2 mammal (Table 29). On the other hand 1 reptilian, 21 birds and 3 mammal species was recorded during the impact year which was not observed during the baseline year (Table 30). The wildlife species recorded during the baseline and impact year in the Hail Haor site, Turag Bangshi site and cumulative has been compared and shown in the appendix 23. There are changes in the names of some of the wildlife as used during baseline and impact. The impact report used the name from the updated IUCN red Book. The changes including the old names are given in Appendix 24.

The occurrence of wildlife species depends on various factors including change in habitat quality, hydrological regime, and abundance of food, shelter and other local factors. At the same time there could be less migration due to external factors for birds in particular. The wildlife are however declining nationally due to habitat destruction, agricultural extension, construction and reducing water areas, Deforestation, human disturbance (human movement in wildlife habitat), lack of awareness about wildlife diversity, destruction of nesting trees, random use of agrochemical, and others including flood and natural clematis. The habitat of wildlife destroys day by day in a slow motion. Long term monitoring is necessary to come to conclusion.

**Table 28: Comparison of Vertebrate Wildlife of Hail Haor and Turag-Banshi Site for Baseline and 1<sup>st</sup> Impact year**

Organism	Hail Haor						Turag-Bangshi						Cumulative	
	Dry		Wet		Cumulative		Dry		Wet		Cumulative		(Both site)	
	Imp	Base	Imp	Base	Imp	Base	Imp	Base	Imp	Base	Imp	Base	Imp	Base
Amphibian	5	5	5	5	5	5	5	5	5	6	5	6	5	6
Reptile	19	18	17	17	19	20	16	14	15	16	16	16	19	20
Avis	112	57	96	88	112	119	89	83	77	72	96	102	120	139
Mammal	22	17	22	19	23	21	18	14	17	16	19	20	25	24
<b>Total</b>	<b>158</b>	<b>97</b>	<b>140</b>	<b>129</b>	<b>159</b>	<b>165</b>	<b>128</b>	<b>116</b>	<b>114</b>	<b>110</b>	<b>136</b>	<b>144</b>	<b>169</b>	<b>189</b>

Note: Imp = Impact Year, Base = Baseline situation

**Table 29: List of Wildlife Species Observed During Baseline Survey but not Observed During the Impact Study in Both Hail Haor and Turag-Banshi Site**

Common Name	Scientific Name	Common Name	Scientific Name
<b>Amphibian</b>		<b>Avis</b>	
1. Ornate Microhylid	<i>Microhyla ornata</i>	24. Plain Prinia	<i>Prinia inornata</i>
<b>Reptile</b>		25. Scally-breasted Munia	<i>Lonchura punctulata</i>
1. Brown Roofed Turtle	<i>Kachuga smithii</i>	26. Spotted Red Shank	<i>Tringa erythropus</i>
2. Peacock Softshell Turtle	<i>Aspideretes hurum</i>	27. Striated Prinia	<i>Prinia criniger</i>
<b>Avis</b>		28. Temmink's Stint	<i>Calidris temminkli</i>
1. Bank Myna	<i>Acridotheres ginginianus</i>	29. White Wagtail	<i>Motacilla alba</i>
2. Chestnut-headed Bee-eater	<i>Merops leschenaulti</i>	30. White-browed Wagtail	<i>Motacilla maderaspatensis</i>
3. Citrine Wagtail	<i>Motacilla citriola</i>	31. Wire-tailed Swallow	<i>Hirundo smithii</i>
4. Clamorous Reed-warbler	<i>Aerocephalus stentorius</i>	32. Wood Sandpiper	<i>Tringa glareola</i>
5. Common Snipe	<i>Gallinago gallinago</i>	33. Wryneck	<i>Jynx torquilla</i>
6. Common Stone-chat	<i>Sexicola torquata</i>	34. Yellow Wagtail	<i>Motacilla flava</i>
7. Common Wood shrike	<i>Tephrodornis pondicerianus</i>	35. Yellow-breasted Bunting	<i>Emberiza aureola</i>
8. Dasky Warbler	<i>Phylloscopus fuscatus</i>	36. Zitting Cisticola	<i>Cisticola juncidis</i>
9. Great Egret	<i>Egretta alba</i>	37. Eastern Marsh Harrier	<i>Circus spilonotus</i>
10. Green Sandpiper	<i>Tringa ochropus</i>	38. Rufos Turtle Dove	<i>Streptopelia orientalis</i>
11. Grey Heron	<i>Ardea cinerea</i>	39. Shikra	<i>Accipiter bedius</i>
12. Indian Black-headed Munia	<i>Lonchura malacca</i>	<b>Mammals</b>	
13. Indian Cuckoo	<i>Cuculus micropterus</i>	1. False Vampire	<i>Megaderma lyra</i>
14. Jungle Nightjar	<i>Caprimulgus indicus</i>	2. Mole Rat	<i>Bandicota bengalensis</i>
15. Kestrel	<i>Falco tinnunculus</i>		
16. Large Hawk Cuckoo	<i>Hierococcyx sparveriioides</i>		
17. Lesser Spotted Eagle	<i>Aquila pomparina</i>		
18. Long-tailed Nightjar	<i>Caprimulgus macrurus</i>		
19. Marsh Sandpiper	<i>Tringa stagnatilis</i>		
20. Pacific Golden Plover	<i>Pluvialis fulva</i>		
21. Pied Harrier	<i>Circus melanoleucos</i>		
22. Pintail Snipe	<i>Gallinago stenura</i>		
23. Plain Martin	<i>Riparia paludicola</i>		

**Table 30: Wildlife Species Recorded During Impact but not Baseline in Both Hail Haor and Turag-Banshi Site**

Sl no	Common Name	Scientific Name
<b>Reptile</b>		
1.	Stripped Keelback	<i>Amphiesma stolata</i>
<b>Avis</b>		
1.	Asian Bared Owlet	<i>Glancidium cuculoides</i>
2.	Black-winged Stilt	<i>Himantopus himantopus</i>
3.	Greater Racket-tailed Drongo	<i>Dicrurus paradiseus</i>
4.	Grey Drongo	<i>Dicrurus leucophaeus</i>
5.	Grey-headed Lapwing	<i>Vanellus cinerius</i>
6.	Large Cuckoo Shrike	<b>Coracina macei</b>
7.	Little Bittern	<i>Ixobrychus minutus</i>
8.	Pheasant-tailed Jacana	<i>Hydrophasianus chirurgus</i>
9.	Pied Wagtail	<i>Motacilla alba</i>
10.	Red Jungle Fowl	<i>Gallus gallus</i>
11.	Red-vented Flycatcher	<i>Ficedula parva</i>
12.	Rofous Woodpecker	<i>Micropternus brachyurus</i>
13.	Rosy Minivet	<i>Pericrocotus roseus</i>
14.	Scarlet Minivet	<i>Pericrocotus flammeus</i>
15.	Water Cock	<i>Gallierex cineria</i>
16.	Water Rail	<i>Rallus aquaticus</i>
17.	Oriental Pied Hornbill	<i>Anthracoceros albirostris</i>
18.	Fantail Snipe	<i>Gallinago gallinago</i>
19.	Golden fronted Leaf Bird	<i>Chloropsis aurifrons</i>
20.	Greater Painted Snipe	<i>Rostratula bengalensis</i>
21.	Eastern Golden Plover	<i>Pulvialis dominica</i>
<b>Mammal</b>		
1.	Barking Deer	<i>Muntiacus muntjak</i>
2.	Capped Langur	<i>Trachypithecus pileatus</i>
3.	Indian Pangolin	<i>Manis crassicaudata</i>

### 3.2 Threatened Species

A total of 23 species of threatened non-fish vertebrate species were identified at the sites as shown in Table 31. These included critically endangered (CR), endangered (EN) and vulnerable species as 2, 12 and 9 respectively. During the baseline study it was 26 species where critically endangered (CR), endangered (EN) and vulnerable species was 2, 13 and 11 respectively.

The endangered species, Asian Tortoise (*Kachuga smithi*) was found in Hail Haor site during the baseline which was not found during the impact study. Again Ornate Microhylid (*Microhyla ornata*) found in Turag-Bangshi and Asiatic Jackal (*Canis aureus*) found in both Turag-Banshi and Hail Haor site both vulnerable species was not recorded during the impact study.

Table 31: Threatened Wildlife Species Identified at MACH Sites

Common English Name	Scientific Name	Hail Haor Site	Turag-Bangshi Site	Status
<b>Birds</b>				
1. Oriental Pied Hornbill	<i>Antheracoceros albirostris</i>	Y	-	EN
2. Brown fish owl	<i>Bubo zeylonensis</i>	Y	-	EN
<b>Reptilia</b>				
1. Common Vine Snake	<i>Ahaetulla nasutus</i>	Y	Y	VU
2. Banded Krait	<i>Bungarus fasciatus</i>	Y	Y	EN
3. Wall Lizard	<i>Gekko gekko</i>	Y	Y	VU
4. Brahminy Terrapin	<i>Hardella thurgi</i>	Y	Y	EN
5. Asian Tortoise	<i>Kachuga smithi</i>	Y	-	EN
6. Monocellate Cobra	<i>Naja kaouthia</i>	Y	Y	VU
7. Binocellate Cobra	<i>Naja naja</i>	Y	Y	EN
8. Rat Snake	<i>Ptyas mucosus</i>	Y	Y	VU
9. Rock python	<i>Python molurus</i>	Y	-	EN
10. Bengal Lizard	<i>Varanus bengalensis</i>	Y	Y	VU
<b>Mammalians</b>				
1. Asiatic Jackal	<i>Canis aureus</i>	Y	Y	VU
2. Fishing Cat	<i>Felis viverrina</i>	Y	-	EN
3. Common Mongoose	<i>Herpestes edwardsi</i>	Y	Y	VU
4. Hoolock Gibbon	<i>Hylobates hoolock</i>	Y	-	CR
5. Porcupine	<i>Hystrix indica</i>	Y	Y	EN
6. Rufoustailed Hare	<i>Lepus nigricollis</i>	Y	Y	EN
7. Common Otter	<i>Lutra lutra</i>	Y	Y	CR
8. Rhesus Macaque	<i>Macaca mulata</i>	Y	-	VU
9. Freshwater Dolphin	<i>Platanista gangetica</i>	-	Y	EN
10. Large Civet	<i>Viverra zibetha</i>	Y	Y	EN
11. Small Civet	<i>Viverricula indica</i>	Y	Y	VU
12. Bengal fox	<i>Vulpes bengalensis</i>	Y	Y	VU
13. Capped Langur	<i>Trachypithecus pileatus</i>	Y	-	VU

Note: Y= Present

Section D  
Vegetation

## 1. Introduction

The MACH project is being implementing the activity set to reach the goal of the project, which is "to promote ecologically sound management of floodplain resources for the sustainable supply of food to the poor of Bangladesh". The project has reached its 3<sup>rd</sup> year and by this time the project activities that is being implemented including the physical and management interventions is expected to bring a positive changes in the vegetation status in the area. In order to monitor the changes success of indicators has already been selected and accordingly a baseline has been established on the selected parameters.

This section of the report concentrates on the vegetation status in Hail Haor and Turag-Bangshi sites of the MACH project. And shall present the findings -regarding the vegetation parameters during the 1<sup>st</sup> year of impact of the project and at the same time draws a comparison with the baseline situation.

Data used for this report has been collected during the wet season and dry season surveys for the vegetation in Turag-Bangshi site and Hail Haor site. Wet season surveys have been conducted during 4 to 10 August' 2001 in Turag-Bangshi site and during 19 to 29 August'2001 in Hail Haor site. Dry season surveys have been conducted during 20 to 24 February 2001 and 1 to 13 March 2001 in Turag-Bangshi site and Hail Haor site respectively.

## 2. Methodology

Same methodology as in case of baseline study was followed for impact assessment. Data was collected by direct field observation and by interviews with the local people. Quadratic qualitative (for aquatic vegetation) and quadratic quantitative (for terrestrial vegetation) methods were also used in this survey. After visiting the field, transects were drawn based on vegetation diversity, occurrence and habitat types. The vegetation was studied in the varying sized quadrates. For the aquatic and terrestrial vegetation study 2m<sup>2</sup> and 4m<sup>2</sup> quadrates from each transect were examined. For aquatic vegetation, type, habitat, cover and use were examined while for terrestrial vegetation, density, frequency, abundance, relative density, relative frequency, relative abundance and important value index were studied.

## 3. Findings

### 3.1 Hail Haor Site

#### 3.1.1 Aquatic Vegetation Status

A total of 82 hydrophyte species under 34 families were observed during the dry season of 1<sup>st</sup> impact year survey (Table 32). While during the dry season of the baseline it was 84.

During the wet season of 1<sup>st</sup> impact year survey a total of 91 species of aquatic vegetation under 35 families were observed in Hail Haor (Appendix 25). While during the wet season of the baseline year it was 86.

**Table 32: Types of Vegetation Observed in Hail Haor During First Year Impact Study.**

Sl no	Types of Vegetation	Season	
		Dry	Wet
1	Free floating	3	5
2	Submerged	10	15
3	Emergent	32	31
4	Marginal	24	25
5	Floating leaved	13	15
<b>Total species observed</b>		<b>82</b>	<b>91</b>

A cumulative total of 94 hydrophyte species was observed in Hail Haor through out the 1<sup>st</sup> impact year which was 106 (in the baseline report mentioned 107 because of duplication in entry for one species) during baseline. It is revealed that through out the year of impact 12 species were less observed compared

to the baseline situation. A total of 28 hydrophyte species were not observed during the 1<sup>st</sup> impact year which was observed and recorded during the baseline situation (Table 33).

**Table 33: List of Hydrophytes Observed During the Baseline but not During the First Impact Year Survey in Hail Haor**

Sl no	Local Name	Scientific Name	Family	Use
<b>Submerged</b>				
1.	Boitha pata	<i>Aponogeton sp</i>	Aponogetonaceae	OT
2.	Shaola	<i>Myriophyllum sp</i>	Myriophyllaceae	OT
3.	Gang kola	<i>Ottelia sp</i>	Hydrocharitaceae	FS
4.	Jai	<i>Utricularia inflexa</i>	Lentibulariaceae	OT
5.	Khai shaola	<i>Utricularia sp</i>	Lentibulariaceae	OT
<b>Emergent</b>				
6.	Panichapra	<i>Eleusine indica</i>	Gramineae	FP
7.	Boro chesra	<i>Eriocaulon acutangula</i>	Cyperaceae	OT
8.	Ghash	<i>Lindernia sp</i>	Scrophulariaceae	OT
9.	Khagra	<i>Phragmites karka</i>	Gramineae	FB
10.	Chitki	<i>Phyllanthus sp</i>	Euphorbiaceae	OT
11.	Pani khechur	<i>Sagittaria guyanensis</i>	Alismataceae	OT
<b>Floating leaved</b>				
12.	Pani aga	<i>Ludwigia adscendens</i>	Onagraceae	OT
13.	Sapla	<i>Nymphaea pubescens</i>	Nymphaeaceae	OR
14.	Zinari gach	<i>Nymphoides cristatum</i>	Menyanthaceae	OR
<b>Marginal</b>				
15.	Ghash	<i>Axonopus compressur</i>	Gramineae	FP
16.	Phul ghash	<i>Cyperus rotundus</i>	Cyperaceae	FP
17.	Ghash	<i>Desmodium sp</i>	Gramineae	FP
18.	Ghash	<i>Echinochloa stagnina</i>	Gramineae	FP
19.	Helencha	<i>Eclipta prostata</i>	Compositae	OT
20.	Kella ghash	<i>Eclipta sp</i>	Compositae	OT
21.	Ghash	<i>Elatine sp</i>	Elatinaceae	OT
22.	Helencha	<i>Enhydra sp</i>	Compositae	OT
23.	Ghash	<i>Fimbristylis scaberrima</i>	Cyperaceae	FP
24.	Ghash	<i>Fimbristylis sp</i>	Cyperaceae	FP
25.	Ghash	<i>Rottboelia sp</i>	Gramineae	FP
26.	Ghash	<i>Sacciolepis interrupta</i>	Gramineae	FP
27.	Phul ghash	<i>Sporobolus airroides</i>	Gramineae	FP
28.	Phul ghash	<i>Sporobolus holvulus</i>	Gramineae	FP

Note: OT= Other use, FS= Food (Starch/Cereal), FP= Feed plant/Forage, FB= Fibre/Thatching/Wickerwork, OR= ornamental/Hedge.

On the other hand 16 new species was observed and recorded during the 1<sup>st</sup> impact year, which were not found during the baseline year (Table 34). The occurrence of the hydrophytes like other aquatic organisms depends on various factors including the hydrological regime especially for the grasses and others if the water dries up only then they bloom. On the other hand there could be other external factors like agriculture cropping in the dried land could limit the occurrence of some hydrophytes which might come back if that piece of land is not cultivated in the coming year. The another reason could be dominance of certain species that might inhibit the occurrence of other species. The occurrence of the

hydrophytes could also varies over the years naturally. Time series data including the abundance will be used to find the trend of the occurrence of the species.

**Table 34: List of Hydrophytes Observed During the Impact Year but not During the Baseline Survey in Hail Haor**

Sl no	Local Name	Scientific Name	Family	Use
<b>Submerged</b>				
1.	Pani chapra	<i>Limnophila indica</i>	Scrophulariaceae	OT
2.	Pata shaola	<i>Potamogeton</i> sp	Potamogetonaceae	OT
<b>Emergent</b>				
3.	Hijal	<i>Barringtonia acutangula</i>	Lecythidaceae	TS
4.	Bet	<i>Calamus rotang</i>	Palmae	FB
5.	Phul ghash	<i>Cyperus cephalotes</i>	Cyperaceae	FP
6.	Borun	<i>Crataeva nurvala</i>	Capparidaceae	Tree
7.	Pani goicha	<i>Cyanotis aristata</i>	Commelinaceae	OT
8.	Phul ghash	<i>Launaea asplefolia</i>	Compositae	OT
9.	Karoch	<i>Pongamia pinnata</i>	Leguminosae	TS
10.	Ikr	<i>Scheuchzeria palustris</i>	Gramineae	FB
<b>Floating leaved</b>				
11.	Zinari gach	<i>Nymphaea aurantiifolia</i>	Nymphaeaceae	OT
<b>Marginal</b>				
12.	Boro hatsure	<i>Acalypha hispida</i>	Euphorbiaceae	M
13.	Kanta gach	<i>Amaranthus viridis</i>	Amaranthaceae	FV
14.	Phul ghash	<i>Eragrostis unioloides</i>	Gramineae	FP
15.	Chockphuta	<i>Helianthus tuberosus</i>	Compositae	OT
16.	Ghash	<i>Oldenlandia brachypoda</i>	Rubiaceae	OT

**Table 35: List of Terrestrial Plant Species Observed During the Baseline but not During the First Impact Year Survey in Hail Haor**

Sl no	Local Name	Scientific Name	Family
<b>Shrubs</b>			
1.	Patabahar	<i>Acalypha welkesiana</i>	Euphorbiaceae
2.	Boncarpus	<i>Hibiscus vitifolius</i>	Malvaceae
3.	Tokma	<i>Hyptis suaveolens</i>	Labiatae
4.	Kamini	<i>Murraya paniculata</i>	Rutaceae
5.	Jorgunda	<i>Xanthium indicum</i>	Compositae
<b>Shrubs like</b>			
6.	Akh	<i>Saccharum officinarum</i>	Gramineae
<b>Tree</b>			
7.	Sada shirish	<i>Albizia lebeck</i>	Leguminosae
8.	Koroi	<i>Albizia sp</i>	Leguminosae

### 3.1.2 Terrestrial Vegetation Status

A total of 119 of terrestrial plants species under 43 families were observed during the dry season of 1<sup>st</sup> impact year survey (Appendix 28). While during the dry season of the baseline it was 111. A total of 128 species of terrestrial plants under 43 families were observed during wet season. A total of 130 species of

terrestrial plants under 45 family observed at Hail Haor all over the year (Appendix 26). While during base line a total of 55 species was observed. It is noted here that during the baseline the Lawachhara forest was not included under the survey and included later on to accommodate the project policy of incorporating the over all watershed. A total of 56 new species were observed (Appendix 27) in the extended part of the transect 3 i.e. Lawachhara forest. in addition to the common species found elsewhere Hence the baseline species should be considered to 111 (55 observed during baseline plus 56 observed in the lawachhara) There are 8 species observed during baseline was not observed during impact (Table 35). Again there are 27 species which was not observed during baseline but during impact.

**Table 36: List of Terrestrial Plant Species Observed During the Impact Year but not During the Baseline Survey in Hail Haor**

SI no	Local Name	Scientific Name	Family
<b>Shrubs</b>			
1.	Bonjui	<i>Clerodendrum viscosum</i>	Verbenaceae
2.	Sthalpadma	<i>Hibiscus mutabilis</i>	Malvaceae
3.	Korobi	<i>Sarchochlamys pulcherrima</i>	Urticaceae
4.	Tagor	<i>Tabernaemontana divaricata</i>	Apocynaceae
5.	Mendi	<i>Lawsonia inermis</i>	Lythraceae
<b>Small tree</b>			
6.	Kamranga	<i>Averrhoa carambola</i>	Averrhoaceae
7.	Tomal	<i>Diospyros cordifolia</i>	Ebenaceae
8.	Gab	<i>Diospyros peregrina</i>	Ebenaceae
9.	Bokul	<i>Mimosops elengi</i>	Sapotaceae
10.	Aurboroi	<i>Phyllanthus acidus</i>	Euphorbiaceae
11.	Dalim	<i>Punica granatum</i>	Punicaceae
<b>Tree</b>			
12.	Root chambol	<i>Albizia sp</i>	Leguminosae
13.	Agor	<i>Aquilaria agallocha</i>	Thymeliaceae
14.	Bandorlathi	<i>Cassia fistula</i>	Leguminosae
15.	Tali koro	<i>Cassia occidentalis</i>	Leguminosae
16.	Chickrassi	<i>Chickrassia tabularis</i>	Meliaceae
17.	Harish	<i>Derris robusta</i>	Leguminosae
18.	Teli gorjon	<i>Dipterocarpus turbinatus</i>	Dipterocarpaceae
19.	Jolpai	<i>Elaeocarpus robustus</i>	Elaeocarpaceae
20.	Mandar	<i>Erythrina indica</i>	Leguminosae
21.	Panijum	<i>Eugenia formosa</i>	Myrtaceae
22.	Zogadumur	<i>Ficus glamerata</i>	Moraceae
23.	Telsure	<i>Hopea odorata</i>	Dipterocarpaceae
24.	Katgolap	<i>Plumeria acutifolia</i>	Apocynaceae
25.	Rokto chandon	<i>Pterocarpus santalinus</i>	Leguminosae
26.	Junglijum	<i>Syzygium waltichii</i>	Myrtaceae
27.	Lohakath	<i>Xylia dolabiformis</i>	Leguminosae

Total 19 species were found increased during 1<sup>st</sup> year impact survey out of which 9 species was introduced by MACH project and 10 species naturally grown up.

**Planted 9 species were**

1. Root Chambal (*Albizia Spp.*)
2. Agor (*Aquilaria agallocha*)
3. Kamranga (*Averrhoa carambola*)
4. Chickrashi (*Chickrassia tabularis*)
5. Teli gorjon (*Dipterocarpus turbinatus*)
6. Jolpai (*Elaeocarpus robustus*)
7. Telsure (*Hopea odorata*)
8. Rokto chandon (*Pterocarpus santalinus*)
9. Lohakath (*Xylia dola biformis*)

### 3.2 Turag-Bangshi Site

#### 3.2.1 Aquatic Vegetation Status

A total of 31 species (Table 37) of aquatic vegetation under 19 families were observed in the dry season during the 1st year of impact period. While during the wet season survey a total of 41 species of aquatic vegetation under 23 families were observed.

A total of 48 species (Appendix 28) of aquatic vegetation observed at Turag-Bangshi site all over the year while during baseline it was 52. There are

**Table 37: Types of Vegetation Observed in Turag-Bangshi During First Impact Year Survey.**

Sl no	Types of Vegetation	Season	
		Dry	Wet
1.	Free Floating	5	4
2.	Submerged	7	11
3.	Emergent	8	10
4.	Marginal	5	5
5.	Floating leaved	6	11
<b>Total Species Observed</b>		<b>31</b>	<b>41</b>

**Table 38: List of Hydrophytes Observed During the Baseline but not During the First Impact Year Survey in Turag Bangshi**

Sl no	Local Name	Scientific Name	Family	Use
<b>Submerged</b>				
1.	Ichadurki	<i>Ceratophyllum demersum</i>	Ceratophyllaceae	OT
2.	Ichadurki	<i>Chara sp</i>	Characeae	OT
3.	Shaola	<i>Dopartium junceum</i>	Polygonaceae	OT
4.	Ichadurki	<i>Najas sp</i>	Najadaceae	OT
<b>Emergent</b>				
5.	Dal ghash	<i>Echinochloa sp</i>	Gramineae	FP
6.	Gach shaola	<i>Limnophylla heterophylla</i>	Scrophulariaceae	OT
7.	Ghash	<i>Limnopoia meeboldii</i>	Gramineae	FP
8.	Shaola	<i>Monochoria chorchorifolia</i>	Sterculiaceae	OT
9.	Khagra	<i>Phragmites karka</i>	Gramineae	FB
10.	Pani kochu	<i>Sagittaria sagittifolia</i>	Alismataceae	OT
11.	Boronol	<i>Saccharum sp</i>	Gramineae	FB
<b>Floating leaved</b>				
12.	Sapla	<i>Nymphaea pubescens</i>	Nymphaeaceae	OR
13.	Kastal gach	<i>Nymphoides cristatum</i>	Menyanthaceae	OR
14.	Ichadurki	<i>Potamogeton octandus</i>	Potamogetonaceae	OT
<b>Marginal</b>				
15.	Phul ghash	<i>Cyperus cephalotes</i>	Cyperaceae	FP
16.	Vadal ghash	<i>Cyperus difformis-</i>	Cyperaceae	FP
17.	Ghash	<i>Echinochloa crusgalli</i>	Gramineae	FP
18.	Ghash	<i>Echinochloa stagnina</i>	Gramineae	FP
19.	Kaishha	<i>Saccharum spontaneum</i>	Gramineae	FB

**Table 39: List of Hydrophytes Observed During the 1<sup>st</sup> Impact Year but not During the Baseline Survey in Turag Bangshi**

Sl no	Local Name	Scientific Name	Family	Use
<b>Submerged</b>				
1.	Ichadurki	<i>Utricularia aurea</i>	Lentibulariaceae	OT
<b>Emergent</b>				
2.	Helanchi	<i>Alternanthera philoxeroides</i>	Amaranthaceae	FV
3.	Paddy	<i>Oryza sp</i>	Gramineae	FS
4.	Tagoi	<i>Sagittaria guyanensis</i>	Alismataceae	OT
<b>Floating leaved</b>				
5.	Makna	<i>Eurale ferox</i>	Nymphaeaceae	FS
6.	Amboli	<i>Merselia minuta</i>	Merseliaceae	OT
7.	Rokto Sapla	<i>Nymphaea rubra</i>	Nymphaeaceae	OR
<b>Free floating</b>				
8.	Pana	<i>Wolffia arrhyza</i>	Limnaceae	OT
<b>Marginal</b>				
9.	Vadal ghash	<i>Cyperus rotang</i>	Cyperaceae	FP
10.	Helanchi	<i>Enhydra sp</i>	Compositae	FV
11.	Bish kantali	<i>Polygonum glabrum</i>	Polygonaceae	OT
12.	Bish kantali	<i>Polygonum lamatum</i>	Polygonaceae	OT
13.	Bish kantali	<i>Polygonum tomentosum</i>	Polygonaceae	OT
14.	Benna	<i>Vetiveria zizanioides</i>	Gramineae	FB
15.	Dura	<i>Cynodon sp</i>	Gramineae	FP
16.	Bish kantali	<i>Polygonum ocreocarpa</i>	Polygonaceae	OT

### 3.2.2 Terrestrial Vegetation Status

A total of 103 species of terrestrial plants under 36 families were observed during dry season.

During the wet season survey a total of 99 species of terrestrial plants under 35 families were observed.

A total of 107 species of terrestrial plants under 35 family observed at Turag-Bangshi all over the year (Appendix 29).

During baseline it was 62 (Mentioned 63 in the baseline by making a duplicate entry for one species). It is noted here that the Sal forest was not included during the baseline survey. Transect 1 has been extended to cover the Sal forest after the baseline. In the Sal Forest a total of 21 species in addition to the common species found elsewhere were observed and recorded (Appendix 30) The baseline species number should therefore be at 83 (62 original and 21 species observed in the Sal forest). There are 4 species observed during the baseline was not observed during the impact year (Table 40). Again there are 28 new species recorded during the impact year which was not observed during the baseline (Table 41).

**Table 40: List of Terrestrial Plant Species Observed During the Baseline but not During the First Impact Year Survey in Turag Bangshi**

Sl no	Local Name	Scientific Name	Family
<b>Shrubs</b>			
1.	Aurhor	<i>Cajanus cajan</i>	Leguminosae
2.	Patibet	<i>Clinogyne dichotoma</i>	Maranthaceae
3.	Chaa	<i>Thea sinensis</i>	Theaceae
<b>Tree</b>			
4.	Koroi	<i>Albizia sp</i>	Leguminosae

**Table 41: List of Terrestrial Plant Species Observed During the 1<sup>st</sup> Impact Year but not During the Baseline Survey in Turag Bangshi**

Sl no	Local Name	Scientific Name	Family
<b>Shrubs</b>			
1.	Sada akond	<i>Calotropis procera</i>	Solanaceae
2.	Jhonjhoni	<i>Crotalaria saltiana</i>	Leguminosae
3.	Dhutra	<i>Datura metel</i>	Solanaceae
4.	Nol khagra	<i>Phragmites karka</i>	Gramineae
5.	Chitki	<i>Phyllanthus reticulata</i>	Euphorbiaceae
6.	Korobi	<i>Sarcochlamys pulcherrima</i>	Urticaceae
<b>Shrubs like</b>			
7.	Gendari	<i>Saccharum officinarum</i>	Gramineae
<b>Treelike</b>			
8.	Borua bansh	<i>Bambusa balcoa</i>	Gramineae
9.	Rengun bansh	<i>Dendrocalamus strictus</i>	Gramineae
10.	Nalibansh	<i>Melocanna bacifera</i>	Gramineae
<b>Small tree</b>			
11.	Tut	<i>Morus indica</i>	Moraceae
<b>Tree</b>			
12.	Pitraj	<i>Aphanamixis polystachya</i>	Meliaceae
13.	Bilati semul	<i>Ceiba pentandra</i>	Bombacaceae
14.	Tejpata	<i>Cinnamomum tamala</i>	Lauraceae
15.	Daruchini	<i>Cinnamomum zealanicum</i>	Lauraceae
16.	Sishu	<i>Dalbergia sissoo</i>	Leguminosae
17.	Rongi	<i>Dysoxylum binectiferum</i>	Meliaceae
18.	Mandar	<i>Erythrina indica</i>	Leguminosae
19.	Zogadumur	<i>Ficus racemosa</i>	Moraceae
20.	Auchin brikka	<i>Ficus sp</i>	Moraceae
21.	Jarul	<i>Lagerstromia pervifolia</i>	Lythraceae
22.	Rajaphal	<i>Nephedium longana</i>	Sapindaceae
23.	Katgolap	<i>Plumeria aquatifolia</i>	Apocynaceae
24.	Piralu	<i>Randia uliginosa</i>	Rubiaceae
25.	Amra	<i>Spondius pinnata</i>	Anacardiaceae
26.	Arjun	<i>Terminalia arjuna</i>	Combretaceae
27.	Bohera	<i>Terminalia belerica</i>	Combretaceae
28.	Ziga	<i>Trema orientalis</i>	Ulmaceae

Total 24 species are increased during 1<sup>st</sup> year impact survey. Most of them were shrubs and naturally grown up. Local people planted few of them.

# Appendices



**Appendix 2****List of Observed Gears During First Impact Year at Hail Haor**

<b>Sl no.</b>	<b>Local Name</b>
1	<i>Veshal/Khara</i>
2	<i>Ber Jal</i>
3	<i>Thela Jal /Jali</i>
4	<i>Dharma Jal</i>
5	<i>Jhaki Jal</i>
6	<i>Current Jal</i>
7	<i>Koch</i>
8	<i>Tenta/Teora</i>
9	<i>Kathi Borshi</i>
10	<i>Guli/Ghuni/Chai</i>
11	<i>Hatuni</i>
12	<i>Dewatering</i>
13	<i>Bana/Bara</i>
14	<i>Daon Borshi/Longline</i>
15	<i>Suta Jal</i>
16	<i>Afa Jal</i>
17	<i>Faron</i>

## Appendix 3

## Average Commonly Fishing Efforts (observations/day) at Hail Haor (April'00 to March'01)

Months	Apr'00	May	June	July	Aug	Sept.	Oct.	Nov.	Dec.	Jan'01	Feb	March
<b>Jethua Beel</b>												
<i>Veshal/Khara</i>	0	0	0	0	1	3	0	0	0	0	0	0
<i>Ber Jal</i>	0	0	0	0	1	0	1	0	0	0	1	0
<i>Thela Jal</i>	0	2	1	0	0	0	1	1	0	1	1	0
<i>Current Jal</i>	0	5	21	0	12	59	24	40	1	1	3	0
<i>Guli/Guni</i>	0	0	0	0	0	0	0	27	19	0	0	0
<i>Suta Jal</i>	0	0	0	0	0	0	0	0	0	0	0	0
<b>Gopla river (Inside Hail Haor)</b>												
<i>Veshal/Khara</i>	10	3	0	0	0	0	9	0	2	9	9	3
<i>Ber Jal</i>	2	0	0	0	0	0	0	0	1	0	0	1
<i>Thela Jal</i>	2	0	0	0	0	0	0	0	0	2	5	0
<i>Current Jal</i>	6	0	0	0	0	0	0	15	0	1	16	39
<i>Guli/Guni</i>	0	0	0	0	0	0	10	4	0	0	0	0
<i>Suta Jal</i>	0	0	0	0	0	0	0	0	0	0	0	0
<b>Boulashir Floodplain</b>												
<i>Veshal/Khara</i>	0	2	0	0	0	0	0	0	0	0	0	0
<i>Ber Jal</i>		1	2	1	3	2	1	2	1	0	0	0
<i>Thela Jal</i>	1	2	2	1	0	2	1	1	0	1	0	0
<i>Current Jal</i>		14	30	15	48	13	33	106	50	14	176	18
<i>Guli/Guni</i>	132	85	8	31	0	170	105	274	114	276	512	328
<i>Suta Jal</i>	0	0	0	0	0	0	0	25	0	3	0	0
<b>Cheruadubi Beel</b>												
<i>Ber Jal</i>	1	0	0	0	0	1	0	0	0	0	0	0
<i>Thela Jal</i>	2	1	0	0	0	0	0	0	0	1	1	0
<i>Current Jal</i>	5	0	42	0	0	0	0	69	149	14	24	32
<i>Guli/Guni</i>	16	0	0	0	0	31	160	22	56	141	240	0
<i>Suta Jal</i>	0	0	0	0	0	0	0	20	0	4	0	0
<b>Shananda Beel</b>												
<i>Ber Jal</i>	0	0	0	0	3	2	0	0	1	0	0	0
<i>Thela Jal</i>	0	0	0	0	0	1	1	1	0	0	6	0
<i>Current Jal</i>	0	0	0	0	0	4	0	0	3	20	0	3
<i>Guli/Guni</i>	0	0	0	0	0	0	0	0	53	87	0	0
<i>Suta Jal</i>	0	0	0	0	0	0	0	0	2	0	0	0
<b>62- Beel</b>												
<i>Veshal/Khara</i>	0	0	1	0	1	0	0	0	0	0	0	0
<i>Ber Jal</i>	0	0	1	1	1	1	1	1	1	0	0	0
<i>Thela Jal</i>	0	1	1	0	0	1	1	1	1	1	0	0
<i>Current Jal</i>	0	1	3	1	4	18	12	26	9	5	0	0
<i>Guli/Guni/Chai</i>	0	1	0	0	0	0	0	0	7	15	0	0
<i>Suta Jal</i>	0	0	0	0	2	0	1	2	1	0	0	0

Continue.....

Months	Apr'00	May	June	July	Aug	Sept.	Oct.	Nov.	Dec.	Jan'01	Feb	March
<b>Rustampur</b>												
<i>Veshal/Khara</i>	0	0	0	0	0	0	0	1	1	0	0	0
<i>Ber Jal</i>	0	0	0	1	1	1	1	1	1	0	0	0
<i>Thela Jal</i>	0	0	0	1	1	1	1	1	0	0	0	0
<i>Current Jal</i>	0	1	2	10	0	3	3	6	11	4	0	0
<i>Guli/Guni/Chai</i>	43	4	0	0	0	6	10	8	8	111	0	0
<i>Suta Jal</i>	0	0	0	0	0	4	0	3	0	0	0	0
<b>Kazura Beel</b>												
<i>Ber Jal</i>	0	0	0	0	0	0	0	0	1	0	0	0
<i>Thela Jal</i>	0	0	0	0	1	0	0	0	0	0	0	0
<i>Current Jal</i>	0	0	0	25	9	13	10	24	22	4	0	0
<i>Guli/Guni/Chai</i>	0	0	0	0	0	0	0	0	0	9	0	0
<b>Agari Beel</b>												
<i>Thela Jal</i>	0	0	0	0	0	0	0	5	6	10	0	0
<i>Current Jal</i>	0	0	0	0	0	0	0	10	18	0	0	0
<b>Balla Beel</b>												
<i>Ber Jal</i>	0	1	0	0	0	0	0	1	1	0	0	0
<i>Thela Jal</i>	1	0	0	0	0	0	0	1	1	0	0	0
<i>Current Jal</i>	10	0	0	0	0	0	0	179	78	23	1	0
<i>Guli/Guni/Chai</i>	0	0	0	0	0	0	0	12	12	166	64	225
<i>Suta Jal</i>	0	0	0	0	0	0	0	5	20	0	0	0

## Appendix 4

## Average Fishing Hours of Major Gear by Month, Season and Habitat in Hail Haor Site

Season	Month	Thela jal	Veshal jal	Current jal	Ber jal	Guli/Ghuni jal	Suta jal
<b>Beel</b>							
	Apr-00	7.75	0	13.33	8.50	14.00	0
	May-00	4.70	0	10.50	7.00	0	0
	June-00	9.25	0	5.75	9.00	0	0
<b>Pre-Monsoon</b>		<b>7.04</b>	<b>0</b>	<b>8.68</b>	<b>8.25</b>	<b>14.00</b>	<b>0</b>
	Jul-00	7.00	0	14.00	9.75	0	0
	Aug-00	0	0	0	8.33	0	0
	Sep-00	0	0	0	3.83	23.63	0
<b>Monsoon</b>		<b>7.00</b>	<b>0</b>	<b>14.00</b>	<b>7.45</b>	<b>23.63</b>	<b>0</b>
	Oct-00	8.50	14.00	14.50	4.97	24.04	0
	Nov-00	0	0	14.84	3.43	21.25	19.31
	Dec-00	0	17.00	17.89	4.00	16.13	16.00
<b>Post Monsoon</b>		<b>8.50</b>	<b>17.00</b>	<b>16.05</b>	<b>4.33</b>	<b>21.54</b>	<b>18.65</b>
	Jan-01	3.08	0	19.06	0	20.97	24.00
	Feb-01	3.11	0	7.89	2.50	24.00	0
	Mar-01	0	0	7.54	0	0	0
<b>Dry</b>		<b>3.10</b>	<b>0</b>	<b>14.09</b>	<b>2.50</b>	<b>21.14</b>	<b>24.00</b>
<b>Floodplain</b>							
	Apr-00	1.75	0	0	0	11.09	0
	May-00	6.20	0	8.80	8.00	11.41	0
	Jun-00	4.45	9.88	9.32	5.83	9.50	0
<b>Pre-Monsoon</b>		<b>5.38</b>	<b>0</b>	<b>9.13</b>	<b>6.65</b>	<b>11.15</b>	<b>0</b>
	Jul-00	6.25	12.38	7.86	9.70	7.50	0
	Aug-00	5.81	13.00	9.33	7.81	0	19.50
	Sep-00	5.37	15.40	9.09	4.32	22.13	24.00
<b>Monsoon</b>		<b>5.63</b>	<b>0</b>	<b>8.95</b>	<b>6.19</b>	<b>20.41</b>	<b>22.50</b>
	Oct-00	4.13	0	9.78	2.65	22.57	11.00
	Nov-00	3.80	14.00	13.49	3.58	20.59	15.67
	Dec-00	2.50	0	13.45	2.83	17.82	15.50
<b>Post Monsoon</b>		<b>3.41</b>	<b>14.00</b>	<b>12.11</b>	<b>3.19</b>	<b>19.88</b>	<b>15.04</b>
	Jan-01	3.21	0	14.39	0	16.54	16.00
	Feb-01	0	0	12.50	0	23.83	0
	Mar-01	0	0	7.58	0	19.92	0
<b>Dry</b>		<b>3.21</b>	<b>0</b>	<b>13.01</b>	<b>0</b>	<b>19.57</b>	<b>16.00</b>
<b>River</b>							
	Apr-00	8.17	18.34	13.00	7.25	0	0
	May-00	0	16.00	0	0	0	0
<b>Pre-Monsoon</b>		<b>8.17</b>	<b>18.34</b>	<b>13.00</b>	<b>7.25</b>	<b>0</b>	<b>0</b>
	Oct-00	0	13.00	0	0	24.00	0
	Nov-00	0	0	22.75	0	19.75	0
	Dec-00	0	9.63	0	6.00	0	0
<b>Post Monsoon</b>		<b>0</b>	<b>9.63</b>	<b>22.75</b>	<b>6.00</b>	<b>21.88</b>	<b>0</b>
	Jan-01	5.69	21.39	7.00	0	0	0
	Feb-01	5.78	16.61	8.83	0	0	0
	Mar-01	0	16.00	8.22	6.00	0	0
<b>Dry</b>		<b>5.74</b>	<b>18.57</b>	<b>8.31</b>	<b>6.00</b>	<b>0</b>	<b>0</b>

**Appendix 5**  
**CPUE of Most Commonly Used Gears at Hail Haor (April'00 – March'01)**

Season	Month	<i>Thela jal</i>	<i>Veshal jal</i>	<i>Current jal</i>	<i>Ber jal</i>	<i>Guli/Ghuni</i>	<i>Suta jal</i>
<b>Beel</b>							
	Apr-00	1.64	0.18	0.06	59.65	-	-
	May-00	0.63	-	0.16	4.64	-	-
	June-00	1.34	-	0.06	33.79	-	-
	<b>Pre-Monsoon</b>	<b>1.16</b>		<b>0.11</b>	<b>39.43</b>	<b>0.06</b>	-
	Jul-00	13.44	-	0.08	5.24	-	-
	Aug-00	-	-	-	16.35	-	-
	Sep-00	-	-	-	7.06	0.15	-
	<b>Monsoon</b>	<b>13.44</b>	-	<b>0.08</b>	<b>10.52</b>	<b>0.15</b>	-
	Oct-00	2.13	-	0.04	12.18	0.14	-
	Nov-00	-	-	0.09	6.72	0.06	0.21
	Dec-00	-	23.17	0.19	12.19	0.22	0.56
	<b>Post Monsoon</b>	<b>2.13</b>	<b>23.17</b>	<b>0.13</b>	<b>10.13</b>	<b>0.14</b>	<b>0.24</b>
	Jan-01	0.77	-	0.32	-	0.13	0.45
	Feb-01	1.68	-	0.24	5.11	0.29	-
	Mar-01	-	-	0.14	-	-	-
	<b>Dry</b>	<b>1.30</b>	-	<b>0.28</b>	<b>5.11</b>	<b>0.16</b>	<b>0.44</b>
<b>Floodplain</b>							
	Apr-00	0.18	-	-	-	0.07	-
	May-00	2.31	-	0.12	0.05	2.55	-
	Jun-00	1.73	2.95	0.14	11.50	0.07	-
	<b>Pre-Monsoon</b>	<b>2.00</b>	-	<b>0.13</b>	<b>8.14</b>	<b>0.06</b>	-
	Jul-00	2.47	3.66	0.08	18.13	0.10	-
	Aug-00	1.41	2.73	0.21	20.82	-	0.22
	Sep-00	1.63	3.03	0.20	7.17	0.13	0.22
	<b>Monsoon</b>	<b>1.73</b>	-	<b>0.19</b>	<b>13.43</b>	<b>0.13</b>	<b>0.22</b>
	Oct-00	0.50	-	0.18	9.65	0.06	0.24
	Nov-00	1.32	20.95	0.12	7.46	0.05	0.18
	Dec-00	1.78	-	0.12	9.62	0.13	0.08
	<b>Post Monsoon</b>	<b>1.37</b>	<b>20.95</b>	<b>0.13</b>	<b>8.45</b>	<b>0.08</b>	<b>0.14</b>
	Jan-01	1.29	-	0.28	-	0.16	0.41
	Feb-01	-	-	0.19	-	0.13	-
	Mar-01	-	-	0.13	-	0.07	-
	<b>Dry</b>	<b>1.29</b>	-	<b>0.22</b>	-	<b>0.11</b>	<b>0.41</b>
<b>River</b>							
	Apr-00	2.94	3.76	0.18	5.06	-	-
	May-00	-	0.41	-	-	-	-
	<b>Pre-Monsoon</b>	<b>2.94</b>	<b>3.76</b>	<b>0.18</b>	<b>5.06</b>	-	-
	Oct-00	-	7.22	-	-	0.20	-
	Nov-00	-	-	0.07	-	0.09	-
	Dec-00	-	7.41	-	20.21	-	-
	<b>Post Monsoon</b>	-	<b>7.41</b>	<b>0.07</b>	<b>20.21</b>	<b>0.16</b>	-
	Jan-01	6.93	16.24	0.16	-	-	-
	Feb-01	4.69	8.41	0.46	-	-	-
	Mar-01	-	14.00	0.17	9.00	-	-
	<b>Dry</b>	<b>5.59</b>	<b>12.56</b>	<b>0.21</b>	<b>9.00</b>	-	-

## Appendix 6

## Catch Composition (%) by Habitat and Season at Hail Haor (April'00-March'01)

	Snake-heads	Eels	Major Carp	Large Catfish	Minor Carp	Prawns	Small Catfish	Ex-Species	Knife fish	Small fish
<b>Pre-Monsoon</b>										
<i>Beel</i>	29.39	2.16	-	-	-	0.97	19.72	-	1.21	46.54
Floodplain	14.52	2.64	-	-	-	2.80	13.07	0.05	-	66.91
River	11.84	9.38	-	-	-	3.17	23.15	-	1.32	51.14
Canal	15.00	-	-	-	-	-	11.96	-	-	73.03
<b>Monsoon</b>										
<i>Beel</i>	5.38	2.37	-	-	-	4.17	6.65	-	2.28	79.16
Floodplain	4.18	5.95	0.01	0.11	0.00	1.54	7.92	0.10	0.57	79.62
River	-	8.00	-	-	-	-	8.00	-	-	84.00
Canal	-	-	-	-	-	-	-	-	-	-
<b>Post-Monsoon</b>										
<i>Beel</i>	7.13	0.89	1.62	2.91	0.73	1.62	11.83	0.47	1.77	71.03
Floodplain	12.69	1.58	0.50	1.00	0.05	2.62	8.09	-	1.38	72.09
River	0.45	1.69	6.29	0.55	-	0.79	8.28	-	0.42	81.52
Canal	25.44	-	2.87	2.60	2.40	2.80	32.05	-	2.32	29.52
<b>Dry</b>										
<i>Beel</i>	11.28	4.47	2.77	2.37	0.51	5.81	12.16	0.67	7.89	52.08
Floodplain	4.28	5.21	0.11	0.06	0.01	17.81	3.36	-	0.25	68.90
River	11.77	6.47	8.57	5.39	0.02	1.88	1.18	-	8.58	56.15
Canal	13.41	-	2.62	-	1.74	3.55	19.42	-	-	59.26

## Appendix 7

## Estimated Fish Catch by Species in Hail Haor by Habitat Type (April'00 – March'01)

Sl #	Species Name	Total Number	(%)	Weight(Kg)	(%)
<i>Beel</i>					
1	<i>Jat Puti</i>	1543973	6.00	13782.21	15.01
2	<i>Mola</i>	5720579	22.23	9908.38	10.79
3	<i>Meni/Bheda</i>	342295	1.33	8641.45	9.41
4	<i>Foli</i>	70387	0.27	5913.18	6.44
5	<i>Taki</i>	190791	0.74	5810.65	6.33
6	<i>Khalisha</i>	414492	1.61	4567.99	4.97
7	<i>Tengra</i>	481733	1.87	3756.30	4.09
8	<i>Magur</i>	18753	0.07	3195.91	3.48
9	<i>Thengua Echa</i>	2212437	8.60	2799.88	3.05
10	<i>Shol</i>	27319	0.11	2556.78	2.78
11	<i>Kaikla</i>	229528	0.89	2345.54	2.55
12	<i>Boal</i>	1744	0.01	2032.80	2.21
13	<i>Gojar</i>	2351	0.01	1908.70	2.08
14	<i>Rui</i>	1857	0.01	1811.27	1.97
15	<i>Gura Echa</i>	6725364	26.14	1731.31	1.89
16	<i>Shing</i>	139848	0.54	1694.56	1.85
17	<i>Guchi Baim</i>	259973	1.01	1544.82	1.68
18	<i>Kanchan Puti</i>	303666	1.18	1431.45	1.56
19	<i>Boro Baim</i>	17822	0.07	1189.49	1.3
20	<i>Bele</i>	238245	0.93	1138.29	1.24
21	<i>Dankina</i>	710665	2.76	1132.99	1.23
22	<i>Koi</i>	13662	0.05	1094.56	1.19
23	<i>Tit Puti</i>	360619	1.40	948.39	1.03
24	<i>Chuna Khalisha</i>	611758	2.38	909.20	0.99
25	<i>Golsa/Kabasi Tengra</i>	44413	0.17	897.94	0.98
26	<i>Ranga Chanda</i>	2458718	9.56	886.18	0.96
27	<i>Bajri Tengra</i>	324265	1.26	877.24	0.96
28	<i>Gol Chanda</i>	610435	2.37	869.80	0.95
29	<i>Tepa</i>	264178	1.03	787.62	0.86
30	<i>Tara Baim</i>	13601	0.05	709.88	0.77
31	<i>Kani Pabda</i>	61909	0.24	565.67	0.62
32	<i>Gutum</i>	150747	0.59	505.29	0.55
33	<i>Goinna</i>	1183	0.00	440.54	0.48
34	<i>Lal Khalisha</i>	133015	0.52	429.36	0.47
35	<i>Lamba Chanda</i>	199059	0.77	417.99	0.46
36	<i>Comon Carp/Karfu</i>	218	0.00	394.40	0.43
37	<i>Kali/Napti Koi</i>	241702	0.94	324.57	0.35
38	<i>Mrigel</i>	831	0.00	259.04	0.28
39	<i>Chela</i>	95143	0.37	249.04	0.27
40	<i>Potka</i>	56434	0.22	211.19	0.23
41	<i>Naftani</i>	52755	0.21	208.86	0.23
42	<i>Pabda/Madhu</i>	4128	0.02	189.64	0.21
	<i>Pabda/Kowakata/Ghorakata</i>				
43	<i>Jhili Puti</i>	215536	0.84	149.36	0.16
44	<i>Gora Gutum/Ganga Shagor</i>	14386	0.06	138.34	0.15
45	<i>Kalibaush</i>	218	0.00	85.09	0.09

Sl#	Species Name	Total Number	(%)	Weight(Kg)	(%)
46	Grass Carp	37	0.00	76.00	0.08
47	Futani Puti	74908	0.29	53.56	0.06
48	Chep Chela	6906	0.03	34.44	0.04
49	Moa	5570	0.02	30.78	0.03
50	Cheng	1275	0.00	26.86	0.03
51	Thai Shor Puti	71	0.00	26.35	0.03
52	Poa	6285	0.02	22.71	0.02
53	Reckha Kholisha	14905	0.06	20.72	0.02
54	Mirror Carp	10	0.00	18.00	0.02
55	Tin Chokha	14875	0.06	11.31	0.01
56	Senia (Eusufi)	5052	0.02	10.11	0.01
57	Rani	3138	0.01	9.68	0.01
58	Tatkini	250	0.00	8.63	0.01
59	Air	10	0.00	8.10	0.01
60	Telapia	15	0.00	8.00	0.01
61	Chola Puti	917	0.00	7.70	0.01
62	Silver Carp	30	0.00	6.20	0.01
63	African Magur	2	0.00	4.00	0
64	Chapila	898	0.00	3.53	0
65	Dimua/Kathalia Echa	11780	0.05	2.95	0
66	Kuicha	55	0.00	2.39	0
67	Sheild Kholisha	2340	0.01	2.34	0
68	Chaka/Gangina	5	0.00	0.57	0
69	Bata	10	0.00	0.26	0
70	Narkeli Chela	2	0.00	0.01	0
<b>Total 70 Species</b>		<b>25732081</b>	<b>100.00</b>	<b>91838.34</b>	
<b>Floodplain</b>					
1	Mola	14737572	40.29	19755.35	26.03
2	Jat Puti	1927311	5.27	13772.49	18.15
3	Meni/Bheda	196883	0.54	4741.45	6.25
4	Taki	147542	0.40	4013.95	5.29
5	Tengra	392878	1.07	3746.83	4.94
6	Ranga Chanda	6379907	17.44	2968.92	3.91
7	Guchi Baim	453685	1.24	2585.96	3.41
8	Khalisha	208905	0.57	2380.99	3.14
9	Kaikla	284498	0.78	2323.88	3.06
10	Thengua Echa	1974529	5.40	2105.79	2.78
11	Chuna Khalisha	756550	2.07	1518.34	2
12	Dankina	755252	2.06	1340.28	1.77
13	Gura Echa	3926452	10.73	1259.24	1.66
14	Shing	58453	0.16	1145.54	1.51
15	Tepa	288010	0.79	1035.20	1.36
16	Kanchan Puti	256910	0.70	1002.02	1.32
17	Shol	80674	0.22	985.87	1.3
18	Gol Chanda	644397	1.76	876.91	1.16
19	Bele	137669	0.38	725.57	0.96
20	Jhili Puti	1097397	3.00	718.38	0.95
21	Gutum	199878	0.55	652.69	0.86
22	Tit Puti	227452	0.62	646.09	0.85
23	Lal Khalisha	268518	0.73	623.49	0.82

Sl #	Species Name	Total Number	(%)	Weight(Kg)	(%)
24	<i>Chela</i>	217707	0.60	559.09	0.74
25	<i>Foli</i>	8423	0.02	543.23	0.72
26	<i>Gojar</i>	3943	0.01	515.16	0.68
27	<i>Koi</i>	9452	0.03	470.64	0.62
28	<i>Golsa/Kabasi Tengra</i>	27967	0.08	384.87	0.51
29	<i>Tara Baim</i>	39964	0.11	372.01	0.49
30	<i>Bajri Tengra</i>	52825	0.14	283.55	0.37
31	<i>Boal</i>	307	0.00	264.75	0.35
32	<i>Kuicha</i>	1811	0.00	261.71	0.34
33	<i>Kali/Napti Koi</i>	109714	0.30	213.66	0.28
34	<i>Lamba Chanda</i>	225906	0.62	209.68	0.28
35	<i>Fulani Puti</i>	329108	0.90	145.77	0.19
36	<i>Reckha Kholishu</i>	90996	0.25	120.11	0.16
37	<i>Rui</i>	157	0.00	112.76	0.15
38	<i>Boro Baim</i>	1611	0.00	101.32	0.13
39	<i>Kani Pabda</i>	11548	0.03	97.84	0.13
40	<i>Magur</i>	3007	0.01	96.28	0.13
41	<i>Chep Chela</i>	17505	0.05	44.88	0.06
42	<i>Thai Shor Puti</i>	1621	0.00	38.33	0.05
43	<i>Chapila</i>	1269	0.00	20.56	0.03
44	<i>Pabda/Madhu</i>	820	0.00	18.13	0.02
	<i>Pabda/Kowakata/Ghorakatu</i>				
45	<i>Cheng</i>	952	0.00	17.92	0.02
46	<i>Tin Chokha</i>	13893	0.04	13.37	0.02
47	<i>Goinna</i>	103	0.00	13.16	0.02
48	<i>Potka</i>	1172	0.00	10.06	0.01
49	<i>Kalibaush</i>	49	0.00	7.49	0.01
50	<i>Naftani</i>	435	0.00	6.06	0.01
51	<i>Mrigel</i>	70	0.00	4.37	0.01
52	<i>Sheild Kholisha</i>	3772	0.01	3.77	0
53	<i>African Magur</i>	62	0.00	1.60	0
54	<i>Bacha</i>	31	0.00	1.05	0
55	<i>Poa</i>	230	0.00	0.92	0
56	<i>Buth Koi/Bali Chata/Balitora</i>	120	0.00	0.60	0
57	<i>Rani</i>	25	0.00	0.37	0
58	<i>Narkeli Chela</i>	155	0.00	0.23	0
<b>Total 58 Species</b>		<b>36578052</b>	<b>100.00</b>	<b>75880.53</b>	
<b>River</b>					
1	<i>Jat Puti</i>	463235	7.03	2732.98	14.23
2	<i>Mola</i>	1365509	20.73	2294.87	11.95
3	<i>Rui</i>	2134	0.03	1240.46	6.46
4	<i>Foli</i>	12664	0.19	1236.18	6.44
5	<i>Kaikla</i>	142515	2.16	1177.80	6.13
6	<i>Guchi Baim</i>	236246	3.59	1156.19	6.02
7	<i>Gojar</i>	799	0.01	1034.90	5.39
8	<i>Tengra</i>	191796	2.91	796.46	4.15
9	<i>Meni/Bheda</i>	140898	2.14	788.72	4.11
10	<i>Boal</i>	804	0.01	763.14	3.97
11	<i>Chela</i>	474762	7.21	756.88	3.94
12	<i>Kanchan Puti</i>	124027	1.88	701.11	3.65

SI #	Species Name	Total Number	(%)	Weight(Kg)	(%)
13	<i>Shol</i>	1240	0.02	661.01	3.44
14	<i>Bele</i>	82742	1.26	518.78	2.7
15	<i>Tepa</i>	167747	2.55	390.56	2.03
16	<i>Chuna Khalisha</i>	298864	4.54	362.30	1.89
17	<i>Tit Puti</i>	136912	2.08	319.70	1.66
18	<i>Dankina</i>	202470	3.07	288.87	1.5
19	<i>Gura Echa</i>	875797	13.30	216.44	1.13
20	<i>Taki</i>	5526	0.08	214.98	1.12
21	<i>Gutum</i>	75854	1.15	210.00	1.09
22	<i>Ranga Chanda</i>	738894	11.22	197.09	1.03
23	<i>Khalisha</i>	12875	0.20	162.26	0.85
24	<i>Thengua Echa</i>	211685	3.21	128.61	0.67
25	<i>Lamba Chanda</i>	116178	1.76	121.26	0.63
26	<i>Jhili Puti</i>	203375	3.09	108.98	0.57
27	<i>Gol Chanda</i>	74328	1.13	102.16	0.53
28	<i>Tara Baim</i>	22935	0.35	94.84	0.49
29	<i>Lal Khalisha</i>	75803	1.15	83.77	0.44
30	<i>Kali/Napti Koi</i>	66371	1.01	72.18	0.38
31	<i>Futani Puti</i>	39581	0.60	68.38	0.36
32	<i>Kani Pabda</i>	2076	0.03	40.54	0.21
33	<i>Bajri Tengra</i>	15872	0.24	35.77	0.19
34	<i>Kalibaush</i>	145	0.00	30.02	0.16
35	<i>Mrigel</i>	157	0.00	27.18	0.14
36	<i>Shing</i>	1120	0.02	26.68	0.14
37	<i>Golsa/Kabasi Tengra</i>	960	0.01	19.29	0.1
38	<i>Rani</i>	558	0.01	7.11	0.04
39	<i>Cheng</i>	349	0.01	4.68	0.02
40	<i>Boro Baim</i>	71	0.00	3.40	0.02
41	<i>Goinna</i>	7	0.00	2.24	0.01
42	<i>Koi</i>	90	0.00	2.13	0.01
43	<i>Pabda/Madhu</i> <i>Pabda/Kowakata/Ghorakata</i>	30	0.00	1.16	0.01
44	<i>Reckha Kholisha</i>	38	0.00	0.15	0
<b>Total 44 Species</b>		<b>6586039</b>	<b>100.00</b>	<b>19202.21</b>	
<b>Canal</b>					
1	<i>Shing</i>	5188	3.76	137.91	15.84
2	<i>Taki</i>	3468	2.51	126.62	14.54
3	<i>Khalisha</i>	6078	4.41	102.19	11.74
4	<i>Jat Puti</i>	6788	4.92	81.09	9.31
5	<i>Meni/Bheda</i>	3397	2.46	64.54	7.41
6	<i>Tengra</i>	8692	6.30	55.51	6.38
7	<i>Kaikla</i>	2312	1.68	47.69	5.48
8	<i>Shol</i>	55	0.04	32.15	3.69
9	<i>Mola</i>	17371	12.60	25.44	2.92
10	<i>Kanchan Puti</i>	2950	2.14	20.37	2.34
11	<i>Thengua Echa</i>	11300	8.19	19.13	2.2
12	<i>Goinna</i>	79	0.06	16.40	1.88
13	<i>Mrigel</i>	51	0.04	14.75	1.69
14	<i>Magur</i>	60	0.04	14.50	1.67
15	<i>Lal Khalisha</i>	2853	2.07	13.95	1.6

SI #	Species Name	Total Number	(%)	Weight(Kg)	(%)
16	<i>Tit Puti</i>	8579	6.22	11.43	1.31
17	<i>Gol Chanda</i>	5978	4.33	11.43	1.31
18	<i>Dankina</i>	7999	5.80	11.43	1.31
19	<i>Boal</i>	12	0.01	10.20	1.17
20	<i>Chuna Khalisha</i>	4927	3.57	9.60	1.1
21	<i>Foli</i>	134	0.10	9.10	1.05
22	<i>Kali/Napti Koi</i>	7408	5.37	8.27	0.95
23	<i>Rui</i>	16	0.01	7.00	0.8
24	<i>Gura Echa</i>	23641	17.14	6.14	0.71
25	<i>Gojar</i>	4	0.00	5.70	0.65
26	<i>Kani Pabda</i>	586	0.42	4.98	0.57
27	<i>Ranga Chandu</i>	7948	5.76	2.55	0.29
28	<i>Cheng</i>	30	0.02	0.72	0.08
<b>Total 28 Species</b>		<b>137904</b>	<b>100.00</b>	<b>870.79</b>	

## Appendix 8

## List of Observed Fish Species and Habitat Preference In Hail Haor (April'00 to March'01)

SI no.	Species Name	SI no.	Species Name
<b>Beel Resident Fish</b>		<b>Exotics Fish</b>	
1.	<i>Jat Puti</i>	41.	<i>Lamba Chanda</i>
2.	<i>Kanchan Puti</i>	42.	<i>Meni/Bhedu</i>
3.	<i>Jhili Puti</i>	43.	<i>Tara Baim</i>
4.	<i>Futani Puti</i>	44.	<i>Foli</i>
5.	<i>Chola Puti</i>	<b>Migratory Fish</b>	
6.	<i>Mola</i>	45.	<i>Thai Shor Puti</i>
7.	<i>Chela</i>	46.	<i>African Magur</i>
8.	<i>Ranga Chanda</i>	47.	<i>Telapia</i>
9.	<i>Gol Chanda</i>	48.	<i>Silver Carp</i>
10.	<i>Chapila</i>	49.	<i>Grass Carp</i>
11.	<i>Khalisha</i>	50.	<i>Mirror Carp</i>
12.	<i>Lal Khalisha</i>	51.	<i>Comon Carp/Karfu</i>
13.	<i>Chuna Khalisha</i>	52.	<i>Tepa</i>
14.	<i>Dankina</i>	53.	<i>Gora Gutum/Ganga Sha</i>
15.	<i>Koi</i>	54.	<i>Goinna</i>
16.	<i>Bele</i>	55.	<i>Tatkini</i>
17.	<i>Kaikla</i>	56.	<i>Pabda/Madhu</i> <i>Pabda/Kowakata/Ghorakata</i>
18.	<i>Gutum</i>	57.	<i>Rui</i>
19.	<i>Tin Chokha</i>	58.	<i>Mrigel</i>
20.	<i>Guchi Baim</i>	59.	<i>Narkeli Chela</i>
21.	<i>Kuicha</i>	60.	<i>Dimua/Kathalia Echa</i>
22.	<i>Taki</i>	61.	<i>Thengua Echa</i>
23.	<i>Shol</i>	62.	<i>Kalibaush</i>
24.	<i>Cheng</i>	63.	<i>Golsa/Kabasi Tengra</i>
25.	<i>Bajri Tengra</i>	64.	<i>Poa</i>
26.	<i>Tengra</i>	65.	<i>Air</i>
27.	<i>Shing</i>	66.	<i>Boal</i>
28.	<i>Magur</i>	67.	<i>Bachu</i>
29.	<i>Gura Echa</i>	68.	<i>Bata</i>
30.	<i>Naftani</i>	69.	<i>Chaka/Gangina</i>
31.	<i>Buth Koi/Bali Chata/Balitora</i>	70.	<i>Potka</i>
32.	<i>Reckha Kholisha</i>	71.	<i>Senia (Eustufi)</i>
33.	<i>Sheild Kholisha</i>	72.	<i>Moa</i>
34.	<i>Chep Chela</i>		
35.	<i>Kali/Napti Koi</i>		
36.	<i>Rani</i>		
37.	<i>Boro Baim</i>		
38.	<i>Gojar</i>		
39.	<i>Kani Pabda</i>		
40.	<i>Tit Puti</i>		

## Appendix 9

## List of Gears Observed in Turag-Bangshi (April'00 – March'01)

Sl #	Gear Name	Sl #	Gear Name
1	<i>Veshal/Khara</i>	16	<i>Guli/Ghuni/Chai</i>
2	<i>Ber Jal</i>	17	<i>Polo</i>
3	<i>Moi Jal</i>	18	<i>Hatani</i>
4	<i>Gamcha</i>	19	<i>Dewatering</i>
5	<i>Thela Jal/Jali</i>	20	<i>Akra</i>
6	<i>Dharma Jal</i>	21	<i>Daon Borshi/Longline</i>
7	<i>Jhaki Jal</i>	22	<i>Uthal Jal</i>
8	<i>Current Jal</i>	23	<i>Dhore Jal</i>
9	<i>Koi Jal</i>	24	<i>Hogra</i>
10	<i>Kathi Jal</i>	25	<i>Ghurni Jal</i>
11	<i>Koch</i>	26	<i>Moshari Jal</i>
12	<i>Tenta/Teora</i>	27	<i>Sata</i>
13	<i>Hat Borshi</i>	28	<i>Ram Jal</i>
14	<i>Kathi Borshi</i>	29	<i>Naar Jal</i>
15	<i>Gara Borshi</i>		

## Appendix 10

## Average Fishing Efforts Observed in a Day at Turag-Bangshi Site (April '00 – March '01)

Months	April'00	May	June	July	August	Sept.	Oct.	Nov.	Dec.	Jan'01	Feb.	March
<b>Mokesh Beel (South)</b>												
<i>Moi Jal</i>	0	0	0	0	0	0	0	1	0	0	0	0
<i>Ber Jal</i>	0	0	0	1	1	1	3	2	0	0	0	0
<i>Thela Jal</i>	3	4	2	1	2	1	1	4	1	2	1	1
<i>Jhaki Jal</i>	0	1	62	0	0	0	1	1	0	0	0	0
<i>Current Jal</i>	28	50	0	30	46	44	46	71	83	44	20	29
<b>Mokesh Beel (North)</b>												
<i>Moi Jal</i>	0	0	1	2	0	1	0	0	1	0	0	0
<i>Ber Jal</i>	0	0	0	1	1	0	1	3	2	1	0	0
<i>Thela Jal</i>	2	2	1	1	2	1	1	4	8	3	1	0
<i>Jhaki Jal</i>	1	0	0	0	0	0	0	0	1	1	0	1
<i>Current Jal</i>	15	39	52	43	33	47	43	63	77	47	19	28
<b>Kaliadaha</b>												
<i>Ber Jal</i>	1	1	0	0	1	1	2	1	0	1	1	1
<i>Thela Jal</i>	3	3	2	2	2	2	2	3	3	5	9	4
<i>Jhaki Jal</i>	0	6	0	0	0	0	0	0	1	0	0	0
<i>Current Jal</i>	17	25	28	32	52	53	27	56	67	37	32	43
<b>Mokesh Khal</b>												
<i>Moi Jal</i>	0	0	1	1	0	0	0	0	0	0	0	0
<i>Thela Jal</i>	0	0	0	0	1	1	1	0	0	0	0	0
<i>Jhaki Jal</i>	2	5	3	2	1	1	12	8	5	3	2	2
<i>Dhore Jal</i>	0	0	0	1	0	0	1	1	1	1	0	0
<b>Turag River</b>												
<i>Moi Jal</i>	1	1	1	0	0	0	0	2	3	2	3	1
<i>Ber Jal</i>	1	0	0	0	0	0	0	1	1	1	0	0
<i>Thela Jal</i>	0	0	0	0	0	0	1	0	0	0	0	0
<i>Jhaki Jal</i>	3	2	2	1	2	3	4	4	5	3	6	3
<i>Current Jal</i>	0	0	0	0	0	0	0	0	0	0	0	3
<i>Dhore Jal</i>	0	0	0	0	0	0	1	0	0	0	0	0
<b>Aowla Khal</b>												
<i>Thela Jal</i>	0	0	0	0	0	0	0	1	1	0	0	0
<i>Jhaki Jal</i>	0	3	2	2	1	1	4	6	2	0	0	0
<i>Current Jal</i>	0	0	0	0	0	0	1	0	0	0	0	0
<i>Dhore Jal</i>	0	0	0	0	0	0	1	1	1	0	0	0
<b>Aowla Beel</b>												
<i>Moi Jal</i>	1	0	0	0	1	0	0	0	1	1	1	0
<i>Ber Jal</i>	0	2	0	1	1	1	1	2	1	0	0	0
<i>Thela Jal</i>	6	5	1	3	1	2	2	2	2	1	2	1
<i>Jhaki Jal</i>	16	2	1	1	1	1	0	1	2	3	3	4
<i>Current Jal</i>	21	34	29	40	42	23	78	78	45	54	43	51
<b>Bangshi River</b>												
<i>Moi Jal</i>	2	2	1	1	0	0	0	2	5	3	2	1
<i>Ber Jal</i>	1	1	1	0	0	1	1	2	1	0	1	0
<i>Thela Jal</i>	0	0	0	1	1	0	1	1	0	0	0	0
<i>Jhaki Jal</i>	1	2	3	2	2	2	3	4	9	7	4	3
<i>Current Jal</i>	1	0	0	0	0	0	0	0	2	0	4	1
<i>Dhore Jal</i>	0	0	0	0	0	0	1	1	0	0	0	0

## Appendix 11

## Average Fishing Hours of Major Gear by Month, Season and Habitat in Turag-Bangshi (April'00 – March'01)

Season	Month	Thela jal	Moi jal	Dhore jal	Current jal	Ber jal	Jhaki jal
<b>Beel</b>							
	Apr-00	3.24	4.92	-	4.05	4.42	3.10
	May-00	2.52	-	-	3.66	5.33	4.06
	June-00	1.36	-	-	3.63	-	3.00
<b>Pre-Monsoon</b>		<b>2.52</b>	<b>4.92</b>	<b>-</b>	<b>3.77</b>	<b>5.10</b>	<b>3.60</b>
	Jul-00	1.42	-	-	3.70	5.00	2.00
	Aug-00	1.60	3.00	-	4.01	7.50	1.00
	Sep-00	1.34	-	-	4.72	4.10	1.75
<b>Monsoon</b>		<b>1.46</b>	<b>3.00</b>	<b>-</b>	<b>4.13</b>	<b>5.27</b>	<b>1.70</b>
	Oct-00	2.27	-	-	5.68	4.06	1.00
	Nov-00	2.07	6.25	-	3.60	4.19	3.17
	Dec-00	2.80	6.00	-	4.07	3.50	2.62
<b>Post Monsoon</b>		<b>2.30</b>	<b>6.13</b>	<b>-</b>	<b>4.30</b>	<b>4.10</b>	<b>2.62</b>
	Jan-01	2.26	6.50	-	5.09	1.50	4.00
	Feb-01	2.30	6.00	-	5.18	5.00	2.92
	Mar-01	2.48	-	-	5.66	2.50	2.74
<b>Dry</b>		<b>2.32</b>	<b>6.17</b>	<b>-</b>	<b>5.28</b>	<b>3.00</b>	<b>3.15</b>
<b>Floodplain</b>							
	Apr-00	3.33	-	-	3.30	-	4.37
	May-00	2.50	-	-	4.11	-	-
	Jun-00	1.33	5.50	-	3.93	-	-
<b>Pre-Monsoon</b>		<b>2.42</b>	<b>5.50</b>	<b>-</b>	<b>3.92</b>	<b>-</b>	<b>4.37</b>
	Jul-00	3.25	5.88	-	4.54	2.50	-
	Aug-00	1.36	-	-	6.28	4.83	-
	Sep-00	1.33	5.00	-	3.52	-	-
<b>Monsoon</b>		<b>1.70</b>	<b>5.70</b>	<b>-</b>	<b>4.64</b>	<b>4.25</b>	<b>-</b>
	Oct-00	1.38	-	-	4.98	4.00	-
	Nov-00	3.56	-	-	4.82	4.00	-
	Dec-00	2.86	7.50	-	3.79	5.92	5.00
<b>Post Monsoon</b>		<b>2.84</b>	<b>7.50</b>	<b>-</b>	<b>4.59</b>	<b>4.48</b>	<b>5.00</b>
	Jan-01	3.50	-	-	3.63	6.63	6.00
	Feb-01	1.13	-	-	6.20	-	-
	Mar-01	-	-	-	5.61	-	4.00
<b>Dry</b>		<b>2.91</b>	<b>-</b>	<b>-</b>	<b>4.69</b>	<b>6.63</b>	<b>4.67</b>
<b>River</b>							
	Apr-00	-	3.57	-	5.00	3.75	2.91
	May-00	-	3.74	-	-	4.00	2.56
	Jun-00	-	2.50	-	-	4.00	1.97
<b>Pre-Monsoon</b>		<b>-</b>	<b>3.52</b>	<b>-</b>	<b>5.00</b>	<b>3.88</b>	<b>2.51</b>
	Jul-00	1.00	5.00	-	-	-	2.00
	Aug-00	3.00	-	-	-	-	3.14
	Sep-00	-	-	-	-	3.50	2.17
<b>Monsoon</b>		<b>2.00</b>	<b>5.00</b>	<b>-</b>	<b>-</b>	<b>3.50</b>	<b>2.50</b>

Season	Month	<i>Thelajal</i>	<i>Moi jal</i>	<i>Dhore jal</i>	<i>Current jal</i>	<i>Ber jal</i>	<i>Jhaki jal</i>
	Oct-00	1.69	-	4.00	-	2.50	2.03
	Nov-00	1.17	2.83	5.33	-	3.08	2.30
	Dec-00	-	4.49	-	5.67	3.02	2.22
<b>Post Monsoon</b>		<b>1.58</b>	<b>4.07</b>	<b>4.44</b>	<b>5.67</b>	<b>3.01</b>	<b>2.19</b>
	Jan-01	-	3.29	-	-	2.50	2.00
	Feb-01	-	3.93	-	5.75	4.00	2.08
	Mar-01	-	3.00	-	7.25	-	2.66
<b>Dry</b>		-	<b>3.41</b>	-	<b>6.50</b>	<b>3.00</b>	<b>2.27</b>
<b>Canal</b>							
	Apr-00	-	-	-	-	-	2.66
	May-00	-	-	-	-	-	2.19
	Jun-00	-	2.00	-	-	-	1.94
<b>Pre-Monsoon</b>		-	<b>2.00</b>	-	-	-	<b>2.17</b>
	Jul-00	-	1.75	0.50	-	-	1.94
	Aug-00	1.50	-	-	-	-	2.40
	Sep-00	1.50	-	-	-	-	1.00
<b>Monsoon</b>		<b>1.50</b>	<b>1.75</b>	<b>0.50</b>	-	-	<b>1.86</b>
	Oct-00	2.88	-	5.08	2.00	-	2.40
	Nov-00	2.25	-	2.63	-	-	1.82
	Dec-00	6.17	-	8.50	-	-	2.83
<b>Post Monsoon</b>		<b>3.54</b>	-	<b>4.75</b>	<b>2.00</b>	-	<b>2.24</b>
	Jan-01	-	-	2.00	-	-	2.65
	Feb-01	-	-	-	-	-	3.00
	Mar-01	-	-	-	-	-	2.00
<b>Dry</b>		-	-	<b>2.00</b>	-	-	<b>2.59</b>

## Appendix 12

## Estimated Fish Catch by Species in Turag-Bangshi Site (April'00 – March'01)

Sl no	Species Name	Total Number (%) by Number	Weight (kg)	(%) by Weight	
<i>Beel</i>					
1.	<i>Jat Puti</i>	426751	5.53	3107.91	12.37
2.	<i>Gura Echa</i>	3092235	40.04	2239.35	8.91
3.	<i>Taki</i>	67258	0.87	2144.96	8.54
4.	<i>Tengra</i>	176471	2.29	2054.53	8.18
5.	<i>Chapila</i>	279632	3.62	1533.61	6.10
6.	<i>Tit Puti</i>	326536	4.23	1449.11	5.77
7.	<i>Guchi Baim</i>	136701	1.77	1290.75	5.14
8.	<i>Bele</i>	235449	3.05	1084.00	4.31
9.	<i>Rui</i>	1572	0.02	1011.20	4.02
10.	<i>Shol</i>	2660	0.03	755.42	3.01
11.	<i>Kaikla</i>	85166	1.10	640.09	2.55
12.	<i>Bagha Puti</i>	112182	1.45	636.23	2.53
13.	<i>Mrigel</i>	2746	0.04	611.96	2.44
14.	<i>Satka Chingri</i>	294496	3.81	530.93	2.11
15.	<i>Gol Chanda</i>	471967	6.11	475.22	1.89
16.	<i>Chola Puti</i>	44379	0.57	430.64	1.71
17.	<i>Air</i>	2083	0.03	410.29	1.63
18.	<i>Lamba Chanda</i>	366039	4.74	387.13	1.54
19.	<i>Gutum</i>	112908	1.46	371.91	1.48
20.	<i>Potka</i>	40311	0.52	342.87	1.36
21.	<i>Boal</i>	996	0.01	327.28	1.30
22.	<i>Foli</i>	10994	0.14	246.84	0.98
23.	<i>Boro Baim</i>	2369	0.03	240.30	0.96
24.	<i>Mola</i>	200516	2.60	237.98	0.95
25.	<i>Tatkini</i>	13512	0.17	228.91	0.91
26.	<i>Chela</i>	239428	3.10	217.90	0.87
27.	<i>Ranga Chanda</i>	247587	3.21	207.25	0.82
28.	<i>Chuna Khalisha</i>	156479	2.03	197.18	0.78
29.	<i>Shing</i>	13770	0.18	183.46	0.73
30.	<i>Khalisha</i>	50652	0.66	178.86	0.71
31.	<i>Lal Khalisha</i>	58985	0.76	140.32	0.56
32.	<i>Dhela</i>	123580	1.60	134.94	0.54
33.	<i>Koi</i>	2295	0.03	117.45	0.47
34.	<i>Catla</i>	2737	0.04	115.57	0.46
35.	<i>Tara Baim</i>	5017	0.06	101.86	0.41
36.	<i>Tepa</i>	20355	0.26	75.31	0.30
37.	<i>Dankina</i>	54644	0.71	68.44	0.27
38.	<i>Comon Carp/Karfu</i>	103	0.00	67.94	0.27
39.	<i>Kalibaush</i>	663	0.01	55.92	0.22
40.	<i>Ghaura</i>	6940	0.09	47.40	0.19
41.	<i>Kali/Napti Koi</i>	58188	0.75	46.91	0.19
42.	<i>Mirror Carp</i>	215	0.00	37.97	0.15
43.	<i>Magur</i>	2016	0.03	32.59	0.13
44.	<i>Golsa/Kabasi Tengra</i>	2158	0.03	31.50	0.13
45.	<i>Gugri Bila</i>	60082	0.78	30.28	0.12

SI no	Species Name	Total Number (%) by Number	Weight (kg)	(%) by Weight	
46.	<i>Kachki</i>	52210	0.68	29.31	0.12
47.	<i>Thai Shor Puti</i>	89	0.00	29.12	0.12
48.	<i>Silver Carp</i>	301	0.00	26.61	0.11
49.	<i>Cheng</i>	1723	0.02	24.55	0.10
50.	<i>Rani</i>	34402	0.45	22.96	0.09
51.	<i>Jhili Puti</i>	8265	0.11	21.41	0.09
52.	<i>African Magur</i>	31	0.00	16.28	0.06
53.	<i>Shar Puti</i>	51	0.00	12.87	0.05
54.	<i>Grass Carp</i>	1023	0.01	10.25	0.04
55.	<i>Tin Chokha</i>	8945	0.12	9.34	0.04
56.	<i>Golda Echa</i>	31	0.00	8.27	0.03
57.	<i>Yangra</i>	170	0.00	6.51	0.03
58.	<i>Telapia</i>	20	0.00	4.63	0.02
59.	<i>Bagha Air/Baghaura</i>	62	0.00	4.13	0.02
60.	<i>Hilsha (Jaika)</i>	16	0.00	3.99	0.02
61.	<i>Kanchan Puti</i>	310	0.00	3.74	0.01
62.	<i>Kani Pabda</i>	310	0.00	3.14	0.01
63.	<i>Baspata/Kazuli</i>	256	0.00	2.57	0.01
64.	<i>Dimua/Kathalia Echa</i>	1232	0.02	2.23	0.01
65.	<i>Gora Gutumi/Ganga Shagor</i>	426	0.01	2.13	0.01
66.	<i>Chaka/Gangina</i>	302	0.00	0.56	0.00
67.	<i>Pabda/Madhu</i> <i>Pabda/Kowakata/Ghorakata</i>	20	0.00	0.47	0.00
68.	<i>Mamoli Chapila</i>	81	0.00	0.45	0.00
69.	<i>Kuicha</i>	10	0.00	0.03	0.00
	<b>Total</b>	<b>7722109</b>	<b>100.00</b>	<b>25124.02</b>	<b>100.00</b>
<b>Floodplain</b>					
1.	<i>Jat Puti</i>	218178	6.75	1407.74	13.58
2.	<i>Taki</i>	29281	0.91	931.46	8.99
3.	<i>Gura Echa</i>	1236745	38.25	928.46	8.96
4.	<i>Chapila</i>	151965	4.70	729.62	7.04
5.	<i>Tit Puti</i>	144322	4.46	637.39	6.15
6.	<i>Bagha Puti</i>	98385	3.04	584.70	5.64
7.	<i>Tengra</i>	53281	1.65	543.29	5.24
8.	<i>Chola Puti</i>	42033	1.30	439.07	4.24
9.	<i>Bele</i>	102391	3.17	429.40	4.14
10.	<i>Guchi Baim</i>	51675	1.60	416.11	4.02
11.	<i>Air</i>	2370	0.07	349.27	3.37
12.	<i>Mrigel</i>	927	0.03	297.70	2.87
13.	<i>Kaikla</i>	27257	0.84	243.56	2.35
14.	<i>Rui</i>	532	0.02	217.02	2.09
15.	<i>Shol</i>	453	0.01	179.88	1.74
16.	<i>Satka Chingri</i>	149762	4.63	176.07	1.70
17.	<i>Gol Chanda</i>	172014	5.32	172.21	1.66
18.	<i>Tatkini</i>	9377	0.29	168.61	1.63
19.	<i>Lamba Chanda</i>	121120	3.75	151.83	1.47
20.	<i>Chuna Khalisha</i>	93389	2.89	142.58	1.38
21.	<i>Gutum</i>	35612	1.10	134.11	1.29
22.	<i>Potka</i>	17094	0.53	118.52	1.14
23.	<i>Chela</i>	97959	3.03	108.03	1.04

Sl no	Species Name	Total Number (%) by Number		Weight (kg)	(%) by Weight
24.	<i>Khalisha</i>	21607	0.67	93.74	0.90
25.	<i>Mola</i>	64779	2.00	85.66	0.83
26.	<i>Shing</i>	4621	0.14	64.08	0.62
27.	<i>Tepa</i>	14877	0.46	63.54	0.61
28.	<i>Ranga Chanda</i>	70200	2.17	59.24	0.57
29.	<i>Boro Baim</i>	2052	0.06	52.59	0.51
30.	<i>Foli</i>	4861	0.15	51.61	0.50
31.	<i>Tara Baim</i>	2880	0.09	49.45	0.48
32.	<i>Lal Khalisha</i>	16975	0.52	47.47	0.46
33.	<i>Dhela</i>	31259	0.97	37.96	0.37
34.	<i>Mamoli Chapila</i>	4960	0.15	28.32	0.27
35.	<i>Dankina</i>	26511	0.82	25.85	0.25
36.	<i>Magur</i>	630	0.02	25.83	0.25
37.	<i>Gugri Bila</i>	62806	1.94	25.82	0.25
38.	<i>Thai Shor Puti</i>	356	0.01	23.79	0.23
39.	<i>Ghaura</i>	3810	0.12	19.06	0.18
40.	<i>Kali/Napti Koi</i>	16875	0.52	13.41	0.13
41.	<i>Mirror Carp</i>	55	0.00	13.41	0.13
42.	<i>African Magur</i>	8	0.00	13.18	0.13
43.	<i>Kachki</i>	9338	0.29	11.47	0.11
44.	<i>Kalibaush</i>	40	0.00	11.09	0.11
45.	<i>Koi</i>	155	0.00	8.16	0.08
46.	<i>Kanchan Puti</i>	5476	0.17	7.38	0.07
47.	<i>Catla</i>	6774	0.21	7.25	0.07
48.	<i>Peali</i>	370	0.01	3.70	0.04
49.	<i>Cheng</i>	76	0.00	3.65	0.04
50.	<i>Telapia</i>	16	0.00	3.10	0.03
51.	<i>Tin Chokha</i>	3045	0.09	3.05	0.03
52.	<i>Rani</i>	1886	0.06	1.57	0.02
53.	<i>Golsa/Kabasi Tengra</i>	42	0.00	1.29	0.01
54.	<i>Chaka/Gangina</i>	60	0.00	0.80	0.01
55.	<i>Shar Puti</i>	10	0.00	0.10	0.00
56.	<i>Dimua/Kuthalia Echa</i>	8	0.00	0.01	0.00
<b>Total</b>		<b>3233540</b>	<b>100.00</b>	<b>10363.26</b>	<b>100.00</b>
<b>River</b>					
1.	<i>Jat Puti</i>	119373	4.83	912.19	10.02
2.	<i>Boro Baim</i>	13174	0.53	806.96	8.86
3.	<i>Bele</i>	128759	5.21	637.93	7.01
4.	<i>Gura Echa</i>	713603	28.85	623.82	6.85
5.	<i>Tit Puti</i>	93911	3.80	467.99	5.14
6.	<i>Golsa/Kabasi Tengra</i>	28929	1.17	386.87	4.25
7.	<i>Chapila</i>	57432	2.32	353.26	3.88
8.	<i>Tengra</i>	28991	1.17	311.95	3.43
9.	<i>Taki</i>	12019	0.49	287.64	3.16
10.	<i>Chela</i>	266333	10.77	275.55	3.03
11.	<i>Rita</i>	16562	0.67	262.45	2.88
12.	<i>Satka Chingri</i>	167202	6.76	255.73	2.81
13.	<i>Ghaura</i>	5066	0.20	236.00	2.59
14.	<i>Boal</i>	665	0.03	229.89	2.53
15.	<i>Guchi Baim</i>	27094	1.10	227.88	2.50

Sl no	Species Name	Total Number (%) by Number	Weight (kg)	(%) by Weight	
16.	<i>Kaikla</i>	27809	1.12	193.10	2.12
17.	<i>Rui</i>	179	0.01	184.53	2.03
18.	<i>Gutum</i>	51371	2.08	165.74	1.82
19.	<i>Air</i>	1481	0.06	165.65	1.82
20.	<i>Pabda/Madhu</i> <i>Pabda/Kowakata/Ghorakuta</i>	19372	0.78	160.25	1.76
21.	<i>Tatkini</i>	8550	0.35	149.88	1.65
22.	<i>Gol Chanda</i>	112680	4.56	138.98	1.53
23.	<i>Lamba Chanda</i>	107357	4.34	137.45	1.51
24.	<i>Mrigel</i>	546	0.02	109.33	1.20
25.	<i>Chola Puti</i>	10348	0.42	105.06	1.15
26.	<i>Kalibaush</i>	529	0.02	104.62	1.15
27.	<i>Baspata/Kazuli</i>	17856	0.72	97.00	1.07
28.	<i>Mola</i>	76006	3.07	94.18	1.03
29.	<i>Dhela</i>	75092	3.04	84.43	0.93
30.	<i>Foli</i>	8496	0.34	75.77	0.83
31.	<i>Chuna Khalisha</i>	50536	2.04	68.55	0.75
32.	<i>Bagha Air/Baghaura</i>	710	0.03	63.37	0.70
33.	<i>Bagha Puti</i>	9822	0.40	55.71	0.61
34.	<i>Poa</i>	339	0.01	52.62	0.58
35.	<i>Potka</i>	9808	0.40	52.34	0.57
36.	<i>Koi</i>	1558	0.06	50.86	0.56
37.	<i>Buth Koi/Bali</i> <i>Chata/Balitora</i>	32710	1.32	47.00	0.52
38.	<i>Tepa</i>	10593	0.43	46.43	0.51
39.	<i>Ranga Chanda</i>	43982	1.78	44.15	0.48
40.	<i>Catla</i>	68	0.00	36.75	0.40
41.	<i>Shol</i>	41	0.00	30.80	0.34
42.	<i>Silong</i>	559	0.02	30.01	0.33
43.	<i>Gora Gutum/Ganga Shagor</i>	7021	0.28	29.61	0.33
44.	<i>Kani Pabda</i>	1997	0.08	29.55	0.32
45.	<i>Kachki</i>	42970	1.74	26.41	0.29
46.	<i>Dankina</i>	20628	0.83	22.64	0.25
47.	<i>Gugri Bila</i>	11739	0.47	17.13	0.19
48.	<i>Rani</i>	1704	0.07	16.56	0.18
49.	<i>Silver Carp</i>	70	0.00	14.80	0.16
50.	<i>Lal Khalisha</i>	10398	0.42	14.40	0.16
51.	<i>Meni/Bheda</i>	1225	0.05	13.49	0.15
52.	<i>Peali</i>	889	0.04	10.72	0.12
53.	<i>Golda Echa</i>	963	0.04	9.63	0.11
54.	<i>Chaka/Gangina</i>	2664	0.11	9.58	0.11
55.	<i>Gojar</i>	10	0.00	9.30	0.10
56.	<i>Nayan bali</i>	2816	0.11	7.72	0.08
57.	<i>Shar Puti</i>	41	0.00	7.00	0.08
58.	<i>Kali/Napti Koi</i>	5200	0.21	6.80	0.07
59.	<i>Khalisha</i>	1227	0.05	6.09	0.07
60.	<i>Thai Shor Puti</i>	18	0.00	5.35	0.06
61.	<i>Batasi</i>	494	0.02	5.18	0.06
62.	<i>Khalla/Kharshulla</i>	131	0.01	4.97	0.05
63.	<i>Bacha</i>	20	0.00	2.27	0.02

Sl no	Species Name	Total Number	(%) by Number	Weight (kg)	(%) by Weight
64.	<i>Tara Baim</i>	108	0.00	2.20	0.02
65.	<i>Cheng</i>	30	0.00	2.00	0.02
66.	<i>Vangra</i>	90	0.00	2.00	0.02
67.	<i>Jhili Puti</i>	1478	0.06	1.63	0.02
68.	<i>Kanchan Puti</i>	424	0.02	1.27	0.01
69.	<i>Tin Chokha</i>	960	0.04	1.20	0.01
70.	<i>Mamoli Chapila</i>	135	0.01	1.19	0.01
71.	<i>Narkeli Chela</i>	390	0.02	1.17	0.01
72.	<i>Tengra (Batasio)</i>	108	0.00	0.93	0.01
73.	<i>Peashi</i>	10	0.00	0.16	0.00
	<i>Total</i>	2473469	100.00	9103.62	100.00
<b>Canal</b>					
1.	<i>Chapila</i>	129156	17.22	885.70	27.72
2.	<i>Jat Puti</i>	51140	6.82	438.94	13.74
3.	<i>Bele</i>	44985	6.00	280.01	8.76
4.	<i>Tit Puti</i>	45018	6.00	279.51	8.75
5.	<i>Boro Baim</i>	1359	0.18	208.37	6.52
6.	<i>Gura Echa</i>	363742	48.51	198.75	6.22
7.	<i>Tengra</i>	14070	1.88	167.52	5.24
8.	<i>Mrigel</i>	557	0.07	138.85	4.35
9.	<i>Taki</i>	4947	0.66	134.77	4.22
10.	<i>Tatkini</i>	1332	0.18	78.78	2.47
11.	<i>Potka</i>	6932	0.92	64.09	2.01
12.	<i>Gol Chanda</i>	48759	6.50	62.00	1.94
13.	<i>Guchi Baim</i>	2747	0.37	40.86	1.28
14.	<i>Bagha Puti</i>	3912	0.52	27.67	0.87
15.	<i>Rui</i>	50	0.01	27.53	0.86
16.	<i>Mola</i>	10837	1.45	20.16	0.63
17.	<i>Gutum</i>	3170	0.42	18.61	0.58
18.	<i>Air</i>	135	0.02	17.82	0.56
19.	<i>Chola Puti</i>	1048	0.14	12.67	0.40
20.	<i>Kaikla</i>	731	0.10	11.92	0.37
21.	<i>Ghaura</i>	300	0.04	10.50	0.33
22.	<i>Chela</i>	5757	0.77	9.11	0.29
23.	<i>Shol</i>	84	0.01	7.51	0.24
24.	<i>Rita</i>	88	0.01	6.63	0.21
25.	<i>Lamba Chanda</i>	2967	0.40	6.53	0.20
26.	<i>Satka Chingri</i>	3260	0.43	5.90	0.18
27.	<i>Golsa/Kabasi Tengra</i>	277	0.04	5.37	0.17
28.	<i>Tara Baim</i>	93	0.01	4.88	0.15
29.	<i>Khalla/Kharshulla</i>	166	0.02	4.14	0.13
30.	<i>Foli</i>	41	0.01	3.65	0.11
31.	<i>Baspata/Kazuli</i>	314	0.04	2.50	0.08
32.	<i>Vangra</i>	88	0.01	2.43	0.08
33.	<i>Shing</i>	76	0.01	2.00	0.06
34.	<i>Bagha Air/Baghaura</i>	10	0.00	1.55	0.05
35.	<i>Batasi</i>	46	0.01	0.89	0.03
36.	<i>Silong</i>	8	0.00	0.85	0.03
37.	<i>Kalibaush</i>	10	0.00	0.67	0.02
38.	<i>Lal Khalisha</i>	269	0.04	0.63	0.02

Sl no	Species Name	Total Number	(%) by Number	Weight (kg)	(%) by Weight
39.	<i>Gora Gutum/Ganga Shagor</i>	80	0.01	0.60	0.02
40.	<i>Ranga Chanda</i>	584	0.08	0.56	0.02
41.	<i>Kuicha</i>	10	0.00	0.52	0.02
42.	<i>Chuna Khalisha</i>	253	0.03	0.52	0.02
43.	<i>Peali</i>	21	0.00	0.47	0.01
44.	<i>Kanchan Puti</i>	30	0.00	0.31	0.01
45.	<i>Pabda/Madhu</i>	48	0.01	0.28	0.01
	<i>Pabda/Kowakata/Ghorakata</i>				
46.	<i>Dhela</i>	109	0.01	0.27	0.01
47.	<i>Rani</i>	50	0.01	0.25	0.01
48.	<i>Chaka/Gangina</i>	39	0.01	0.18	0.01
49.	<i>Golda Echa</i>	8	0.00	0.16	0.00
50.	<i>Khalisha</i>	28	0.00	0.13	0.00
51.	<i>Tepa</i>	20	0.00	0.05	0.00
52.	<i>Buth Koi/Bali</i>	10	0.00	0.05	0.00
	<i>Chata/Balitora</i>				
53.	<i>Nayan bali</i>	10	0.00	0.03	0.00
54.	<i>Kali/Napti Koi</i>	30	0.00	0.02	0.00
55.	<i>Tin Chokha</i>	10	0.00	0.02	0.00
	<i>Total</i>	<b>749821</b>	<b>100.00</b>	<b>3194.69</b>	<b>100.00</b>

## Appendix 13

## CPUE of Most Commonly Used Gears in Turag-Bangshi (April'00 – March'01)

Season	Month	<i>Thetajal</i>	<i>Moijal</i>	<i>Dhorejal</i>	<i>Currentjal</i>	<i>Berjal</i>	<i>Jhaki jal</i>
<b>Beel</b>							
	Apr-00	1.24	1.50	0	0.03	2.39	0.54
	May-00	0.87	0	0	0.02	0.95	1.03
	Jun-00	0.28	0	0	0.01	0	0.53
<b>Pre-Monsoon</b>		<b>0.87</b>	<b>1.50</b>	<b>0</b>	<b>0.02</b>	<b>1.31</b>	<b>0.80</b>
	Jul-00	0.13	0	0	0.01	0.78	0.39
	Aug-00	0.52	1.80	0	0.01	3.90	0.25
	Sep-00	0.37	0	0	0.01	2.36	0.41
<b>Monsoon</b>		<b>0.33</b>	<b>1.80</b>	<b>0</b>	<b>0.01</b>	<b>2.35</b>	<b>0.37</b>
	Oct-00	0.52	0	0	0.01	4.80	0.29
	Nov-00	1.12	0.76	0	0.01	7.75	2.35
	Dec-00	0.89	3.47	0	0.01	3.67	0.57
<b>Post Monsoon</b>		<b>0.91</b>	<b>2.11</b>	<b>0</b>	<b>0.01</b>	<b>6.18</b>	<b>1.13</b>
	Jan-01	0.89	2.97	0	0.02	1.11	1.55
	Feb-01	0.66	1.60	0	0.01	4.80	0.81
	Mar-01	1.06	0	0	0.03	1.37	0.73
<b>Dry</b>		<b>0.84</b>	<b>2.05</b>	<b>0</b>	<b>0.02</b>	<b>2.43</b>	<b>0.99</b>
<b>Floodplain</b>							
	Apr-00	0.86	0	0	0.01	0	0.70
	May-00	0.69	0	0	0.01	0	0
	Jun-00	0.31	1.71	0	0.03	0	0
<b>Pre-Monsoon</b>		<b>0.64</b>	<b>1.71</b>	<b>0</b>	<b>0.02</b>	<b>0</b>	<b>0.70</b>
	Jul-00	0.29	2.48	0	0.01	4.81	0
	Aug-00	0.33	0	0	0.01	2.81	0
	Sep-00	0.28	2.00	0	0.00	0	0
<b>Monsoon</b>		<b>0.31</b>	<b>2.38</b>	<b>0</b>	<b>0.01</b>	<b>3.31</b>	<b>0</b>
	Oct-00	0.33	0	0	0.01	4.34	0
	Nov-00	2.63	0	0	0.01	5.29	0
	Dec-00	0.70	8.90	0	0.12	6.01	2.87
<b>Post Monsoon</b>		<b>1.43</b>	<b>8.90</b>	<b>0</b>	<b>0.03</b>	<b>5.31</b>	<b>2.87</b>
	Jan-01	1.72	0	0	0.01	3.87	0.59
	Feb-01	0.13	0	0	0.02	0	0
	Mar-01	0	0	0	0.01	0	1.26
<b>Dry</b>		<b>1.32</b>	<b>8.90</b>	<b>0</b>	<b>0.01</b>	<b>3.87</b>	<b>1.03</b>
<b>River</b>							
	Apr-00	0	0.72	0	0.07	0.54	0.25
	May-00	0	0.76	0	0	1.47	0.44
	Jun-00	0	0.55	0	0	0.90	0.25
<b>Pre-Monsoon</b>		<b>0</b>	<b>0.72</b>	<b>0</b>	<b>0.07</b>	<b>0.86</b>	<b>0.29</b>
	Jul-00	0.03	1.38	0	0	0	0.27
	Aug-00	0.08	0	0	0	0	0.35
	Sep-00	0	0	0	0	3.39	0.46
<b>Monsoon</b>		<b>0.05</b>	<b>1.38</b>	<b>0</b>	<b>0</b>	<b>3.39</b>	<b>0.38</b>

Season	Month	<i>Thela jal</i>	<i>Moi jal</i>	<i>Dhore jal</i>	<i>Current jal</i>	<i>Ber jal</i>	<i>Jhaki jal</i>
	Oct-00	0.39	0	3.61	0	0.56	0.42
	Nov-00	0.10	1.42	0.29	0	2.44	0.81
	Dec-00	0	2.73	0	0.30	2.81	0.57
<b>Post Monsoon</b>		<b>0.33</b>	<b>2.29</b>	<b>2.50</b>	<b>0.30</b>	<b>2.40</b>	<b>0.61</b>
	Jan-01	0	1.63	0	0	2.28	0.48
	Feb-01	0	1.10	0	0.09	1.00	0.37
	Mar-01	0	1.08	0	0.02	0	0.43
<b>Dry</b>		<b>0</b>	<b>1.33</b>	<b>0</b>	<b>0.05</b>	<b>1.85</b>	<b>0.43</b>
<b>Canal</b>							
	Apr-00	0	0	0	0	0	0.33
	May-00	0	0	0	0	0	0.41
	Jun-00	0	0.37	0	0	0	0.28
<b>Pre-Monsoon</b>		<b>0</b>	<b>0.37</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0.36</b>
	Jul-00	0	0.42	0.03	0	0	0.20
	Aug-00	0.19	0	0	0	0	0.34
	Sep-00	0.46	0	0	0	0	0.43
<b>Monsoon</b>		<b>0.32</b>	<b>0.42</b>	<b>0.03</b>	<b>0</b>	<b>0</b>	<b>0.29</b>
	Oct-00	0.31	0	8.92	0.25	0	1.41
	Nov-00	0.99	0	5.01	0	0	1.10
	Dec-00	3.00	0	13.43	0	0	0.82
<b>Post Monsoon</b>		<b>1.15</b>	<b>0</b>	<b>8.18</b>	<b>0.25</b>	<b>0</b>	<b>1.20</b>
	Jan-01	0	0	1.00	0	0	0.54
	Feb-01	0	0	0	0	0	0.42
	Mar-01	0	0	0	0	0	0.51
<b>Dry</b>		<b>0</b>	<b>0</b>	<b>1.00</b>	<b>0</b>	<b>0</b>	<b>0.51</b>

Appendix 14

Catch Composition (%) by Habitat and Season in Turag-Bangshi

Season	Snake-heads	Eels	Major Carp	Large Catfish	Minor Carp	Prawns	Small Catfish	Small Fish	Ex-Species	Knife fish	Hilsha	Others
<b>Pre-Monsoon</b>												
Beel	25.37	8.81	1.60	8.16	0.01	9.63	17.77	27.55	0.95	0.14	-	-
Floodplain	11.03	11.57	-	1.48	-	18.60	20.08	37.25	-	-	-	-
River	1.48	13.00	2.75	2.66	-	16.71	16.20	46.27	-	-	-	0.92
Canal	5.11	11.44	1.14	1.82	0.13	7.56	5.99	66.78	-	-	-	0.02
<b>Monsoon</b>												
Beel	8.18	10.70	7.10	1.46	0.84	7.74	7.99	52.29	2.37	1.14	0.17	-
Floodplain	5.76	5.01	3.75	0.85	-	10.10	8.09	66.43	-	-	-	-
River	0.71	10.28	34.68	2.85	-	7.18	11.18	29.35	3.70	-	-	0.06
Canal	4.56	24.37	28.25	1.95	-	8.98	6.51	25.38	-	-	-	-
<b>Post-Monsoon</b>												
Beel	8.77	5.89	10.16	2.27	1.43	9.30	8.08	52.06	0.67	1.37	-	-
Floodplain	11.99	4.18	6.63	4.28	2.41	7.85	5.66	55.55	0.76	0.70	-	-
River	4.51	11.73	3.82	8.46	2.24	7.85	13.94	46.25	0.05	1.12	-	0.03
Canal	4.24	6.66	3.48	0.69	2.99	6.21	6.14	69.45	-	0.14	-	-
<b>Dry</b>												
Beel	10.75	4.08	1.49	1.22	0.09	20.87	6.72	54.45	0.02	0.29	-	-
Floodplain	9.14	6.14	1.37	2.03	-	21.36	1.99	57.77	0.04	0.16	-	-
River	0.94	9.21	-	9.39	-	17.65	13.93	48.88	-	-	-	0.00
Canal	8.73	1.21	5.66	-	-	4.32	0.14	79.93	-	-	-	-



Species Name	Scientific Name
<b>Small Catfish</b>	
Batasi	<i>Pseudotropius atherrinoides</i>
Bajri Tengra	<i>Mystus tengara</i>
Golsa/Kabasi Tengra	<i>Mystus cavasius</i>
Tengra	<i>Mystus vittatus</i>
Bacha	<i>Eutropiichthys vacha</i>
Baspata/Kazuli	<i>Danio devario</i>
Silong	<i>Silonia silondia</i>
Gang Magur	<i>Plotosus canius</i>
Kani Pabda	<i>Ompok himaculatus</i>
Madhu Pabda/Pabda	<i>Ompok pabda</i>
Chaka/Gangina/Kaoua kata/Ghorakata	<i>Chaca chaca</i>
Shing	<i>Heteropneustes fossilis</i>
Magur	<i>Clarius batrachus</i>
Ghaura	<i>Clupisoma garua</i>
Gang Tengra	<i>Gagata viridescens</i>
Tengra (Batasio)	<i>Batasio batasio</i>
Senia (Eusufi)	<i>Gagata cenia</i>
Gongi	
<b>Large Catfish</b>	
Air	<i>Mystus aor</i>
Guzi air/Guzkata	<i>Mystus seenghala</i>
Bagha Air	<i>Bagarius bagarius</i>
Boal	<i>Wallago attu</i>
Baghaura	
Rita	<i>Rita rita</i>
Pangas	<i>Pangasius pangasius</i>
<b>Eels</b>	
Boro Baim	<i>Mastacembelus armatus</i>
Guchi Baim	<i>Mastacembelus pancalus</i>
Tara Baim	<i>Macragnathus aculeatus</i>
Kuicha	<i>Cuchia cuchia</i>
Kecho Bime	<i>Ophichthys boro</i>
<b>Snakeheads</b>	
Taki	<i>Channa punctatus</i>
Shol	<i>Channa striatus</i>
Gojar	<i>Channa marulius</i>
Cheng	<i>Channa gachua</i>

Species Name	Scientific Name
<b>Prawn</b>	
Gura Echa	<i>Macrobrachium lamrrei</i>
Golda Echa	<i>Macrobrachium rosenbergii</i>
Satka Chingri	<i>Macrobrachium</i>
Dimua/Kathalia Echa	
Thengua Echa	<i>Macrobrachium birmanicus</i>
Boiragi Echa	
<b>Exotic fish</b>	
Thai Shor Puti	<i>Puntius gonionotus</i>
Nailotika	<i>Oreochromis niloticus</i>
African Magur	<i>Clarias gariepinus</i>
Telapia	<i>Oreochromis (Telapia) mossambicus</i>
Silver Carp	<i>Hypophthalmichthys molitrix</i>
Grass Carp	<i>Ctenopharyngodon idellus</i>
Mirror Carp	<i>Cyprinus carpio specularis</i>
Common Carp/Karfu	<i>Cyprinus carpio communis</i>
Bighead Carp	<i>Aristichthys nobilis</i>
<b>Knife Fish</b>	
Chital	<i>Notopterus chitala</i>
Foli	<i>Notopterus notopterus</i>
<b>Dry Fish</b>	
Dry Fish	
Rocket	
Loitka	
<b>Hilsha</b>	
Hilsha	<i>Tenualosa ilisha</i>

## Appendix 16

## Fish Species Observed and Their Habitat Preference in Turag-Banshi (April'00 to March'01)

Sl no	Species Name	Sl no	Species Name
<b>Beel Resident</b>		<b>Exotics</b>	
1	<i>Jat Puti</i>	44	<i>Thai Shor Puti</i>
2	<i>Kanchan Puti</i>	45	<i>African Magur</i>
3	<i>Jhili Puti</i>	46	<i>Telapia</i>
4	<i>Chola Puti</i>	47	<i>Silver Carp</i>
5	<i>Bagha Puti</i>	48	<i>Grass Carp</i>
6	<i>Mola</i>	49	<i>Mirror Carp</i>
7	<i>Dhela</i>	50	<i>Common Carp/Karfu</i>
8	<i>Chela</i>	<b>Migratory</b>	
9	<i>Ranga Chanda</i>	51	<i>Tepa</i>
10	<i>Gol Chanda</i>	52	<i>Gora Gutum/Ganga Shagor</i>
11	<i>Chapila</i>	53	<i>Vangra</i>
12	<i>Khalisha</i>	54	<i>Tatkini</i>
13	<i>Lal Khalisha</i>	55	<i>Pabda/Madhu</i>
14	<i>Chuna Khalisha</i>		<i>Pabda/Kowakata/Ghorakata</i>
15	<i>Dankina</i>	56	<i>Rui</i>
16	<i>Koi</i>	57	<i>Catla</i>
17	<i>Bele</i>	58	<i>Mrigel</i>
18	<i>Kaikla</i>	59	<i>Golda Echa</i>
19	<i>Gutum</i>	60	<i>Narkeli Chela</i>
20	<i>Tin Chokha</i>	61	<i>Dimua/Kathalia Echa</i>
21	<i>Guchi Baim</i>	62	<i>Kalibaush</i>
22	<i>Kuicha</i>	63	<i>Golsa/Kabasi Tengra</i>
23	<i>Taki</i>	64	<i>Shar Puti</i>
24	<i>Shol</i>	<b>Riverine</b>	
25	<i>Cheng</i>	65	<i>Kachki</i>
26	<i>Tengra</i>	66	<i>Poa</i>
27	<i>Shing</i>	67	<i>Khalla/Kharshulla</i>
28	<i>Magur</i>	68	<i>Peali</i>
29	<i>Gura Echa</i>	69	<i>Air</i>
30	<i>Buth Koi/Bali Chata/Balitoru</i>	70	<i>Batasi</i>
31	<i>Tengra (Batasio)</i>	71	<i>Boal</i>
32	<i>Satka Chingri</i>	72	<i>Hilsha (Jatka)</i>
33	<i>Gugri Bila</i>	73	<i>Peashi</i>
34	<i>Kali/Napti Koi</i>	74	<i>Bagha Air/Baghaura</i>
35	<i>Rani</i>	75	<i>Bachu</i>
36	<i>Boro Baim</i>	76	<i>Rita</i>
37	<i>Gojar</i>	77	<i>Ghaura</i>
38	<i>Kani Pabda</i>	78	<i>Silong</i>
39	<i>Tit Puti</i>	79	<i>Chaka/Gangina</i>
40	<i>Lamba Chanda</i>	80	<i>Baspata/Kazuli</i>
41	<i>Meni/Bheda</i>	<b>Unknown</b>	
42	<i>Tara Baim</i>	81	<i>Potka</i>
43	<i>Foli</i>	82	<i>Nayan hali</i>
		83	<i>Mamoli Chapila</i>

Appendix 17

Table 1: Fishing Access by Gear and Season in Hail Haor (April'00 – March 01)

Season	Gear Name	Leased	Sub-leased	Non leased	Fishing in Open Access	Own Water body	Wage labour	Total
Pre Monsoon	Veshal/Khara	2	13	0	0	11	0	26
	Ber Jal	0	3	0	0	13	0	16
	Theta Jal /Jali	0	1	0	0	31	0	32
	Current Jul	0	6	0	0	29	0	35
	Guli/Chai	0	9	0	0	19	0	28
	Suta Jal	0	0	0	0	0	0	0
<b>Overall</b>		<b>2</b>	<b>32</b>	<b>0</b>	<b>0</b>	<b>103</b>	<b>0</b>	<b>137</b>
Monsoon	Veshal/Khara	2	0	0	0	1	0	3
	Ber Jal	0	39	0	0	16	0	55
	Theta Jal /Jali	0	5	0	0	13	0	18
	Current Jul	0	54	0	0	20	0	74
	Guli/Chai	0	15	0	0	4	0	19
	Suta Jal	0	3	0	0	0	0	3
<b>Overall</b>		<b>2</b>	<b>116</b>	<b>0</b>	<b>0</b>	<b>54</b>	<b>0</b>	<b>172</b>
Post Monsoon	Veshal/Khara	3	5	0	0	0	0	8
	Ber Jal	0	47	0	0	2	0	49
	Theta Jal /Jali	0	2	0	0	33	0	35
	Current Jul	8	132	0	0	21	0	161
	Guli/Chai	1	49	0	0	9	0	59
	Suta Jal	1	11	0	0	0	0	12
<b>Overall</b>		<b>13</b>	<b>246</b>	<b>0</b>	<b>0</b>	<b>65</b>	<b>0</b>	<b>324</b>
Dry Season	Veshal/Khara	0	21	0	0	0	0	21
	Ber Jal	0	1	0	0	1	0	2
	Theta Jal /Jali	0	0	0	0	36	0	36
	Current Jul	4	37	0	1	13	0	62
	Guli/Chai	7	38	2	0	1	1	53
	Suta Jal	0	2	0	0	0	0	2
<b>Overall</b>		<b>11</b>	<b>99</b>	<b>2</b>	<b>1</b>	<b>51</b>	<b>1</b>	<b>176</b>

Appendix 17

Table 2: Fishing Access by Gear and Habitat in Hail Haor (April'00 –March'01)

Habitat	Bangla Name	Leased	Sub leased	Non leased	Fishing In Absence	Open Access	Own Water body	Wage labour	Total
<b>Beel</b>	<i>Veshal/Khara</i>	2	0	0	0	0	0	0	2
	<i>Ber Jal</i>	0	20	0	0	7	0	1	28
	<i>Thela Jal /Jali</i>	0	2	0	0	33	0	0	35
	<i>Current Jul</i>	5	65	0	1	12	0	7	90
	<i>Guli/Chai</i>	5	29	0	0	5	0	3	42
	<i>Suta Jal</i>	0	5	0	0	0	0	1	6
<b>Overall</b>		12	121	0	1	57	0	12	203
<b>Floodplain</b>	<i>Veshal/Khara</i>	4	9	0	0	3	0	0	16
	<i>Ber Jal</i>	0	68	0	0	21	0	0	89
	<i>Thela Jal /Jali</i>	0	6	0	0	67	0	0	73
	<i>Current Jul</i>	9	163	0	0	61	0	1	234
	<i>Guli/Chai</i>	3	81	2	0	27	1	1	115
	<i>Suta Jal</i>	1	11	0	0	0	0	0	12
<b>Overall</b>		17	338	2	0	179	1	2	539
<b>River</b>	<i>Veshal/Khara</i>	1	39	0	0	9	0	0	49
	<i>Ber Jal</i>	0	2	0	0	4	0	0	6
	<i>Thela Jal /Jali</i>	0	0	0	0	13	0	0	13
	<i>Current Jul</i>	0	1	0	0	10	0	0	11
	<i>Guli/Chai</i>	0	1	0	0	1	0	0	2
	<i>Suta Jal</i>	0	0	0	0	0	0	0	0
<b>Overall</b>		1	43	0	0	37	0	0	81

## Appendix 18

**Table 1: Distribution of HHs by Land Holding Size in Hail Haor**

Village Name	Landless		Marginal		Small		Medium		Large		Total	
	No	(%)	No	(%)	No	(%)	No	(%)	No	(%)	No	(%)
Uttar Baruna	21	60.00	4	11.43	3	8.57	4	11.43	3	8.57	35	100.00
Baruna (Borobari)	22	62.86	7	20.00	2	5.71	3	8.57	1	2.86	35	100.00
Baruna (Migherhati)	27	77.14	7	20.00	0	0.00	1	2.86	0	0.00	35	100.00
Hazipur	21	60.00	7	20.00	3	8.57	3	8.57	1	2.86	35	100.00
Paschim Varaura	21	60.00	10	28.57	2	5.71	2	5.71	0	0.00	35	100.00
Lalbag	17	48.57	8	22.86	6	17.14	4	11.43	0	0.00	35	100.00
Dighapara	25	71.43	6	17.14	3	8.57	1	2.86	0	0.00	35	100.00
Rustampur	26	74.29	3	8.57	3	8.57	1	2.86	2	5.71	35	100.00
Bade Alisha	16	45.71	8	22.86	6	17.14	4	11.43	1	2.86	35	100.00
Vimshi (Namapara)	25	71.43	5	14.29	5	14.29	0	0.00	0	0.00	35	100.00
Boulashir	21	60.00	6	17.14	5	14.29	3	8.57	0	0.00	35	100.00
Mirzapur	24	68.57	5	14.29	3	8.57	1	2.86	2	5.71	35	100.00
Shoilpur	25	71.43	8	22.86	1	2.86	1	2.86	0	0.00	35	100.00
<b>Total</b>	<b>291</b>	<b>63.96</b>	<b>84</b>	<b>18.46</b>	<b>42</b>	<b>9.23</b>	<b>28</b>	<b>6.15</b>	<b>10</b>	<b>2.20</b>	<b>455</b>	<b>100.00</b>

**Table 2: Distribution of HHs by Land Holding Size in Turag-Bangshi**

Village Name	Landless		Marginal		Small		Medium		Large		Total	
	No	(%)	No	(%)	No	(%)	No	(%)	No	(%)	No	(%)
Majhukhan	20	57.14	13	37.14	2	5.71	0	0.00	0	0.00	35	100.00
Taltoli	17	48.57	10	28.57	3	8.57	4	11.43	1	2.86	35	100.00
Bastoli	19	54.29	8	22.86	3	8.57	3	8.57	2	5.71	35	100.00
Kaliadaho	19	54.29	5	14.29	5	14.29	4	11.43	2	5.71	35	100.00
Sholhati	17	48.57	11	31.43	5	14.29	1	2.86	1	2.86	35	100.00
Gopinpur	17	48.57	9	25.71	2	5.71	6	17.14	1	2.86	35	100.00
Boroi Bari	26	74.29	7	20.00	0	0.00	2	5.71	0	0.00	35	100.00
Medi Ashulia	24	68.57	5	14.29	0	0.00	5	14.29	1	2.86	35	100.00
<b>Total</b>	<b>159</b>	<b>56.79</b>	<b>68</b>	<b>24.29</b>	<b>20</b>	<b>7.14</b>	<b>25</b>	<b>8.93</b>	<b>8</b>	<b>2.86</b>	<b>280</b>	<b>100.00</b>

## Appendix 19

## List of Wildlife Species Observed During First Impact Year in Hail Haor (April'00 to March'01)

Common Name	Scientific Name	Winter			Monsoon			
		T-1	T-2	T-3	T-1	T-2	T-3	
<b>Amphibian</b>								
1	Bull Frog	<i>Hoplobatrachus tigerinus</i>	√	x	x	√	√	x
2	Common Toad	<i>Bufo melanostictus</i>	√	√	√	√	√	√
3	Cricket Frog	<i>Limnonectes limnocharis</i>	√	x	x	√	x	x
4	Skipper Frog	<i>Euphlyctis cyanophlyctis</i>	√	√	x	√	x	x
5	Tree Frog	<i>Rana temporalis</i>	x	√	√	x	√	√
<b>Reptile</b>								
1	Banded Krait	<i>Bungarus fasciatus</i>	x	√	√	x	√	x
2	Bengal Monitor	<i>Varanus bengalensis</i>	x	x	√	x	√	√
3	Binocellate Cobra	<i>Naja naja</i>	x	√	√	x	x	√
4	Brahminy River Turtle	<i>Hardella thurjii</i>	√	x	x	x	x	x
5	Checkered Keelback	<i>Xenocrophis piscator</i>	√	x	x	√	x	x
6	Common Garden Lizard	<i>Calotes versicolor</i>	x	√	√	x	√	√
7	Common Skink	<i>Mabuya carinata</i>	x	√	√	x	√	√
8	Common Smooth Water Snake	<i>Enhydrys enhydrys</i>	√	x	x	√	x	x
9	Common Vine Snake	<i>Ahaetulla nasutus</i>	x	√	√	x	√	√
10	Common Worm Snake	<i>Ramphotyphlops braminus</i>	x	√	√	x	√	√
11	House Lizard	<i>Hemidactylus brookii</i>	x	√	√	x	√	x
12	Indian Roofed Turtle	<i>Kachuga tecta</i>	√	x	x	√	x	x
13	Monocellate Cobra	<i>Naja kaouthia</i>	x	√	√	√	x	√
14	Olive Keelback	<i>Atretium schistosum</i>	√	x	x	√	x	x
15	Rat Snake	<i>Culuber mucosus</i>	x	√	√	√	√	x
16	Rock Python	<i>Python molurus</i>	x	x	√	x	x	√
17	Spotted Lizard	<i>Hemiductylus frenatus</i>	x	x	√	x	√	x
18	Stripped Keelback	<i>Amphiesma stolata</i>	√	x	x	x	x	x
19	Wall Lizard	<i>Gekko gecko</i>	x	√	√	x	√	√
<b>Avis</b>								
1	Abbott's Babbler	<i>Malacocincla abbotti</i>	X	√	√	X	√	√
2	Ashy Wood-swallow	<i>Artamus fuscus</i>	x	√	√	x	√	√
3	Asian Bared Owllet	<i>Glancidium cuculoides</i>	x	x	√	x	x	x
4	Asian Cuckoo	<i>Eudynamis scolopacea</i>	X	√	√	X	√	x
5	Asian Palm Swift	<i>Cypsiurus halasiensis</i>	√	√	√	√	√	x
6	Asian Pied Starling	<i>Sturnus contra</i>	√	√	√	√	√	√
7	Barn Owl	<i>Tyto alba</i>	√	x	√	x	√	x
8	Baya Weaver	<i>Ploceus philippinus</i>	√	√	X	√	√	X
9	Black Drongo	<i>Dicrurus macrocercus</i>	√	√	√	√	√	√
10	Black Kite	<i>Milvus migrans</i>	√	√	x	√	√	x
11	Black-crested Yellow Bulbul	<i>Pycnonotus melanicterus</i>	x	x	√	x	x	x
12	Black-crowned Night Heron	<i>Nycticorax nycticorax</i>	√	x	x	√	x	x

Common Name	Scientific Name	Winter			Monsoon			
		T-1	T-2	T-3	T-1	T-2	T-3	
13	Black-headed Oriole	<i>Oriolus xanthornus</i>	√	√	√	x	√	√
14	Black-rumped Flameback	<i>Dinopium benghalensis</i>	X	√	√	X	√	√
15	Black-shouldered Kite	<i>Elanus caeruleus</i>	√	x	√	x	√	x
16	Black-winged Stilt	<i>Himantopus himantopus</i>	√	x	x	√	x	x
17	Blue-tailed Bee-eater	<i>Merops philippinus</i>	x	x	√	x	√	x
18	Blue-throated Barbet	<i>Megalaima asiatica</i>	X	√	√	X	x	√
19	Brahminy Kite	<i>Haliaster indus</i>	√	√	x	x	x	√
20	Bronzed Drongo	<i>Dicrurus aeneus</i>	X	x	√	X	x	√
21	Bronze-winged Jacana	<i>Metopidius indicus</i>	√	x	x	√	x	x
22	Brown Fish Owl	<i>Ketupa zeylonensis</i>	√	x	X	√	x	X
23	Brown Shrike	<i>Lanius cristatus</i>	√	√	x	√	x	x
24	Brown-cheeked Fulvetta	<i>Aleippe pavocephala</i>	x	√	√	x	x	√
25	Buff-breasted Babbler	<i>Pellorneum tickelli</i>	x	√	√	x	√	√
26	Cattle Egret	<i>Bubulcus ibis</i>	√	x	x	√	√	x
27	Common Hawk Cuckoo	<i>Hierococcyx varius</i>	X	√	√	X	√	x
28	Common Hoopoe	<i>Upupa epops</i>	X	√	√	X	√	x
29	Common Iora	<i>Aegithina tiphia</i>	X	√	√	X	√	√
30	Common Kingfisher	<i>Alcedo atthis</i>	√	x	√	√	√	x
31	Common Moorhen	<i>Gallinula chloropus</i>	√	x	x	√	x	x
32	Common Myna	<i>Acridotheres tristis</i>	√	√	√	√	√	√
33	Common Sandpiper	<i>Actitis hypoleucos</i>	√	x	x	x	x	x
34	Common Swallow	<i>Hirundo rustica</i>	√	√	X	x	x	X
35	Common Tailor Bird	<i>Orthotomus sutorius</i>	x	√	√	x	√	√
36	Eastern Golden Plover	<i>Pulvialis dominica</i>	√	x	x	x	x	x
37	Emerald Dove	<i>Chalcophaps indica</i>	X	√	√	X	x	√
38	Eurasian Collared Dove	<i>Streptopelia decaocta</i>	x	√	√	x	√	√
39	Fantail Snipe	<i>Gallinago gallinago</i>	√	x	x	x	x	x
40	Fulvous Whistling Teal	<i>Dendrocygna bicolor</i>	√	x	x	√	x	x
41	Golden-fronted Leaf Bird	<i>Chloropsis aurifrons</i>	x	x	√	x	x	√
42	Great Egret	<i>Casmerodius alba</i>	√	x	x	√	x	x
43	Great Tit	<i>Parus major</i>	x	√	√	√	x	√
44	Greater Coucal	<i>Centropus sinensis</i>	√	√	√	x	√	√
45	Greater Painted Snipe	<i>Rostratula benghalensis</i>	√	x	x	x	x	x
46	Greater Racket-tailed Drongo	<i>Dicrurus paradiseus</i>	x	x	√	x	x	√
47	Green Bee-eater	<i>Merops orientalis</i>	X	√	√	X	√	√
48	Green-billed Malkoha	<i>Rophodytes tristis</i>	X	x	√	X	√	√
49	Grey Drongo	<i>Dicrurus leucophaeus</i>	x	x	√	x	x	x
50	Grey Wagtail	<i>Motacilla cineria</i>	√	√	√	x	x	x
51	Grey-headed Fishing Eagle	<i>Ichthyophaga ichthyaetus</i>	√	x	x	√	x	x
52	Grey-headed Lapwing	<i>Vanellus cinerius</i>	√	x	x	x	x	x
53	Grey-headed Myna	<i>Sturnus malabaricus</i>	X	√	√	X	√	√
54	Hill Myna	<i>Gracula religiosa</i>	x	x	√	x	√	√
55	House Crow	<i>Corvus splendens</i>	√	√	√	√	√	x
56	House Sparrow	<i>Passer domesticus</i>	√	√	√	√	√	x

Common Name	Scientific Name	Winter			Monsoon		
		T-1	T-2	T-3	T-1	T-2	T-3
57 Indian Pond Heron	<i>Ardeola grayii</i>	√	x	x	√	√	x
58 Indian Roller	<i>Coracias benghalensis</i>	x	√	√	x	√	x
59 Indian White-rumped Vulture	<i>Gyps bengalensis</i>	√	x	x	x	x	√
60 Intermediate Egret	<i>Mesophoyx intermedia</i>	√	x	x	√	√	x
61 Jungle Babbler	<i>Turdoides striatus</i>	√	√	√	x	√	x
62 Jungle Crow	<i>Corvus macrorhynchus</i>	X	√	√	√	√	√
63 Jungle Myna	<i>Acridotheres fuscus</i>	X	√	√	X	√	√
64 Large-tailed Shrike	<i>Lanius schuch</i>	x	√	x	x	x	x
65 Lesser Coucal	<i>Centropus bengalensis</i>	x	x	√	x	x	√
66 Lesser Racket-tailed Drongo	<i>Dicrurus remifer</i>	X	x	√	X	x	√
67 Lesser Whistling Duck	<i>Dendrocigna javanica</i>	√	x	x	√	x	x
68 Lineated Barbet	<i>Megelaima lineata</i>	x	√	√	x	√	√
69 Little Cormorant	<i>Phalacrocorax niger</i>	√	x	x	√	x	x
70 Little Egret	<i>Egretta garzetta</i>	√	x	x	√	√	x
71 Little Grebe	<i>Tachybaptus ruficollis</i>	√	x	x	√	x	x
72 Little Spider-hunter	<i>Arachnothera longirostris</i>	X	√	√	X	x	√
73 Orange-breasted Green Pigeon	<i>Treron bicincta</i>	X	√	√	X	x	√
74 Oriental Magpie Robin	<i>Copsychus saularis</i>	X	√	√	X	√	√
75 Oriental Pied Hornbill	<i>Anthracoceros albirostris</i>	x	x	√	x	x	√
76 Paddy-field Pipit	<i>Anthus novaeseelandiae</i>	√	x	x	√	x	x
77 Pale-bellied Flower-pecker	<i>Dicaeum erythrorhynchus</i>	x	√	√	x	√	√
78 Pheasant-tailed Jacana	<i>Hydrophasianus chirurgus</i>	√	x	x	√	x	x
79 Pied Cuckoo	<i>Clamator jacobinus</i>	x	√	√	x	x	x
80 Pied Wagtail	<i>Motacilla alba</i>	√	√	√	x	x	x
81 Plaintive Cuckoo	<i>Cacomantis passerinus</i>	X	√	X	X	√	X
82 Pompadour Pigeon	<i>Treron pompadora</i>	x	√	√	x	√	√
83 Purple Sunbird	<i>Nectarinia asiatica</i>	X	√	√	X	√	√
84 Purple-rumped Sunbird	<i>Nectarinia zeylonica</i>	x	√	√	x	√	√
85 Red Collared Dove	<i>Streptopelia tranquebarica</i>	x	√	√	x	√	√
86 Red Jungle Fowl	<i>Gallus gallus</i>	X	x	√	X	x	√
87 Red-breasted Parakeet	<i>Psittacula alexandri</i>	x	√	√	x	x	x
88 Red-vented Bulbul	<i>Pycnonotus cafer</i>	√	√	√	x	√	√
89 Red-vented Flycatcher	<i>Ficedula parva</i>	x	√	√	x	x	x
90 Red-wattled Lapwing	<i>Vanellus indicus</i>	√	x	x	√	x	x
91 Red-whiskered Bulbul	<i>Pycnonotus jocosus</i>	X	√	√	√	√	x
92 Rock Pigeon	<i>Columba livia</i>	√	√	√	x	√	x
93 Rose-ringed Parakeet	<i>Psittacula krameri</i>	x	√	√	x	√	x
94 Rosy Minivet	<i>Pericrocotus roseus</i>	x	x	√	x	x	√
95 Rufous Woodpecker	<i>Celeus brachyurus</i>	x	√	√	x	√	√
96 Rufous-winged Bush Lark	<i>Mirafara assamica</i>	X	√	√	X	√	√
97 Scarlet Minivet	<i>Pericrocotus flammeus</i>	x	x	√	x	x	√
98 Silver-bill Munia	<i>Lonchura malabarica</i>	√	√	√	x	√	x
99 Small Minivet	<i>Pericrocotus</i>	x	√	√	x	√	√

Common Name	Scientific Name	Winter			Monsoon		
		T-1	T-2	T-3	T-1	T-2	T-3
	<i>cinnamommeus</i>						
100 Spotted Dove	<i>Streptopelia chinensis</i>	√	√	√	x	√	√
101 Spotted Munia	<i>Lonchura punctulata</i>	√	√	√	√	√	√
102 Spotted Owlet	<i>Athene brama</i>	X	√	√	X	√	√
103 Tree Pie	<i>Dendrocitta vagabunda</i>	X	√	√	X	√	x
104 Water Cock	<i>Gallixrex cineria</i>	√	x	x	√	x	x
105 Water Rail	<i>Rallus aquaticus</i>	√	x	x	√	x	x
106 White-breasted Water-hen	<i>Amaurornis phoenicurus</i>	√	x	x	√	x	x
107 White-rumped Shama	<i>Copsychus malabaricus</i>	x	x	√	x	x	√
108 White-throated Fantail	<i>Rhipidura albicollis</i>	X	√	√	X	√	√
109 White-throated Kingfisher	<i>Helcyon smyrnensis</i>	√	√	X	√	√	X
110 Yellow Bittern	<i>Ixobrycus sinensis</i>	√	x	x	√	x	√
111 Yellow-footed Green Pigeon	<i>Treron phoenicoptera</i>	x	√	√	x	√	x
112 Yellow-fronted Pied Woodpecker	<i>Dendrocopos mahrattensis</i>	x	√	√	x	x	√
<b>Mammal</b>							
1 Asiatic Jackal	<i>Canis aureus</i>	x	√	√	x	√	√
2 Bandicot Rat	<i>Bandicota indica</i>	√	√	√	√	√	x
3 Barking Deer	<i>Muntiacus muntjak</i>	x	x	√	x	x	√
4 Bengal Fox	<i>Vulpes bengalensis</i>	x	x	x	x	√	√
5 Black Giant Squirrel	<i>Ratufa bicolor</i>	x	x	√	x	x	√
6 Capped Langur	<i>Trachypithecus pileatus</i>	x	x	√	x	x	√
7 Common House Rat	<i>Rattus rattus</i>	√	√	x	x	√	x
8 Common Mongoose	<i>Herpestes edwardsi</i>	X	√	√	X	√	√
9 Common Otter	<i>Lutra lutra</i>	√	x	X	√	x	X
10 Field Mouse	<i>Mus boduga</i>	√	√	X	√	√	X
11 Fishing Cat	<i>Felis viverrina</i>	X	x	√	√	√	x
12 Flying Fox	<i>Pteropus giganteus</i>	x	√	√	x	√	√
13 Grey Musk Srew	<i>Suncus murinus</i>	X	√	x	X	√	x
14 Hoolock Gibbon	<i>Hylobates hoolock</i>	x	x	√	x	x	√
15 House Mouse	<i>Mus musculus</i>	x	√	√	x	√	x
16 Indian Pangolin	<i>Manis crassicaudata</i>	x	x	√	x	x	√
17 Indian Pipistrelle	<i>Pipestrellus coromandalianus</i>	X	√	√	X	√	x
18 Large Civet	<i>Viverra zibetha</i>	x	√	√	x	√	x
19 Porcupine	<i>Hystrix indica</i>	x	x	√	x	√	√
20 Rhesus Macaque	<i>Macaca mulatta</i>	X	x	√	X	x	√
21 Rufous-tailed Hare	<i>Lepus nigricollis</i>	X	√	√	X	x	√
22 Small Civet	<i>Viverricula indica</i>	X	√	√	X	√	x
23 Small Mongoose	<i>Herpestes auropunctatus</i>	x	√	√	x	√	x

## Appendix 20

## Comparison of Observed Wildlife Species with Baseline Survey and First Year Impact Survey in Hail Haor

Sl no	Common Name	Scientific Name	Occurrence	
			Baseline	1st Year Impact
<b>Amphibian</b>				
1.	Bull Frog	<i>Hoplobatrachus tigerinus</i>	√	√
2.	Common Toad	<i>Bufo melanostictus</i>	√	√
3.	Cricket Frog	<i>Limnonectes limnocharis</i>	√	√
4.	Skipper Frog	<i>Euphletis cyanophlyctis</i>	√	√
5.	Tree Frog	<i>Rana temporalis</i>	√	√
<b>Reptile</b>				
1.	Banded Krait	<i>Bungarus fasciatus</i>	√	√
2.	Bengal Monitor	<i>Varanus bengalensis</i>	√	√
3.	Binocellate Cobra	<i>Naja naja</i>	√	√
4.	Brahminy River Turtle	<i>Hardella thurjii</i>	√	√
5.	Brown Roofed Turtle	<i>Kachuga smithii</i>	√	-
6.	Checkered Keelback	<i>Xenocrophis piscator</i>	√	√
7.	Common Garden Lizard	<i>Calotes versicolor</i>	√	√
8.	Common Skink	<i>Mabuya carinata</i>	√	√
9.	Common Smooth Water Snake	<i>Enhydrys enhydrys</i>	√	√
10.	Common Vine Snake	<i>Ahaetulla nasutus</i>	√	√
11.	Common Worm Snake	<i>Ramphotyphlops braminus</i>	√	√
12.	House Lizard	<i>Hemidactylus brookii</i>	√	√
13.	Indian Roofed Turtle	<i>Kachuga tecta</i>	√	√
14.	Monocellate Cobra	<i>Naja kaouthia</i>	√	√
15.	Olive Keelback	<i>Atretium schistosum</i>	√	√
16.	Peacock Soft-shell Turtle	<i>Aspideretes hurum</i>	√	-
17.	Rat Snake	<i>Coluber mucosus</i>	√	√
18.	Rock Python	<i>Coluber molurus</i>	√	√
19.	Spotted Lizard	<i>Hemidactylus frenatus</i>	√	√
20.	Stripped Keelback	<i>Amphiesma stolata</i>	-	√
21.	Wall Lizard	<i>Gekko gekko</i>	√	√
<b>Avis</b>				
1.	Abbott's Babbler	<i>Malacocincla abbotti</i>	√	√
2.	Ashy Wood-swallow	<i>Artamus fuscus</i>	√	√
3.	Asian Bared Owlet	<i>Glancidium cuculoides</i>	-	√
4.	Asian Cuckoo	<i>Eudynamis scolopacea</i>	√	√
5.	Asian Openbill	<i>Anastomus oscitans</i>	√	-
6.	Asian Palm Swift	<i>Cypsiurus balasiensis</i>	√	√
7.	Asian Pied Starling	<i>Sturnus contra</i>	√	√
8.	Avocet	<i>Recurvirostra avocetta</i>	√	√
9.	Bank Myna	<i>Acridotheres ginginianus</i>	√	-
10.	Barn Owl	<i>Tyto alba</i>	√	√

Sl no	Common Name	Scientific Name	Occurrence	
			Baseline	1st Year Impact
11.	Baya Weaver	<i>Ploceus philippinus</i>	√	√
12.	Black Drongo	<i>Dicrurus macrocercus</i>	√	√
13.	Black Kite	<i>Milvus migrans</i>	√	√
14.	Black-crested Yellow Bulbul	<i>Pycnonotus melanicterus</i>	√	√
15.	Black-crowed Night Heron	<i>Nycticorax nycticorax</i>	√	√
16.	Black-headed Oriole	<i>Oriolus xanthornus</i>	√	√
17.	Black-rumped Flameback	<i>Dinopium benghalensis</i>	√	√
18.	Black-shouldered Kite	<i>Elanus caeruleus</i>	√	√
19.	Black-winged Stilt	<i>Himantopus himantopus</i>	√	√
20.	Blue-tailed Bee-eater	<i>Merops philippinus</i>	√	√
21.	Blue-throated Barbet	<i>Megalaima asiatica</i>	√	√
22.	Brahminy Kite	<i>Haliaster indus</i>	√	√
23.	Bronzed Drongo	<i>Dicrurus aeneus</i>	√	√
24.	Bronze-winged Jacana	<i>Metopidius indicus</i>	√	√
25.	Brown Fish Owl	<i>Ketupa zeylonensis</i>	√	√
26.	Brown Shrike	<i>Lanius cristatus</i>	√	√
27.	Brown-cheeked Fulvetta	<i>Alcippe poiocephala</i>	√	√
28.	Buff-breasted Babbler	<i>Pellorneum tickelli</i>	√	√
29.	Cattle Egret	<i>Bubulcus ibis</i>	√	√
30.	Clamorous Reed-warbler	<i>Aerocephalus stentorius</i>	√	-
31.	Common Hawk Cuckoo	<i>Hierococcyx varius</i>	√	√
32.	Common Hoopoe	<i>Upupa epops</i>	√	√
33.	Common Iora	<i>Aegithina tiphia</i>	√	√
34.	Common Kingfisher	<i>Alcedo atthis</i>	√	√
35.	Common Moorhen	<i>Gallinula chloropus</i>	√	√
36.	Common Myna	<i>Acridotheres trisris</i>	√	√
37.	Common Sandpiper	<i>Actitis hypoleucos</i>	√	√
38.	Common Stone-chat	<i>Sexicola torquata</i>	√	-
39.	Common Swallow	<i>Hirundo rustica</i>	√	√
40.	Common Tailor Bird	<i>Orthotomus sutorius</i>	√	√
41.	Common Teal	<i>Anas crecca</i>	√	√
42.	Coot	<i>Fulica atra</i>	√	√
43.	Coppersmith Barbet	<i>Megalaima haemacephala</i>	√	-
44.	Dusky Warbler	<i>Phylloscopus fuscatus</i>	√	-
45.	Eastern Golden Plover	<i>Puvialis dominica</i>	√	√
46.	Eastern Marsh Harrier	<i>Circus spilonotus</i>	√	-
47.	Emerald Dove	<i>Chalcophaps indica</i>	√	√
48.	Eurasian Collared Dove	<i>Streptopelia decaocta</i>	√	√
49.	Fantail Snipe	<i>Gallinago gallinago</i>	-	√
50.	Fulvous Whistling Teal	<i>Dendrocygna bicolor</i>	√	√
51.	Golden Fronted Leaf-bird	<i>Chloropsis aurifrons</i>	-	√
52.	Great Egret	<i>Casmerodius alba</i>	√	√
53.	Great Tit	<i>Parus major</i>	√	√
54.	Greater Coucal	<i>Centropus sinensis</i>	√	√
55.	Greater Painted Snipe	<i>Rostratula benghalensis</i>	-	√
56.	Greater Racket-tailed Drongo	<i>Dicrurus paradiseus</i>	√	√

Sl no	Common Name	Scientific Name	Occurrence	
			Baseline	1st Year Impact
57.	Green Bee-eater	<i>Merops orientalis</i>	√	√
58.	Green-billed Malkoha	<i>Rophodytes tristis</i>	√	√
59.	Grey Drongo	<i>Dicrurus leucophaeus</i>	-	√
60.	Grey Heron	<i>Ardea cineria</i>	√	-
61.	Grey Nightjar	<i>Caprimulgus indicus</i>	√	-
62.	Grey Wagtail	<i>Motacilla cineria</i>	√	√
63.	Grey-headed Fishing Eagle	<i>Ichthyophaga ichthyuetus</i>	√	√
64.	Grey-headed Lapwing	<i>Vanellus cinerius</i>	-	√
65.	Grey-headed Myna	<i>Sturnus malabaricus</i>	√	√
66.	Grey-lag Goose	<i>Anser anser</i>	√	√
67.	Hill Myna	<i>Gracula religiosa</i>	√	√
68.	House Crow	<i>Corvus splendens</i>	√	√
69.	House Sparrow	<i>Passer domesticus</i>	√	√
70.	Indian Cuckoo	<i>Cuculus micropterus</i>	√	-
71.	Indian Pond Heron	<i>Ardeola grayii</i>	√	√
72.	Indian Roller	<i>Coracias benghalensis</i>	√	√
73.	Indian White-rumped Vulture	<i>Gyps bengalensis</i>	√	√
74.	Intermediate Egret	<i>Mesophoyx intermedia</i>	√	√
75.	Jack Snipe	<i>Gallinago minima</i>	√	√
76.	Jungle Babbler	<i>Turdoides striatus</i>	√	√
77.	Jungle Crow	<i>Corvus macrorhynchus</i>	√	√
78.	Jungle Myna	<i>Acridotheres fuscus</i>	√	√
79.	Large-tailed Shrike	<i>Lanius schus</i>	√	√
80.	Lesser Coucal	<i>Centropus bengalensis</i>	√	√
81.	Lesser Racket-tailed Drongo	<i>Dicrurus remifer</i>	√	√
82.	Lesser Spotted Eagle	<i>Aquila pomparina</i>	√	-
83.	Lesser Whistling Duck	<i>Dendrocygna javanica</i>	√	√
84.	Lineated Barbet	<i>Megelaima lineata</i>	√	√
85.	Little Cormorant	<i>Phalacrocorax niger</i>	√	√
86.	Little Egret	<i>Egretta garzetta</i>	√	√
87.	Little Grebe	<i>Tachybaptus ruficollis</i>	√	√
88.	Little Spider-hunter	<i>Arachnothera longirostris</i>	√	√
89.	Orange-breasted Green Pigeon	<i>Treron bicincta</i>	√	√
90.	Oriental Magpie Robin	<i>Copsychus saularis</i>	√	√
91.	Oriental Pied Hornbill	<i>Anthraceros albirostris</i>	-	√
92.	Paddy-field Pipit	<i>Anthus novaeseelandiae</i>	√	√
93.	Pale-billed Flowerpecker	<i>Dicaeum erythrorhynchos</i>	√	√
94.	Pied Cuckoo	<i>Clamator jacobinus</i>	√	√
95.	Pied Kingfisher	<i>Ceryle rudis</i>	√	√
96.	Pied Wagtail	<i>Motacilla alba</i>	√	√
97.	Pintail	<i>Anas acuta</i>	√	√
98.	Plain Martin	<i>Riparia paludicola</i>	√	-
99.	Plaintive Cuckoo	<i>Cacomantis passerinus</i>	√	√
100.	Pompadour Green Pigeon	<i>Treron pompadora</i>	√	√

Sl no	Common Name	Scientific Name	Occurrence	
			Baseline	1st Year Impact
101.	Purple Moorhen	<i>Porphyrio porphyrio</i>	√	√
102.	Purple Sunbird	<i>Nectarinia asiatica</i>	√	√
103.	Purple-rumped Sunbird	<i>Nectarinia zeylonica</i>	√	√
104.	Red Collared Dove	<i>Streptopelia tranquebarica</i>	√	√
105.	Red Jungle Fowl	<i>Gallus gallus</i>	√	√
106.	Red-breasted Parakeet	<i>Psittacula alexandri</i>	√	√
107.	Red-vented Bulbul	<i>Pycnonotus cafer</i>	√	√
108.	Red-vented Flycatcher	<i>Ficedula parva</i>	√	√
109.	Red-wattled Lapwing	<i>Vanellus indicus</i>	√	√
110.	Red-whiskered Bulbul	<i>Pycnonotus jocosus</i>	√	√
111.	Rock Pigeon	<i>Columba livia</i>	√	√
112.	Rose-ringed Parakeet	<i>Psittacula krameri</i>	√	√
113.	Rosy Minivet	<i>Pericrocotus roseus</i>	√	√
114.	Rudy Shell-duck	<i>Tadorna ferruginea</i>	√	√
115.	Rufous Treepie	<i>Dendrocitta vagabunda</i>	√	√
116.	Rufous Woodpecker	<i>Celeus brachyurus</i>	√	√
117.	Rufous-winged Bush Lark	<i>Mirafara assamica</i>	√	√
118.	Scarlet Minivet	<i>Pericrocotus flammeus</i>	√	√
119.	Silver-bill Munia	<i>Lonchura malabarica</i>	√	√
120.	Small Minivet	<i>Pericrocotus cinnamomus</i>	√	√
121.	Sociable Lapwing	<i>Vanellus gregarius</i>	√	√
122.	Spotted Dove	<i>Streptopelia chinensis</i>	√	√
123.	Spotted Munia	<i>Lonchura punctulata</i>	√	√
124.	Spotted Owlet	<i>Athene brama</i>	√	√
125.	Spotted Red Shank	<i>Tringa erythropus</i>	√	-
126.	Striated Prinia	<i>Prinia criniger</i>	√	-
127.	Temminck's Stint	<i>Calidris temminckii</i>	√	-
128.	Water Cock	<i>Gallix rex cineria</i>	√	√
129.	Water Rail	<i>Rallus aquaticus</i>	√	√
130.	White-breasted Water-hen	<i>Amaurornis phoenicurus</i>	√	√
131.	White-rumped Shama	<i>Copsychus malabaricus</i>	√	√
132.	White-tailed Lapwing	<i>Vanellus leurus</i>	√	√
133.	White-throated Fantail	<i>Rhipidura albicollis</i>	√	√
134.	White-throated Kingfisher	<i>Helecyon smyrnensis</i>	√	√
135.	Yellow Bittern	<i>Ixobrychus sinensis</i>	√	√
136.	Yellow-fronted Pied Woodpecker	<i>Dendrocopos mahrattensis</i>	√	√
137.	Yellow-legged Green Pigeon	<i>Treron phoenicoptera</i>	√	√
138.	Yellow-wattled Lapwing	<i>Vanellus malabaricus</i>	√	√
139.	Zitting Cisticola	<i>Cisticola juncidis</i>	√	-
<b>Mammal</b>				
1.	Asiatic Jackal	<i>Canis aureus</i>	√	√
2.	Bandicoot Rat	<i>Bandicota indica</i>	√	√
3.	Bengal Fox	<i>Vulpes bengalensis</i>	√	√

Sl no	Common Name	Scientific Name	Occurrence	
			Baseline	1st Year Impact
4.	Black Giant Squirrel	<i>Ratufa bicolor</i>	√	√
5.	Capped Langur	<i>Trachypithecus pileatus</i>	-	√
6.	Common House Rat	<i>Rattus rattus</i>	√	√
7.	Common Mongoose	<i>Herpestes edwardsi</i>	√	√
8.	Common Otter	<i>Lutra lutra</i>	√	√
9.	False Vampire	<i>Megaderma lyra</i>	√	-
10.	Field Mouse	<i>Mus boduga</i>	√	√
11.	Fishing Cat	<i>Felis viverrina</i>	√	√
12.	Flying Fox	<i>Pteropus giganteus</i>	√	√
13.	Grey Musk Srew	<i>Suncus murinus</i>	√	√
14.	Hoolock Gibbon	<i>Hylobates hoolock</i>	√	√
15.	House Mouse	<i>Mus musculus</i>	√	√
16.	Indian Pangolin	<i>Manis crassicaudata</i>	√	√
17.	Indian Pipistrelle	<i>Pipistrellus coromandalianus</i>	√	√
18.	Large Civet	<i>Viverra zibetha</i>	√	√
19.	Porcupine	<i>Hystrix indica</i>	√	√
20.	Rhesus Macaque	<i>Macaca mulatta</i>	√	√
21.	Rufous-tailed Hare	<i>Lepus nigricollis</i>	√	√
22.	Small Civet	<i>Viverricula indica</i>	√	√
23.	Small Mongoose	<i>Herpestes auropunctatus</i>	√	√
24.	Barking Deer	<i>Muntiacus muntjak</i>	-	√
25.	Indian Pangolin	<i>Manis crassicaudata</i>	-	√

## Appendix 21

## List of Wildlife Species Observed During First Impact Year in Turag-Bangshi (April'00 to March'01)

Sl no	Common Name	Scientific Name	Winter			Monsoon		
			T-1	T-2	T-3	T-1	T-2	T-3
<b>Amphibian</b>								
1.	Bull Frog	<i>Hoplobatrachus tigerinus</i>	✓	✓	✓	✓	x	✓
2.	Common Toad	<i>Bufo melanostictus</i>	✓	✓	✓	✓	✓	✓
3.	Cricket Frog	<i>Limnonectes limnocharis</i>	✓	x	✓	✓	x	x
4.	Skipper Frog	<i>Euphlyctis cyanophlyctis</i>	✓	x	x	✓	x	x
5.	Tree Frog	<i>Rana temporalis</i>	x	x	✓	✓	x	x
<b>Reptile</b>								
1.	Banded Krait	<i>Bungarus fasciatus</i>	x	✓	x	x	✓	x
2.	Bengal Monitor	<i>Varanus bengalensis</i>	x	✓	✓	✓	✓	✓
3.	Binocellate Cobra	<i>Naja naja</i>	x	✓	x	x	✓	x
4.	Brahminy River Turtle	<i>Hardella thurjii</i>	✓	x	✓	x	✓	x
5.	Checkered Keelback	<i>Xenochrophis piscator</i>	✓	✓	✓	✓	✓	✓
6.	Common Garden Lizard	<i>Calotes versicolor</i>	x	✓	x	✓	x	✓
7.	Common Skink	<i>Mabuya carinata</i>	✓	✓	✓	✓	x	✓
8.	Common Smooth Water Snake	<i>Enhydris enhydris</i>	✓	✓	x	✓	✓	x
9.	Common Vine Snake	<i>Ahaetulla nusutus</i>	x	✓	✓	✓	✓	x
10.	Common Worm Snake	<i>Typhlina bramina</i>	x	✓	x	✓	x	x
11.	House Lizard	<i>Hemidactylus brooki</i>	x	✓	x	✓	x	x
12.	Indian Roofed Turtle	<i>Kachuga tecta</i>	x	x	✓	x	✓	x
13.	Monocellate Cobra	<i>Naja kauothia</i>	x	✓	x	✓	✓	x
14.	Olive Keelback	<i>Atretium sechistosum</i>	✓	✓	✓	✓	✓	x
15.	Rat Snake	<i>Coluber mucosus</i>	x	✓	✓	x	✓	x
16.	Wall Lizard	<i>Gekko gekko</i>	x	✓	✓	✓	x	x
<b>Avis</b>								
1.	Abbott's Babbler	<i>Tricostoma abbotti</i>	x	✓	x	✓	✓	✓
2.	Ashy Wood-shallow	<i>Artamatus fuscus</i>	x	✓	✓	✓	✓	x
3.	Asian Cuckoo	<i>Eudynamys scolopacea</i>	✓	✓	x	✓	x	✓
4.	Asian Openbill	<i>Anastomus oscitans</i>	x	x	x	✓	x	x
5.	Asian Palm Swift	<i>Cypsurus balasiensis</i>	✓	✓	✓	✓	x	✓
6.	Asian Pied Starling	<i>Sturnus contra</i>	✓	✓	✓	✓	✓	✓
7.	Barn Owl	<i>Tyto alba</i>	x	✓	✓	✓	x	✓
8.	Baya Weaver	<i>Ploceus philippinus</i>	x	✓	x	✓	x	✓
9.	Black Drongo	<i>Dicrurus macrocerus</i>	✓	✓	✓	✓	✓	✓
10.	Black Kite	<i>Milvus migrans</i>	✓	✓	x	✓	x	✓
11.	Black-crowned Night Heron	<i>Nycticorax nycticorax</i>	x	✓	x	✓	x	✓
12.	Black-headed Oriole	<i>Oriolus xanthornus</i>	x	✓	✓	✓	x	✓
13.	Black-rumped Flameback	<i>Dinopium benghalense</i>	x	✓	✓	✓	✓	✓
14.	Black-shouldered Kite	<i>Elanus caeruleus</i>	x	✓	x	x	x	✓
15.	Black-winged Stilt	<i>Himantopus himantopus</i>	x	✓	x	x	✓	x
16.	Brahminy Kite	<i>Haliaster indus</i>	✓	✓	x	x	x	✓
17.	Bronzed Drongo	<i>Dicrurus aeneus</i>	x	✓	x	x	✓	x

Sl no	Common Name	Scientific Name	Winter			Monsoon		
			T-1	T-2	T-3	T-1	T-2	T-3
18.	Bronze-winged Jacana	<i>Metopidius indicus</i>	✓	x	x	✓	x	x
19.	Brown Fish Owl	<i>Ketupa zeylonensis</i>	x	✓	✓	x	✓	x
20.	Brown Shrike	<i>Lanius cristatus</i>	x	✓	✓	✓	x	x
21.	Brown-cheeked Fulvetta	<i>Alcippe poioicephala</i>	x	✓	X	✓	x	x
22.	Buff-breasted Babbler	<i>Pellorneum tickelli</i>	x	✓	x	✓	x	x
23.	Cattle Egret	<i>Bubulcus ibis</i>	✓	✓	x	✓	✓	✓
24.	Cinnamon Bittern	<i>Ixobrychus cinnamomeus</i>	x	✓	x	X	X	x
25.	Common Hawk Cuckoo	<i>Hierococeyx varius</i>	x	✓	x	✓	X	x
26.	Common Hoopoe	<i>Upopa epops</i>	x	✓	X	✓	X	x
27.	Common Iora	<i>Aegithina tiphia</i>	x	✓	x	✓	✓	✓
28.	Common Kingfisher	<i>Alcedo atthis</i>	✓	✓	✓	✓	✓	✓
29.	Common Moorhen	<i>Gallinula chloropus</i>	x	x	x	✓	x	x
30.	Common Myna	<i>Acridotheres tristis</i>	✓	✓	✓	✓	✓	✓
31.	Common Sandpiper	<i>Actitis hypoleucos</i>	✓	✓	✓	X	x	x
32.	Common Swallow	<i>Hirundo rustica</i>	✓	✓	✓	x	x	X
33.	Common Tailor Bird	<i>Orthotomus satorius</i>	✓	✓	x	✓	✓	✓
34.	Crimson-breasted Barbet	<i>Megalaima haemacephala</i>	✓	x	X	X	x	x
35.	Emerald Dove	<i>Chalcophas indica</i>	x	✓	x	✓	X	x
36.	Eurasian Collared Dove	<i>Streptopelia decaocta</i>	x	✓	x	✓	x	✓
37.	Fulvous Whistling Teal	<i>Dendrocygna bicolor</i>	x	x	x	✓	x	x
38.	Great Tit	<i>Parus major</i>	x	✓	X	✓	x	✓
39.	Greater Coucal	<i>Centropus cinensis</i>	✓	✓	x	✓	X	x
40.	Green Bee-eater	<i>Merops orientalis</i>	✓	✓	✓	✓	X	✓
41.	Green Shank	<i>Tringa nebularia</i>	✓	✓	x	X	x	x
42.	Grey Wagtail	<i>Motacilla caspicu</i>	✓	✓	✓	x	x	X
43.	Grey-backed Shrike	<i>Lanius tephronotus</i>	✓	✓	x	X	x	x
44.	Grey-headed Myna	<i>Sturnus malabaricus</i>	✓	✓	x	✓	X	x
45.	House Crow	<i>Corvus splendens</i>	✓	✓	x	✓	✓	✓
46.	House Sparrow	<i>Passer domesticus</i>	✓	✓	✓	✓	✓	✓
47.	Indian Pond Heron	<i>Ardeola grayii</i>	✓	✓	✓	✓	✓	✓
48.	Indian Roller	<i>Coracias benghalensis</i>	x	✓	x	x	✓	X
49.	Indian White-rumped Vulture	<i>Gyps bengalensis</i>	x	x	x	x	✓	x
50.	Intermediate Egret	<i>Mesophoyx intermedia</i>	✓	✓	x	✓	X	x
51.	Jungle Babbler	<i>Turdoides striatus</i>	✓	✓	x	✓	✓	x
52.	Jungle Crow	<i>Corvus marorrhynchos</i>	✓	✓	✓	X	✓	✓
53.	Jungle Myna	<i>Acridotheres fuscus</i>	✓	✓	✓	✓	X	✓
54.	Large Cuckoo Shrike	<i>Coracina macei</i>	x	✓	✓	x	✓	✓
55.	Green-billed Malkoha	<i>Rhopodytes tristis</i>	x	✓	x	x	✓	x
56.	Large-tailed Shrike	<i>Lanius schach</i>	✓	✓	✓	x	x	X
57.	Lesser Whistling Duck	<i>Dendrocygna javanica</i>	✓	✓	x	✓	X	x
58.	Lineated Barbet	<i>Megalaima lineata</i>	x	✓	x	x	x	✓
59.	Little Bittern	<i>Ixobrychus minutus</i>	✓	✓	x	X	x	x
60.	Little Cormorant	<i>Phalacrocorax niger</i>	✓	✓	x	✓	✓	x
61.	Little Egret	<i>Egretta garzetta</i>	✓	✓	x	✓	✓	x
62.	Little Grebe	<i>Podiceps ruficollis</i>	✓	✓	x	✓	✓	x
63.	Orange-breasted Green Pigeon	<i>Treron binincta</i>	x	✓	x	✓	x	x
64.	Oriental Magpie Robin	<i>Copsychus saularis</i>	✓	✓	✓	✓	✓	✓

Sl no	Common Name	Scientific Name	Winter			Monsoon		
			T-1	T-2	T-3	T-1	T-2	T-3
65.	Paddy-field Pipit	<i>Anthus novaeseelandiae</i>	✓	✓	x	✓	x	x
66.	Pale-billed Flower-pecker	<i>Dicaeum erythrorhynchos</i>	x	✓	x	✓	x	✓
67.	Pied Cuckoo	<i>Clamator jacobinus</i>	✓	✓	x	x	x	x
68.	Pied Kingfisher	<i>Ceryle rudis</i>	✓	✓	✓	✓	x	x
69.	Pied Wagtail	<i>Motacilla alba</i>	✓	✓	✓	x	x	x
70.	Plaintive Cuckoo	<i>Cacomantis passerinus</i>	x	x	x	✓	x	x
71.	Pompadour Pigeon	<i>Treron pompadora</i>	x	✓	x	✓	x	x
72.	Purple Sunbird	<i>Nectarinia asiatica</i>	x	✓	x	✓	x	x
73.	Purple-rumped Sunbird	<i>Nectarinia zeylonica</i>	x	✓	x	✓	x	x
74.	Red Collared Dove	<i>Streptopelia tranquebarica</i>	x	✓	x	✓	x	x
75.	Red-breasted Flycatcher	<i>Ficedula parva</i>	x	✓	x	x	x	x
76.	Red-vented Bulbul	<i>Picnonotus cafer</i>	✓	✓	✓	✓	✓	✓
77.	Red-wattled Lapwing	<i>Vanellus indicus</i>	x	✓	x	x	x	✓
78.	Rock Pigeon	<i>Colomba livia</i>	x	✓	x	✓	x	✓
79.	Rofous Woodpecker	<i>Micropternus brachyurus</i>	x	✓	x	x	x	x
80.	Rose-ringed Parakeet	<i>Psittacula krameri</i>	✓	✓	x	✓	x	x
81.	Rufous Treepie	<i>Dendrositta vagabunda</i>	x	✓	✓	✓	✓	✓
82.	Rufous-winged Bush Lark	<i>Mirafra asamica</i>	x	✓	x	x	x	✓
83.	Scarlet Minivet	<i>Pericrocotus flammeus</i>	x	✓	x	x	x	x
84.	Silver-bill Munia	<i>Lonchura malabarica</i>	✓	x	x	✓	x	x
85.	Small Minivet	<i>Pericrocotus peregrinus</i>	✓	✓	x	✓	x	x
86.	Spotted Dove	<i>Streptopelia sinensis</i>	x	✓	x	✓	✓	✓
87.	Spotted Munia	<i>Lonchura subindulata</i>	x	✓	x	✓	x	✓
88.	Spotted Owlet	<i>Athene brava</i>	x	✓	✓	✓	x	✓
89.	Water Cock	<i>Gallinix cineria</i>	x	x	x	✓	x	x
90.	Water Rail	<i>Rallus aquaticus</i>	x	x	x	✓	x	x
91.	White-breasted Kingfisher	<i>Halcyon smyrnensis</i>	✓	✓	✓	✓	✓	✓
92.	White-breasted Waterhen	<i>Amaurornis phoenicurus</i>	✓	✓	✓	✓	x	x
93.	White-throated Fantail	<i>Raipidura albicollis</i>	x	✓	x	✓	x	✓
94.	Yellow Bittern	<i>Ixobrychus sinensis</i>	✓	✓	x	✓	✓	x
95.	Yellow-footed Green Pigeon	<i>Treron phoenicoptera</i>	x	✓	x	✓	x	x
96.	Yellow-fronted Pied Woodpecker	<i>Picooides malharrattensis</i>	x	✓	✓	x	x	x
<b>Mammal</b>								
1.	Asiatic Jackal	<i>Canis aureus</i>	✓	✓	✓	x	✓	x
2.	Bandicoot Rat	<i>Bandicota indica</i>	✓	✓	✓	x	x	✓
3.	Bengal Fox	<i>Vulpes bengalensis</i>	x	✓	x	x	x	x
4.	Common House Rat	<i>Rattus rattus</i>	x	✓	✓	x	x	x
5.	Common Mongoose	<i>Herpestes edwardsi</i>	x	✓	✓	✓	x	x
6.	Common Otter	<i>Lutra lutra</i>	✓	✓	x	x	✓	x
7.	Field Mouse	<i>Mus bahuga</i>	✓	✓	✓	✓	x	✓
8.	Fishing Cat	<i>Prionailurus viverrinus</i>	✓	✓	x	x	x	x
9.	Flying Fox	<i>Pteropus giganteus</i>	x	x	✓	x	x	✓
10.	Ganges River Dolphin	<i>Platanista gangetica</i>	✓	x	✓	x	x	✓

Sl no	Common Name	Scientific Name	Winter			Monsoon		
			T-1	T-2	T-3	T-1	T-2	T-3
11.	Grey Musk Shrew	<i>Suncus murinus</i>	x	✓	✓	✓	x	x
12.	House Mouse	<i>Mus musculus</i>	x	✓	✓	✓	x	x
13.	Indian Pipistrelle	<i>Pipistrellus coromandalianus</i>	x	x	✓	x	x	✓
14.	Irrawady Squirrel	<i>Callosciurus pygerythrus</i>	x	✓	x	✓	x	x
15.	Large Civet	<i>Viverra zibetha</i>	✓	✓	✓	✓	x	✓
16.	Porcupine	<i>Hystrix indica</i>	x	✓	x	x	✓	x
17.	Rufous-tailed Hare	<i>Lepus nigricollis</i>	x	x	x	✓	x	x
18.	Small Civet	<i>Viverricula indica</i>	✓	✓	✓	✓	✓	✓
19.	Small Mongoose	<i>Herpestes auropunctatus</i>	✓	✓	x	✓	✓	x

Note: T-1 = Transect 1, T-2 = Transect 2, T-3 = Transect 3

## Appendix 22

## Comparison of Observed Wildlife Species with Baseline Survey and First Year Impact Survey in Turag-Bangshi

Sl no	Common Name	Scientific Name	Occurrence	
			Baseline	1 <sup>st</sup> Year Impact
<b>Amphibia</b>				
1.	Bull Frog	<i>Hoplobatrachus tigerinus</i>	√	√
2.	Common Toad	<i>Bufo melanostictus</i>	√	√
3.	Cricket Frog	<i>Limnonectes limnocharis</i>	√	√
4.	Ornate Microhylid	<i>Microhyla ornata</i>	√	-
5.	Skipper Frog	<i>Euphlyctis cyanophlyctis</i>	√	√
6.	Tree Frog	<i>Rana temporalis</i>	√	√
<b>Reptile</b>				
1.	Banded Krait	<i>Bungarus fasciatus</i>	√	√
2.	Bengal Monitor	<i>Varanus bengalensis</i>	√	√
3.	Binocellate Cobra	<i>Naja naja</i>	√	√
4.	Brahminy River Turtle	<i>Hardella thurjii</i>	√	√
5.	Checkered Keelback	<i>Xenochrophis piscator</i>	√	√
6.	Common Garden Lizard	<i>Calotes versicolor</i>	√	√
7.	Common Roofed Turtle	<i>Kachuga tecta</i>	√	-
8.	Common Skink	<i>Mabuya carinata</i>	√	√
9.	Common Smooth Water Snake	<i>Enhydryis enhydryis</i>	√	√
10.	Common Vine Snake	<i>Ahaetulla nusutus</i>	√	√
11.	Common Worm Snake	<i>Typhlina bramina</i>	√	√
12.	House Lizard	<i>Hemidactylus brooki</i>	√	√
13.	Indian Roofed Turtle	<i>Kachuga tecta</i>	√	√
14.	Monocellate Cobra	<i>Naja kauothia</i>	√	√
15.	Olive Keelback	<i>Atretium sechistosum</i>	√	√
16.	Rat Snake	<i>Coluber mucosus</i>	√	√
17.	Wall Lizard	<i>Gekko gekko</i>	√	√
<b>Avis</b>				
1.	Abbott's Babbler	<i>Tricastoma abbotti</i>	√	√
2.	Ashy Wood-shallow	<i>Artamatus fuscus</i>	√	√
3.	Asian Cuckoo	<i>Eudynamys scolopacea</i>	√	√
4.	Asian Openbill	<i>Anastomus oscitans</i>	-	√
5.	Asian Palm Swift	<i>Cypsurus halasiensis</i>	√	√
6.	Asian Pied Starling	<i>Sturnus contra</i>	√	√
7.	Barn Owl	<i>Tyto alba</i>	√	√
8.	Baya Weaver	<i>Ploceus philippinus</i>	√	√
9.	Black Drongo	<i>Dicrurus macrocerus</i>	√	√
10.	Black Kite	<i>Milvus migrans</i>	√	√
11.	Black-crowned Night Heron	<i>Nycticorax nycticorax</i>	√	√
12.	Black-headed Oriole	<i>Oriolus xanthornus</i>	√	√
13.	Black-rumped Flameback	<i>Dinopium benghalensis</i>	√	√

Sl no	Common Name	Scientific Name	Occurrence	
			Baseline	1 <sup>st</sup> Year Impact
14.	Black-shouldered Kite	<i>Elanus caeruleus</i>	√	√
15.	Black-winged Stilt	<i>Himantopus himantopus</i>	-	√
16.	Blue-tailed Bee-eater	<i>Merops philippinus</i>	√	-
17.	Brahminy Kite	<i>Haliastur indus</i>	√	√
18.	Bronzed Drongo	<i>Dicrurus aeneus</i>	-	√
19.	Bronze-winged Jacana	<i>Metopidius indicus</i>	√	√
20.	Brown Fish Owl	<i>Ketupa zeylonensis</i>	√	√
21.	Brown Shrike	<i>Lanius cristatus</i>	√	√
22.	Brown-cheeked Fulvetta	<i>Alcippe poioicephala</i>	√	√
23.	Buff-breasted Babbler	<i>Pellorneum tickelli</i>	√	√
24.	Cattle Egret	<i>Bubulcus ibis</i>	√	√
25.	Cinnamon Bittern	<i>Ixobrychus cinnamomeus</i>	-	√
26.	Common Hawk Cuckoo	<i>Hierococcyx varius</i>	√	√
27.	Common Hoopoe	<i>Upupa epops</i>	√	√
28.	Common Iora	<i>Aegithina tiphia</i>	√	√
29.	Common Kingfisher	<i>Alcedo atthis</i>	√	√
30.	Common Myna	<i>Acridotheres tristis</i>	√	√
31.	Common Sandpiper	<i>Actitis hypoleucos</i>	√	√
32.	Common Swallow	<i>Hirundo rustica</i>	√	√
33.	Common Tailor Bird	<i>Orthotomus satorius</i>	√	√
34.	Common Wood Shrike	<i>Tephrodornis pondicerianus</i>	√	-
35.	Crimson-breasted Barbet	<i>Megalaima haemacephala</i>	√	√
36.	Emerald Dove	<i>Chalcophaps indica</i>	-	√
37.	Eurasian Collared Dove	<i>Streptopelia decaocta</i>	√	√
38.	Fantail Snipe	<i>Gallinago gallinago</i>	√	-
39.	Fulvous Whistling Duck	<i>Dendrocygna javanica</i>	√	√
40.	Great Egret	<i>Casmerodius albus</i>	√	-
41.	Great Tit	<i>Parus major</i>	√	√
42.	Greater Coucal	<i>Centropus cinensis</i>	√	√
43.	Green Bee-eater	<i>Merops orientalis</i>	√	√
44.	Green Shank	<i>Tringa nebularia</i>	√	√
45.	Green-billed Malkoha	<i>Rhopodytes tristis</i>	-	√
46.	Grey Wagtail	<i>Motacilla caspica</i>	-	√
47.	Grey-backed Shrike	<i>Lanius tephronotus</i>	√	√
48.	Grey-headed Fishing Eagle	<i>Ichthyophaga ichthyaeus</i>	√	-
49.	Grey-headed Myna	<i>Sturnus malabaricus</i>	√	√
50.	House Crow	<i>Corvus splendens</i>	√	√
51.	House Sparrow	<i>Passer domesticus</i>	√	√
52.	Indian Cuckoo	<i>Cuculus micropterus</i>	√	-
53.	Indian Pond Heron	<i>Ardeola grayii</i>	√	√
54.	Indian Roller	<i>Coracias benghalensis</i>	√	√
55.	Indian White-rumped Vulture	<i>Gyps bengalensis</i>	-	√
56.	Intermediate Egret	<i>Mesophoyx intermedia</i>	√	√
57.	Jungle Babbler	<i>Turdoides striatus</i>	√	√

Sl no	Common Name	Scientific Name	Occurrence	
			Baseline	1 <sup>st</sup> Year Impact
58.	Jungle Crow	<i>Corvus marorhynchos</i>	√	√
59.	Jungle Myna	<i>Acridotheres fuscus</i>	√	√
60.	Kestrel	<i>Falco tinnunculus</i>	√	-
61.	Large Cuckoo Shrike	<i>Coracina macei</i>	-	√
62.	Large Hawk Cuckoo	<i>Hierococcyx sparverioides</i>	√	√
63.	Lesser Coucal	<i>Centropus bengalensis</i>	√	-
64.	Lesser Whistling Duck	<i>Dendrocygna javanica</i>	√	-
65.	Lineated Barbet	<i>Megalaima lineata</i>	√	√
66.	Little Bittern	<i>Ixobrychus minutus</i>	-	√
67.	Little Cormorant	<i>Phalacrocorax niger</i>	√	√
68.	Little Egret	<i>Egretta garzetta</i>	√	√
69.	Little Grebe	<i>Podiceps ruficollis</i>	√	√
70.	Long-tailed Nightjar	<i>Caprimulgus macrurus</i>	√	-
71.	Long-tailed Shrike	<i>Lanius schach</i>	√	√
72.	Orange-breasted Green Pigeon	<i>Treron binincta</i>	√	√
73.	Oriental Magpie Robin	<i>Copsychus saularis</i>	√	√
74.	Paddy-field Pipit	<i>Anthus novaeseelandiae</i>	√	√
75.	Pale-billed Flowerpecker	<i>Dicaeum erythrorhynchus</i>	√	√
76.	Pied Cuckoo	<i>Clamator jacobinus</i>	√	√
77.	Pied Kingfisher	<i>Ceryle rudis</i>	√	√
78.	Pied Wagtail	<i>Motacilla alba</i>	√	√
79.	Pintail Snipe	<i>Gallinago stenura</i>	√	-
80.	Plain Martin	<i>Riparia paludicola</i>	√	-
81.	Plaintive Cuckoo	<i>Cacomantis passerinus</i>	-	√
82.	Pompadour Pigeon	<i>Treron pompadora</i>	-	√
83.	Purple Sunbird	<i>Nectarinia asiatica</i>	√	√
84.	Purple-rumped Sunbird	<i>Nectarinia zeylonica</i>	√	√
85.	Red Collared Dove	<i>Streptopelia tranquebarica</i>	√	√
86.	Red-breasted Flycatcher	<i>Ficedula parva</i>	√	√
87.	Red-vented Bulbul	<i>Picnonotus cafer</i>	√	√
88.	Red-wattled Lapwing	<i>Vanellus indicus</i>	√	√
89.	Rock Pigeon	<i>Colomba livia</i>	√	√
90.	Rofous Woodpecker	<i>Micropternus brachyurus</i>	√	√
91.	Rose-ringed Parakeet	<i>Psittacula krameri</i>	√	√
92.	Rufous Treepie	<i>Dendrositta vagabunda</i>	√	√
93.	Rufous-winged Bush Lark	<i>Mirafra asamica</i>	√	√
94.	Scarlet Minivet	<i>Pericrocotus flammeus</i>	-	√
95.	Shikra	<i>Accipiter hadius</i>	√	-
96.	Silver-bill Munia	<i>Lonchura malabarica</i>	√	√
97.	Small Minivet	<i>Pericrocotus peregrinus</i>	√	√
98.	Spotted Dove	<i>Streptopelia sinensis</i>	√	√
99.	Spotted Munia	<i>Lonchura subundulata</i>	√	√
100.	Spotted Owlet	<i>Athene brava</i>	√	√
101.	Water Cock	<i>Gallix rex cineria</i>	-	√
102.	Water Rail	<i>Rallus aquaticus</i>	√	√

Sl no	Common Name	Scientific Name	Occurrence	
			Baseline	1 <sup>st</sup> Year Impact
103.	White-breasted Water-hen	<i>Amaurornis phoenicurus</i>	√	√
104.	White-browed Wagtail	<i>Motacilla maderaspatensis</i>	√	-
105.	White-throated Fantail	<i>Raipidura albicollis</i>	√	√
106.	White-throated Kingfisher	<i>Halcyon smyrnensis</i>	√	√
107.	Wire-tailed Swallow	<i>Hirundo smithi</i>	√	-
108.	Wryneck	<i>Jynx torquilla</i>	√	-
109.	Yellow Bittern	<i>Ixobrychus sinensis</i>	√	√
110.	Yellow-footed Green Pigeon	<i>Treron phoenicoptera</i>	√	√
111.	Yellow-fronted Pied Woodpecker	<i>Picoides mahrattensis</i>	√	√
<b>Mammal</b>				
1.	Asiatic Jackal	<i>Canis aureus</i>	√	√
2.	Bandicoot Rat	<i>Bandicota indica</i>	√	√
3.	Bengal Fox	<i>Vulpes bengalensis</i>	-	√
4.	Common House Rat	<i>Rattus rattus</i>	√	√
5.	Common Mongoose	<i>Herpestes edwardsi</i>	√	√
6.	Common Otter	<i>Lutra lutra</i>	√	√
7.	Field Mouse	<i>Mus hoduga</i>	√	√
8.	Fishing Cat	<i>Prionailurus viverrinus</i>	√	√
9.	Flying Fox	<i>Pteropus giganteus</i>	√	√
10.	Ganges River Dolphin	<i>Platanista gangetica</i>	√	√
11.	Grey Musk Shrew	<i>Suncus murinus</i>	√	√
12.	House Mouse	<i>Mus musculus</i>	√	√
13.	Indian Pipistrelle	<i>Pipistrellus coromandalianus</i>	√	√
14.	Irrawady Squirrel	<i>Callosciurus pygerythrus</i>	√	√
15.	Large Civet	<i>Viverra zibetha</i>	√	√
16.	Porcupine	<i>Hystrix indica</i>	√	√
17.	Rufous-tailed Hare	<i>Lepus nigricollis</i>	√	√
18.	Small Civet	<i>Viverricula indica</i>	√	√
19.	Small Mongoose	<i>Herpestes auropunctatus</i>	√	√
20.	Mole Rat	<i>Bandicota bengalensis</i>	√	-

## Appendix 23

## Comparison of Observed Wildlife Species with Baseline Survey and First Year Impact Survey in both Hail Haor and Turag-Bangshi

Sl no	Common Name	Scientific Name	Occurrence	
			Baseline	1 <sup>st</sup> Year Impact
<b>Amphibian</b>				
1.	Bull Frog	<i>Hoplobatrachus tigerinus</i>	√	√
2.	Common Toad	<i>Bufo melanostictus</i>	√	√
3.	Cricket Frog	<i>Limnonectes limnocharis</i>	√	√
4.	Ornate Microhylid	<i>Microhyla ornata</i>	√	-
5.	Skipper Frog	<i>Euphlyctis cyanophlyctis</i>	√	√
6.	Tree Frog	<i>Rana temporalis</i>	√	√
<b>Reptile</b>				
1.	Banded Krait	<i>Bungarus fasciatus</i>	√	√
2.	Bengal Monitor	<i>Varanus bengalensis</i>	√	√
3.	Binocellate Cobra	<i>Naja naja</i>	√	√
4.	Brahminy River Turtle	<i>Hardella thurjii</i>	√	√
5.	Brown Roofed Turtle	<i>Kachuga smithii</i>	√	-
6.	Checkered Keelback	<i>Xenochrophis piscator</i>	√	√
7.	Common Garden Lizard	<i>Calotes versicolor</i>	√	√
8.	Common Skink	<i>Mabuya carinata</i>	√	√
9.	Common Smooth Water Snake	<i>Enhydris enhydris</i>	√	√
10.	Common Vine Snake	<i>Ahaetulla niusutus</i>	√	√
11.	Common Worm Snake	<i>Typhlina bramina</i>	√	√
12.	House Lizard	<i>Hemidactylus brooki</i>	√	√
13.	Indian Roofed Turtle	<i>Kachuga tecta</i>	√	√
14.	Monocellate Cobra	<i>Naja kauothia</i>	√	√
15.	Olive Keelback	<i>Atretium sechistosum</i>	√	√
16.	Peacock Soft-shell Turtle	<i>Aspideretes hurum</i>	√	-
17.	Rat Snake	<i>Coluber mucosus</i>	√	√
18.	Rock Python	<i>Python molurus</i>	√	√
19.	Spotted Lizard	<i>Hemidactylus frenatus</i>	√	√
20.	Stripped Keelback	<i>Amphiesma stolata</i>	-	√
21.	Wall Lizard	<i>Gekko gekko</i>	√	√
<b>Avis</b>				
1.	Abbott's Babbler	<i>Tricastoma abbotti</i>	√	√
2.	Ashy Wood-shallow	<i>Artamatus fuscus</i>	√	√
3.	Asian Bared Owlet	<i>Glancidium cuculoides</i>	-	√
4.	Asian Cuckoo	<i>Eudynamys scolopacca</i>	√	√
5.	Asian Openbill	<i>Anastomus oscitans</i>	√	√
6.	Asian Palm Swift	<i>Cypsurus halasiensis</i>	√	√
7.	Asian Pied Starling	<i>Sturnus contra</i>	√	√
8.	Bank Myna	<i>Acridotheres ginginiamus</i>	√	-
9.	Barn Owl	<i>Tyto alba</i>	√	√
10.	Baya Weaver	<i>Ploceus philippinus</i>	√	√

Sl no	Common Name	Scientific Name	Occurrence	
			Baseline	1 <sup>st</sup> Year Impact
11.	Black Drongo	<i>Dicrurus macrocercus</i>	√	√
12.	Black Kite	<i>Milvus migrans</i>	√	√
13.	Black-crested Yellow Bulbul	<i>Pycnonotus melanicterus</i>	√	√
14.	Black-crowned Night Heron	<i>Nycticorax nycticorax</i>	√	√
15.	Black-headed Oriole	<i>Oriolus xanthornus</i>	√	√
16.	Black-rumped Flameback	<i>Dinopium benghalensis</i>	√	√
17.	Black-shouldered Kite	<i>Elanus caeruleus</i>	√	√
18.	Black-winged Stilt	<i>Himantopus himantopus</i>	√	√
19.	Blue-tailed Bee-eater	<i>Merops philippinus</i>	√	√
20.	Blue-throated Barbet	<i>Megalaima asiatica</i>	√	√
21.	Brahminy Kite	<i>Haliaster indus</i>	√	√
22.	Bronzed Drongo	<i>Dicrurus aeneus</i>	√	√
23.	Bronze-winged Jacana	<i>Metopidius indicus</i>	√	√
24.	Brown Fish Owl	<i>Ketupa zeylonensis</i>	√	√
25.	Brown Shrike	<i>Lanius cristatus</i>	√	√
26.	Brown-cheeked Fulvetta	<i>Alcippe poioicephala</i>	√	√
27.	Buff-breasted Babbler	<i>Pellorneum tickelli</i>	√	√
28.	Cattle Egret	<i>Bubulcus ibis</i>	√	√
29.	Chestnut-headed Bee-eater	<i>Merops leschenaulti</i>	√	√
30.	Cinnamon Bittern	<i>Ixobrychus cinnamomeus</i>	√	√
31.	Citrine Wagtail	<i>Motacilla citriola</i>	√	√
32.	Clamorous Reed-warbler	<i>Aerocephalus Stentorius</i>	√	√
33.	Common Hawk Cuckoo	<i>Hierococcyx varius</i>	√	√
34.	Common Hoopoe	<i>Upupa epops</i>	√	√
35.	Common Iora	<i>Aegithina tiphia</i>	√	√
36.	Common Kingfisher	<i>Alcedo atthis</i>	√	√
37.	Common Moorhen	<i>Gallinula chloropus</i>	√	√
38.	Common Myna	<i>Acridotheres tristis</i>	√	√
39.	Common Sandpiper	<i>Actitis hypoleucos</i>	√	√
40.	Common Snipe	<i>Gallinago gallinago</i>	√	√
41.	Common Stone-chat	<i>Sexicola torquata</i>	√	√
42.	Common Swallow	<i>Hirundo rustica</i>	√	√
43.	Common Tailor Bird	<i>Orthotomus satorius</i>	√	√
44.	Common Wood Shrike	<i>Tephrodornis pondicerianus</i>	√	√
45.	Coppersmith Barbet	<i>Megalaima haemacephala</i>	√	√
46.	Dasky Warbler	<i>Phylloscopus fuscatus</i>	√	√
47.	Eastern Golden Plover	<i>Puvialis dominica</i>	√	√
48.	Eastern Marsh Harrier	<i>Circus spilonotus</i>	√	√
49.	Emerald Dove	<i>Chalcophaps indica</i>	√	√
50.	Eurasian Collared Dove	<i>Streptopelia decaocta</i>	√	√
51.	Fantail Snipe	<i>Gallinago gallinago</i>	√	√
52.	Fulvous Whistling Duck	<i>Dendrocygna javanica</i>	√	√
53.	Golden-fronted Leaf Bird	<i>Chloropsis aurifrons</i>	√	√
54.	Great Egret	<i>Egretta alba</i>	√	√

Sl no	Common Name	Scientific Name	Occurrence	
			Baseline	1 <sup>st</sup> Year Impact
55.	Great Tit	<i>Parus major</i>	√	√
56.	Greater Coucal	<i>Centropus cinensis</i>	√	√
57.	Greater Painted Snipe	<i>Rostratula bengulensis</i>	-	√
58.	Greater Racket-tailed Drongo	<i>Dicrurus paradiseus</i>	-	√
59.	Green Bee-eater	<i>Merops orientalis</i>	√	√
60.	Green Sandpiper	<i>Tringa ochropus</i>	√	-
61.	Green Shank	<i>Tringa nebularia</i>	√	√
62.	Green-billed Malkoha	<i>Rhopodytes tristis</i>	√	√
63.	Grey Drongo	<i>Dicrurus leucophaeus</i>	-	√
64.	Grey Heron	<i>Ardea cinerea</i>	√	-
65.	Grey Wagtail	<i>Motacilla caspica</i>	√	√
66.	Grey-backed Shrike	<i>Lanius tephronotus</i>	√	√
67.	Grey-headed Fishing Eagle	<i>Ichthyophaga ichthyactus</i>	√	√
68.	Grey-headed Lapwing	<i>Vanellus cinerius</i>	-	√
69.	Grey-headed Myna	<i>Sturnus malabaricus</i>	√	√
70.	Hill Myna	<i>Gracula religiosa</i>	√	√
71.	House Crow	<i>Corvus splendens</i>	√	√
72.	House Sparrow	<i>Passer domesticus</i>	√	√
73.	Indian Black-headed Munia	<i>Lonchura malacca</i>	√	-
74.	Indian Cuckoo	<i>Cuculus micropterus</i>	√	-
75.	Indian Pond Heron	<i>Ardeola grayii</i>	√	√
76.	Indian Roller	<i>Coracias benghalensis</i>	√	√
77.	Indian White-rumped Vulture	<i>Gyps bengalensis</i>	√	√
78.	Intermediate Egret	<i>Mesophoyx intermedia</i>	√	√
79.	Jungle Babbler	<i>Turdoides striatus</i>	√	√
80.	Jungle Crow	<i>Corvus marorrhynchos</i>	√	√
81.	Jungle Myna	<i>Acridotheres fuscus</i>	√	√
82.	Jungle Nightjar	<i>Caprimulgus indicus</i>	√	-
83.	Kestrel	<i>Falco tinnunculus</i>	√	-
84.	Large Cuckoo Shrike	<i>Coracina macei</i>	-	√
85.	Large Hawk Cuckoo	<i>Hierococcyx sparverioides</i>	√	-
86.	Lesser Coucal	<i>Centropus bengalensis</i>	√	√
87.	Lesser Racket-tailed Drongo	<i>Dicrurus remifer</i>	√	√
88.	Lesser Spotted Eagle	<i>Aquila pomparina</i>	√	-
89.	Lesser Whistling Duck	<i>Dendrocygna javanica</i>	√	√
90.	Lineated Barbet	<i>Megalaima lineata</i>	√	√
91.	Little Spider-hunter	<i>Arachnothera longirostris</i>	√	√
92.	Little Bittern	<i>Isobrychus minutus</i>	-	√
93.	Little Cormorant	<i>Phalacrocorax niger</i>	√	√
94.	Little Egret	<i>Egretta garzetta</i>	√	√
95.	Little Grebe	<i>Podiceps ruficollis</i>	√	√
96.	Large-tailed Nightjar	<i>Caprimulgus macrurus</i>	√	-
97.	Long-tailed Shrike	<i>Lanius schach</i>	√	√

Sl no	Common Name	Scientific Name	Occurrence	
			Baseline	1 <sup>st</sup> Year Impact
98.	Marsh Sandpiper	<i>Tringa stagnatilis</i>	√	-
99.	Orange-breasted Green Pigeon	<i>Treron binincta</i>	√	√
100.	Oriental Magpie Robin	<i>Copsychus saularis</i>	√	√
101.	Oriental Pied Hornbill	<i>Anthracoceros albirostris</i>	-	√
102.	Pacific Golden Plover	<i>Pluvialis fulva</i>	√	-
103.	Paddy-field Pipit	<i>Anthus novaeseelandiae</i>	√	√
104.	Pale-billed Flowerpecker	<i>Dicaeum erythrorhynchos</i>	√	√
105.	Pheasant-tailed Jacana	<i>Hydrophasianus chirurgus</i>	-	√
106.	Pied Cuckoo	<i>Clamator jacobinus</i>	√	√
107.	Pied Harrier	<i>Circus melanoleucos</i>	√	-
108.	Pied Kingfisher	<i>Ceryle rudis</i>	√	√
109.	Pied Wagtail	<i>Motacilla alba</i>	-	√
110.	Pintail Snipe	<i>Gallinago stenura</i>	√	-
111.	Plain Martin	<i>Riparia paludicola</i>	√	-
112.	Plain Prinia	<i>Prinia inornata</i>	√	-
113.	Plaintive Cuckoo	<i>Cacomantis passerinus</i>	√	√
114.	Pompadour Pigeon	<i>Treron pompadora</i>	√	√
115.	Purple Sunbird	<i>Nectarinia asiatica</i>	√	√
116.	Purple-rumped Sunbird	<i>Nectarinia zeylonica</i>	√	√
117.	Red Collared Dove	<i>Streptopelia tranquebarica</i>	√	√
118.	Red Jungle Fowl	<i>Gallus gallus</i>	-	√
119.	Red Whiskered Bulbul	<i>Pycnonotus jocosus</i>	√	√
120.	Red-breasted Flycatcher	<i>Ficedula parva</i>	√	√
121.	Red-breasted Parakeet	<i>Psittacula alexadri</i>	√	√
122.	Red-vented Bulbul	<i>Picnonotus cafer</i>	√	√
123.	Red-vented Flycatcher	<i>Ficedula parva</i>	-	√
124.	Red-wattled Lapwing	<i>Vanellus indicus</i>	√	√
125.	Rock Pigeon	<i>Colomba livia</i>	√	√
126.	Rofous Woodpecker	<i>Micropternus brachyurus</i>	-	√
127.	Rose-ringed Parakeet	<i>Psittacula krameri</i>	√	√
128.	Rosy Minivet	<i>Pericrocotus roseus</i>	-	√
129.	Rufous Treepie	<i>Dendrositta vagabunda</i>	√	√
130.	Rufous-winged Bush Lark	<i>Mirafra asamica</i>	√	√
131.	Scally-breasted Munia	<i>Lonchura punctulata</i>	√	-
132.	Scarlet Minivet	<i>Pericrocotus flammeus</i>	-	√
133.	Silver-bill Munia	<i>Lonchura malabarica</i>	√	√
134.	Small Minivet	<i>Pericrocotus peregrinus</i>	√	√
135.	Spotted Dove	<i>Streptopelia sinensis</i>	√	√
136.	Spotted Munia	<i>Lonchura subundulata</i>	√	√
137.	Spotted Owlet	<i>Athene brava</i>	√	√
138.	Spotted Red Shank	<i>Tringa erythropus</i>	√	-
139.	Striated Prinia	<i>Prinia criniger</i>	√	-
140.	Temminck's Stint	<i>Calidris temmincki</i>	√	-
141.	Water Cock	<i>Gallixrex cineria</i>	-	√
142.	Water Rail	<i>Rallus aquaticus</i>	-	√

Sl no	Common Name	Scientific Name	Occurrence	
			Baseline	1 <sup>st</sup> Year Impact
143.	White Wagtail	<i>Motacilla alba</i>	√	-
144.	White-breasted Water-hen	<i>Amaurornis phoenicurus</i>	√	√
145.	White-browed Wagtail	<i>Motacilla maderaspatensis</i>	√	-
146.	White-rumped Shama	<i>Copsychus malabaricus</i>	√	√
147.	White-throated Fantail	<i>Raipidura albicollis</i>	√	√
148.	White-throated Kingfisher	<i>Halcyon smyrnensis</i>	√	√
149.	Wire-tailed Swallow	<i>Hirundo smithii</i>	√	-
150.	Wood Sandpiper	<i>Tringa glareola</i>	√	-
151.	Wryneck	<i>Jynx torquilla</i>	√	-
152.	Yellow Bittern	<i>Ixobrychus sinensis</i>	√	√
153.	Yellow Wagtail	<i>Motacilla flava</i>	√	-
154.	Yellow-breasted Bunting	<i>Emberiza aureola</i>	√	-
155.	Yellow-footed Green Pigeon	<i>Treron phoenicoptera</i>	√	√
156.	Yellow-fronted Pied Woodpecker	<i>Picoides mahrattensis</i>	√	√
157.	Zitting Cisticola	<i>Cisticola juncidis</i>	√	-
<b>Mammal</b>				
1.	Asiatic Jackal	<i>Canis aureus</i>	√	√
2.	Bandicoot Rat	<i>Bandicota indica</i>	√	√
3.	Barking Deer	<i>Muntiacus muntjak</i>	-	√
4.	Bengal Fox	<i>Vulpes bengalensis</i>	√	√
5.	Black Giant Squirrel	<i>Ratufa bicolor</i>	√	√
6.	Capped Langur	<i>Trachypithecus pileatus</i>	-	√
7.	Common House Rat	<i>Rattus rattus</i>	√	√
8.	Common Mongoose	<i>Herpestes edwardsi</i>	√	√
9.	Common Otter	<i>Lutra lutra</i>	√	√
10.	False Vampire	<i>Megaderma lyra</i>	√	-
11.	Field Mouse	<i>Mus boduga</i>	√	√
12.	Fishing Cat	<i>Prionailurus viverrinus</i>	√	√
13.	Flying Fox	<i>Pteropus giganteus</i>	√	√
14.	Ganges River Dolphin	<i>Platanista gangetica</i>	√	√
15.	Grey Musk Shrew	<i>Suncus murinus</i>	√	√
16.	Hoolock Gibbon	<i>Hylobates hoolock</i>	√	√
17.	House Mouse	<i>Mus musculus</i>	√	√
18.	Indian Pangolin	<i>Manis crassicaudata</i>	-	√
19.	Indian Pipistrelle	<i>Pipistrellus coromandalianus</i>	√	√
20.	Irrawady Squirrel	<i>Callosciurus pygerythrus</i>	√	√
21.	Large Civet	<i>Viverra zibetha</i>	√	√
22.	Mole Rat	<i>Bandicota bengolensis</i>	√	-
23.	Porcupine	<i>Hystrix indica</i>	√	√
24.	Rhesus Macaque	<i>Macaca mulatta</i>	√	√
25.	Rufous-tailed Hare	<i>Lepus nigricollis</i>	√	√
26.	Small Civet	<i>Viverricula indica</i>	√	√
27.	Small Mongoose	<i>Herpestes auropunctatus</i>	√	√

## Appendix 24

## List of Changed Common Name and Scientific Names of Wildlife According to IUCN

Name Used in Baseline		Name Used in Impact According to IUCN		
Sl no	Common Name	Scientific Name	Common Name	Scientific Name
<b>Amphibian</b>				
1.	Bull Frog	<i>Rana tigrina</i>	Bull Frog	<i>Hoplobatrachus tigerinus</i>
2.	Cricket Frog	<i>Rana limnocharis</i>	Cricket Frog	<i>Limnonectes limnocharis</i>
3.	Frog	<i>Microhylla Ornata</i>	Ornate Microhylid	<i>Microhylla Ornata</i>
4.	Skipper Frog	<i>Rana cyanophlyctis</i>	Skipper Frog	<i>Euphlyctis cyanophlyctis</i>
<b>Reptile</b>				
1.	Rat Snake	<i>Ptyas mucosus</i>	Rat Snake	<i>Coluber mucosus</i>
2.	Roofed Terrapin	<i>Kachuga tecta</i>	Indian Roofed Turtle	<i>Kachuga tecta</i>
<b>Avis</b>				
1.	Ashy Drongo	<i>Dicrurus leucophaeus</i>	Grey Drongo	<i>Dicrurus leucophaeus</i>
2.	Asian Koel	<i>Eudynamys scolopacea</i>	Asian Cuckoo	<i>Eudynamys scolopacea</i>
3.	Black-crested Yellow Bulbul	<i>Pycnonotus melanicterus</i>	Black-crested Yellow Bulbul	<i>Pycnonotus melanicterus</i>
4.	Rock Dove	<i>Colomba livia</i>	Rock Pigeon	<i>Colomba livia</i>
5.	Brainfever	<i>Cuculus varius</i>	Common Hawk Cuckoo	<i>Hierococcyx varius</i>
6.	Brown Fish Owl	<i>Bubo zeylonensis</i>	Brown Fish Owl	<i>Ketupa zeylonensis</i>
7.	Bushlark	<i>Mirafra assamica</i>	Rufous-winged Bushlark	<i>Mirafra assamica</i>
8.	Chestnut Bittern	<i>Ixobrychus cinnamomeus</i>	Cinnamon Bittern	<i>Ixobrychus cinnamomeus</i>
9.	Crimson-breasted Barbet	<i>Megalaima haemacephala</i>	Coppersmith Barbet	<i>Megalaima haemacephala</i>
10.	Crow Pheasant	<i>Centropus cinensis</i>	Greater Coucal	<i>Centropus cinensis</i>
11.	Greay Tit	<i>Parus major</i>	Great Tit	<i>Parus major</i>
12.	Hoopoe	<i>Upopa epops</i>	Common Hoopoe	<i>Upopa epops</i>
13.	Indian Ring Dove	<i>Streptopelia decaocta</i>	Eurasian Collared Dove	<i>Streptopelia decaocta</i>
14.	Intermediate Egret	<i>Egretta intermedia</i>	Intermediate Egret	<i>Mesophoyx intermedia</i>
15.	Large Green-billed Malkoha	<i>Rhopodytes tristis</i>	Green-billed Malkoha	<i>Rhopodytes tristis</i>
16.	Large Whistling Teal	<i>Dendrocygna javanica</i>	Fulvous Whistling Duck	<i>Dendrocygna javanica</i>
17.	Lesser Golden-backed Woodpecker	<i>Dinopium benghalense</i>	Black-rumped Flameback	<i>Dinopium benghalense</i>
18.	Lesser Whistling	<i>Dendrocigna javanica</i>	Lesser	<i>Dendrocigna javanica</i>

Name Used in Baseline			Name Used in Impact According to IUCN	
Sl no	Common Name	Scientific Name	Common Name	Scientific Name
19.	Teal Magpie Robin	<i>Copsychus saularis</i>	Whistling Duck Oriental Magpie Robin	<i>Copsychus saularis</i>
20.	Night Heron	<i>Nycticorax nycticorax</i>	Black-crowned Night Heron	<i>Nycticorax nycticorax</i>
21.	Pied Crested Cuckoo	<i>Clamator jacobinus</i>	Pied Cuckoo	<i>Clamator jacobinus</i>
22.	Pied Hornbill	<i>Anthracoceros albirostris</i>	Oriental Pied Hornbill	<i>Anthracoceros albirostris</i>
23.	Pond Heron	<i>Ardeola grayii</i>	Indian Pond Heron	<i>Ardeola grayii</i>
24.	Quaker Babbler	<i>Alcippe poioicephala</i>	Brown-checked Fulveta	<i>Alcippe poioicephala</i>
25.	Red Turtle Dove	<i>Streptopelia tranquebarica</i>	Red Collared Dove	<i>Streptopelia tranquebarica</i>
26.	Shama	<i>Copsychus malabaricus</i>	White-rumped Shama	<i>Copsychus malabaricus</i>
27.	Tailor Bird	<i>Orthotomus satorius</i>	Common Tailor Bird	<i>Orthotomus satorius</i>
28.	Tibetan Shrike	<i>Lanius tephronotus</i>	Grey-backed Shrike	<i>Lanius tephronotus</i>
29.	Tickell's Babbler	<i>Trichastoma tickelli</i>	Buff-breasted Babbler	<i>Pellorneum tickelli</i>
30.	Tickell's Flowerpecker	<i>Dicaeum erythrorhynchos</i>	Pale-billed Flowerpecker	<i>Dicaeum erythrorhynchos</i>
31.	Treepie	<i>Dendrositta vagabunda</i>	Rufous Treepie	<i>Dendrositta vagabunda</i>
32.	White-browed Fantail Flycatcher	<i>Raipidura albicollis</i>	White-throated Fantail	<i>Raipidura albicollis</i>
33.	White-rumped Vulture	<i>Gyps bengalensis</i>	Indian White- rumped Vulture	<i>Gyps bengalensis</i>
<b>Mammal</b>				
1.	Asiatic Jackal	<i>Vulpes bengalensis</i>	Asiatic Jackal	<i>Canis aureus</i>
2.	Ganges Dolphin	<i>Platanista gangetica</i>	Ganges River Dolphin	<i>Platanista gangetica</i>

## Appendix 25

List of Observed Hydrophyte Species During 1<sup>st</sup> Impact Year in Hail Haor

Sl no	Local Name	Scientific Name	Family	Use	Dry	Wet
<b>Emergent</b>						
1)	Shechishak	<i>Alternanthera philoxeroides</i>	Amaranthaceae	FV	Y	Y
2)	Vat Shola	<i>Aeschynomene aspera</i>	Leguminosae	FB	Y	Y
3)	Sechishak	<i>Alternanthera sessilis</i>	Amaranthaceae	FV	Y	Y
4)	Hijal	<i>Barringtonia acutangula</i>	Lecythidaceae	TS	Y	Y
5)	Jali bet	<i>Calamus rotang</i>	Palmae	OT	Y	Y
6)	Panighash	<i>Ceratopteris thalictroides</i>	Pteridophyta	OT	Y	Y
7)	Kochu	<i>Colocasia esculenta</i>	Araceae	FV	Y	Y
8)	Borun	<i>Crataeva nurvala</i>	Capparidaceae	FU	Y	Y
9)	Panigoicha	<i>Cyanotis aristata</i>	Commelinaceae	OT	Y	Y
10)	Ful Ghash	<i>Cyperus rotang</i>	Cyperaceae	FP	Y	Y
11)	Ful Ghash	<i>Cyperus sp.</i>	Cyperaceae	FP	Y	Y
12)	Chatiogol	<i>Cyperus tagetum</i>	Cyperaceae	FP	Y	Y
13)	Bhui pat	<i>Dentella repens</i>	Rubiaceae	OT	Y	N
14)	Paura	<i>Echinochloa crusgalli</i>	Gramineae	FP	Y	Y
15)	Borochesra	<i>Eleocharis dulcis</i>	Cyperaceae	FP	Y	Y
16)	Deyokolum	<i>Ipomoea fistulosa</i>	Convolvulaceae	FV	Y	Y
17)	Phul ghash	<i>Kyllinga melanosperma</i>	Cyperaceae	FP	Y	N
18)	Panichapra	<i>Limnophila heterophylla</i>	Scrophulariaceae	OT	Y	Y
19)	Panichapra	<i>Limnophila cana</i>	Scrophulariaceae	OT	N	Y
20)	Bamni dopra	<i>Limnopoia meeboldies</i>	Gramineae	FP	N	Y
21)	Tikiokra	<i>Melochia corchorifolia</i>	Sterculiaceae	OT	N	Y
22)	Kechur	<i>Monochoria hastata</i>	Pontederiaceae	FP	Y	Y
23)	Ghash	<i>Oldenaldia brachypoda</i>	Rubiaceae	OT	Y	Y
24)	Jhoradhan	<i>Oryza rufipogon</i>	Gramineae	FP	Y	Y
25)	Dhan	<i>Oryza sp</i>	Gramineae	FS	Y	Y
26)	Baksha	<i>Panicum paludosum</i>	Gramineae	FP	N	Y
27)	Panigoicha	<i>Paspalum scrobiculatum</i>	Gramineae	FP	Y	Y
28)	Lal Kukra	<i>Pesicaria ocreocarpa</i>	Polygonaceae	OT	Y	Y
29)	Lal Kukra	<i>Pesicaria dichotoma</i>	Polygonaceae	OT	Y	Y
30)	Erali Ghash	<i>Pseudoraphis brunoninana</i>	Gramineae	FP	Y	Y
31)	Erali Ghash	<i>Pseudoraphis spinescens</i>	Gramineae	FP	Y	Y
32)	Karoch	<i>Pongamia pinnata</i>	Leguminosae	OT	Y	Y
33)	Chesra	<i>Pycreus stramineus</i>	Cyperaceae	FP	Y	Y
34)	Choto Chesra	<i>Schoenoplectus articulatus</i>	Cyperaceae	FP	Y	Y
35)	Ikr	<i>Scherlostachya fusca</i>	Gramineae	OR	Y	Y
<b>Submerged</b>						
36)	Shaola	<i>Blyxa japonica</i>	Hydrocharitaceae	OT	N	Y
37)	Biral Lazur	<i>Ceratophyllum desmersum</i>	Ceratophyllaceae	OT	Y	Y
38)	Shaola	<i>Ceratophyllum sp.</i>	Ceratophyllaceae	OT	Y	Y
39)	Pani ghash	<i>Dopartium junceum</i>	Scrophulariaceae	OT	N	Y
40)	Kata Shaola	<i>Hydrilla verticillata</i>	Hydrocharitaceae	OT	Y	Y
41)	Pani Ghash	<i>Myriophyllum sp.</i>	Haloraceae	OT	Y	Y
42)	Gura Shaola	<i>Najas gramineae</i>	Najadaceae	OT	Y	Y
43)	Gura Shaola	<i>Najas sp.</i>	Najadaceae	OT	Y	Y
44)	Pattera	<i>Vallisneria spiralis</i>	Limnaceae	OT	Y	Y
45)	Shaola	<i>Nitella sp.</i>	Algae (BGA)	OT	Y	Y
<b>Submerged floating</b>						
46)	Bicha Shaola	<i>Utricularia stellaris</i>	Lentibulariaceae	OT	N	Y
47)	Bicha Shaola	<i>Utricularia aurea</i>	Lentibulariaceae	OT	Y	Y

Sl no	Local Name	Scientific Name	Family	Use	Dry	Wet
48)	Bicha Shaola	<i>Utricularia exoleata</i>	Lentibulariaceae	OT	Y	Y
<b>Floating leaved</b>						
49)	Baithapata	<i>Aponogeton appendiculatus</i>	Aponogetonaceae	OT	Y	Y
50)	Phokol	<i>Euraile ferox</i>	Nymphaeaceae	FS	Y	Y
51)	Futki	<i>Hygroryza aristata</i>	Gramineae	FP	Y	Y
52)	Kolmi Shak	<i>Ipomoea aquatica</i>	Convolvulaceae	FV	Y	Y
53)	Paniaga	<i>Ludwigia repens</i>	Onagraceae	OT	Y	Y
54)	Amrail Shak	<i>Mersilea minuta</i>	Mersileaceae	OT	Y	Y
55)	Shapla	<i>Nymphaea nouchali</i>	Nymphaeaceae	OR	Y	Y
56)	Nilshapla	<i>Nymphaea stellata</i>	Nymphaeaceae	OR	N	Y
57)	Lal Shapla	<i>Nymphaea rubra</i>	Nymphaeaceae	FV	Y	Y
58)	Zinari ghash	<i>Nymphoides indicum</i>	Menyanthaceae	OT	Y	Y
59)	Shaola	<i>Nymphoides aurantiacum</i>	Menyanthaceae	OT	N	Y
60)	Padma	<i>Nelumbo nucifera</i>	Nymphaeaceae	FS	Y	Y
61)	Pata shaola	<i>Potamogeton sp</i>	Potamogetonaceae	OT	Y	Y
62)	Shingrai	<i>Trapa natans</i>	Trapaceae	FS	Y	Y
63)	Shingrai	<i>Trapa maximoiczii</i>	Trapaceae	FS	Y	Y
<b>Free floating</b>						
64)	Kutipana	<i>Azolla pinnata</i>	Salviniaceae	FT	Y	Y
65)	Dal	<i>Eichhornia crassipes</i>	Pontederiaceae	FP	Y	Y
66)	Topa pana	<i>Pistia stratiotes</i>	Araceae	OT	N	Y
67)	Indurkani pana	<i>Salvinia cuculata</i>	Salviniaceae	OT	N	Y
68)	Indurkani pana	<i>Salvinia natans</i>	Salviniaceae	OT	Y	Y
<b>Marginal</b>						
69)	Borohatisure	<i>Acalypha hispida</i>	Euphorbiaceae	OT	Y	Y
70)	Chaptapata	<i>Axonopus affinis</i>	Gramineae	FP	Y	Y
71)	Kanta gach	<i>Amaranthus viridis</i>	Amaranthaceae	FV	Y	Y
72)	Dopra	<i>Cynodon dactylon</i>	Gramineae	FP	Y	Y
73)	Ful Ghash	<i>Cyperus cephalotes</i>	Cyperaceae	FP	Y	Y
74)	Ful Ghash	<i>Cyperus tenuispica</i>	Cyperaceae	FP	Y	Y
75)	Phul ghash	<i>Digitaria sanguinalis</i>	Gramineae	FP	Y	Y
76)	Tandera	<i>Echinochloa sp.</i>	Gramineae	FP	Y	Y
77)	Helencha	<i>Enhydra fluctuans</i>	Compositae	FV	Y	Y
78)	Phul ghash	<i>Eragrostis uniloides</i>	Gramineae	FP	Y	Y
79)	Babnilota	<i>Evolvulus sp</i>	Convolvulaceae	OT	Y	Y
80)	Chatki Ghash	<i>Fimbristylis miliacea</i>	Cyperaceae	FP	Y	Y
81)	Chockfuta	<i>Helianthus tuberosus</i>	Compositae	OT	N	Y
82)	Chailla	<i>Hemarthia protensa</i>	Gramineae	FP	Y	Y
83)	Panichapra	<i>Limnophila sessiliflora</i>	Scrophulariaceae	OT	Y	Y
84)	Panichapra	<i>Limnophila sp</i>	Scrophulariaceae	OT	Y	Y
85)	Panichapra	<i>Limnophila indica</i>	Scrophulariaceae	OT	Y	Y
86)	Phulghash	<i>Launaea asplefolia</i>	Compositae	OT	Y	Y
87)	Pani Ghash	<i>Lindernia rotundifolia</i>	Scrophulariaceae	OT	Y	Y
88)	Pisach	<i>Lippia gamenica</i>	Lippiaceae	OT	Y	Y
89)	Lota	<i>Micania scandens</i>	Compositae	OT	Y	Y
90)	Ghash	<i>Paspalum conjugatum</i>	Gramineae	FP	Y	Y
91)	Lal Kokra	<i>Polygonum lanatum</i>	Polygonaceae	OT	Y	N
92)	Lal Kokra	<i>Polygonum glabrum</i>	Polygonaceae	OT	Y	Y
93)	Lal Kokra	<i>Polygonum pedunculare</i>	Polygonaceae	OT	Y	Y
94)	Boro Kokra	<i>Polygonum tomentosum</i>	Polygonaceae	OT	Y	Y

## Appendix 26

List of Terrestrial Plant Species Observed During 1<sup>st</sup> Impact Year at Hail Haor

Sl no	Local Name	Scientific Name	Family	Dry	Wet
<b>Shrubs</b>					
1.	Bashok	<i>Adhatoda vasica</i>	Acanthaceae	N	Y
2.	Jali bet	<i>Calamus rotang</i>	Palmae	Y	Y
3.	Pepe	<i>Carica papaya</i>	Caricaceae	Y	Y
4.	Choto kalkesunda	<i>Cassia tora</i>	Leguminosae	Y	Y
5.	Labu	<i>Citrus limmon</i>	Rutaceae	Y	Y
6.	Murta	<i>Clinogyne dichotoma</i>	Maranthaceae	N	Y
7.	Vat	<i>Clerodendrum squamatum</i>	Verbenaceae	Y	Y
8.	Vat	<i>Clerodendrum viscosum</i>	Verbenaceae	Y	Y
9.	Jhonjhoni	<i>Crotalaria saltiana</i>	Leguminosae	Y	Y
10.	Golokbet	<i>Daemonorops jenkinsianus</i>	Palmae	Y	Y
11.	Motmoti	<i>Glycosmis arborea</i>	Rutaceae	Y	Y
12.	Sthalpadma	<i>Hibiscus mutabilis</i>	Malvaceae	Y	Y
13.	Joba(single)	<i>Hibiscus rosa-sinensis</i>	Malvaceae	Y	Y
14.	Deokolum	<i>Ipomoea fistulosa</i>	Convolvulaceae	Y	Y
15.	Lanton kanta	<i>Lantana camara</i>	Verbenaceae	Y	Y
16.	Mendi	<i>Lawsonia inermis</i>	Lythraceae	Y	Y
17.	Nishi	<i>Melastoma malabathricum</i>	Melastomataceae	Y	Y
18.	Chitki	<i>Phyllanthus reticulatus</i>	Euphorbiaceae	Y	Y
19.	Moankanta	<i>Randia dumetorum</i>	Rubiaceae	Y	Y
20.	Venna	<i>Ricinus communis</i>	Euphorbiaceae	Y	Y
21.	Korobi	<i>Sarcochlamys pulcherrima</i>	Urticaceae	Y	Y
22.	Tit begun	<i>Solanum filicifolium</i>	Solanaceae	Y	Y
23.	Tagor	<i>Tabernaemontana divaricata</i>	Apocynaceae	Y	Y
24.	Medla	<i>Tephrosia candida</i>	Leguminosae	Y	Y
25.	Chaa	<i>Thea sinensis</i>	Theaceae	Y	Y
26.	Phul jharu	<i>Thysanolaena maxima</i>	Gramineae	Y	Y
<b>Small tree</b>					
27.	Sorifa	<i>Anona reticulata</i>	Annonaceae	Y	Y
28.	Ataphal	<i>Anona squamosa</i>	Annonaceae	Y	Y
29.	Kamranga	<i>Averrhoa carambola</i>	Averrhoaceae	Y	Y
30.	Jambura	<i>Citrus grandis</i>	Rutaceae	Y	Y
31.	Malta	<i>Citrus sinensis</i>	Rutaceae	Y	Y
32.	Tomal	<i>Diospyros cordifolia</i>	Ebenaceae	Y	Y
33.	Ipil-Ipil	<i>Leucaena leucocephala</i>	Leguminosae	Y	Y
34.	Bokul	<i>Mimosops elengi</i>	Sapotaceae	Y	Y
35.	Khami	<i>Mitragyne pervifolia</i>	Rubiaceae	Y	Y
36.	Sajna	<i>Moringa oliefera</i>	Moringaceae	Y	Y
37.	Tut	<i>Morus indica</i>	Moraceae	Y	Y
38.	Nagassar	<i>Mesua nagassarium</i>	Guttiferae	Y	Y
39.	Aurboroi	<i>Phyllanthus acidus</i>	Euphorbiaceae	Y	Y
40.	Peyara	<i>Psidium guajava</i>	Myrtaceae	Y	Y
41.	Dalim	<i>Punica granatum</i>	Punicaceae	Y	Y
42.	Shaora	<i>Styrelbus asper</i>	Urticaceae	Y	Y
43.	Boroi	<i>Zizyphus mauritiana</i>	Rhamnaceae	Y	Y
44.	Holdekorobi	<i>Thevetia peruviana</i>	Apocynaceae	Y	Y

Sl no	Local Name	Scientific Name	Family	Dry	Wet
<b>Tree like</b>					
45.	Borua bansh	<i>Bambusa balcoa</i>	Gramineae	Y	Y
46.	Nol jai	<i>Bambusa longispiculata</i>	Gramineae	Y	Y
47.	Bakal bansh	<i>Bambusa teres</i>	Gramineae	Y	Y
48.	Jai bansh	<i>Bambusa vulgaris</i>	Gramineae	Y	Y
49.	Narikel	<i>Cocos nucifera</i>	Palmae	Y	Y
50.	Lathi bansh	<i>Dendrocalamus strictus</i>	Gramineae	Y	Y
51.	Muli bansh	<i>Melocanna hucifera</i>	Gramineae	Y	Y
52.	Khejur	<i>Phoenix sylvestris</i>	Palmae	Y	Y
<b>Tree</b>					
53.	Mangium	<i>Acacia mangium</i>	Leguminosae	Y	Y
54.	Akashi	<i>Acacia moniliformis</i>	Leguminosae	Y	Y
55.	Agor	<i>Aquilaria agallocha</i>	Thymeliaceae	N	Y
56.	Gunallay	<i>Acrocarpus fraxinifolius</i>	Leguminosae	Y	Y
57.	Bel	<i>Aegle marmelos</i>	Rutaceae	Y	Y
58.	Sheel koro	<i>Albizia lucida</i>	Leguminosae	Y	Y
59.	Sada koro	<i>Albizia odoratissum</i>	Leguminosae	Y	Y
60.	Malacana	<i>Albizia malacana</i>	Leguminosae	N	Y
61.	Root chambol	<i>Albizia sp</i>	Leguminosae	N	Y
62.	Tetlia cham	<i>Albizi richardia</i>	Leguminosae	Y	Y
63.	Chaitan	<i>Alstonia scholaris</i>	Apocynaceae	Y	Y
64.	Kadom	<i>Anthocephalus chinensis</i>	Rubiaceae	Y	Y
65.	Khudijum	<i>Antidesma ghasembilla</i>	Euphorbiaceae	Y	Y
66.	Rata	<i>Aphanamixis polystachya</i>	Meliaceae	Y	Y
67.	Supari	<i>Areca catechu</i>	Palmae	Y	Y
68.	Chapalish	<i>Artocarpus chaplasha</i>	Moraceae	Y	Y
69.	Kanthal	<i>Artocarpus heterophyllus</i>	Moraceae	Y	Y
70.	Deua	<i>Artocarpus lakoocha</i>	Moraceae	Y	Y
71.	Neem	<i>Azadirachta indica</i>	Meliaceae	Y	Y
72.	Hijal	<i>Barringtonia acutangula</i>	Lecythidaceae	Y	Y
73.	Semul	<i>Bombax ceiba</i>	Bombacaceae	Y	Y
74.	Tal	<i>Borassus flabellifer</i>	Palmae	Y	Y
75.	Chaur	<i>Caryota urens</i>	Palmae	Y	Y
76.	Bandorlathi	<i>Cassia fistula</i>	Leguminosae	Y	N
77.	Tali koro	<i>Cassia occidentalis</i>	Leguminosae	Y	Y
78.	Tejpata	<i>Cinnamomum tamala</i>	Lauraceae	Y	Y
79.	Bottle brush	<i>Callistemon linearis</i>	Myrtaceae	N	Y
80.	Chickrassi	<i>Chickrassia tabularis</i>	Meliaceae	Y	Y
81.	Borun	<i>Crataeva nurvala</i>	Capparidaceae	Y	Y
82.	Sishu	<i>Dalbergia sissoo</i>	Leguminosae	Y	Y
83.	Krishnachura	<i>Delonix regia</i>	Leguminosae	Y	Y
84.	Harish	<i>Derris robusta</i>	Leguminosae	Y	N
85.	Chalta	<i>Dillenia indica</i>	Dilleniaceae	Y	Y
86.	Gab	<i>Diospyros peregrina</i>	Ebenaceae	Y	Y
87.	Telia gorjon	<i>Dipterocarpus turbinatus</i>	Dipterocarpaceae	N	Y
88.	Gorjon	<i>Dipterocarpus costatus</i>	Dipterocarpaceae	Y	Y
89.	Rongi	<i>Dysoxylum binectariferum</i>	Meliaceae	Y	Y
90.	Jolpai	<i>Elaeocarpus robustus</i>	Elaeocarpaceae	N	Y
91.	Kalauza	<i>Ehretia acuminata</i>	Boraginaceae	Y	Y
92.	Kanta mandar	<i>Erythrina indica</i>	Leguminosae	Y	Y

Sl no	Local Name	Scientific Name	Family	Dry	Wet
93.	Eucalyptus	<i>Eucalyptus sp</i>	Myrtaceae	Y	Y
94.	Pani jum	<i>Eugenia formosa</i>	Myrtaceae	Y	Y
95.	Bot	<i>Ficus benghalensis</i>	Moraceae	Y	Y
96.	Bot (Pakur)	<i>Ficus lacor</i>	Moraceae	Y	Y
97.	Zogdumur	<i>Ficus glamerata</i>	Moraceae	Y	Y
98.	Dungra	<i>Ficus hispida</i>	Moraceae	Y	Y
99.	Gamar	<i>Gmelina arborea</i>	Verbenaceae	Y	Y
100.	Dhulza	<i>Grewia orbiculata</i>	Tiliaceae	Y	Y
101.	Rubber	<i>Hevea brasiliensis</i>	Euphorbiaceae	Y	Y
102.	Telsure	<i>Hopea odorata</i>	Dipterocarpaceae	N	Y
103.	Jarul	<i>Lagerstromia pervifolia</i>	Lythraceae	Y	Y
104.	Litchu	<i>Litchi chinensis</i>	Sapindaceae	Y	Y
105.	Amm	<i>Mangifera indica</i>	Anacardiaceae	Y	Y
106.	Boisha neem,	<i>Mellia sempervirens</i>	Meliaceae	Y	Y
107.	Champa	<i>Michelia champaca</i>	Magnoliaceae	Y	Y
108.	Kat golap	<i>Plumeria acutifolia</i>	Apocynaceae	Y	Y
109.	Rokto chandon	<i>Pterocarpus santalinus</i>	Leguminosae	N	Y
110.	Bish jarul	<i>Prema benghalensis</i>	Verbenaceae	Y	Y
111.	Ratebuja	<i>Samanea saman</i>	Leguminosae	Y	Y
112.	Panch guti	<i>Schima wallichii</i>	Theaceae	Y	Y
113.	Vela	<i>Semicarpus anacardium</i>	Anacardium	Y	Y
114.	Shal	<i>Shorea robusta</i>	Dipterocarpaceae	Y	Y
115.	Jungli amra	<i>Spondius dulce</i>	Anacardiaceae	Y	Y
116.	Amra	<i>Spondius pinnata</i>	Anacardiaceae	Y	Y
117.	Udal	<i>Sterculia villosa</i>	Sterculiaceae	Y	Y
118.	Mehogoni	<i>Swietenia macrophylla</i>	Meliaceae	Y	Y
119.	Jum	<i>Syzygium cumini</i>	Myrtaceae	Y	Y
120.	Golap jum	<i>Syzygium jambos</i>	Myrtaceae	Y	Y
121.	Jungli jum	<i>Syzygium wallichii</i>	Myrtaceae	Y	Y
122.	Tetul	<i>Tamarindus indica</i>	Leguminosae	Y	Y
123.	Segun	<i>Tectona grandis</i>	Verbenaceae	Y	Y
124.	Arjun	<i>Terminalia arjuna</i>	Combretaceae	Y	Y
125.	Bohera	<i>Terminalia belerica</i>	Combretaceae	Y	Y
126.	Ziga	<i>Trema orientalis</i>	Ulmaceae	Y	Y
127.	Mera	<i>Tewia polycarpa</i>	Euphorbiaceae	Y	Y
128.	Khakra	<i>Webera campaniflora</i>	Rubiaceae	Y	Y
129.	Lohakath	<i>Xylia dolabiformis</i>	Leguminosae	N	Y
130.	Bajna	<i>Xanthoxylum rhesta</i>	Rutaceae	Y	Y

Note: Y = Present, N = Absent

## Appendix 27

List of Terrestrial Plants Observed in Extended Part of Transect-3 in addition to the Species Observed at Other Parts of the Transect (Lawa Chhara forest included into transect for study during 1<sup>st</sup> impact Year).

Sl	Local Name	Scientific Name	Family
<b>Shrubs</b>			
1.	Bashok	<i>Adhatoda vasica</i>	Acanthaceae
2.	Jali bet	<i>Calmus rotang</i>	Palmae
3.	Pepe	<i>Carica papaya</i>	Caricaceae
4.	Chotokalkesunda	<i>Cassia tora</i>	Leguminosae
5.	Golokbet	<i>Daemonorops jenkinsianus</i>	Palmae
6.	Moankanta	<i>Randia dumetorum</i>	Rubiaceae
7.	Tit begun	<i>Solanum filicifolium</i>	Solanaceae
8.	Medla	<i>Tephrosia candida</i>	Leguminosae
<b>Tree like</b>			
9.	Brua bansh	<i>Bambusa balcoa</i>	Gramineae
10.	Nol jai	<i>Bambusa teres</i>	Gramineae
<b>Small tree</b>			
11.	Shorifa	<i>Anona reticulata</i>	Annonaceae
12.	Malta	<i>Citrus sinensis</i>	Rutaceae
13.	Ipil-Ipil	<i>Leucaena leucocephala</i>	Leguminosae
14.	Nagassar	<i>Mesua nagassarium</i>	Guttiferae
15.	Khami	<i>Mitragyne pervifolia</i>	Rubiaceae
<b>Tree</b>			
16.	Mangium	<i>Acacia moniliformis</i>	Leguminosae
17.	Akashi	<i>Acacia moniliformis</i>	Leguminosae
18.	Gunallaya	<i>Acrocarpus fraxinifolius</i>	Leguminosae
19.	Bel	<i>Aegle marmelos</i>	Rutaceae
20.	Malacana	<i>Albizia malacana</i>	Leguminosae
21.	Koroi	<i>Albizia odoratissim</i>	Leguminosae
22.	Tetlia cham	<i>Albizia richardia</i>	Leguminosae
23.	Rata	<i>Aphanamixis polystachya</i>	Meliaceae
24.	Supari	<i>Areca catechu</i>	Palmae
25.	Dewa	<i>Artocarpus lakoocha</i>	Moraceae
26.	Hijal	<i>Barringtonia acutangula</i>	Lecythidaceae
27.	Bottle brush	<i>Callistemon linearis</i>	Myrtaceae
28.	Chaur	<i>Caryota urens</i>	Palmae
29.	Borun	<i>Craeva nurvala</i>	Capparidaceae
30.	Krishnachura	<i>Delonix regia</i>	Leguminosae
31.	Gorjon	<i>Dipterocarpus costatus</i>	Dipterocarpaceae
32.	Eucalyptus	<i>Eucalyptus sp</i>	Myrtaceae
33.	Bot	<i>Ficus benghalensis</i>	Moraceae
34.	Dungra	<i>Ficus hispida</i>	Moraceae
35.	Pakur	<i>Ficus lacor</i>	Moraceae
36.	Gamar	<i>Gmelina arborea</i>	Verbenaceae
37.	Dhulza	<i>Grewia orbiculata</i>	Tiliaceae
38.	Rubber	<i>Hevea brasiliensis</i>	Euphorbiaceae
39.	Jarul	<i>Lagerstromia pervifolia</i>	Lythraceae
40.	Boisha neem	<i>Mellia sempervirens</i>	Meliaceae

SI	Local Name	Scientific Name	Family
41.	Champa	<i>Michelia champaca</i>	Magnoliaceae
42.	Sajna	<i>Moringa oliefera</i>	Moringaceae
43.	Khejur	<i>Phoenix sylvestris</i>	Palmae
44.	Bish jarul	<i>Prema benghalensis</i>	Verbenaceae
45.	Puncguti	<i>Schima wallichii</i>	Theaceae
46.	Vela	<i>Semicarpus anacardium</i>	Anacardiaceae
47.	Shal	<i>Shorea robusta</i>	Dipterocarpaceae
48.	Jungli amra	<i>Spondius dulce</i>	Anacardiaceae
49.	Udal	<i>Sterculia villosa</i>	Sterculiaceae
50.	Jum	<i>Syzygium cumini</i>	Myrtaceae
51.	Golpjum	<i>Syzygium jambos</i>	Myrtaceae
52.	Arjun	<i>Terminalia arjuna</i>	Combretaceae
53.	Bohera	<i>Terminalia belerica</i>	Combretaceae
54.	Mera	<i>Tewia polycarpa</i>	Euphorbiaceae
55.	Khakra	<i>Webera campaniflora</i>	Rubiaceae
56.	Bajna	<i>Xanthoxylum rhestu</i>	Rutaceae

## Appendix 28

List of Hydrophyte Species Observed During 1<sup>st</sup> Impact Year in Turag-Bangshi Site

Sl no	Local Name Emergent	Scientific Name	Family	Use	Dry	Wet
1)	Vat Shola	<i>Aeschynomene indica</i>	Leguminosae	OR	Y	Y
2)	Helanchi	<i>Alternanthera philoxeroides</i>	Amaranthaceae	FV	Y	Y
3)	Moisha Numba	<i>Cyperus rotang</i>	Cyperaceae	FP	Y	Y
4)	Helanchi	<i>Enhydra fluctuans</i>	Compositae	FV	Y	Y
5)	Boro Chesra	<i>Eriocaulon acatangula</i>	Cyperaceae	FP	Y	Y
6)	Dholkolmi	<i>Ipomoea fistulosa</i>	Convalvalaccac	FU	Y	Y
7)	Khechur	<i>Monochoria hastata</i>	Pontederiaceae	OT	N	Y
8)	Arali Ghash	<i>Pseudoraphis brunoninan</i>	Gramineae	FP	N	Y
9)	Arail	<i>Pseudoraphis spinescens</i>	Gramineae	FP	N	Y
10)	Dhan	<i>Oryza sp</i>	Gramineae	FS	Y	N
11)	Choto chesra	<i>Shoenoplectus articulatus</i>	Cyperaceae	FP	Y	N
12)	Chatrajungle	<i>Saccharum sp.</i>	Gramineae	FB	N	Y
13)	Kochu	<i>Sagittaria guyanensis</i>	Alismataceae	OT	N	Y
<b>Submerged</b>						
14)	Ghechu	<i>Aponogeton natans</i>	Aponogetonaceae	OT	Y	Y
15)	Shaola	<i>Ceropteris sp.*</i>	Pteridophyta	OT	N	Y
16)	Ichadurki	<i>Hydrilla verticillata</i>	Hydrocharitaceae	OT	Y	Y
17)	Shaola	<i>Myriophyllum sp.</i>	Haloraceae	OT	N	Y
18)	Ichadurki	<i>Najas gramineae</i>	Limnocharitaceae	OT	Y	Y
19)	Ichadurki	<i>Nechanandra alternifolia</i>	Hydrocharitaceae	OT	Y	Y
20)	Gangkola	<i>Ottelia alismoides</i>	Hydrocharitaceae	FS	N	Y
21)	Shaola	<i>Potamogeton mucronatus</i>	Limnocharitaceae	OT	Y	Y
22)	Ichadurki	<i>Potamogeton sp.</i>	Potamogetonaceae	OT	N	Y
23)	Icha durki	<i>Utricularia aurea</i>	Lentibulariaceae	OT	Y	Y
24)	Pattera	<i>Vallisneria spirales</i>	Limnaceae	OT	Y	Y
<b>Floating leaved</b>						
25)	Makna	<i>Eurailia ferox</i>	Nymphaeaceae	FS	Y	Y
26)	Dula ghash	<i>Hygroryza aristata</i>	Gramineae	OT	Y	Y
27)	Kolmi Shak	<i>Ipomoea aquatica</i>	Convalvalaceae	FV	Y	Y
28)	Panidoga	<i>Ludwigia adscendens</i>	Onagraceae	OT	N	Y
29)	Panidoga	<i>Ludwigia repens</i>	Onagraceae	OT	N	Y
30)	Amboli	<i>Mersilea minuta</i>	Merseliaceae	OT	N	Y
31)	Rokto sapla	<i>Nymphaea rubra</i>	Nymphaeaceae	OR	N	Y
32)	Shapla	<i>Nymphaea nouchali</i>	Nymphaeaceae	OR	N	Y
33)	Zinargach	<i>Nymphoides indicum</i>	Menyanthaceae	OT	Y	Y
34)	Baksha	<i>Panicum paludosum</i>	Gramineae	FP	Y	Y
35)	Shingrai	<i>Trapa natans</i>	Trapaceae	FS	Y	Y
<b>Free floating</b>						
36)	Katipana	<i>Azolla pinnata</i>	Salviniaceae	OT	Y	Y
37)	Kochuripana	<i>Eichhornia crassipes</i>	Pontederiaceae	FP	Y	Y
38)	Khudipana	<i>Limna minor</i>	Limnaceae	OT	Y	N
39)	Topapana	<i>Pistia stratiotes</i>	Araccae	OT	N	Y
40)	Tetulapana	<i>Salvinia natans</i>	Araccae	OT	Y	Y
41)	Pana	<i>Wolffia arrhyza</i>	Limnaceae	OT	Y	N

Sl	Local Name	Scientific Name	Family	Use	Dry	Wet
<b>Marginal</b>						
42)	Durba ghash	<i>Cynodon dactylon</i>	Gramineae	FP	Y	Y
43)	Chula Ghash	<i>Fimbristylis milliacea</i>	Cyperaceae	FP	Y	N
44)	Bish kantali	<i>Polygonum lanatum</i>	Polygonaceae	OT	Y	N
45)	Bish kantali	<i>Polygonum glabrum</i>	Polygonaceae	OT	N	Y
46)	Bish kantali	<i>Polygonum tomentosum</i>	Polygonaceae	OT	Y	N
47)	Bish kantali	<i>Polygonum ocreocarpa</i>	Polygonaceae	OT	N	Y
48)	Benna	<i>Vetiveria zizanioides</i>	Gramineae	FB	Y	Y

Note: Y for Observed and N for not found during the season.

## Appendix 29

List of Observed Terrestrial Plant Species During 1<sup>st</sup> Impact Year in Turag-Bangshi Site

Sl no	Local Name	Scientific Name	Family	Dry	Wet
<b>Shrubs</b>					
1.	Ulotkambol	<i>Abroma augusta</i>	Sterculiaceae	Y	Y
2.	Anarosh	<i>Ananus sativus</i>	Bromeliaceae	Y	N
3.	Pepe	<i>Carica papaya</i>	Caricaceae	Y	Y
4.	Sada akond	<i>Calotropis procera</i>	Asclepiadaceae	Y	Y
5.	Labu	<i>Citrus limmon</i>	Rutaceae	Y	Y
6.	Vat(Lal)	<i>Clerodendrum squamatum</i>	Verbenaceae	Y	Y
7.	Choto kalkesunda	<i>Cassia tora</i>	Leguminosae	Y	Y
8.	Pati labu	<i>Citrus aurantifolia</i>	Rutaceae	Y	N
9.	Jhonjhoni	<i>Crotalaria saltiana</i>	Leguminosae	N	Y
10.	Agra	<i>Croton bonplandianum</i>	Euphorbiaceae	Y	Y
11.	Gollabet	<i>Daemonorops jenkinsianus</i>	Palmae	Y	Y
12.	Dhutra	<i>Datura metel</i>	Solanaceae	Y	Y
13.	RoktoJoba	<i>Hibiscus rosa-sinensis</i>	Malvaceae	Y	Y
14.	Dholkolmi	<i>Ipomoea fistulosa</i>	Convolvulaceae	Y	Y
15.	Jungli venna	<i>Jatropha gossypifolia</i>	Rutaceae	Y	Y
16.	Dantmajon	<i>Glycosmis arborea</i>	Rutaceae	Y	Y
17.	Mendi	<i>Lawsonia inermis</i>	Lythraceae	Y	Y
18.	Chitki	<i>Phyllanthus reticulatus</i>	Euphorbiaceae	Y	Y
19.	Bishlong	<i>Randia sp</i>	Rubiaceae	Y	N
20.	Moankanta	<i>Randia dumetorum</i>	Rubiaceae	Y	Y
21.	Venna	<i>Ricinus communis</i>	Euphorbiaceae	Y	Y
22.	Gendari	<i>Saccharum officinarum</i>	Gramineae	Y	Y
23.	Korobi	<i>Sarchochlamys pulcherrima</i>	Urticaceae	Y	Y
<b>Small tree</b>					
24.	Shorifa	<i>Anona reticulata</i>	Annonaceae	Y	Y
25.	Ataphal	<i>Anona squamosa</i>	Annonaceae	Y	Y
26.	Kamranga	<i>Averrhoa carambola</i>	Averrhoaceae	Y	Y
27.	Jambura	<i>Citrus grandis</i>	Rutaceae	Y	Y
28.	Sajna	<i>Moringa oliefera</i>	Moringaceae	Y	Y
29.	Tut	<i>Morus indica</i>	Moraceae	Y	Y
30.	Kamini	<i>Murraya paniculata</i>	Rutaceae	Y	Y
31.	Aurboroi	<i>Phyllanthus acidus</i>	Euphorbiaceae	Y	Y
32.	Peyara	<i>Psidium guajava</i>	Myrtaceae	Y	Y
33.	Dalim	<i>Punica granatum</i>	Punicaceae	Y	Y
34.	Shaora	<i>Streblus asper</i>	Urticaceae	Y	Y
35.	Holdekorobi	<i>Thevetia peruviana</i>	Apocynaceae	Y	Y
36.	Nishinda	<i>Vitex trifolia</i>	Verbenaceae	Y	Y
37.	Boroi	<i>Zizyphus mauritiana</i>	Rhamnaceae	Y	Y
38.	Anai	<i>Zizyphus rugosa</i>	Rhamnaceae	Y	Y
<b>Tree like</b>					
39.	Borua bansh	<i>Bambusa balcoa</i>	Gramineae	Y	Y
40.	Tolla bansh	<i>Bambusa longispiculata</i>	Gramineae	Y	Y
41.	Bon bansh	<i>Bambusa tulda</i>	Gramineae	Y	N
42.	Jai bansh	<i>Bambusa vulgaris</i>	Gramineae	Y	Y
43.	Narikel	<i>Cocos nucifera</i>	Palmae	Y	Y

Sl	Local Name	Scientific Name	Family	Dry	Wet
44.	Orabansh	<i>Dendrcalamus longispiculata</i>	Gramineac	Y	N
45.	Rengun bansh	<i>Dendrcalamus strictus</i>	Gramineac	Y	Y
46.	Noli bansh	<i>Melocanna bacifera</i>	Gramineac	Y	Y
47.	Khejur	<i>Phoenix sylvestris</i>	Palmae	Y	Y
48.	Nolkhagra	<i>Phragmites karka</i>	Gramineac	Y	Y
49.	Tal	<i>Borassus flabellifer</i>	Palmae	Y	Y
<b>Tree</b>					
50.	Akashmoni	<i>Acacia moniliformis</i>	Leguminosae	Y	Y
51.	Mangium	<i>Acacia mangium</i>	Leguminosae	Y	Y
52.	Babla	<i>Acacia nilotica</i>	Leguminosae	Y	Y
53.	Nalcha	<i>Acrocarpus fraxinifolius</i>	Leguminosae	Y	Y
54.	Bel	<i>Aegle marmelos</i>	Rutaceae	Y	Y
55.	Sheel koroi	<i>Albizia lucida</i>	Leguminosae	Y	Y
56.	Kadom	<i>Anthocephalus chinensis</i>	Rubiaceae	Y	Y
57.	Khudijum	<i>Antidesma ghasembilla</i>	Euphorbiaceae	Y	Y
58.	Pitraj	<i>Aphanamixis polystachya</i>	Meliaceae	Y	Y
59.	Supari	<i>Areca catechu</i>	Palmae	Y	Y
60.	Chapalish	<i>Artocarpus chaplasha</i>	Moraceae	Y	Y
61.	Kanthal	<i>Artocarpus heterophyllus</i>	Moraceae	Y	Y
62.	Deua	<i>Artocarpus lakoocha</i>	Moraceae	Y	Y
63.	Neem	<i>Azadirachta indica</i>	Meliaceae	Y	Y
64.	Hijal	<i>Barringtonia acutangula</i>	Lecythidaceae	Y	Y
65.	Semul	<i>Bombax ceiba</i>	Bombacaceae	Y	Y
66.	Lal polash	<i>Butea superba</i>	Leguminosae	Y	N
67.	Sonalu	<i>Cassia fistula</i>	Leguminosae	Y	Y
68.	Bilati semul	<i>Ceiba pentandra</i>	Bombaceae	Y	Y
69.	Tejpata	<i>Cinnamomum tamala</i>	Lauraceae	N	Y
70.	Daruchini	<i>Cinnamomum zealanicum</i>	Lauraceae	N	Y
71.	Borun	<i>Crataeva nurvala</i>	Capparidaceae	Y	Y
72.	Sishu	<i>Dalbergia sissoo</i>	Leguminosae	Y	Y
73.	Krishnachura	<i>Delonix regia</i>	Leguminosae	Y	Y
74.	Gab	<i>Diospyros peregrina</i>	Ebenaceae	Y	Y
75.	Gorjon	<i>Dipterocarpus costatus</i>	Dipterocarpaceae	Y	N
76.	Rongi	<i>Dysoxylum binectariferum</i>	Meliaceae	Y	Y
77.	Jolpai	<i>Elaeocarpus robustus</i>	Elaeocarpaceae	Y	Y
78.	Mandar	<i>Erythrina indica</i>	Leguminosae	Y	Y
79.	Eucalyptus	<i>Eucalyptus sp</i>	Myrtaceae	Y	Y
80.	Kodbel	<i>Feronia limonia</i>	Rutaceae	Y	Y
81.	Bot	<i>Ficus benghalensis</i>	Moraceae	Y	Y
82.	Zogdumur	<i>Ficus glamerata</i>	Moraceae	Y	Y
83.	Khoksha	<i>Ficus hispida</i>	Moraceae	Y	Y
84.	Auchin brikkha	<i>Ficus sp</i>	Moraceae	N	Y
85.	Bot (Pakur)	<i>Ficus lacor</i>	Moraceae	Y	Y
86.	Gamar	<i>Gmelina arborea</i>	Verbenaceae	Y	Y
87.	Kutisshar	<i>Halarrhena antidyssenteria</i>	Apocynaceae	Y	Y
88.	Jarul	<i>Lagerstromia pervifolia</i>	Lythraceae	Y	N
89.	Litchu	<i>Litchi chinensis</i>	Sapindaceae	Y	Y
90.	Am	<i>Mangifera indica</i>	Anacardiaceae	Y	Y
91.	Moha neem,	<i>Mellia sempervirens</i>	Meliaceae	Y	Y

Sl	Local Name	Scientific Name	Family	Dry	Wet
92.	Rajaphal	<i>Nephelium longana</i>	Sapindaceae	Y	Y
93.	Kat golap	<i>Plumeria acutifolia</i>	Apocynaceae	Y	Y
94.	Piralu	<i>Randia uliginosa</i>	Rubiaceae	Y	Y
95.	Ratebuja	<i>Samanea saman</i>	Leguminosae	Y	Y
96.	Gojari	<i>Shorea robusta</i>	Dipterocarpaceae	Y	Y
97.	Jungli amra	<i>Spondius dulce</i>	Anacardiaceae	Y	Y
98.	Amra	<i>Spondius pinnata</i>	Anacardiaceae	Y	Y
99.	Mehogoni	<i>Swietenia macrophylla</i>	Meliaceae	Y	Y
100.	Jum	<i>Syzygium cumini</i>	Myrtaceae	Y	Y
101.	Tetul	<i>Tamarindus indica</i>	Leguminosae	Y	Y
102.	Segun	<i>Tectona grandis</i>	Verbenaceae	Y	Y
103.	Arjun	<i>Terminalia arjuna</i>	Combretaceae	Y	Y
104.	Bohera	<i>Terminalia belerica</i>	Combretaceae	Y	Y
105.	Pitali	<i>Tewia polycarpa</i>	Euphorbiaceae	Y	Y
106.	Ziga	<i>Trema orientalis</i>	Ulmaceae	Y	Y
107.	Bajna	<i>Xanthoxylum rhesta</i>	Rutaceae	Y	Y

**Appendix 30**

**List of Terrestrial Plants Observed in Extended Part of Transect-1 Included During the 1<sup>st</sup> Impact Year But Was Not Included during the Baseline**

Sl	Local Name	Scientific Name	Family
<b>Shrubs</b>			
1.	Anarosh	<i>Ananas sativus</i>	Bromeliaceae
2.	Chotokalkesunda	<i>Cassia tora</i>	Leguminosae
3.	Labu	<i>Citrus limmon</i>	Rutaceae
4.	Agra	<i>Croton bonplandianum</i>	Euphorbiaceae
5.	Joba(single)	<i>Hibiscus rosa-sinensis</i>	Malvaceae
6.	Jungli venna	<i>Jatropha gossypifolia</i>	Rutaceae
7.	Mendi	<i>Lawsonia inermis</i>	Lythraceae
8.	Kamini	<i>Murraya paniculata</i>	Rutaceae
9.	Moankanta	<i>Randia dumetorum</i>	Rubiaceae
10.	Venna	<i>Ricinus communis</i>	Euphorbiaceae
<b>Small tree</b>			
11.	Shorifa	<i>Anona reticulata</i>	Annonaceae
12.	Kamranga	<i>Averrhoa carambola</i>	Averrhoaceae
13.	Aurboroi	<i>Phyllanthus acidus</i>	Euphorbiaceae
14.	Dalim	<i>Punica granatum</i>	Punicaceae
<b>Tree</b>			
15.	Babla	<i>Acacia nilotica</i>	Leguminosae
16.	Kadom	<i>Anthocephalus chinensis</i>	Rubiaceae
17.	Borun	<i>Crataeva nurvala</i>	Capparidaceae
18.	Gab	<i>Diospyros peregrina</i>	Ebenaceae
19.	Kutissar	<i>Halarrhona antydysenteria</i>	Apocynaceae
20.	Jungli amra	<i>Spondius dulce</i>	Anacardiaceae
21.	Pitkali	<i>Trewia polycarpa</i>	Euphorbiaceae