

## ANNEX 1

### THE GAIBANDHA PROJECT

#### 1. Fisheries In & Adjacent to GIP

##### 1.1 Gaibandha District & Project Area

The present Gaibandha District once formed part of the old Greater Rangpur District, along with Kurigram, Lalmonirhat and Nilphamari. All four areas are now separate districts but officially published fish production data have not yet been divided to reflect the new district boundaries. The Gaibandha Project area comprises parts of three thanas (formerly upazilas) from Gaibandha District, namely Sadullapur, Sundarganj and Gaibandha Sadar, together with parts of Kaunia and Pirgacha thanas from Rangpur District.

This section of the fisheries report addresses the impacts of FCD & FCDI hitherto and in the future, on fish production and the livelihoods of the fishing communities, within and in the vicinity of G.I.P. In order to avoid duplication environmental and ecological issues pertaining to fisheries have been dealt with separately in volumes 3 and 11 respectively.

##### 1.2 Fish Production Data

FAP 2 fisheries specialists undertook field visits and studies in the project area, on numerous occasions during the latter part of 1991 and 1992. Between them they visited most of the accessible parts of GIP and much of the surrounding countryside. It was found that some fishing effort and fish production data for each thana are collected by thana staff, but are not published as such or stored in retrievable form. In addition, unless a project area coincides with that of one or more thanas, there is no system for the analysis of such data on a project area basis. However, DOF district and thana staff assisted in compiling a set of fish catch and farmed fish production estimates for the project area covering 1990/91. Unfortunately it was not possible to obtain similar information for earlier years because the data was not available or retrievable. The only indicators as to past trends are the old Rangpur District records plus anecdotal evidence from DOF staff, fishermen, traders and other persons, together with FAP 12 reports concerning part of the project area.

Table 1 shows the official annual production figures for greater Rangpur District, for the period from 1983/84 to 1989/90. It appears that riverine and beel catches have declined by more than 80% and about 30% respectively, which generally accords with the opinions expressed by local professional fishermen. The subsistence floodplain fishery seems to have increased by more than 80%, according to the statistics, but not according to most local opinion which considers that catch rates have declined. Farmed fish production is shown as having increased by nearly 60%, which could even be an underestimate.



**Table - 1 Rangpur "Old" District; Fish Production Trends**

('000 metric tons)

Sub-sector	1983/84	1984/85	1985/86	1986/87	1987/88	1988/89
(a) <u>Capture Fish</u>						
River	7.6	6.1	3.7	2.8	2.2	1.2
Beels	2.5	1.3	1.3	1.2	2.3	1.7
Flood Plain	8.8	9.8	13.4	14.4	16.2	16.3
-----	-----	-----	-----	-----	-----	-----
Total Capture	18.9	17.2	18.4	18.4	20.7	19.2
(b) <u>Cultured Fish</u>						
Fish Ponds	1.9	1.8	2.4	3.5	3.0	3.1
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Total Production	20.8	19.0	20.8	21.9	23.7	22.3

Source: From Department of Fisheries, Annual Fish Catch Statistical Bulletins

Table 2 shows the estimated quantities of fish produced from the Gaibandha Project area during 1990/91, together with the areas of the fisheries concerned and their productivity rates. Despite breaches in the flood defence embankments along the Teesta, Brahmaputra and Ghagot rivers which can affect up to 38,600 ha of F1 to F4 floodplain, such flooding is usually of short duration and it is estimated that on a 1:5 year basis, a little more than 3000 ha will remain flooded to a depth of at least 0.3m for at least 3 months. This formula has been adopted by FAP 2 to define "fishable flood plain" during the study. Thus, within the project area there is fishable floodplain of no more than 3020 ha which is currently estimated to yield about 210 tons of mainly subsistence capture fish, or just over 28% of project area total fish production. There is additional production from a much larger area of floodland to the west of the Ghagot River, within Gaibandha District but outside the project area. The rivers produced about 70 mt. or around 10% of the total but are believed to be in continuing decline. Culture fisheries produce nearly 50% of the total and have some potential for further expansion.



**Table - 2 Gaibandha Drainage Improvement Project - Fisheries Data**

Water body		Area (ha)	Av. Prod. Rate (kg/ha/yr)	Production (mt)
(a)	Capture Fisheries:			
	Beels-Seasonal	180	180	30
	Beel-Perennial	200	400	80
	Rivers	1800	40	70
	Flood Plain	3020	70	210
	Other	n/a	n/a	100
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	Total Capture Fish			490
(b)	Culture Fisheries:			
	Cultured Ponds	380	850	320
	Derelect Ponds	90	180	15
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	Totals			335
(c)	Overall Total Catch			825

Source: Compiled from information provided by district and upazila DOF staff, fishermen and fish farmers.

### 1.3 Fishing Effort

There are reported to be about 2000 full time and part time fishermen, not counting the majority of the rural population in the flooded areas who work the floodplain seasonal subsistence fishery during the monsoon period. 1987 feasibility study of the Satdamua Katler Beel Project, which lies between the Gaibandha to Kaunia railway and the Ghagot River in the southern part of the study area, noted that there were about 300 fishing households fishing the Ghagot and beels. However, as the beels were increasingly being drained for agricultural cropping, some of the fishermen were being forced to move or seek other employment. Over 200 of the regular fishermen are based on Hurudanga and Bamondanga beels, which are now leased by fishermen's associations from DOF under New Fisheries Management Policy arrangements. The remaining fishermen are mostly dispersed along the principal rivers, despite the low catches, for want of any other opportunities. The project area fishing fleet is said to comprise 50 large boats, up to about 25 ft. in length, and 91 small craft of less than 15 ft.

### 1.4 Natural Fish Spawn Collection

There are up to five spawn collection sites along the right bank of the Brahmaputra in Gaibandha Sadar and centred on Kamarzani, which appear to be the only such locations in the project area. Production was reported by the DFO to have been 235 kg (1 kg equals about 400,000 fry), in 1989, 125 kg in 1990 and less than 77 kg last year. Collection, for which special licences have to be obtained, takes place each year from mid-June to mid-July. The licence fee in 1991 was Tk. 189 per person for about 80 people and total collection costs were said to be about Tk. 850 per kg but the spawn sold for about Tk.2000 per kg.



There are other collecting centres nearby, but outside the project area, which are reported to produce up to 1000 kg. per year. In general and as is also the case elsewhere in the country, wild spawn production is on the decline, probably reflecting a progressive reduction in the breeding stocks of fish in the river systems, and increasing concern about the future availability of fish fry and fingerlings for restocking ponds and other water bodies. However, the low state of the riverine fish stocks suggests that stricter limits and controls should now be imposed on spawn collection, in the interests of conservation.

### **1.5 Carp Hatchery Production**

There is a hatchery at Pirgacha and four more privately owned mini-hatcheries in the project area, and a total of 22 nursery units, two of which are Government owned. Hatchery production during 1990/91 was 25 Kg, whilst the nurseries produced about 4,400,000 fish fingerlings for sale to farm pond owners. Several fish farmers stated that there was a shortage of fry and fingerlings at the times when ponds should be restocked. DOF staff estimated the shortfall to exceed 10 million fingerlings, only part of which could be satisfied by supplies carried from as far a field as Jessore. The position is likely to get worse when the Third Fisheries Project (TFP) extends into Gaibandha District, unless additional hatcheries can be established in the vicinity.

### **1.6 Pond Fish Cultivation**

Inquiries by FAP 2 fisheries staff during 1991 concluded that the project area contained relatively few ponds, and was not regarded as being especially well suited to fish farming. However, the total area of ponds was subsequently noted to be about 470 ha, of which some 380 ha were being actively cultured. Most of the cultured ponds are located in the northern section, in Kaunia and Pirgacha thanas and part of Sundarganj. Despite the embankments, it was found that much of the floodplain in the southern and southeastern sections, in Gaibandha Sadar, Sadullapur and parts of Sundarganj thanas is still liable to annual inundation and the resultant high risk of over-topping of ponds, even if only briefly, is a strong disincentive to expenditure on restocking.

It was also observed that household mounds in the southern compartment rarely exceeded 2 ft in height above the surrounding land, indicating an expectation that annual flooding would normally be quite shallow. It was therefore not necessary to dig so deeply to obtain sufficient earth for the mound, but it was also observed, during March 1992, that many of these household borrow-pits were dry. Local pond owners confirmed that in order to have year-round water it was necessary to dig the pond 12 to 15 ft deep because of the porous nature of the surface layers of soil. Such deep ponds are more costly to excavate and difficult to manage, adding to the disincentives.

### **1.7 Capture Fisheries**

There are two important perennial beels at Bamondanga and Hurudanga, which between them support around 200 fishermen. In addition there are eight more, including Kachuadha Beel in Gaibandha Sadar, Maruadha Beel in Sundarganj and Satrail Beel in Sadullapur Thana which continue to hold some water throughout the year, but most of the other former beels within the project area have silted up or been drained so that they now dry out for part of the year and can no longer sustain permanent fish populations. Fishermen who used to harvest these beels were forced either to give up fishing and seek





other work, or concentrate on the rivers where the fish stocks were also declining. It seems likely that even more fishermen will have to seek other forms of employment in future unless alternative fisheries can be opened up.

One possibility lies to the south of the project and west of the Ghagot River where there appear to be more extensive areas of floodland water bodies which could be developed by combined DOF and NGO efforts to increase their production potential and accommodate more fishermen.

## 1.8 Fish Marketing

Prices noted as being received by fishermen averaged around Tk. 30/kg for carp and Tk. 25/kg for most other fish species during February 1992. Local market prices were up to Tk. 50-60/kg for large carp (e.g. Catla & Mrigal), Tk. 35-40/kg for smaller sized major carps and other species, including Silver carp, Foli (Notopterus) and Chapila (Gudusia), and below Tk. 35/kg for other minor carps and small misc. fishes. Prices at major urban markets would be higher again and all prices show quite marked seasonal changes. It was interesting to note that in the Hurudanga Beel area, about 80% of the 1991 catch was Chapila, a sardine-like clupeid fish found in most freshwater areas in Bangladesh. This contrasts with reports from the Atrai basin which suggested that Boal (Wallagu attu) was becoming the dominant species. During August 1992 it was noted that at least half of the fish on offer in Gaibandha Town market, was iced Hilsa which was caught at sea and brought all the way from Barisal. Pond fish production was represented by only a small quantity of Silver Carp and tilapia but there were moderate supplies of live fish such as Koi, Singhi and Magur.

## 1.9 Fisheries Support Services

There is a District Fisheries Office situated in Gaibandha town and responsible for the whole of Gaibandha District but only for the southern part of the project area. The northern part which takes in parts of Kaunia and Pirgacha thanas is the responsibility of the District Fisheries Office in Rangpur. Each district office should have a DFO, Extension Officer and a Fish Resources Survey Officer, whilst each thana should also have a TFO, Asst. FO and a Field Assistant. It was reported that an additional post of Extension Officer had been sanctioned for each thana office, which will help greatly provided they are given the means to travel to all parts of the thanas concerned in order to perform their duties. Unfortunately there has been a general and long standing lack of transport and recurrent operating funds.

Development work now in hand includes beel restocking, the rehabilitation & exploitation of borrow-pits fisheries with WFP Food for Work assistance and promoting the further development of pond fisheries within GIP and elsewhere in the two districts. NGOs are also involved in this work, some independently but mostly in collaboration with DOF, and are assisting in the formation and organisation of groups of landless fishermen to take over fish pond and jalmohal fishing leases. These NGOs include the Bangladesh Rural Advancement Committee (BRAC), RD9 which is an offshoot of the Rangpur Dinajpur Rural Service (RDRS), the Grameen Bank and Chinnaya Mul Unnayan. It is understood that others have also expressed interest in fisheries sector development.



## **2. Impacts of Existing FCD Developments**

### **2.1 The Teesta River Right Embankment**

There is a major break in the TRE below the Teesta and Buri Teesta confluence, well upstream of the GIP area but through which flood flows spill overland into the upper Ghagot River and cause it in turn to overspill its banks further downstream. The impact on fisheries of this FCD failure is generally beneficial, in that some fish appear to be carried with the flood water from the Teesta to the Ghagot and thence to floodplain in GIP and more especially on the right bank of the Ghagot. However, it is clearly necessary to restore the embankment because of the crop damage and disruption to road communications that occur each year and it is to be hoped that the Ghagot River fish stocks can be supplemented in some other way.

The Teesta Right Embankment from Kaunia to the Brahmaputra confluence is also breached and being eroded at several places and is a significant source of inflow to GIP. However, because of the direction of land slope, only a small area is affected. Restoration of this section of TRE to full FCD integrity will therefore have only a marginal impact on fish stocks in the beels or on migrations to and from the river. There should be an added benefit to fish farming if the extension service can be geared up to take the necessary action.

### **2.2 The Brahmaputra Right Embankment**

The BRE is also being eroded and is breached in some places, including one public cut, from its junction with TRE to the Manas River outfall. Again the downward slope from NW to SE ensures that inflows do not affect large areas of land. However, the embankment and inadequate regulator capacity in the vicinity of Manas results in severe drainage congestion and consequently, in the public cuts. The original construction of BRE would have blocked off numbers of khals, now long since silted up and reclaimed for agricultural use, but which would have facilitated the interchange of fish stocks between the river and its floodplain. Restoration of BRE will have little effect, by itself, on the remaining fish stocks, but if, as is clearly necessary, action is also taken to reduce drainage water congestion then the area and depth of floodplain inundation will be substantially reduced and the quantity of fish available for subsistence fishing by rural families will also be correspondingly diminished.

### **2.3 Kaunia to Bamandanga Railway Embankment**

A number of small bridges and culverts allow overflows mainly from the upper Ghagot River, to enter the project area and flow southwards via Masankura Canal to the main flood area in the southern compartment. If the channels through the railway embankment were blocked off, or a parallel solid dyke built, there would be an adverse impact on the floodplain fishery. Model results suggest that the fishable floodplain will be reduced in area by about 30% and fish stock replenishment and production will also fall.

The Burail Nadi river enters GIP through this section and helps to maintain water levels in Hurudanga Beel. Hurudanga is still an important fishery supporting more than 100 fishermen and it is therefore not intended to close off this flow.



## **2.4 Ghagot Left Embankment, Bamandanga to Gaibandha Town**

The existing embankment is in need of rehabilitation and there is a large non-embanked gap opposite Gaibandha. As a result a considerable area of land inside GIP still gets flooded each year with river water and many local residents benefit from the subsistence fishery which depends on this annual flood.

Rehabilitation of existing embankment sections and completion of the remainder to full FCD status would certainly reduce flood levels and the area of inundation in the southern part of the project. Subsistence fish catches and species diversity would also be reduced and it is doubtful if there could be much compensatory increase in pond fish farming because of the need to dig ponds so deeply in this area if they are to hold water all year round.

Consequent on TRE sealing and even after completion of the Ghagot Left Embankment extension, it is expected that flows across the Ghagot right bank will be significantly reduced compared with present levels. It is possible that fisheries in the floodland areas adjacent to the Ghagot right bank may be affected, but not too severely by this change.

In view of the importance of the Bamandanga Beel fishery, the canal connecting it to the Ghagot River will be kept open. A regulator will be needed to check excessive inflow and the beel may need to be partially excavated and embanked to protect surrounding farmland. Provision for this work is included in the plan and project estimates.

## **3. Options for GIP & Their Effects on Fisheries**

### **3.1 The Range of Options**

Some 17 possible variations were considered most of which had the repairs to TRE and BRE as items in common. The other main variables were:

- new Manos regulator at outfall to Brahmaputra, or
- Ghagot River Left open to Brahmaputra,
- regulator on the Alai,
- new regulator at Manos/Ghagot confluence,
- BRE joined to Ghagot left embankment,
- backwater levee on Ghagot right bank,
- extension to Ghagot left embankment,
- full length Ghagot right embankment,
- compartmentalisation.

The option finally selected for 25 year analysis was Option 0, which has all the above features except for the full Ghagot right embankment and the Ghagot/Manos outfall regulator.



Family/Species	Local Name	Main Fresh Water River	Flood Plain and Beels	Hill Streams
<b>Family : COBITIDAE</b> <i>Nemachilus botia</i> <i>Nemachilus corica</i> <i>Nemachilus zonatus</i> <i>Nemachilus savona</i> <i>Acanthopthalmus pangia</i> <i>Somileptes gongota</i> <i>Botia dario</i> <i>Botia lohachata</i> <i>Botia dayi hora</i> <i>Lepidecephalus guntea</i> <i>Lepidocephalus annandae</i> <i>Neoeucirrhichthys nalbant</i>	Balichata, Natwa Koirka, Korica Dari Savon Khorka Panga Poia, Pahari-gutum Rani Rani, Putul Rani, Purual Gutum Puiya ?	* * * * * * * * * * * *		* * * * * * * * * * * *
<b>Family : CLARIDAE</b> <i>Clarias batrachus</i>	Magur	*	*	
<b>Family : SILURIDAE</b> <i>Wallago attu</i> <i>Ompok bimaculatus</i> <i>Ompok pabda</i> <i>Ompok pabo</i>	Boal Kani pabda Madhu pabda ?	* * * *	* * *	
<b>Family : HETEROPNEUSTIDAE</b> <i>Heteropneustes fossilis</i>	Shingi	*	*	
<b>Family : CHACIDAE</b> <i>Chaca chaca</i>	Cheka	*	*	
<b>Family : SCHILBEIDAE</b> <i>Silonia silonida</i> <i>Pangasius pangasius</i> <i>Ailia coila</i> <i>Aillichthys punctata</i> <i>Pseudeutropius atherinoides</i> <i>Eutropiichthys vacha</i> <i>Clupisoma murius</i> <i>Clupisoma garua</i>	Shillong Pangas Kajuli Kajuli Batasi Bacha Muribacha Ghaura	* * * * * * * *		* *
<b>Family : AMBLYCIPITIDAE</b> <i>Amblyceps mangois</i>	?	*		





#### **4. Proposals for Mitigation**

##### **4.1 Preservation & Improvement of Khas Water Bodies**

As stated in the fisheries section of the Regional Plan, there is said to be an agreement between BWDB, DOF and their respective Ministries, to the effect that in all future plans for FCD development, any state owned, or khas, water bodies in the areas concerned which hold water all year round, should not be drained as in the past, but should be preserved and improved for capture fisheries development under the New Fisheries Management Policy. In compliance with this very important agreement, it is proposed that funding should be included under the provision for mitigatory measures, for the improvement of Kachuadha, Bamandanga, Maruadha, Satrail ad Hurudanga beels and a perennial section of the Matherhat Canal, all of which are located inside the GIP perimeter, as shown in Figure 2.

Improvement should take the form of the excavation of silted up areas around the edges of the beels, using the spoil to raise bunds within which the area and depth of permanent water can be increased, thereby expanding productivity and the numbers of fishermen who can be supported by these fisheries. The work should be jointly supervised by local BWDB and DOF officers and NGO assistance should be sought to help organise the fishermen into groups or associations. The cost of supplementary stocking, after completion of the physical works should also be included.

##### **4.2 Development of Borrow-pit Fisheries**

In the course of constructing embankments, roads and other facilities, a very large area and number of borrow-pits have been dug with little or no thought given to their possible productive use afterwards. Virtually it costs no more to plan the shape and depth of the borrow-pit and ensure compliance by the contractors, than it does to allow them to leave the area as an unusable derelict wasteland. In parts of the GIP area the ground is too porous and borrow-pits too shallow to hold water long enough to produce a fish crop, but the District Fishery Officer estimates there are at least 200 ha of potentially productive old borrow-pits within GIP.

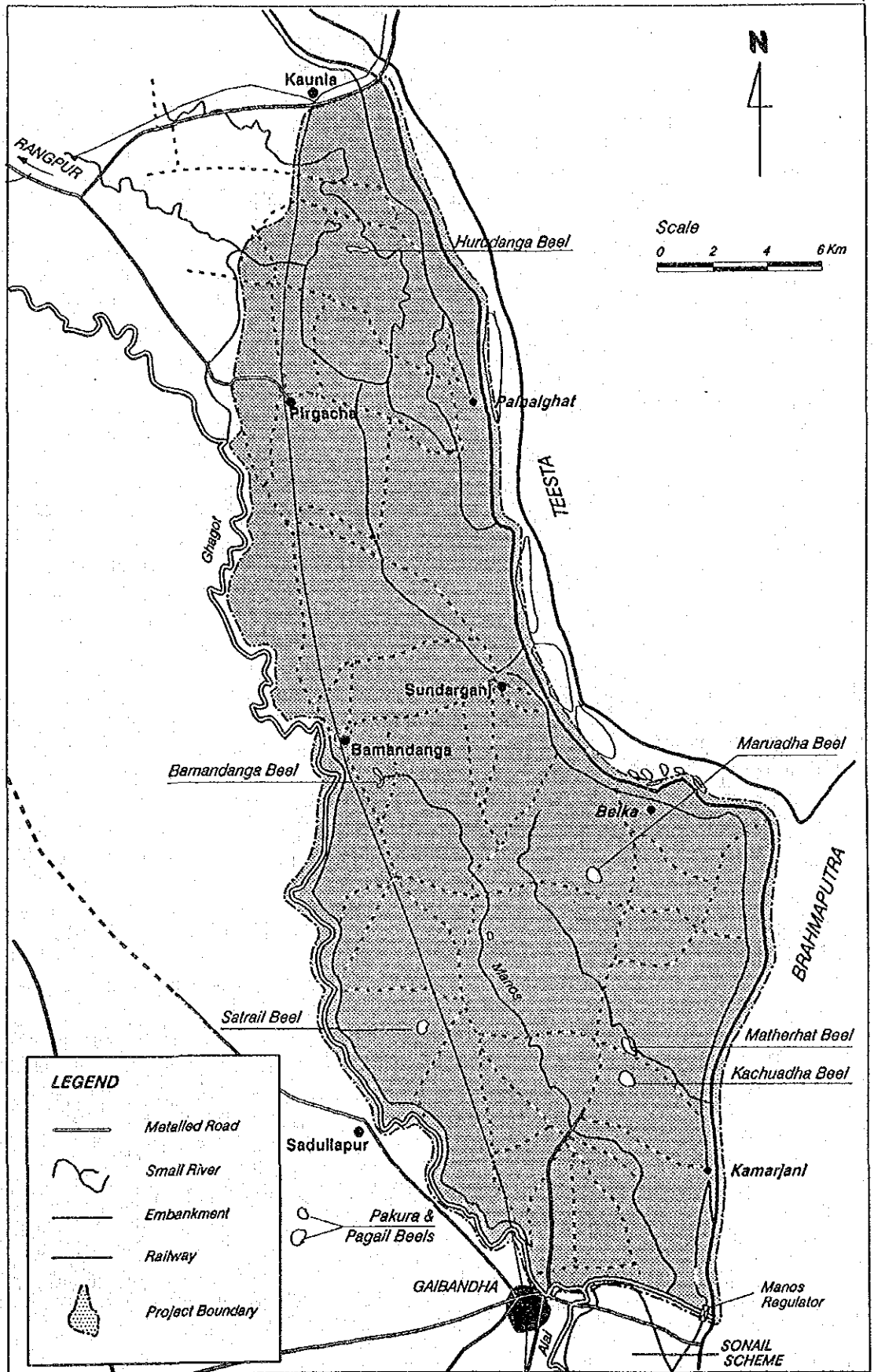
It is proposed that these areas should be excavated under similar administrative arrangements as above, stocked and allocated to the use of NFMP fishermen's groups, again with appropriate NGO assistance. Costs, including labour, supervision, some materials, transport and restocking, is estimated at about Tk. 6 lakhs per hectare, ie a total of Tk. 12 crore, but a large part of that could qualify for FFW assistance.

##### **4.3 Modified FCD Structure**

Designs for modifying or rebuilding sluices, regulators and other FCD structures so as to permit two way traffic by fish stocks, without jeopardising the protective function of the flood control structure, are still being studied by FAP 17. The problem is one which requires monitored pilot trials of perhaps several possible designs to determine their effectiveness and until such trials have been completed it is not considered sensible to propose any such developments in GIP. However, it is suggested that token provision be included in GIP estimates so that the position can be kept under review pending FAP 17 reaching some conclusions.



Figure 2  
BEEL IMPROVEMENT



Source : NWRS

C:\WP51\FIG2.BEEL.DWG



#### 4.4 Enhancement of Capture Fish Resources

It has already been proposed that provision be included for restocking certain beels and borrow-pits. Third Fisheries Project (TFP) is likely to extend its beel restocking programme into Gaibandha District and several other beels in the area have already been partially improved with FFW assistance in readiness. Bearing in mind that GIP is likely to have external impacts as well as impacts on internal fisheries, it is proposed that GIP provision should also include funding for supplementary stocking in floodland areas in the eastern part of Sadullapur Thana and in Shaghata Thana, which could suffer from the effects of embanking the Ghagot right bank and the Alai regulator.

For these reasons it is proposed that Pakuria and Pagail beels in Sadullapur, and Telian Beel and Bill Basta Beel in Shaghata should also be restocked. Ideally the restocking programme should include enhancement of fish stocks in the Ghagot River itself but the technology for doing this effectively has still to be established. This is a further matter on which FAP 17 should produce useful advice in due course, so in the meantime only token provision is proposed.

#### 4.5 Fish Farming Opportunities

Increased protection from flooding, whether from river water or from rainfall congestion and thus a reduction in the risk of ponds being overtopped and fish swept away by flood water, creates the opportunity to restock any ponds that are in suitable condition, and to rehabilitate others that have fallen into disuse and become derelict. However, experience from other projects (vide FAP 12 reports) shows that the response has often been disappointing mainly because of DOF's inability to field the necessary extension effort to give pond owners the right advice and the general lack of access to low cost rural credit to cover the costs of pond rehabilitation or new pond construction.

A further problem in GIP is high soil porosity, particularly in the southern half, and the consequent need to dig very deeply for year-round water which adds greatly to costs. Conditions are more favourable in the northern half of GIP, and it is here that efforts should concentrate in the earlier years. The project could provide some support, eg transport for extension workers and for their training as and when needed, at the new Parbatipur aquaculture centre. It seems unlikely that Flood Action Programmes could engage directly in the field of rural credit but they can remind the authorities concerned about the needs for appropriate action.

#### 4.6 Other Programmes in Support

##### (a) New Water-body Area Survey

As has been stressed in the Regional Planning Section, there is urgent need for the survey information on ponds, perennial water body areas and locations to be updated. Existing data was compiled by SPARRSO vide a UNDP contract in 1982/83 but was mainly based on Landsat imagery from February 1980 and is thus now some twelve years old. In the meantime many rivers have changed course, beels have been drained or become seasonal, new ponds have been dug, old derelict ponds renovated and others fallen into disuse, yet the statistical system for fisheries, on which all fisheries planning depends, is still restricted to using the original SPARRSO twelve year old water area data.



As far as GIP is concerned there is no purpose in suggesting a repeat survey of the GIP area alone, but a nationwide project with this aim in mind seems entirely appropriate to the Flood Action Plan. Donor funds would be needed to enable SPARRSO to undertake the satellite imagery analysis and for sample ground level verification surveys.

(b) Fisheries Statistics

Although the statistical system known as the Fisheries Resources Survey System (FRSS) was set up in 1983 with FAO assistance, following a review and overhaul of earlier arrangements, and was designed for computerised analysis, it has deteriorated to the stage where it is now taking more than 2½ years to process the annual figures and reorganisation of the tables on the basis of "new" district boundaries has not yet been accomplished. Such inordinate delays make it extremely difficult to manage the fisheries properly, and there is urgent need for a further injection of equipment, skills and training for local staff to help speed up the process.

(c) Enforcement of Fisheries Rules

Regrettably any new investments aimed at revitalising the capture fisheries will be largely wasted unless the existing fisheries laws and rules for fish protection are complied with. Landings of undersized fish from prohibited small mesh nets are commonplace and in most places have been allowed to continue unchecked. Failure to take the necessary action puts all the remaining capture fish stocks at risk. DOF needs to give the most urgent attention to dealing with this issue.

(d) Revitalising Fisheries Extension

FAP 2 field studies, supported by FAP 12 findings demonstrate that the expected benefits to aquaculture from FCD developments have frequently failed to materialise, largely because of DOF's inability to provide the necessary extension support. Future project plans should address this problem and if possible include some appropriate level of provision to assist DOF in fulfilling its obligations.

(e) Research into Minor Carp Propagation

Hatchery technology in Bangladesh for exotic and indigenous major carp species, is well advanced and already widely adopted by the private sector. The range of species which can be artificially spawned is fully suited to pond fish culture, but for the restoration of open water capture fisheries a wider range is greatly to be preferred. Ideally the range should include a number of smaller, less costly and easily bred species, having the needs of the poorer sections of the population in mind.

Some of the existing Government hatcheries should be commissioned to undertake an experimental breeding trials programme, under the control of FRI scientists and aimed at broadening the range of fish species that can be bred in captivity to support the restocking work.





#### 4.7 Cost Estimates

##### (a) Khas Water Bodies

Improvements of Kachuadha, Bamondanga, Maruadha, Satrail and Hurudanga beels;

- ▶ excavation and construction of about 25 km of low bunds around the beels, 200,000 cu.m. @ Tk. 46 ..... Tk. 92 Lakhs
- ▶ fish stocking, 65 ha x 5000/ha @ Tk. 600 per 1000 fingerlings ..... Tk. 2 Lakhs
- ▶ travel, supervision & misc. @ 15% ..... Tk. 14 Lakhs
- Total ..... Tk. 10.8 million

##### (b) Borrow-pits

- ▶ excavation of 2000 ha @ Tk. 5 lakhs/ha ..... 10 crore
- ▶ stocking @ 5000/ha; Tk.600/1000 ..... 6 lakhs
- ▶ travel, supervision & misc. @ 15% ..... 1.5 crore
- Total ..... Tk. 115.1 million

##### (c) Structures

- ▶ Token provision only ..... Tk. 100

##### (d) External Fish Stock Enhancement

- ▶ Restocking Pakuria, Pagail, Telian and Bill Basta Beel, 162 ha x 5000 x 600 ... Tk. 5 Lakhs
- ▶ travel, supervision, etc. .... 0.75 lakhs
- Total ..... Tk. 575,000

##### (e) Fisheries Extension

- ▶ Transport & training of field staff ..... Tk. 4 Lakhs
- ▶ 200 bicycles @ Tk. 5000 ..... Tk. 1 Lakh
- Total ..... Tk. 500,000

#### 4.8 Benefits

##### (a) Khas Water Bodies

The investment would generate additional fish production from the beels totalling about 80 mt. per year, worth at least Tk. 3.2 million to the fishermen and providing employment opportunities for at least 60 additional fishermen.



(b) Borrow-pits

On the assumption that these areas currently produce little or as fish, the investment could generate additional production of about 160 mt. fish per year, worth Tk. 6.4 million to the fishermen and provide work for at least 200 fishermen.

(c) Structures

Token provision only, pending further advice from FAP17.

(d) Fish Stock Enhancement

The project should generate an extra 32 mt. fish worth Tk. 11.3 million to the fishermen and possibly provide an additional 20 jobs for fishermen.

(e) Fisheries Extension

Benefits of extension efforts are difficult to quantify but if the average yield of existing cultured ponds can be increased by 18-20% and half of the derelict ponds can be made productive again, they could produce at least 80 mt. p.a. more than now, worth Tk. 4 million to the pond owners.



# APPENDIX 1

## PROVISIONAL LIST OF FISH SPECIES OCCURRING IN THE NORTH WEST REGION

Family/Species	Local Name	Main Fresh Water River	Flood Plain and Beels	Hill Streams
Family : SYNGNATHIDAE Doryichthys cuncalus Doryichthys chokderi	Kumirer Khil "	* *		
Family : ANGUILLIDAE Anguilla bengalensis	Bamoch, Banehara	*		*
Family : SYNBRANCHIDAE Monopteros cuchia	Kuchia	*	*	
Family : TETRAODONTIDAE Tetraodon cutcutia Chelonodon patoca	Tepa, Potka Potka	* *	*	
Family : BELONIDAE Xenentodon cancila	Kakila	*	*	
Family : HEMIRHAMPHIDAE Hyporhamphus gaimardi	Ekthuita	*		
Family : CYPRINODONTIDAE Aplocheilus panchax	Kanpona	*	*	
Family : CHANNIDAE Channa striatus Channa marulius Channa barca Channa punctatus Channa orientalis	Shol Gajar Pipla, Tila Taki, Lata Gachua		* * * * *	
Family : PSILORHYNCHIDAE Psilorhynchus sucatio Psilorhynchus balitora Psilorhynchus gracilis	Titari Balitora Balitora	* * *		* * *



Family/Species	Local Name	Main Fresh Water River	Flood Plain and Beels	Hill Streams
Family : CYPRINIDAE				
Oxygaster gora	Ghorachela	*	*	
Salmostoma bacaila	Katari	*	*	
Esomus danricus	Darkina		*	
Chela cachius	Chep chela	*		
Chela laubuca	Laubuca	*	*	
Aspidoparia jaya	Jaya	*		
Aspidoparia morar	Morari	*		*
Rasbora elanga	Along	*		
Rasbora rasbora	Darkina	*	*	
Rashbora daniconius	Darkina	*	*	
Barilius bola	Bhol, Bol	*		*
Barilius shacra	Koksa, Saku koksha	*		
Barilius titleo	Tila, Tila kakara, Patharchata	*		
Barilius barna	Koksa, Bani koksa	*		
Barilius vagra	Koksa, khoksa	*	*	
Danio devario	Debari chapehala	*	*	
Danio rerio	Anju	*		
Danio acquipinnatus	Chebli	*	*	
Amblyphayngodon mola	Mola	*	*	
Amblypharyngodon microlepis	Mola	*	*	
Rohtee cotio	Keti	*	*	
Chagunius chagunio	Jarua, Utti	*	*	*
Labeo gonius	Goni	*	*	
Labeo nandina	Nandil	*	*	*
Labeo calbasu	Kalibaus	*	*	
Labeo rohita	Rui	*		
Labeo angra	Angrot	*	*	*
Labeo bata	Bata	*		
Labeo boga	Bhangan	*		
Labeo dero	Kursha	*		
Cirrhinus mrigala	Mrigal	*	*	
Cirrhinus reba	Tatkini, Laacho	*	*	
Puntius sarana	Sarpunti	*	*	
Puntius chola	Chalapunti	*	*	
Puntius phutunio	Phutani punti	*	*	
Puntius conchoni	Takapunti	*		
Puntius tieti	Tit punti	*	*	
Puntius gelius	Gili punti	*	*	
Puntius sophore	Jat punti	*	*	
Puntius terio	Teri punti	*	*	
Puntius cosuatis	Kosati punti	*	*	
Tor tor	Mohashol, Mohal	*		
Tor putitora	Mohashol, Mahaseer	*		
Catla catla	Katla, Katal	*	*	
Crossocheilus latius	Kalabata	*		
Garra gotyla	Ghar Poia	*		*





Family/Species	Local Name	Main Fresh Water River	Flood Plain and Beels	Hill Streams
<b>Family : COBITIDAE</b> <i>Nemachilus botia</i> <i>Nemachilus corica</i> <i>Nemachilus zonatus</i> <i>Nemachilus savona</i> <i>Acanthopthalmus pangia</i> <i>Somileptes gongota</i> <i>Botia dario</i> <i>Botia lohachata</i> <i>Botia dayi hora</i> <i>Lepidecephalus guntea</i> <i>Lepidocephalus annandae</i> <i>Neoeucirrhichthys nalbant</i>	Balichata, Natwa Koirka, Korica Dari Savon Khorka Panga Poia, Pahari-gutum Rani Rani, Putul Rani, Purual Gutum Puiya ?	* * * * * * * * * * * *		* * * * * * * * * * *
<b>Family : CLARIDAE</b> <i>Clarias batrachus</i>	Magur	*	*	
<b>Family : SILURIDAE</b> <i>Wallago attu</i> <i>Ompok bimaculatus</i> <i>Ompok pabda</i> <i>Ompok pabo</i>	Boal Kani pabda Madhu pabda ?	* * * *	* * *	
<b>Family : HETEROPNEUSTIDAE</b> <i>Heteropneustes fossilis</i>	Shingi	*	*	
<b>Family : CHACIDAE</b> <i>Chaca chaca</i>	Cheka	*	*	
<b>Family : SCHILBEIDAE</b> <i>Silonia silonida</i> <i>Pangasius pangasius</i> <i>Ailia coila</i> <i>Aillichthys punctata</i> <i>Pseudeutropius atherinoides</i> <i>Eutropiichthys vacha</i> <i>Clupisoma murius</i> <i>Clupisoma garua</i>	Shillong Pangas Kajuli Kajuli Batasi Bacha Muribacha Ghaura	* * * * * * * * *		* *
<b>Family : AMBLYCIPITIDAE</b> <i>Amblyceps mangois</i>	?	*		

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Family/Species	Local Name	Main Fresh Water River	Flood Plain and Beels	Hill Streams
Family : BAGRIDAE				
Rita rita	Rita	*		
Mystus aor	Ayre, Air	*	*	
Mystus seenghala	Guizza	*	*	
Mystus menoda	Ghagla	*	*	
Mystus cavasius	Golsha	*	*	
Mystus bleekeri	Tengra	*	*	
Mystus tengara	Bajari-tengra	*	*	
Mstus vittatus	Tengra	*	*	
Family : SISORIDAE				
Sisor rhabdophorus	Sisor	*		*
Cona conta	?	*		
Glyptothorax shawi	?			*
Glyptothorax riberioi	?			*
Pseudecheneis sulcatus	?			*
Gagala gagata	Gang-tengra	*		
Gagata viridescens	Gang-tengra	*		*
Gagata cenia	Cenia, Jungla	*		
Bagarius bagarius	Baghair	*		*
Hara hara	Kutakanti	*		*
Family : NOTOPTERIDAE				
Notopterus chitala	Chital	*	*	
Notopterus notopterus	Foli	*	*	
Family : ENGRAULIDAE				
Setipinna phasa	Phasa		*	
Setipinna taty	Teli-phasa		*	
Family : CLUPEIDAE				
Hilsa ilisha	Ilish	*		
Corica soborna	Kachki	*		
Ililsha motius	Choukka	*		
Gonialosa manminna	Chapila	*		
Family : MASTACEMBELIDAE				
Macrognathus aculeatus	Tara baim	*	*	
Mastacembelus armatus	Baim	*	*	
Mastacembelus pancalus	Baim	*	*	
Family : MUGILIDAE				
Rhinomugil corsula	Bata, Khalla	*		
Mugil cascasia	Bata	*		



Family/Species	Local Name	Main Fresh Water River	Flood Plain and Beels	Hill Streams
Family : ANABANTIDAE Colisa sota Colisa fasciatus Colisa lalius Ctenops nobilis Anabas testudineus	Boicha Khalisha Boicha Neftani Koi	* * * * *	* * * * *	
Family : GOBIIDAE Glossogobius giuris	Bele	*		
Family : NANDIDAE Nandus nandus	Bheda	*	*	
Family : PRISTOLEPIDAE Badis badis	Koi-bandi		*	
Family: SCIAENIDAE Pama pama	Poa	*		
Family : CENTROPOMIDAE Chanda nama Chanda beculis Chanda ranga	Chanda Chanda Chanda	* * *	* * *	



# APPENDIX 2

## NW REGION CAPTURE FISHERIES: FRESHWATER FISH AND PRAWN BREEDING PERIODS

FISH SPECIES/GROUPS	Water Level											
	J	F	M	A	M	J	J	A	S	O	N	D
<b>Major Carps:</b>												
- Labeo spp, Catla catla				*	*	*	*					
- Cirrhinus Mrigala					*	*	*					
<b>Minor Carps:</b>												
- Oxygaster & Puntius spp				*	*	*	*	*	*			
- Rasbora, Danio, Rohtee spp				*	*	*	*	*	*			
- Esomus danricus				*	*	*	*	*	*	*	*	*
- Amblyphryngodon				*	*	*	*	*	*	*	*	*
<b>Clupeids</b>												
- Hilsa ilisha	*	*	*				*	*	*	*	*	*
<b>Catfish</b>												
- Wallagu attu					*	*	*	*				
- Ompok spp.					*	*	*	*				
- Schilbeids (Pangasius, Clupisoma)			*	*	*	*	*	*				
- Claries batrachus				*	*	*	*	*				
- Mystus spp				*	*	*	*	*				
<b>Minnows</b>												
- Aplocheilus panchax		*	*	*	*	*	*	*	*	*	*	*
<b>Snakeheads</b>												
- Channa spp.				*	*	*						
<b>Perciforms</b>												
- Chanda nama			*	*	*	*	*	*	*	*	*	*
- Nandus nandus				*	*	*	*	*	*	*	*	*
<b>Anabantids</b>												
- Colisa spp.						*	*	*	*	*	*	*
- Anabas testudineus						*	*	*	*	*	*	*
<b>Gobies</b>												
- Glassogobius giuris			*	*	*	*	*	*	*	*	*	*
<b>Spiny Eels</b>												
- Mastacembelus				*	*	*	*					
<b>Freshwater Prawn</b>												
- Macrobrachium resenbergi				*	*	*						

Sources: Account of the fishes of the Padma; M.S. Islam & M.S. Hossain, 1983.  
MPO Technical Report No. 17, November 1985.  
Freshwater Fishes of Bangladesh, AKA Rahman 1989.





### APPENDIX 3

#### Scarce Capture Fisheries Species Previously Abundant in Inland Waters of North West Region

SPECIES GROUP	LOCAL NAME	SCIENTIFIC NAME
Major Carps	Rui	<i>Labeo rohita</i>
Major Carps	Kalibaus	<i>Labeo calbasu</i>
Major Carps	Mrigal	<i>Cirrhinus mrigala</i>
Major Carps	Katla	<i>Catla catla</i>
Lesser Carps	Sarpunti	<i>Puntius sarana</i>
Lesser Carps	Nandil	<i>Labeo nandina</i>
Cat fish	Rita	<i>Rita rita</i>
Cat fish	Air	<i>Mystus aor</i>
Cat fish	Kaunia	<i>Mystus menada</i>
Cat fish	Tengra	<i>Batasio and Mystus spp.</i>
Cat fish	Kajuli	<i>Ailia coila</i>
Cat fish	Pangas	<i>Pangasius batrachus</i>
Cat fish	Magur	<i>Clarias batrachus</i>
Cat fish	Shingi	<i>Heteropneustes fossilis</i>
Clupeids	Chapila	<i>Gudusia chapra</i>
Climbing Perch	Koi	<i>Anabas testudineus</i>
Climbing Perch	Khalisa	<i>Colisa spp.</i>
Snake Heads	Shol	<i>Channa striatus</i>
Snake Heads	Gajar	<i>Channa marulius</i>
Snake Heads	Taki	<i>Channa punctatus</i>

Source: IDA, Bangladesh Fishery Sector Review, October, 1990. Reports from Fisheries Department. Staff, Fishermen and Fish Traders during FAP2 Field Surveys.



# APPENDIX 4

## Fishing Gears Used In Inland Waters with Local Names and Modifications

English Names	Local Names	Remarks
Cast net	Jaki Jal, Kharki Jal Pak Jal, Khapla Jal Moya Jal	Operated by an individual fisherman casting from bank, knee deep water, boat or floats.
Cast net	Uther Uter	Large in size, operated by two persons from a boat, covers more areas.
Hand-scoop net	Thela Jal	Hand operated small net fitted in rectangular bamboo frame
Lift net	Vel Jal Khara Jal	Net fitted in a 'v' shaped bamboo frame and pivoted on bamboo pole gantry
	Nouka Veshal	Lift net operated from mobile boat
Stake Net	Mokh Jal Bedge Jal	Funnel shaped, fixed in stakes or buoys, operate by three or four persons from a boat
Seine Net or Shore Seine Net	Ber Jal Bare Jel Jagat Ber Jal	Large net, 50-75 m.M. Mesh size, operated by 12-14 fishermen for encircling a large water area.
	Dal Jal Khatha Jal Jagh Jal Bichan Jal	Ordinary seine net rectangular shape operated by 5-20 persons depending on size. Some times the net is set by two boats one at each end to enclose the area quickly
	Kona Ber Kal Masher Jal Chara Kal	Rectangular seine net with fine mesh, two-eight persons operate the net
	Tona Jal	A very large seine net operated by nine to twenty persons
	Dharma Jal	Small in size operated from a boat
Gill Net	Fash Jal, Koi Jal Moi Jal, Goar Jal Punti Jal	Trap net, paced in a fixed place over night, rectangular. The mesh size determines what kind of fish will be caught.
	Current Jal Chadi Jal	Trap net with fine mesh & made up of nylon twine operated in flowing waters
Dip Net	Chak Jal	Square shaped net tie loosely to crossed bamboos and operated from a boat or fixed place close to shore
Traps	Chai Ghuni Polo Bhan	Made of netting on a frame, woven bamboo strips or basket works of several shape an sires



# APPENDIX 5

## Numbers of Fishermen and Fishing Vessels in NWR

Planning Unit		Fishing Villages	Fishermen		Fishing Vessels	
No.	Name		Fulltime	Part time	Large	Small
1	Thakurgaon	58	1000	5000	79	70
2	Upper Atrai	50	1380	1000	70	80
3	Teesta Right Bank	47	4600	15000	101	134
4	Teesta Left Bank	NA	720	3000	27	44
5	Kurigram	18	2900	30000	185	89
6	Upper Karatoya	87	8200	60000	426	235
7	Gaibandha	21	1970	30000	50	91
8	Middle Bangali	137	20900	100000	2186	1473
9	Joypurhat	440	9300	21500	368	322
10	Barind Tract	87	5500	30000	275	120
11	Mohananda Basin	79	4200	10000	100	130
12	Atrai Left Bank	204	16200	40000	365	475
13	Atrai Right Bank	179	22700	160000	1114	429
14	Lower Bangali	133	17200	70000	270	925
15	Pabna	92	11000	19700	245	296
Totals:		1632	12770	595200	5861	4913

Source: DOF - District and Upazila Fishery Offices

