

## CHAPTER 5

# FISH MANAGEMENT

### 5.1 INTRODUCTION

As a result of impoundment of rivers by dams the physical structure of riverbeds may change, physicochemical environment may get impacted, upstream - down stream linkages may get cut. In spite of this the fisheries management concerns were not given due importance in the past while deciding the dam design alternatives. Happily, this situation has improved since environmental impact assessment (EIA) became universally mandatory for most types of dam projects and presently all possible measures are taken to make the dam projects, as far as possible, eco-friendly.

### 5.2 FISH IN DIBANG RIVER

Dibang River and its major tributaries nurture a large variety of useful fish population. The medium altitudes, which represent a large portion of the catchment, including the proposed reservoir area, are reported to have Mahaseers, minor carps, lesser berits, Cat fishes etc. Mahaseer which is common in these rivers is a prime spot fish in India and holds good promise of conservation and development of Master game fishery in this region which could be a special attraction for tourists visiting the area. This may be combined with culture of Minor carp.

Similarly, in the high altitude areas with snow-fed rivers, there is perhaps ample scope of culture of fishes like Brown and Rainbow trout, Scale and Mirror carps, Leather carps etc. Trout culture for stocking rivers in the Dibang Wild Life Sanctuary with game fish as well as for sale, though unknown to this area at present, may hold promise for future.

Due to extensive network of rivers in the Himalayan mountain region, there is a tremendous potential for pisciculture. There are several examples of successful fish culture in plains, but hill and mountain areas are still lacking in this sphere. Non-availability of flat land, fish seeds, appropriate technology,

training and marketing are some of the obstacles in the way of commercial fishery in the hill regions. Therefore, culture fishery is not well developed in these areas and people depend on capture fishery. In Arunachal Pradesh, an extensive enterprise for fish culture does not exist except for some stray fish farms being developed.

### 5.3 CONSERVATION AND MANAGEMENT CONSIDERATIONS OF DIBANG RIVER

The Dibang River supports numbers of fish species with biologically diverse characters. Out of them the species which are migratory are presented in the table 5.1.

Table 5.1: List of Migratory fishes

<u>Sl. No.</u>	<u>Zoological name</u>	<u>Common name</u>	<u>NBFR</u>
1.	<i>Schizothorax richardsonii</i>	Snow trout	ID
2.	<i>Tor putitora</i>	Jungapithia	VU
3.	<i>Tor tor</i>	Bokapithia	ID
4.	<i>Neolissiocheilus hexagonolepis</i>	Copper mahasheer	NE
5.	<i>Chagunius chagunio</i>	Patharchatti	ID
6.	<i>Crossocheilus latius latius</i>	Lurali	ID

7.	<i>Garra annadalei</i>	Garra	NE
8.	<i>Garra gotyla gotyla</i>	Garra/Gharporia	NE
9.	<i>Psilorhynchus balitora</i>	Balitora	VU
10.	<i>Glyptothorax pectinopterus</i>		NF
11.	<i>Bagarius bagarius</i>	Garua	VU
11.	<i>Schizothorachthys esocinus</i>	Chirruh	ID

Note : VU=Vulnerable, NE=Not Evaluated, NF=Status not Found, ID=Indeterminate.

*Schizothorax richardsonii*, *Tor putitora*, *Tor tor*, *Neolissiocheillus hexagonolepis*, *Chagunius chagunio* are migratory in nature for breeding purpose. Four species viz. *Crossocheilus latius latius*, *Garra annadalei*, *Garra gotyla gotyla*, *Psilorhynchus balitora* are local migratory for feeding.

High river discharge, fast water currents and want of suitable spawning ground in the lower reaches of the river are the reasons which force the fish to swim upstream in search of suitable eco-system to spawn. Mahaseers attain maturity in the size ranging from 30-40 cm. The fish lay eggs in sandy/ gravelly pits in the river bed or beneath rocks boulders in shallow waters receiving moderate current at a depth of 40-60 cm and in water sufficiently clean and transparent. Size of putitora mahaseer fry and fingerlings found during the investigation ranged from 18 to 120 mm.

Putitora mahaseer species starts spawning from the onset of south-west monsoon in mid July which continues till the middle of October in flooded

river. The peak breeding occurs in August-September in ambient water temperature from 18<sup>0</sup>C to 22<sup>0</sup>C.

The other important migratory species *Tor tor* have a prolonged breeding period commencing from July-August continuing sometimes till November in water temperature 17<sup>0</sup>C - 22<sup>0</sup>C and transparency 20-30 cm. Fish species of the river belonging to other commercial and miscellaneous groups have usual spawning periods well spread which make them available throughout the year in shallow marginal areas of the river in clear water and steady velocity. Their rate of growth is slow, average sizes vary from 35 to 125 mm.

### **5.3.1 Mitigation of the Negative Impact**

To minimise the impact of damming on the fishery of a river several mitigative measures are generally taken.

### **5.3.2 Stop Use of Destructive Fishing Methods**

The responsible authority should stop the killing of fishes by destructive methods like poisoning and use of dynamite in the diverted river channel and pool regions respectively. Such fishing methods not only kill the fries, fingerlings and brood fishes but also destroy the breeding habitats of the fish themselves.

Lack of awareness about the importance of riverine fishery in the local inhabitants is the major problem for the destruction of riverine fishes. Uneducated local fishermen do not understand the destructive nature of the use of poison, dynamite and the importance of natural habitat of fish. So, awareness camp should be organized from time to time for the conservation of fish species among local people.

### **5.3.3 Ban of Harmful Fishing Implements**

The fine meshed net like Cast net, Bhureli jal, and mosquito nets which catch fish juveniles must be banned because they reduce the survival rate of fish species. Fish poisons are widely used in diverted river channel, most of which are derived from plant parts such as *Sapium* sp., bark of *Myrica esculanta*, stem of cacti etc. Public in the area should be made acquainted

with the importance of fish conservation and the destructive effects of the poisons.

Dynamiting which is a destructive method killing all the types as well as age groups of fishes. Hence, it must be checked and totally banned.

Hence, all of these harmful means and methods of fishing must be checked and totally banned for the proper conservation and management of fish biodiversity.

#### **5.3.4 Other Measures**

During this study various alternatives for fish conservation and translocations were discussed with the Fishery officers of Roing and Guwahati. Even though, construction of fishways (fish ladders) of different types in the dam for the up and down movement of the fish is a good option. Keeping in mind the height of the present dam construction of a fish ladder/fish ways is not technically feasible. Another step that could help the fish move up and down of the dam is provision of a fish bypass. However, the local topography of the Dibang makes provision of fish bypass almost impossible and least viable. A third option is the incorporation of a fish lift in the dam structure. The biological uncertainty for its function, as well as the high costs (construction and operation cost and the cost of compensatory release of water) all count against this option.

The main objectives of the mitigation program include:

- To maintain fish Biodiversity and production in affluent streams entering the reservoir.
- To maintain fish Biodiversity and production in the riverine environments downstream from the dam.
- To develop the new fisheries potentials created in the reservoir of the dam.

In spite of the fact that the bypass facilities (Ladders / Bypasses) and Fish lifts won't be feasible in case of the proposed Dibang Project, the objectives listed

above can be realised by adopting fish propagation techniques. The biologically and economically best alternative to compensate for the obstructed migration possibilities of the fish in the river seems to be the option of artificial hatching and continuous restocking of the river and the reservoir. It is therefore, recommended to build a Fish hatchery in the Project area.

#### **5.4 RECOMMENDATIONS**

Creation of a barrier in the form of a dam across the migratory path of some fishes may considerably undermine the survival and breeding of fishes. Hence hatchery in the nearby areas is the most suitable proposition for the fish population. For successful conservation and management of indigenous fish species in the Dibang river the following recommendation are made.

##### **5.4.1 Fish Hatchery**

The Reservoir which will be formed due to damming may be commercially exploited for fish consumption during the non-breeding seasons and co-operation may be sought from the state fishery department in this regard. However for developing fish culture a Hatchery is proposed in the vicinity of the reservoir.

For the development of cold water fishery in the area, construction of a Hatchery is the most important. The location of the hatchery can be identified somewhere near Etalin in consultation with the State Fisheries Department and State Fishery Colleges. The fish hatchery can be managed by the State Fisheries Department, which may be equipped with the technical know-how for running trout and carp culture fisheries. After rearing the spawn in the hatchery for a stipulated period of time the young fish can be restocked in the reservoir as well as in the river, both upstream and downstream for replenishing the natural population. Both the activities can be managed by an officer of the rank of Fishery Project officer with the help of subordinate staff.

##### **5.4.1.1 Seed Collection**

One of the main problems faced during the Culture practices is the procurement of the seed, particularly of the indigenous varieties. For

procuring the fish seed, the brood fish can be easily collected from the river itself, especially just below the dam. The striped fish can be returned to the natural habitat and the spawn reared in the hatchery constructed for the purpose.

For the development of fisheries and management of reservoir following steps are necessary:

#### **5.4.1.2 Analysis of Water Quality**

Prior to seed stocking in the reservoir, detailed study of physical, chemical and biological characteristics of water and the soil of reservoir is required.

#### **5.4.1.3 Seed Stocking**

The main problem confronting the fisheries developing agencies is whether the resident indigenous species would be able to establish successfully in the lacustrine system. Therefore, it would be worthwhile to introduce rainbow trout and brown trout and a few indigenous species on an experimental basis in the proposed reservoir from the fish stock reared in the proposed hatchery. The total hatchery of 1.5 ha area would require about 15-20 kg seeds for the stocking in the first year.

#### **5.4.1.4 Organization of Fishermen**

Owing to smaller water spread entire reservoir of Dibang project could be treated as a ringlet beat. The reservoir would support and require an organization of about 20 fishermen in the beginning. The Fishery Department would be advised to allow the use of fishing gears of definite types (cast nets and gill nets, etc.) and proper mesh size to prevent the young and juvenile fish from over-exploitation. Simultaneously, the authorities should initiate a training programme for operating hatchery at the surface and deeper waters.

#### **5.4.1.5 Other Requirements**

For the control of noxious weeds, harvesting of fishes (for rapid growing fishes and non-cultivable fishes) and maintenance of embankments, the Fishery Department needs some mechanical control devices, boats and chemicals.

#### **5.4.1.6 Conservation of Downstream River Bed**

Since construction of the dam affects the flow of water in the river, the river bed below the dam site gets invariably affected and many a time a long stretch of river bed down stream of a dam gets affected due to low volume of water. However, in the present case the Power House is to be located very close to the dam and as such there are very low chances of the down stream of the dam getting dried up. The construction of dam also will not affect the water requirement of the population residing in the downstream areas. This population generally depends upon the local streams and springs for drinking water and for other domestic uses. There is also no competitive use of water downstream of dam for industrial purposes. Therefore, the impact of damming on the downstream areas is not anticipated.

#### **5.4.2 Management of Reservoir Fisheries**

##### **5.4.2.1 Institutional Mechanism**

The plan is proposed to be implemented through the State Fisheries Department of Arunachal Pradesh, the funds for which will be released periodically by the project to the Fisheries Department. An Advisory Committee is proposed to be instituted which would monitor the implementation aspects, priorities, activities, etc. The committee would offer advice on development of marketing linkages and training programmes, keeping in mind people's participation in fisheries development schemes.

- |                                      |                                  |
|--------------------------------------|----------------------------------|
| <input type="checkbox"/> Chairman    | Head of the Project              |
| <input type="checkbox"/> Co-Chairman | Head, State Fisheries Department |
| <input type="checkbox"/> Member      | Nominee of Fisheries Department  |
| <input type="checkbox"/> Member      | Two Representative from PAF      |
| <input type="checkbox"/> Member      | Environment Officer, NHPC        |
| <input type="checkbox"/> Member      | Local NGO Representative         |



#### **5.4.2.2 Staffing Pattern**

For smooth implementation and maintenance of fish farms, the following staffing pattern has been suggested.

<u>S. No.</u>	<u>Staff</u>	<u>Nos.</u>
1.	Farm Superintendent	1
2.	Farm Manager	2
3.	Farm Assistant	3
4.	Fish Farm Attendant	6
5.	Chowkidar	1
6.	Driver	1

#### **5.4.2.3 Planning and Monitoring**

A Farm Superintendent appointed full time on behalf of The Advisory Committee would coordinate and oversee the operation of the proposed fisheries Development and Management Plan. Various teams led by Farm Managers would be constituted to look after activities such as (i) land acquisition, development of fish farm facilities and office at allocated site, (ii) execute fish breeding activity and (iii) marketing of product.

The Farm Superintendent would evaluate/monitor both financial and administrative aspects at the Farm Office. The implementation, monitoring and appraisal of the plan should be reported regularly. After five years of management and maintenance, the fish farms will be handed over to the state fishery department.

The meetings of Advisory Committee would be held once every three months in order to ensure incorporation of preference of the PAFs and resolve logistic problems in plan implementation. The Farm Superintendent with team members would meet every week to ensure the implementation of project on time to time. Six monthly progress reports would be submitted to NHPC for evaluation and disbursement of finance.

## 5.5 COST ESTIMATES

A budgetary provision of Rs.112.00 lakhs has to be kept for the setting up of fish hatchery infrastructure and its maintenance. The details for the creation of these facilities are given in Table 5.2

**Table 5.2: Cost estimates for fish management**

<b>S. No</b>	<b>Item</b>	<b>Rate (Rs. in Lakh)</b>	<b>Amount (Rs. in Lakh)</b>
<b>A.</b>	<b>Non-Recurring Expenditure</b>		
1.	Land for Fish hatchery ( Area 1.5 ha)	1.75 /ha	2.63
2.	Hatchery (One concrete hall with provision for 25 troughs and 110 trays)		12.00
3.	Three nursery ponds (5x2x1 m)	2.00 / Pond	6.00
4.	Three rearing pond (10x5x2 m)	5.00 / Pond	15.00
5.	Three holding ponds (30x10x3 m)	4.00 / Pond	12.00
6.	Office complex, with all infrastructure and separate provision for store and two laboratories and fish feed room, etc.		20.00
7.	Cost of fish seed (20 kg)	0.006/kg	0.12
8.	Cost of 1500 kg fish feed (Local name: Balichanda) @ Rs. 200 per 15 kg bag	-	0.20
9.	Contingency & miscellaneous expenditure		15.00
.	<b>Total (A)</b>		<b>82.95</b>
<b>B.</b>	<b>Recurring Expenditure</b>		
1.	<b>Salaries (for 5 years)</b>		
	i. Farm cum Reservoir Assistant	0.20 / month	12.00

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	(One)		
	ii. Farm Attendants (Two)	0.08 /month	9.60
	iii. Chowkidar (One)	0.07 / month	4.20
2.	Maintenance of Ponds	0.60 / year	3.00
	<b>Total (B)</b>		<b>28.80</b>
	<b>Grand total (A +B)</b>		<b>111.75</b> <b>Say, 112.00</b>