

Working Paper 217

**Fisheries and Livelihoods in
Tungabhadra Basin, India:
Current Status and Future
Possibilities**

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ISBN 81-7791-173-2

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FISHERIES AND LIVELIHOODS IN TUNGABHADRA BASIN, INDIA CURRENT STATUS AND FUTURE POSSIBILITIES¹

Manasi S², Latha N³ and K V Raju⁴

Abstract

Management of water resources is crucial for supporting livelihoods, particularly marginal communities. The study aims at understanding the livelihood patterns of fishermen within the Tungabhadra sub basin, a tributary of river Krishna located in peninsular India. Household surveys, focus group discussions and interviews were carried out in order to understand the current status, besides trying to identify key issues and constraints that curtail fisheries development. Lack of integrated approach in development initiatives and water management plans warrants the need for Integrated Water Resource Management to support livelihoods.

Introduction

It is estimated that 12 million people are directly engaged in fishing and about 60 million are exclusively dependent on it for a living in India. The National Water Policy, 2002, emphasizes on efficient planning and management of water resources in view of its importance for human and animal life, to maintain ecological balance and for economic and developmental activities not only in terms of its importance for human and animal life, but also for ecological balance and economic and developmental activities. Although it stresses the importance of bringing all water resources available within the category of utilizable resources, allocation for fisheries development has not been specified, considering the fact that it supports livelihoods of majority of marginal fishermen. In Karnataka, India, the state water policy 2002, has ranked fisheries as fourth in order of its importance while operating any water resource projects. The assumption is that, given the proper socio-economic, environmental and institutional frameworks, fisheries can contribute significantly to the household income and provide a way out of poverty for a significant section in India. However, the absence of integrated policies or management approach in sectors such as water resources in a majority of developing countries including India, limits diversification of livelihoods.

Objectives

The aim of the study is to look at the livelihood patterns of marginal communities within the Tungabhadra sub basin (TBSB), a tributary of the larger river system - Krishna located in the peninsular India. The study focuses on fisheries as a source of livelihood, current status and institutional support available, people dependant on it, development initiatives and suggestions for improvements. It involves

¹ The study is a part of an international collaborative research project (STRIVER) funded by the European Union under FP7 research program.

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collection of data from household's dependent on fisheries as a source of livelihood, contextual factors including market and institutional options that impact their livelihoods and the constraints facing marginal communities for survival. The assumption is that water resources management in the basin and water allocation decisions directly impact the fisheries.

The study addresses the following research questions so as to analyze fisheries as a means of livelihood in the TBSB and how it can support marginal communities and women.

- What opportunities do fisheries provide for rural fisher folk and women in its current form and what are the future possibilities?
- How do factors related to current water management and institutional conditions influence the livelihood options of the marginal communities?

The overall objective is to examine whether water resources management in the TBSB recognizes fisheries as a viable option in improving the livelihoods and reducing poverty and if so, the desired changes and the role/future for the marginal communities and women in the fisheries sector in the basin.

The following part of the report is divided into various sections. The report begins with an overview of the status of fisheries followed by methodology, results based on the primary survey and focus group discussions, covering fishing sources, rights, methods, and marketing. Finally, the report provides a brief analysis of fishermen livelihoods and their problems in addition to development of fisheries in TBSB followed by policy inputs for improvement of livelihoods.

Status of Fisheries

Fishing plays an important role in supporting livelihoods worldwide and also forms an important source of diet for over one billion people. Further, inland fisheries is of particular importance to the rural poor accounting for about 15% of total global employment (FAO, 2000). In the Southern lowlands of Laos, 80-90 percent of households involved in fishing contribute 30% of rural household income (Lorenzen *et al.*, 2000). In Northeast Nigeria, around 42 to 70% of rural households who are dependent on fishing contribute 24-28% of their income (Neiland & Sarch, 1994). Similarly in the Brazilian Amazon, floodplain households earn about 30% of their income from fishing (Almeida, Lorenzen & McGrath, 2002). These figures illustrate that fishing can be closely integrated in the livelihood strategies of rural households. During the past three decades, the number of fishers and aquaculturists has grown faster than the world's population, and even faster than employment in traditional agriculture.

Similarly, fisheries sector plays an important role in the Indian economy by way of contributing to the national income, employment and foreign exchange. It has a vast potential for fish resources both from inland and marine environment. India has about 1.6 million hectares of freshwater lakes, ponds, and swamps and nearly 64,000 kilometers of rivers and streams. The economic liberalization policies initiated in 1991 opened up new opportunities for fisheries growth. The production has increased from 0.6 million tones of fish five decades ago to nearly 6.0 million tones, out of which inland fisheries contributes 45.4%. Special efforts have been made to promote extensive and intensive inland fish farming, besides modernizing coastal fisheries, and encouraging deep-sea fishing through joint ventures.

Andhra Pradesh ranks second in inland fisheries with 8.93lakh fishermen population, contributing 2.30% to Gross State Domestic Product, and the quantity of fish produced during 2005-06 was 8.91 lakh tonnes. Fishery sector provides employment for 14 lakh people. The state has prepared a master plan for a period of three years between 2006 and 2009 with an outlay of INR 400 crores for fisheries development (<http://www.ysr.in/userpressitem.aspx?id=35>)

Karnataka possesses the third highest area of total inland water bodies with over 500,000 ha comprising 73 reservoirs, 6015 major tanks, 20000 minor tanks and nearly 6000 Kms of river stretch with a production potential of 264000 MT/year and ranks 13th in the country (Hameed, 2000). The average fish production in the last 5 years is 278000 tonnes with 42% from the inland sector. Karnataka accounts for a considerable portion of population dependent on fisheries, whose livelihood improvement forms part of the state's social welfare objective.

Methodology

Study Area

River Tungabhadra is the largest tributary of the river Krishna, contributing an annual discharge of 14,700 million m³ at its confluence point to the main river. The river is transboundary and the TBSB stretches over an area of 48,827 km² in both the riparian states of Karnataka (38,790 km²) and Andhra Pradesh (9037 km²) and finally joins Krishna that flows into Bay of Bengal. Tungabhadra covers seven districts⁵ and twenty-eight taluks⁶ in Karnataka and four districts in Andhra Pradesh⁷; the sub-basin is mostly rainfed, dominated by red soils with 1200 mm of average annual rainfall. Agriculture is the major occupation and major crops grown are paddy, jowar, sugarcane, cotton and finger millet. Fishing is three next major activities that support more than 10,000 families.

Water storage capacity of the Tungabhadra reservoir is reducing due to siltation from mining activities. Conflicts within and across sectors are common apart from interstate disputes. Population pressure and increased urbanisation have further compounded the situation. With issues being complex at various levels, the impacts have been serious resulting in land use changes and pollution affecting quality of life and livelihoods of vulnerable communities, in specific.

⁵ Shimoga, Chikamagalore, Davanagere, Haveri, Bellary, Koppal and Raichur

⁶ Chikamagalore, Tarikere, Koppa, Sringeri, N.R.Pura, Shimoga, Bhadravathi, Channagiri, Harihar, Honnali, Ranebennur, Hirekerur, Haveri, Hospet, Siruguppa, Bellary, Koppal, Gangavathi, Sindhnoor, Manvi and Raichur

⁷ Mehboobnagar, Kurnool, Anantpur and Cuddappah.

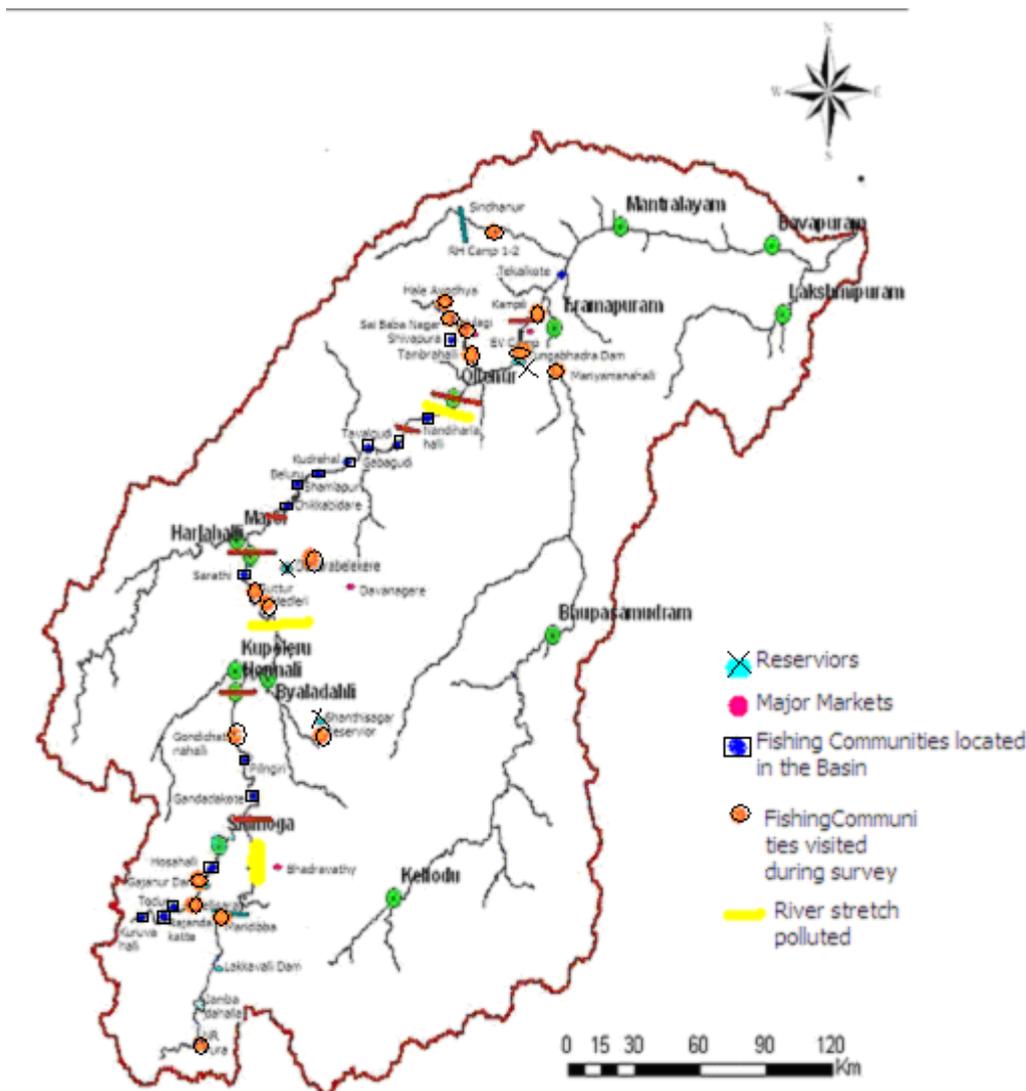


Fig 1.0: Tungabhadra Basin Map showing locations of Fishing Communities

Fishing communities and major markets of fish trade are spread along the basin (see Fig 1.0). However, the number of households within these communities vary from 4 to 100. During the course of the study, the team interacted with sixteen communities. Small-scale fishermen are more vulnerable and are forced to migrate across the basin.

Methods

Data was collected from both the primary and secondary sources. Primary data was collected from key informants - direct and indirect dependents. Household survey of fishermen households, labourers hired by fishermen (direct dependents), and middleman – traders (indirect dependents) was carried out. Secondary data sources included – State Fisheries Department, Karnataka State Fisheries Development Corporation and Fisheries co-operative societies (FCS).

The study was conducted in TBSB from January 2008 to April 2008. The data was gathered through household survey of 106 fisher folk selected through stratified random sampling based on two

criteria - water sources and socio-economic status. Interviews and focus group discussions with 30 traders were also carried out. The sample size across different sources is given in Table 1.0. A larger sample survey was not possible due to time and resource constraints.

Table 1.0: Sample size across different sources

| Water sources | Sample size |
|----------------------|--------------------|
| Reservoirs | 36 |
| Tanks | 16 |
| Private ponds | 10 |
| River | 44 |
| Total | 106 |

The survey was more extensive in nature with a view to getting a broader idea of fisheries across TBSB. The sampling ensured representation of informants from different fishing sources - Reservoirs – Major and Minor, Tanks – Major and Minor, Private Ponds, River Stretch leased out by the Department. Women and men together contribute to the household economy through fishing; hence to understand livelihoods, both men and women were interviewed.

Results

The following sections focus on survey results. The section on socio-economic aspects covers the various fishing sources and categories of fishermen dependent on these sources. Institutional aspects capture the formal and informal arrangements in the fisheries sector followed by key issues highlighting the problems/constraints in the fisheries sector. The final section provides options that can help in reforming the sector.

Fishing Sources

Fishing is one of the major activities supporting livelihoods and mainly involves procuring fish from four different sources – (a) Reservoirs (b) River (c) Village Ponds or Tanks and (d) Private Ponds.

Reservoir/Dam

Reservoirs are one of the major sources of fishing supporting 40 % of fishing community. Reservoirs cover a water-spread area of 57217 ha (98% major reservoirs⁸). All reservoirs are owned and managed by the Irrigation Department except Tungabhadra Reservoir, which is managed by the Tungabhadra Board. The Irrigation department does not have fishing activity on the priority list; however, Tungabhadra Board has a separate wing to promote fishing. Fishery activity in the reservoirs is prominent and particularly intense in the TB reservoir dominated by large-scale fishermen, whereas in other reservoirs, there are only small-scale fishermen.

⁸ Major reservoirs comprises water spread area of more than 500 ha and Minor reservoirs of less than 500 ha

River

The other major source for fishing activity is the river network and its tributaries. Number of fishermen dependant on the river network vary largely. The Department of Fisheries is responsible for leasing out river stretches through tenders. River-based fishing societies formed across the basin bid for the fishing locations. Fish catch obtained from river source is found to be uncertain due to natural constraints, frequent tearing of nets etc.

Tanks

Tanks are another major source of fishing. Based on the area, tanks are categorized into – Minor (area of > 10 ha) which *Gram Panchayats* (village councils) own and operate. Major tanks are maintained by *Zilla Panchayath* (area between 10 and 25 ha) and Fisheries Department (area of >25 ha). *Panchayats* auction the tanks to the fishing community which in turn, depends on the contractor (locally called *Sahukar*) who invests the money on behalf of the community. Fishermen are given the fishing rights after paying license fee to the FCSs. The FCS or the contractor is responsible for releasing appropriate quantity of fingerlings.

Socio-Economic Aspects

Fishing Communities

Fishing communities, located throughout the basin, are either restricted to a few households spread out in a village or living in a locality together in groups, or 'camps' and range between 4 to 200 households. They are concentrated more in the Tungabhadra river stretch (5000 families) compared to Tunga (3000 families) and Bhadra stretch (2000 families). Total fishermen population is 133987 out of which 34028 are full time fishermen. Difference in economic status across fishermen is found to be evident. A few households are found totally dependent on fishing and others have supplementary income from other sources. Fishermen prefer that their children develop skills other than fishing but with poor access to schooling and supportive infrastructure like transportation, children at a very young age are trained to catch fish. In TB Reservoir, children from Andhra Pradesh work as labourers for a sum of INR. 5000 – on a half yearly contract.

Large -scale Fishermen

Large-scale fishermen fish in larger groups by hiring 15 to 20 labourers and are confined only to TB reservoir (400 groups) representing about 30% of the total fishermen population. Labourers are usually hired from Andhra Pradesh. Nearly 66 percent of the fishermen are engaged in fishing throughout the year and the rest between 6 to 10 months. During the lean period, they are engaged in agriculture and construction etc. They use Alivi nets of various sizes ranging from 1 to 12 inches. They are members of FCS and pay an annual membership fee for obtaining license. The larger groups are headed by a fisherman who invests approximately around INR 3 lakhs. Each labourer is paid between INR 1800 to 2500 per month along with allowance for food, medical expenses, etc. The group spends the whole

night (up to 10 hours) casting the nets and fishing till early hours. Fish catch ranging between 10 to 100 kgs, and is highly dependent on weather conditions, fingerlings released and season.

Small-scale Fishermen

Small-scale fishermen work in a team of two or three persons representing 60 % in the basin. Payments made to the society⁹ vary between INR 200 (riverine, tank) to INR 4000 (reservoir) based on type of net and fishing location. They use gill nets of various sizes. 53% of fishermen invest about INR 2000 on boats and nets, annually. They are members of FCS and obtain license for a period varying between 3 months to 1 year. However, there are instances where some fishing communities pay the Fisheries department for canal fishing in Saibabanagar. Small-scale fishermen are economically poor and most vulnerable as fish catch depends on external factors beyond their control and hence, migration becomes inevitable to sustain livelihoods. The quantity of fish catch per day during the lean season is as low as ½ kg at times, however, in general varies between 3 – 5 kgs (for 55% of the fishermen). Nonetheless, 76% of the fishermen are able to harvest 10-20 kgs during peak season. Average income level varies between INR 2000 to INR 6000 per month. 26% of fishing camps are located in areas that have very poor access to the main city, isolating women and children for most part of the year. During lean periods, women have to walk long distances in search of odd jobs while men migrate for months. In the absence of transportation facilities, children are generally confined to these camps with no access to schooling and basic medical care.

Women and Fishing in TBSB

The role of women largely depends on the socio-economic conditions of the households. Overall, the conditions and quality of life for women are poor across different fishing groups. This included long working hours, poor wages in addition to the burden of household maintenance. There are no special programs targeting women. For instance, women in Hale Ayodhya, confine themselves mainly to weaving nets. However, women in this village do not go out for selling fish unlike their counter parts in some villages. Women are involved mostly in processing and marketing of fish. In Thambrahalli, about 40 women work as labourers sorting fish for the large contractors. On an average, they sort out 30 kgs of fish per day and are paid about INR 45 per day. Women also work as agricultural labourers to supplement their household income.

Formal Fishing Rights

Fishing rights are given through open tenders in reservoirs and rivers, whereas in the case of tanks, it is done through open auctioning. We see in the following sections, as to how these varied forms of allocating fishing rights favour/disfavour the fishing communities. For example, licensing favours the fishermen in the place of tender systems, whereas, in the tank systems, open auctioning invites any person to bid for the tank, and promote aquaculture as entrepreneurship thereby disfavours or

⁹ Payments have to be made to the society that would have got the bid

marginalising the fishing communities. Department of Fisheries decides on the minimum reserve price for obtaining fishing rights.

Licensing

The legal fishing rights across sources are granted by the Department of Fisheries through licensing process. Members have to register by paying the prescribed fee annually, which varies according to location, duration of contract, types of nets, and number of boats. The members are given license to fish for a period of 6 months or one year. However, they are not eligible to get any credit facilities. Licensing system is preferred as the fee happens to be minimal in TBSB where initially, leasing of the reservoir, was given to the small-scale fishermen by obtaining license from the TB Board. However, this practice was changed in 2001. The Board calls for a tender notification and the societies bid and the highest bidder benefits the license. However, in certain areas, the fee varies and as a result fishermen find it difficult to pay the license amount forcing them to depend on middlemen. Thus, the system works against the welfare of the fishermen.

Open Auctioning

Open auctioning is another common practice for allotting fishing rights across water bodies except in the TB reservoir. In the case of village tanks, *Gramapanchayats* are empowered to allot fishing rights through open auctioning that is not confined to the fishing communities within the village. Such a practice is usually to the disadvantage of the small-scale fishermen in the village as outsiders/middlemen get involved in bidding to get fishing rights. These middlemen in turn, employ the local fishermen as labourers; in the process the local fishermen lose not only the rights to fish in the local water bodies but are also forced to work for low wages. Although there is a regulation in the Department of Fisheries that the local fishermen should be given priority, the local councils and government agencies do not follow it.

Open Tender

Allotting fishing rights through open tenders is being practiced only in the Tungabhadra Reservoir since 2000. Tungabhadra Board, an autonomous body is responsible for inviting tenders with the main objective of cutting down on illegal users. Information on call for tender is intimated to the FCS. The highest bidder gets the tender and they in turn, sub lease the fishing rights to other fishermen. In reality, it is the private contractors/middlemen who enter the process and bid using the support of FCS, as the fishermen are not economically strong enough to pay the tender amount. Thus the open tender system remains in the name of the FCS but dominated by the middlemen. Further the presence of middlemen has led to more competition and an increase in the tender amount each year – from INR 300,000 in 2000 to INR 450,000 in 2007. Middlemen play an important role in influencing fishing activities from the net to the market stage. Middlemen provide advance loans to fishermen who in turn, are expected to sell their fish catch to them with the prices being decided by the middlemen which turn out to be often lower than the market price. It is often the case that middlemen from the neighbouring

districts - Vijayawada and Kolkata - pay advances to individuals to compete for the tender. These individuals, in turn, sub-contract the licenses to middle level fishermen.

Although the system benefits the Board, it has led to disadvantages for the fishing community. All categories - small/large-scale fishermen and traders are against the tender system. Irrespective of the harvest, the fishing groups have to pay, which may not be in the interest of the fishing groups. Apart from this, fishermen have no other skills to bank upon. Thus the tender system has led to creation of more societies, dependency on middlemen, debt traps and social conflicts.

Fishing Methods

Nets Used

Two main types of nets are used across the basin – Alivi nets and Gill nets.

Alivi Nets Prior to Alivi net usage, fishermen were using konti balai, Rangoon nets and other gill nets of various dimensions. As the nets were made of cotton and not durable, the fish catch used to be too less to help them sustain. With a view to overcome this problem, the migrant fishermen from Andhra Pradesh brought Alivi nets that proved lucrative increasing its usage but have been controversial as they remove fish indiscriminately in large numbers. Currently, licensed Alivi net users contribute 88 – 92% of the fish catch from the reservoir and the nets have proved economically profitable.

Gill Nets - are used for catching all kinds of fish depending on the mesh size. Small-scale fishermen usually own nets from 3 to 10 inches. The nets are used based on the period, source and location in which the fishermen operate. The fishermen change the nets based on the availability and types of fish, which is seasonal. Surface gill nets, bottom set gill nets, small shore drag net, cast nets and hook and line are the commonly used fishing tackles.

Markets

Every town has at least a single selling outlet where the local traders sell fish. Markets are not well managed and have no proper storage facilities. The town of Bhadravathi, over the years, has emerged as the central point for fish trading with 5 major and 5 medium traders operating. However, in Davanagere and Bhadravathi, mainly marine fishes purchased from Goa, Karwar and Ankola are sold. In addition to local fishes produced in TBSB, the traders procure fish from neighbouring provinces like Andhra Pradesh, Goa, and Maharashtra indicating the potential for further development of fisheries. Fish is sold through FCS as well to the traders directly based on the understanding they have with them. There are no definite methods followed in selling fish, rather, it is a combination of traditional practices, networking and mutual understanding; however, there is no federation as such.

Fish Species and Price: Fish price varies across the regions, seasons and sources of fish catch. Some species was priced up to INR 180 per kg because of high demand in the local market. Price of fish sold per kg is between Rs. 15-30 (small fish) and Rs. 35-80 (big fish). About 62% of the fishermen sell fish to the contractors from whom they avail of advance loans. The common varieties available in TBSB are given in Table 2.0. Small fishes are mainly dried and then sold, whereas the big ones are sold

fresh. Small fish is mainly used for poultry, but some times is used for consumption as well. The Damma species has medicinal values and is mainly exported.

Table 2.0: Common Fish Species available across TBSB

| Common names | Scientific name | Price per kg |
|-----------------|---|--------------|
| Bale meenu | Wallago attu | 20-30 |
| Girlu | Mystus seengala | 30-40 |
| Chelu menu | Heteropneustes fossilis | 40 |
| Ane meenu | Clarius batrachus | 40 |
| Bilihalati | Silonia childrenii | 20-30 |
| Common carp | Cyprinus carpio var communis | 30-35 |
| Grass carp | Ctenopharyngodon idella | 30-35 |
| Silver carp | Hypophthalmichthys molitrix | 30-35 |
| Katla | Catla catla | 30 |
| Rohu | Labeo rohita | 30 |
| Kemmenu | Labeo fimbriatus | 30 |
| Mrigaal | Cirrhina mrigal | 30 |
| Jilebi | Tilapia mossambica | 40 |
| Bilihargi | Puntius pulhellus | 30-35 |
| Kolcha | Puntius kolus | 20-25 |
| Mahseer | Tor khudree | 40 |
| Saslu | Rasbora species | 30 |
| Chappali meenu | Notopterus notopterus | 25 |
| Murrels | Channa gachua, Channa marulius, Channa striatus, Channa punctatus | 30-40 |
| Nettikannukorva | Glossogobius giuris | 30-35 |
| Bitiha | Chela chela | 30-35 |
| Haragi | Barbus pulchellus | 40-50 |
| Pakke | Esomus daniconius | 40 |
| Halati | Pseudotropocus lakree | 30-35 |
| Gambusia | Gambusia affinis | 40 |

Fish Traders

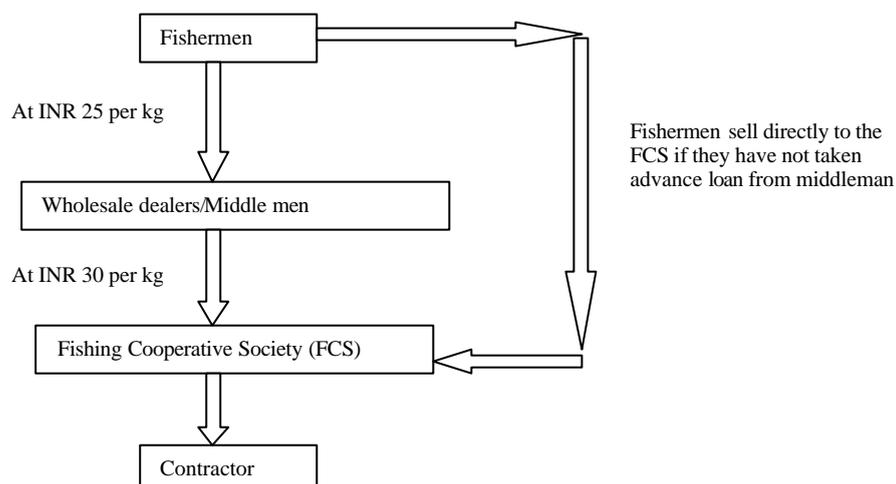
Traders are engaged at different levels in the fish marketing chain. Based on their roles, they can be grouped into (1) Catchers cum traders (2) Individual sellers and (3) Buyers and traders (see table 3.0). 90% of traders were involved full time. Schematic Representation of Fish Trade in TBSB is given in Fig 2.0.

Table 3.0: Traders' Roles at Different levels

| Traders type | Roles |
|--------------------------------|---|
| Catchers cum Traders | - Catch and sell fish in the nearby villages/towns - Men are engaged in catching fish and the women sell fish in towns/villages |
| Individual Sellers | Women - Buy fish from market and sell in villages/towns - Buy fish from fishermen and sell in nearby villages/towns Men - Buy fish either from market or fishermen and sell in villages/towns - Regional only (Buy from other districts and distribute to retail traders across towns) |
| Buyers and Traders – Middlemen | - Play an important role in fish trading - Lend loans as advance to the fishermen and in turn procure fish from them |

Source: Survey

Fig 2.0: Schematic Representation of Fish Trade in TBSB



Fishing and Livelihoods

Movement of fishermen between various places within the basin and outside is a common phenomenon. Often this causes hardships for families in their social life, as it involves living in temporary settlements. Two types of migratory fishermen are seen - fishermen who migrate on their own and fishermen brought by the contractors. The first category fishermen pay a lease fee as fixed by the department and the fish catch is sold at the local market, whereas the second category fishermen are paid certain amount by the contractor and the fish they catch are given to the contractor.

Dependency level

Dependency level on fisheries is decreasing compared to earlier days as most of the fishermen feel that fishing is less remunerative. Fishermen opine that tender system has increased their investment costs and their dependency on middlemen. As income derived from fisheries is found to be meagre and uncertain, diversification into other occupations seems common (refer Table 4.0). All the fishermen cite

either of the following reasons for diversification– low fish catch, lean season, off-season. For instance, more than 100 families in Bhadra reservoir practices both agriculture and fishing. In Maridibba, most of the families migrate during lean season; with collecting firewood spending about six hours to get a meagre sum of INR 20 and further 90% of fishermen work in other sectors during lean period. About 10% have shifted to government jobs as observed in two communities –Gondichakkana halli and Nellisara - where the youth are found to be educated and aware of other options. In addition to reduced income, the fishermen are affected with a social stigma that has forced them to move out of fishing activities.

Table 4.0: Activity-wise Diversification across Households

| Details | Number of families |
|---|--------------------|
| Agriculture | 10 |
| Agricultural labour | 35 |
| Baby sitting, garage, and construction labour. Petty shop | 5 |
| Working as fishing labour | 10 |
| Nothing | 40 |
| Total | 100 |

Source: Survey

Fisheries Development

Fisheries is a state subject under the Indian constitution, and hence the primary responsibility of administration and management of developmental programmes rests with the state governments. However, Government of India provides financial assistance to the states for different schemes that are initiated through state fisheries department, fisheries cooperatives and development corporations. Apart from these, the Government of India has been promoting export development through various agencies like Fish Farmers Development Agency (FFDA), The National Cooperative Development Corporation (NCDC) etc. our observations during the study indicated that efforts to develop fisheries are not integrated with activities within and other sectors. As a result, decisions made by the Water Resources Department do not take into consideration the needs of the fisheries sector while releasing water for irrigation purposes. This is a major drawback for fisheries in the TBSB as irrigation and drinking water get the priority. The government should take note of the fact that fisheries is a non-consumptive use and efforts to promote fisheries in TBSB can only increase the productivity of water resources without affecting other sectors.

Department of Fisheries

The Department of Fisheries of the Government of Karnataka aims to promote both marine and inland fish production along with proper utilization of resources. The policies and developmental schemes of the government are implemented through the Department of Fisheries, apart from the department maintaining a data bank of resources, production and investment. A Secretary heads the Department of Fisheries at the state level with zonal offices, and district level directors. The TBSB has two zonal offices, one each in Shimoga – covering Tunga and Bhadra rivers and Bellary for Tungabhadra River.

The Karnataka Fisheries Development Corporation is engaged in activities like ice production, cold storage plants and marketing of frozen fish. A comprehensive policy for tendering out fish catch in tanks, reservoirs, and rivers was formulated in 1997¹⁰, and later amended in 2005 according to which the tanks are to be leased out on priority basis for Water Users Associations, FCS, Unemployed youth, and registered water user's cooperatives/institutions.

The *Karnataka Cooperative Fisheries Federation* aims for the development of fisheries in tanks and reservoirs through FCS, who are members of the federation, by stocking quality fingerlings and marketing of fish through retail outlets and livelihoods improvement of the inland fisherman. The Assistant Registrar of Co-operative Societies plays a key role, at the micro level in facilitating fishermen cooperative societies' formation and functions.

Tungabhadra Board

Tungabhadra Board is an autonomous body, which does not fall under the purview of the Department of Fisheries. The Board has various wings with fisheries being one of them; it is responsible for the management of fisheries in the TB reservoir interms of timely completion of approved projects, maintenance, distribution of profits, granting of lease, production and marketing of quality fish seeds, ice and fish nets.

Fishermen Co-operative Societies (FCS)

Fisheries Department promotes the formation of FCS, which can be formed by registering under the Co-operative Society's Act 1956. In TBSB, 57 FCS have been registered in the riverine systems and 14 in the Reservoir fisheries. During the study, interactions were held with 8 societies to understand their role, functions and constraints. It has been observed that the dynamics at which the societies function depends largely on sources, location and year of society formation. The rules evolved are location specific.

There are seven active FCS in the Tungabhadra reservoir, and the Tungabhadra Fishermen's Society - EV society camp is one of the oldest societies formed in 1964. With the introduction of the Tender system, there has been an increase in the tender amount each year that has led to more involvement of middlemen resulting in conflicts among the fishing societies. While this situation prevails in TBRP, in Devarabilikere, the society with the members and representatives from seven surrounding villages is functioning well with well laid out rules. However, in Shanthisagara reservoir, the society is currently inactive although it is one of the oldest (formed in 1956). There was an effort to raise the fingerlings through the society by raising loans and paying to the department three years ago; but with poor rainfall, the reservoir dried up and the society incurred huge loss, forcing the fishermen to migrate to far off places. Kampli Fishermen Society is a well-established society with funds amounting to INR 200,000 and providing considerable benefits for the fisher folk. The society has good institutional arrangements and abiding by well formulated rules. Violation of any rules attracts legal action and

¹⁰ Government Order No. AHF 52 SFM 95 dated 09-06-1997 and amendments have been issued for the above order vide Government order No/AHF/166/SFS/2004 dated 15/01/2005 and 04/05/2005.

penalties. An active society with new ideas tried to coordinate marketing fish with a brand name but did not succeed; however it has remained enthusiastic. Department of Fisheries can identify such societies to empower them with further skills.

Major Challenges

Declining trend in Production

Fish production in TBSB has declined over a period of time due to various constraints although there is scope for improvement (See Table 5.0). The local and regional markets import fish from neighbouring states, despite Tungabhadra reservoir having highest water spread area. Reasons include inadequate quantity of fingerlings released by the Department, increase in illegal fishing due to poor governance, production of fish seeds in government nurseries being far below the actual demand with inadequate infrastructure facilities to support, pollution from industries and dynamite operations having very poor accountability. Complaints often go unnoticed or unregistered or do not get converted into action in terms of prevention.

Table 5.0: Year-wise Fish production in TBSB

| Year | Fish production in Metric tonnes |
|---------|----------------------------------|
| 2000-01 | 41188.39 |
| 2001-02 | 33176.81 |
| 2002-03 | 21947.55 |
| 2003-04 | 20703.36 |
| 2004-05 | 25638.55 |

Source: Statistical Bulletin of Fisheries 2004-05, Department of Fisheries, GOK

Lack of Integrated Approach

Various departments including Fisheries, Irrigation and Agriculture do not have a common strategy or management to address the problems and needs of respective sectors. The State Water Policy does not specify how the needs of various sectors can be addressed in terms of integrated approach simultaneously. The Irrigation Department controls the water management and does not consider allocating water for fisheries as a priority. Implementation of IWRM initiatives in TBSB is one way of keeping a balance between the needs of various sectors as improvement of livelihoods is part of IWRM principles, and as such attempt to implement IWRM can also ensure the development of Fisheries sector in the region.

Government Benefit Schemes and Small-scale fishermen

The Government has undertaken various schemes to meet the requirements of fishermen. However, benefits of the schemes have not reached down the vulnerable groups. As the schemes are routed through the societies usually dominated by the rural elite, favouritism becomes prominent. With poor accountability and transparency, there is scope for misuse of funds. It has been observed that certain schemes are meant for certain socially deprived classes (Scheduled Caste) and as such the fishing

communities are not eligible to apply for these schemes. The benefits (cycles, nets etc) from these schemes have not actually been used by the beneficiaries, instead are sold to the fishermen or other people. The survey indicates that 82 percent of marginal fishermen have not received any kind of support/benefits from the government sponsored schemes. Thus it is necessary that the policies be framed towards weaker sections / marginal fishermen in order to improve their livelihood and quality of life.

Skill Up gradation and Training

Training provided by the Department mainly relates to methods of fishing and related aspects. Fishing being a traditional occupation, the training is not of much help to the fishermen. Fishermen prefer skill development programmes such as fish processing, and value added products. As a major proportion of such products comes from small-scale home industries, imparting training to women is considered essential.

Linkages

Marketing

Access to markets is a major problem. For instance, fishing community in Nellisara village indicated that the distance from the village/town to the nearest market centre is about 20 kms and that fish would decompose while being transported. Lack of storage facilities and poor networking also force them to sell at low prices. If better infrastructure facilities are provided, fish could be preserved for longer periods and sold at bigger market centres at higher prices. The small-scale fishers are very poor hence have to depend on middlemen for credit cutting down their profit margins. Dependency on the middlemen not only makes it impossible for the fishermen to come out of the vicious cycle of debt but also to sell the fish at low prices. However, Nellisara village is an exception having access to bank loans.

Conflicts

Conflicts are common among various sectors related to issues of water sharing, pollution, change in institutional arrangements and release of fingerlings. These problems vary in terms of intensity across the basin. Societies that were established early are in a dominating position not only in getting schemes but also allocating them to people of their choice. This has caused tension amongst the fishing communities and led to establishment of new societies. For instance in Hulagi, terms of contract and sharing of the river have created a conflict due to ambiguity. Fishermen in Hulagi who have been traditionally fishing for a stretch of 35 kms from Hulagi to Kampli are now restricted to 10 kms. The stretch is shared between Hulagi and Kampli society. Hulagi society has been insisted that it be given the initial right of obtaining lease for 15 kms, but its demand has not been sanctioned as yet.

Industrial pollution

Industrial pollution is one of the major factors affecting fishermen livelihoods as the industrial discharge includes heavy metals, affecting breeding and leading to fish kill particularly in summer. 47% of

fishermen resort pollution and fish kills have negative impact in terms of health and reduced income. Instances of fish kill have abounded at different stretches of the river, for instance, in Hale Ayodhya, in 2004; fish kill was very intense, where the fishing communities were unable to fish for the whole year. There are documentations on the composition of fish species that have been reduced or have become extinct over the years. Fishermen have expressed concerns over the increasing use of chemical fertilizers in agriculture affecting around 75 villages. Rural people residing in the vicinity of the industries mention that the fish available are not edible due to foul smell and bad taste. However, it needs further probing about the extent and intensity of pollution affecting quality of fish and reasons for non-edibility.

Dynamite Operation

Stretches of the river systems face threat by some groups of people who illegally use dynamite. The purpose is to catch fish at one go. The blast occurs 2-3 times in a week in 10 locations across the river. Only partial fish can be collected in the process, the remaining fish decompose emitting bad stench and pollute the river and ecosystem. Although there have been many conflicts with these groups besides complaints to the department and the Fisheries Acts placing a ban on such activities, the issue remains.

Deteriorating Tanks

Fishing in Tanks forms a major source of livelihood and is financially and physically more secure than river fishing. Fishermen in most of the places are unable to invest due to lack of funds and inviting thereby middlemen. However, efforts are on, though not sufficient, interms of providing subsidies for the young persons from the fishing communities. It would be useful if fishing in the tanks were to be restricted to the fishermen in the villages only in order to protect their livelihood. Panchayats should take up the fisheries development in village tanks in co-ordination with the Department of Fisheries and the FCS.

Development of Fisheries as a livelihood option

Women and Fisheries

1. Education and training: The *low literacy status* amongst women restricts them from acquiring proper skills. It is important to design training programs that suit women. Besides, extension services are dominated by men, and men-women contact is not allowed socially. Training should be conducted close to villages or homesteads, during the day when women are free from household chores using simple visual aids.

2. Physical mobility: Women in developing countries are not permitted to work outside the homesteads or with men folk. This is closely linked to religion, class or caste to which the household belongs. Such *socio-cultural restrictions* limit women's contribution to household income and narrow down options for employment and income sources.

3. Access to credit : In general, women have less access to credit or financing sources due to the various socio-cultural restrictions and low literacy. Lack of legal ownership over land makes it difficult to procure loans from banks or from other formal credit facilities.

4. Lack of recognition: Researchers have not adequately documented women's contribution to the economy. Poor documentation is one of the reasons for the absence of gender sensitiveness in government policies and programs.

Benefits of women's participation in aquaculture

On the contrary, women's participation is changing with the mounting pressure on land and water resources, environmental degradation, out-migration of male family members and increasing rural poverty. Integrating gender in aquaculture :

- Benefits women through an increase in household income and improvement in nutrition
- Helps women gain control over their own livelihoods and improve their status both within the household and the community
- Improved access to income and livelihood options
- Higher household income due to added human capital in aquaculture
- Increased participation in various decision-making processes within the family.

To ensure better involvement of women in aquaculture development and improving the economic conditions of women, the following aspects can be considered:

- A better understanding of the existing gender relations in the community and the household must be acquired by institutions/organisations working for the development of aquaculture. Participatory technology development offers more scope for incorporating women's experiences.
- Aquaculture training and extension efforts should be improved through a holistic approach that encompasses women's time use, household responsibilities, literacy levels, as well as all aspects of their daily chores.
- Development of indicators to ensure that the involvement of women is monitored on a regular basis so that their participation can be re-focused regularly.
- A mechanism is necessary to expose women to more extensive market information and to link them to a wider market network.

Building capacities and skill up gradation

Fisheries has definitely proved to be an important sector supporting livelihoods of a large population directly and indirectly. However, it has been observed that this sector largely supports the fishermen at the subsistence level but has a large scope for improvement by building capacities through skill up gradation and empowerment. Small interventions can have a larger impact on their quality of life besides securing their livelihoods. It is important that the training programmes are focused and need based. As stated earlier, fishermen prefer to improve their economic status through value addition

options. It would be important to organize meetings where the fishermen are involved so that they can come up with suggestions about their requirements.

Suitable Options

1. Entrepreneurship development – There is shortage of fish seed production though the techniques of fish seed collection have been improved and several new centres established. Although there have been demonstrations by extension agencies of the State and Central Governments, small farmers do not have enough resources and cannot afford risks involved in fish culture enterprise. As economic feasibility is evident, it is important that commercial entrepreneurs amongst the fishing communities take up aquaculture and seed production so as to increase fish production and their income.
2. Value addition through fish processing units and training in catering is seen as the most relevant options to engage women in particular.
3. Provide scientific information and technical support regularly.
4. Financial aid with accountability and ensuring fair distribution.
5. Involving younger generation in infrastructure development to promote marketing

Establishing market linkages

Establishing market linkages to ensure that the benefits accrue to the fishermen directly, is important as the fishermen are generally at the mercy of middlemen. Providing the fishermen with adequate access to finances would liberate them from middlemen.

- (1) Establishing markets with supportive storage facilities would ensure the quality of fish and better price. It has been observed that more than 70% of the fishermen do not have any access to cold storage facilities, forcing them to sell the fish at lower prices. It is also important to build markets keeping in view the location of the fishing communities and proximity, making it convenient for direct selling and storage. Improvement in hygienic way of handling fish for better pricing is another important dimension that needs attention.
- (2) Linking up with city based marketing outlets – Reliance, Food world, Smart, e-choupal and others would be another vital option as the fishermen have no direct linkages with city based marketing outlets. As there is a high demand for fish obtained from river, it would be useful to provide supportive mechanisms and transportation to the city based outlets.

Three tier structures for FCS/vertical corporations

Social mobilization is confined to large-scale fishermen with limited role for the small-scale fishermen and problems encountered vary at times. Setting up a 3-tier structure for FCS would aid in better mobilization of resources to meet the requirements of the fishermen communities. Education and awareness creation are to be incorporated for empowering them with disaster preparedness, approach to resolving local conflicts, legal aspects and alternatives in income generating activities.

Basin level FCS

Fisheries in the TBSB contribute to livelihoods in various ways: as a source of food, income, social benefits and reduced vulnerability to poverty. However, the situation across the communities is very complex and dynamic. Largely, the fishing community is poor and vulnerable as livelihoods are subject to external influences like environmental degradation, poor legal framework, weather conditions, and pollution, inadequate institutional arrangements and volatile markets. It is important to effectively manage and tap the potential, as there is a large scope for improvement of fisheries in terms of livelihoods in TBSB, and also to change approaches for ensuring fisheries sustainability.

Policy and Management Initiatives

1. At the National Level

- Certain national policies mention “poverty alleviation” and “social equity” as one of the objectives but these needs to be implemented at the grassroots level.
- Need to allocate funds in the national budgets for training of the poor and women in Fisheries.
- To emphasize on co-ordination of relevant sectors to make it easy for the entry of poor into fisheries.

2. At the Regional Level

- Improved cooperation in Fisheries management, which should be oriented to strategic and cross-sectoral matters, such as capacity-building, co-ordination of relevant sectors, etc.
- Exchange of experiences among researchers and managers on the formulation and enforcement of measures proposed in policies.
- Closer cooperation among national and regional governmental organizations and international and local NGOs in the promotion of participation of small-scale fishermen.
- Water bodies should be divided into coherent management units, which should be the basis for planning of fisheries development, and integrated with other sectoral development plans.

3. At the Local Level

- To provide authority and improve capacity of community organizations to monitor the farms to make sure those regulations are enforced. To ensure the participation of fishermen in planning and implementation.
- To strengthen the capacity of organizations in planning, monitoring, and data bases etc. at the local level which help in maintaining databases for the benefit of the agencies dealing with poverty reduction programs.
- To organize/strengthen fish farmers associations at the local level
- Priority should be given to the poor while issuing permits, rights and licenses for aquaculture.
- Support the children with residential schools with adequate health care. This is very relevant and important to support the fishermen in the light of the inevitability of frequent and long-term migration.

Conclusion

The study shows that fisheries in TBSB support the livelihoods of a significant proportion of the population. However, the State Water Policy and water management plans do not consider fisheries as a priority, though it does mention that water should be ensured for various sectors. The Water Resources Department controls and manages a majority of the water bodies within the TBSB and adjoining areas. As a consequence, Department of Fisheries does not have the freedom and the competence to develop water bodies for improving fisheries. The main focus in TBSB is on agriculture and managing water to meet the needs of irrigation and domestic drinking water. Development initiatives by the Department of Fisheries are not integrated with the water management plans or other development activities of The Water Resources Department or the Agriculture Department. This is evident from the fact that certain parts of the river where fishermen engage in fishing activities become completely dry during late winters; this is because water release is controlled by the water resources department and there is no co-ordination between the two. This definitely shows the importance of IWRM to support fisheries on which a significant percentage of the population are dependent for their livelihoods.

A number of policies and institutions already exist in TBSB that can facilitate the entry of poor, women and youth into fisheries. What is needed is an integrated framework within which where the relevant policies, departments and programs can be pulled together for facilitating the access to the poor. Various measures can be imitated at the local level, like improving the water bodies, issuing licenses only to small-scale and traditional fishermen, developing local co-operative insurance schemes to include poor, legitimizing community networks, increasing training programs etc. Security of tenure is an important issue and fishermen are concerned about the rights to access and the use of common waters. The complexities of the poor are diverse that need to be addressed through a holistic approach with regard to future fisheries development programs.

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