
CHAPTER TWO

MATERIAL AND METHODS

MATERIAL :

The district of Kolhapur in Maharashtra State is a part of the Western Deccan Plateau, lying along the eastern side of the Western Ghats, situated between 15° & 17° N latitude and 93° to 94° E longitude. This district is bordered on the east and the north by Sangli district and on the West by Ratnagiri and Sindhudurg districts of Maharashtra state and on the South by Belgaum district of Karnatak State. The Physical features of this area are varied in nature consisting of plains, plateaus and hill ranges. Kolhapur district is transversed on the west by a long range of the Western Ghats, which has thrown out several spurs in the east. The high altitude of these ranges and their copious rainfall upto 6000 mm per year have given rise to a large number of streams and rivers.

The major rivers of Kolhapur district are Warana, Panchganga, Dudhaganga, Vedaganga, Hiranyakeshi and Ghataprabha. These rivers originate in the Western Ghats and flow south-east and north-east across the Kolhapur plateau towards the Krishna river system. Out of these rivers Panchganga is the most important river system in the district.

Topographically the catchment area of the Panchganga River System (PRS) can roughly be divided into two zones marked by broad diuratic difference (i) the Western mountain tract covered by the Western Ghats, with subtropical evergreen and semievergreen vegetation, and its spurs with valleys. The elevation above the mean sea level in the hilly west varies

from 600 meters in the valleys to 1000 meters at the crest of the Western Ghats, ii) the main eastern plain, the elevation in the plain varies from 500 to 600 meters above mean sea level.

The total fall of river is only around 500 meters and the main river course runs for about 150 km, therefore the average slope is 3.33 per thousand.

The Panchganga River System (PRS) has a total length of about 338 km. It has five main tributaries namely Bhogawati (83 km), Tulsi (30 km), Dhamani (41 km), Kumbhi (48 km) and Kasari (69 km). These rivulets unite to form 'Panchganga river' at Prayag near Kolhapur city. After the formation of river Panchganga at Prayag the water runs for about 67 km, before it meets river Krishna at Narasinghwadi (Fig. 1).

The catchment area of the PRS is about 2603.10 sq.km. The catchment areas of the tributaries are Bhogawati (410.62 sq.km.), Tulsi (204.37 sq.km.), Dhamani (206.87 sq.km.), Kumbhi (310.62 sq.km.), Kasari (668.75 sq.km.) and Panchganga (801.37 sq.km.) respectively. The catchment areas mainly consist of degraded forests in the Western Ghats region and waste lands and agriculture lands in the river basin in the eastern zone.

The present river channel represents a condition of equilibrium established after clearing of trees from both plains and slopes and after considerable change in both the character and magnitude of suspended and bed-load materials carried by the river as the result of erosion in its watershed. Upon slopes in an area where a dry season is followed by a monsoon are subject to rapid erosion of materials that may then be easily transported

by a river with flood discharges.

The main trunk of the PRS is formed in the region of intermediate gradient. At the mid stage the flow greatly increases and the meanders become larger. At this mid stage it is rather deep with a smaller surface to volume ratio. Later when it reaches plains it becomes broad and comparatively shallow with a large surface to depth ratio (Plate-I-A&B).

Typically, the silt load becomes much heavier in this region. The photosynthetic zone is thus restricted to the shoaling areas of meanders. In the area the current is greatly reduced, the suspended solids settle down and the clearer water permits extensive algal growth. It is here that one often finds the greatest concentration of fish, algae and invertebrates.

The flood plain of the river is comparatively large and small ponds are numerous in summer. These are often connected with the river during high flow and as a result add considerable numbers of various kinds of aquatic life to the river. This intermediate gradient area is the section of the river that has been used by man heavily over time for farming settlements.

Presently, there are 2 dams and 39 weirs in the river system in addition to these 2 dams and 7 weirs are under different stages of construction (Fig. 2). The main source of water to the rivers is the seasonal south west monsoon which lasts for about three months i.e. June till August. The rivulets in the river system were known to be perennial in the past but due to construction of dams and weirs and extensive use of water for irrigation, industrial purpose and city water supply, most of

them have become seasonal.

The natural flow of the river is often altered by the creation of dams which would not have been necessary or could have been greatly reduced in size if we had planned the use of the watershed so that the rain penetrated the soil rather than producing erratic runoff.

The effects of dams in the PRS are observed, both upstream and downstream, in physical and chemical changes in water quality and changes in the structure of the river channel, depositional and erosional rates of sediments and the abundance and diversity of aquatic life (Shinde, 1988).

During the monsoon months there are floods depending on the intensity of the precipitation. However, in most of the months water does not come out of the river bed. At the origins the tributaries are shallow, narrow and have significant gradient which helps the speed of the water current. In this section the streams and rivulets are meandering and influence erosion in the catchment areas. In contrast to this in the tributaries in the eastern plains the water is deep (upto 40 feet), calm and there are many pools which were known to support rich fish fauna. However, during the recent years, due to various man made changes there has been decline in the fisheries of PRS affecting the life of thousand of fishermen who depended on it.

METHODS :

The methodology of the study was divided into two types of investigations, to understand various factors affecting the fish

and fisheries of PRS. The methods adopted were (i) ecological and socio-economic survey of fishermen community and (ii) observations of the routine fishing activities. This included experimental fishing with the help of the main three traditional fishing gears i.e. cast net, gill net, and drag net.

The traditional inland fishermen are scattered in the 26 villages on the banks of the PRS (Fig. 3). During the present study a 11 page questionnaire was administered, in all the 26 villages. In the survey emphasis was given on the following broad topics, present and past status of fisheries, changes in the riverine ecology due to the impact of human activities, reasons for fish mortality, fishing gears etc.

A vast data is generated for the first time, from such a study in the state of Maharashtra, is being computer analysed and it will be used in future studies by the author. Some of the data used in the present study is based on the part of the investigations made by the author in the survey of fisheries of Panchganga River System, sponsored by the Department of Environment, Govt. of India.

Altogether 870 traditional fishermen families belonging to the Bhoi, Bagadi and Koli sub-castes were found in the 26 villages on the PRS (Table No. 1). Out of these 870 families 269 were engaged in other occupations than fishing for some generations. The remaining 601 families had fishing as a traditional main occupation. However, due to the decline in the riverine fisheries 292 fishermen families had left fishing recently as main occupation. Therefore around 55 % i.e. 168 families out of the 309 families were interviewed by using

Table No. 1 : Distribution of fishermen community in the Panchganga River System (PRS).

Name of River	No. of Village	Total No. of Fishermen household	Total fishermen population estimated	Total No. of Fishermen fishing at	No. of sample (Survey)	No. of Fishermen left fishing
1) Bhogawati/Tulsi	9	153	925	104	60	041
2) Kumbhi/Dhamani	5	28	169	24	13	004
3) Kasari	4	40	242	30	21	---
4) Panchganga	7	584	3553	114	67	219
5) Krishna	1	65	390	37	7	038
Total	26	870	5279	309	168	292

Fig.No. 3 : Distribution of villages and Field Stations
in the PRS.

No.	Villages	No.	Field Stations
1.	Gudalwadi	1.	Gudalwadi
2.	Avali (B.)	2.	Parite
3.	Shirgaon	3.	Haladi
4.	Ghotawade	4.	Bid
5.	Thikpurli	5.	Are
6.	Haladi	6.	Salvan
7.	Bid	7.	Varange Padali
8.	Khupire	8.	Prayag
9.	Varange Padali	9.	P.Ghat
10.	Salvan	10.	K.Bavada
11.	Kale	11.	Ichalkaranji
12.	Malhar Peth	12.	Shirol
13.	Morewadi	13.	Padali
14.	Sangrul	14.	Sabalawadi
15.	Sonurle	15.	Hanmantwadi
16.	Nebhapur	16.	Ambewadi
17.	Kololi		
18.	Waghve		
19.	Vadange		
20.	Kolhapur		
21.	Vasagade		
22.	Rukadi		
23.	Ichalkaranji		
24.	Shirdhon		
25.	Shirol		
26.	Kurundwad		

random sampling method. Each interview on an average lasted for one hour and preferably the eldest person from the family was interviewed to get an idea about the past status of fisheries in PRS.

The experimental fishing was done at 16 field stations on the five tributaries (Fig. 3). The cast net and gill net operations were conducted at 12 field stations for experimental fishing. Cast nets with mesh size of 1, 1.5, 2, 2.5 and 4 cm were used. The gill nets having a mesh size ranging from 2 to 10 cm were operated with the help of two local fishermen. The drag nets were operated at 4 field stations with the help of a team of 11 local fishermen, the lengths of the nets used were from 24 to 30 pattis (portion) where each portion was 6 meters and were dragged from .5 to 1 km. distance.

The length and weight of each fish caught was measured in all the cast and gill net operations. In drag nets due to the large number of small fishes caught only the total weight of the catch was measured. The fish catch in all the experiments was analysed in the field.

The traditional fishing methods like, fish trap, bag net, hook and lines, cast net, gill net, drag net and also fishing by plant poisoning and dynamite were observed in the PRS.

The various fish samples collected were preserved in 7 % formalin in the field and the fishes were identified in the laboratory by using 'Fishes of India', Day (1958) Vol I & II and 'The Freshwater Fishes of India, Pakistan, Bangladesh, Burma and Shrilanka', Jayaram (1981). This taxonomic classification

was later confirmed from the Regional Office of the Zoological survey of India at Pune.

The survey and field observations were conducted from September 1986 to December 1987. The experimental fishing with local fishermen, was carried out during the period from February 1987 to June 1987.

The data thus generated was analysed manually and also with the help of a computer from the Department of Statistics, University of Poona.