KARNATAKA STATE BIODIVERSITY STRATEGY AND ACTION PLAN (KBSAP)

(As a part of National Biodiversity Strategy and Action Plan - NBSAP)

Volume II

Centre for Ecological Sciences
Indian Institute of Science
Bangalore 560 012

January 2002

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TUMKUR AMANIKERE – A CASE STUDY*

OCTOBER 2001



** Conducted as a part of Karnataka state bio-diversity Strategy and Action Plan (KBSAP)*

WILDLIFE AWARE NATURE CLUB
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1. PREFACE

Wildlife Aware Nature Club: WANC - as it is popularly known, was established in 1990 by a few young nature lovers. It was the first organization to be formed in Tumkur district for the cause of nature and wildlife conservation. WANC today is considered as the most active & dedicated environmental NGO in this region. Among its activities WANC has been involved in surveys of many important wildlife areas of Karnataka, to help in their better management. This case study on Tumkur Amanikere is an extension of its activities and its commitment to conservation. WANC is proud to be associated with the KBSAP under the agesis of the prestigious Centre for Ecological Sciences of Indian Institute of Science (IISc), Bangalore and the Karnataka Forest Department.

2. ACKNOWLEDGEMENTS

This report is the outcome of the faith reposed in WANC by Prof. Madhav Gadgil of CES, for which WANC is grateful to him.

3. LIST OF PHOTOGRAPHS AND MAPS

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4. Tumkur Amanikere

4a) Background:

Tumkur district has a large network of wetlands and Tumkur town environs have many like the Tumkur amanikere, Shettihalli kere, Upparhalli kere and others.

According to the Tumkur District Planning Map of the National Atlas and Thematic Mapping Organisation of the Dept. of Science and Technology there are 1542 tanks serving the purpose of irrigation in the district.

But, according to the Mysore Gazetteer, 1930 the District had a total of 1,428 tanks of which Tumkur taluk had 202. The major tanks of Tumkur taluk were

1) Maidala Amanikere, which had the capacity of 1,001 units and an area of 1,147 acres.

2) Tumkur Amanikere, which had the capacity of 632 units and an area of 835 acres.

3) Bugdenhalli Amanikere, which had the capacity of 697 units and an area of 796 acres.

Irrigation Tanks of Tumkur district in 1930:

Taluk	Tanks in action	
	Major	**Minor**
Sira	57	98
Koratagere	17	51
Turuvekere	11	29
Gubbi	62	87
Pavagada	36	33
Madhugiri	61	75
Tiptur	42	73
Kunigal	30	65
Chiknayakana Halli	32	133
Tumkur	62	116

But many of the wetlands in Tumkur town like Ballenkatte and one more small lake near Kunigal gate have been filled up and exist no more. With an estimated population of 2 lakh in the 2001 census, the human pressure is likely to claim many more lakes, unless strong measures are taken to reverse this damaging trend.

4b) LOCATION :

With the hills of Devarayana Durga state forest as backdrop, Tumkur amanikere is picturesquely located in the heart of the old parts of Tumkur town.

Geographical co-ordinates:

N: 13° 21' N
E: 77° 07' E

Altitude: Apx. 785 meters above sea level

4c) AREA: The records of Minor irrigation department show the area as 508 acres, although the Mysore Gazetteer of 1930 mentions the tank as having an area of 835 acres.

4d) CLIMATE:

Rainfall: Tumkur taluk receives an average annual rainfall of 688m

Humidity: The maximum humidity is in monsoons and early summer is the period of minimum humidity.

Temperature: The maximum temperature is 38 degrees C, while the minimum is 11 degrees C.

4e) ATCHKAT: An area of 750 acres forms the atchkat, where even today crops like Paddy, different vegetables, coconut and areca are grown. The right and left canals, 2 and 2.5 km long, feed this area. The bund is 1800 mts long.

4f) CAPACITY: 165.44 million Cubic feet.

4g) CATCHMENT AREA: The total catchment area is 35 Sq. km. It includes the western slopes of the western part of Devarayana Durga state forest.

4h) BUNDS/SLUICE GATES: In the southwestern corner of the tank the stone bund is depressed as an outlet which permits the over flow of the rainwater when the lake is full. Also in the northwestern portion of the tank there are sluice gates, which are mechanically operated.

The water that overflows this tank enters Bheemasandra tank to the west of Tumkur town. This downstream joins the upper Shimsha and finally enters into Kaveri river basin.

4i) WATER SOURCES: The two major, west flowing seasonal nullahs which feed this tank are Devarayapatna nullah and Hanumanthpura nullah.

4j) LEGAL STATUS: the Minor Irrigation department owns this tank.

4k) USES: Spread over an area of 22 Sq. km, Tumkur has a population of two lakh with an average floating population of fifty thousand. Even after the supply of Hemavathi waters to Tumkur town, the problem of drinking water is growing everyday. Tumkur needs an estimated 5 MLD water everyday, 3.44 MLD of which is supplied by Hemavathi project and Tube wells. It still has a shortage of 1.56 MLD water. With an average rainfall of 688 mm falling over a period of 45 rainfall days mainly from June to October, this tank is extremely important in trapping rain water and recharging ground water. Due to the indiscriminate digging bore/tube wells, the ground water table level of Tumkur is going down drastically, hence the need to conserve this tank acquires utmost importance.

Cultural uses: The tank was earlier used for immersion of idols of Lord Ganesha annually. Due to the steep decline in the water quality, this tradition has now almost stopped. There is a temple named after the stone outlet of the tank known as *'Kodi Basaveshwara'* temple. The *'Nagarakallu'* statues attract many religious people. Whenever this tank over flows, the sight of over flowing water itself is the greatest attraction of Tumkur town.

4l) HISTORY:

The records of Chandramouleshwari temple near T.Begur mention Tumkur Amanikere as being constructed in 1130 AD by the Chola king, Rajendra Chola. There are also records of the tank being cleaned by the Palegars of Gubbi Hoshalli and the Ganga – Gowri prayers being offered. The Mysore rulers then maintained the tank efficiently.

1. View 1 from north of Amanikere



2. View 2 from north of Amanikere



3. *A View from south of Amanikere*



4. *View from west of Amanikere towards southeast. Note the coverage of water hyacinth. In the background are some of the hills of Devarayan a Durga state forest*



4m) FLORA: 

Profile: Amanikere has been surveyed in all the four directions to have a better view for sketching the tank profile.

1) **View from eastern direction:** Along the eastern boundary of the lake there are agricultural fields. Many of the encroachments have taken place here.

The following are the features of the existing profile:

Trees on the bund: There are few trees like "Rain tree" (*Samanea saman*); "Copper pod tree" (*Peltophorum pterocarpum*); "Gul mohar" (*Delonix regia*); "Jaali mara" (*Prosopis juliflora*) etc, growing on the bund.

Shrubs that grow are mainly *Datura matel, Zizyphus jujuba, Solanum xanthocarpum, Solanum indicum, Cassia auriculata, Lantana camara, Parthenium hysterophorus*, ocassionally *Parkinsonia aculeata*.

Herb layer includes more hard species like *Sida acuta, Sida rhombifolia, Abutilon indicum, Croton bonplandianum, Cassia tora* and some climbers like *Cardiospermum helicacabum, Ipomoea muricata, Ipomoea hederifolia*. Grasses like *Eragrostis unioloides, Eragrostis bifaria, Cynodon dactylon, Aristida setacea* grows profusely. Marshy/Aquatic plants like *Polygonum chinense, Typha angustifolia, Cyperus haspan, Ipomoea carnea* grows very well.

The most troublesome aquatic weed is water hyacinth (*Eichorina crassepis*) occupies near the peripheral region of the tank where more effluents, sewage water flows in and gets collected.

Towards the east- north part of the tank there are human settlements and cultivation.

2) **View from the southern side:** The old Bangalore – Mumbai national highway, National Highway No: 4 forms the southern boundary of the lake. The major sewage inlets into the tank are located in the southern part of the tank, one towards southeast and the other at the centre.

The following are the features of the existing profile:

A) Stony bund: It lacks woody vegetation on the upper surface of the bund, except for few shrubs, herbs and grasses.

B) Towards the lower region of the bund on the inner surface there are aquatic plants like *Cyperus haspan, Typha angustifolia, Polygonum chinense.*

C) Water hyacinth occupies 20% of the tank towards the bund where the washermen wash clothes and also there is an inlet of the sewage water.

3) View from the western side: Towards the right hand side there is a bund along the road and human settlements towards the left hand side of the tank. Water hyacinth prevails even here.

The following are the features of the existing profile:

Encroachment areas are towards West-northwest.

There are some aquatic plants like *Polygonum chinense, Typha angustifolia, Cyperus haspan*, and *Ipomoea carnea* growing well.

There are also some trees as mentioned in 1 growing on the bund.

Water hyacinth occupies at least 40% of the tank due to the sewage water inflow.

Some shrubs as mentioned in 1 are present.

4.) View from the northern side:

The Sira Gate –Satyamangala road passes along the northern boundary of the lake. A large number of encroachments have taken place here. Here the water hyacinth occupies about 20% of the tank.

The following are the features of the existing profile:

The encroachment area has mainly human settlements, cultivation, and brick making factory.

The stony bund bears very little woody vegetation.

There are a few aquatic plants as mentioned in 2 growing well.

Water hyacinth occupies 20% of the tank at the polluted regions where the sewage water flows in.

5. *Amanikere in Sep.2001, the tank over flew after a gap of 11 years*





6. *Young boys with their catch of fish in Amanikere, Sep. 2001*

4n) FAUNA:



Hundreds of life forms are dependent on Tumkur Amanikere. Many species of birds, amphibians, reptiles and insects can be seen in and around this lake.

Birds

A total of 121 Species of birds belonging to 42 families have been recorded in this lake. This lake is very important because it is a breeding ground for many resident birds and a feeding/resting place for many migratory ones. 42 species breed in this tank and 46 species are migratory. Some of the migratory birds come from far away countries of Siberia, Europe, East, North and Central Asia, while some of them are local migrants coming from different parts of Karnataka and Peninsular India.

Many of the birds using this tank are endangered and hence their habitat should be protected.

Asian Waterfowl Census:

Asian Waterfowl Census (AWC) is an International wetland birds' conservation project initiated in the year 1987 and coordinated by Wetlands International based in Malaysia. The census is important in increasing the general awareness of wetlands and their water birds. Since 1993, many wetlands of Tumkur district are being surveyed each winter by members of Wildlife Aware Nature Club (WANC), to count the water birds. This helps in determining the population trends of the water birds and action can be taken, based on the information, to conserve the water birds and their habitat i.e. wetlands.

Tumkur Amanikere – Data from AWC

Year	No. of birds	Total species	Coverage
1993	621	15	100%
1994	-	-	-
1995	1453	26	100%
1996	156	15	25 to 50%
1997	336	13	25 to 50%
1998	1721	20	75 to 99%
1999	17	263	75 to 99%
2000	21	243	75 to 99%
2001	19	237	75 to 99%

BUTTERFLIES

Note: - Although a large variety of insects are found in this lake, only a few species, which could be identified, are mentioned here.

A total of 24 species of butterflies belonging to 6 families have so far been recorded in the lake. Many of these butterflies are endangered and breed on suitable host plants found around the tank environs. All of these species are protected under Wildlife Protection Act 1972.

SPIDERS

Spiders are a very important agent against mosquito menace as they are very helpful to people living around the lake, to control the mosquito population. A total of 12 species of spiders have been sighted here, of which 3 could not be identified.

MAMMALS

6 Species of mammals have been recorded.

AMPHIBIANS

Like spiders even frogs/toads play a major role as biological agents against mosquitoes.

5 species of frogs and 2 species of toads have been sighted here.

REPTILES

A total of 3 lizards, 1 skink, 12 snakes and 3 species of tortoises have been recorded.

SCORPIONS

Two species of unidentified scorpions have been recorded.

FISHES

An unspecified number of fish are found here, yet to be identified.

5. INTRODUCTION TO KBSAP (Karnataka state Biodiversity Strategy and Action Plan)

India is a land rich in diverse forms of life. But unfortunately much of this is under threat due to a host of reasons. Serious attempts are being made from various quarters to save this precious natural wealth. The Government of India under the Ministry of Environment and Forests (MoEF) has initiated a project for the preparation of a National Bio-diversity Strategy and Action plan (NBSAP). This project, which is participatory in nature with inputs from a broad spectrum of the society, aims at conservation of biological diversity, its sustainable utilization and equal sharing of benefits.

The Centre for Ecological Sciences at the Indian Institute of Science is co-ordinating at state level the preparation of Karnataka state Bio-diversity Strategy and Action plan (KBSAP). This attempt in Karnataka will broadly include the following six themes:

(a) Management of protected areas

(b) Medicinal plants

(c) Freshwater fishes

(d) Wetlands

(e) Cultural traditions of conservation, and

(f) Land races of cultivated plants.

To harness the ideas of the common man and expertise of technical people in Karnataka, a 4-way approach is being adopted. Among these are case studies of selected areas by leading NGOs. Wildlife Aware Nature Club (WANC) has been identified by the CES to do case studies on Tumkur Amanikere and also Bhadra Tiger Reserve.

6. THE CASE STUDY

6 a) BACKGROUND:

Karnataka has approximately 40,000 wetlands most of which are man made. They were primarily meant for the purpose of irrigation, drinking water and related domestic purposes. In the meanwhile, they also have evolved as an extremely important habitat for a diverse variety of flora and fauna particularly fish, amphibians and waterfowl.

Of late due to industrialisation and developmental activities, a large number of these wetlands are under sever pressure. Also many of them are choking due to the invasion of aquatic weeds like Water hyacinth.

6 b) AIMS OF THE STUDY:

The main aim of this study is to enquire in to the ecological health of Tumkur amanikere wetland and develop a strategy and action plan to protect it from threats and sustainably use it. This could be taken up as a model to conserve wetlands facing similar threats in Karnataka.

6 c) METHODS OF STUDY:

As mentioned, WANC as been closely associated with the tank since many of the members are residents of Tumkur and residences of many of the members are located near it. All the data collected till date and the personal experiences have been channelled for this case study. New investigations like the status of the Catchment area, feeder nullahs, extent of encroachments etc were done for this study. Much of the data collected has been documented on Photographs and Video.

6 d) RESOURCES / BASE LINE DATA:

Before initiating the actual fieldwork, attempts were made to collect the updated information on the wetland. The following documents were referred:

i) Gazetteer: Mysore Gazetteer, 1930

ii) Topo Sheets: The following Survey of India Sheet was used
57 G/3 (1:50,000 scale)

iii) Books / Literature: The literature, which proved very helpful

in getting reliable data of the wetland particularly its flora and fauna is listed in the references section.

iV) Field visits by WANC members: Since its formation in 1990, WANC members have been regularly visiting the tank. All this has placed WANC in a better position to carry out the case study in a fair manner and do justice to the faith reposed in it.

6 e) FINDINGS / DATA COLLECTED:

Threats to Amanikere

A) **Sewage water inlets:** Sewage from a number of localities of Tumkur town is directly let into the Amanikere. This sewage brings in heavy amounts of salts, organic and inorganic wastes everyday, as a result of which even the watercolour has changed. The level of dissolved salts has risen from 0.5 to 1.78 dsm. Calcium, sodium, potassium & magnesium salts have been traced out. If this is left unchecked, sooner or later the ground water table will definitely be affected.

B) **Garbage dumping:** The ever growing Tumkur town is generating large amounts of waste everyday. Much of this waste is dumped in to the Amanikere, which has directly led to the deterioration in the quality of water and in turn affecting entire natural cycle. Waste that is dumped not only includes solid debris like material from demolished structures, poultry waste but alarmingly medical waste from hospitals and nursing homes. There have been instances when amputated limbs and terminated foetuses have also been thrown in here. Lack of implementation of strict guidelines to segregate toxic and non-toxic waste and the absence of incinerators to dispose it have been major reasons. A large number of pigs are dependent on the garbage dumps and reside in and around the amanikere. This has led to the lake acting as a source of many deadly diseases.

C) **Encroachments:** At least 15 acres of Amanikere has been encroached till date. The areas in the northern part where residences are present and along the eastern boundary where agriculture is being practised are prone to encroachments.

D) **Water hyacinth:** This exotic weed has choke vast expanses of the water cover. It has been reported that this weed spreads in waters that have high content of heavy

metals. Hence the existence of this weed is directly related to the level of water pollution.

E) **Developmental projects:** Of late Big *'land sharks'* of Tumkur district are trying to take undue advantage of the ever expanding urban localities of the town. They intend upon filling up amanikere for commercial purposes. In spite of public opposition, the President of Tumkur City Municipality Council has written a letter to the Chief Engineer, Minor Irrigation Department, requesting for the handing over of 35 acres of amanikere for the construction of a bus stand. Encouraged by this, some others are suggesting the building of a road in the middle of the tank and similar plans. All this will sound the death kneel for the centuries old amanikere.

F) **Threats to Catchment areas:** There are a number of activities that are threatening the catchment areas of the tank like the western slopes of the hills in western part of Devarayana Durga state forest. Illegal grazing, illicit felling of green cover for firewood etc are contributing to the soil erosion which leads to decreased inflow and increased silt deposition.

G) **Destruction of feeder / inflowing nullahs:** The nullahs feeding amanikere are threatened due to various reasons. Encroachments, diversion for agricultural purposes, overgrowth of vegetation in the beds and dumping of solid debris have vastly reduced their water holding and flowing capacity. The destruction of sources feeding a wetland is the beginning of the cycle of destruction of any wetland. Once the nullahs are destroyed, it will drastically reduce the inflow of water which in turn will dry up tanks. This will encourage encroachments, unwanted activities and ultimately demands by land grabbers to declare the tank as dead and its filling for commercial purposes.

H) **Large Scale Defecation:** A large number of people use Amanikere daily to answer their call of nature. This has directly affected the water quality, apart from the resultant visual pollution and the foul smell that has emanated.

I) **Illegal sand lifting:** A large amount of sand is lifted in the nullahs feeding the tank, near the places where the nullahs join the tanks. This creates deep trenches and results in heavy localised water logging and decreased inflow into the tank.

J) **Poaching / hunting:** A number of birds are poached every monsoon by people from the nearby slums, mainly for the purpose of cheap meat. This has decreased the population of many birds like Whitebreasted water hen, Moorhens and Little Cormorants.

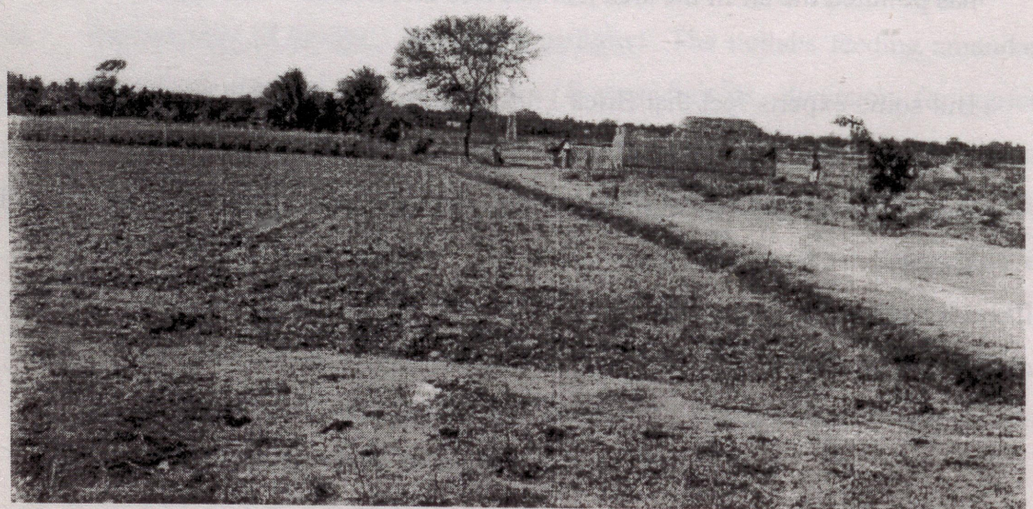
K) **Silt:** A large amount of silt is deposited on the tank bed, which has reduced the capacity of the tank.

L) **Brick kilns- A threat or Advantage?** A large number of brick kilns have come up along the dry eastern and northern parts of the tank. In order to supply bricks these factories are creating huge craters in the tank. This has disturbed the Amanikere's ecology. The aquatic species also find it difficult to improve their productivity. There have been instances were trees around the tank have been felled to be used for baking the bricks. The black soot emitted from brick burning has polluted the air in the area and has also affected the water quality.

But some experts feel that Brick kilns actually help the tank's ecology in a major way by removing silt deposits. This in turn creates more space for inflowing water and helps in rejuvenating some of the springs which feed this tank with fresh water.

7.View from east. The brick kilns can be seen.





8.Encroachments in the dried up tank bed in the eastern portion.

9.One of the nullahs feeding Amanikere





10.Another nullah feeding the Amanikere with its bed relatively intact.

11. View of one of the Nullahs feeding the tank. Note the overgrowth of the vegetation and the filed up bed.



12. Amanikere has become a major ground for dumping of waste, which includes toxic medical waste



7. RECOMMENDATIONS FOR STRATEGY TO CONSERVE AMANIKERE

1. Stop the inflow of sewage
2. Prevent dumping
3. Protect incoming/feeder nullahs
4. Stop encroachments
5. Prevent illegal sand lifting
6. Protect catchment area
7. Prevent large scale defecation
8. Prevent land sharks from grabbing the tank in the name of developmental projects
9. Remove silt
10. Regulation of brick manufacturing activities
11. Prevent poaching
12. Prevent occurrence of Water hyacinth
13. Involve masses in conservation of the wetland
14. Create recreational facilities for common man

8. RECOMMENDATIONS FOR ACTION PLAN TO CONSERVE AMANIKERE

1. Preventing the inflow of sewage: There are two options to achieve this. The first is to have a common point where the sewage can be collected and treated at a plant. The treated water can then be let in to the tank. The second option is to direct all the sewage away from the tank into a treatment plant. Either way a large number of resultant problems like emanating of foul stench, breeding of pigs and their carrying of diseases, profusion of water hyacinth and others can be avoided.

2. Protecting the feeder nullahs / streams: The protection of **nullahs**, which fed this tank, no matter how small or big they are, is extremely important in conserving the tank. The debris should be cleared of them, encroachments if any should be removed, the vegetation overgrowth should be removed and their banks should be strengthened.

3. Encroachments: Although encroachments pose a major **problem**, they should be tactfully handled. The first and the most important task is to prevent further encroachment into the tank. This can be done by fencing off the entire area. Trees can be grown along the boundary without destroying the existing vegetation *(NOTE: Tree and shrub species suitable to the area are indicated in the suggested tree and shrub species checklist)*. These pre-emptive measures will avoid all the *encroachment* related problems which will obviously arise later. As for the existing encroachments, action should be taken depending on the nature of encroachments

a. If there are residences and places of worship on the encroached lands, then their eviction is bound to create law and order problems. Hence they should be regularised only on the condition that their owners pay a fixed rate of fee. This fee should be balanced taking in view the existing market rates. The fund so collected can be exclusively utilised for the development of the tank. This will have a major effect on deterring further encroachments.

b. If the encroachments are being used for commercial purposes including agriculture then they should be evicted according to the law. This way prime land belonging to the tank can be reclaimed and fore shore planting can be done on it.

4. Protecting the catchment area: Steps should be taken to protect the catchment area. Deforestation, over grazing particularly by the goats should be prevented.

5. Remove Brick kilns: The authorities should take serious measures to prevent brick manufacturers from setting up brick kilns on the tank bed.

6. Stop Dumping: The dumping of urban waste should cease immediately. This can be done by:

A) Solid waste can be used for land filling like old and unused quarrying sites.

B) Organic waste be segregated and can be converted into bio manure.

C) The district administration and health authorities should take urgent steps to set up incinerators to safely dispose bio medical waste generated from the City's hospitals and clinics.

7. Eradicating Water hyacinth: Since the presence of sewage encourages the growth of Water hyacinth. The diversion of sewage will make conditions unfavourable for this weed to profuse. Once the sewage inflow is prevented, the deweeding then will bear good results. After deweeding, aquatic plants such as *Nelumbo nucifera, Nymphaea nouchali* can be introduced to keep the tank hygenic.

8. Open Air defecation: The city municipal authorities should initiate steps to prevent public from using Amanikere as a toilet. Pay and use toilets can be constructed and can be maintained on the lines of organisations like Sulabh International.

9. Silt Removal: The Karnataka Government has recently embarked upon a massive desilting programme covering thousands of tanks through out the state. The Government should also include the Tumkur Amanikere in this programme.

10. **Prevent poaching**: Steps have to be taken by the forest department to strictly enforce Wildlife Protection Act. Cases if any booked against poachers should be widely publicised so that poaching is prevented. Awareness to this effect has to be created by local wildlife NGOs.

11. Fish can be introduced by the fisheries department to keep the tank healthy and provide employment to many people.

12. **Ideal Centre for Nature and Environmental education**: Facilities should be created to use the tank as a centre for educating common man to learn about environment particularly the wetlands. School children can be encouraged to study the tank as an ideal wetland ecosystem. Since hundreds of birds' breed in the tank and hundreds more migrate into it- many from other countries, bird watching can be promoted as a creative hobby. Youth can be invited to nature conservation movement, thereby building a healthy society.

13. **As a recreation centre**: Infrastructure for recreational facilities should be created for the common man to avail. This will strongly involve the common man to conserve this tank.

A) A jogging track should be created within the fenced area along the boundary of the tank

B) Structures for sitting should be created for the people to enjoy the serene climate

C) A small portion of the tank towards southwestern part can be used for boating. Care should be taken to see that this does not disturb the birds.

D) All relevant measures should be taken to prevent plastic from polluting the area.

13. A committee should be created to overlook the development of the tank and prevent it from threats. This committee should include elected representatives, representatives of district administration, forest department, Environmental NGOs, and prominent members of the public.

SUGGESTED TREE SPECIES TO BE PLANTED:

1) *Terminalia arjuna*

2) *Lagerstroemia lanceolata*

3) *Tamarindus indica*

4) *Prosopis juliflora*

5) *Acacia ferruginea*

6) *Acacia polyacantha*

7) *Terminalia tomentosa*

8) *Artocarpus hirsutus*

9) *Mangifera indica*

10) *Acacia farnesiana*

11) *Muntugia calabura*

12) *Azadirachta indica*

13) *Madhuca longifolia*

14) *Bauhinia purpurea*

15) *Bombax malabarica*

16) *Ceiba pentandra*

17) *Butea frondosa*

18) *Erythrina stricta*

19) *Syzygium jambos*

20) *Ficus racemosa*

21) *Ficus religiosa*

22) *Ficus benghalensis*

SUGGESTED SHRUB SPECIES TO BE PLANTED:

1) *Ziziphus jujuba*

2) *Parkinsonia digitata*

3) *Adhatoda vasica*

4) *Bambusa arundinacea*

BRIEF REVIEW OF THE STRUGGLE OF TUMKUR'S PEOPLE TO SAVE AMANIKERE

Tumkur district is considered to be a hot bed of environmental activism. When it comes to conservation issues, large section of people of the district whole-heartedly involve themselves in any way they can. This has been a major reason for the periodic highlighting of environment related issues in the district.

The rapid urbanisation has beset its own ecological problems. Tumkur amanikere has been threatened for quite some time now. The will of the people came into open when there was a move in 1999 by the chairman of the Tumkur Road Safety Panel supporting the release of a portion of the area to set up a bus stand for private busses. A public meet was organised in Tumkur city by Tumkur Science Centre. The meet was called to discuss whether to protect Amanikere or not and was chaired Former Secretary for Environment and Forests, Shri. A.N.Yellappa Reddy. Among the guest of honours were, Shri.Gopala Krishne Gowda, Deputy Commissioner of Tumkur district, Shri. Harish Bhat from Centre for Ecological Sciences, Dr.Chakrapani, Shri.M.N.Narayanswamy,IFS, Deputy Conservator of Forests, and Shri.C.Jayaram,IFS, Deputy Conservator of Forests. The meet overwhelmingly resolved to protect the tank and not let it be used for any commercial purposes. It was decided to set up a committee to prepare a report to suggest ways to protect the tank. Members of the committee included Dr.H.S.Niranjan Aradhya, Dr.Mahesh G.S and Shri. Ameen Ahmed of WANC, Shri.Naveed Ahmed Khan, Shri.Panchalinge Gowda and Shri. Krishna from Karnataka Forest Department. Accordingly, Tumkur Science Centre prepared an excellent report under the guidance of Shri.C.S.Yatiraju. The report was submitted, in public, to all the elected representatives of Tumkur town. The responsible persons present on the dais spoke and promised to conserve amanikere. In the mean time WANC persuaded Karnataka Forest Department to put up a hoarding at a strategic location near the amanikere to educate people about the presence of migratory birds and the punishment for their poaching or disturbance.

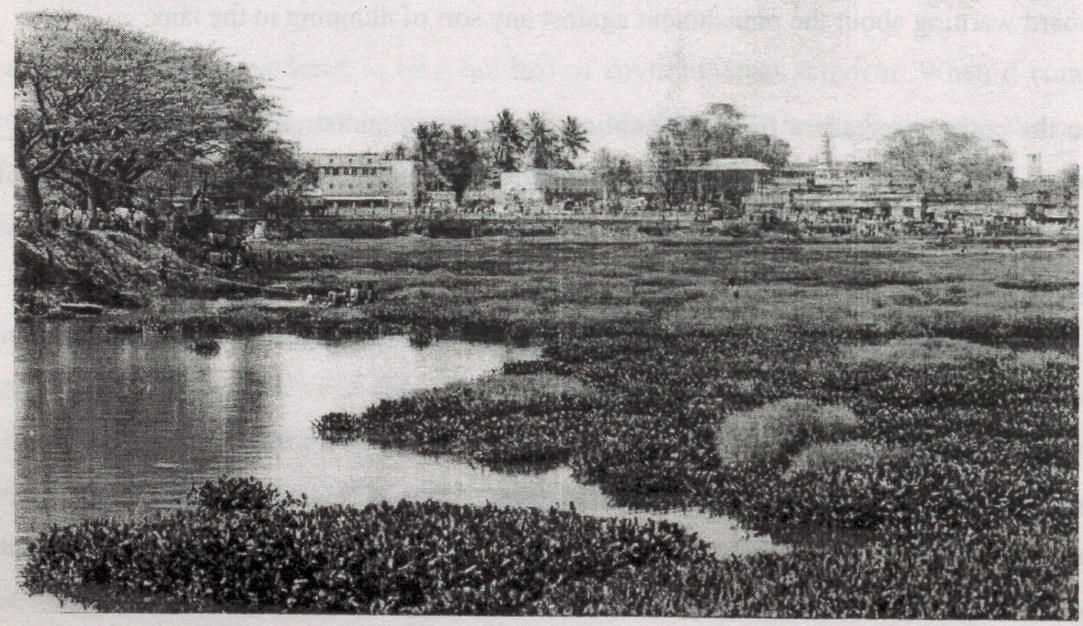
But shockingly, a few months later the President of the Tumkur City Municipality Council (CMC) wrote a letter to the Chief Engineer, Minor Irrigation Department, with a request to hand over 35 acres for the construction of a bus stand. The word is that many of the elected representatives of Tumkur town want to destroy the tank for commercial purposes, or else

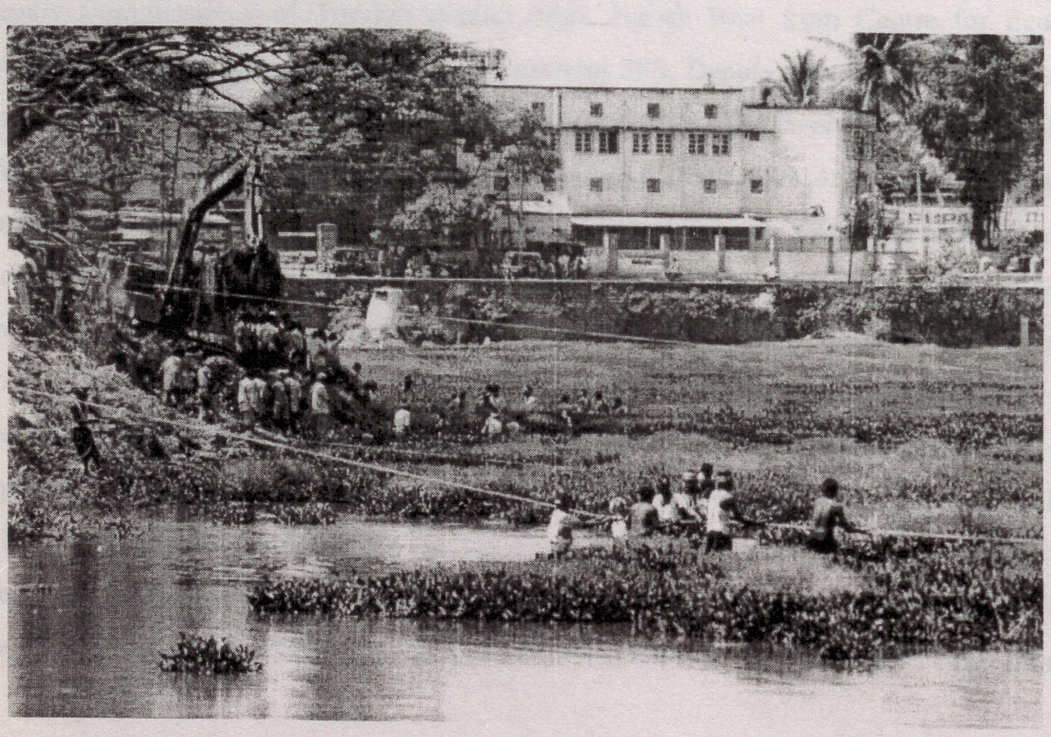
how could have such a step been taken by the CMC? Seeing the threat to the tank, some concerned citizens have gone to the Honourable High court and have forced a halt on converting the tank in to a commercial centre. Also the Minor Irrigation Department has put up a board warning about the punishment against any sort of dumping in the tank.

Due to the constant pressure from the public, the district administration recently launched a massive programme involving the public to remove water hyacinth. But only a very small amount of the tank could be cleared in spite of hundreds of men and many machines struggling for about a week. Even though the exercise was given up, the volunteering of a large number of people proved that the common man wants Amanikere to be protected at any cost.

Although for the time being the tank is secure against major threats like bus stand or a road, it continues to suffer due to the inlet of sewage and the strangulating encroachments, which are enough to kill this pride of Tumkur.

13. 'Operation clean up' of Amanikere





14. 'Operation clean up' of Amanikere –Another view

CHECKLIST OF FLORA AND FAUNA OF TUMKUR

AMANIKERE

Checklist 1: BIRDS

Common Name	Scientific Name	
1. Family: PODICIPITIDAE - Grebes		
Little Grebe -	*Tachybaptus ruficollis*	**Br.**
2. PELECANIDAE - Pelicans		
Spotbilled Pelican -	*Pelecanus philippensis*	**LM**
3. PHALACROCORACIDAE - Cormorants, Darters		
Large Cormorant -	*Phalacrocorax carbo*	**LM**
Little Cormorant -	*Phalacrocorax niger*	**LM**
Indian Shag or Snake bird -	*Phalacrocorax fuscicollis*	**LM**
Darter -	*Anhinga rufa*	**LM**
4. ARDEIDAE - Herons, Egrets		
Grey Heron -	*Ardea cinerea*	**LM**
Purple heron -	*Ardea purpurea*	**LM**
Pond heron / Paddy bird -	*Ardeola grayii*	**Br.**
Cattle egret -	*Bubulcus ibis*	**Br.**
Large Egret -	*Ardea alba*	**LM**
Smaller egret -	*Egretta intermedia*	**LM**
Night heron -	*Nycticorax nycticorax*	**LM**
5. CICONIIDAE - Storks		
Painted stork -	*Mycteria leucocephala*	**LM**
Openbill stork -	*Anastomus oscitans*	**LM**
White necked stork -	*Cioconia episcopus*	**LM**
6. THRESKIORNITHIDAE - Ibises, Spoonbills		
White Ibis -	*Threskiornis aethiopica*	**LM**
Black Ibis -	*Pseudibis papillosa*	**LM**
Spoon bill -	*Platalea leucorodia*	**LM**
7. ANATIDAE - Ducks, Geese		
Lesser Whistling Teal -	*Dendrocygna javanica*	**LM**
Large Whistling teal -	*Dendrocygna bicolor*	**LM**
Pintail -	*Anas acuta*	**M**
Common teal -	*Anas crecca*	**M**
Spotbill duck -	*Anas poecilorhyncha*	**LM**
Common Pochard -	*Aythya ferina*	**M**
Cotton teal -	*Nettapus coromandelianus*	**Br.**

8. ACCIPITRIDAE - Hawks, Vultures

Black winged Kite -	*Elanus careuleus*	
Pariah Kite -	*Milvus migrans govinda*	**Br.**
Brahminy kite -	*Haliastur badius*	**Br.**
Shikra -	*Accipter badius*	
Indian Long billed Vulture -	*Gyps indicus*	
Indian White backed Vulture -	*Gyps bengalensis*	
Egyptian or Scavenger Vulture -	*Neophron percnopterus*	
Marsh harrier -	*Circus aeruginosus*	**M**
Crested Serpent Eagle -	*Spilornis cheela*	
Osprey -	*Pandion haliaetus*	**M**

9. PHASIANIDAE - Quails, Partridges

Grey Partridge -	*Francolinus pondicerianus*	

10. RALLIDAE - Coots

White breasted waterhen -	*Amaurornis phoenicurus*	**Br.**
Indian Moorhen -	*Gallinula chloropus*	**Br.**
Purple Moorhen -	*Porphyrio porphyrio*	**Br.**
Coot -	*Fulica atra*	**Br.**

11. JACANIDAE - Jacanas

Pheasant tailed Jacana -	*Hydrophasianus chirurgus*	**Br.**
Bronze winged Jacana -	*Metopidius indicus*	**Br.**

12. RECURVIROSTRIDAE - Stilts

Black wing stilt -	*Himantopus himantopus*	**M**

13. CHARADRIIDAE - Lapwings, Plovers, Sandpipers

Red wattled Lapwing -	*Vanellus indicus*	**Br.**
Little Ringed plover -	*Charadrius dubius*	**M**
Wood sandpiper -	*Tringa glareola*	**M**
Common sandpiper -	*Tringa hypoleucos*	**M**
Little stint -	*Calidris minuta*	**M**

14. LARIDAE - Gulls, Terns

Indian River Tern -	*Sterna aurantia*	**LM**

15. COLUMBIDAE - Doves, pigeons

Blue Rock Pigeon -	*Columba livia*	**Br.**
Indian Ring Dove / Collared Turtle Dove -	*Streptopelia decaocta*	
Little Brown Dove -	*Streptopelia senegalensis*	

16. PSITTACIDAE - Parakeets

Rose ringed Parakeet -	*Psittacula krameri*	**Br.**

17. CUCULIDAE - Cuckoos

Pied Crested Cuckoo -	*Clamator jacobinus*	**LM**
Crow Pheasant / Coucal -	*Centropus sinensis*	

Brain fever bird -	*Cuculus varius*	
Koel -	*Eudynamys scolapacea*	**Br.**
18. STRIGIDAE - Owls		
Barn Owl -	*Tyto alba*	
Spotted Owlet -	Athene brama	**Br.**
19. APODIDAE - Swifts		
House Swift -	Apus affinis	**LM**
Palm Swift -	Cypsiurus parvus	**LM**
20. ALCENIDAE - Kingfishers		
Lesser Pied Kingfisher -	Ceryle rudis	**Br.**
Small blue / Common kingfisher -	Alcedo athis	**Br.**
White breasted Kingfisher -	Halcyon smyrnensis	**Br.**
21. MEROPIDAE - Bee - Eaters		
Blue tailed Bee-eater -	Merops philippinus	**LM**
Green Bee-eater -	Merops orientalis	**Br.**
22. CORACIIDAE - ROLLERS		
Indian Roller -	Coracias benghalensis	
23. UPUPIDAE - Hoopoes		
Hoopoe -	Upupa epops	**Br.**
24. CAPITONIDAE - Barbets		
Small green barbet -	Megalaima viridis	**Br.**
Coppersmith / Crimson breasted barbet -	Megalaima haemacephala	
25.PICIDAE - Woodpeckers		
Larger golden backed woodpecker -	Chrysocolaptes lucidus	
26. ALAUDIDAE - Larks		
Red winged bush-lark -	Mirafra erythroptera	
Ashy crowned finch-lark -	Eremopterik grisea	
27. HIRUNDINIDAE - Swallows		
Dusky crag martin -	Hirundo concolor	
Wire tailed swallow -	Hirundo smithii	**M**
Red rumped swallow -	Hirundo daurica	**M**
28. LANIDAE – Shrikes		
Bay backed shrike -	Lanius vittatus	
29. ORIOLIDAE - Oribles		
Golden Oriole -	Oriolus oriolus	**LM**
30. DICRURIDAE – Drongos		
Black Drongo or King Crow -	Dicrurus adsimilis	**Br.**
Grey / Ashy Drongo -	Dicururs leucophaeus	**LM**

31. ARTAMIDAE - Swallow-shrikes

Ashy swallow-shrike -	Artamus fuscus

32. STURNIDAE - Mynas

Grey headed Myna -	Sturnus malabaricus blythi
Brahminy myna -	Sturnus pagodarum **Br.**
Common Myna -	Acridotheres tristis **Br.**
Jungle Myna -	Acridotheres fuscus

33. CORVIDAE - Crows

House Crow -	Corvus splendens **Br.**
Jungle Crow -	Corvus macrorhynchos **Br.**

34. CAMPEPHAGIDAE - Cuckoo - shrikes

Common wood shrike -	Tephrodornis pondicerianus

35. IRENIDAKE - Leafbirds, Ioras

Common iora -	Aegithina tiphia

36. PYCNONOTIDAE - Bulbuls

Red whiskered bulbul -	Pycnonotus jocosus **Br.**
Red vented bulbul -	Pycnonotus cafer **Br.**
White browed bulbul -	Pycnonotus luteolus

37. MUSCICAPIDAE

Subfamily - TIMALIINAE - Babblers

Jungle Babbler -	Turdoides striatus
White headed Babbler -	Turdoides affinis

Subfamily -MUSCICAPINAE - Flycatchers

Brown flycatcher -	Muscicapa latirostris **LM**

Subfamily - SYLVINAE - Warblers

Plain wren warbler -	Prinia subflava **Br.**
Ashy wren warbler -	Prinia socialis **Br.**
Tailor Bird -	Orthotomus sutorius **Br.**
Blyth's Reed Warbler-	Acrocephalus dumetorum **M**
Lesser white throat -	Sylvia curruca **LM**

Subfamily- Robins

Magpie Robin -	Copsychus saularis **Br.**
Black Redstart -	Phoenicurus ochruros **M**
Pied Bush Chat -	Saxicola caprata
Indian Robin -	Saxicoloides fulicata

38. PARIDAE - Tits

Grey tit	-	Parus major

39. MOTACILLIDAE - Pipits & Wagtails

Paddyfield pipit	-	Anthus novaeseelandiae **M**
Yellow Headed Wagtail	-	Motacilla citreola **M**
Grey Wagtail	-	Motocilla cinerea **M**
Large Pied Wagtail	-	Motocilla maderaspatensis **M**

40. DICAEIDAE - Flower peckers

Tickell's Flower Pecker	-	Dicaeum erythrorhynchos **Br.**

41. NECTARINIIDAE - Sunbirds

Purple rumped sunbird	-	Nectarinia zeylonica **Br.**
Purple sunbird	-	Nectarinia asiatica **Br.**

42. ZOESTORIDAE - White eyes

White Eye	-	Zoesterops palpebrosa

43. PLOCIDAE

Subfamily - PASSERINAE - Sparrows

House sparrow	-	Passer domesticus **Br.**

Subfamily - PLOCINAE

Baya	-	Ploceus philippinus **Br.**

Subfamily - ESTRILDINAE

Red Munia	-	Estrilda amanadava **Br.**
White backed Munia	-	Lonchura striata **Br.**
White throated Munia	-	Lonchura malabarica **Br.**
Spotted Munia	-	Lonchura punctulata **Br.**
Blackheaded Munia	-	Lonchura malacca **Br.**

LM - Local Migrants from nearby districts /states.
M - Migrants from other countries
Br - Birds breeding within the lake or in the trees/man made structures adjoining lake boundaries

Checklist 2: BUTTERFLIES

Common Name	**Scientific Name**

Danaidae

Blue Tiger -	*Tirumala limniace exoticus*
Common Crow -	*Euploea core core*
Plain Tiger -	*Danaus chrysippus chrysippus*
Striped Tiger -	*Danas genutia genutia*

Lycaendae

Common Cerulean -	*Jamides celeno aelianus*
Common Pierrot -	*Castalius rosimon rosimon*
Pale Grass Blue -	*Zizeeria maha ossa*

Nymphalidae

Baron -	*Euthalia aconthea meridionalis*
Baronet -	*Symphaedra nais*
Blue Pancy -	*Precis orithya*
Common Castor -	*Ariadne merione merione*
Common Leopard -	*Phalanta phalantha phalantha*
Common sailor -	*Neptis hylas varmona*
Danaid Eggfly -	*Hypolimnas misippus*
Lemon Pansy -	*Precis lemonias lemonias*
Yellow Pansy -	*Precis hiertia hierta*

Papilonidae

Common Blue Bottle -	*Graphium sarpedon teredon*
Common Mormon -	*Papilio polytes polytes*
Common Rose -	*Pachliopta aristolochiae aristolochiae*
Lime Butterfly -	*Papilio demoleus*
Tailed Jay -	*Graphium agamemnon menides.*

Pieridae

Common Emigrant -	*Catopsilla crocale*
Common Grass Yellow -	*Eurema hecabe simulate*

Satyridae

Common Evening Brown -	*Melantis leda leda*

Checklist 3: SPIDERS **Checklist 3: SPIDERS**

No.	Common Name	Scientific Name
1	Speckled Band – Four leg	Argiope anasuja
2	Banded Four leg	*Argiope pulchella*
3	Long – Horned orb	*Gasteracantha dalyi*
4	Tri banded Spiky orb	*Gasteracantha geminata*
5	Green Lynx	*Peucetia viridane*
6	Box longlegs	*Crosspriza lyoni*
7	Common Big – Jaw	Tetra gnatha mandibulata
8 & 9	Social Spiders	*Eresidae* (2 species)
10, 11 & 12		3 unidentified species

Reference:
Preston Ahimaz, Vijayalakshmi. K., ***Spiders: An Introduction***.

Checklist 4: MAMMALS

Common Name	Scientific Name
Primates	
Bonnet Macaque	*Macaca radiata*
Mangooses	
Common Mongoose	*Herpestes edwardsi*
Rodents	
Three stripped Palm Squirrel	*Funambulus palmarum*
Indian Field Mouse	*Mus booduga*
Common House Rat	*Rattus rattus*
Bandicoot Rat	*Bandicota indica*

Checklist 5: AMPHIBIANS

Frogs:
Green Pond Frog
Indian Bull Frog
Baloon Frog
Funny Looking Frog
Rana cyanopllyctie

Toads
Common Indian Toad
Marbled Toad

Checklist 6: REPTILES

Snakes:
11 species of snakes have been recorded in and around the lake. Most of the snakes, particularly the ***Rat snake*** help to control the rat population.

No.	Common name	Scientific name
1	Common worm snake or Blind snake	Typhlina bramina
2	John's Earth Boa	*Eryk johni*
3	Trinket Snake	*Elaphe helena*
4	Common Rat Snake or Dhaman	*Ptyas mucosus*
5	Common Kukri Snake	*Oligodon arnensis*
6	Common Wolf Snake	*Lycodon aulicus*
7	Checkered Keel back	*Xenochrophis piscator*

8	Olivaceous Keel back	*Atretium schistosum*
9	Green Keel back	*Macropisthodon plumbicolor*
10	Common Green Whip Snake	*Ahaetulla nasutus*
11	Indian Cobra	*Naja naja*

Tortoises/Turtles -

Fresh water or Mud Turtles

Peninsular Mud Turtle or Flap Shell - *Lissemys punctata granasa*

Fresh water Tortoises or Terrapins

Indian Pond Terrapin - *Melanochelys trijuga trijuga*

Land Tortoises

Starred Tortoise - *Geochelone elegans*

Lizards

Geckos

Southern Hill Gecko - *Hemidactylus frenatus*

Termite Hill Gecko - *Hemidactylus triedus*

Agamids

Common Garden Lizard or Blood sucker - *Calotes versicolor*

Skinks

Common or Brahminy Skink - *Mabuya carinata*

9. REFERENCES

> Tumkur Amanikere Sanrakshane- Yeke Mattu Hege? **Tumkur Science Centre and Save Tumkur Amanikere Committee**

> Mysore Gazetteer, 1930

> Daniel. J.C., ***The book of Indian Reptiles***, BNHS-OXFORD.

> Prater. S.H., ***The book of Indian Animals***, BNHS-OXFORD

> Preston Ahimaz, Vijayalakshmi. K., ***Spiders: An Introduction***.

> ***Field Guide - Some South Indian Butterflies***, Nilgiri Wildlife and Environment Association.

> Ali. S & Ripley .D., ***A pictorial Guide to the birds of the Indian sub-content.***

> Ali. S., ***The book of Indian Birds***, BNHS - OXFORD.

> *Asia Waterfowl Census 1993*, **Asian Wetland Bureau and International Wetlands Research Bureau.**

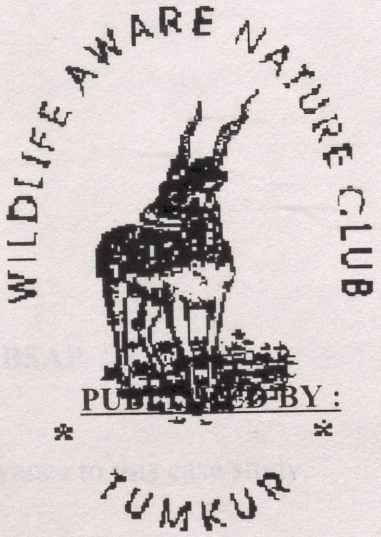
> Lopez.A and Mundkur.T (eds) 1997, "***The Asian Waterfowl census 1994 – 1996, Results of the coordinated water bird census and an overview of the status of wetlands in Asia***", Wetlands International, Kuala Lumpur

> ***The Naturalist***, Volume 7, Issue 2, March - April 1997, News letter of Wildlife Aware Nature Club

BHADRA TIGER RESERVE – A CASE STUDY*



** Conducted as a part of Karnataka bio-diversity Strategy and Action Plan (KBSAP)*



WILDLIFE AWARE NATURE CLUB
Nisarga, Nisarga Layout,

TUMKUR- 572103

OCTOBER 2001

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6e) Findings/Data Collected

> Number of villages to which questionnaires were sent

> Number of villages from which questionnaires were received

> Number of villages visited by WANC members

> Excerpts / Comments of interviews

> Man- Animal conflict

> Threats to Flora and Fauna

7. RECOMMENDATIONS FOR STRATEGY TO CONSERVE BHADRA TIGER RESERVE

8. RECOMMENDATIONS FOR ACTION PLAN TO CONSERVE BHADRA TIGER RESERVE

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10. Note on Acquisition and Rehabilitation in Bhadra Wildlife Sanctuary

WANC MEMBERS WHO CONTRIBUTED TO THIS PROJECT

The following members comprised of the WANC team who conducted this project

1. Murthy.T.V.N.
2. Dr.Mahesh.G.S
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4. Prasanna.D.R
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6. Gundappa.B.V
7. Ameen Ahmed
8. Vismaya Naik
9. Santosh.T.M
10. Chandrashekhar Upadhyaya
11. Mallikarjun

THIS REPORT HAS BEEN EDITED BY: Ameen Ahmed

1. PREFACE

Wildlife Aware Nature Club: WANC - as it is popularly known, was established in 1990 by a few young nature lovers. It was the first organization to be formed in Tumkur district for the cause of nature and wildlife conservation. WANC today is considered as the most active & dedicated environmental NGO in this region. Among its activities, WANC has been involved in many surveys of important wildlife areas of Karnataka, to help in their better management. This case study on Bhadra Tiger Reserve is an extension of its activities and its commitment to conservation. WANC is proud to be associated with the KBSAP under the agesis of the prestigious Centre for Ecological Sciences of Indian Institute of Science (IISc), Bangalore and the Karnataka Forest Department.

2. ACKNOWLEDGEMENTS

This report is the outcome of the faith reposed in WANC by Prof. Madhav Gadgil of CES, for which WANC is grateful to him. The wildlife wing of the Karnataka Forest Department led by Sri. S.K.Chakrabarthy, Chief Wildlife Warden and Principal Chief Conservator of Forests (Wildlife) and his subordinates Sri.Yatish Kumar, Deputy Conservator of Forests (Bhadra Wildlife Division), Mr.Thimmaiah, Assistant Conservator of Forests (Chikmagalur wildlife Sub-division), Mr. Nagaraj, Assistant Conservator of Forests (Lakvalli wildlife Sub-division) and all concerned officials of the Forest Department lent all possible support to the smooth functioning of this study. Mr.Kenchappa and Mr.Chandrashekaraiah Chief Secretaries of Chikmagalur Zilla Panchayat and Shimoga Zilla Panchayat were extremely helpful in the WANC members to approach the concerned Gram Panchayats. Also the data collection would not have been possible but for the reliable information given by the respective Mandal and Gram Pradhans.

3. LIST OF PHOTOGRAPHS AND MAPS

1. *The 300-year-old Jagara giant tree is the biggest teak tree in Karnataka, with a girth of 5.21 metres.*

2. *Due to the presence of a viable population of tigers the sanctuary was declared as a tiger reserve in 1999*

3. *The 200 Sq. K m. Bhadra Reservoir divides the Aldera state forest in the north from the main body of the sanctuary.*

4. *There are about 16 villages within the sanctuary supporting 736 families.*

5. *WANC members visited all villages within the sanctuary and 25 villages along the periphery of the sanctuary.*

6. *A photo of WANCers during one of their visits to the villages.*

7. *After the visits to the villages, two group interactions were held during the weekly village fairs at Siruvase and Mallandur in mid June*

8. *Posters were displayed at the village fairs to attract them to the group discussions.*

9. *Many coffee estates pollute the sanctuary's water sources by pumping the untreated water into the sanctuary flowing in their vicinity.*

10. *Map of Bhadra Wildlife Sanctuary*

4. BHADRA TIGER RESERVE



Nestled amidst the scenic ranges of the Western Ghats is India's youngest Tiger Reserve – Bhadra Wildlife Sanctuary. It is spread across the Malnad districts of Chikmagalur and Shimoga

4a) LOCATION:

Geographical co-ordinates:

N: 13 25' to 13 50'

E: 75 15' to 75 50'

4b) AREA: 492.46 sq. km

Core Zone: 133 sq. km

Tourism Zone: 100.83 sq. km

Buffer zone: 258.63 sq. km

The entire sanctuary is divided into three parts. While the Aldera state forest is divided from the main body to south by the expansive Bhadra reservoir (200 Sq. km), private coffee estates surround the Baba budain giri reserve forest.

4 c) TERRAIN:

The saucer shaped Jagara Valley lies within the Horseshoe shaped Bababudan hills. The terrain within the valley undulates gradually while the surrounding peaks are of towering height. The lowest point in the sanctuary is 2267 feet at the junction of Thadabehalla and Somavahini halla. The highest point is Bidddigiri, about 4636 feet above sea level. The nearby Mullainagiri peak is 1900 metres (6317 feet), the highest in Karnataka.

4d) CLIMATE:

Temperatures in the Jagara valley range from 8 C to 35 C, while the surrounding peaks are even colder during winter. Southwest monsoons drain the Jagara valley with about 2500 mm of rain, chiefly between early June and late September. But the plains in the northern part of the sanctuary receive less than a thousand mm of rainfall.

4e) FLORA:

Bhadra is mosaic of different habitats with Bamboo being very common. In northern part of the sanctuary the habitat is mainly dry deciduous. Towards south the trees are much taller and are of moist deciduous type. Baba budain giri state forest, which is in the eastern part of the sanctuary, consists of Shola evergreen forests. Plantations of teak and eucalyptus are present in parts of the sanctuary. Jagara giant is a huge teak tree, considered to be the biggest in Karnataka. The girth of this 300-year-old tree is 5.21 metres.

4f) FAUNA:

The sanctuary is extremely rich in wildlife, due to its proximity to Western Ghats and the diverse habitat. These forests have always been known for the big wild cats. Until the formation of the sanctuary these forests were a happy hunting ground for hunters, considered by many of them as a Paradise on earth. Well-known hunter Kenneth Anderson claimed to have shot many tigers here, including the `Lakvalli man-eater' fearing whom, construction work of the huge Bhadra reservoir had to be briefly abandoned. The sanctuary even today has a very healthy tiger population, the reason for which it was recently declared as a tiger reserve. Leopards, wild dogs, jungle cats, jackal, striped hyena and Indian fox are the main predators found here. Elephants have made Bhadra as their home since long. Bhadra is known for its large population of Gaur. A severe outbreak of rinderpest or `foot and mouth' epidemic during late eighties, led to the death of many gaurs. The strict protection being afforded by the forest department has once again raised their numbers considerably. Chital or spotted deer is the commonest deer here. Sambar and barking deer are also found here. Among the smaller mammals are: Slender loris, Porcupine, Black napped hare and mouse deer. Giant malabar squirrels, typical of the Western Ghats, can be seen in plenty in Muthodi area. Along the many streams and Bhadra reservoir, Otters and Marsh crocodiles can be seen. The southern part of Bhadra, particularly the area around Muthodi is extremely rich in birds, butterflies and reptiles. The sanctuary is home to over 250 species of birds, many of which like the malabar pied hornbill, malabar Trogon, blue winged parakeet are endemic to the Western Ghats. Some of India's most beautiful and big butterflies like southern birdwing and blue mormon are found here. Rare and unique reptiles like the flying lizard can be seen gliding amidst the huge trees here. Apart from King Cobra- the largest poisonous snake on earth, Malabar pit vipers and rare coral snakes are found here.

The 300-year-old Jagara giant tree is the biggest ***teak tree in Karnataka, with girth of 5.21 metres***



Due to the presence of a viable population of tigers the sanctuary was declared as a tiger reserve in 1999



4g) WATER RESOURCES:

Numerous streams most of which feed the Bhadra River flow through these pristine forests, forming an abundant source of water for the wildlife here. Among them is the Somavahini halla, which flows through the tourist complex of Muthodi. During summer many animals can be found along the banks of Bhadra reservoir.

4h) LEGAL STATUS:

This forest was first given the status of a protected area in 1952 when 252 sq. km (77.45 Sq. miles) of it was declared as Jagara Valley Wildlife Sanctuary, in 1952, named after the hamlet of Jagara, vide Govt. notification No: A & F 6175 /90 (1) FT 112-40-2 dated 21st February 1951. The area was enlarged to the present 492 sq. km in September 1974 and renamed as Bhadra, vide notification AFD 25 FWL 74 dated 25th September 1974. The final notification was issued in 1998 vide G.O.No.FEE 58 FWL 96 dated 9th March 1998. Due to the healthy tiger population and the prospects of the area as a long-term habitat for the tiger and related species to thrive, the Govt. of India upgraded it into a tiger reserve on 19th November 1998.

4i) VILLAGES / SETTLEMENTS WITHIN THE SANCTUARY:

There are 16 villages within the sanctuary with few basic amenities supporting 736 families.

The 200 Sq. Km. Bhadra Reservoir divides the Aldera state forest in the north from the main body of the sanctuary.



There are about 16 villages within the sanctuary, supporting a 736 families.



4j) APPROACH:

There are two approaches to the sanctuary from Bangalore. The one from north is from Tarikere. Muthodi in the south can be approached via Chikmagalur (33 km by road). The nearest railhead in south is Kadur, which is 40 km from Chikmagalur. To north, Tarikere is the nearest Railhead



4k) TOURISM:

Muthodi is the main place for tourists to stay in Bhadra. There are a number of cottages here along with a couple of dormitories and rest houses. There are excellent facilities to organise nature camps. During rainy season, chances of sighting wildlife decrease due to misty conditions and the dense vegetation cover. But the scenery within and around the sanctuary with the backdrop of the Bababudan giri hills, during this period is spectacular. Sigekhan, a couple of kilometres from Muthodi, is one such place. Standing atop the isolated forest bungalow one can enjoy entire landscape of the horseshoe shaped Bababudan giris and the Jagara valley within it. A walk around this place early morning or late evening can reveal interesting wildlife. Kemmanagundi and Bababudan giri are the two hill stations near Muthodi. The Salim Ali Nature centre has a few trophies of wild animals along with a good library. Also there are facilities to screen wildlife movies on video. The best time to visit the park is from October to March. It is not advisable to visit the park during peak summer or from July to August when the monsoons are at their fury.

5. INTRODUCTION TO KBSAP (Karnataka state Biodiversity Strategy and Action Plan)

India is a land rich in diverse forms of life. But unfortunately much of this is under threat due to a host of reasons. Serious attempts are being made from various quarters to save this precious natural wealth. The Government of India under the Ministry of Environment and Forests (MoEF) has initiated a project for the preparation of a National Bio-diversity Strategy and Action plan (NBSAP). This project, which is participatory in nature with inputs from a broad spectrum of the society, aims at conservation of biological diversity, its sustainable utilization and equal sharing of benefits.

The Centre for Ecological Sciences at the Indian Institute of Science is co-ordinating at state level the preparation of Karnataka state Bio-diversity Strategy and Action plan (KBSAP). This attempt in Karnataka will broadly include the following six themes:

(a) Management of protected areas

(b) Medicinal plants

(c) Freshwater fishes

(d) Wetlands

(e) Cultural traditions of conservation, and

(f) Land races of cultivated plants.

To harness the ideas of the common man and expertise of technical people in Karnataka, a 4-way approach is being adopted. Among these are case studies of selected areas by leading NGOs. Wildlife Aware Nature Club (WANC) has been identified by the CES to take up case studies on Bhadra Tiger Reserve and Tumkur Amanikere.

6. THE CASE STUDY

6 a) AIMS OF THE STUDY:

India is a land extremely rich in natural wealth. But much of this is under threat due to many factors. Of the 17 % of land mass under forest cover in our country, only 3.3% has been set apart for wildlife sanctuaries and a mere 1.1% has been reserved for National Parks. Karnataka has 21 wildlife sanctuaries and 5 national parks. Like other states of the nation, even here the sanctuaries are facing varying degree of pressure. There are various lines of thoughts on how to protect these areas. While some would like wildlife to be given priority over humans in these areas, others advocate equal rights for both wildlife and forest dwelling humans.

This KBSAP initiated case study on Bhadra wildlife sanctuary aims to thoroughly review the current status and difficulties associated with the management of Protected Areas. This study aims to come out with relevant measures for the successful management of Protected Areas through the KBSAP.

6 b) METHODS OF STUDY:

As mentioned, earlier (see chapter 4, ***About Bhadra Wildlife Sanctuary***), there are 16 villages / hamlets inside the sanctuary. Apart from the residents of these 16 villages, there are more than 30 villages along the periphery of the sanctuary, many of whose residents are in one way or the other associated with the sanctuary and its wildlife. In order to get fair views from all these villages, WANC adopted two methods to under take the study:

1.) Direct and **2.) Indirect**

1) Indirect:

To complete the case study under the given period of time and at the same time for the WANC members to personally visit all the villages in and around the sanctuary was a very difficult task. Hence a novel idea to send questionnaires to each of these villages was adopted (Questionnaire included below). WANC took the help of the Chief Secretaries of Chikmagalur and Shimoga Zilla Panchayats in approaching the respective Gram Panchayats to make it sure that the questionnaires reach all the villages. While many of the Gram

Panchayats returned the questionnaires by post, some were personally collected by WANC members at the respective Gram Panchayat offices.

2) Direct:

i) Field Visits: Apart from the villages to which the questionnaires were sent, WANC members paid field visits to all the 16 villages coming within the sanctuary area. Apart from this 25 Villages along the sanctuary periphery were visited. This was done to collect the views and information from villagers and forest officials who work at the field/grass root level, apart from getting a first hand experience of the relevant things. By doing this, a fair representation of views through out the sanctuary could be elicited.

ii) Group Discussions: Two Group discussions were held along with the villagers during the Village Fairs of Siruvase and Mallandur in June 2001. Posters on wildlife and Bhadra sanctuary were displayed during the fairs first at Siruvase then at Mallandur. This attracted a number of Villagers and also coffee planters. Questions were posed to the visiting villagers taking care that people were in groups of same villages. This would reduce the margin for errors for the data provided. This way some extremely important and otherwise unknown data was collected like that of the cattle lifting at Bogase village.

6 c) RESOURCES / BASE LINE DATA:

Before initiating the actual fieldwork, attempts were made to collect the updated information on the sanctuary. The following documents were referred:

i) Gazetteer: Year 1930 Mysore State

ii) Topo Sheets: The following Survey of India Sheets were used to get a picture of the topography, location of the villages, approaches etc.

No: 48 O/7(1979),

No: 48 O/9(1980)

No: 48 O/10(1979)

No: 48 O/11(1978)

No: 48 O/14(1979)

FSI No. 480 (1986)...

iii) Books / Literature: The following literature proved very helpful in getting reliable data of the Sanctuary particularly its flora and fauna.

a) Shekar Singh, Ashish Kothari et al., ***Directory of National Parks and Wildlife Sanctuaries of Karnataka***. Published by Indian Institute of Public Administration, New Delhi.

b) G.N.Srikantaiah, I.F.S, (DCF, Chikmagalur Division), Dr.S.Subramanya, I.A.S. (Deputy Commissioner, Chikmagalur District), ***Bhadra Wildlife Sanctuary, Acquisition, Rehabilitation and Resettlement Project.*** Government of Karnataka, February 1992.

c) Karanth, Ullas K (1982): ***Bhadra Wildlife Sanctuary and its endangered ecosystem***, Journal of Bombay Natural History Society, Vol.79(1), Pages 79 – 86.

iv) Field visits by WANC members: Since its formation in 1990 WANC members have been regularly visiting the various forests and Wildlife habitats. As a part of this, on several occasions members have visited Bhadra sanctuary and its surrounding forests and villages. Most of the observations particularly those pertaining to the flora and the fauna have been documented by members. Apart from this WANC had organised two nature camps at Muthodi in the heart of the sanctuary for 8 days during the Wildlife Week (I week of October) of 1997. All this has placed WANC in a better position to carry out the case study in a fair manner and do justice to the faith reposed in it.

WANC members visited all the villages within the sanctuary and 25 villages along the periphery of the sanctuary.



A photo of WANCers during one of their visits to the villages.



After the visits to the villages, two group interactions were held during the weekly village fairs at Siruvase and Mallandur in mid June





Posters were displayed at the village fairs to attract them to the group discussions.

6 d) CONSTRAINTS:

Time was probably the only constraint during the case study. If the project was for a period more than the present 5 months then more villages could have been visited, making the data collected even more reliable and accurate.

6 e) FINDINGS / DATA COLLECTED FROM STUDY:

i) Findings of Indirect survey

I. Villages inside the Sanctuary:

Name of Village	Taluk	Total population (apprx)	Cattle population (apprx)	Families	Forest encroachment	Main problems		Remarks
					Y/N	To man		
						Cattle lifting (apprx)	Crop raid (apprx)	
Hebbe	Chk	400	500	97	Y	Y(T,L) 80	Y(WB,E)	
Madla	Chk	350	2000	159	Y	Y(T,L) 10	Y(WB,E)	
Hipla	Chk	300	500	98	Y	Y(T,L) 10	Y(WB,E)	Eshwara temple (400 yrs)
Keseve	Chk	300	150	60	Y	Y(T,L) 15	Y(WB,E)	Brahma temple
Muthodi	Chk	120	120	36	Y	Y(T,L) 5	Y(WB,E)	
Karuvane	Chk	150	150	52	Y	Y(T,L) 4	Y(WB,E)	
Waddihatti	Chk	200	200	51	Y	Y(T,L) 5	Y(WB,E)	
Hebbekurkul mane	NRP	30	50	7	Y	Y(T,L)	Y(WB,E)	
Bidare	NRP	50	50	12	Y	Y(T,L)	Y(WB,E)	

Shiragola	NRP	150	200	40	Y	Y(T,L) 20	Y(WB,E)	Rama,chennakeshava,mallikarjuna temples
Balegadde	NRP	50	50	20	Y	Y(T,L)	Y(WB,E)	
Mutt	NRP	75	100	24	Y	Y(T,L)	Y(WB,E)	
Hunasekatte	NRP	40	50	15	Y	Y(T,L)	Y(WB,E)	
Heggarmattuvane	NRP	110	150	68	Y	Y(T,L)	Y(WB,E)	
Kancugar	NRP	25	35	7	Y	Y(T,L)	Y(WB,E)	
Madhuguni	NRP	100	150	28	Y	Y(T,L) 20	Y(WB,E)	

NOTE:

CHK – Chikmagalur taluk

NRP - N.R.Pura taluk

II. Villages outside the Sanctuary:

Name of Village	Total population (apprx)	Cattle population (apprx)	Families (apprx)	Forest encroachment	Main problems	
					To man	
				Y/N	Cattle lifting	Crop raiding
Khandya	150	300	30	Y	Y(T,L) 5	Y(WB,E)
Suguduvani	200	500	50	Y	N	Y(WB,E)
Bidare gundi hambala	72	50	30	Y	Y(T,L)	Y(WB,E)
Kodihirebylu	350	500	80	Y	Y(T,L)	Y(WB,E)
Trasamutta	100	150	35	Y	Y(T,L)	Y(WB,E)
Kara Gadde	122	60	35	Y	Y(T,L)	Y(WB,E)
Kundur	150	300	40	Y	Y(T,L) 20	Y(WB,E)
Kenchi Koppa	600	700	350	Y	Y(T,L) 10	Y(WB,E)
Honne Koppa	300	110	63	Y	Y(T,L) 6	Y(WB,E)
Byre makki	160	50	36	Y	N	N
Magalu	280	200	55	Y	N	N
Chandra valli dapti	500	150	93	Y	N	N
Bale koppa	150	80	30	Y	Y(T,L)	Y(WB,E)
Bidare Patna	50	40	15	Y	Y(T,L)	Y(WB,E)
Karadi Khana	350	40	80	Y	Y(T,L)	Y(WB,E)
Badigere	400	300	150	Y	Y(T,L)	Y(WB,E)

Siravase	500	400	200	Y	Y(T,L) 15	Y(WB,E)
Bogase	150	250	50	Y	Y(T,L) 40	Y(WB,E)
Kodi	250	300	70	Y	Y(T,L) 20	Y(WB,E)
Kodi coffee estate	100	130	35	Y	Y(T,L)	Y(WB,E)
Dabbare	110	125	40	Y	Y(T,L)	Y(WB,E)

ii) Findings of Direct survey

Number of villages visited by WANC members.

a) ***Within the Sanctuary*****.....**

Name of Village

1. Hebbe
2. Madla
3. Hipla
4. Keseve
5. Muthodi
6. Karuvane
7. Madla – Waddihatti
8. Hebbe Kurkulmane
9. Bidare
10. Shiragola
11. Balegadde
12. Mutt
13. Hunasekatte
14. Heggarmattuvane
15. Kancugar
16. Madhuguni

b) ***Outside / Periphery of the Sanctuary*****.....**

Name of Village

1. Khandya
2. Sugudavani

3. Bidare Gundi Hombala
4. Kodi Hire beelu
5. Trasamutta
6. Kara Gadde
7. Lakkavalli – Kunduru
8. Kenchi Koppa
9. Honne Koppa
10. Bire Makki
11. Magalu
12. Chandara Valli
13. Harana Kore
14. Chandara Valli dapthi
15. Bale koppa
16. Bidare Patna
17. Karidi Khana
18. Badigere
19. Siravase
20. Kundur *
21. Bagase
22. Musgilli
23. Kodi
24. Kodi Coffee Estate
25. Dabbare.



iii) Man-Animal conflict:

Loss of Human lives:

*An elephant killed a 35-year-old man 3 years back at Siruvase.

*One more case in 1987 in Muthodi village of a 16-year-old boy being killed by an Elephant has been recorded.

Loss of livestock: (Part of this information collected during the weekly village fair at Siruvase and Mallandur in June 2001) In Bogase village, villagers informed WANC surveyors that approximately 80 cattle have been killed in one year on an average. In one house of Mr.Manjappa Shetty and cattle lifted by carnivores in a single night during the

monsoons in June 2000. The villagers did not lodge compensation claims with the Forest Department, as they were afraid that they would be rehabilitated. There are claims that even the elected representatives of Grama Panchayat advise villagers against claiming compensation. Last year the villagers of Bogase claimed to have seen a Tigress with her cubs for at least 20 days, some of them claim it be one month. The Tigers, the villagers say kill the cattle without fear.

#Crop loss: There are regular raids by wild animals into the human habitations particularly into those villages that are within the sanctuary. The total compensation paid by the Forest department from 1st April 1997 till 31st March 1998 is Rs.42, 500

#Loss to Wildlife:

*The straying outside the sanctuary of wild animals, particularly the big cats-Tigers and Leopards, is rarely tolerated by the surrounding villagers. On April 1, 2001 a fully-grown tigress was killed by a group of farmers after it strayed out of the sanctuary. The incident occurred in Karkuchchi colony near Lakkavalli village on the northern outskirts of the sanctuary. The killing was sparked by the alleged attack by the tigress on one Mr.Rammappa, a farmer who incidentally survived the attack.

**Cases of cattle poisoning:* There have not any been any cases of revenge killings of big cats by poisoning dead cattle.

**Case of Electrocution of Wild animals:* There are claims of wild boars being electrocuted near estates.

iv) Threats to the Sanctuary:

Forest Fires: Considerable portions of the Sanctuary are affected, as villagers set afire to the forests. Particularly the teak plantations along the periphery are affected the most. This is supposedly done to facilitate the growth of fresh grass for grazing.

Illegal grazing: There are a large number of livestock belonging to the villagers residing in the sanctuary. They are supplying milk to the diaries in Chikmagalur. Some of them even lend their cattle to other villages to graze. Apart from grazing within the villages, the cattle enter even to the core zone. Most of them are not vaccinated. The

grazing is unguarded, during rainy season the cattle are not expected to be back. The vaccination programme by the Karnataka Forest Department has to be intensified.

Collection of fire wood: Most of these villagers depend on the sanctuary for their daily needs of fuel wood.

Poaching / hunting: There have not been many cases of bigger mammals like Tiger, Leopards, Gaur, Chital, Sambar or elephants being poached. The poaching of small game like Wild boar Blacknaped Hare still persists, particularly along the periphery.

Smuggling of timber: The timber smuggling lobby is active in parts of the sanctuary particularly towards those parts of the sanctuary that adjoin Koppa territorial Division. The Press has carried extensive coverage of the havoc that timber smuggling lobby has wrecked in Chikmagalur district.

#SEVERING OF WILDLIFE CORRIDORS:

The wildlife corridors connecting Bhadra Tiger reserve to its neighbouring sanctuaries have been severely threatened. The wildlife corridor to the north-west connecting the sanctuary to Shettihalli sanctuary has been totally cut off both by the Bhadra Reservoir and also the Gajanur anicut. Although to south the corridor connecting to Kudremukh National Park is relatively intact, it is being threatened by factors like encroachments into the neighbouring forests. Develpoment projects in the long term will create islands of wildlife populations, which will break the transfer of gene pool resulting in inbreeding.

a.) Upper Bhadra Project: This project aimed to provide water to the parts of the dry Chitradurga, Tumkur and Kolar districts. Accordingly there were plans to construct a dam at Magundi in Koppa taluk to impound waters in Bhadra reservoir. This would have drowned many hectares of Bhadra Wildlife Sanctuary. But this was dropped, as it was financially and technically unviable.

Now there are reports that a revised plan proposed by Retired Superintending Engineer Sri. G.S.Paramasivaiah will be implemented. The draft plan is to build two dams. One is across the measure Nullah at Kesave (within Bhadra Sanctuary) or Siddarmath. The other dam is across Kanura Halla at Kanuru in Koppa taluk of Chikmagalur district. If this plan

is implemented then large forests of the core of Bhadra wildlife sanctuary will be drowned and destroyed forever.

b) Mining of Iron Ore: The Visvesvaraya Iron and Steel Limited (VISL) a subsidiary of Steel Authority of India (SAIL) started mining 738 hectares of land in Kemmanagundi in 1923. Due to unviable production costs, the company stopped mining in 1983. Crippling financial losses forced SAIL to take over the plant in 1989. The SAIL commissioned a Blast Furnance at VISL in 1995, which prompted the state Government to recommend the handing over of 78.9 hectares including 47 hectares of forest land for renewing the mining. Of this, 16.25 hectares of forest had mineral deposits, which was expected to produce 4.2 million tones of iron

The Assistant Commissioner of Tarikere sub division issued a final notification in March 1998 to include 16.25 ha of this forest land belonging to the Chikmagalur territorial division in to the Bhadra wildlife division. But since then some influential politicians of the area have been lobbying to renew mining in this part of the Sanctuary

Netravathi Diversion Scheme: This project again proposed by Sri.Paramasivaiah aims at building a network of 37 small dams and two canals 300 km long starting from Lingadahole in Pushpagiri wildlife sanctuary till Kudremukh national park. One of the main canals to transport water from this canal dam-network will cut through the heart of the Bhadra Wildlife Sanctuary. This will massively affect the corridors for movement of the wildlife. This project proposal is still in the preliminary stage but very much under consideration

7. RECOMMENDATIONS FOR STRATEGY TO CONSERVE BHADRA TIGER RESERVE

1. Rehabilitation of the villages within the sanctuary should be carried out as planned by all the concerned authorities. There should be no compromise on this issue.
2. Forest fires should be prevented
3. The three zones within the sanctuary i.e. Core, buffer and tourism should be clearly marked and their sanctity maintained.
4. Encroachments should be prevented at any cost.
5. The lower hierarchy of the forest department should be strengthened
6. The compensation procedure for loss to villagers by wildlife should be simplified.
7. There should be better co-ordination between the higher and the lower officials of the forest department.
8. Wildlife census has to be conducted in the sanctuary twice a year by involving interested nature lovers and local NGOs.
9. There should be incentives to those who have served the forest department beyond the call of the duty.
10. Collection of firewood should be strictly controlled.
11. Poaching should be strictly dealt with.
12. The checklists of the flora and fauna should be regularly and scientifically updated.
13. Pollution of Water sources should be prevented.

14. Illegal power fencing should be checked.

15. Developmental projects should be critically reviwed

16. Common man should be encouraged to visit, learn and love the sanctuary.

#Many of the coffee estates pollute the sanctuary's water sources by pumping the untreated water flowing in their vicinity.



8. RECOMMENDATIONS FOR ACTION PLAN TO CONSERVE BHADRA TIGER RESERVE

1. The number of lower strung staff particularly the Forest guards should be increased, and local youth should be given preference.

2. The surrounding villagers should be relentlessly targeted to educate them to know about the harms caused by forest fires to wildlife. Punishment for abetting forest fires should be strict and severe.

3. The lower cadre staffs particularly Foresters and others below their rank should be transferred within the sanctuary, unless any adverse comments pertain to them.

4. Powers should be given to the forest staff on par with the Police to effectively protect the sanctuary.

5. The Sanctuary boundaries should be demarcated prominently. Punishment to the encroachers should be strict and no mercy should be shown to them.

6. The higher-level officers of the Sanctuary should reside in the Head quarters of the sanctuary. They should be available during any emergency to guide their sub-ordinates.

7. Those who have outstandingly served the sanctuary should be awarded.

8. Alternative fuel sources should be made available to the villages to stop the collection of firewood.

9. Vaccination programme of the cattle within and along the sanctuary periphery has to be intensified.

10. More anti-poaching patrols and camps should be established.

11. To update the checklists of the flora and fauna, researchers should be invited and encouraged and work in the sanctuary regularly. There is every chance that there will be extension of the species' range, particularly as most of this area falls in the

Western Ghats. Also there are chances that new species might be discovered, the example of a new toad discovered recently in the nearby Kudremukh National Park is worthy of being mentioned.

12. Coffee pulp from the surrounding coffee estates should be prevented from being pumped in to the Sanctuaries water sources. Also the massive use of pesticides should be dealt with.

13. The feasibility committee of the developmental projects affecting any Protected Area like Upper Bhadra project or Nethravathi diversion scheme should also consist of forest department officials not only engineers.

14. Nature camps should be regularly conducted for school students and the youth by the forest department. Help may be taken from interested NGOs to do so.

15. The accommodation rates of the forest rest houses should be reduced to suit budget of common man. There should be discounts to students and those involved in scientific projects.

9. Note on Acquisition and Rehabilitation in Bhadra Wildlife Sanctuary

1. The Bhadra Wildiife Sanctuary extends over an area of 492.6 Sq.Kms, in the Districts of Chickmagalur and Shimoga. The initial Notification declaring Bhadra Wildlife Sanctuary was issued by State Government vide G.O.No.AFD 25 FWL 74 dated 06-09-1974 read at (1) above and the final Notification was issued in the year 1998 vide G.O.No.FEE 58 FWL 96 dated 09-03-1998 Realising the ecological Importance and the Potential to support high density faunal populations, this sanctuary has been upgraded to the status of Project Tiger Reserve by the Government of India on November 19. 1998. There are 16 villages inside the Bhadra Wildlife Sanctuary, comprising of 736 families. A project was prepared by the Deputy Commissioner of Chickmagalur in the year 1992 to acquire 861.00 acres of Revenue Land of these villagers and rehabilitate them outside the sanctuary at an estimated cost of Rs.12.76 Crores (Rs.7.02 for Acquisition and Rs.5.74 Crores for Rehabilitation). This project was submitted to the Government for approval.

2. The Deputy Commissioner, Chickmagalur was directed by the Government to calculate the acquisition and rehabilitation cost as per the current rates. As per the directions of the Government, the Deputy Commissioner, Chickmagalur has revised the acquisition cost to Rs. 13.00 Crores and the Rehabilitation cost to Rs.4.65 crores and has submitted to the Government for approval in the letter read at (3) above.

Cost of Rehabilitation as per the proposed New Rehabilitation Package.

Sl.No.	Details	Amount (Rs.in lakhs) 152.30 Expected Budget.
1.	Exgratia payment for displaced families (736 families)	(Tentative)
2.	Cost of Infrastructure for displaced families a. Construction of SchoolBuilding b. Road network including drainage c. Burial grounds and recreation park. d. Shopping complex e. Bus Shelter f. Temple g. Water supply	 10.00 51.00 6.00 5.00 1.00 3.00 33.00
3.	Providing Electricity	100.00
4.	Transportation cost at Rs.5000/- per displaced family (736 families)	36.80
5.	Dispensary and Veterinary Dispensary	25.00
	Total:	423.10
6.	Contingency and Administrative Overheads at 10% of total.	42.31
	Grand Total:	465.41 (Tentative)

3.The 16 Villages coming under this project are

Villages	No. of families for the purpose of rehabilitation benefits.	Extent of land to be acquired (in Acres)
Hebbe	97	99.7
Madla	159	250.15
Hipla	98	143.46
Keseve	60	85.25
Muthodi	36	34.23
Karuvane	52	106.00
Madla – Waddihatti	51	17.62
Hebbe Kurkulmane	7	5.00
Bidare	12	7.20
Shiragola	2	-
Balegadde	20	33.22
Mutt	24	17.49
Hunasekatte	15	-
Heggarmattuvane	68	1.1
Kancugar	7	-
Madhuguni	28	60.87
Total:	736	861.29

4) The State Government has written a letter to the Government of India that the cost of the acquisition would be met by the Government of India and the cost of rehabilitation will be met by Government of Karnataka. Already the Government of India has released Rs.1.68 Crores on March 1999 for acquisition of lands and the Government of Karnataka has released Rs. 0.50 Crores for rehabilitation. An amount of Rs. 2.18 Crores has been

deposited with the Deputy Commissioner, Chickmagalur on 31-03-1999. Again the Government of India has released Rs. 2.00 Crores in January 2001 for acquisition of lands.

5) Out of these already 4(1) Notification under Land Acquisition Act has been issued for Hebbe, Madla and Hebbe-kurkulmane villages on 24-05-1999. The 6(1) Notification has been issued on 19-08-2000 and 22-06-2000. The Deputy Commissioner, Chikmagalur has informed that the acquisition of Hebbe village can be completed with the available money.

6) The Forest, Ecology and Environment Department has to obtain a written consent of Government of India about the acquisition cost. The cost of rehabilitation will be met by the State Government subject to maximum ceiling of Rs.5.00 crores (Rupees Five Crores Only

8) The Government of Karnataka has sanctioned rehabilitation and resettlement package benefits and facilities to the families affected by the acquisition of land for the project Bhadra Wildlife Sanctuary in Chickmagalur District.

GOVERNMENT ORDER NO.RD 69 REH 97

BANGALORE DATED MARCH 28TH 2001

1. Government are pleased to sanction following Rehabilitation and Resettlement Package benefits and facilities to the families affected by the acquisition of land for the project Bhadra Wildlife Sanctuary in Chickmagalur District.

A) Land Acquisition and Compensation.

a. Coffee lands
b. Other lands
c. Malki
d. Buildings
e. Solatium and additional market value as admissible under land Acquisition act.
f. Encroachers on if the encroachers are eligible as per state Government Land. Government orders for regularisation of their unauthorised cultivation, and if regularisation orders are issued as per rules, compensation may be determined as per land Acquisition act.

B) Rehabilitation Scheme.

a. Land Grants

Families holding own lands plus extent regularised wherever applicable.

Maximum extent proposed for grant.

.....

Wetland/Plantation Land

1. 5 Acres and above -
   5 Acres t upset price of Rs.1000/-per acre.

2. 1-5 Acres and above -
   3 Acres at upset price of Rs.1,000/- per acre.

3. Less than 1 Acre/Landless -

1 Acre at upset price of Rs 1,000/- per acre

.....

b. House site at free of cost.

Land holdings inclusive of Extent o fencroachment Regularised	*Area of the site
1. 1.5 Acres and above 2. 1-5 Acres 3. Less that 1 Acre/landless	90' * 60' 80' * 50' 50' * 40'

c. Transportation cost,
Lump sum grant of Rs 5000/- each family.

d. Dismantled building material can be utilised by occupants.

e. Amenities

Civic amenities in rehabilitation colony, M.C.Halli viz..,
site formation, roads, Drains, Sanitation, Drinking
water, Electricity, School, Post Office, Hospital,
Playground, Shopping Complex, Place for worship etc.

f. Each family to be treated as a unit for the purpose of rehabilitation grant and distribution of site and number of families is limited to 736 including landless persons and encroachers.

g. Rehabilitation Grant

As per standard rehabilitation package to be approved by the Government in due course.

2. Sanction is accorded:

    1) to release the amount of Rs.4.65 crores (Rupees Four Crores Sixty Five Lakhs only) as and when required for rehabilitating 736 families of 16 villages.
    2) For acquisition of lands (861.29 Acres) pertaining to the Bhadra Wildlife Sanctuary:
    3) For grant of lands at an upset price of Rs.1000.00 (Rupees One Thousand Only)

3. The Forest Ecology and Environment Department to obtain a written consent of Government of India about the acquisition cost of Rs. 13.00 crores (Rupees Thirteen Crores Only):

4. This order issues with the concurrence of the Finance Department vide its note No.FD/140/Exp/VH/2001 Dated 7.2.2001.

BY ORDER AND IN THE NAME OF THE GOVERNMENT OF KARNATAKA

(K.S.JAIPRAKASH REDDY)
Deputy Seceratary to Government
(Revenue Department(Rehabilitation and Coordination)

10. REFERENCES

1. Shekar Singh, Ashish Kothari et al., ***Directory of National Parks and Wildlife Sanctuaries of Karnataka***. Published by Indian Institute of Public Administration, New Delhi.

2. G.N.Srikantaiah, I.F.S, (DCF, Chikmagalur Division), Dr.S.Subramanya, I.A.S, (Deputy Commissioner, Chikmagalur District), ***Bhadra Wildlife Sanctuary, Acquisition, Rehabilitation and Resettlement Project.*** Government of Karnataka, February 1992.

3. Karanth, Ullas K (1982): ***Bhadra Wildlife Sanctuary and its endangered ecosystem***, Journal of Bombay Natural History Society, Vol.79(1), Pages 79 – 86.

4. The Hindu, Monday, October 5, 1998
5. The Hindu, Sunday, February 25, 2001
6. Deccan Herald, Monday, April 2, 2001
7. Deccan Herald, Sunday, 1st July 2001

WETLAND BIO-DIVERSITY-CASE STUDY-

SULEKERE

(SHANTHISAGAR TANK)

CHANNAGIRI TALUK, DAVANAGERE DISTRICT

H.N. CHANDRASEKHARAIAH, M.F. RAHMAN AND S.L.RAGHAVAN

SOCIETY FOR ADVANCEMENT OF AQUACULTURE
NO.3, PAMPAMAHAKAVI ROAD,
BANGALORE-560018

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Strategy for conservation of indigenous fish fauna and to augment fish production

Acknowledgements

WETLAND BIO-DIVERSITY-CASE STUDY-SULEKERE (SHANTHISAGAR TANK) CHANNAGIRI TALUK, DAVANAGERE DISTRICT

by

H.N. CHANDRASEKHARAIAH, M.F. RAHMAN AND S.L. RAGHAVAN
Society for Advancement of Aquaculture, Bangalore - 560018.

INTRODUCTION

Humans depend for their food, medicines and industrial products from bio-diversity in the wild as well as domesticated components. Conserving bio-diversity, be it terrestrial or aquatic, can provide safety net for human survival, allowing the option for future access to species and associated ecosystems necessary for sustaining life. Bio-diversity conservation is beyond the goals of traditional nature conservation and it also includes protection of nature from the adverse impacts of human activities with a challenge of meeting peoples needs from planned and sustainable utilisation of its components.

Karnataka has more than 44,000 man-made wetlands which are seasonal, long-seasonal and perennial, constructed over a period of time for multipurpose utilisation like irrigation, drinking water, washing, bathing, etc., These resources are important habitats for different kinds of aquatic flora and fauna. Majority of the wetlands in the State, oflate, are encroached upon, silted, weed infested as a result of which the water holding capacity is greatly reduced affecting the aquatic life. Entry of untreated effluents and domestic sewage has made certain tanks highly polluted which also has affected the quality of water and the aquatic life.

These resources used to harbour varities of indigenous fish life which was a source of nutritious food for the rural population, besides providing livelihood for the fishermen.

OBJECTIVES OF THE PROJECT

To assess the present status of quality of water, soil, flora and fauna, a case study of Sulekere (Shantisagar tank) in Channagiri taluk of Davanagere district was undertaken. The purpose of the study, in general, is to evolve strategies for the protection and development of such wetlands bio-diversity in the State.

The case study of the wetland Sulekere was undertaken by the Society for Advancement of Aquaculture, Bangalore - 560018 atthe instance of Prof. Madhav Gadgil, Project Co-ordinator, Centre for Ecological Sciences, Indian Institute of Science, Bangalore - 560012.

SULEKERE (SHANTISAGAR TANK)

Sulekere (Shantisagar tank) is one of the oldest and largest perennial tanks next only to Kambam tank of Andhra Pradesh. The tank was constructed by Princes Shantavva some 600 years age by creating a bund in between two hillocks across Hirehalla and Soppinahalla streams in Channagiri taluk, Davanagere district. The waterspread area of the tank is 2466 ha. maximum depth being 9 M with an average of 5 M. The longitudinal length of the tank is 16 km and has the circumference of 40 km. The catchment area of the tank is around 84,416 ha and it commands an irrigated area of 2876 ha. The annual rainfall in the region is about 646mm. The tank is situated at longitude 75°55' and latitude 14° 8' and is in semi-malnad area of the State. The length of the bund is 38 M.

Formerly, water level of the tank used to recede. Now, the Bhadra reservoir canal, located close-by, is connected to it, as much. it maintains, almost, constant water leverl throughout the year. The depth of the tank is said to have been reduced by about 1.0 to 1.2 M by way of siltation. The marginal areas of the tank, to an extent of 15% of the total waterspread, is encroached and is utilised for cultivation of agricultural crops. The tank, to an extent of 30% of the total waterspread area. is infested with different types of aquatic plants. There are no industries located in the catchment area of the tank. There is a Fishseed Production Farm of the Department of Fisheries. Government of Karnataka, located below the tank which has an area of 4.15 ha. Majority of the ponds in the farm are in dilapidated condition and are weed infested. Very few ponds. presently, are in use.

METHODOLOGY

Four sampling stations were fixed for conducting comprehensive observations on physico-chemical and biological features of water, soil, plankton, benthos, aquatic weeds and fishes.

Station - 1 : Near the bund
Station - 2 : Near Ittige village
Station - 3 : Near Somalapur village and
Station - 4 : Near Kerebilchi village

Samples of water, soil, plankton, benthos, aquatic weeds and fishes were collected from each station and were subjected to detailed physico-chemical and biological analysis.

The water samples, by employing standard methods, were analysed for temperature, turbidty, pH, dissolved oxygen, alkalinity, free ammonia, phosphate, nitrate and nitrite.

The productive potentially of the water was assessed by using light and dark bottles technique.

The soil samples were analysed for pH, organic carbon and total nitrogen.

For plankton, a total volume of 100 L of surface water was strained through a plankton net made of nylobolt silk cloth corresponding to 21XXX. The samples thus collected were preserved in 5% formalin and subjected to qualitative and quantitative analysis.

Samples of littoral biota were collected by operating `D' type net having a mouth opening of 0.44 M and towed for a length of 10 M and preserved in 5% formalin and analysed.

Different types of aquatic weeds observed in the tank were collected and identified.

Various types of fishing gears were operated and fish specimens collected were identified. Visited fish landing centres and fish markets for recording the catch composition and fish fauna as well.

The fishermen of the area and the citizens, as also officers of the Department of Fisheries were contacted to ascertain the past and the present status of the fishery of the tank.

OBSERVATION

The physico-chemical conditions of water and soil collected from four stations are presented in Table - 1.

Water:

The air temperature was found to range from 27.0 to 33.2°C and was higher than the water temperature. The water temperature was lower than the air temperature and ranged between 23.5 and 30.5°C. Lower values were recorded during July, 2001. The water was clear, odourless even during rainy season and turbidity was less than 100 mg/l. The water was alkaline in nature with pH ranging between 8.4 and 8.6.

Dissolved oxygen concentration varied from 5.5 to 7.4 mg/1 and was in optimum level. Total alkalinity was in moderate concentrations and ranged between 80 and 112 mg/l. Lower values recorded during July is on account of incursion of rain water. The water was free from pollution and free ammonia was absent in all the stations.

Phosphata was found in trace quantities as also nitrites. Nitrate was in low concentration and ranged from 0.142 to 0.146 mg/l.

The primary productivity values ranged between 322.8 and 348.4 mgC/m3/hr indicating the productive potential of the tank.

In general, the water was alkaline in nature with moderate hardness, optimum level of dissolved oxygen and low levels of nutrients and was free from any form of pollution.

Soil :

The soil is alkaline in nature with pH ranging from 8.0 to 8.2. Low organic carbon was recorded (0.08 to 0.12%) while total nitrogen content, exhibiting low concentrations, ranged from 0.06 to 0.08%.

Table – 1

Physico – chemical conditions of water and soil

Parameters	**Station – 1**	**Station – 2**	**Station – 3**	**Station – 4**
WATER :				
Air Temperature °C	27-27.5	27-27.5	27-27.5	27.0-33.2
Water Temperature °C	23.5-27.0	23.5-27.1	24.0-27.0	24.0-30.5
Colour	Colourless	Colourless	Colourless	Colourless
Odour	Odourless	Odourless	Odourless	Odourless
Turbidity-mg/1	Clear<100	Clear<100	Clear<100	Clear<100
Dissolved Oxygen-mg/1	6.0-7.2	5.75-7.2	5.5-6.8	6.5-7.4
PH	8.4-8.6	8.4-8.6	8.4-8.5	8.4-8.6
Total Alkalinity-mg/1	80.0-112.0	80.0-112.0	80.0-108.0	80.0-112.0
Free Ammonia-mg/1	Nil	Nil	Nil	Nil
Phosphate-mg/1	Tr.	Tr.	Tr.	Tr.
Nitrate-mg/1	0.146	0.142	0.146	0.144
Nitrite-mg/1	Tr	Tr	Tr	Tr
Primary Productivity				
-mg C/m^3/hr.	348.4-322.8			

Parameters	**Station - 1**	**Station - 2**	**Station - 3**	**Station – 4**
SOIL:				
PH	8.0-8.1	8.0-8.2	8.0-8.2	8.0-8.2
Organic Carbon %	0.09-0.12	0.09-0.14	0.08-0.12	0.08-0.12
Total Nitrogen %	0.06-0.08	0.06-0.08	0.06-0.08	0.06-0.08

Plankton :

The qualitative and quantitative planktonic groups are presented in Table - 2. in general, plankton density was moderate. It was found to range from 1 - 42 u/l. Zooplankton dominated over phytoplankton when total planktonic forms were taken into account. Qualitatively, planktonic species were in poor representations in all the stations.

Among Phytoplankton, Myxophyceae was represented by *Oscillatoria*, Chlorophyceae by *Eudorina, Mougeotia, Pediastrum, Ulothrix* and *Clowterium* and Bacillariophyceae by *Fragillaria* and *Synedra*.

Among Zooplankton, Protozoa was represented by *Arcilla* and *Difflugia*, Copepoda by Cyclops and *Nauplius*, Rotifers by *Filinia* and *Keratella*, Cladocera, incidentally the largest group, by *Ceriodaphnia, Diaphnosoma, Daphnia, Simocephalus* and Ostracoda by *Cypris*.

Table - 2

Qualitative and Quantitative Composition of Planktonic Groups

Groups/Family/Species	**Station -1**	**Station -2**	**Station -3**	**Station -4**
PHYTOPLANKTON:				
MYXOPHYCEAE:				
Oscillatoria	--	01	01	--
CHLOROPHYCEAE:				
Eudorina	10	04	17	02
Mougeotia	01	--	01	--
Pediastrum	02	01	03	02
Ulothrix	05	--	03	--
Closterium	02	--	02	--
BACILLARIOPHYCEAE:				
Fragillaria	02	07	11	03
Synedra	02	17	25	06
Groups/Family/Species	**Station -1**	**Station -2**	**Station -3**	**Station –4**

ZOOPLANKTON:				
PROTOZOA				
Arcella	05	07	12	03
Diffugia	02	--	03	--
COPEPODA:				
Cyclops	20	42	02	05
Nauplius	01	09	04	01
ROTIFERS:				
Filinia	01	01	--	--
Keratella	02	02	12	01
CLADOCERA:				
Ceriodaphnia	02	--	02	--
Diaphnosoma	01	02	--	--
Daphnia	01	20	01	--
Simocephalus	01	--	01	--
OSTRACODA:				
Cypris	03	--	--	02

Littoral fauna :

Organisms listed in Table -3, occurred variously in the shallow areas of the tank in different stations were sampling was done. The rich aquatic vegetation offers favourable conditions for their shelter and multiplication.

Nine species of insects belonging to seven families coming under four Orders; molluscs, where gastropods dominated over bivalves, had nine forms belonging to six families under four Orders, fishes, eight species belonging to five families and two Orders and crustanceans, two species belonging to one family and an Order were recorded from the tank. Incidentally, the rich molluscan fauna could be utilised as food by the non-predatory catfish - *pangasius pangasius*.

The tank presented optimum level of various biotic components for sustaining fish life in the tank.

Table - 3

Littoral fauna constituents of Sulekere Tank

Insect :			
	Order	:	Ephemeroptera
	Family	:	BAETIDAE
		1.	*Caenis* spp.
		2.	*Cloeon* spp.
	Order	:	Odonata
	Suborder	:	Anisoptera
	Family	:	COENAGRIONIDAE
		3.	*Enallagma* spp.
	Order	:	Hemiptera
	Family	:	PLEIDAE
		4.	*Plea* spp.
	Family	:	NEPIDAE
		5.	*Hydrometra elongata* Fabricius
	Family	:	BELOSTOMATIDAE
		6.	*Diplonychus annulatum* Fabricius
	Order	:	Coleoptera
	Family	:	DYTISCIDAE
		7.	*Dytiscus limbatus* Fabricius
		8.	*Cybister* larvae
	Family	:	HYDROPHILIDAE
		9.	*Berosus indicus* Mets.
Molluscs:			
	Class	:	Gastropoda
	Subclass	:	Prosobranchia
	Family	:	VIVIPARIDAE
	Subfamily	:	Bellamyinae
	Genus	:	*Bellamya* Jousseaune
		1.	*Bellamya bengalensis* (Lamarck)
		2.	*Bellamya heliciformis* (Mueller)

	Family	:	THIARIDAE
	Subfamily	:	*Thiarinae* s.str.
	Genus	:	*Thiara* Roeding

	Subgenus	:	*Thiara* s.str.
		3.	*Thiara (Thiara) scabra* Mueller
	Subgenus	:	*Melanoides* Olivier
		4.	*Thiara (Melanoides) tuberculata* (Mueller)
	Subclause	:	Pulmonata
	Order	:	Basommatophora
	Family	:	LYMNAEIDAE
	Genus	:	*Lymnaea* Lamarck
	Subgenus	:	**Pseudocuccinea**
		5.	*Lymnaea luteola* Lamarck
	Family	:	PLANORBIDAE
	Subfamily	:	Planorbinae s.str.
	Genus	:	**Gyraulus Charpentier**
		6.	*Gyraulus convexiusculus* (Hutton)
	Class	:	Bivalvia
	Subclass	:	Paleoheterodonta
	Order	:	Unionoida
	Family	:	UNIONIDAE
	Subfamily	:	Unioninae
	Genus	:	*Lamellidens* Simpson
		7.	*Lamellidens corianus* Lea
		8.	*Lamellidens marginalis* (Lamarck)
	Subclause	:	Heterodonta
	Order	:	Veneroida
	Family	:	CORBIDULIDAE
	Genus	:	*Corbicula* Megerle von Muehlfeld
		9.	*Corbicula striatus* Deshayes
Fish:			
	Order	:	Cypriniformes
	Family	:	CYPRINIDAE
	Subfamily	:	Danioninae (Rasborinae)

	Genus	:	*Rasbora* Bleeker
		1.	*Rasbora daniconius* (Hamilton - Buchanan)
	Order	:	Cyprinodontiformes
	Family	:	APLOCHEILIDAE
	Subfamily	:	Aplocheilinae
	Genus	:	*Aplocheilus* McClelland
		2.	*Aplocheilus lineatus* (Valenciennes)
	Family	:	POECILIDAE

	Subfamily	:	Poecilinae
-	Genus	:	*Poecilia* Bloch & Schneider
		3.	*Poecilia (Lebistes) reticulata* (Peters)
	Order	:	Perciforms
	Suborder	:	Percoidei
	Family	:	CHANDIDAE (=AMBASSIDAE)
	Genus	:	*Chanda* Hamilton - Buchanan
		4.	*Chanda nama* Hamilton - Buchanan
	Genus	:	Parambassis Bleeker
		5.	*Parambassis ranga* (Hamilton - Buchanan)
	Suborder	:	Labroidei
	Family	:	CICHLIDAE
	Genus	:	*Etroplus* Cuvier
		6.	*Etroplus maculatus* (Bloch)
	Genus	:	Oreochromis Gunther
		7.	*Oreochromis mossambica* (Peters)
	Suborder	:	Gobioidei
	Family	:	GOBIIDAE
	Subfamily	:	Gobiinae
	Genus	:	*Glossogobius* Gill
		8.	*Glossogobius giuris giuris* (Hamilton - Buchanan)
Crustacea:			
	Class	:	Crustacea
	Subclass	:	Malacostraca
	ORder	:	Decapoda
	Family	:	PALAEMONIDAE
		1.	*Macrobrachium* spp.
		2.	*Caridina* spp.

Table - 4

Occurrence of Littoral Organisms in different stations of the Tank

Fauna	**Station -1 Dam site**	**Station -2 Ittige**	**Station -3 Somalpur**	**Station -4 Kerebilchi**
Insects:				
Caenis spp.	--	P	P	--

Cloeon spp.	--	P	P	P
Enallagma spp.	P	P	P	--
Plea spp.	--	P	--	P
Hydrometra elongata	--	P	P	P
Diplonychus annulatum	--	P	P	P
Dytiscus limbatus	--	P	P	P
Fauna	**Station -1 Dam site**	**Station -2 Ittige**	**Station -3 Somalpur**	**Station -4 Kerebilchi**
Molluscs:				
Bellamya bengalensis	--	P	P	P
Bellamya heliciformis	--	P	P	--
Thiara (Thiara scabra	--	P	P	P
Thiara (Melanoides) tuberculata	--	P	P	P
Lymnaea luteola	--	P	P	P
Gyraulus convexiusculus	--	P	P	P
Lamellidens corianus	--	P	P	P
Lamellidens marginalis	--	P	P	--
Corbicula stria tella	--	P	P	--
Fish:				
Rasbora daniconius	--	P	P	P
Aplocheilus lineatus	P	P	P	P
Poecilia (Lebistes) reticulata	--	P	P	P
Chanda nama	--	P	P	P
Parambassis ranga	--	P	P	P
Etroplus maculatus	--	P	P	P
Oreochromis mossmbica	P	P	P	P
Glossogobius giuris giuris	--	--	--	P
Crustacea:				
Macrobrachium spp.	P	P	P	P
Caridina spp.	--	P	P	P

Macro-Vegetation :

Barring the dam/bund zone, the aquatic vegetation was quite rich in the other stations Ten (10) species belonging to six (6) families were recorded from the tank (Table - 5). Some

of the aquatic weeds like *Vallisneria, Hydrilla, Aponogeton* and *Potamogeton* could be profitably utilised as food component by introducing the indigenous and exotic herbivorous fish species like *Puntius pulchellus* and *Ctenopharyngodon idella* respectively.

Table - 5

	Family	:	GENTIANACEAE
	Genus	:	**Limnanthemum**
		1.	*Limnanthemum indicum* Thwaites
	Family	:	CONVOLVULACEAE
	Genus	:	**Ipomoea**
		2.	*Ipomoea aquatica* Forsk.
	Family	:	HYDROCHARITACEAE
	Genus	:	**Hydrilla**
		3.	*Hydrilla verticillata* Casp.
	Genus	:	**Vallisneria**
		4.	*Vallisneria spiralis* Linn.
	Family	:	NAIADACEAE
	Genus	:	**Aponogeton**
		5.	*Aponogeton monostrachyon* Linn.
		6.	*Aponogeton crispum* Thumb.
	Genus	:	**Potamogeton**
		7.	*Potamogeton crispus* Linn.
	Family	:	CYPERACEAE
	Genus	:	**Cyperus**
		8.	*Cyperus distans* Linn.
	Genus	:	**Eleocharis**
		9.	*Eleocharis plantaginea* R.Br.
	Family	:	CHARACEAE
	Genus	:	**Chara**
		10.	*Chara brachypus* Braun.

Fishes :

During the period of study, twenty five species of fishes belonging to eleven families and six Orders were recorded. Apart from the Indian major carp - *Catla catla*, *Labeo rohita* and the cichlid - *Oreochromis mossambica*, rest of the species are indigenous to the system. By weight, *Cyprinus carpio* dominates in the fish catch of the tank followed by *L. rohita*, *Puntius* spp., *Cirrhinus* spp., *Mystus* spp., *O.mossambica*, and Murrels. Reports indicate that the rich indigenous fish fauna of the tank is greatly reduced; hence measures should be taken to restore the earlier situation so as to maintain `bio-diversity of the fish genetic resources' ofthe tank in its enterity. Systematic list of the fishes observed in the tank is presented in Table - 6.

Table - 6

Systematic list of the fish fauna of Sulekere Tank

	Super Class	:	Gnathostomata
	Class	:	Actinopterygii
	Subclass	:	Neopterygii
	Division	:	Teleostei
	Sub-Division	:	Osteoglossomorpha
	Order	:	Osteglossiformes
	Suborder	:	Notopteroidei
	Family	:	NOTOPTERIDAE
	Genus	:	*Notopterus* Lacepede
		1.	*Notopterus notopterus* (Pallas)
	Sub-division	:	Euteleostei
	Super order	:	Ostariophysi
	Order	:	Cypriniformes
	Family	:	CYPRINIDAE
	Subfamily	:	Danioninae (=Rasborinae)
	Tribe	:	Oxygasterini
	Genus	:	*Salmostoma* Swainson
		2.	*Salmostoma clupeoides* (Bloch)
	Tribe	:	Danionini
	Genus	:	*Rasbora* Bleeker
		3.	*Rasbora daniconius* (Hamilton - Buchanan)
	Subfamily	:	Cyprininae
	Tribe	:	Cyprinini
	Subtribe	:	Cyprini
	Genus	:	*Cyprinus* Linnaeus

		4.	*Cyprinus carpio* var *communis* Linnaeus
		5.	*Cyprinus carpio* var *specularis* Lacepede
	Tribe	:	Systomini
	Subtribe	:	Systomi
	Genus	:	*Puntius* Hamilton - Buchanan
		6.	*Puntius chola* (Hamilton - Buchanan)
		7.	*Puntius sarana sarana* (Hamilton – Buchanan)
		8.	*Puntius sophore* (Hamilton - Buchanan)
		9.	*Puntius ticto* (Hamilton - Buchanan)
	Tribe	:	Labeonini
	Subtribe	:	Labeones
	Genus	:	*Cirrhinus* Oken
		10.	*Cirrhinus reba* (Hamilton - Buchanan)
	Genus	:	*Catla* Valenciennes
		11.	*Catla catla* (Hamilton - Buchanan)
	Genus	:	*Labeo* Cuvier
		12.	*Labeo* rohita (Hamilton - Buchanan)
	Order	:	Siluliformes
	Family	:	BAGRIDAE
	Subfamily	:	Bagrinae
	Genus	:	*Mystus* Scopoli
		13.	*Mystus cavasius* (Hamilton - Buchanan)
	Family	:	CLARIDAE
	Genus	:	*Clarias* Scopoli
		14.	*Clarias batrachus* (Linnaeus)

	Superorder	:	Acanthopterygii
	Series	:	Atherinomorpha
	Order	:	Cyprinodontiformes
	Family	:	APLOCHEILIDAE
	Subfamily	:	Aplocheilinae
	Genus	:	*Aplocheilus* McClelland
		15.	*Aplocheilus lineatus* (Valenciennes)
	Family	:	POECILIDAE
	Subfamily	:	Poecilinae
	Genus	:	*Poecilia* Block & Schneider
		16.	*Poecilia (Lebistes) reticulara* (Peters)

	Order	:	Synbrachiformes
	Suborder	:	Mastacembelodei
	Family	:	MASTACEMBELIDAE
	Subfamily	:	Mastacembelinae
	Genus	:	*Mastacembelus* Scopoli
		17.	*Mastacembelus armatus* (Lacepede)
	Order	:	Perciformes
	Suborder	:	Percoidei
	Family	:	CHANDIDAE (=AMBASSIDAE)
	Genus	:	*Chanda* Hamilton - Buchanan
		18.	*Chanda nama* Hamilton - Buchanan
	Genus	:	Parambassis Bleeker
		19.	Parambassis ranga (Hamilton - Buchanan)
	Suborder	:	Labroidei
	Family	:	CICHLIDAE
	Genus	:	*Etroplus* Cuvier
		20.	*Etroplus maculatus* (Bloch)

	Genus	:	*Oreochromis* Gunther
		21.	*Oreochromis mossambica* (Peters)
	Suborder	:	Gobioidei
	Family	:	GOBIIDAE
	Subfamily	:	Gobinae
	Genus	:	*Glossogobius* Gill
		22.	**Glossogobius giuris giuris**
			(Hamilton - Buchanan)
	Suborder	:	Channoidei
	Family	:	CHANNIDAE
	Genus	:	*Channa* Scopoli
		23.	*Channa marulius* (Hamilton - Buchanan)
		24.	*Channa orientalis* Bloch & Schneider
		25.	*Channa striatus* (Bloch)

Fish species which are no more available in the tank

Few decades back, before undertaking the introduction of fast-growing Indian major carp, *Catla catla, Labeo rohita* and *Cirrhinus mrigala*, fish species indigenous to the tank were dominating. Butm presently, the composition of indigenous fish is very much reduced

and even the introduced carp, except *L.rohita* and stray cases of *C.catla, C.migala* is not being recorded at all. The fish species indigenous to the waterbody which were once contributing considerably to the fishery of the tank were *Tor khudree, Puntius pulchellus, Labeo fimbriatus, Gonoproktopterus kolus, Ompok, bimaculatus* and *Wallago attu.* These species are no more available in the tank. In addition, the population of Murrels-*Channa marulius, C.striatus* and *C.orientalis* has also come down considerably. The accidental entry of exotic Tilapia - *Oreochromis mossambica* appears to be taking a dominating role in the fishery of the tank; hence efforts are to be made to eliminate the species to the extent possible from this tank to maintain biodiversity of the fish species indigenous to the tank.

The fishermen of the area prefers introduction of the gangetic carps annually and, here, the Department of Fisheries has to shoulder the responsibility.

Table - 7

Fish species which are no more available in the tank

	Order	:	Cypriniformes
	Family	:	CYPRINIDAE
	Subfamily	:	Cyprininae
	Tribe	:	Cyprinini
	Subtribe	:	Cypini
	Genus	:	**Tor Gray**
		1.	*Tor khudree* (Sykes)
	Genus	:	*Puntius* Hamilton - Buchanan
		2.	*Puntius pulchellus* (Day)
	Genus	:	*Gonoproktopterus* Bleeker
		3.	*Gonoproktopterus kolus* (Sykes)
	Genus	:	*Labeo* Cuvier
		4.	*Labeo fimbriatus* (Bloch)
	Order	:	Siluriformes
	Family	:	SILURIDAE
	Genus	:	*Ompok* Lacepede
		5.	*Ompok bimaculatus* (Bloch)
	Genus	:	*Wallago* Bleeker
		6.	*Wallago attu* (Schneider)

PRESENT STATUS OF SULEKERE

The fishery of the tank is managed by the Department of Fisheries and is organising stocking of fast growing species of fishes annually and is also issuing licences for the exploitation of fishery. There are about 400 fishermen actively engaged in fishing throughout the year. They operate castnets, gillnets, prawn nets, long-lines, rod and line for fishing. Though the Department of Fisheries issues fishing permits for using gillnets with mest size of 2.5 inches and above only, the fishermen seldom practice these conditions.

The Department of Fisheries, in order to augment fish production, is stocking the tank with fast-growing gangetic carps. The number of fish seed stocked in the tank for the last five years is as in Table - 8.

Table – 8

Fish seed introduced in the Sulekere

Period	Number stocked (in lakhs)				Total
	Rohu	Catla	Mrigal	Common carp	
1996-97	17.48	1.00	7.68	3.60	29.68
1997-98	22.89			7.05	29.94
1998-99	7.73	2.00	--	12.90	22.83
1999-2000	6.50	0.50	0.8	5.85	13.65
2000-2001	11.72	--	--	3.40	15.12
Total	66.32	3.50	8.48	32.80	111.12

The statement indicates that the fish seed stocked in the tank is 111.12 lakhs spread over five years. Out of this, 66.32 lakhs is Rohu and 32.80 lakhs common carp. The quantity of Catla and Mrigal introduced into the tank is very low. It is reported that Catla, Rohu and Common carp records good growth.

Table - 9, denotes the number of licences issued to the fishermen and the revenue realised for the period from 1996-97 to 2000-2001.

Table – 9

Licences issued and the realised

Period	No.of licences issued	Revenue realised
1996-97	201	73300.00
1997-98	276	108620.00
1998-99	418	187600.00
1999-2000	347	185500.00
2000-2001	255	164200.00

Licences issued include fishing with castnets, gillnets, (2.5 in. mesh size and above), long-lines and rod and line. The fishing permit holders also operate small-meshed gillnets, castnets and prawn nets. Gillnet fishing is conducted by a fishing unit (2 fishermen) with the help of a coracle and required nets. Licences are issued to the fishermen for fishing all through the year and no `close-season' is being observed by the parties.

The present fish production is estimated to be 140 M. tonnes valued at Rs. 35.00 lakhs @ Rs. 25/- per kg. The fishermen land their fish catches at Ittige, Somalapura, Kerebilchi, Kagathur, Basavarajapura and Dam-site. The average fish catch per day ranges from 150 - 400 kg, the peak fish production is being during the monsoon months. The indigenous fish fauna account to 20% only. The average annual fish catch for a fishing unit works-out to about 3.5 M. tonnes. The fish harvested, to an extent of 20% is sold locally and rest is supplied to fish merchants which they normally market at Davanagere, Harihar, Channagiri, Santhebennur, etc., The fish is transported in baskets / gunny bags without ice. The fisher women are generally engaged in the marketing of fish locally. The approximate composition of fish harvested presently is as follows:

Rohu	:	30%
Common carp	:	40%
Murrels	:	05%
Catfishes	:	05%
Tilapia	:	10%
Others	:	10%

The selling price of fish depends, generally, on the quantity of fish landed, size, weight and the species. Normally, carp, murrels, and catfishes fetch about Rs. 25/- to 30/- per kg at the spot. Thus, a fishing unit earns Rs. 87,500/- to Rs. 1,05,000/- annually. The fishermen are able to earn substantially compared with the average per capita income in the State.

INLAND FISHERMEN COOPERATIVE SOCIETY

There are 14 fishing villages in and around the tank with 5000 fishermen population of which, 80 from Ittige, 250 from Somalapura, 40 from Kerebilchi and 30 from Basavarajapura are actively engaged in the fishing profession.

There is one Fishermen Cooperative Society functioning in Sulekere area which has a membership of 2500. They have a share capital of Rs. 37,875/- (Rs.7,000/- from the Government and Rs.30,875/- from the members). Formerly, the Society used to provide fishery requisites to its members. Presently, the Society is interested to avail the National Welfare Housing Scheme to its members. In all, 148 houses under this scheme have been constructed for the members of the Society. (48 houses in Somalapura and 100 houses in Basavarajapura). These houses are constructed and provided to the fishermen free of cost of Rs. 30,000/- each.

The society is not involved in the development of fisheries in the tank or in the processing and marketing of the fish harvested. The members of the Society belongs to Ganga matha, Bestha, Scs, Sts., Kumbara, and Muslim communities.

It was reported that the children of the fishermen of the area are studying in Schools and Colleges and the educated, for want to employment opportunities elsewhere, are actively engaged in the fishing activities. The fishermen also own cattle, sheep, poultry etc., to augment additional income.

The locally available target fish species have reduced in their population and efforts, hence, are to be made to restore the earlier position. The aquatic weeds are predominantly present in the shallower areas of the tank. The weeds in the tank, presently, are not posing any problem in the normal fishing activity.

According to knowledgeable sources over the last 10 years, species like *Puntius pulchellus.*
Gonoproktopterus kolus, Labeo fimbriatus, Ompok bimaculatus, Wallago attu and *Tor khudree* present in large numbers and contributing towards considerable fishery of the tank, have disappeared and are no more recorded. Fish species like *Puntius sophore, P.ticto, Danio aequipinnatus, Salmostoma* spp., *Channa marulius, C.striatus, C.orientalis, Clarias batrachus* and *Mastacembelus armatus* are said to have decreased in their population.

As stated earlier, the indigenous fish fauna has drastically reduced. The income of fishermen, however, has not come down on account of the stocking of carps and increased fish production. However, following reasons could be assigned for the elimination of certain endemic fish species and in the reduction of others.

1. Indiscriminate fishing :

Though the fishermen are expected to operate nets of 2.5 inches mesh size and above only, the operation of small-meshed nets throughout the year has resulted in the decline of endemic fish species.

2. Non-observance of `closed-season' :

The breeding season of majority of fish species coincides with the onset of monsoon. During this season, fishes are caught in large scale. The fishes are not allowed to breed resulting in the depletion of their stock.

3. Stocking of Common carp :

Department of Fisheries is organising stocking of fast-growing fish species every year in the tank to augment fish production. From the statement of stocking carried out in the

tank, it may be made out that common carp has been introduced in large quantities followed by Rohu. Common carp, being an omnivore, also has the habit of browsing in the shallower regions of the tank damaging the eggs released by the indigenous fish. This has affected the indigenous fish fauna in the tank to a great extent. This species attains early maturity and breed thoughout the year; thus its population increases and compete for food and space.

4. Inadvertent introduction of T.ilapia :

The inadvertent introduction of T.ilapia has also affected the endemic fish species as they are prolific breeders and are omnivorous. They also compete for food and space.

The fish production has increased on account of stocking of fast-growing gangetic carp and the exotic common carp. The catches of the fishermen have also increased although, as reported, there is marked decrease in the indigenous fish fauna.

Because of the large scale fish landings during monsoon, price per kg of fish, comparatively, is less. During other seasons, the fish fetch a higher price. The prices now prevailing are higher compared with the ones what they used to get in the past. The consumer, in general, prefers, murrels, catfishes major carps and common carp.

Fishermen or local citizens of the area not concerned about the conservation of the targetted fish species. They are interested only in increasing the stocking density of the cultivable species of fishes so as to enable them to have good catches and to increase their earnings. If systematic development of the fishery by stocking compatible species of proper size, number and composition is undertaken, the production of fish proportionately increases; when fish landing is in large scale, then the need arises to preserve the produce either in cold storage or by using ice. Therefore, it is suggested that an ice plant and cold storage of suitable capacity may be established to prevent spoilage of fish and to market the fish in good condition and at a higher price.

The fishermen are of the opinion that the management, conservation and exploitation strategy should be the responsibility of the Department of Fisheries as their Co-operative Society. Zilla Panchayat, Taluk Panchayats are not conversant with this type of

developmental programmes. The Department of Fisheries may also organise fish pooling centres in present fish landing places with proper facilities for hygeinic handling of fish.

The fishermen and the local people are of the opinion that the fish seed farm, which is in dilapidated condition, to be renovated and put to use for the purpose it was established and be provided with necessary man-power for its effective management.

There was no instance of mortality of fish encountered any time on account of flow of untreated effluents as there are no industries located close-by and the entry of domestic sewage into the tank is also not there. Use of pesticides for agricultural practices in the catchment area also has not affected the fishery in any form. No dynamiting or poisoning has ever been reported.

DISCUSSION

The Sulekere (Shantisagar tank) water, in general, in alkaline in nature with moderate hardness, optimum level of dissolved oxygen and low levels of nutrients and is unpolluted. The productive potentially is good as revealed by the primary productivity values. The plankton was moderate, both qualitatively and quantitatively. The benthic fauna was rich, with molluscs dominating followed by insects, fishes and crustaceans. The aquatic vegetation of desirable species were present in the medium. The indigenous fish faun diversity was also adequately represented.

According to the officials of the Department of Fisheries and the fishermen, it was indicated that the tank held quite a good number of fish species. During the period of study, 25 fish species were recorded. Information gathered indicates species like *Puntius pulchellus, Labeo fimbriatus, Gonoproktopterus kolus, Ompok bimaculatus, Wallago attu* and *Tor khudree* are no more available from the tank. It was also pointed that species like *Puntius sophore, C. orientalis, Clarias batrachus* and *Mastacembelus armatus* have drastically reduced in their population.

The tank fishery is managed by the Department of Fisheries. Annually fast-growing Indian major carp and exotic common carp are stocked for improving the fish productivity.

But only Rohu and Common carp are stocked in large numbers when compared with Mrigal and Catla. Exotic Tilapia-*Oreochromis mossambica* has established in the tank and they form a sizeable fishery. To rehabilitate the disappeared fish species, it is necessary to collect them from the sources available and breed them in captivity and stock them into the tank besides, collecting the young ones of these fishes and introduce them for their growth and perpetuation. In the interest of safe-guarding the fishes, it is essential for strict observance of mesh regulation and `close season'. The fishermen who mainly depend on fishing profession may be identified and be provided with sustenance allowance during the **`closed season'**. These efforts will result in enriching the indigenous fishery besides augmenting fish production.

Though the fishing licences are issued for conducting fishing by gillnets with 2.5 inches mesh-size and above, there is no strict supervision on the operation of fishing nets, as such, smaller meshed nets are operated throughout the year. There is no `close-season' for fishing being observed to protect catching the brood stock during the breeding season.

The fishermen, presently, are getting better catches and equally good price compared to earlier times, 20% of the fish harvested is being sold locally and the rest is handed over to fish merchants for marketing in urban areas.

Fishermen or the local populace are not concerned about the conservation of the fishery of the tank in general and indigenous fishes in particular.

If the tank is scientifically developed by stocking catla, rohu, mrigal, grass carp and pulchellus at the rate of 1000 fingerings of 70 - 100 mm per ha (total fish seed required for the tank is 24.66 lakhs), the fish production could be increased to 1450 M tonnes valued at Rs. 3.7 crores considering the average growth of fish as 1.0 Kg. per year with 60% survival. But the common carp and tilapia population should be reduced besides stopping stocking of common carp totally.

The Fishermen Cooperative Society, which is dormant at present, should be revived and it should undertake supply of fishery requisites and organise fish marketing and other allied activities beneficial to fishermen. When the fish production is likely to increase, it is necessary to provide preservation facilities by establishing ice-plants and cold storages. It

may be considered to organise a NGO with all concerned departmental officers, fishermen and public to manage the fishery of the tank.

STRATEGY FOR CONSERVATION OF INDIGENOUS FISH FAUNA AND TO AUGMENT FISH PRODUCTION

1. Indigenous fishes which are endemic to the area and which have reached a stage of rare, endangered and threatened, condition, may be initially collected and stocked into the tank for growth and perpetuation of their generation.

2. The National Bureau of Fish Genetic Resources, Lucknow (UP) may be entrusted with the responsibility of establishing `**gene bank**' of the economically important fish species like *Puntius pulchellus, Labee fimbriatus, L.calbasu, Gonoproktopterus kolus, Tor khudree*, etc. which will help in conserving the valuable fish genetic resources of the area.

Some of these fishes may be maintained at the fish farm located close-by after attending to the repairs of the ponds and to make them breed in captivity. Bhadra fish farm could also be utilised for the purpose and the progeny so obtained could be stocked into the Sulekere tank. Care should be taken to stock fingerlings between 70 and 100 mm in length for better survival. This shall be providing scope for the in-site conservation of the rate, endangered and threatened fish species.

3. In the interest of protecting the indigenous fish population, the stocking of common carp in to the tank should be stopped. Efforts may also be made to reduce their population by intensive exploitation.

4. Tilapia is also not a desirable fish which starts multiplying in its early age and compete for food and space with other fishes in the tank. Intensive exploitation fishes to thrive well.

5 Though the licences are issued for fishing with 2 1/2 in. mesh size and above in the gillnets, the fishermen are not strictly following this condition and they are operating smaller meshed nets and are exploiting juveniles and adults, thus preventing them from attaining appropriate size of maturity and breeding. Therefore strict measures should be imposed to protect the brood stock.

6. Majority of the fishes breed during monsoon. During this season, fishermen exploit fishery in large scale. This will prevent the fishes to breed and perpetuate their generation. In the interest of protecting the brood stock and to allow them to breed, fishing during monsoon months may be prohibited. The fishermen shall be deprived of their earnings during the `**closed season'**. To enable them to maintain their families, suitable sustanence allowance may be provided after identifying such persons who are exlusively depending on fishing.

7. Washing of pesticides containers and sprayers used for spraying pesticides should not be washed in the tank water.

8. The use of pesticides in agricultural practices in the catchment area of the tank may, in the long run, affect the fish stocks of the tank. Therefore, the agriculturists should be educated to use bio-fertilizers and bio-pesticides only. Proper literature in this regard in local languages may be prepared, printed and made available to agrocultural and others too.

9. No industries discharging harmful effluents into the tank should be established in the catchment area of the tank.

10. Compatible species of fishes may be stocked for augmenting fish production and to while the food available in different niches of the tank.

11. For effective utilisation and control of aquatic vegetatio in the tank, herbivorous fishes like indigenous *Puntius pulchellus* and the exotic Grass carp - *Ctenopharyngodon idella* may be introduced in adequate numbers.

12. If scientific methods are adopted in stocking, development of fisheries and exploitation, fish production may be increased to an extent of about 10 times from the present level.

13. Instead of depending on the supply of fish fingerlings from the fish farms, it may be considered to receive only the fry of different varieties of fishes and rear them in especially erected `pens' in the suitable shallover areas of the tank. The seed should be provided with supplementary feed and other required care while rearing and when they attains 70 to 100

mm in size, may be released into the tank. This will ensure proper stocking and give scope for better survival and growth.

14. To prevent soil erosion and siltation of the tank, suitable afforestation measures may be undertaken on the Government land. Even agriculturists may be encouraged to raise useful trees.

15. At present, the exploited fishery is landed at four places in the vicinity of the tank. They are not provided with any facility, pack, etc, for transportation to other places for marketing of the produce. Therefore, it may be considered to establish suitable fish landing-cum-packing sheds at these four with necessary equipments.

16. At contemplated, if fisheries development is undertaken, the fish production shall increase. This increased fish production should be properly preserved and marketed. Therefore, there is a need to establish a cold storage and an ice plant of appropriate capacity to take care of the situation.

17. The Fishermen Cooperative Society is neither in a sound financial position nor has the ability and expertise to manage the tank fisheries. The area of the tank is spread over and covers number of village panchayats. As such, it may be difficult for one panchayat to shoulder the responsibility. The Taluk Panchayats and Zilla Parishads may not give adequate attention on account of their logistics. Therefore, it may be considered to organise an autonomous Institution with representative from fishermen, village panchayats, taluk panchayats zilla parishats, local MLSa and officers of the Fisheris, Irrigation and Forest Department to manage the fisheries development, exploitation and marketing. This Institution should be provided with necessary powers to impose suitable measures (mesh regulation, observance of `close-season' etc.,) to conserve the fishery of the tank. The routine issue of licences permits for fishing may be discontinued and royalty system of fishing may be enforced to generate required funds for future development of the tank fishery, besides, providing scope for fishermen to improve their catches, receipts and economic condtions. The institution may be initially provided with adequate funds for this purpose.

18. Importance of conservation fishes and maintenance of bio-diversity should be made known to fisheren and general public. Suitable awareness literature in Kannada may be prepared and distributed in all the villges, schools, fishermen cooperative society etc.

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FISH SANCTUARY, RIVER CAUVERY-CASE STUDY

RAMANATHAPURA, ARKALGUD TALUK, HASSAN DISTRICT

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FISH SANCTUARY, RIVER CAUVERY-CASE STUDY RAMANATHAPURA, ARKALGUD TALUK, HASSAN DISTRICT

by

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INTRODUCTION

Karnataka, with vast riverine stretches of about 6000 kms, boasts of harbouring a rich and varied fish fauna. It is on record that there are around 200 fish species in these resources. Some of the riverine stretches near the temples are the abodes for certain protected fish species and are called`sanctuaries' and they are to be protected. Sanctuaries for the protection of fishes have been established from early times. Government of Karnataka has declared following fish congregation centres as fish sanctuaries.

Sl.	Name of the Sanctuaries	River	Taluk	District
1.	Ranganathittu	Cauvery	Srirangapatna	Mandya
2.	Ramanathapura	Cauvery	Arakalagudu	Hassan
3.	Shishila	Kumaradhara	Belthangadi	Dakshina Kannada

There are some more riverine stretches in the state where congegation of fishes are protected by religious and other institutions and they are :

Sl.	Name of the Sanctuaries	River	Taluk	District
1.	Sringeri	Tunga	Sringeri	Chikmagalore
2.	Jammatigi	Tunga	Koppal	Chikmagalore

3.	Chippalagudda	Tunga	Thirthahalli	Shimoga
4.	Bachanayakanahalli	Kumaradhara	Sulya	Dakshina Kannada
5.	Todkhana	Chandragiri	Sulya	Dakshina Kannada
6.	Payaswini	Payaswini	Sulya	Dakshina Kannada
7.	Thingale	Seethanadi	Karkala	Dakshina Kannada
8.	Nisargadhama	Cauvery	Kushalnagar	Coorg

A declining trend in fish species, population and size have been noticed over the past few decades in these sanctuaries. The reason attributed is to the fast changing `eco-systems' brought about by environmental alterations consequent to construction of several barrages, weirs, anicuts etc., along the riverine course and the establishment of various industries, factories, increased agricultural activities and human habitation.

In such a scenarios, these three sanctuaries serve as areas of safe habitation for fishes as these are protected zones under Wildlife Act of 1972. However, data on the existing fish species and their populations in the sanctuaries and their status are not available. No measures are adopted for the protection and propagation of endemic fish species, as also, ecological monitoring has received very little attention over the past few decades.

OBJECTIVES OF THE STUDY

To assess the present `**status'** of a fish sanctuary including its area, depth, physico-chemical conditions of water, soil, plankton, benthos, aquatic vegetation and fish fauna and to evolve strategies for the protection and development as also to safeguard the bio-diversity.

Ramanathapura Fish Sanctuary :

Ramanathapura fish sanctuary situated in river Cauvery near Rameshwara Temple in Ramanathapura, Arakalgudu taluk, Hassan District also known as Vanhi Pushkarani. It was declared as sanctuary as per G.O. No. G. 1627 / Ft. 296.35.2 of 11/17.06.1935 by the Government of Mysore under the provisions of Section 5 (1) of Mysore Game and Fish Preservation Regn. II of 1901 which states that fishing for one furlong on either side of the pond known as `**Vanhi Pushkarani'** in the Cauvery river by the side of the Rameshwara

temple at Ramanathapura, Arakalgud taluk be prohibited" The sanctuary lies between 12(degree)37' latitude and 76(degree)5' longitude.

According to legends, the fishes in the `**Vanhi Pushkarani**' are the incarnations of noble souls around Lord Shiva. It has been observed that the fishes sheltering in the area never gets dislocated inspite of heavy floods in the river. Once when Maharaja of Mysore visited this fish sanctuary, he was pleased to decorate some fishes with snout rings.

METHODOLOGY

Three stations, one at sanctuary proper and one each at 1 km above and below on either side of the sanctuary were fixed for comprehensive observations on physico-chemical and biological features of water, soil, plankton, benthos, aquatic weeds and fishes.

Station - 1 1 km upstream of the sanctuary.
Station - 2 Sanctuary
Station - 3 1 km downstream of the sanctuary.

Samples of water, soil, plankton, benthos, aquatic vegetation and fishes were collected from each station and were analysed for physico-chemical and biological parameters employing standard methods.

After recording the temperature, the water, samples were analysed for turbidity, pH, dissolved oxygen, alkalinity, free ammonia, phosphate, nitrate and nitrite.

Light and dark bottle technique was employed for assessing the primary productivity.

The soil samples were analysed for pH, organic carbon and total nitrogen.

For plankton, 100 litres of surface water was strained through a plankton net made of nylobolt silk cloth corresponding to 21XXX. The samples collected were preserved in 5% formalin and subjected to both qualitative and quantitative analysis.

`D' type of net having a mouth opening of 0.44 M was towed to a length of 10 M to collect littoral biota. The samples were preserved in 5% formalin and analysed.

Different types of aquatic weeds observed in the areas were collected and identified.

Fishing gears of different types were operated and fish specimens collected were identified. Visited fish markers also to record fish fauna from the riverine stretch sampled.

The fishermen of the locality, elder citizens of the area and Officers of the Department of Fisheries, were contacted to ascertain the past and present status of the fish sanctuary.

OBSERVATIONS

The river stretch in the area studied is rocky with some pools. One such pool by the side of the Rameshwara temple is **Vanhi Pushkarani**. The pool is about 1.00 ha in area with an average depth of 1.5 M. The pool is silted up to some extent and the stone steps from the temple to **Vanhi Pushkarani** is in dilapidated condition. Although this pool is devoid of aquatic vegetation, on either side of the pool in the river stretch and in the middle of the river, thick grassy patches were observed. It has been also noticed that vehicles are being washed near the sanctuary and is also used for washing and bathing.

A small sign board of the size 1.5 X 1.5 feet is fixed near the sanctuary indicating its existence.

Presently, the sanctuary has famous game-fish of India - Mahseer - Tor khudree and the Katli Chocolate Mahseer-Neolissoclilus hexagonolepis. The latter species is observed to be in large numbers.

No organised feeding of fishes in the sanctuary is being done. Pilgrims and tourists, however, feed the fishes with groundnut, fried rice, biscuits, bread pieces etc. during festive seasons and on other days. There is no strict watch and ward by the Department of Fisheries or any other agencies (NGO's). The temple authorities said to be having vigil against poaching in sanctuary area. However, there are reports of dynamiting and poisoning in the sanctuary area during the lean season.

There is a fish nursery of the Department of Fisheries situated nearby the sanctuary, but is not in much use on account of leaky ponds.

Water :

The physico-chemical conditions of water and soil are presented in Table - 1.

Air temperature was found to range from 33.0 to 33.3°C. It was higher than the water temperature which was between 30.0 and 32.5°C. The water was clear, odourless and turbidity was less than 100 mg/l and it exhibited alkaline character with pH of 8.4. No variations in pH was noticed from different stations.

The dissolved oxygen ranged from 5.0 to 5.1 mg/l with no significant variations from different stations and was in moderate levels.

Total alkalinity at 104.0 mg/l was in moderate concentrations.

The water was free from pollution and free ammonia was absent in all the stations.

Nutrients like phosphates and nitrites were found in trace quantities while nitrate was in low concentration and found to range from 0.146 to 0.148 mg/l

The primary productivity value was recorded at 166.42 mgC/m3/hr indicating moderate productive potentially.

In general, the water was alkaline in nature with moderate hardness, satisfactory level of dissolved oxygen with low levels of nutrients and free from any pollution. Due to fluviatile conditions, no significant variations in the parameters from station to station could be observed.

The soil exhibited an alkaline character with pH of 8.1, low organic carbon content of 0.120 to 0.122% and total nitrogen of 0.06%.

Table - 1

Physico - Chemical conditions of water and soil

Parameters	**Station –1**	**Station -2**	**Station -3**
WATER:			
Air Temperature °C	33.0	33.3	33.0

Water Temperature °C	30.0	305	32.0
Colour	Colourless	Colourless	Colourless
Odour	Odourless	Odourless	Odourless
Turbidity -mg/l	Clear<100	Clear<100	Clear<100
Dissolved Oxygen - mg/l	5.0	5.1	5.0
PH	8.4	8.4	8.4
Total Alkalinity - mg/l	104.0	104	104.0
Free Ammonia - mg/l	Nil	Nil	Nil
Phosphate - mg/l	Tr.	Tr.	Tr.
Nitrate - mg/l	0.148	0.148	0.146
Nitrite - mg/l	Tr.	Tr.	Tr.
Primary Productivity			
mg $C/m^3/hr.$	166.42		

Parameters	**Station –1**	**Station -2**	**Station -3**
SOIL:			
PH	8.1	8.1	8.1
Organic Carbon %	0.122	0.120	0.122
Total Nitrogen %	0.06	0.06	0.06

PLANKTON :

Qualitative and quantitative planktonic groups are as in Table -2. Phytoplankton was found to dominate over zooplankton in all the stations where studies were conducted. Their numbers ranged between 1 and 23 u / litre. Qualitatively, phytoplankton, was contributed by Myxo phyceae, Chlorophyceae and Bacillariophyceae.

Myxophyceae was represented by Oscillatoria and Spiruline, Chlorophyceae by Spirogyra, Ulothrix, Pediastrum, Closterium and Mougeotia. Synedra, Asterionella, Cyclotella and Fragillaria constituted Bacillariophyceae.

Zooplankton was constituted by Protozoa, Copepoda, Rotifera, Cladocera and Ostracoda. Their numbers ranged from 1 to 8 u /l.

Protozoa was represented by Difflugia. Copepoda by Cyclops and Diaptomus, Rotifera by Keratella and Diaphnosoma, Cladocera by Ceriodaphnia and Ostracoda by Cypris.

The miscellaneous group was represented by insect remains, vegetative parts and nematodes.

Table - 2

Qualitative and Quantitative composition of Planktonic groups				
Groups		**Station -1**	**Station -2**	**Station –3**
PHYTOPLANKTON			7	
MYXOPHYCEAE	**Oscillatoria**	2	1	11
	Spirulina	-		-
CHLOROPHYCEAE	Pediastrum	2	3	5
	Closterium	-	-	1
	Mougeotia	2	-	1
	Spirogyra	7	11	7
	Ulothrix	5	13	2

Groups		**Station -1**	**Station -2**	**Station -3**
BACILLARIOPHYCEAE				
	Synedra	11	17	23
	Asterionella	-	3	5
	Cyclotella	1	-	3

ZOOPLANKTON :				
PROTOZOA	Diffugia	2	1	2
COPEPODA	Diaptomus	3	2	1
	Cyclops	8		7
			1	
ROTIFERA	Keratella	3	1	5
	Diaphnosoma			1
			2	
CLADOCERA	Ceriodaphnia	2		1
OSTRACODA	Cypris	1		
			1	
MISCELLANEOUS	Insect remains	2	1	3
	Vegetative parts	2		2
	Nematodes	1		2

LITTORAL FAUNA :

The forms listed were from the shallow weed infested marginal riverine stretches. Their distribution, in the three stations sampled, were almost identical. Amongst Insects, five species belonging to six Families coming under Four Orders; Molluscs - where Gastropods dominated over Bivalves, had nine species belonging to six Families under two Orders; Fishes - five species coming under four Families and three Orders and Crustacean - one species belonging to a Family and an Order were recorded. The riverine stretch where sampling was done, presented optimum occurrence of various benthic faunistic elements to sustain fish life.

INSECTS :			
	Order	:	Ephemeroptera
	Family	:	BAETIDAE
		1.	Cloeon spp.
	Order	:	Odonata
	Suborder	:	Anisoptera
	Family	:	LIBELLULIDAE
		2.	Urothemis signata (Rambur)
	Family	:	Coenagrionidae
		3.	Enallagma spp.
	Order	:	Hemiptera
	FAmily	:	NEPIDAE
		4.	Laccotrphes maculatus Fabricius
	Family	:	BELOSTOMATIDAE
		5.	Diplonychus annulatum Fabricius
	Order	:	Coleoptera
	Family	:	DYTISCIDAE
		6.	Dytiscus limbatus Fabricius
MOLLUSCS :			
	Class	:	Gastropoda
	Subclass	:	Prosobranchia
	Order	:	Mesogastropoda
	Family	:	VIVIPARIDAE
	Subfamily	:	Bellamyinae
	Genus	:	Bellamya Jousseaune

		1.	Bellamya bengalensis (Lamarck)
	Family	:	BITHYNIIDAE
	Subfamily	:	Bithyniinae S.str.
	Genus	:	Gabbia Tryon
		2.	Gabbia stenothyroides (Dohrn.)
	Family	:	THIARIDAE
	Subfamily	:	Thiarinae s.str.
	Genus	:	Thiara Roeding
	Subgenus	:	Thiara s.str.
		3.	Thiara (Thiara) scabra (Mueller)
	Subgenus	:	Melanoides Olivier
		4.	Thiara (Melanoides) tuberculata (Mueller)
	Subfamily	:	Melanatriinae
	Genus	:	Sulcospira Troschel
		5.	Sulcospira huegeli (Philipi)
	Subclass	:	Pulmonata
	Order	:	Basommatophora
	Family	:	LYMNAEIDAE
	Genus	:	Lymnaea Lamarck
		6.	Lymnaea acuminata Lamarck
		7.	Lymnaea luteola Lamarck
	Family	:	PLANORBIDAE
	Genus	:	Indoplanorbis Annadale & Prashad
		8.	Indoplanorbis exustus (Deshayes)
	Class	:	Bivalvia
	Subclass	:	Heterodonta

Order	:	Veneroida
Family	:	CORBICULIDAE
Genus	:	Corbicula Megerle von.Muehfeld
	9.	Corbicula striatella Deshayes

Fishes:			
	Order	:	Cypriniformes
	Family	:	CYPRINIDAE
	Subfamily	:	Danioninae (=Rasborinae)
	Tribe	:	Danionini
	Genus	:	Rasbora Bleeker
		1.	Rasbora caveruu (Jerdon)
	Subfamily	:	Cyprininae
	Tribe	:	Systomini
	Subtribe	:	Systomi
	Genus	:	Puntius Hamilton - Buchanan
		2.	Puntius ticto (Hamilton - Buchanan)
	Order	:	Cyprinodontiformes
	Family	:	APLOCHEILIDAE
	Subfamily	:	Aplocheilinae
	Genus	:	Aplocheilus McClelland
		3.	Apolcheilus lineatus (Valenciennes)
	Family	:	POECILIDAE
	Subfamily	:	Poecilinae
	Genus	:	Gambusia Poey
		4.	Gambusia affinis (Baird & Girard)

	Order	:	Perciformes
	Suborder	:	Percoidei
	Family	:	CHANDIDAE (=AMBASSIDAE)
	Genus	:	Parambassis Bleeker
		5.	Parambassis ranga (Hamilton - Buchanan)
Crustacean:			
	Class	:	Crustacea
	Subclass	:	Malacostraca
	Order	:	Decapoda
	Family	:	PALAEMINIDAE
		1.	Macrobrachium spp.

AQUATIC WEEDS :

The aquatic weeds - Hydrilla verticillata, Potamogeton pectinatus and Chara spp., along with terrestrial grassy vegetation (the latter in the exposed marginal areas of the riverine stretch) were found well distributed in the stations where hydrobiological collections were made. Following is the systematic list of weeds observed.

Family : HYDROCHARITACEAE
Genus : Hydrilla
1. Hydrilla verticillata Casp.

Family : NAIADACEAE
Genus : Potamogeton
2. Potamogeton pectinatus Linn.

Family : CHARACEAE
3. Chara spp.

The occurrence of particularly Hydrilla spp. and Potamogeton spp. warrants introduction of indigenous herbivorous carp - Puntius pulchellus and the exotic Grass carp – Ctenopharyngodon idella. All the weeds harbour various types of aquatic insects and molluscan fauna which forms the food of many species of fishes.

FISH FAUNA :

Twenty seven fish species belonging to eleven Families and six Orders were collected from the riverine stretch where hydrobiological and fisheries investigations were carried-out. The list, in additiona to the economically important fishes, also recorded the occurrence of the medium and minor carps, weed fishes, catfishes and murrels. Though the distribution of fish species was almost identical, however, carps and weed fishes were the dominant ones by numbers.

Super Class	:	Gnathostomata
Class	:	Actinopterygii
Subclass	:	Neopterygii
Division	:	Teleostei
Subdivision	:	Osteoglossomorpha
Order	:	Osteoglossiformes
Suborder	:	Notopteroide
Family	:	NOTOPTERIDAE
Genus	:	Notopterus Lacepede
	1.	Notopterus notopterus (Pallas)
Subdivision	:	Euteleostei
Superorder	:	Ostariophysi
Order	:	Cypriniformes
Family	:	CYPRINIDAE

Subfamily	:	Danioninae (=Rasborinae)
Tribe	:	Oxygasterini
Genus	:	Salmostoma Swainson
	2.	Salmostoma acinaces (Valenciennes)
Tribe	:	Danioni
Genus	:	Danio Hamilton - Buchanan
	3.	Danio aequipinnatus (McClelland)
Genus	:	Rasbora Bleeker
	4.	Rasbora caverii (Jerdon)
Subfamily	:	Cypininae
Tribe	:	Cypinini
Suybtribe	:	Cypini
Genus	:	Cyprinus Linnaeus
	5.	Cyprinus carpio var communis (Linnaeus)
Subtribe	:	Tores
Genus	:	Tor Gray
	6.	Tor khudree (Sykes)
Genus	:	Neolissochilus Rainboth
	7.	Neolissochilus hexagonolepis (McClelland)
Tribe	:	Systomini
Subtribe	:	Systomi
Genus	:	Puntius Hamilton - Buchanan
	8.	Puntius carnaticus (Jerdon)

	9.	Puntius chola (Hamilton - Buchanan)
	10.	Puntius sophore (Hamilton - Buchanan)
	11.	Puntius ticto (Hamilton - Buchanan)
Tribe	:	Labeonini
Subtribe	:	Labeones
Genus	:	Labeo Cuvier
	12.	Labeo calbasu (Hamilton - Buchanan)
	13.	Labeo rohita (Hamilton - Buchanan)
Subfamily	:	Garrinae
Genus	:	Garra (Hamilton - Buchanan)
	14.	Garra gotyla stenorhynchus (Jerdon)
Order	:	Siluriformes
Family	:	BAGRIDAE
Subfmily	:	Bagrinae
Genus	:	Mystus Scopoli
	15.	Mystus cavasius (Hamilton - Buchanan)
	16.	Mystus montanus (Jerdon)
Family	:	SILURIDAE
Genus	:	Ompok Lacepede
	17.	Ompok bimaculatus (Bloch)
Genus	:	Wallago Bleeker
	18.	Wallago attu (Schneider)
Superorder	:	Acanthopterygii
Series	:	Atherinomorpha
Order	:	Cyprinodontiformes
Family	:	APLOCHEILIDAE

Subfamily	:	Aplocheilinae
Genus	:	Aplocheilus McClelland
	19.	Aplocheilus lineatus (Valenciennes)
Family	:	POECILIDAE
Subfamily	:	Poecilinae
Genus	:	Gambusia Poey
	20.	Gambusia affinis (Baird & Girard)
Order	:	Synbranchiformes
Suborder	:	Mastacembelidei
Family	:	MASTACEMBELIDAE
Subfamily	:	Mastacembelinae
Genus	:	Mastacembelus Scopoli
	21.	Mastacembelus armatus (Lacepede)
Series	:	Percomorpha
Order	:	Perciformes
Suborder	:	Percodei
Family	:	CHANDIDAE (=AMBASSIDAE)
		Chanda Hamilton - Buchanan
	22.	Chanda nama Hamilton - Buchanan
Genus	:	Parambassis Bleeker
	23.	Parambassis ranga (Hamilton - Buchanan)
Suborder	:	Labroidei
Family	:	CICHLIDAE
Genus	:	Oreochromis Gunther
	24.	Oreochromis mossambica (Peters)

Suborder	:	Anabantoidea
Family	:	ANABANTIDAE
Genus	:	Anabas Cuvier
	25.	Anabas testudineus (Bloch)
Suborder	:	Channoidei
Family	:	CHANNIDAE
Genus	:	Channa Scopoli
	26.	Channa marulius (Hamilton - Buchanan)
	27.	Channa striatus (Bloch)

DISCUSSION

The water was alkaline in nature with moderate hardness, satisfactory levels of dissolved oxygen with low levels of nutrients and free from any pollution. Fluviatile conditions of water was observed. The soil was alkaline with low organic carbon and total nitrogen. The primary productive values were in moderate level. The plankton and the benthic fauna was in moderate levels.

Aquatic vegetation was represented by Hydrilla Potomogeton and Chara. Which could profitably be utilised as fish food by introducing herbivorous carps. P.pulchellus and C.idella

27 species of fishes were recorded in and around sanctuary area, of which the dominant forms were N.hexagonolepis, T.khudree, P.carnaticus, L.calbasu, O.marulius and minnows. Though species like L.calbasu, P.carnaticus, T.khudree N.hexagonolepis & C.marulius are listed under `threatened' category, these species however, are found in small numbers. N.hexagonolepis, is the only species available in large numbers in the sanctuary. Therefore, concerted efforts are to be made to protect these fishes by arranging proper watch and ward, feeding, etc.

The temple authorities and general public are of the opinion that the population of fishes, species-wise in the sanctuary, as also their individual size has considerably reduced. It is also stated that Bili Meenu - T.khudree which was once a dominant species, has dwindled in its population and the present species in abundance noted is Ellu meenu - N.hexagonolepis. They further stated that there is no proper watch and ward and no regular feeding for fishes in the sanctuary is being done. There are good number of licenced fishermen engaged in fishing in river Cauvery who are stationed in Konanur, 3 km away from the sanctuary. They operate different type of nets with varied mesh sizes in both upper and lower stretches of the sanctuary and catch fish species of all sizes. Poaching and dynamiting are also resorted-to during summer months. Thus they, to a large extent, are responsible for the redution in the population of the fishes in the sanctuary and also in the riverine stretch of the area.

The fish sanctuaries are important from the point of protecting the fishes of the concerned rivers; but all the fishes of a river may not be a constituent in the fish population of the sanctuary. Efforts, hence, may be made to collect and stock them in the sanctuaries to protect and propagate them.

Though these sanctuaries are, to some extent protected, they have yet been subjected to poisoning, dynamiting overfeeding causing depletion of oxygen during festivals resulting in mass mortality of valuable fish stocks. To quote, at sishila the sanctuary was poisoned causing destruction of hordes of fishes. Thanks to the NGOs who have now taken steps to restore the sanctuary. An instance at Bachanayakanahalli, Enakal sanctuary in Kumaradhara in the recent past, subjected to over-feeding causing depletion of oxygen and mass mortality of fishes. Such instances may be taking place in other sanctuaries also which commands vigil all the time in order to maintain bio-diversity of the valuable fish genetic resources.

STRATEGIES FOR THE IMPROVEMENT OF THE SANCTUARY

1. There may be several other fish congregation centres in the perennial rivers in the State. Besides these, fishes congregate at the foot of the falls and also at anicuts. Therefore, it is necessary to undertake a detailed survey to identify such congregation places and demarcate the areas for declaring them as **"fish sanctuaries"** to protect the endemic fish species.

Proper boundary of the sanctuary should be fixed by installing prominant **"sign boards"** at strategic points incorporated with details such as **`Fish sanctuary'** its extension. Do's and Don'ts to ensure the safety and well being of the fishes.

Do's	Don'ts
(a)Feed the fishes with biscuits, bread, fried or cooked rice, rice polish	Throwing stones, cigarettes, cigar beedi stubs, plastic bags, oily stuffs, papers and any other wastes etc and ground nut oil cake.
(b) Maintain respectable Fishing distance to view the fishes in their natural habitat.	Poisoning, dynamiting, washing of clothes, pesticide containers; sprayers used for spraying pesticides etc.

2. As against one furlong on either side of **Vanhi Pushkarani** as sanctuary, a distance of 1.5 Km above and 1-5. Km below may be declared as the new boundary. This is in view of the fact that there are deep pools located within the proposed extended portion of the riverine stretch where also

fishes, during the summer months, take shelter and are vulnerable for fishing. By declaring these areas, proper shelter and safety could be ensured to the fishes endemic to the region which help in multiplication of its stocks and maintain bio-diversity. The Government should take steps to amend the existing limits of **one furlong** on either side of the sanctuary to **1.5 Kms**.

3. The fishes in the sanctuary are likely to migrate for breeding during monsoon and post-monsoon seasons. At present fishing is permitted beyond the sanctuary area during these seasons. To prevent exploitation of brood migrating fishes, it is necessary to prohibit fishing in the riverine stretch of 10 Kms - upstream and downstream, in the interest of protecting the fishery and its propogation.

4. It is observed that the pools in the sanctuary area are silted-up. Efforts to desilt pools with least distuubance to the fishes may hence be undertaken, so as to provide scope for the fishes to have enough space in the sanctuary.

5. Certain marginal areas of the river stretch near the sanctuary where grass / weeds are found, may be cleared manually.

6. It is noticed that vehicles are being washed in the sanctuary area. This may lead to pollution which in turn affect the fishes. As such, cleaning of vehicles in the vicinity of the sanctuary area has to be totally prohibited.

7. A separate ghat may be created beyond the notified sanctuary area for washing of washing cloths and bathing purposes.

8. Some of the stone slabs of the **steps** leading to the Vanhi Purshkarani are dislocated and some of them have fallen into the sanctuary proper obstructing the normal movement of the fishes. Action may be taken to remove these from the sanctuary area, repair steps and prevent further damage.

9. Unless public are involved in maintaining the sanctuary, it is difficult to protect it. Therefore NGO's should be organised to take care of the sanctuary with necessary financial assistance. This is to ensure the safety of the fishes and regular feeding as at present no institution or individuals are involved in the maintenance of the sanctuary.

10. Feeding of fishes should be done as a daily routine and over-feeding during festivals in particular should be controlled by proper supervision as unutilised feed materials may lead to pollution (depletion of oxygen etc.,) and in mass mortality of fishes.

11. Apart from collecting and cooling the existing fish species available in the river stretch in the sanctuary, other endemic species of the river may also be pooled and protected. This shall be institutes conservation of all the endemic species of the river.

12. Government fish nursery near the sanctuary may be got repaired and utilised for raising the endemic fish species collected from the Cauvery river before they are released into the sanctuary.

13. A Mahseer fish hatchery established at Harangi (35 Km from Ramanathapura) in Coorg district may be utilised for breeding T.khudree, N.hexagonolepis. P.carnaticus, L.calbasu etc. and rejuvinate the stocks in this river as also elsewhere in the State by the Department of Fisheries.

14. Departmental Officers may be trained in different aspects of fish culture and breeding and to enforce legal proceedings against those who violate law in maintaining the sanctuary.

15. Mass awareness among the people should be created regarding the importance of fish sanctuary by circulating suitable literature in local languages.

16. Only three areas in the State are officially declared as **`Sanctuaries'** by the Department of Fisheries.

The other 8 fish congregation spots / sanctuaries which, presently, are being managed by religious institutions and others should also be declared as sanctuaries. A detailed study of these 8 sanctuaries may be under taken and suitable measures to improve them on the lines indicated may be followed to protect and maintain the bio-diversity of their fish genetic resources.

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16. Annexure K: List of Participants

16. Annexure K: List of Participants

The following codes have been used to categorize the participants

S = Steering committee I = Industry P = Participant T = Teacher V = Volunteer (Student/locals) A = All India Radio Programme Participants G = Government officials E = Experts C = Case study team W = Working group B = Special invitees O = Organizing members N = News paper article respondents

A C Chandrakala Tumkur	A
A.S. Chandramouli AIR	A
Abhyankar Belthangadi	A
Adnoor Haveri	A
Ambikamma Tumkur	A
Anandappa Kolar	A
Anandappa Shimoga	A
AnanthKumar Nagamangala	A
Ananthram Srirangapatna	A
Anasuya Mysore	A
Angadi Gadag	A
Anuradha B.R. AIR	A
Archana Hassan	A
Arunakumar Shimoga	A
Ashwathamma Tumkur	A
Avatigera Bijapur	A
B. V. Padma AIR	A
Banu Nanjangood	A

Basamma Tumkur	A
Basanna Tumkur	A
Basava Nanjangood	A
Basavaraj Bagalkote	A
Basavaraj Chitradurga	A
Basavaraja Belgaum	A
Basha Chikmagalur	A
Bhanumathi Shimoga	A
Bhavana Chikmagalur	A
Bhimappa Bijapur	A
Brahmayya Blore	A
C Shyamala Gundlupet	A
Chakravarthy Hassan	A
Chalapathi Kolar	A
Chanchala Nanjangood	A
Chandra Mysore	A
Chandrahasa Mandya	A
Chandrakala Mysore	A
Chandranath Davanegere	A
Chandrashekar Belgaum	A
Chandravathi Kundapur	A
Chandravathi Udupi	A
Chandregowda Hassan	A
Charan Mysore	A

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Chidananda Tumkur	A
Chikmat Gadag	A
Chondamma Kodagu	A
Chotteppagola Belgaum	A
D V Asha Kolar	A
Derenama Punajanur	A
Doddmane Haveri	A
Doreswamy Chamarajanagar	A
Dundavva Bijapur	A
Dyamesh Bagalkote	A
Gadigeppa Haveri	A
Ganapathi Blore	A
Ganesh Blore	A
Gangaraj Blore	A
Gayathri Blore	A
Girija Blore	A
Girija Kolar	A
Girish Raichur	A
Girish Kumar Chamarajanagara	A
Gopala Blore	A
Govinda Bantawal	A
Gurumurthy Kodagu	A
Gururaja Kolar	A
H S Venkatram Shivmoga	A

H.R.Krishna Murthy Director -AIR	A
Halasur Haveri	A
Hallur Bagalkote	A
Hanumanthraju Tumkur	A
Hemalatha Bantwal	A
Hiremath Gadag	A
Hubballi Haveri	A
Ikbalkhan Dharwad	A
Indiramma Kodagu	A
Indu Yesupriya AIR	A
Iranna Laxmishwar	A
Jagadamba Hoskote	A
Jairanganath Karwar	A
Janaki Hassan	A
Jayanna Chitradurga	A
Jayaram Mudugere	A
Jayasheela Hassan	A
Jimi Kodagu	A
Jnaneshwara Tumkur	A
Jyothi Shimoga	A
Jyothi Karkala	A
K Gunashekar Deputy Director - AIR	A
K.S.Nirmala Devi AIR	A
Kate Bijapur	A

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Kaushik Shimoga	A
Kiran Blore	A
Kirshnamurthy Udupi	A
Kodihala Koppala	A
Komala Blore	A
Kotrappa Bellary	A
Krishnamurthy Chikmagalur	A
Krishnamurthy Udupi	A
Krishnamurthy Shimoga	A
Krishnappa Kolar	A
Krupa Kolar	A
Kubeera Haveri	A
Kulkarni Bijapur	A
Kulkarni Gadag	A
Kumar Madikeri	A
Kumar Mysore	A
Kumari Mysore	A
Kumudam AIR	A
Laxmi Hassan	A
Laxmibai Belgaum	A
Leela Shekar Gundlapete	A
Leelavathi Shimoga	A
Lokesh Hassan	A
M C Mamatha Tumkur	A

M Prasad Nanjangudu	A
M Vimala Shivmoga	A
M. S. Puttamadanayaka Nanjangudu	A
Madhavi Haveri	A
Madhayya Kollegal	A
Madhuvi Haveri	A
Mahadev Blore	A
Mahadeva Nanjangood	A
Mahadeva murthy Nanjangood	A
Mahadevaiah Chamarajanagar	A
Mahadevappa Kodagu	A
Mahadevappa Bellary	A
Mahadevappa Koppala	A
Mahadevayya Tumkur	A
Mahadevegowda Chamarajanagara	A
Mahalingaya Tiptur	A
Mahantappa Raichur	A
Mahantesh Belgaum	A
Mahesh Mandya	A
Malini Blore	A
Manikanta Chamarajanagar	A
Manjappa Haveri	A
Manjegowda Hassan	A
Manju Chikkahalli	A

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Manju H.D.Kote	A
Manju Mysore	A
Manju Mysore	A
Manjula devi Chikkabalapura	A
Manjunath Udupi	A
Manjunath Hassan	A
Manjunath Udupi	A
Manjunath Kundapur	A
Maya Haliyala	A
Meera Blore	A
Mukantihal Bijapur	A
Mukunda Mysore	A
Nagabushana Hassan	A
Nagamani Nanjangood	A
Nagamma Nanjangood	A
Naganayaka Mysore	A
Nagaraj Shimoga	A
Nagaraj Mysore	A
Nagarathna Chamarajanagara	A
Nagarathna Mysore	A
Nagarathnamma Blore	A
Nagasundaramurthy Blore	A
Nagasundaramurthy Mysore	A
Nagaveni Nanjangood	A

Nagendra Mysore	A
Nagesh Sringeri	A
Namiraj Mysore	A
Nanjundswamy Mysore	A
Narasimhamurthy Pollampalli	A
Narayan Rai Puttur	A
Narayana Shimoga	A
Narayanaswamy Blore	A
Nataraj Hunsoor	A
Nethravathi Chitradurga	A
Niranjanmurthy Bijapur	A
Nirmala Chikmagalur	A
Nirmala Tumkur	A
P L Ramakrishana Rao Kolar	A
P R Ramesh Kolar	A
Padmavathamma Kolar	A
Pankaja Davanegere	A
Paramesh Hassan	A
Parijathamma Kolar	A
Pathiraj Yadavanahalli	A
Patil Haveri	A
Poornima Hassan	A
Poornima Karkala	A
Prajna Udupi	A

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Prajwal Bangalore	A
Prakash Shimoga	A
Prakash Haveri	A
Prasad Mandya	A
Prathima Ujire	A
Pushpa Tumkur	A
Puttamadanayaka Nanjangood	A
Puttaswamy Chennapatna	A
Puttaswamy Blore	A
Radhakrishna Kairala	A
Radhakrishna Bantwala	A
Raghavendra Sirsi	A
Raghavendra Blore	A
Raheshwari Bijapur	A
Rajanna Tumkur	A
Rajashekar Hassan	A
Rajendra Kumar Mysore	A
Rajesh Shimoga	A
Rajesh Magadi	A
Rajesh Blore	A
Rajeshwari Bijapur	A
Rakesh sharma Mysore	A
Ramachandra Hassan	A
Ramachandra Puttur	A

Ramakrishna Tiptur	A
Ramakrishna Hassan	A
Ramamani Blore	A
Ramamurthy Mysore	A
Ramaradhya Mysore	A
Ramarathna Blore	A
Ramaswamy Shimoga	A
Ramegowda Mandya	A
Ramesh Kundapur	A
Ramesh Blore	A
Ramyashri Mulukunte	A
Rane Haliyala	A
Ranganath Karwar	A
Rangaswamy Nanjangood	A
Rangaswamy Shetty Nanjangudu	A
Ravi kantha Tumkur	A
Ravi nayak Chitradurga	A
Ravikantha Bagalkote	A
Ravishankar Karwar	A
Rekha Hassan	A
Robert Nanjangood	A
Rohit Mysore	A
S Asha Bangalore	A
Sadananda Shimoga	A

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Sandeep Blore	A
Sanjeeva Udupi	A
Sanju Belgaum	A
Santhosh Kodagu	A
Sarvamangala Blore	A
Sarvamangala Mandya	A
Sathisha Kondandur	A
Sathyabhama Mandya	A
Sathyanarayana Hassan	A
Sathyanarayana Shimoga	A
Seetha Nanjangood	A
Seetharama Kolar	A
Seetharamappa Kolar	A
Shamala Kolar	A
Shanthamma Chitradurga	A
Sharadha Karwar	A
Sharadhamma Blore	A
Shardha Blore	A
Shashikiran Malur	A
Shashikiran Kolar	A
Sheshappa Puttur	A
Shila Haveri	A
Shila Bijapur	A
Shilpa Haveri	A

Shiridhar Tumkur	A
Shivakumar Hesarur	A
Shivanal Bijapur	A
Shivananda Chikamagalur	A
Shivananda Malur	A
Shivanandappa Shimoga	A
Shivanna Koppala	A
Shivappa Shimoga	A
Shivarama Hassan	A
Shivarama Kundapur	A
Shivashankar Nanjangood	A
Shivaswamy Chamarajanagara	A
Shoba Chamarajanagara	A
Shridhar Tumkur	A
Shrikanta Blore	A
Shrinath Blore	A
Shrinath Blore	A
Shrishaila Koppala	A
Siddappa Tumkur	A
Siddappa Hunsur	A
Someshekar Blore	A
Soubhagya Tumkur	A
Srinath Blore	A
Srinivas murthy Kolar	A

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Sudarshan Blore	A
Sudha Chitradurga	A
Sudha Haveri	A
Sugnanachari Malur	A
Suguna Blore	A
Sugunamathi Mysore	A
Sujatha Belthangadi	A
Suma Hassan	A
Sumangala Mummigatti AIR	A
Sumathi Chitradurga	A
Sumithra Tumkur	A
Sumithra Shimoga	A
Sumitra Blore	A
Sundara murthy Chitradurga	A
Suresh Mysore	A
Suresh Hunsur	A
Suresh Belgaum	A
Swarnamba Shimoga	A
Thimmaraj Chalkere	A
Thirthamallesh Hassan	A
Triveni Tumkur	A
Triveni Herur	A
Tulasi Udupi	A
Uma Mysore	A

Umadevi Blore	A
Umesh Blore	A
Umesh Dharwad	A
Umesh Bidar	A
Umesh Mandya	A
Usha Shimoga	A
Vanaja Blore	A
Vanajakshi Gadag	A
Vanajakshi Mandya	A
Vanajamma Kolar	A
Varghese Mundagod	A
Vedavathi Kundapur	A
Vedavathi Mysore	A
Veena Blore	A
Veerabhadra Mysore	A
Veerabhadrappa Blore	A
Veeranna gowda Dharwad	A
Venkataramana Mandya	A
Venkatarathna Kolar	A
Venkatesh Chitradurga	A
Venkatramana Mandya	A
Vijaya Kasargod	A
Vijaya Nanjangood	A
Vijayakumar Bellary	A

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Vijayakumari Kundapur	A
Vinaya krishna Belthangadi	A
Vishvanath Blore	A
Y N Premakumari Kolar	A
Y.D. Ramaradhya Mysore	A
Yashodha Belthangadi	A
Yashodha Hassan	A
Yathesh Tumkur	A
Yelukotappa Gadag	A
Yogananda Chikmagalur	A
Yogesh Chikmagalur	A
Chengappa Vice president- Coorg Wildlife Society	B
Dr KP Achar Teacher	B
Suresh Heblikar Head - Ecowatch	B
Chandrashekarupadhya	C
Dr. Mahesh	C
Santhosh	C
B.V . Gundappa	C,T
T.V.N. Murthy	C,W
Prof. S.N. Bhat Teacher Bangalore	E
Yogesh Gokhale, Researcher Centre for Ecological.Science Indian Institute of Science , Bangalore	E
Chandrashekaraiah H.N. Retd. Jt. Director-Fisheries	E,C,W
M.F. Rahman Scientist	E,C,W
S. Sridhar	E,W
S.G. Neginhal Deputy Conservator of Forests(Retd.)	E,W
Dr. S.N. Bhat R.V.P.High School,	E,W

Hameed Scientist	G
K.G Uthappa Advocate Ganicoppal	G
M.M. Jaya R.F.O Madikeri	G
P. Anur Reddy Conservator of Forests Kodagu	G
R.K Srivastav DFO Virajpet	G
T.R. Satish Chandran Former Chief Secretary	G
Vijay Bhaskar Comissioner for Public Instruction	G
Vijaya Raghava singh Assistant conservator of Forest Thithimathi Sub Division Thithimathi 571254	G
Dr. M. H. Swaminath Conservator for Forests	G,W,S
K. S. Nadgoud Govt High School	K
Kunjira Mulya Gidamulika Doctor Mala,	K
P. Hanumantharaya K. Rampura Pavagada Tumkur	K
Sharadamma S.V.S High School Agumbe	K
Anwart lossia Udaya T. V. Camera	M
Ayyappa Tukkai Columnist Suddingola	M
B. Venkatsingh Press	M
Channabasava E. T.V Kannada	M
Etv News Reporter Madikeri	M
H.S Manjunath Pajavani Pha	M

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Jeavan Chinnappa Reporter THE HINDU	M
M. D. Jee Kaveri T. V.	M
M. S. Rajendra Kumar Pajavani	M
Ramkrishna The New Indian Express	M
Sunil Kumar	M
T.M Satish Vijaya karnataka	M
Udaya T.V Reporter Madikeri	M
A. Shivaprakash # 48, Hemavathi, R.P.M. Coloney Kuvempunagara Mysore	N
Aparna R. # 245, 2nd Main Road, Panchasheelanagara Nagarabhavi Post Bangalore	N
Asha S. # B- 477, "Susheela Sadana"Maother theresa School (back side) Bahubali nagara, jalahalli Bangalore	N
B. Mallesh Kadalabalu Post Hagaribommanahalli Ballari	N
B. Sreenivasa 15/2, 8th cross, Sudhamnagar, (Near masjid) Bangalore Bangalore	N
B.N Chandrashekar # 163/1 1st Floor, 9th Cross, 4th Main, Narasimharaja colony Bangalore Bangalore -19	N
B.N. Mohan Kumar # 9 &10 Swamy Vivekananda Street Amruthahalli Bangalore	N
Chandrashekar G. # 736 Bangalore	N

Bangalore	
Chethana Hegde, Baragara P. Devisara Siddapura U.K	N
D.Geetha Maruthi Nilaya, P.W.D. (opp) P.W.D office Anekal Bangalore	N
Dayanand M. Patil Mole (post) Athani Belgaum	N
Divakar B.K. Mariyappa Vidyarthi Nilaya Chamarajapet Bangalore- 18	N
G.N. Maruthi 68/1, 16th Cross, 4th Main, Chinayanpalya Bangalore- 30	N
Gopu Gobale Shishila Belthangadi D.K	N
H.M Sathish Helluru Adivala -577511 Hiriyur Shivmoga	N
J. Vivek # 550, 18th Main, Judical Layout, G.K.V.K. (P) YNT Bangalore- 65	N
K. Sandhya # 40/7, Syndicate Bank Staff Quarters, Nandini Layout Bangalore Bangalore	N
K. Sharadha Bhat # 58, Shanthananda Residency, Mechan Plastital Road Udupi Udupi	N
K.S. Jagannath Kaduru Chikkamangalore	N
Ladan saheba B. # 49, 1st Main, Binnimil Road (back side) Ganganagar Bangalore Bangalore	N

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Lokesh Heroor Heroor (post), Sirsi Via U.K	N
M. Siddaramu Prasaranga, manasagangothri Mysore -6	N
M.S. Agnes Prathitha B.D.A. # 116, 7th Cross, 2nd Main Road, 'E' Block, Church Street Lingarajpura Bangalore Bangalore	N
M.V. Narmada Melekote Tumkur	N
Madhusudan K.H. Kakolu Hesaragatta Bangalore north - 89	N
Mahendra Kumar B.S Sri Venugopala Eng., Industries, Pradana Road, Near KSRTC Bus Stop Hiriyur Shivmoga	N
Manjunath H. Anvayika Pranishasthra, 1802/32, 11nth Cross Anjaneya Street Davanagere	N
N.Raghavendra 3rd BAMS, Room No. 4, B.K. mariyappa hostal, 3rd Main, ChamarajPet Bangalore Bangalore	N
Nagappa Ramesh Harijana M. Kurabathahalli Post Alamala Bijapura	N
Naresh M.M 2nd Proff BAMS, Govt Ayurvedic Medical College Bangalore Bangalore	N
Naveen V. Koramangala Bangalore Bangalore	N
P.M. Makanadara Nidagundi, Vanathi (P) Basavana Bagevadi Vijapura	N
Parvathi Bellakatte, Harakabavi (P) Kodligi	N

Ballari	
Pranesh Varna B. Retd., Teacher, Somavarapet, Nagara- 577425 Shivmoga	N
Prof. M.S. Appa # 774, 4th Main, 2nd Stage, West of Chord Road P.O Mahalakshmi Puram Bangalore-86	N
R. Ravikumar 2nd B.A.M.S Govt Ayurvedic Mahavidyalaya Dhanvanthari Road, bangalore Bangalore Bangalore	N
Rajeshwari G. 2nd Prof BAMS, GAMC Bangalore Bangalore	N
Ramaya G. # 133, Nandana VHBCS layout West of card Road Bangalore Bangalore	N
Rashmee D. 2nd Proff BAMS, Govt Ayurvedic Medical College	N
Raviraj Doddamani # 203, 1st Main, 5th Cross, Manjunathnagar Bangalore -10	N
Rizwana Kouser # 388/A, S.A.K. Villa, M.E.S. Road Gokula, Mathikere (Post) Bangalore Bangalore	N
S.K Srinivas 2nd Professional BAMS, Govt Ayurveda Medical College Bangalore	N
S.K. Kumar Bettahalasur Bangalore North Bangalore	N
S.N Sathyanarayanappa Associate Professor (inland Fisheries) Regional Research Station Mudigere -577132	N
S.T. Shivappa Retd., Principal., # 1660/32/A,11th Cross	N

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Tharalabalu Street Davanagere Davanagere	
Savitha R. # Kudur, Near Telephone Exchange Magadi Bangalore Rural	N
Shilpa M.V Kamadenahalli Kolar Kolar	N
Shreelatha S. Kuka Subramanya Sulya Sulya	N
Sri Aruna Coffee Works # 6, Dr.Shivaramakarantha Road Mudalapalya, Bangalore Bangalore	N
Sukanya M	N
T. Thimmaiah Deputy Commissioner of Income Tax (Retd), # 139/B, 10th Main, Rajmahal Vilas Exte., Bangalore Bangalore	N
T.C.Rajalakshmi " SRI GAYATHRI", Left Side of Sri Thayappa's Sani Temple Ramaswamy Palaya, Bangalore Bangalore	N
Temsuwapang Bangalore Bangalore	N
V.S.N. Nagaraj # Harsha Hotel Mathikere -54 Bangalore- 54	N
Vaishali S. # 833,shudu Road T.N. Pura	N
Vijayakumar Salimar # 129/2 Old Bar Line Road Shivmoga Shivmoga	N
A. Naga A. C.	P
A. R.Kuruban Training Associate K.V.K.	P
A.A. Sathish Kumar Teacher, Areena Juniour College Cherambane Madikeri	P

A.N. Yellappa Reddy Deputy Conservator of Forests(Retd.)	P
Akshay Heblikar	P
Ambika Govt P.U. College	P
Dr. Ameen Ahmed	P
Ashik Somaiha The Director Natural Remedies,19th K.M Stone Veerasandra, Indstrial Area	P
Ashoka J. Asst, Prof, RRS,	P
Ashoka Mulha Yavakapadi Village Yavakapadi Post Coorg 571212	P
Dr. Aurn Venkatraman	P
B. Harishchandra Pakkala Post Grade Putthuru Mukrampadi	P
B. K. Parameshwar Rao	P
B. S. Polis gowdar Asst, Prof., I.D.E, CAE	P
B. S. Raghavendra Teacher P. N. College	P
Dr. B. T.Pujan	P
Dr. B.V. Patil Teacher	P
Babu K.R Cee Coorg Field Office Virajpet	P
Basavalingappa Eshwar Farms	P
Basavaraj Ballathi	P
Basavaraj S. Para District Information Officer	P
Beena Majai	P
Bharmagoudra	P
Dr. C. V. Patil Teacher Director of Instruction (Agri) College of Agriculture	P
Dr. D H Gowda Vidhyabidhibi High School , Sanjeeviri, K.R. EXT	P
D. Pampanna neravi Sri gowri" Rajendraraj Mukyadwara	P
D.J. Shankarappa Teacher Professor Govt. Ay. Mid. Collage	P

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Dodderi. Kuluvanahalli Post,	
Devadattam C.A.E	P
Divun N. T. P. N. College	P
E. Basavaraju Secretary B. G. V. S IISC. Campus. Bangalore 560012	P
E. Basavaraju Bharatha Gnyana Vignyana Samithi C. E. S. Campous Bangalore	P
Faizar Rahman Daily salar	P
Girish Kumar Govt P.U. College	P
Goolappagowda Jegarkal	P
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Hugan L.B. A. C,	P
Indumathi S.	P
J.K. Neeskanth Asst., Professor	P
J.Raghunath Bhat Tumkur Science Center	P
J.T Kunjappa Rtd. B.D.O Madikeri	P
Jagjiwan Ram Assistant Animal Scientist	P
Jalilpasha Govt P.U. College	P
K. A. Subramanyan	P
K. B. Yeshoda C. E. E. V Murnad Post	P
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Lakshmikanth Teacher	P
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Lokesha Teacher	P

Associate Professor College of Agriculture	
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M.M Prakash Kolathoda Bygodu Village HATHUR Post S. Kodagu	P
M.N Ramesh Asst, Professor of Forestry College Forestry, Ponnampet	P
Mahalingappa Articulture	P
Mallikarjun . D.L	P
Mallikarjun Kinkere	P
Manju Sharma	P
Manjunath M P. N. College	P
Manu	P
Dr. Mohankumar H. D. Teacher Associate Professor College of Agriculture	P
Dr. N. B. Naravani D. I. College of Agriculture Eng.,	P
N.A. Kusholoppa Mukkoti mahalakshimi Temple Koikoolu Village	P
N.B. Ponnappa K. Nidnganne	P
Dr. N.D Prakash Teacher Dept of COL & FB Ponnampet	P
N.P Madappa Ponnumadu- Estate Kattemadu village Post Madikeri 571252	P
Nagalika V. P. Sr- F-S	P
Naik V. V.	P
Nainesh Student	P
Nandeesh	P
Nandisha Prashanth Chitramandiradha Sankirna, Kaggaladu, Gowdagere Post,	P

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Nanja Reddy A.C.R	P
Neyakauda Bopanna Makkotu Temple Kaikadu Village Paraue Post	P
O. J. COLACO Western Ghats Pharmaceuticals E - 8, Kumbalgodu INDL EST,	P
P. Katti RRS	P
P. M. Munikrishnappa Asst., Prof.,	P
Dr. P. M. Salimath Teacher Prof & Head Plant Breeding & Genetics	P
Dr. P. S. Hugeer Teacher C.A.S.	P
P. Shivarajappa H.vo. 1-8-88	P
P.K Abdul lathif Teacher B.G.V.S IISC Campous, Yashvanthapura Bangalore	P
Paramashivaih Gowdanakatte, Mattihalli Post,	P
Dr. Prabhuraj Teacher Asst., Professor Dept.	P
Prasanna D. R.	P
Praveen K.S Student	P
Praveen Karanth	P
PREM COLACO Western Ghats Pharmaceuticals C- 8, Kumbalgodu INDL EST,	P
Prof. S. S. Kumath C.A.E	P
Dr. R. R. Hanchinal Teacher Sr Wheet Breeder	P
R. Ramu	P
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Raju charan A.C	P

Ramakrishna Hegde Teacher College of Forestory Ponnampet.	P
Dr. Ravikumar Teacher Plant Breder	P
Dr. S. A. Patil Teacher Vice Chancellor	P
Dr. S. N. Vasudevan A.C.R	P
S. S. Kandaga A.M.E.	P
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S.Shivaramu Chickballi Village & Post, Basaralu Hobali,	P
S.T. Vishwanath President Mauil Ayappa Seva Samithi Mayamudi	P
S.V. Pandit Ecowatch	P
Sandesh	P
Saravanan Y.	P
Saritha Iyer	P
Sharadha Govt P.U. College	P
Sharanabasava Govt P.U. College	P
Sharanappa G. Teacher Govt High School	P
Shivan V. V C. E. S. , Indian Institute of Science Bangalore 560 012	P
Shivareddy	P
Somanna Ehittrappa Chetty Estate P.O Box 166, Kutta Post	P
Sri Basavaraja swami Editor Suddimula Paper	P
Srinivas Naik K. G. A.	P
Srirama shetty 4- C-1 H. M. T Quarters H.M.T Ltd	P

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Tumkur	
Subramanya Adiga Ubna English School, Asaar Moholla School, Ayurveda Bhavan Rangamandira Road	P
Surendra Ghar Samyvekta Karhata	P
Suresh Heblikar	P
Syed Halizalla H.W.O 6-2- 73/16	P
Prof. T. Basavaraj Teacher Forestry College . Ponnampet	P
T.M Ravanappa Teacher Forestry College Ponnampet.	P
T.N. A Perumal Nature Photographer	P
T.S.Raghavendra Swamy Teacher H.P.S. Shira 572137	P
Tadahal P. B.	P
Dr. Tulisi Prasanna B. H.S. Botanical Fourldation " TULASI" Srikrishnanagar Kyathasndra Post	P
U. Satyanarayan Kaveri T. V.	P
Dr. V. Hiremath Library	P
V. Satish kumar Asst., Prof, S.W.C.E Dept	P
V. Srinivasa Teacher Forestry College Ponnampet	P
Vai nath Hiremat	P
Varalakshmi K. Teacher	P
Veerbswanth Student	P
Vijaya Kumar Govt P.U. College	P
Viru patil Student	P

Vishwaradya	P
Vrushabendraih T Begur, T Begur Post,	P
Prof H.Y. Mohan Ram Teacher	S
Dr. M.D. Subash Chandran Teacher Dept., of Botany, Dr. Baliga College, Kumata	S
A Jathappa Teacher S. M. R. H. S. Balila	T
Amare A. Lathi Govt. High School Hire Aralihalli Yelburga Koppal	T
B. H. Thotadadya N.V.S.S.Jr.High School Byalahalli gate Kalkere, Mayasandra (H.O) Turvekere Tumkur	T
B. V. Gundappa Govt. P.U.College Nagavalli Tumkur Tumkur Dist	T
B.S. Raghavendra Teacher S. D . P.U. College Kodagu	T
C. Krishnegowda Govt. Junior College Srirangapatna Mandya	T
C. Yathiraju Teacher Presedent, Tumkur Science Center Tumkur.	T
D. S. Bhat Sri Babru Lingeswara Vidyalaya Lukkeri Masur Kumta 581331	T
D.G. Puttaraju Seethamma Girls High School Davanagere Jeevanashikshana Kendra, D/2, Vidyanagar Davangere 57700	T
Devayya Swamy Govt. P.U College Kavital Kavital	T

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Raichur 584120	
Devayya swamy Teacher	T
Dhananjaya N. Teacher Vishveshwaraya High School Bhadravathi	T
Doggalli Gowdru Puttaraju Teacher Davanagere	T
G. Basappa Govt. High School Yaramaras Camp Raichur	T
H. H. Patgar Sri Babru Lingeswara Vidyalaya Lukkeri Masur Kumta 581330	T
Jayanthi Shetty Govt. High School Koodabettu, Mala Karkala UDUPI	T
K. Hashini K.S.P.M Govt. High School Pervaji Karkala Udupi	T
K. Nagaraja Rao Sri Maruthi Rural High School Kabbigere Koratagere Tumkur	T
K. V. Hegde Sri Subramanya Comp P. U. College Kavalakki Honnavar	T
K.G.Bhat Vidyodaya Junior College Yadalli,SIRSI, North Karnataka	T
K.N. Jagadish Teacher BerchamansHigh School Shettykoppa (P)	T
K.N.Madhusudhan Rao Annuthairi,	T
K.S.Jagadeeshaiah Govt. Junior College Koratagere Koratagere Tumkur	T
Lakshmikanta Govt. High School Jalahalli Devdurga	T

RAICHUR	
M. Gangadharappa S.V.V.P High School Ponnasandra Pavagada Tumkur	T
M. N.Venkatesh Babu M.G.M.G. High School Madhugiri Tumkur	T
Madhu Srinivasan Asst., Master R. V. P. P. U. College Y. N. Hoskote.	T
Madhusudan Rao Amruthagiri Govt H. P. School Maralena halli Tumkur Tumkur	T
Mallikarjuna H. M. Teacher Govt High School	T
Mamatha R. P. Rotary High School Malavalli Malavalli Mandya 571430	T
N. Dhanjaya Visveswaraih Kannada & English High School New Bridge Road, Old Town, Bhadravathi Shivmoga	T
N. Indiramma Teacher Gov P. U. College	T
Prasad B. Teacher Sri Veerabadreshwara High School Sadashivanagara	T
R. Madhusudan Sri Maruthi Rural High School Kabbigere Koratagere Tumkur	T
Ramakrishnappa Govt P.U College Boranakanive	T
S. G. Bhat Sri Subramanya Comp P. U. College Kavalakki Honnavar	T
S. Hanumanthappa Govt. P.U.College Nagavalli Tumkur	T

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Tumkur Dist	
S. N. Hegde Shri Gajanan High School Sampkhand Sirsi U.K 581315	T
S.V. Lohithashwa S.B.M.M.R. High School Hiriyour, Bhadravathi Shivmoga.	T
Sharanappa Anand High School Yaramar RAICHUR	T
Smt. Rama Y. K. Nehru Memorial P U College Aranthodu Sullia D.K.	T
Somashekar gowda Govt. High School Hire Aralihalli Yelburga Koppal	T
Somashekarappa Govt. P.U. College Yelburgi Koppala	T
Suma P. S.V.S High School Agumbe	T
U. P. Umadevi Shree Siddaganga P.U.College TUMKUR	T
V.S Nazen Ahamed Govt. High School Alakapura Gauribidhanur , KOLAR	T
Vajramuni S Teacher Kausalya High School N.M halli Malavalli Mandya	T
Venkateshwara Rao Anand High School Yaramar RAICHUR	T
Y. B. Meti Govt. P.U. College Yelburgi Koppala	T
Y. C. Umadevi Lecturer	T

Sri Siddhaganga P.U. College	
Yogesh S Govt. Jr. College Malur Thirthahalli	T
C. Yathiraju	T,W
A. Anatha Damle Addahalla House , Post : Shishila Belthangadi 574198	V
A. C. Chandravala A.C.Chandrakala Sridevi Nilaya Jagjyothi Basaveswara Road Shantinagar Tumkur	V
A. C. Mamatha A.C.Chandrakala Sridevi Nilaya Jagjyothi Basaveswara Road Shantinagar Tumkur	V
A. P. Bharath N.V.S.J.C.H. S	V
Adappa Govt. Junior College Nagavalli Nagavalli	V
Amith Rotary High School Malavalli Malavalli Mandya 571430	V
Amulya K.L Student Govt. High School Boranakanive Chikka Nayakana Halli Tumkuru 572218	V
Amurtha Sindhu Govt. Junior College Srirangapatna Mandya	V
Anada K. Field Asst. NST Kurunja House, Post : Shibaje Belthangadi 574198	V
Aneyappa K.M. NST Byrakatte, Post : Shishila Belthangadi	V
Anil Kumar S.V.V.P High School Ponnasandra Pavagada Tumkur	V

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Annapurna K. L. M.G.M.G. High School Madhugiri Tumkur	V
Anupama Nehru Memorial P U College Aranthodu Sullia D.K.	V
Anuradha Bhat Student (PHD) Centre for Ecological Sciences, Indian Institute of Science , Bangalore -	V
Anuradha S. Rotary High School Malavalli Malavalli Mandya 571430	V
Arun B Research / Teaching, S.R.F, Mangalore University, Mangalore University, Mangalagangothri	V
B Kiran Kumar Student Wildlife Aware Nature Club Kabbigere.	V
B. Anitha S.V.V.P High School Ponnasandra Pavagada Tumkur	V
B. Hemavathi Sri Rama Nagara, Post: Shishila Belthangadi 574198	V
B. S. Smt. D Chennamma P U College Madapura Post Kodagu 571251	V
B. S. Veerabhadrachari S.B.M.M.R. High School Hiriyour, Bhadravathi Shivmoga.	V
B.J.Kumarswamy Govt. Junior College Nagavalli Nagavalli	V
B.S. Natesh Student S.V.V.P.H School Ponnasamudra Pavagada	V
B.V. Gundappa Junior Asst	V

Govt. P.U. College Nagavalli Tumkur	
Babu Mera Karegudde , Post : Shishila Belthangadi 574198	V
Bhumika Rajenahalli Seethamma Govt high School Davanagere	V
Boregowda Rotary High School Malavalli Malavalli Mandya 571430	V
C. Hanumanthyya Teacher Neharu Vidyashala Balika High School Mamasandra Tharuvakere Tumkuru 572221	V
C. Krishnamohana Reddy R.V.P.P U College Y.N.Hosakote Pavagada	V
Chandra C. Kolambe House, Post : Shishila Belthangadi 574198	V
Chandrashekar Govt. High School Hire Aralihalli Yelburga Koppal	V
Chandrashekaraiah Govt. P.U. College Chikkanayakanahalli Tumkur	V
Chaya S Govt. P.U. College Chikkanayakanahalli Tumkur	V
Chethana Kumari L Vidyabodhini High School Balila Sullia D.K.	V
Chinmaya Visveswaraih Kannada & English High School New Bridge Road, Old Town, Bhadravathi Shivmoga	V
Chinnaya Malekudiya Badigudde House ,Post : Shishila	V

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Belthangadi 574198	
Chowde gowda Kowshalya High School Nelamakanahalli Malavalli Mandya Dist	V
D. C. Radha N.V.S.S.Jr.High School Byalahalli gate Kalkere, Mayasandra (H.O) Turvekere Tumkur	V
D. Nagalakshmi S. A. S High School Agumbe	V
D. S. Bhat Shri Babrulingeshwar Vidyalaya Lukkeri Masur Kumta North Kannada	V
D.N. Vasundhara Student Davanagere.	V
Dashavant Govt. High School Jalahalli	V
Dashavantappa Govt. High School Jalahalli Devdurga RAICHUR	V
Deepthi Rajenahalli Seethamma Govt high School Davanagere	V
Deepthi M.R. Student B.G.V.S Davangere, Jeevana Shikshana Kendra D-2, Vidyanagara Davangere 577006	V
Dhanya K.E. BerchamansHigh School Shettykoppa	V
Dhushyanth M. B. Student Vidhyabidhibi High School Balila	V
Divin N. T Smt. D Chennamma P U College Madapura Post Kodagu 571252	V
E.Basavaraju	V

Bharatha Jnana vijnana samithi IISc. Campus, Bangalore - 560012	
F. S. Pujar Govt. P.U. College Yelburgi Koppala	V
G. Basappa A. M. Teacher Govt High School	V
G. Kushalappa Vaikuntapura Shishila, Post :Shishila Belthangadi 574198	V
G. Mohitha Govt.' Junior College Srirangapatna Mandya	V
Ganesh R Gokale Indithoru House, Post : Shishila Belthangadi 574138	V
Ganesh Shasthry Reporter The Canara Times	V
Ganeshprasad K. Student Vidhyabidhibi High School Balila	V
Gangaraju Govt. High School Alakapura Gauribidhanur , KOLAR	V
Giresh Kumar Govt. P.U College Kavital Kavital Raichur 584121	V
Gopalkrishna Sri Subramanya Comp P. U. College Kavalakki Honnavar	V
Gopalkrishna Gokale Shivasadana ' Acharipalu House, Post : Shishila Belthangadi 574198	V
Gopu Gokale Post : Shishila Belthangadi 574198	V
Gururaj Govt High School	V

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H. K. Subramanya Govt. P.U.College Nagavalli Tumkur Tumkur Dist	V
H.D.Rekha Govt. Junior College Koratagere Koratagere Tumkur	V
H.M. Sonnappa Reddy Asst. Director of Fisheries, Dept. of fisheries , Sairam building , Alakke Mangalore 575003	V
H.N. Chandrashekharaiah Former Joint Director of fisheries , 376, 21st Cross I & II East, Jayanagara Bangalore 560011	V
Hariprasad K.S.P.M Govt. High School Pervaji Karkala Udupi	V
Harsha Visveswaraih Kannada & English High School New Bridge Road, Old Town, Bhadravathi Shivmoga	V
Hema S. Amruthagiri Govt H. P. School Maralena halli Tumkur Tumkur	V
Hemanth Reddy Govt. High School Alakapura Gauribidhanur , KOLAR	V
I. K. maddeni Sree veerabhadreswar High School Godachi Post Ramadurga Belgaum	V
Iranna Govt. P.U. College Yelburgi Koppala	V
Ishwara Bhat Shiva Kripa , Naganadka Shishila	V
Ishwarappa Poojary Kolake Bailu House , Post : Shishila Belthangadi 574128	V
J. S. Thippeswamy	V

R.V.P.P U College Y.N.Hosakote Pavagada	
Jaleel Pasha Govt. P.U College Kavital Kavital Raichur 584124	V
Jayantha A. P. Nehru Memorial P U College Aranthodu Sullia D.K.	V
Jayaprakash S Karkala	V
K Dada Kahalandar S.B.M.M.R. High School Hiriyour, Bhadravathi Shivmoga.	V
K. Babu M Kolake Bailu House , Post : Shishila Belthangadi 574128	V
K. Lingappa Salian Field Asst NST Dharmasthala 574216	V
K. N. Shivarajaiha Sri Maruthi Rural High School Kabbigere Koratagere Tumkur	V
K. Nemiraj Field Asst NST Koppadagandi House, Kadirudyavara, Post : Killuru Belthangadi 574214	V
K. P. Sweetha S. A. S High School Agumbe	V
K. Ramachndra Vaikuntagiri Colony, Post : Shishila Belthangadi 574198	V
K.G. Gokale Shishila Inditheru House, Post : shishila Belthangadi 574198	V
K.J. Naveen Kumar Kabbigere,	V
K.M. Chenappa Kollambe Shishila, Post; Shishila	V

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Belthangadi 574198	
K.N.Veena Seethamma Girls High School Davanagere Jeevanashikshana Kendra, D/2, Vidyanagar Davangere 57700	V
K.S.Nadagouda Govt. High School Jalahalli	V
Karilingappa Govt. Girls High School Jalahalli Devdurga RAICHUR	V
Karthik S. Rotary High School Malavalli Malavalli Mandya 571430	V
Karyappa P.S Vice President, Agricultural Co operative Committee Pundigaddhe House, Post: Enekallu Sullia 574238	V
Kavitha N. Rajenahalli Seethamma Govt high School Davanagere	V
Krishna Kumar Govt. High School Koodabettu, Mala Karkala UDUPI	V
Krishnappa N.V.S.S.Jr.High School Byalahalli gate Kalkere, Mayasandra (H.O) Turvekere Tumkur	V
Krishnappa K. Meenagundi House,Post : Shishila Belthangadi 574198	V
Kumargowda Govt. P.U. College Yelburgi Koppala	V
Kunha M.R. Colony ,Post : Shishila Belthangadi 574198	V
Kusumavathi Field Asst.	V

NST Parnadka, Post : Rekya Belthangadi 574229	
Linga Djila Kolake Bailu House , Post : Shishila Belthangadi 574138	V
Lingappa Kolake House, Post : Shishila Belthangadi 574198	V
M. B. Patgar Sri Babru Lingeswara Vidyalaya Lukkeri Masur Kumta 581332	V
M. H. Ravi Rotary High School Malavalli Malavalli Mandya 571430	V
M. Murari Damle Muchichiradka House, Post: Shishila Belthangadi 574198	V
M. Narahari Damle Muchiradka House, Post : Shishila Belthangadi 574198	V
M. R.Umapathi Rotary High School Malavalli Malavalli Mandya 571430	V
M. Savitha G. H. P. S.	V
M. V. Punetha N.V.S.S.Jr.High School Byalahalli gate Kalkere, Mayasandra (H.O) Turvekere Tumkur	V
M.F .Rahman Fiseries Scientist Central Inland Fishries and Society for Advancement of Aquaculture No.3. Pampa maha kavi Road, Chamarajpete, Bangalore 560 018	V
M.N. Venkatesh Babu Asst. Teacher M.G.M.G. High School Madugiri Tumkur.	V

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Tumkur 572132	
Madhusmitha V. Patil Student B.G.V.S Davangere, Jeevana Shikshana Kendra D-2, Vidyanagara Davangere 577006	V
Mahamtesh G. Govt. High School HireAratihalli Koppal T.G Yelburga	V
Mahesh Anand High School Yaramar RAICHUR	V
Mahesh .S Govt. Jr. College Malur Thirthahalli	V
Mahesh M. N. Rotary High School Malavalli Malavalli Mandya 571430	V
Mallikarjun Govt. High School Yaramaras Camp Raichur	V
Mamatha R.P. Asst. Teacher Bharath Gyan Vigyan Samithi, Rotary High School Malaralli 571430	V
Manju S Student Kausalya High School N.M Halli Malavalli Mandya	V
Manjulakshi Govt. Junior College Koratagere Koratagere Tumkur	V
Manjunath M Smt. D Chennamma P U College Madapura Post Kodagu 571253	V
Manjunath patgar Shri Babrulingeshwar Vidyalaya Lukkeri Masur Kumta North Kannada	V
Manjunath Shetty	V

Range Forest Officer, Belthangady	
Manjunatha H. N Rotary High School Malavalli Malavalli Mandya 571430	V
Mari K. Shoba N.V.S. Girls. Jr. High School Mayasandra Post & (H.O) Turvekere Tumkur 572222	V
Monayya Acharya Vidyabodhini High School Balila Sullia D.K.	V
Mudukappa Govt. Junior College Koratagere Koratagere Tumkur	V
Murashilli V. N. S.J.Y.S.H.S.	V
N. Kavitha Student B.G.V.S Davangere, Jeevana Shikshana Kendra D-2, Vidyanaga Davangere 577006	V
N. M. Jamadar Sree veerabhadreswar High School Godachi Post Ramadurga Belgaum	V
N. Raghava Purusha Shishila Naganadka , Belthngadi	V
N.V. Vyasa Naga' Lamps House , Post : Shishila Belthangadi 574198	V
Nagalakshmi S.V.S High School Agumbe	V
Nandisha N. Kowshalya High School Nelamakanahalli Malavalli Mandya Dist	V
Niranjana Reddy Student S.V.V.P.H School Ponnasamudra Pavagada	V
Nirmala Student Neharu Vidyashala Balika High School	V

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Mayasandra Taruvakere Tumkuru 572221	
Nishkala gowda Govt. Junior College Srirangapatna Mandya	V
Nithin Kumar K. B. Rotary High School Malavalli Malavalli Mandya 571430	V
P Prasad Kalidasa P.U. College Siragate, Tumkur	V
P. Kiran Kumar Sri Maruthi Rural High School Kabbigere Koratagere Tumkur	V
P. Mohana Kumari Student N.V.S. Girls High School Mayasandra Taruvakere Tumkuru 572221	V
P.B. Shalemane B.G.V.S. Danvangere Mogana Halli, Post : Kaddle Ballu, Davangere	V
P.G. Basgod Vidyodaya Junior College Yadalli,SIRSI, North Karnataka	V
Paramesh L. V Govt. P.U.College Nagavalli Tumkur Tumkur Dist	V
Pijina Mugera Kolake Bailu House , Post : Shishila Belthangadi 574138	V
Poornima C.N Govt. P.U. College Chikkanayakanahalli Tumkur	V
Prabhakar N.V.S. Girls. Jr. High School Mayasandra Post & (H.O) Turvekere Tumkur 572224	V
Prajwal B. R. Acharya Institute of Technology Hesaraghatta Road Soldevanahalli Bangalore	V

Prakash Kolambe House, Post : Shishila Belthangadi 574198	V
Pranesh Rao Anand High School Yaramar RAICHUR	V
Pushpalatha S.Bhat President, Parisarasaktha Okkoota Pernaje house, Uppinangady, Puttur	V
R. Gajendra Govt. P.U. College Boranakanive C. N. Halli Tumkur	V
R. Manohar Govt. P.U. College Boranakanive C. N. Halli Tumkur	V
R. V. Hegde Shri Gajanan High School Sampkhand Sirsi U.K 581315	V
Radhika D. Vidyabodhini High School Balila Sullia D.K.	V
Raghavendra Sri Subramanya Comp P. U. College Kavalakki Honnavar	V
Rajeev Salian Nagarika Seva Trust, Guruvaynkere	V
Rakesh Nellithaya Onmanthimar House, Post : Shishila Belthangadi 574198	V
Asst.Prof Ramachandra Bhat Dept. of Fisheries Economics, College of Fisheries , Mangalore	V
Ramesh B. Sri Durga Parameshwari Yuvaka Mandala (R) Bairakattee House ,Post : Shishila Belthangadi 574198	V
Rameshwari N. S. Student Gov P. U. College	V

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Ranganath M.G.M.G. High School Madhugiri Tumkur	V
Ravindra Govt. Jr. College Malur Thirthahalli	V
Ravish Vidyodaya Junior College Yadalli,SIRSI, North Karnataka	V
Renukappa N. Visveswaraih Kannada & English High School New Bridge Road, Old Town, Bhadravathi Shivmoga	V
Revanna Student N.V.S.J.C.H. S	V
S. S. Bhat Shri Gajanan High School Sampkhand Sirsi U.K 581315	V
S. Udaya Udaya TV	V
S.Krishnamohan Reddy Student R.V.P.High School, Y.N.Hospet.	V
S.M. Sorati Sree veerabhadreswar High School Godachi Post Ramadurga Belgaum	V
S.M. Suma M. G. M. Girls High School Opp. Town hall road, Madugiri Tumkuru 572132	V
S.V. Lohithshwa Teacher S.B.M.M.R. High School Hiriyooru Badravathi 577302	V
Sachin Shetty Govt. High School Koodabettu, Mala Karkala UDUPI	V
Sahana MSRP Student M. G. M. Girls High School Opp. Town hall road, Madugiri	V

Tumkuru 572132	
Sanda Shetty Govt High School Mala, Kudabettu	V
Sandesh Govt. High School Jalahalli Devdurga RAICHUR	V
Santhosh N.B Student Kausalya High School N.M Halli	V
Savitha T. Govt. P.U. College Boranakanive C. N. Halli Tumkur	V
Shampa Daithota President, Dakshina Kannada Parisarasakthara Okkoota Post: Panaje , Putturu 574259	V
Sharanabasava Govt. Girls High School Jalahalli Devdurga RAICHUR	V
Sharanappa Govt. High School Jalahalli	V
Sharanappa .A. M. Govt. High School Jalahalli Devdurga RAICHUR	V
Sharavanabasava Govt. P.U College Kavital Kavital Raichur 584123	V
Shekar Colony Vaikuntapura, Post : Shishila Belthangadi 574198	V
Shibi U.C Reporter Janavahini Belthngadi	V
Shishupal K.S.P.M Govt. High School Pervaji Karkala Udupi	V
Shiva Bhat H	V

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Research Asst. Nagarika Seva Trust Guruvayanakere Belthangady	
Shridhara A. Damle Muchiradka House, Post : Shishila Belthangadi 574198	V
Shrikant Vidyodaya Junior College Yadalli,SIRSI, North Karnataka	V
Shwetha K. P S.V.S High School Agumbe	V
Shyam Bhat Kolari Durga ,Bhuvaneshwari Nagara, Hebbala, Dasarahalli, Bengalore 560624	V
Siddaraju S. Rotary High School Malavalli Malavalli Mandya 571430	V
Sowbhagya T.G. BerchamansHigh School Shettykoppa	V
Sowmya Rani C.N Govt. P.U. College Chikkanayakanahalli Tumkur	V
Sridev K.S.P.M Govt. High School Pervaji Karkala Udupi	V
Srinidhi S CES, IISc., Bangalore 560012	V
Srinivasa G. K. Visveswaraih Kannada & English High School New Bridge Road, Old Town, Bhadravathi Shivmoga	V
Srinivasa K. Meenagundi House, Post : Shishila Belthangadi 574198	V
Subhash Govt High School	V
Sumalatha Amruthagiri Govt H. P. School	V

Maralena halli Tumkur Tumkur	
Sundar K. Kolake Bailu House , Post : Shishila Belthangadi 574128	V
Sundara K Youth Club Shishila, Kolambe, Post : Shishila Belthangadi 574198	V
Sushma Student Govt. High School, Boranakannive Chikka Nayakana Halli Tumkuru 572218	V
Suvarna A. M Govt. Girls High School Jalahalli Devdurga RAICHUR	V
Swetha N.V.S. Girls. Jr. High School Mayasandra Post & (H.O) Turvekere Tumkur 572223	V
Syfulla Govt. High School Alakapura Gauribidhanur , KOLAR	V
T.S. Thippeswamy Student C.E.S. Y.N.Hospet.	V
T.Shantha K V N.V.S. Girls. Jr. High School Mayasandra Post & (H.O) Turvekere Tumkur 572221	V
Thimmaraju S.V.V.P High School Ponnasandra Pavagada Tumkur	V
Thriyambaka S. Anatha Sadana, Post : Shishila Belthangadi 574198	V
U. Prema Kumari Shale Gudde House, Post : Shishila Belthangadi 574198	V
Ubedulla M. S. Rotary High School Malavalli Malavalli	V

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Mandya 571430	
Uma Shree Siddaganga P.U.College TUMKUR	V
Umavathi Kolakebailu, Post : Shishila Belthangadi 574198	V
Umesh Govt. High School Yaramaras Camp Raichur	V
Umesh K. Shishila Karegudde House , Post : Shishila Belthangady 574198	V
V. B. Patgar Sri Babru Lingeswara Vidyalaya Lukkeri Masur Kumta 581333	V
V. O. Gonabal Sree veerabhadreswar High School Godachi Post Ramadurga Belgaum	V
V. S. Hegde Shri Gajanan High School Sampkhand Sirsi U.K 581315	V
Vamana K. Kolambe House, Post : Shishila Belthangadi 574198	V
Vanishree V S Govt. Junior College Koratagere Koratagere Tumkur	V
Vanutha E. Shree Siddaganga P.U.College TUMKUR	V
Vasanth G. Patgar Shri Babrulingeshwar Vidyalaya Lukkeri Masur Kumta North Kannada	V
Vasundara Rajenahalli Seethamma Govt high School Davanagere	V
Veerabadra Govt. High School Mysore Mysore Mysore 570008	V

Venkappa M.K. Guddethota Colony House, Post : Shishila Belthangadi 574198	V
Vidya S. Nayak Trustee, NST Guruvaynkere	V
Vidyashri Student Govt. High School Arasinamakki Padegudde House, Shibaje, Post : Shibaje Belthangadi 574198	V
Vijay A. Student Vishveshwaraya High School Bhadravathi	V
Vijaya Kumar Govt. P.U College Kavital Kavital Raichur 584122	V
Vijaya Shanthi Student M.G.M Girls High School Opp. Town Hall Road, Madugiri Tumkuru 572132	V
Vijeth A. M. Student Vishveshwaraya High School Bhadravathi	V
Vinay Kumar Govt High School	V
Virupaksha gowda Govt. High School Hire Aralihalli Yelburga Koppal	V
Virupakshaih Govt. High School HireAratihalli Koppal T.G Yelburga	V
Vishnu Gokale Sneha Kuttira ,Post : Shishila Belthangadi 574198	V
Vishwanatha V. Kolambe House , Post : Shishila Belthangadi 574198	V
Vishwaradya Govt. High School	V

S = Steering committee I = Industry P = ParticipantT = Teacher V = Volunteer (Student/locals)A = All India Radio Programme Participants G = Government officials E = Experts C = Case study team W = Working group B = Special invitees O = Organizing members N = News paper article respondents

Jalahalli	
Y.A. Nazurulla Ichan Teacher Govt. High School Borana Kanive Yagachi halli, Chikkanayakana Halli, Post: Ganadhal Tumkur 572218	V
Y.B.Nayak Govt. Jr. College Malur Thirthahalli	V
Yethesh N.V.S.J.C.H. S	V
Chekreddy	V,O
KA Subramaniyan Researcher	V,O
Prema Iyer Researcher	V,O
Rathnavarma	V,O
Vijayageetha Gadagakar Researcher	V,O
Harish Bhat Researcher C. E. S. & IISC	W
Prof. Madhav Gadgil Guru Krupa Opp.Marigaddige Compound Ashoka Road Bangalore.	W
Prathima F. R. L. H. T Bangalore.	W
Dr Ameen Ahmed Doctor	W,C
T.V.N. Murthy Founder - WANC	W,C
Dr Amit Agarwal Director- Natural Remedies	W,E
Dr CG Kushalappa Teacher	W,E
Dr Channesh Scientist	W,E
S. Sridhar Head - INCERT	W,E
S.G.Neginhal Deputy Conservator of Forests	W,E
Dr Sathyanarayana Bhat Doctor	W,E
Dr Ravi Ralph Conservator of Forests	W,G
Dr Shyam Bhat	W,G

Deputy Director- Fisheries	
Dr M.H. Swaminath Conservator of Forests	W,G,S
Darshan Shankar Director - FRLHT	W,S
B.V.Gundappa Havyasi Nisarga Parinathara Thanda 'Nisarga' Nisarga Layout,	W,T

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17. Annexure L: List of Organizations contributing to the Programme

17. Annexure L: List of Organizations contributing to the Programme

The following codes have been used to categorize the organizations

C = College E = Private Enterprise G = Government Departments NGO = Non Governmental Organizations S = Schools

Chennamma Jr. College Somvarapet Coorg	C
Govt. Jr. College Srirangapatna	C
Govt. Jr. College Malur	C
Govt. PU College Koratagere	C
Govt. PU College Chikanayakanahalli	C
Govt. PU College Venkatapura	C
Govt. PU College Nagavalli	C
Govt. PU College Yelaburga	C
Govt. PU College Pattanayakanahalli	C
Govt. PU College Kavital	C
Kalidasa Jr. College Kalidasa Nagar	C
Nehru. Jr. College Mayasandra	C
RVPPU College Y. N. Hoskote	C
Seethamma PU College Davanagere	C
Siddanga PU College Tumkur	C
Subramanya Junior College Bhaskeri,Honnavara Honnavara U.K.	C
Vidyodhaya P. U. College Yadahalli Sirsi U.K.	C

Karnataka Ayurveda drug Manufacture Association Bangalore Bangalore Bangalore	E
Natural Remedies Veerasandra layout, Bangalore Bangalore Bangalore	E
Agriculture Dept. GoK M. S. Building, Bangalore Bangalore Bangalore	G
All India Radio Bangalore Bangalore Bangalore	G
CES, IISc Bangalore Bangalore Bangalore	G
Department of Public Instruction Bangalore Bangalore Bangalore	G
Ecology, Env. Forests, GoK M. S. Building, Bangalore Bangalore Bangalore	G
Fisheries Department Mangalore Mangalore Mangalore	G
Fisheries Department Bangalore Bangalore Bangalore	G
Forestry College Ponnampet Virajpet Coorg	G
Govt. Ayurvedic Medical College Bangalore Bangalore Bangalore	G
K.S.C.S.T. Bangalore Bangalore Bangalore	G
KFD, Aranya Bhavan	G

C = College E = Private Enterprise G = Government Departments NGO = Non Governmental Organizations S = Schools

Bangalore Bangalore Bangalore	
KFD, Kolar Kolar Kolar Kolar	G
KFD, Mysore Mysore Mysore Mysore	G
KFD, Tumkur Tumkur Tumkur Tumkur	G
State Pollution Control Board Bangalore Bangalore Bangalore	G
B.A.I.F. Tiptur Tiptur Tumkur	NGO
B.G.V.S. Bangalore Bangalore Bangalore	NGO
F.R.L.H.T. Anand Nagar Bangalore Bangalore	NGO
I.N.C.E.R.T. Bangalore Bangalore Bangalore	NGO
Mathsya Hitha Rakshana Vedike Shishila Belthangadi D.K.	NGO
Nagarika Seva Trust Guruvayanakere Belthangadi D.K.	NGO
Society for Advancement of Aquaculture Bangalore Bangalore Bangalore	NGO
Tumkur Science Centre Tumkur Tumkur	NGO

Tumkur	
Wildlife Aware Nature Club Tumkur Tumkur Tumkur	NGO
Alagavadi High School Navalgunda	S
Anand High School Yeramarus	S
Berchman's High School Shimoga	S
Govt. Girls High School Jalahalli	S
Govt. High School Koodabettu Karkala Udupi	S
Govt. High School Karkala Karkala Udupi	S
Govt. High School Yeramarus	S
Govt. High School Belur Hassan Hassan	S
Govt. High School Sujjalur, Malavalli	S
Govt. High School Manvi	S
Govt. High School Alakapura	S
Govt. High School Kustagi	S
Govt. High School Jalahalli	S
Govt. Hr. Pr. School Amruthagiri	S
Govt. School Bramasandra	S
Havanur Rural High School Havanur	S
Hebbalu Govt. High School Hebbalu, Belur Hassan Hassan	S
Hirur High School Hiriyur	S

Kausalya High School Malavalli	S
Maruthi Rural High School Koratagere	S
MGMG High School Madhugiri	S
Nehru Memorial High School Aranthodhu, Sullia Sullia D.K.	S
NVS Girls High School Mayasandra	S
NVSJCHS Mayasandra	S
Ranganatha High School Kalapura	S
Rotary High School Malavalli	S
S. V. S. High School Agumbe Thirthahalli Shimoga	S
St. Theresa High School Belthangadi Belthangadi D.K.	S
SVVP High School Ponnasamudra	S
Veerabhadreshwara High School Godachi, Ramdurga	S
Vidhyabodhini High School Balila, Sullia Sullia D.K.	S
Visheveswaraiya High School Bhadravathi	S