

Comprehensive Management Action Plan for Conservation of Ousteri Lake, Puducherry

Draft Report
(November 2010 – January 2011)

Submitted to

The Department of Forests and Wildlife, Government of Puducherry



Submitted by

Sálim Ali Centre for Ornithology and Natural History (SACON),

Moongilpallam, Anaikatty (PO),

Coimbatore - 641108, Tamil Nadu

February – 2011



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INTRODUCTION

Wetlands are the ecotones or transitional zones between permanently aquatic and dry terrestrial ecosystems. According to Ramsar Convention (1971) wetlands are "*areas of marsh, fen, peatland or water, whether natural or artificial, permanent or temporary with water that is static or flowing, fresh, brackish or salt, including areas of marine water the depth of which at low tide does not exceed six meters*". Wetlands as resources are responsible for the well-being of the mankind and the vital elements of national and global ecosystems and economics (Hussain 2007). Wetlands supporting aquatic flora and fauna provides many economic benefits to mankind that include food, drinking water, irrigation for agriculture, ground water recharge, erosion control, water sports, ecotourism, cultural and heritage tourism and other recreational values. It also includes many ecological functions such as supporting biodiversity (including several endangered and threatened species), maintaining hydrological cycle and regime, bio-geochemical functioning and climate stability (Bhatnagar *et al.* 2007).

Wetland ecosystems, their characteristics, functions, the ecological goods and services they offer to human kind and other living species, are all controlled by the hydrological regimes. Wetlands form breeding and feeding grounds for numerous resident and migratory water birds and several other lesser known species. Nearly 20% of the globally threatened bird species are found in wetlands of the Asian region. Thus, studying and understanding the quality of wetlands becomes important for the long term conservation of flora and fauna. As a great productive life supporting system, wetlands have immense socio-economical, ecological, and aesthetical importance. The natural beauty and diversity of animals, and plants make wetland aesthetically captivating (Tam and Wong 2000). In view of their environmental, ecological and conservation values some of the wetlands in the world are protected as National Parks and World Heritage Sites, whereas others are able to generate considerable returns from tourism. Recreational activities such as fishing, hunting, boating and as retreats with relieving and stimulating aesthetically pleasing ambience uphold wetlands as a source income.

In India wetlands are distributed in almost all bioclimatic regions. India, by virtue of its extensive geographical stretch and varied terrain and climate, supports a rich diversity of

both inland and coastal wetlands. Since last two decades, wetlands are facing serious threats due to anthropogenic activities and many of the wetlands are vanishing and getting converted to other type of land use (Mitsch and Gosselink 2000, Prasad et al. 2002, Vijayan et al. 2004). Across the globe, their area is getting declined due to manifold reasons, including anthropogenic and natural processes. Burgeoning population, intensified human activity, unplanned development, absence of management structure, lack of proper legislation and lack of awareness about the vital role played by these ecosystems (functions, values, etc.) are the important causes that have contributed to their decline and subsequent disappearance (Mitsch and Gosselink 2000). In addition, wetlands are important feeding, breeding, and drinking areas for wildlife and provide a staging ground and refuge for waterfowl. As with any natural habitat, wetlands are important in supporting species diversity and have a complex and important food web. The rate of wetland loss has accelerated in recent years. While in urban areas these ecosystems are disappearing fast, in rural areas also the pace is catching up. Thus, the wetlands are one of the most threatened ecosystems of the world (Turner 1991). In places like Tamil Nadu and Puducherry, the fate of wetlands is very grievous in the coming decades, with growing demands for housing infrastructure, high foreign remittance, prevalent culture of nuclear families and flaming land prices. (<http://www.kerenvis.nic.in/biodiversity/Wetlands.pdf>). The Government of India has been implementing the National Wetlands Conservation Programme (NWCP) in close collaboration with the State/UT Governments since the year 1985-86. Under the programme, 115 wetlands have been identified till now (Anon, 2009). In Puducherry, the Ousteri Lake is the only lake falling under this list of wetlands of national importance.

Puducherry, well known for wetlands, has a total of 82 major and small wetlands in and around the town as per the details given by Puducherry forest department officials. These wetlands provide livelihood for the residents around the regions in the form of agricultural produce, fish, fuel, fiber, fodder, and a host of other day-to-day necessities. In Puducherry, there are two major wetlands namely Ousteri and Bahour. During 2008, Ousteri wetland was declared as a bird sanctuary. It is the largest lake in Puducherry region, and is home to hundreds of bird species including several migratory ones, which flock here in large numbers during migratory seasons. The sanctuary is also known for a

wide variety of fish, mussels and crabs. In the past, the lake had also served as the largest breeding sites for the Common Coot in South India (Chari and Abbasi 2003 & 2005).

Origin of the study

Wetlands in the urban areas have always been exploited for several purposes due to anthropogenic activities. However, such activities may lead to alteration of wetland characteristics and thus cause changes in species composition and density. The Ousteri Lake (*Oussudu Eri* in Tamil) is the most important fresh-water lake of Puducherry region. Located approximately 10 km west of Puducherry town, the lake is a major wintering ground for a large number of migratory birds. The lake is rich in flora and fauna and is known to provide several ecological services including recharging underground aquifers and providing several livelihood options for the local community. However, recently the lake and its surrounding are facing threats and pressures from several anthropogenic activities (encroachment, poaching and pollution) including rapid urbanizations and infrastructure developments in the immediate vicinity of the lake. Considering the importance of this wetland ecosystem, Government of Puducherry requested Sálim Ali Centre for Ornithology and Natural History (SACON) to prepare a Comprehensive Management Action Plan (CMAP) for Conservation of the Ousteri lake so that various conservation and management interventions can be taken up for long-term sustainability of this lake.

The Objectives of the study

The major objectives of the present study were to:

- Assess the state of environment in and around the Ousteri Lake.
- Examine the probable threats to the lake and its ecological environs, and
- Develop a Comprehensive Management Action Plan (CMAP) for conservation of the lake and its surroundings.

OUSTERI LAKE

Location

Ousteri Lake, located around 11°56' - 11°58' North and 79°44' - 79°45' East, is a large shallow wetland situated along the eastern boundary of Puducherry. It is an inter-state lake with the water-spread area almost equally shared between the states of Puducherry and Tamil Nadu. The lake situated at a distance of 10 km from Puducherry town in the Western side on Puducherry-Villupuram-Valuthavur main road. Details on the environmental settings of this lake are listed in Table 1. The lake covers an area of about 800 ha (spread across both Tamil Nadu and Puducherry), of which 390 ha is in Puducherry and the rest in Tamil Nadu (Alexander and Pusharaj 2010). Much of the Ousteri bank along the Tamil Nadu side consists of rural settlements, the Pondicherry side of the lake is predominantly urban or suburban (Abbasi and Chari 2008), causing special stresses on the lake.

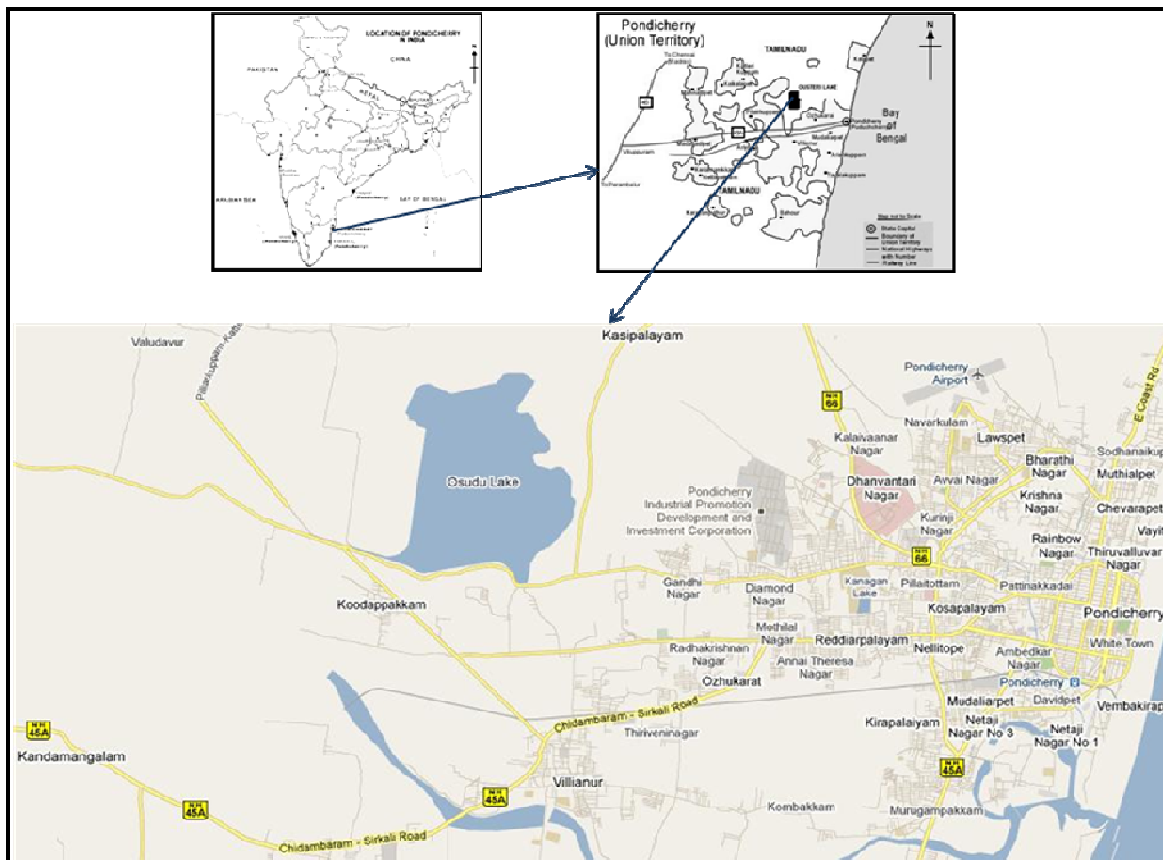


Figure 1. Location of Ousteri Lake, Puducherry

Ousteri is the largest lake in Puducherry and is also one of the important wetlands of Asia (Alexander 2010). In the recent past Ousteri lake has also been identified as a wetland of national importance under the National Wetland Conservation Programme of Ministry of Environment and Forests (MoEF), New Delhi. This lake is also an Important Bird Area (IBA) identified by the BNHS (Bombay Natural History Society), Mumbai. The Asian Wetland Bureau declared Ousteri as one of the 115 significant wetlands in Asia (Anon, 2009).

Table 1. Environmental setting of Ousteri lake

Sl. No.	Particulars	Details
1	Longitude	11°56' - 11°58'
2	Latitude	79°44' - 79°45'
3	Elevation above Mean Sea Level	~15 m above MSL
4	Name of the sub-taluk	Villianur
5	No. and name of the village	29- Oussudu
6	Survey field no.	8
7	Extent & capacity	390 ha – 00A-39Ca.
8	Boundaries	South: Oussudu and Koodappakkam villages West: Ramanathapuram and Thondamanatham villages; and North: Tuthipet and Karasur villages
9	Climatic conditions	Annual Mean Max Temp: 33.1°C Annual Mean Min Temp: 24.1 °C Annual Total Rainfall: 1338 mm
10	Major land use types around the lake	Agriculture, cash crop plantation and human habitation, Scrub jungle, water body.
11	Nearest Highway	State Highway Pondicherry-Thirukkanur-Viluppuram (~35 km SW)
12	Nearest Railway Station	Puducherry RS (~ 13 km, NW)
13	Nearest Airport	Lawspet, Pondicherry (12 ~ km, NW)
14	Nearest Port	Chennai (165 ~ km, NE)
15	Nearest major habitation	Villianur (~ km, SW)
16	Nearest major town	Pondicherry (10 km, SE)
17	Reserved Forests	Nil

Sl. No.	Particulars	Details
18	Historically Important Places	(Auroville, ~10 km), Pondicherry Museum and Library and Arikamedu (~8 km), Gokilambal Thirukameshwara Temple at Villianur (~ 4 km), Sri Aurobindo Ashram (~10 km), Promenade (~10 km), Lighthouse near the sea (~10 km).
19	Rivers/streams around the lake	Sankarabharani river (~ 2 km, South) and Pennaiyar (~7 km S)
20	Major Dams and barrages	Suthukeni barrage (~ 6 km, NW) Vidur dam
21	Other major Industries (with distance from the lake in parentheses)	ABC Engineers (~ 1 km) REIL Electricals (~ 1.5 km) Hindustan National Glass & Industries Ltd (~1 km) Sunbeam Generators Pvt Ltd (~0.5 km)
22	Survey of India Topo sheet covering the lake and surroundings	58m 1/16
23	Seismic zone	Zone-III

Geology and Physiography

Pondicherry is situated on the Coramandel coast and has a geographical area of 293 km². It is a flat monotonous plain, with an average elevation of about 15m above mean sea level. The three major physiographic units present in Pondicherry are i) Coastal plain, ii) Alluvial plain, and iii) Uplands (Source: State ground water unit, Dept. Agriculture, Puducherry). The landscape of this area is a product of the Cretaceous, Paleocene, Eocene, Mio-Pliocene, of recent eras (Abbasi and Chari 2008). The geology comprises of charnockite overlain by a cover of sedimentary sequence. The thickness of this sub-horizontal sedimentary cover increases east to southerly up to 600 m near the coast (Krishnan and Srinivasan 1996). The landform of the area are marine, fluvial and fluvio-marine regimes each sustaining individual soil assemblages. Geologically, Oussudu and its surroundings comprise mostly of alluvium, Manaveli clay stone, and Vanur sand stone.

Hydrology

According to the Tourism Department, the circumference of the lake is 7.275 km. The total catchment area of the lake is 15.54 km². It receives water mainly from Suthukeni check dam through Suthukeni canal and the run-off from the Lake basin. The Suthukeni

check dam is constructed across the river Sankaraparani. The major water source for the Suthukeni dam is the excess water from Veedur dam, Viluppuram District of Tamil Nadu state. The month-wise details of the volume of water inflow and outflow (mcft) and the level of water in Ousteri Lake (million m³) from 1999 till 2010 are presented in Figure 2 (Appendix 1.) It clearly shows that before 2004, the Ousteri Lake was a dynamic seasonal wetland which went almost completely dry during the months of June to September every year. However, the outflow was restricted from year 2004 onwards and the lake has never been dry ever since. This is likely to have affected the lake ecology and has also contributed to the accumulation of pollutants including silt and other settled biological matter and also reduced the availability of submerged vegetation and associated resource base for the migratory birds especially waders.

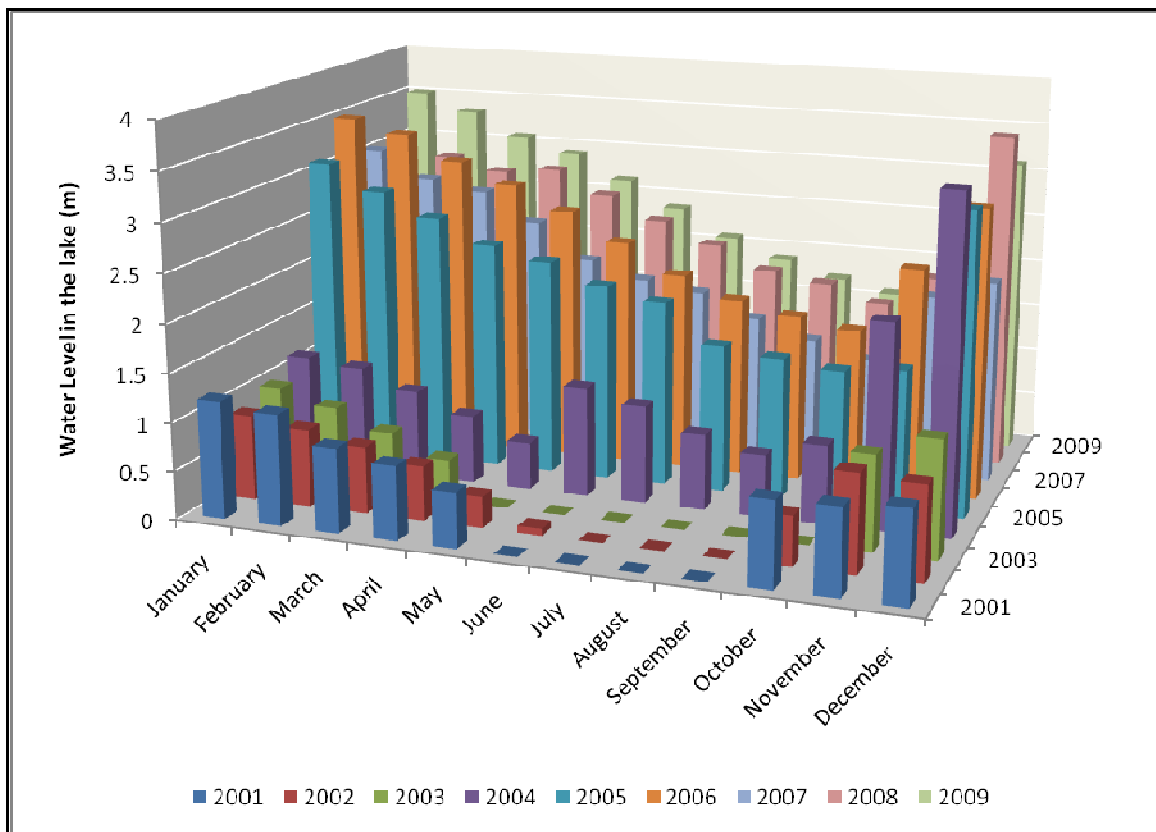


Figure 2. Monthly fluctuation in the water level of Ousteri lake over the years (2001-2009)

Land Use and Land Cover

The predominant land use category around Ousteri Lake is agriculture. Vast stretches of agricultural fields were seen around the lake, as many of the villagers in the surrounding villages practice agriculture. The major land use categories in the catchment of Ousteri are Agriculture followed by settlements and other urban land use; water resources, open scrub, plantations, and open land (Abbasi and Chari 2008, Nobil et al. 2009). An assessment on land use and land cover pattern of Puducherry region by Nobil et al. (2009) reveals that Agriculture is the major land use followed by settlements and plantation (Figure 3 and Figure 4). Several tanks / ponds, satellite ponds, were also seen in the catchment of Ousteri and the list is presented Table 2. Plantations in the catchment area are chiefly that of *Casuarina* sp., and *Cocus nucifera*. The predominant settlements in the region are Villianur, Sedarpet and Katterikuppam, while the rest of the settlements fall under Netapakkam, Agaram, Karasur and Poothurai. There are two prominent industrial belts in the vicinity of Ousteri lake. The one lying in the Northwestern part of the lake has a glass industry, a rubber industry and a coir industry; while the other located towards the road leading to Oussudu from Puducherry town includes a cosmetic industry, a brewery and a dairy. In toto, 25 industries are presently operating in Puducherry region (Source: Confederation of Indian Industries, Puducherry chapter).

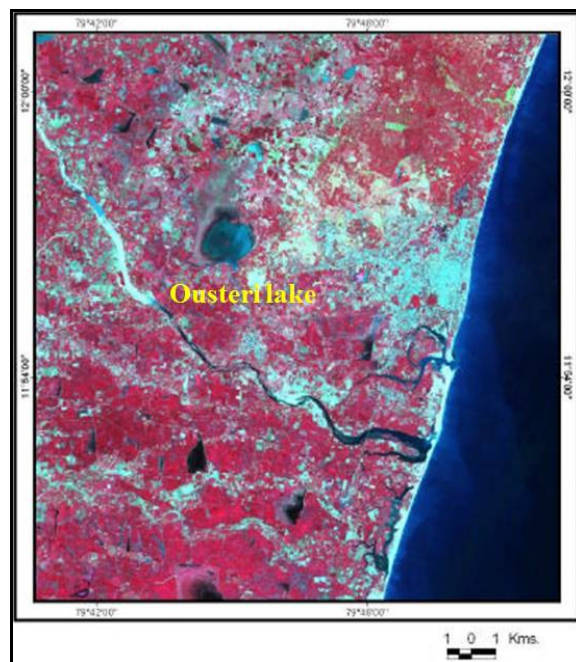


Figure 3. IRS IC LISS III satellite imagery of the study area (Source: Nobil et al. 2009)

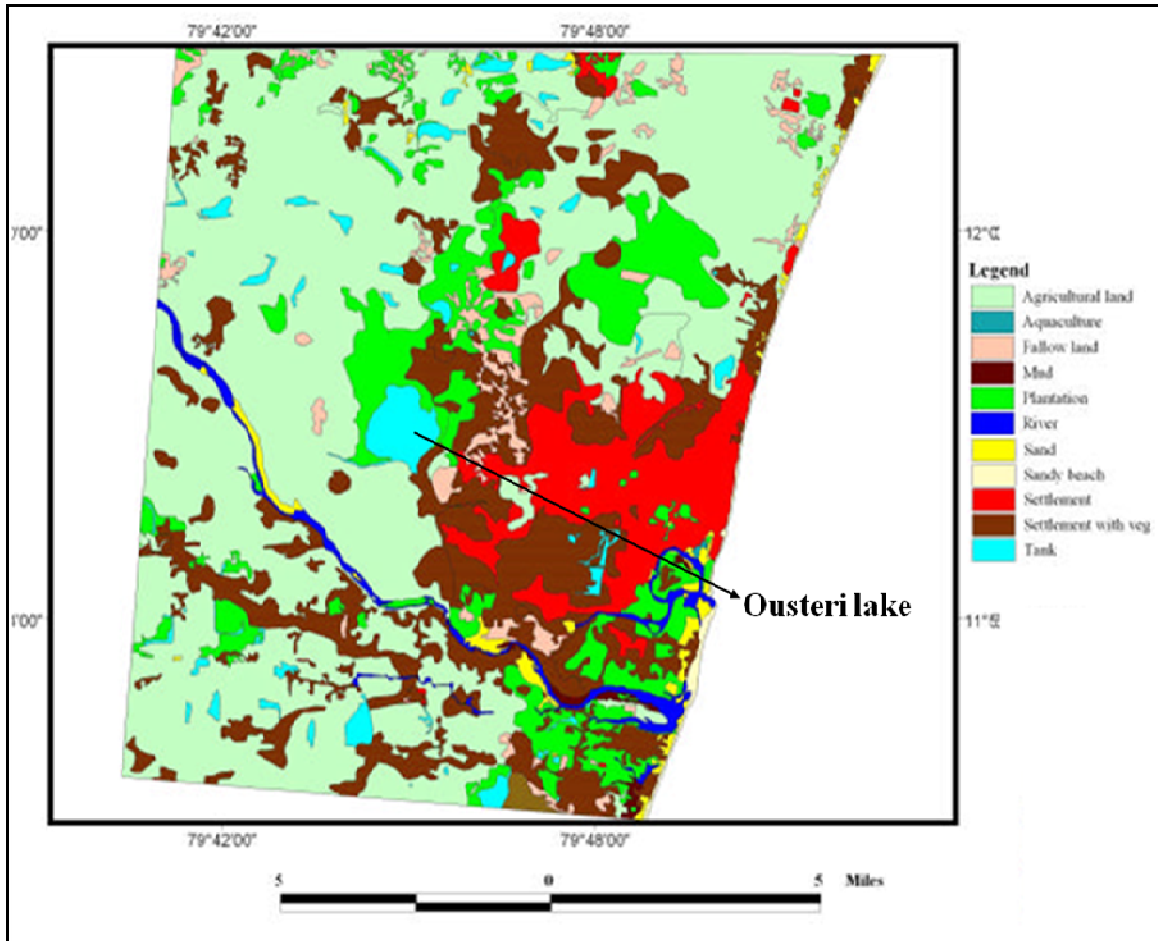


Figure 4. Classified Land use/Land cover map of the study area (Source: Nobil et al. 2009)

Table 2. Major tanks around the Ousteri lake

Sl.No	Name of the Tank/Eri	Capacity Mm ³
1	Thondamanattam tank	0.34
2	Ariyur Tank	0.04
3	Kadaperi Eri	0.16
4	Karasur Tank	0.34
5	Sedarapet Periya Eri	0.42
6	Sedarapet Sitheri	0.13
7	Thuthipet Tank	0.27
8	Katteriputhu Thangal	0.12
9	Kateripazham Thangal	0.17

Climate

The climate of Oussudu watershed is humid. The average annual rainfall of Puducherry region is 1200 mm, of which around 63% occurs in north east monsoon from June to September, while the remaining is scattered sporadically throughout the year. The climate is tropical dissymmetric with the bulk of the rainfall during northeast monsoon (October–December). Figure 5 presents the details about annual rainfall in Puducherry region for 14 years (1994-95 to 2007-08). The 14 year average rainfall for Puducherry is 1338 m. The mean number of annual rainy days is 55 and the mean monthly temperature ranges from 21.3°C to 30.2°C. 13 year record of several meteorological variables collected from the Public Works Department, Puducherry (Table 3) reveals that the annual mean temperature in Puducherry ranged between 23.6°C and 33.7°C.

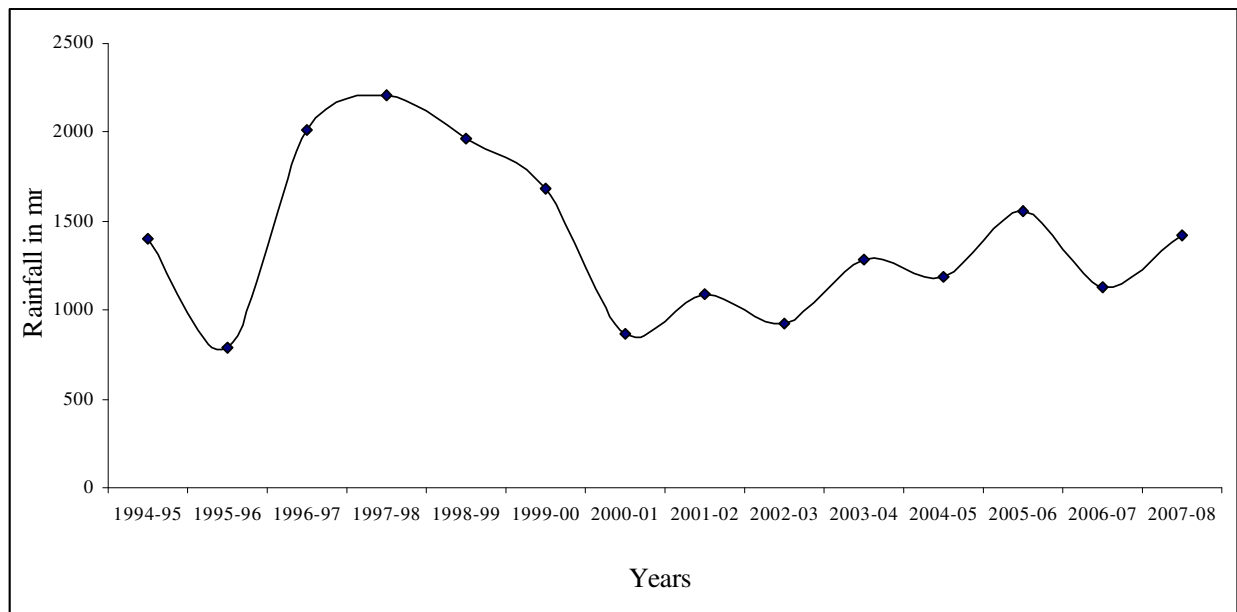


Figure 5. Annual Rainfall pattern in Puducherry

Table 3. Annual profile for Temperature and Relative Humidity at Puducherry

Year	Mean Maximum (°C)	Mean Minimum (°C)	Pooled mean (°C)	Relative Humidity	
				8.30 Hrs	17.30 Hrs
1995	33.2	24.6	28.9	77	76
1996	32.3	23.6	28	85	81

1997	32.8	24.0	28.4	84	80
1998	33.4	24.5	29	83	79
1999	33.1	23.8	28.5	84	78
2000	33.2	24.0	28.5	83	77
2001	33.4	24.2	28.8	83	77
2002	33.7	24.1	28.9	79	74
2003	33.6	24.2	28.5	79	72
2004	33.1	23.9	28.5	78	70
2005	33.3	24.4	28.9	79	72
2006	33.4	24.1	28.8	79	71
2007	33.1	24.1	28.6	79	72
Reference year: January to December					
Source: India Meteorological Department, Chennai					

Livestock and animal husbandry

Historically the major occupation in villages situated in 5 km radius of Ousteri lake was animal husbandry and agriculture. During the last one decade drastic change in the land use has resulted in a shift from these activities practiced earlier. Table 4 presents the details of livestock (as per 2007 census) in villages around Ousteri lake.

Table 4. Details of livestock population in villages within 5 km radius from Ousteri lake

Sl. No.	Village	Total livestock population census (2007)
1.	Sedarapet	473
2.	Karasur	365
3.	Thuthipet	122
4.	Thondamanatham	988
5.	Ramanathapuram	1077
6.	Pilliyarkuppam	882
7.	Koodapakkam	1443
8.	Ulaivakkal	336

9.	Oussudu	1107
10.	Kurumapet	332
11.	Gopalankadai	185
12.	Thavalapet	117
13.	Muthupillaipalayam	196
14.	G.N. Palayam	342
15.	Arasur	186
16.	Villianur	609
<i>Source: 18th Livestock census, Department of Animal Husbandry and Animal Welfare, Puducherry</i>		

Current status

In the recent times, the lake and its watershed have been exposed to enormous pressures due to the increasing human population, industrialization and urbanization. This lake is an example of our degrading wetlands. Ousteri plays a very vital role in recharging the ground water aquifers for the Pondicherry, which is largely dependent on groundwater for its drinking water supply. It also protects the underground aquifers from sea water ingress. Ousteri Lake has been facing serious threats from multiple fronts such as reclamation, agriculture, siltation, weed invasion and poaching. The lake is infested by the aquatic weed *Ipomoea carnea* (Water hyacinth), which is presently covering almost 14% of the water spread area of the lake. Encroachments in the form of rice paddies, land reclamation and plantations are on the rise. Runoff from agricultural fields can add substantial amounts of nitrates and phosphate to the lake waters that stimulates the growth of aquatic macrophytes and planktons, resulting in eutrophication. The ecologically sensitive zones such as roosting areas of birds are located in close proximity of humans. Illegal fishing and poaching of wild birds are quite frequent in the area. These trends if not checked can soon result in rapid eutrophication, siltation, and ultimate death of the lake (Azeez et al. 2008 and 2009).

The activities associated with agriculture and urban land use have brought about dramatic ecological changes affecting the quality of Ousteri watershed in terms of direct destruction of natural habitat types, increased nutrient input to the watercourses and the

lake through increased erosion, agriculture run-off and waste disposal and increased natural resource utilization such as gravel extraction, firewood harvest and fisheries. Considering the area having adequate ecological, faunal, floral, geomorphological, natural or zoological significance, it was declared as a sanctuary vide GO Ms No. 17.Ag, dated 7th October, 2008 for the purpose of protecting, propagating and developing wildlife and its environment.

The Bombay Natural History Society, a member of Birdlife International, has designated Ousteri an Important Bird Area (IBA) of India; over 20,000 birds belonging to nearly 40 species used to inhabit or winter at Ousteri (Balachandran and Alagarrajan 1995, and Jhunjhunwala 1998). The Asian Wetland Bureau declared Ousteri as one of the 93 significant wetlands in Asia. The lake has been identified as one of the heritage sites by IUCN (International Union for Conservation of Nature and Natural Resources) and also ranked among the most important wetlands of Asia. It is one of the most important fresh water lakes in the Pondicherry region. The structure of the lake is very complex, consisting of water, wetland/marsh and mudflats.

Human, industrial and other developmental activities around the lake

- The Ousteri lake is surrounded by vast human settlements. The major settlements around the lake are Oussudu, Ramanathapuram, Thondamanatham, Koodappakkam, Thuthipet, Pathukannu, Poraiyur, Agaram, Villianur, Sedarapet and Katterikuppam, Kurambapet, Karasur and Poothurai.
- A medical college cum hospital named Lakshmi Narayana Hospital and Medical College is located in close vicinity of this lake.
- An amusement park called Pogo land is operational on the embankment of the lake.
- The following prominent industries are found in the vicinity of Ousteri lake. (1) Glass industry (2) rubber industry (3) coir industry (4) cosmetic industry (5) brewery (6) dairy and (7) plastic molding factory.

Vegetation of the area

The area supports diverse flora rich in rare and endemic elements. It is a monsoonal lake and the northeast monsoons leave Ousteri lake flooded during the winter months and goes partially dry during summer months. The vegetation of the study area is very diverse, ranging from small herbs to very large trees including many aquatic plants. Large scale cultivation of paddy could be seen around the wetland. Coconut farms are also very common around the lake.

METHODOLOGY

The proposed management plan would consider both bio-physical and socio-economic environments in and around the lake and the sampling and survey plan was accordingly designed. Secondary information on various aspects was collected from various line departments of Government of Puducherry and other published research articles and reports. To collect data and information on specific components of the ecological system and pertinent issues, widely used standard scientific methods were adopted. Frequent field surveys were undertaken in the study area during November 2010 to January 2011 for collecting relevant data on various aspects of environment.

Vegetation Sampling

Vegetation is universally recognized as an integral component of ecosystems, which indicates the effects of changing environmental conditions in an obvious and easily measurable manner and is much important in site evaluation and classification. Hence, careful analysis of vegetation is very important to know the distribution and types of floral components in an ecosystem. For phytosociological analysis quadrat method was used in the present study since it is the most widely used technique for plant census. Vegetation analysis was done by all sides of the lake.

In order to study the flora of the wetland and its surrounding area in general and to estimate the tree density in particular, quadrats of 10 x 10 m size were laid. A total of 25 such quadrats were laid for representing all the vegetation types during the present study. The Girth at Breast Height (GBH) of plants (trees) occurring in the 10 x 10 m plot were recorded. Species with GBH > 20cm were considered as trees. In the middle of each 10 x 10 m quadrat, a quadrat of 3 x 3 m was laid for shrub density estimation. Similarly, a quadrat of 1 x 1 m was laid within the 3 x 3 m quadrat to record the herbaceous species. All the herbaceous species within the 1 x 1 m quadrat were counted and recorded. Species encountered during the vegetation sampling and surveys were recorded. Information on flora available in previous works also included with appropriate citations. Taxonomic identification of the species encountered in the field was done consulting the flora of Hooker (1872-97), Gamble (1957), Jain and Rao (1983) and Matthew, (1999). The specimens of unidentified plants were preserved in 10% formaldehyde and brought

to the Botanical Survey of India, Coimbatore for further identification by experts. The nomenclature given in the present study was based on the Flora of Tamil Nadu Series 1: Analysis vols. 1-3 (1983-1989).

The vegetation data were analyzed to obtain the quantitative structure and composition of plant communities. For understanding the synthetic characters of the forest vegetation, the species richness and diversity of species in the stands are calculated. The vegetation data were tabulated for frequency, density, abundance, relative frequency, relative density, relative abundance, relative dominance, IVI and composition of plant communities, following Curtis and MC Intosh (1950), Philips (1959), Ludwig and Reynolds (1988), Lande (1996) and Smith and Wilson (1996). The Shannon-Wiener's index of diversity (H') was calculated using the software 'Species diversity and richness (version 2.65, Colwell, 1994-2004, Table 5).

Table 5. Calculating quantitative structure and composition of plant communities

Parameters	Formula adopted
Frequency (%)	(No. of quadrats in which a species occurred/ Total no. of quadrats studied) \times 100
Abundance	Total number of individuals of the species/ No. of quadrats in which the species occurred
Density	Total no. of individuals of a given species/ Total no. of quadrats examined
Relative density	No. of individuals/ No. of individuals of all species
Relative abundance	(Abundance of species \times 100) / Sum of all abundances
Relative frequency	Number of quadrats occurring/ Total no. of quadrats
Basal area	(GBH) $^2 / 4\pi$
Relative Basal area	(Total basal area of Individuals/ Total basal area of all species) \times 100
Dominance	Total basal area/total area sampled
Relative dominance	Total basal area/ Total basal area of all species
IVI	Relative density + Relative dominance + Relative frequency

Faunal Sampling

Various groups of animals found in the study area were recorded by both direct and indirect methods during the present study period. Different sampling techniques were applied to record different faunal groups in the study area. Animals recorded in the present study include butterflies, fishes, amphibians, reptiles, birds and mammals.

The following sampling techniques were used for the study of various fauna during the present study period are given in the Table 6.

Table 6. Sampling techniques used for the faunal study

Taxa	Sampling Methods
Butterflies	Random walk, opportunistic observations
Amphibians	Visual encounter survey (search)
Reptiles	Visual encounter survey (search)
Birds	Random walk, opportunistic observations
Mammals	Tracks and signs, and visual encounter survey

Butterflies

The butterflies in and around the wetland were documented by direct observations, random walk and opportunistic observations, during early morning (06:00 to 10:00 hrs) and evening (17:00 to 19:00 hrs), by using a pair of binoculars. Butterfly survey was carried out by searching 5 m distance on either side of the transect. Gunathilagaraj et al. (1998), Kunte (2000) and Kehimkar (2008) were referred for the identification of Butterflies. Larson (1987-88) was referred for correct scientific nomenclatures of butterflies. The quantification of butterflies were done by using line transect method by covering all sides of the lakes and its environs. The length and numbers of one kilometer transects were selected based on topography, vegetation physiognomy and the availability of the area.

Avifauna

The avifauna in and around the study site were documented by direct observations, Random walk and opportunistic observations, during early morning (06:00 to 10:00 hrs) and evening (17:00 to 19:00 hrs) by using a pair of binoculars. Avifaunal community was recorded and quantification was done using 1 km Line transect method (Bibby et al. 1992 and Sutherland 1996) covering all sides of the lakes and its environs. In total 11 line transects were laid based on topography, vegetation physiognomy and the availability of the area. Based on the visibility of the researcher the search was done on both sides of the transect with the help of 10x50 mm field binoculars. Ali and Ripley (1989) and Grimmet et al. (1998; 2001) were referred for the identification of birds. Grimmet et al. (1998; 2001) were followed for correct nomenclature.

Herpetofauna

Visual Encounter Survey (VES, search) was followed for the survey of the herpetofauna (amphibians and reptiles) in the wetland and its environs were conducted following during the survey for amphibians and reptiles. VES is a method one in which field personnel walk through an area or habitat for a prescribed time period systematically searching for animals. This is an appropriate technique for inventory and monitoring studies. During the search leaf litter, fallen logs, trees (bark, buttress, root and holes), shrubs, boulders, rocks and rock crevices were examined. The identification of herpetofauna was done with the help of Boulenger (1890), Daniel and Sekar (1989), Daniel (1963 & 1975), Daniel (1992), Daniels (1997 a, b & c), Daniels (2005), Indraneil Das (2002), Whitaker and Captain (2004).

Mammals

Survey the mammals in and around the wetland was conducted following standard methods. Both direct and indirect methods (tracks and signs, and visual encounter survey) were applied to get an overall view on mammals present in the area and used the resources. For survey of mammals, tracks and signs, and visual encounter survey were used. Species were also identified by indirect evidences such as pug marks, calls, signs and scats (Bang et al. 1972; Burnham et al. 1980 and Heyer et al. 1994). Mammals were identified following Menon (2003).

Ichthyofauna

Fish fauna inhabiting the Ousteri lake were recorded during the present investigation. Fishes were collected using monofilamentous gill nets, cast nets and drag nets wherever applicable. Fish species reaching the market from fish catchers of local fisher folk around the Ousteri Lake were also included in the list. Fishes caught were released after identification. Fish identification was based on Talwar and Jhingran (1991) and Jayaram (1999). The status of fish species was assigned based on IUCN categorization.

Socio-economic Survey

In order to find out the people's opinions about the status and importance of Ousteri lake, a brief socio-economic survey was also conducted in the villages located within the 5 km radial distance from the Ousteri lake. Customized questionnaire was prepared (Appendix 2) to obtain information about the socio-economic standards of villagers around the lake and their perception and suggestion for improving the lake environment. Data on several socio-economic parameters were collected at household level using both open and closed ended questionnaire. This aided in obtaining information about villagers, their perception and attitude towards Ousteri Lake and its surrounding, and their views were taken for conserving the lake. Several issues such as alternate livelihood options were examined so that villagers can be engaged in different activities which will make them stop poaching and hunting birds. This helped in preparing an environmental management plan where the immediate stakeholders, i.e. the villagers can be engaged.

OBSERVATIONS

Floral analysis

The present study results in the documentation and identification of 480 plant species belonging to 317 genera and spreading over 92 families in the study area, Ousteri lake and its environs (Appendix 3). Among the 480 species, herbaceous plants were dominant with 191 species (41%) followed by trees with 103 species (21%), shrubs 63 species (13%), stragglers were 20 species (4%), climbers 40 species (8%) and grasses 63 species (13%) excluding *Bambusa arundinacea*, which is included under trees due to its arborescent nature (Figure 6). Of the 92 plants families recorded from the study area, Poaceae is the dominant family and it is represented by 64 species followed by Fabaceae 30 species, Euphorbiaceae, Cyperaceae and Caesalpiniaceae with 28, 24 and 19 species each respectively (Figure 7). Among the 317 genera recorded from the study area, *Cyperus* is the dominant genus with 12 species followed by *Cassia* with 9 species, *Fimbristylis* 8 species, *Acacia* and *Phyllanthus* with 7 species each and *Justicia* with 5 species (Figure 8).

The major trees recorded around the lake are *Dalbergia paniculata*, *Acacia auriculiformis*, *Terminalia arjuna*, *Thespesia populnea*, *Tamarindus indicus*, *Khaya senegalensis*, *Ficus benghalensis*, *F. religiosa*, *Azadirachta indica*, *Borassus flabellifer*, *Samanea saman*, *Gmelina arborea*, *Pongamia pinnata*, *Prosopis juliflora*, *Morinda tinctoria*, *Peltophorum pterocarpum*, *Syzygium cuminii*, *Spathodea campanulata*, *Launnea coromandelica*, *Phoenix sylvestre*, *Bombax ceiba*, *Ceiba pentandra* etc. The palm, *Borassus flabellifer* is commonly seen in all sides of the lake.

The shrub such as *Ficus hispida*, *Fluggea leucopyrus*, *Cassia auriculata*, *Rauwolfia tetraphylla*, *Plumbago zeylanica*, *Phoenix laurieri*, *Lantana camara*, *Abutilon hirtum*, *A. indicum*, *Pavetta indica*, *Randia malabarica*, *Calotropis gigantean*, *C. procera*, *Barleria cristata*, *Jatropha gossypifolia*, *J. tanjorensis*, *Ziziphus oenoplia* etc. are commonly seen all around the lake.

Acalypha indica, *Borreria ocymoides*, *Commelina benghalensis*, *C. longifolia*, *Cyperus rotundus*, *Ruellia patula*, *Alysicarpus monilifer*, *Achyranthes aspera*, *Phyllanthus*

maderaspatensis, *Corchorus tridens*, *Desmodium triflorum*, *Euphorbia hirta*, *Justicia procumbens*, *Clitoria ternatea*, *Parthenium hysterophorus*, *Pupalia lappacea*, *Tridax procumbens*, *Pseudarthria viscida* etc. are the major herbaceous plants recorded in the study area.

The common climbers/stragglers recorded in and around the study area are *Cissus trifolia*, *C. vitigena*, *Cardiospermum halicacabum*, *Tragia involucrata*, *T. plukenetii*, *Toddalia asiatica*, *Passiflora foetida*, *Oxystelma esculentum*, *Tiliacora acuminata*, *Tylophora benthamii*, *Pergularia daemia*, *Wattakaka volubilis* etc.

The following grasses viz., *Andropogon pumilus*, *Apluda mutica*, *Arundo donax*, *Bothriochloa pertusa*, *Chloris barbata*, *Cynodon dactylon*, *Eleusine Indica*, *Eragrostis amabilis*, *Saccharum spontaneum*, *Setaria pumila*, *Oplismenus composites*, *Chrysopogon asper* are commonly seen in the study area.

The major hydrophytes recorded during the present study period were *Nelumbo nucifera*, *Nymphaea nouchalii*, *Ceratophyllum demersum*, *Hydrilla verticillata*, *Najas minor*, *Ipomoea carnea*, *Salvinia molesta*, *Pistia stratioides*, *Lemna minor*, *Aponogeton natans*, *Ottelia alismoides*, *Ceratopteris thalictroides*, *Eichornia crassipes*, *Vallisneria spiralis*, *Polygonum glabrum*, *P. hydropiper*, *Typha angustata*, *Vetiveria zizanioides*, *Cyperus* spp. *Fimbristylis* spp. etc. Among them, species such as *Hydrilla verticillata*, *Ceratophyllum demersum*, *Najas minor* and *Nelumbo nucifera* were the major aquatic weeds and they are distributed throughout the lake and the rest are seen along the margins of the lake only.

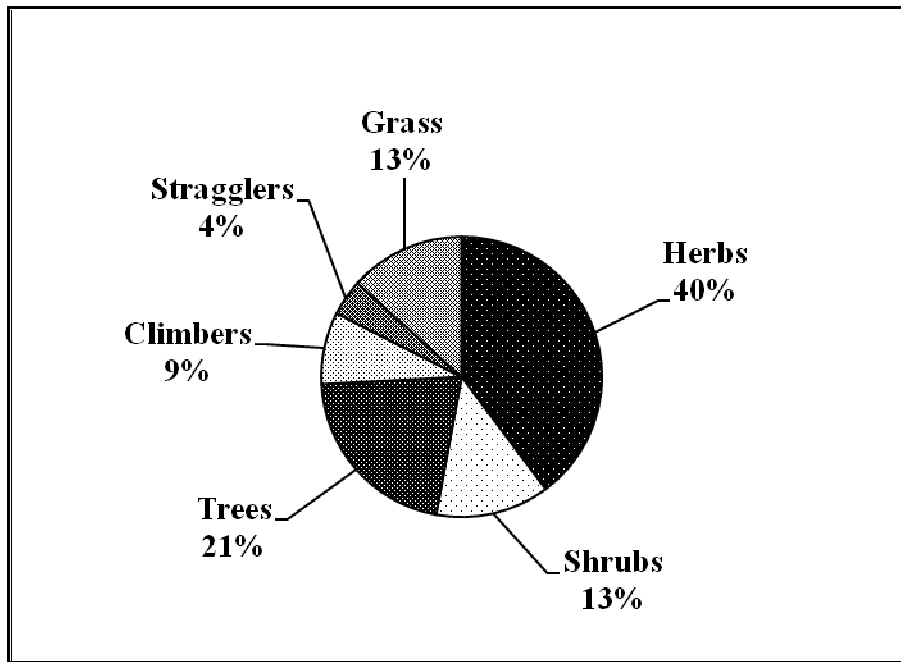


Figure 6. Habit wise analyses of plants in the study area

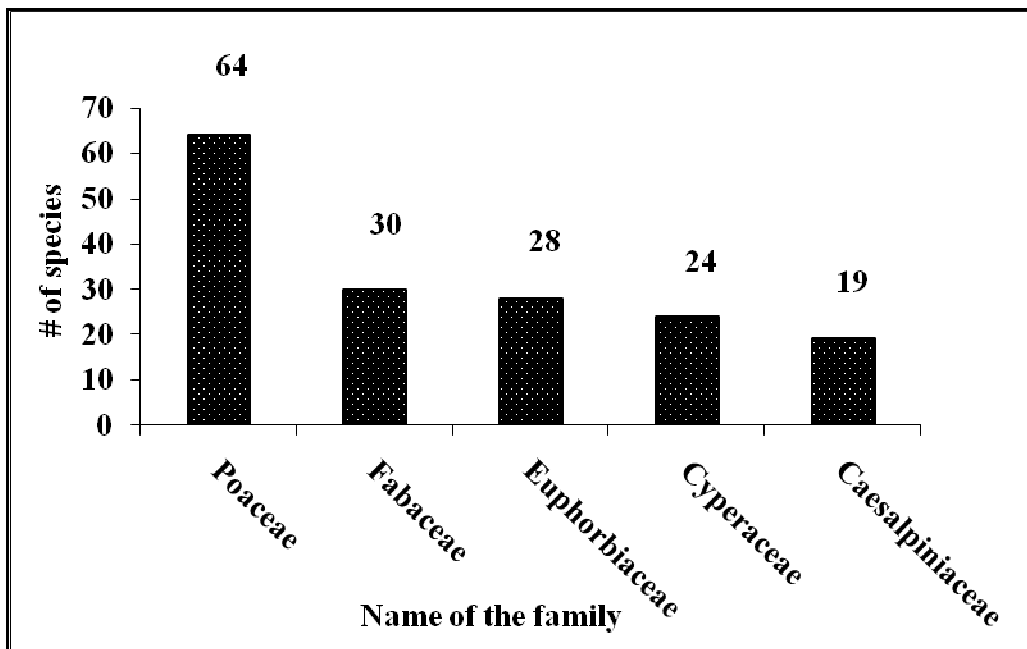


Figure 7. Dominant plant families in the study area

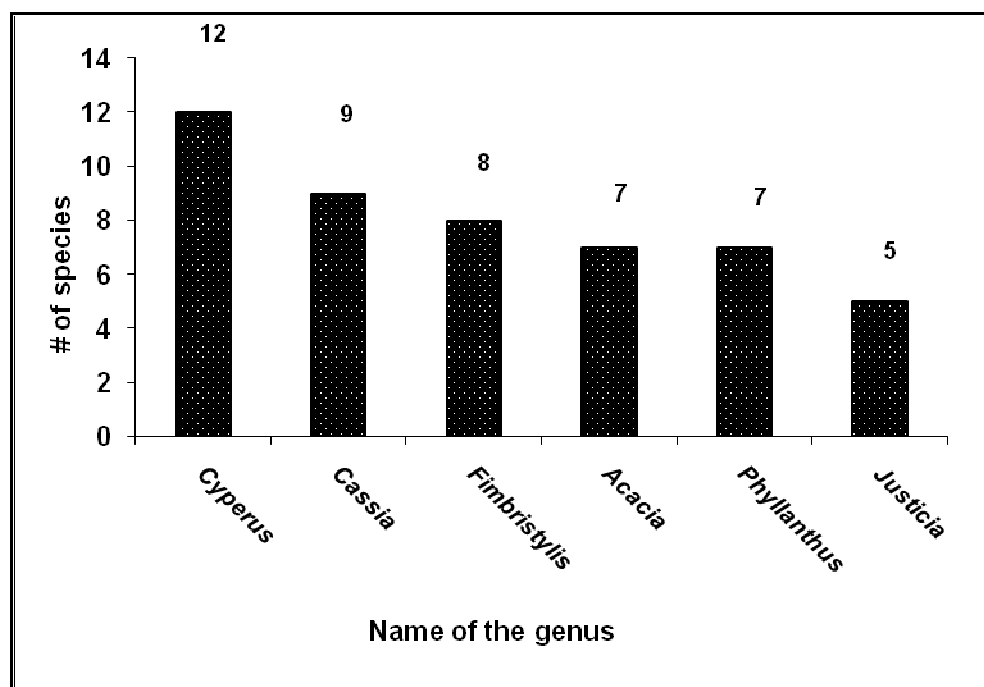


Figure 8. Dominant plant genera in the study area

Endemic plants recorded in and around Ousteri lake

Of the 480 plant species recorded during the present survey, 11 species were found to be endemic (*Andropogon pumilus*, *Asystasia dalzelliana*, *Barleria acuminata*, *Cynodon barberii*, *Drypetes roxburghii*, *Iseilema anthephoroides*, *Jatropha tanjorensis*, *Maba buxifolia*, *Phyllanthus rotundifolia*, *Sarcostemma brunonianum* and *S. intermedium*) and distributed only in the Indian subcontinent (Henry et al. 1978, Ahmedullah and Nayar 1987, Nayar 1996). Among them, only one species i.e. *Jatropha tanjorensis* has restricted distribution in the Coromandel coastal plains of the Indian subcontinent. *Phyllanthus rotundifolia* is distributed in the coastal regions of Tamil Nadu, Andhra Pradesh and Kerala.

Endangered/threatened IUCN red listed medicinal plants

Among the 480 plant species, 20 different species (*Acacia chundra*, *Achyranthes bidentata*, *Aegle marmelos*, *Aristolochia indica*, *Buchanania axillaris*, *Cadaba indica*, *Cassine glauca*, *Celastrus paniculatus*, *Crateva magna*, *Enicostemma littorale*, *Hemidesmus indicus*, *Hugonia mystax*, *Justicia gendarussa*, *Kedrostis foetidissima*, *Plumbago zeylanica*, *Pseudarthria viscida*, *Salacia chinensis*, *Santalum album*,

Semecarpus anacardium and *Terminalia arjuna*) are categorized unused rare/endangered/threatened/vulnerable red listed medicinal plants category. Nevertheless, these are also not limited to the study area and are found elsewhere.

Phytosociology

Tree Community Structure

A total of 150 trees, belonging to 27 species, 24 genera spread over 16 families, were recorded in the study area. The tree community parameters, computed from the data are presented in Table 7. Among these, *Borassus flabellifer* was represented by maximum number of individuals (n = 44) followed by *Azadirachta indica* (n = 30) and *Pongamia pinnata* (n = 10). Highest density was recorded for *Borassus flabellifer* (1.76) followed by *Azadirachta indica* (1.2) and *Samanea saman* (0.32). In terms of relative density highest value was recorded for *Borassus flabellifer* (29.33) followed by *Azadirachta indica* (20.00) and *Pongamia pinnata* (6.67). The Shannon-Weiner diversity for tree community in the study area was 2.5202. The highest Important Value Index (IVI) was recorded for *Borassus flabellifer* (53.61) followed by *Azadirachta indica* (42.11) and *Pongamia pinnata* (18.30).

Shrub Community Structure

A total number of 615 individuals belonging to 50 shrub species coming under 47 genera and spreading over 29 families were recorded in the study area. The shrub community parameters are given in Table 8. Among the 50 species recorded, *Morinda tinctoria* was seen in highest number (n = 103) followed by *Ficus hispida* (n = 67) and *Rauvolfia tetraphylla* (n = 45). Highest density was recorded for *Morinda tinctoria* (4.12) followed by *Ficus hispida* (2.68) and *Rauvolfia tetraphylla* (1.80). Likewise, the highest relative density value was recorded for *Morinda tinctoria* (16.75) followed by *Ficus hispida* (10.89) and *Rauvolfia tetraphylla* (7.32). The Shannon-Weiner diversity for shrub community in total in the study area was 3.2607. Among the various shrubs recorded during the study period, the highest Important Value Index (IVI) was recorded for *Morinda tinctoria* (31.48) followed by *Ficus hispida* (21.42), *Rauvolfia tetraphylla* (16.01).

Table 7. Tree community in parameters in the present study area

Plant Species	N	Qn	GBH	F	A	Den	RF	RA	RD	BA	Do	RDo	IVI
<i>Acacia auriculiformis</i>	1	1	1.48	4	1.00	0.04	1.32	2.53	0.67	0.2	0.00	0	4.51
<i>Acacia nilotica</i>	1	1	0.6	4	1.00	0.04	1.32	2.53	0.67	0.0	0.00	0	4.51
<i>Aegle marmelos</i>	1	1	0.35	4	1.00	0.04	1.32	2.53	0.67	0.0	0.00	0	4.51
<i>Albizia lebbeck</i>	1	1	0.95	4	1.00	0.04	1.32	2.53	0.67	0.1	0.00	0	4.51
<i>Azadirachta indica</i>	30	12	19.46	48	2.50	1.2	15.79	6.32	20.00	30.1	0.01	5	42.11
<i>Bombax ceiba</i>	1	1	1.52	4	1.00	0.04	1.32	2.53	0.67	0.2	0.00	0	4.51
<i>Borassus flabellifer</i>	44	10	38.17	40	4.40	1.76	13.16	11.12	29.33	115.9	0.05	19	53.61
<i>Cassia fistula</i>	2	2	0.74	8	1.00	0.08	2.63	2.53	1.33	0.0	0.00	0	6.49
<i>Ceiba pentandra</i>	6	4	30.74	16	1.50	0.24	5.26	3.79	4.00	75.2	0.03	12	13.05
<i>Delonix regia</i>	6	3	8.36	12	2.00	0.24	3.95	5.05	4.00	5.6	0.00	1	13.00
<i>Ficus benghalensis</i>	3	2	64.23	8	1.50	0.12	2.63	3.79	2.00	328.1	0.13	53	8.42
<i>Fiucs religiosa</i>	2	2	6.06	8	1.00	0.08	2.63	2.53	1.33	2.9	0.00	0	6.49
<i>Khaya senegalensis</i>	3	3	5.15	12	1.00	0.12	3.95	2.53	2.00	2.1	0.00	0	8.47
<i>Lannea coromandelica</i>	2	2	3.06	8	1.00	0.08	2.63	2.53	1.33	0.7	0.00	0	6.49
<i>Madhuca longifolia</i>	1	1	0.95	4	1.00	0.04	1.32	2.53	0.67	0.1	0.00	0	4.51
<i>Millingtonia hortensis</i>	1	1	0.91	4	1.00	0.04	1.32	2.53	0.67	0.1	0.00	0	4.51
<i>Morinda tinctoria</i>	4	2	0.93	8	2.00	0.16	2.63	5.05	2.67	0.1	0.00	0	10.35
<i>Peltophorum pterocarpum</i>	4	3	7.45	12	1.33	0.16	3.95	3.37	2.67	4.4	0.00	1	9.98
<i>Phoenix sylvestre</i>	1	1	0.7	4	1.00	0.04	1.32	2.53	0.67	0.0	0.00	0	4.51
<i>Pongamia pinnata</i>	10	5	11.94	20	2.00	0.4	6.58	5.05	6.67	11.3	0.00	2	18.30
<i>Samanea saman</i>	8	6	21.08	24	1.33	0.32	7.89	3.37	5.33	35.3	0.01	6	16.60
<i>Spathodea campanulata</i>	1	1	2.04	4	1.00	0.04	1.32	2.53	0.67	0.3	0.00	0	4.51
<i>Sterculia foetida</i>	3	2	2.66	8	1.50	0.12	2.63	3.79	2.00	0.6	0.00	0	8.42
<i>Syzygium cuminii</i>	2	2	1.89	8	1.00	0.08	2.63	2.53	1.33	0.3	0.00	0	6.49
<i>Tamarindus indicus</i>	3	2	7.92	8	1.50	0.12	2.63	3.79	2.00	5.0	0.00	1	8.42
<i>Tectona grandis</i>	6	2	6.38	8	3.00	0.24	2.63	7.58	4.00	3.2	0.00	1	14.21
<i>Thespesia populnea</i>	3	3	2.79	12	1.00	0.12	3.95	2.53	2.00	0.6	0.00	0	8.47

Where: N = Number of Individuals, Qn = Number of Quadrats where the species occur, GBH = Girth at Breast Height in meters, F = Frequency in percentage, A = Abundance, Den = Density, RF = Relative Frequency, RA = Relative Abundance, RDn = Relative Density, BA = Basal Area, Do = Dominance, R.Do = Relative Dominance, IVI = Importance Value Index.

Table 8. Shrub community structure in the study area

Name of the Species	N	Qn	F	A	Den	RF	RA	RD	IVI
<i>Abutilon hirtum</i>	35	6	24	5.83	1.4	3.35	4.03	5.69	13.08
<i>Abutilon indicum</i>	44	6	24	7.33	1.76	3.35	5.07	7.15	15.58
<i>Arundo donax</i>	13	2	8	6.50	0.52	1.12	4.49	2.11	7.72
<i>Azadirachta indica</i>	30	12	48	2.50	1.2	6.70	1.73	4.88	13.31
<i>Barleria cristata</i>	14	1	4	14.00	0.56	0.56	9.68	2.28	12.51
<i>Bombax ceiba</i>	8	2	8	4.00	0.32	1.12	2.77	1.30	5.18
<i>Borassus flabellifer</i>	12	5	20	2.40	0.48	2.79	1.66	1.95	6.40
<i>Cadaba indica</i>	4	4	16	1.00	0.16	2.23	0.69	0.65	3.58
<i>Calotropis gigantea</i>	8	5	20	1.60	0.32	2.79	1.11	1.30	5.20
<i>Calotropis procera</i>	4	2	8	2.00	0.16	1.12	1.38	0.65	3.15
<i>Cardiospermum halicacabum</i>	3	1	4	3.00	0.12	0.56	2.07	0.49	3.12
<i>Cassia fistula</i>	1	1	4	1.00	0.04	0.56	0.69	0.16	1.41
<i>Coccinia grandis</i>	4	4	16	1.00	0.16	2.23	0.69	0.65	3.58
<i>Elatostema</i> sp.	5	2	8	2.50	0.2	1.12	1.73	0.81	3.66
<i>Feronia elephantum</i>	1	1	4	1.00	0.04	0.56	0.69	0.16	1.41
<i>Ficus hispida</i>	67	7	28	9.57	2.68	3.91	6.62	10.89	21.42
<i>Ficus religiosa</i>	4	1	4	4.00	0.16	0.56	2.77	0.65	3.97
<i>Fluggea leucopyros</i>	5	4	16	1.25	0.2	2.23	0.86	0.81	3.91
<i>Glycosmis pentaphylla</i>	2	2	8	1.00	0.08	1.12	0.69	0.33	2.13
<i>Gmelina arborea</i>	2	2	8	1.00	0.08	1.12	0.69	0.33	2.13
<i>Hyptis suaveolens</i>	4	2	8	2.00	0.16	1.12	1.38	0.65	3.15
<i>Jasminum rigidum</i>	1	1	4	1.00	0.04	0.56	0.69	0.16	1.41
<i>Jatropha gossypifolia</i>	7	2	8	3.50	0.28	1.12	2.42	1.14	4.68
<i>Lannea coromandelica</i>	1	1	4	1.00	0.04	0.56	0.69	0.16	1.41
<i>Lantana camara</i>	27	11	44	2.45	1.08	6.15	1.70	4.39	12.23
<i>Luffa aegyptiaca</i>	1	1	4	1.00	0.04	0.56	0.69	0.16	1.41
<i>Madhuca longifolia</i>	2	1	4	2.00	0.08	0.56	1.38	0.33	2.27
<i>Millingtonia hortensis</i>	2	1	4	2.00	0.08	0.56	1.38	0.33	2.27
<i>Mitragyna parvifolia</i>	2	1	4	2.00	0.08	0.56	1.38	0.33	2.27
<i>Morinda tinctoria</i>	103	20	80	5.15	4.12	11.17	3.56	16.75	31.48
<i>Mukia maderaspatana</i>	5	4	16	1.25	0.2	2.23	0.86	0.81	3.91
<i>Pavetta indica</i>	10	3	12	3.33	0.4	1.68	2.30	1.63	5.61
<i>Pentatropis microphylla</i>	1	1	4	1.00	0.04	0.56	0.69	0.16	1.41
<i>Pergularia daemea</i>	1	1	4	1.00	0.04	0.56	0.69	0.16	1.41
<i>Phoenix sylvestris</i>	9	4	16	2.25	0.36	2.23	1.56	1.46	5.25
<i>Phyllanthus reticulatus</i>	3	2	8	1.50	0.12	1.12	1.04	0.49	2.64
<i>Pithecellobium dulce</i>	6	4	16	1.50	0.24	2.23	1.04	0.98	4.25
<i>Plumbago zeylanica</i>	14	6	24	2.33	0.56	3.35	1.61	2.28	7.24
<i>Pongamia pinnata</i>	24	4	16	6.00	0.96	2.23	4.15	3.90	10.29
<i>Prosopis juliflora</i>	10	4	16	2.50	0.4	2.23	1.73	1.63	5.59
<i>Rauvolfia tetraphylla</i>	45	10	40	4.50	1.8	5.59	3.11	7.32	16.01
<i>Samanea saman</i>	5	3	12	1.67	0.2	1.68	1.15	0.81	3.64
<i>Solanum trilobatum</i>	17	5	20	3.40	0.68	2.79	2.35	2.76	7.91

<i>Spathodea campanulata</i>	2	1	4	2.00	0.08	0.56	1.38	0.33	2.27
<i>Tamarindus indicus</i>	6	2	8	3.00	0.24	1.12	2.07	0.98	4.17
<i>Tectona grandis</i>	2	1	4	2.00	0.08	0.56	1.38	0.33	2.27
<i>Tiliacora acuminata</i>	17	4	16	4.25	0.68	2.23	2.94	2.76	7.94
<i>Tragia plukenetii</i>	2	1	4	2.00	0.08	0.56	1.38	0.33	2.27
<i>Tylophora benthamii</i>	2	1	4	2.00	0.08	0.56	1.38	0.33	2.27
<i>Ziziphus oenoplia</i>	18	7	28	2.57	0.72	3.91	1.78	2.93	8.62

Where: N= Number of Individuals; Qn= Number of Quadrats where the species occur; F-Frequency in percentage; A-Abundance; Den-Density; RF-Relative Frequency; RA-Relative Abundance; RDn-Relative Density; IVI-Importance Value Index.

Herbaceous community

A total of 1430 individuals belonging to 54 plant species falling under 47 genera and spreading over 20 families were recorded in and around the lake (Table 9). Of the 54 species, the grass *Cynodon dactylon* was represented by highest number of individuals (n = 324) followed by *Cyperus rotundus* (n = 238) and *Ruellia patula* (n = 204). Among the various herbaceous species recorded in the study area, highest density values were recorded for *Cynodon dactylon* (12.96) followed by *Cyperus rotundus* (9.52) and *Ruellia patula* (8.16). The highest relative density value was recorded for *Cynodon dactylon* (22.66) followed by *Cyperus rotundus* (16.64) and *Ruellia patula* (14.27). The Shannon-Weiner diversity observed for herbaceous community in the area is 2.7103. The highest Important Value Index (IVI) values were recorded for *Cynodon dactylon* (40.96) followed by *Cyperus rotundus* (31.32) and *Ruellia patula* (28.15).

Table 9. Herbaceous community parameters in the present study area

Name of the Species	N	Qn	F	A	Den	RF	RA	RD	IVI
<i>Acalypha indica</i>	27	8	32	3.38	1.08	4.62	1.14	1.89	7.65
<i>Achyranthes aspera</i>	63	15	60	4.20	2.52	8.67	1.42	4.41	14.49
<i>Achyranthes bidentata</i>	1	1	4	1.00	0.04	0.58	0.34	0.07	0.99
<i>Alternanthera paronychioides</i>	21	1	4	21.00	0.84	0.58	7.09	1.47	9.14
<i>Alysicarpus monilifer</i>	3	2	8	1.50	0.12	1.16	0.51	0.21	1.87
<i>Boerhaavia diffusa</i>	2	1	4	2.00	0.08	0.58	0.68	0.14	1.39
<i>Borreria ocyroides</i>	2	2	8	1.00	0.08	1.16	0.34	0.14	1.63
<i>Bothriochloa pertusa</i>	14	2	8	7.00	0.56	1.16	2.36	0.98	4.50
<i>Brachiaria ramosa</i>	4	3	12	1.33	0.16	1.73	0.45	0.28	2.46
<i>Brachiaria remota</i>	110	4	16	27.50	4.4	2.31	9.29	7.69	19.29
<i>Chloris barbata</i>	29	6	24	4.83	1.16	3.47	1.63	2.03	7.13
<i>Cleome viscosa</i>	1	1	4	1.00	0.04	0.58	0.34	0.07	0.99

<i>Clitorea ternatea</i>	52	8	32	6.50	2.08	4.62	2.20	3.64	10.46
<i>Commelina benghalensis</i>	6	1	4	6.00	0.24	0.58	2.03	0.42	3.02
<i>Commelina longifolia</i>	1	1	4	1.00	0.04	0.58	0.34	0.07	0.99
<i>Corchorus tridens</i>	2	2	8	1.00	0.08	1.16	0.34	0.14	1.63
<i>Croton sparsiflorus</i>	16	7	28	2.29	0.64	4.05	0.77	1.12	5.94
<i>Cynodon dactylon</i>	324	8	32	40.50	12.96	4.62	13.68	22.66	40.96
<i>Cynotis axillaris</i>	2	1	4	2.00	0.08	0.58	0.68	0.14	1.39
<i>Cyperus rotundus</i>	238	8	32	29.75	9.52	4.62	10.05	16.64	31.32
<i>Dactyloctenium aegyptium</i>	75	5	20	15.00	3	2.89	5.07	5.24	13.20
<i>Desmodium triflorum</i>	26	2	8	13.00	1.04	1.16	4.39	1.82	7.36
<i>Digera muricata</i>	1	1	4	1.00	0.04	0.58	0.34	0.07	0.99
<i>Echinocolana colona</i>	6	4	16	1.50	0.24	2.31	0.51	0.42	3.24
<i>Eleusine indica</i>	3	1	4	3.00	0.12	0.58	1.01	0.21	1.80
<i>Eragrostis amabilis</i>	3	2	8	1.50	0.12	1.16	0.51	0.21	1.87
<i>Eragrostis viscosa</i>	1	1	4	1.00	0.04	0.58	0.34	0.07	0.99
<i>Euphorbia hirta</i>	1	1	4	1.00	0.04	0.58	0.34	0.07	0.99
<i>Evolvulus nummularius</i>	38	2	8	19.00	1.52	1.16	6.42	2.66	10.23
<i>Gomphrena decumbens</i>	1	1	4	1.00	0.04	0.58	0.34	0.07	0.99
<i>Hybanthus enneaspermus</i>	1	1	4	1.00	0.04	0.58	0.34	0.07	0.99
<i>Indigofera sp.</i>	4	2	8	2.00	0.16	1.16	0.68	0.28	2.11
<i>Ipomoea pescarpae</i>	1	1	4	1.00	0.04	0.58	0.34	0.07	0.99
<i>Justicia procumbens</i>	1	1	4	1.00	0.04	0.58	0.34	0.07	0.99
<i>Justicia simplex</i>	11	1	4	11.00	0.44	0.58	3.72	0.77	5.06
<i>Malvastrum coromandelianum</i>	4	1	4	4.00	0.16	0.58	1.35	0.28	2.21
<i>Oldenlandia umbellata</i>	2	1	4	2.00	0.08	0.58	0.68	0.14	1.39
<i>Oplismenus compositus</i>	7	2	8	3.50	0.28	1.16	1.18	0.49	2.83
<i>Panicum psilopodium</i>	2	1	4	2.00	0.08	0.58	0.68	0.14	1.39
<i>Parthenium hysteroporus</i>	4	2	8	2.00	0.16	1.16	0.68	0.28	2.11
<i>Paspalum scrobiculatum</i>	1	1	4	1.00	0.04	0.58	0.34	0.07	0.99
<i>Pavonia procumbens</i>	15	4	16	3.75	0.6	2.31	1.27	1.05	4.63
<i>Pentatropis microphylla</i>	1	1	4	1.00	0.04	0.58	0.34	0.07	0.99
<i>Phyllanthus amarus</i>	10	3	12	3.33	0.4	1.73	1.13	0.70	3.56
<i>Phyllanthus maderaspatensis</i>	9	3	12	3.00	0.36	1.73	1.01	0.63	3.38
<i>Polycarpon prostratum</i>	2	2	8	1.00	0.08	1.16	0.34	0.14	1.63
<i>Pseudarthria viscida</i>	23	6	24	3.83	0.92	3.47	1.29	1.61	6.37
<i>Pupalia lappacea</i>	9	3	12	3.00	0.36	1.73	1.01	0.63	3.38
<i>Rhynchosia minima</i>	7	2	8	3.50	0.28	1.16	1.18	0.49	2.83
<i>Rhynchosia minima</i>	5	2	8	2.50	0.2	1.16	0.84	0.35	2.35
<i>Ruellia patula</i>	204	17	68	12.00	8.16	9.83	4.05	14.27	28.15
<i>Setaria pumila</i>	2	1	4	2.00	0.08	0.58	0.68	0.14	1.39
<i>Sida acuta</i>	12	5	20	2.40	0.48	2.89	0.81	0.84	4.54
<i>Vernonia cinerea</i>	20	8	32	2.50	0.8	4.62	0.84	1.40	6.87
Where: N= Number of Individuals; Qn= Number of Quadrats where the species occur; F-Frequency in percentage; A-Abundance; Den-Density; RF-Relative Frequency; RA-Relative Abundance; RDn-Relative Density; IVI-Importance Value Index.									

Faunal Analysis

Butterflies

A total number of 63 butterfly species falling under 46 genera and spreading over 5 families were recorded during the present survey (Appendix 4). At family level, the family Nymphalidae is the dominant one with 21 species (34%) followed by Pieridae with 14 species (22%) and Lycaenidae 10 species (16%, Figure 9). Species such as Chocolate pansy, Common Jezebel, Plain Tiger, Danaid Eggfly, Common Crow, Lime Butterfly and Common Grass Yellow were commonly seen around the lake. Of the 63 species, few butterflies falling under rare/threatened and endemic category. Crimson Rose, Danaid Eggfly and Common Pierrot are protected under schedule - I of Indian Wildlife Protection Act 1972. Common Gull is included under scheduled – II and Common Crow under schedule - IV of the Act. Double-banded crow, Blue Mormon, Crimson rose and Common-banded peacock are endemic species found occurring in and around the lake, the distributions of which are restricted to the Peninsular India (Kunte, 2000).

Line transect survey resulted in the documentation and identification of 49 butterfly species spreading over five families (Table 10). Of the 49 species, the Chocolate Pansy is the dominant one with 306 individuals followed by Common Jezebel (n=188), Small Grass Yellow, Common Grass Yellow with 169 individuals each.

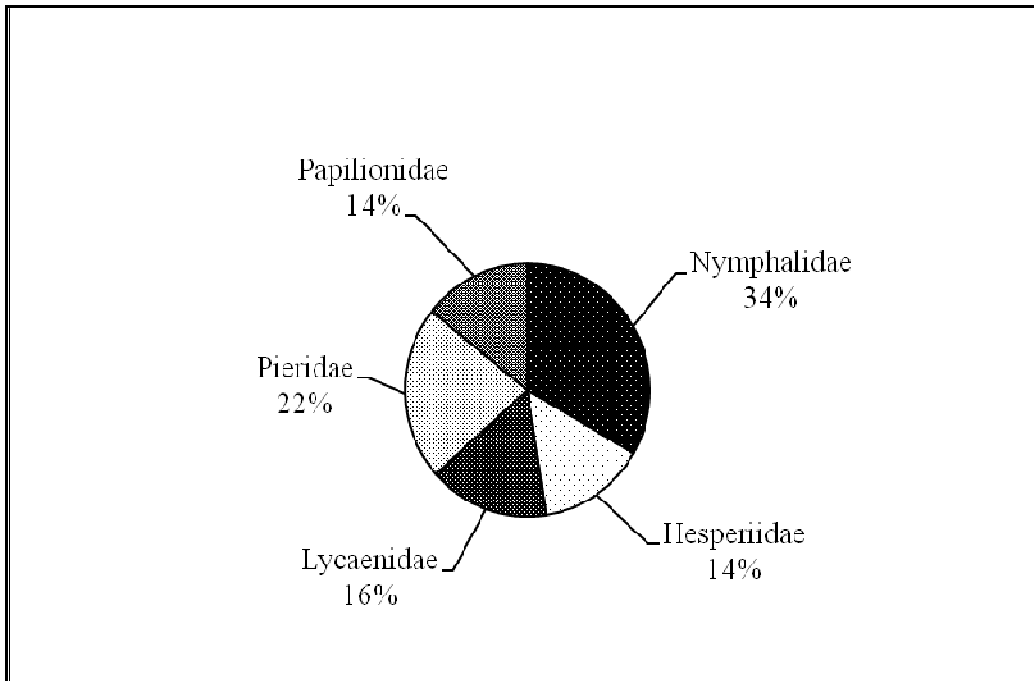


Figure 9. Dominant butterfly families in the study area

Table 10. Cumulative Butterfly counts during the present study

Name of the Species	Number of Individuals
Common Jezebel	188
Chocolate Pansy	306
Angled Castor	10
Danaid Eggfly	83
Striped Tiger	62
Common Evening Brown	22
Blue Mormon	40
Plain Tiger	70
Small Grass Yellow	169
Common Castor	53
Crimson Rose	54
Lime Butterfly	52
Dark Blue Tiger	46
Common Crow	130

Common Rose	58
Glassy Tiger	16
Lemon Pansy	41
Tawny Coster	53
Psyche	86
Common Pierrot	94
Common Gull	46
Common Sailer	118
Mottled Emigrant	83
Common Mormon	94
Common Emigrant	68
Common Leopard	32
Common Wanderer	150
Rice Swift	9
Common Grass Dart	59
Common Grass Yellow	169
Zebra Blue	15
Common Cerulean	10
Banded Blue Pierrot	3
Common Sergeant	7
Tiny Grass Blue	8
Crimson Tip	19
Common Jay	17
Common Bush Brown	34
Great Orange Tip	20
Yellow Orange Tip	31
Dark Cerulean	12
Plains Cupid	11
African Babul Blue	3

Southern Birdwing	6
Small Orange Tip	13
Chestnut Bob	14
Peacock Pansy	3
Tailed Jay	2
Great Eggfly	4

Avifauna

A total of 166 species of birds belonging to 47 families were recorded from the Ousteri lake and its environs during the present study (Appendix 5), which included 75 aquatic species. Of the 47 families, Muscicapidae is the dominant one with 16 species and followed by Accipitridae (12 species), Ardeidae (11 species) and Anatidae (10 species). Of this 166 species, Spoon-billed sandpiper is “Critically endangered” and White-bellied Sea Eagle comes under the category of “Endangered”. Apart from these, birds such as Flamingos, Darter, Spot-billed Pelican, Great white Pelican, Painted Stork, Eurasian Spoon Bill and Pallid Harrier are coming under Near Threatened category (Balasubramanian and Vijayan 2004). Apart from these, the present study results in the addition of following notable species such as Great-white Pelican, White-browed Fantail, Franklin’s Prinia, Lesser Flamingo, Greater Flamingo, Dunlin, Ruff, Crested Serpent Eagle, Black-headed Oriole, Common Iora, Indian Silverbill, Grey Headed Lapwing, White-bellied Sea Eagle, Osprey, Stork-billed Kingfisher, Black-capped Kingfisher, Jungle Babbler, Tawny-bellied Babbler, Rosy Starling, Black-rumped Flameback, Southern Grey Shrike, Crested Tree Swift, etc.

Among the aquatic birds, Little Egret, Cotton Pygmy Goose, Eurasian wigeon, Little Cormorants were recorded in more number during the present survey. Birds such as Spot billed Pelican, Darter, Black Bittern, Purple Heron, Night Heron and Grey Heron are the important species, could be seen throughout the study period. Eventhough the birds such as Painted Stork, Northern Shoveler, Northern Pintail, Mallard, Common Teal, Gargany, Black headed Ibis and Common Pochard were very commonly recorded by Chari et al.

(2008), we have rarely seen in the study period. Birds such as Black Ibis, Eurasian Spoonbill and Spot-billed Duck are very rare species and seen only once during the entire study period. The following birds viz., Bronze-winged Jacana, Great White Pelican, Lesser Flamingo, Greater Flamingo and Woolly-necked Stork are the important wetland birds, are reported first time during the present study from the study area and could see only once during the entire study period.

Among the terrestrial birds, Asian Palm Swifts were very commonly seen in and around the lake followed by White Headed Babbler, Common Myna, Jungle Crow, Black Drongo, House Crow, Red-vented Bulbul and Blue-tailed Beaeater. During the present study period, birds such as Asian Paradise Flycatcher, Jungle Grow, Black-shouldered Kite, Black Headed Oriole, Crested Serpent Eagle, Black-capped Kingfisher, Stork-billed Kingfisher were seen rarely ($N < 10$) in the study area. White-browed Fantail, Ruff, Dunlin, Grey-headed Lapwing, Rufous-winged Bushlark and Bay-backed Shrike were seen only once during the entire study period. Line transect survey resulted in the documentation of 135 avian species (Table 11), of which, Little Egret is the dominant one with 355 individuals followed by Common Myna ($n=338$), and Asian Palm Swift with 337 individuals.

Table 11. Avifaunal community structure in the present study area

Name of the species	N	Habitat	Status
Rufous Treepie	54	T	R
Indian Pond Heron	245	A	R
Little Cormorant	234	A	R
House Crow	174	T	R
Black Drongo	111	T	R
Common Myna	338	T	R
Great Cormorant	28	A	R
Barn Swallow	101	A	R
White-throated Kingfisher	61	A	R
Little Egret	355	A	R
Broad-billed Sandpiper	24	A	M
Yellow Wagtail	13	A	M
Red-vented Bulbul	161	T	R
Marsh Sandpiper	7	A	M

Pacific Swallow	9	T	M
Asian Palm Swift	337	T	R
Rose-ringed Parakeet	82	T	R
Dunlin	3	A	M
Curlew Sandpiper	10	A	M
Spoon-billed Sandpiper	7	A	M
Ruff	7	A	M
Black-bellied Tern	13	A	M
Common Tern	4	T	M
Jungle crow	205	T	R
Black Kite	14	T	R
Small Green Beaeater	87	T	R
White-headed Babbler	282	T	M
Eurasian Wiegeon	229	A	R
Great White Pelican	6	A	R
Asian Koel	63	T	R
Ashy Drongo	58	T	R
Rock Piegeon	19	T	R
Greater Coucal	14	T	R
Chestnut Headed beaeater	28	T	R
Red-wattled Lapwing	107	A	R
House Swift	51	T	R
Grey-headed Lapwing	2	A	M
Intermediate Cormorant	2	A	R
Indian Roller	14	T	R
Common Coot	51	A	R
Brahminy Kite	10	A	R
White-winged Tern	7	A	M
White-browed Bulbul	99	T	R
Pheasant-tailed Jacana	28	A	R
Purple Swamphen	11	A	R
Common Flameback	14	T	R
Loten's sunbird	97	T	R
Purple-rumped Sunbird	60	T	R
Spotted Dove	54	T	R
Baya Weaver	10	T	R
White-bellied Seaeagle	3	A	R
Common Snipe	1	A	M
Shikra	10	T	M
Black-headed Munia	97	T	R
White-bellied Drongo	27	T	R
Blue-faced Malkoha	10	T	R
Common Tailor Bird	33	T	R
Common Kingfisher	22	A	R

Red Collared Dove	16	T	R
Tawny-bellied Babbler	32	T	R
Common Hawk Cuckoo	24	T	R
Purple Sunbird	32	T	R
Blyth's Reed Warbler	14	T	M
Thick-billed Flowerpecker	2	T	R
Purple Heron	11	A	R
Paddyfield Pipit	23	T	R
Brahminy Starling	49	T	M
Ashy-crowned Sparrow Lark	4	T	R
Scaly-breasted Munia	40	T	R
Indian Silverbill	2	T	R
Greenish Warbler	5	T	M
Black-headed Cuckoo Shrike	3	T	R
Ashy Wood Swallow	3	T	R
Small Minivet	12	T	R
Grey Partridge	31	T	R
Grey Heron	2	A	R
Bay-backed Shrike	1	T	R
Pied-bushchat	4	T	R
Blue-tailed Beaeater	81	T	R
Indian Robin	21	T	R
Garganey Teal	31	A	M
Cotton Pygmy-goose	19	A	R
Asian Paradise Flycatcher	5	T	R
Cattle Egret	37	A	R
Pied Kingfisher	2	A	R
River Tern	16	A	R
Intermediate Egret	33	A	R
Great Egret	29	A	R
Darter	6	A	R
Little Grebe	5	A	R
Eurasian Marsh Harrior	13	A	M
Jungle Babbler	50	T	R
Stork-billed Kingfisher	3	A	R
Lesser Coucal	8	T	R
White-breasted Waterhen	19	A	R
Common Moorhen	12	A	R
Spot-billed Pelican	13	A	R
Black-headed Ibis	4	A	R
Black-crowned Night Heron	5	A	R
Northern Pintail	10	A	M
Black-capped Kingfisher	7	A	M
Coppersmith Barbet	25	T	R

Eurasian Golden Oriole	17	T	R
Common Iora	11	T	R
Ashy Prinia	4	T	R
Osprey	2	T	M
House Sparrow	1	T	R
Jungle Prinia	51	T	M
Tickell's Flowerpecker	55	T	R
Common Wood Shrike	3	T	R
Bronze-winged Jacana	33	A	R
Laughing Dove	23	T	R
White-browed Wagtail	4	A	M
Spot-billed Duck	3	A	R
Oriental Magpie Robin	3	T	R
Spotted Owlet	1	T	R
Drongo Cuckoo	7	T	R
Grey Wagtail	2	A	M
Black Eagle	3	T	R
White-cheeked Barbet	4	T	R
Raven	9	T	R
Indian Peafowl	2	T	R
Pied-crested Cuckoo	1	T	R
Indian Nightjar	1	T	R
Unidentified Duck	20	A	
Chestnut-winged Cuckoo	1	T	R
Common Hoopoe	2	T	R
Pallid Harrier	1	T	M
Plain Prinia	12	T	R
Crested Serpent Eagle	2	T	M
Franklin's Prinia	2	T	M
White-browed Fantail	2	T	R
Black-shouldered Kite	1	T	R
Southern Grey Shrike	1	T	R
Crested Tree Swift	1	T	R
A- Aquatic; T-Terrestrial; R-Resident; M-Migratory			

Herpetofauna

The lake and its surrounding area are rich in Herpetofauna with 10 species of amphibians and 29 reptiles (Table 12 and Table 13) were recorded during the present study.

Table 12. Amphibian species recorded in and around Ousteri Lake

S.No	Family	Common Name	Scientific Name	IUCN Status
1	Bufoidea	Common Indian Toad	<i>Duttaphrynus melanostictus</i>	VU
2	Dicroglossidae	Water Skipper or Skipper Frog	<i>Euphlyctis cyanophlyctis</i>	LRnt
3	Dicroglossidae	Indian Pond or Green Frog	<i>Euphlyctis hexadactylus</i>	DD
4	Dicroglossidae	Cricket Frog	<i>Fejervarya mudduraja</i>	-
5	Dicroglossidae	Indian Bull Frog	<i>Hoplobatrachus tigerinus</i>	-
6	Dicroglossidae	Indian Burrowing Frog	<i>Sphaerotheca breviceps</i>	DD
7	Microhylidae	Ornate Narrow-mouthed Frog	<i>Microhyla ornata</i>	LRnt
8	Microhylidae	Narrow-mouthed Frog	<i>Ramanella</i> sp.	-
9	Microhylidae	Lesser or Marbled Balloon Frog	<i>Uperodon systoma</i>	LRnt/N
10	Rhacophoridae	Chunam or Common Tree Frog	<i>Polypedates maculatus</i>	LRic

Table 13. List of Reptile species recorded in and around Ousteri Lake

Sl. No	Common name	Scientific name	Conservation status
Turtles			
1	Indian Starred Tortoise	<i>Geochelone elegans</i>	VU
2	Indian Black Turtle	<i>Melanochelys trijuga</i>	LR
3	Indian Flapshell Turtle*	<i>Lissemys punctata</i>	LR
Lizards			
1	Snake Skink	<i>Lygosoma punctatus</i>	LR
2	Common Supple Skink	<i>Eutropis macularius</i>	LR
3	Common Brahminy Skink	<i>Eutropis carinata</i>	LR
4	Termite Hill Gecko	<i>Hemidactylus triedrus</i>	LR
5	Southern House Gecko	<i>Hemidactylus frenatus</i>	LR
6	Bark Gecko	<i>Hemidactylus leschnaulti</i>	LR
7	Fan-throated Lizard	<i>Sitana ponticeriana</i>	LR
8	Common Garden Lizard	<i>Calotes versicolor</i>	LR
9	Indian Chameleon	<i>Chamaeleon zeylanicus</i>	VU
10	Indian Monitor Lizard	<i>Varanus bengalensis</i>	VU
Snakes			

1	Brahminy Worm Snake	<i>Ramphotyplops braminus</i>	LR
2	Common Sand Boa	<i>Gongylophis conicus</i>	LR
3	Red Sand Boa	<i>Eryx johnii</i>	LR
4	Indian Rock Python	<i>Python molurus molurus</i>	EN
5	Indian Bronze Back	<i>Dendrelaphis tristis</i>	LR
6	Common Vine snake	<i>Ahaetulla nasuta</i>	LR
7	Striped-keelback	<i>Amphiesma stolata</i>	LR
8	Checkered Keelback	<i>Xenochrophis piscator</i>	LR
9	Common Cat Snake	<i>Boiga trigonota</i>	LR
10	Indian Wolf Snake	<i>Lycodon aulicus</i>	LR
11	Indian Kukri	<i>Oligodon arnensis</i>	LR
12	Indian Rat Snake	<i>Ptyas mucosa</i>	LR
13	Spectacled Cobra*	<i>Naja naja</i>	LR
14	Common Krait*	<i>Bungarus caeruleus</i>	LR
15	Russell's Viper*	<i>Daboia russelii</i>	LR
16	Saw -scaled Viper*	<i>Echis carinatus</i>	LR
* Venomous species			

Ichthyofauna of Ousteri lake

Fish fauna inhabiting the lake were recorded during the survey. The list as presented in the Table 14 is a compilation of fish species observed during the study, as well as the data gathered from irrigation department, Govt. of Puducherry and also the ones recorded by earlier studies (Abbasi and Chari 2008). Fish species reaching the market from fish catchers of local fisherfolk were also included in the list. Fish identification was based on Talwar and Jhingran (1991) and Jayaram (1999). A total of 21 fish species were recorded during the present study period.

Among the 25 fish species recorded from the Ousteri lake, two species namely *Pseudeutropius atherinoides* and *Etroplus maculatus* are falling under endangered category (Table 14). Species such as *Catla Catla*, *Mystus vittatus*, *Heteropneustes fossilis*, *Channa orientalis*, *Clarias batrachus*, *Etroplus suratensis* and *Mystus gulio* are vulnerable species. Two species namely, *Channa striatus* and *Gambusia affinis* are falling under Low Risk - least concern category. Three species viz., *Oreochromis mossambica*, *Cyprinus carpio* and *Hypophthalmichthys molitrix* are exotic. Rest of the 10 species are included under Low Risk-near threatened category.

Table 14. List of ichthyofauna recorded from Ousteri lake

Sl. No.	Tamil Name	Common name	Scientific Name	IUCN status (1996)
1	Catla	*Catla	<i>Catla Catla</i>	VU
2	Jilabi Kendai	Tilapia	<i>Oreochromis mossambica</i>	Ex
3	Viraal	Striped Snakehead	<i>Channa striatus</i>	LRlc
4	Rogu Kendai	*Rohu	<i>Labeo rohita</i>	LRnt
5	Kalbasu	Kalbasu	<i>Labeocalbasu</i>	LRnt
6	Mirukula	*Mrigal	<i>Cirrhinus mrigala</i>	LRnt
7	Kezhuthi	Striped Dwarf Catfish	<i>Mystus vittatus</i>	VU
8	Theli	Stinging catfish	<i>Heteropneustes fossilis</i>	VU
9	Koravai	Asiatic snake head	<i>Channa orientalis</i>	VU
10	Kurali Koravai	Spotted Snake head	<i>Channa punctatus</i>	LRnt
11	Paambu Meen	Giant snake head	<i>Channa marulius</i>	LRnt
12	Vilaangu	Indian Shortfin eel	<i>Anguilla bicolor</i>	LRnt
13	Kulla Kendai	*Grass carp	<i>Ctenopharyngodon idella</i>	LRnt
14	Kendai	*Common carp	<i>Cyprinus carpio</i>	Ex
15	Potla Kendai	Indian Potassi	<i>Pseudeutropius atherinoides</i>	EN
16	Silver Kendai	*Silver carp	<i>Hypophthalmichthys molitrix</i>	Ex
17	Iraal	Prawn	<i>Fenneropenaeus indicus</i>	-
18	Aara	Striped Spiny eel	<i>Macrogathus pancalus</i>	LRnt
19	Kosu Meen	Mosquito fish	<i>Gambusia affinis</i>	LRlc
20	Uzhavai	Sleepy goby	<i>Glossogobius giuris</i>	LRnt
21	Senil	Magur	<i>Clarias batrachus</i>	VU
22	Sellakaachi	Orange chromide	<i>Etroplus maculatus</i>	EN
23	Sellavaachi	Green chromide	<i>Etroplus suratensis</i>	VU
24	Vella Kezhuthi	Gangetic mystus	<i>Mystus cavasius</i>	LRnt
25	Kondai Kezhuthi	Long-whiskered catfish	<i>Mystus gulio</i>	VU

*Species introduced by the fisheries department, Govt. of Puducherry for rearing commercially important fishes in Ousteri lake
VU-Vulnerable; LRlc-Low risk-least concern; LRnt-Low Risk-near threatened; EN-Endangered; Ex-Exotic species.

Mammals

A total of 14 species of mammals were recorded during the present study. The list of species is given in Table 15 with their recent scientific name, endemic status, IUCN status and legal status.

Table 15. List of mammals recorded from Ousteri lake

Sl. No.	Common Name	Scientific Name	Endemic	IUCN	Legal
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			status	status	Status
1	Spotted deer	<i>Axis axis</i>	-	LR\Lc	IV
2	Jackal	<i>Canis aureus</i>	-	LR\Lc	I
3	Jungle cat	<i>Fellis chaus</i>	-	-	-
4	Common mongoose	<i>Herpestes edwardsii</i>	-	L R\Lc	-
5	Black naped hare	<i>Lepus nigricollis</i>	-	LR\Lc	-
6	Bonnet macaque	<i>Macaca radiata</i>	Southern India	-	II
7	Indian porcupine	<i>Hystrix indica</i>	-	LR\Nt	IV
8	Bandicoot rat	<i>Bandicota indica</i>	-	LR\Lc	V
9	Three-striped palm squirrel	<i>Funambulus palmarum</i>	-	LR\Lc	-
10	Indian pangolin	<i>Manis crassicaudata</i>	-	LR\Lc	-
11	Asian Palm Civet	<i>Paradoxurus hermaphroditus</i>	-	LR\Lc	II
12	Mice	<i>Mus sp.</i>	-	-	-
13	Short-nosed Fruit Bat	<i>Cynopterus brachyotis</i>	-	-	-
14	Flying fox	<i>Pteropus giganteus</i>	-	-	-

Overall we observed that Ousteri lake harbours rich biodiversity and the overall details of the species richness of all the taxa surveyed are presented in Table 16.

Table 16. Overall species richness of all the taxa surveyed

Name of the organisms		Total number of species	
Plants	Herbs	191	
	Shrubs	63	
	Trees	103	
	Stragglerss	20	
	Climbers	40	
	Grasses	63	
Butterflies		63	
Ichthyofauna		25	
Herpetofauna	Reptiles	Turtles	3
		Lizards	10
		Snakes	16
	Amphibians		14
Avian fauna		166	

Depth profile of the lake

Bathymetric measurements are helpful in preparing a depth profile of the lake. Such data aid in preparing environmental management plans in the water spread area. Depth profile of Ousteri lake was measured manually using long bamboo sticks during the survey. 03 transects were laid crisscrossing the lake. Two transects were of 2.5 km long and the 3rd one was of 2.0 km long. The average depth of the lake was recorded as 3.0 meter. The details of the transects, locations and corresponding depth in metre is presented in Appendix 6. The lake is deeper in the southern part all along the bank starting from Suthukeni channel entry point to till boat house. Details of water availability in Ousteri lake since 1998 till present is presented in Appendix 1. Further an analysis of the water level in the lake in the month of January, considering January as peak migratory season, reveals that the annual average water availability in the lake has been gradually increasing consistently since the year 2003 with a fall in 2007 (Figure 10).

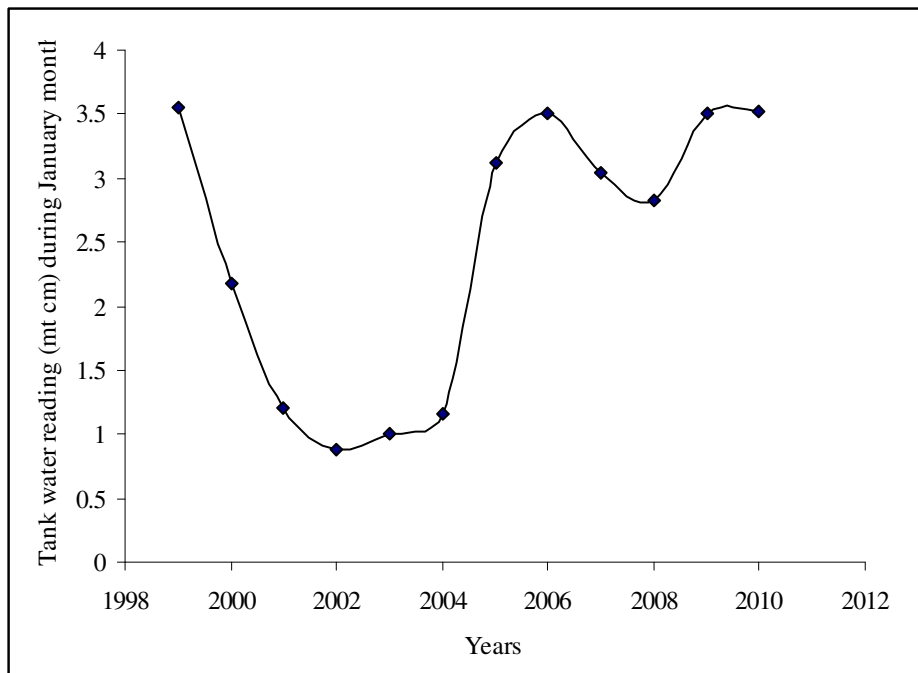


Figure 10. Tank water reading in million m³ every January month

Socio-economic status

A survey of socio-economic status and peoples' activity and dependency pattern on Ousteri lake reveals the following:

- Earlier 18 villages were dependent on ousteri directly for irrigation (Chari & Abbasi, 2007). At the movement, people from villages such as Ousteri, Koodappakkam, Agaram, Poraiyur, Sendhanatham, Olavaizkal etc use the lake water for agricultural purposes. Presently bore well are commonly noticed in these areas. Apart from this, the villagers of Ramanathapuram and Katterikuppam also use the Suthukeni canal, a only water source for Ousteri lake, for irrigation and other basic needs. The major portion of these area covered by Ousteri lake for irrigation.
- The major cropping pattern around the lake is Monoculture cropping such as Paddy and Sugarcane. Casurina and Coconut plantations are also a common around the lake. Polyculture agriculture practice is very rare around the lake.
- Previously, 60% of the farmers around the lake were used dried cow dung, compost, azolla, phosphobacteria and azospirillum (organic forming) instead of synthetic fertilizers for agriculture (Chari and Abbasi, 2007). But in the present situation, farmers use various chemicals, fertilizers and pesticides (chemical farming). These chemicals and pesticides using for agricultural practices around the Ousteri lake watershed have direct implications/impacts with the lake. Organic farming practice involving use of cow dung and compost is very rarely seen in the area.
- Fishing, tough not a main occupation of the people living around the lake, provides additional income to many of the deprived people. Even though the study area is a bird sanctuary and fishing activities were completely prohibited, lot of fishing could be noticed during the present study period for their daily needs in food.
- The present survey revealed that, based on people's opinion inhabiting around the ousteri lake, presently the following factors such as untamed fishing, illegal hunting, dumping of solid wastes tourists and other settlers around the lake,

discharge of industrial effluent to the lake, practice of open defecation around the lake are the major impacts for Ousteri lake in general, various migratory and residential birds and other biological environment in particular. Of these factors, 41% of the respondents feel fishing to be a major threat followed by illegal hunting of birds (28% respondents, Figure 11).

- To expedite the efforts for conserving the lake, declaration of the lake as a sanctuary is a very timely step. In the event of stopping peoples direct interference and dependence on lake, we found out that three major alternative livelihood options does exist (as per public opinion): livestock rearing, employment and self employment or entrepreneurship (Figure 12). Entrepreneurship includes starting their own units of handloom and/or handicrafts, workshop and/or small engineering units for which vocational training is essential. This also includes avenues such as poultry farming, pigery and aquaculture etc.

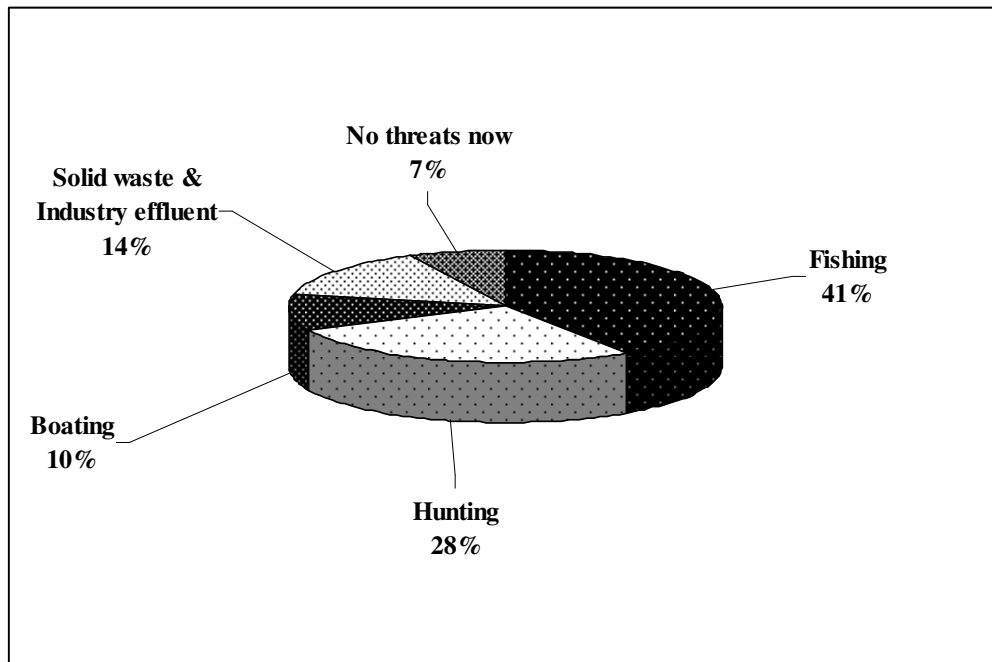


Figure 11. Major impacts to the Ousteri lake as per public opinion

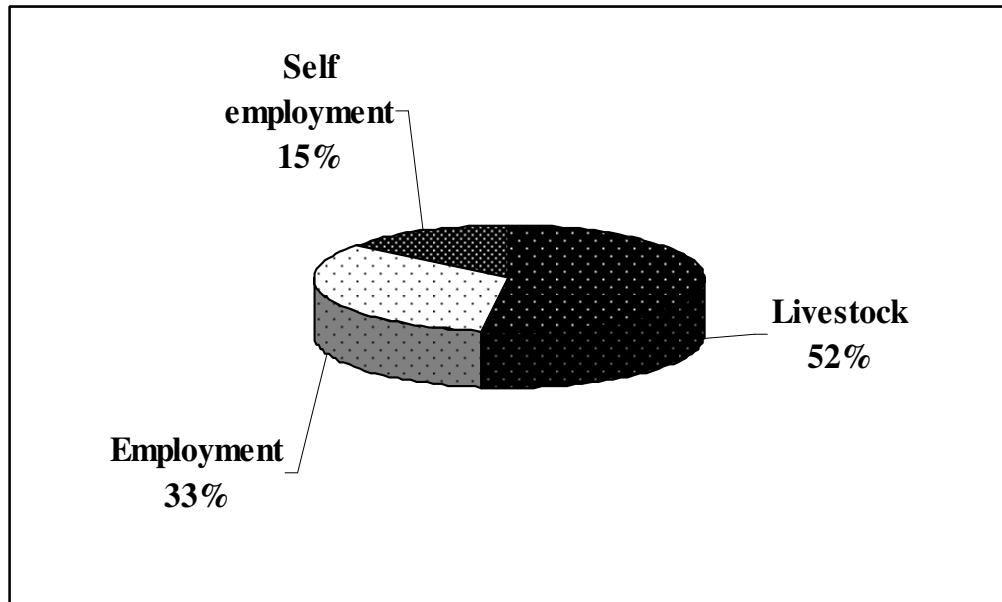


Figure 12. Alternative livelihood options for local community

Public perception on Ousteri lake

Ousteri lake is very important for people living around the lake as it provides several livelihood resources and ecosystem services. The lake is put into use in several ways (Figure 13):

- Water for irrigation, drinking, home needs, bathing, washing of clothes.
- Plays a major role in maintaining and recharging the ground water level. When the lake had dried up, there was significant ground water depletion observed in the nearby villages.
- Commercial (illegal) fishing
- Source of fodder and grass: the shallow banks and lake embankments of the Ousteri lake support in the luxuriant growth of various grasses including reeds and herbaceous species. The local people feed their cattle on these grasses throughout the year. Apart from this, they have practice that, cut and use reeds and grasses those are growing in and around the lake for the purpose of thatching the huts. *Ipomoea*, which grows profusely in the lake used for fencing in the houses and agricultural fields.
- Aesthetic and recreational spot.

- Additionally, many of the respondents do realize the importance of Ousteri lake from several ways and convey their understanding and opinion about the importance of Ousteri as a eco-tourism spot and suggest to promote eco-tourism in a comprehensive manner. The same can also be a source of employment for them.

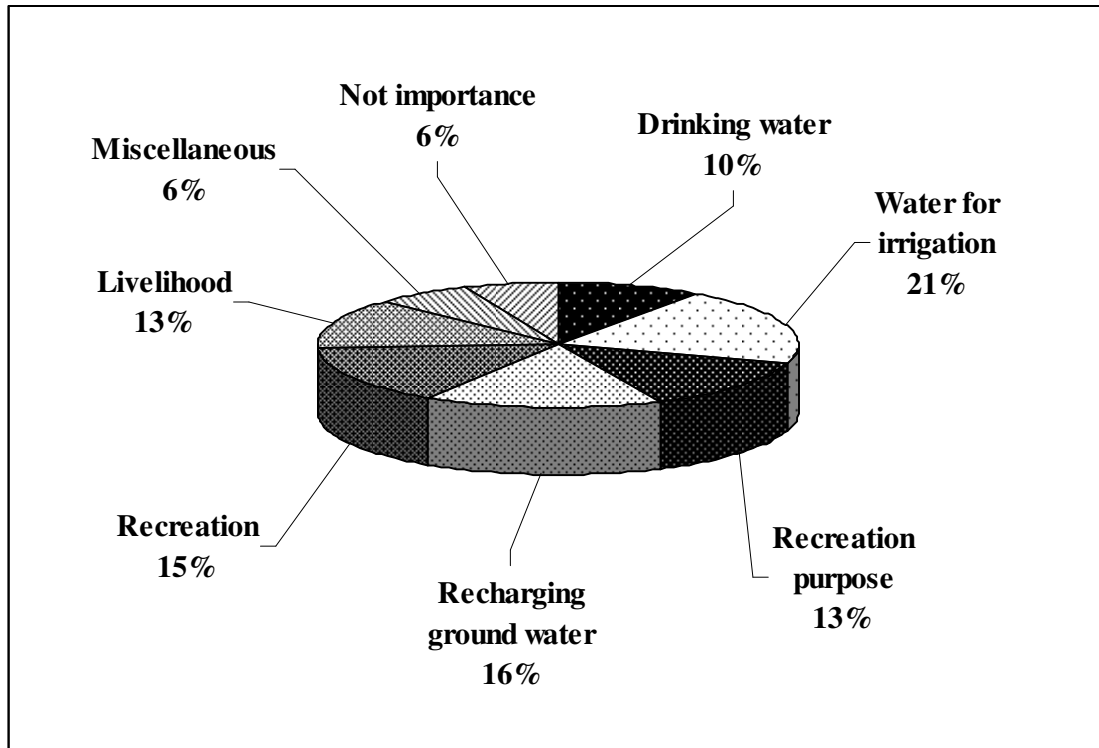


Figure 13. Public opinion on importance of Ousteri lake

Ecosystem services

Wetland ecosystems are known to provide several ecosystem services which supports biodiversity and helps in wellbeing of humankind. During our survey of the lake and its surrounding areas, socio-economic survey of households in several villages, interaction with officials of government and non-government organizations, and referring other published reports on Ousteri, it is found that people recognize several of the ecosystem services as listed below:

- **Provisioning services:** Food, fresh water, fibre, fuel and genetic materials

- ***Regulating services:*** climate regulation, water regulation (hydrological flows including ground water recharge), water purification and waste treatment, erosion regulation, natural hazard regulation, pollination (habitat for pollinators).
- ***Cultural services:*** Recreational, aesthetic and educational
- ***Supporting services:*** Soil formation and nutrient cycling

ECOLOGICAL ISSUES

Ousteri lake is under serious anthropogenic threat at various levels and magnitudes, as is in the case of other wetlands located in urban and agricultural landscape. The lake has been exploited for several decades for day to day needs by the people residing around the wetland thus, affecting the biodiversity of the lake. It is also expected that Ousteri would lose its ecological integrity, if proper coordinated efforts are not taken by management authorities and non-government organizations including general public to save this fragile wetland ecosystem. The action Government of Puducherry declaring about 390 ha of Ousteri lake as a sanctuary is timely, which is appreciated by all. Intensive environmental management programme for comprehensive eco-restoration of the wetland is also envisaged. It is apt that steps should be taken to bring the adjoining parts of the lake under protection. In this regard, discussion with Government of Tamilnadu is important. Mechanism to manage the area joint by both governments and people of Tamil Nadu and Puducherry needs to be developed.

The following are issues to be addressed at the earliest for the conservation of Ousteri and its environment for biodiversity.

Unsustainable fishing

Fishing activity is the major threat for biodiversity of the Ousteri lake as untamed fishing is a regular practice followed around the lake. The diversity of fish species in the lake attracts people for fishing. Even though the fishing has been banned by the Puducherry Government in Ousteri lake, several fishermen could be seen fishing illegally in and around the lakes. Unbridled fishing activity using fishing nets has led to the killing of water snakes and several aquatic bird species (Pelicans, coots, darters). A study by Alexander (2010) states that while the snake remains entangled in the fishing nets, the fisherman simply cuts the snake in order to extricate the fishing nets. Aquatic birds, especially the heronry species visit the lake for foraging and breeding and several of them would be threatened if untamed fishing activities are not controlled/regulated. Aquatic plants such as *Hydrilla verticillata*, *Najas minor*, etc. are food for many birds of Ousteri.

While fishing these aquatic macrophytes also get entangled in the fishing net which directly disturbs the biodiversity of the lake.

Hunting of Birds

One of the most important issues to be dealt with for conserving the birds in Ousteri is hunting of birds in and around the Ousteri lake. During the present survey, it was found that several families of Narikkurava (a group of tribes) community are engaged in hunting of birds, and indeed that has become their chief source of livelihood. There is a hamlet, around 15 families, of Narikruvas on Villianur-Pathukanu junction road, though in a unauthorised settlement (encroachment). We found several species of aquatic birds both resident and migratory being hunted by them. The birds such as Asian Koel (state bird of Puducherry), Great bittern, Common moorhen, White-breasted water hen, Common myna, Common coot, Egrets, Cormorants etc are very common birds hunted by these groups as noticed during the present survey. They are found to sell the dead birds @ Rs. 150 – 200 per kg. Most of them are illiterates and school dropouts and are willing to give up hunting, if appropriate employment opportunities are provided to them. Their preferred nature of work is sweepers and cleaner and security guard. They are also optimistic about adopting livestock and poultry farming as their source of livelihood. The need of the hour is to provide them with appropriate source of livelihood and employing them suitably to stop further hunting of birds.

Dumping of solid wastes on the lake embankments

Modern society generates large quantum of solid wastes thus, imposing problems related to their disposal. In a country like India, it is a common practice to deem wetlands or marshes as wastelands and use them as dumpyards for untreated raw sewage and solid wastes. This practice of solid waste dumping in wetlands leads to fall in ecological / conservation value, species richness or species distribution of the system / area. Apart from shallowing / shrinking of the wetland, dumping municipal wastes can seriously effects the water bodies by releasing noxious chemicals during decomposition. The heavy organic contents in municipal wastes degrade slowly and release acidic and toxic

leachates for many years. The Ousteri wetland is not much an exception to this. During the present study period we could see the large quantities of solid wastes in and around the Ousteri lake embankments. Solid waste dumped in different parts of the wetland is a major environmental and public health threat and a management issue.



Plate 1. Fishermen with their day's catch



Plate 2. Nets with fine mesh size used for illegal fishing in Ousteri lake



Plate 3. Littering around lake: an impact of tourism that needs strict management



Plate 4. Dumping of solid waste by tourists on the lake periphery



Plate 5. Dumping of solid waste by industries along Suthukeni canal



Plate 6. Amusement park near lake: water intensive developmental activities

Vehicular movement, noise and other pollution

Ousteri lake is surrounded by network of roads connecting Pathakanu junction to different places in Puducherry region. A number of both light and heavy motor vehicles ply on these roads. Additionally, establishment of several educational institutions and amusement park near the lake also add on to the vehicular density. These are likely to produce loud, stark and intense noises that are deterrent to birds. Especially use of air horns by the moving vehicles are major source of disturbance to birds using the lake. Boating has always been a source of threat to any wetland which especially is true in the case where mechanised boats are involved for income generation through tourism. These boats are a great source of gaseous and particulate hydrocarbon pollution in Ousteri wetland apart from the noise pollution. They can thus, lead to situations like stress and panic to the water birds and also birds in the banks and nearby trees. Once the tourist activities are in peak then we expect noise levels also to rise up. Thus, certain shy birds in the lake are more likely to get disturbed and abandon their nests due to noise disturbances. Vehicles of various types - two, three and four wheelers of different types are expected to reach the reception or boating yard.

Waste water discharge

The Suthukeni canal is the only major canal that empties into Ousteri lake. This canal is essentially the only means of water movement / discharge of sewage and storm water to the lake. It is currently a channel into which considerable quantity of municipal and fugitive effluents flow in. Several industries such as rubber and glass industries and the agricultural lands located around the Ousteri lake, release runoff water with various chemicals into the Ousteri lake. Several colleges / hospitals, housing / residential projects and commercial / business centers, etc. are also coming up in the vicinity of Ousteri. This will further deteriorate the quality of water coming to the wetland. As mentioned by the officials at boat house of Ousteri, it is a common practice that industries located around the Ousteri lake keep their effluent in large tanks / containers for long period and during the rainy season they release the effluent with flood/runoff which reaches the Ousteri lake. Several tanning and leather industries are surrounding the wetland. Thus, disposal

of effluent from industries located around the Ousteri lake would directly affect the biodiversity of the system. Further, cleaning of hospital clothes on lake banks could also be a source of pathogens, vectors and a heaven for vermin, and a threat to the public health.

Agrochemicals

During the survey it was recorded that intensive agricultural practice was followed in the land adjoining the Ousteri lake. Agriculture being the predominant land use category in Ousteri catchment and considering the elevation contours of 40 m and 20 m above mean sea level towards North and Northeast (Abbasi and Chari 2008), there is a potential risk of run off – rich in nutrients, pesticides and sediments - contaminating the lake. The presence of agricultural fields around the lake contributes significant amounts of N, P, K and pesticides through run-off. It is also presumed that the wetland receives loads of agricultural pesticides from paddy crops cultivated in its border villages. Heavy metals and several pesticides, as an outcome of application of agrochemicals in nearby agriculture fields, can get accumulated through the trophic levels (macrophytes, fish etc.) in the wetland ecosystem and may ultimately affect apex of the food chain, i.e. birds. Wetlands located in agricultural landscapes are particularly affected by agrochemicals (Azeez et al. 2007 and Prusty et al. 2007).

Weed infestation

Infestation of wetlands by weed species is a serious threat mainly to the ecological quality, species composition and environmental goods and services rendered by the wetlands. Weed species such as *Eichornia*, *Salvinia*, *Pistia*, *Ipomoea carnea*, etc. were seen invading the wetland area of Oussudu. Thus infestation of weeds in the lake is a serious issue which would directly affect the biodiversity of the lake and water quality. Apart from aquatic weeds we could also record *Prosopis juliflora* individuals at the road side. Thus, removal of this species is of utmost importance as it is reported to invade the other wetlands at much higher rates (Chandra et al. 2009).

Soil erosion and siltation

Rapid urbanization involves land clearing, levelling and construction activities in the catchment area. Thus, the disturbed and loosened surface soil is easily washed off in rain and is carried away along with the runoff. The silt and sediments reaching the wetland make the water turbid. Their subsequent settling in low lying areas reduces the depth and extent of lake which leads to reduction of macrophytes growth, productivity, water and sediment quality and subsequently the habitat quality (Prusty et al. 2007; Abbasi and Chari 2008). In the case of Ousteri the booming real estate business leading to massive land modification and uprooting of native vegetation causes large scale soil erosion. A considerable portion of the low lying area on the sides of lake becoming drier due to settled soil and silt posing serious threats to Ousteri lake.

Tourism activities

Presently Ousteri lake is one of the locations in the Puducherry region which draws considerable number of tourists both nature lovers as well as commercial tourists. One of the major impacts due to tourism is generation of solid waste near the lake banks and littering of the area. The survey team has noticed dumping and/or throwing of food packets, polythene bags and other solid waste by the tourists near the lake bank.

Environmental Management Plan

In view of the present scenario and threats to its existing and functioning, Ousteri lake needs active conservation and management interventions. This may include activities such as protection, prevention of encroachment, control of polluting activities, and ecosystem restoration and initiating habitat improvement programs. Thus, an attempt is made to discuss and propose management of certain issues that require timely and appropriate management strategy for Ousteri lake. During the study period and in the view of earlier publications we have listed out the major issues related to the management of Ousteri wetland, Puducherry, which are listed in the preceding chapter. Thus, probable / possible management plans and measures have been suggested and discussed in the upcoming paragraphs / subheads.

The EMP proposed focuses only on the Puducherry part of the Ousteri lake. However, similar management actions by Tamilnadu authorities in the part of the lake falling under their control would be very crucial for effective and meaningful long term management of this lake.

Water level

The historic data reveals that the water level in the lake has been kept higher by during the past several years since 2003. This has resulted in permanent flooding of potential bird habitats during the migratory season, which would have otherwise attracted large flocks of migratory water birds. Hence, the sustained high level of water in the lake is likely to have resulted in reduction in numbers and diversity of migratory birds, especially waders. There should be controlled release of water during the lean seasons (around May- Sep) so that the water level reaches near zero level before the NE Monsoon sets in. This would help in restoring the natural ecological dynamics prevailed in the wetland earlier and attract more migratory birds. This would also result in the reduction of aquatic weeds in the lake, improvement of lake water quality and water availability and ground water conditions in the downstream areas as well.

Fishing

Regular monitoring of the fishing activity is suggested. Raids and other monetary fines must be imposed if any of the fishermen is found guilty of carrying out fishing in the lake. Although controlled small scale sustenance fishing activities by local communities using traditional methods of fishing may be allowed, a sustainable and participatory harvesting regime for the the fishing activities in the lake should be developed in consultation with the fishery and ichthyology experts. The fishing regime would include *inter alia* suggesting fishing nets with appropriate mesh sizes, and avoiding specific breeding sites and seasons if any. The Department of Forest and Wildlife may in consultation with fishery department plan out strategies for sustainable harvesting of fish from the lake while ensuring the benefit sharing with the communities around the lake. As several local people around the Ousteri lake are dependent on the lake for their daily livelihood needs, government may also arrange for and promote development of alternate livelihood options such as cattle farming, self employment facilities, etc. for them.

Enquiry with locals revealed that Fishery department is releasing fish seeds (fingerlings) during monsoon. This includes exotic species such *Thilapia* sp. This species is known to dominate over other native species. Examination of fish catch revealed large quantum of *Thilapia mosambica* as well. Hence, it is suggested that department should consider releasing only local species in the lake.

Vehicular movement and boating

- As mentioned in the previous chapter about the disturbance to birds due to vehicular movements and use of air horns, appropriate measure should be taken to stop blowing of air horns. Further, efforts should also be made to divert vehicles moving towards pathakanu junction through a cross road connecting pathakanu-Villianur road and there after to pathakanu junction.
- Rampant use of motor boats in the Ousteri lake for ferrying tourists was seen during the study duration. Boat carrying the tourists crisscrossing the entire wetland was also observed. Regulation of this activity in specified areas needs to

be investigated. Both conservation of biota and tourist interest must be taken care of.

- Replacement of motor boats with paddled boats (having capacity of 4 or 6 persons) and coracles, which would help reduce disturbance to birds is herein proposed.
- Peak activity of birds and many other organisms are during early morning (0500 - 0900 hrs) and evening (1700 - 1900 hrs) hours for feeding activities which return back to their respective nests during dusk hours. Hence, motor boating should be strictly banned / prohibited during dawn and dusk hours in order to have minimal disturbance to the birds.
- *No horn zone* may be declared near the road along the lake side. Further, plantation of tree species which would help trapping the sounds should be promoted and opted.

Boundary demarcation and prevention of encroachment

Booming of real estate leading to the encroachment of wetlands is a very common practise. The parts of Ousteri wetland which have already been encroached should be identified and their protection and restoration measures should be immediately undertaken. In the case of Ousteri wetland, it is thus proposed to mark the protected area boundary in order to prevent further encroachment, and help conservation activities. Subsequently consistent maintenance need to be ensured to achieve the very purpose of boundary wall.

- The boundary wall needs to be designed in such a way that it doesn't disturb the natural flow of water, especially near the lake banks. Culverts/channels can also be constructed at necessary places on the wall and the existing ones can be renewed. Whereas in the center of the lake the boundary may be defined by erecting wooden and/or bamboo sticks.

Mounds within the lake

Presently birds are seen resting and using the trees on the lake bank and some on the island within the lake for roosting and other activities. However, nearly 05 - 07 mounds can be constructed within the lake, wherein bird attracting trees can be planted to facilitate nesting of water birds. Trees such as *Acacia nilotica* is a preferred species. The mounds can be constructed by dredging the lake bed in the nearby areas and accordingly the locations suggested for mounds are in shallow areas as evidenced from wetland depth profile survey. Figure 14 presents the few suggested locations of mounds. However, all mounds should be constructed in due consultation with experts. The undergrowth of the mounds should be cleaned periodically which would help increased use of them by birds and increased visibility for tourists.

Bridge and watch tower

While attempting to improve the banks for attracting tourists, it may also be noted that to avoid increased vehicular movements, a walkway bridge (either floating or hanging) may be constructed to allow tourists and/or naturalists to cross over the canal and reach the western bank of the lake. The bridge construction should not result in ecological disturbance in the site. However, one watch tower also may be constructed near the northern end of the suggested bridge, where facilities such as spotting scope may be made available to the tourists for watching the birds. The watch tower need to be equidistant from the suggested location for constructing mounds. Figure 14 presents the details of the suggested location of watch tower etc. The bridge may be connected to the watch tower through a walk way on the western bank of the lake. Moreover, efforts may also be taken to renovate the existing the watch towers near boat house and increasing their height. Naturalists may be appointed and posted near the watch tower for regulating the tourists and provide information on the natural resources of the area.

Walk-way improvement

A foot trail (existing) along the canal up to Pathukanu junction should be improved, paved walkway with brick (500 m) for bird watch and this nature trail may be used for nature awareness programme. This walkway is located on the western bank of the lake near

Pathukanu junction. Additionally, this walkway may be fenced on the sides exposed towards the main road leading to Pathakanu junction with opening gates in two to three places for entry by visitors and other citizens to use the walkway during morning and evening hours. Similarly the paved walkway found near the existing boat house should be improved for effective uses by tourists and bird watchers. The trees in the area should not be removed.

Dumping of solid wastes on the lake embankments

- Several places near the lake were found as dumpng ground for garbage and other municipal and domestic solid waste. It is proposed to segregate the soild waste into compostible and non-compostible fractions. The compostibles may include food wastes, paper, and vegetation which can be composted on site which later can be used as fertilizer. The non-compostible fraction, which includes plastic, paper, metal parts, batteries, etc. should be collected and stored on site till transferred to the government hazardous waste disposal site.
- It is proposed to train / educate the local public about the repercussions of open dumping practices related to soild waste, manning the surroundings and warnings and punishments / penalties. Awareness programmes related to importance of wetlands and their conservation in terms of open dumping should be conducted / performed. It is also urged to implement proper waste management and treatment programs in and around the lake.
- A management plan should be drawn after discussion with various departments (education, tourism and agriculture). Ban on use of plastics and discharge of solid and liquid effiluent into the wetlands must be strictly implemeted.

Disposal of Sewage

The untreated effluent reaching Ousteri waters is likely to lead to deterioration of water quality in the lake and also its biotic components. Suthukeni canal is a source of sewage and other contaminants to the Ousteri lake. The forest department, Puducherry proposes

renovation of this canal which would take a long way towards improving the quality of the wetland. During the renovation intense care / attention needs to be given to:

- Clearing the canal all along its course for silt and solid wastes
- Reinforcing its sides and closing all unauthorised discharges to it
- Establishing desilting basins / silt traps along the channels that drain storm water to the canal
- Planting trees on the embankments of the canal
- Preventing any sewers joining the canal and enforcing appropriate treatment of discharges to the canal
- Regular monitoring of water quality of the canal
- Erecting grids at the entry point of the canal to wetlands in order to prevent the entry of any floating solids
- Regular cleaning of the installed grids.
- Making compulsory preliminary treatment practices for all the industrial and commercial complexes, and hospitals.
- Monitoring of discharge of hazardous wastes contaminated with discarded drugs, chemicals, tissues, body fluids and pathogens with especial reference to hospitals
- Erecting sign-posts and guide-posts that instruct the pedestrians and other travelers not to throw unwanted items to the channel
- Control discharge of obnoxious chemicals let out from various unauthorised point / fugitive sources and washouts from fuel outlets
- Leaching of metals from tanning and leather industries near the lake should be monitored on a regular basis.

Weed infestation

- The noteworthy growth of weed species such as *Eichhornia crassipes*, *Pistia stratioides*, *Salvinia molesta*, *Polygonum galbrum*, *P. hydropiper* and *Typha angustifolia* in the lake needs to be managed scientifically. Regular removal of these weeds will help sustain the canal, its habitat quality and species diversity, vegetation structure, water quality, salinity, etc. Initially physical removal of

weeds may be necessary in the wetlands, its surroundings and the channel. Apart from the above mentioned weeds, other weed species growing along with aquatic vegetation also need to be controlled / removed.

- The best way of weed prevention from infestation is to prevent the seeds and remnants of weeds from germinating and colonising again in water rich with dissolved nutrients. Thus, regular monitoring of these aquatic weeds in the vicinity of the study area and routine clean up strategy should be strictly followed, to have a check on weed colonisation.
- With respect to *Prosopis juliflora*, it is suggested to remove each and every possible sapling of this species. The species is known to remain in viable form for more than 09 months in cattles stomach / rumen. Thus, measures like quarantine should be taken especially with respect to this species. Photopgraphs with small description about the weeds should be circulated in the form of pamphlets, etc. to the local people to keep them informed about the invading potential and concurrent loss to biodiversity. They should be informed and taught as to how to destroy these weeds.

Automobile exhaust and pollution

The noise created by vehicles would disturb the birds. Thus, measures such as facilitating a smooth flow of traffic by avoiding junctions / signals and steep speed-breakers may help reduce the pollutant levels. Further, it is suggested/ proposed to make a bridge over the canal inorder to restrict / arrest vehicular movement at the roads adjoining Ousteri embankments. Caution / sign boards should be placed at appropriate places for the visitors. Speed limit for vehicles must be strict monitored as per these caution boards.

Other disturbances

The establishment of watch towers involves notable movement of materials and people to the area and intensive activities during the construction. This is likely to alter the local biological environment. It is recommended to plant dense canopy tree species in and around the Ousteri lake, which will help control particulate matters, reduce the noise to certain extent, balance the micrometeorology of the area and would also provide habitat

for some avifauna. A parking lot should be identified and appropriate facilities and strategy to manage wastes and other pollutants arising from the parking lot should be conceived.

Construction debris

Notable quantities of solid wastes are generated during the construction activities. The waste specifically during the construction activities are packaging materials, spoiled construction materials, wastes from other work related activities, waste produced by the labour force, wastes from vehicles, machineries and such like items left unattended or carelessly disposed off will spoil the wetland in several ways and therefore appropriate measures to handle such wastes need to be identified. Further, signs and hoardings should be put up in order to draw attention of the tourists about waste problems.

Soil erosion and siltation

Soil erosion and siltation is a major threat to the very survival of any wetland. To overcome this problem it is suggested to plant trees at edges of Ousteri lake and also Suthukeni canal. Further, systematic dredging can be followed during lean months in order to avoid sedimentation and siltation after consultation from experts. Regular monitoring of water depth could also be a good method of keeping track about siltation and availability of the water spread area. In addition, the outlets of the lake (several of them exist now) should be opened during high flood month. This would take away the sedimentary materials (silt) and other agrochemicals that got trapped.

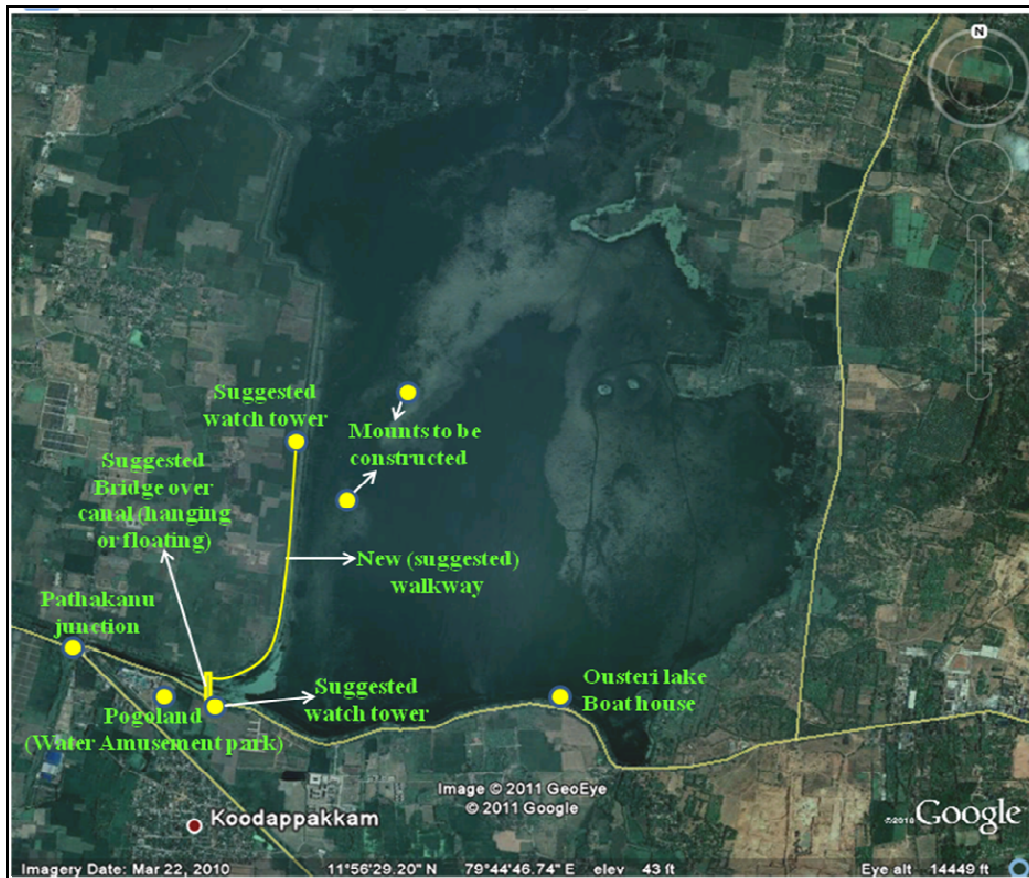


Figure 14. Suggested locations for habitat improvement program around Ousteri lake

Maintaining cleanliness near lake

- Tourists should be advised not to carry food items while visiting lake banks for bird watching in order to avoid throwing up of food materials and other solid waste such as packing materials and polythene bags into water. Moreover, the existing waste materials dumped near the boat house and along the banks of the lake, as observed during our survey, should also be cleaned.
- While efforts should be made to improve the ecotourism activities in and around the lake, efforts also must be taken to ensure that the walkway and nearby areas are not littered by tourists. Necessary instructions may be given in the entry point for all concerned. Hence, the whole stretch should be declared as “*Litter free zone*”.

- Restaurants produce huge quantum of both biodegradable and non-biodegradable waste, and wash water with organic load. Thus, appropriate ways to handle these wastes and subsequent discharges in an ecologically and environmentally benign manner need to be adopted.
- It is expected that on an average more than half a kilogram of solid waste including biodegradable as well as non-biodegradable components will be generated per person per day in a premium tourist location. Thus, special strategy should be adopted by tourist department for handling these different types of wastes based on the expected number of tourists each day.
- Toilet and other such public conveniences also need to be provided with treatment facilities so that human excrements do not get into the environment.

Water and land use planning

- There should be continuous monitoring of the water supply and sewage water generated by the human settlements and industries around the lake. Based on the approvals granted to the existing and new industrial units, and other institutions by the town planning department regular assessment of solid and liquid waste generated within the catchment areas of the drains and water tanks need to be carried out. Based on this assessment the capacity of drains can be periodically reviewed.
- There should be a periodic assessment of boundaries of the lake and their water harvesting area. Boundary pillars and fencing should be provided wherever necessary. The revenue department of the state government should initiate proper land use plan and policy within the catchment areas of the lake and on the either side of the drains. A buffer belt of 5 to 10 meters should be maintained around the lake. Regulating the settlements in and around the lake, including encroachments and unauthorized constructions / hutments need to be regularized and planned.

Ecofriendly/organic agriculture

Application of chemical fertilizers and pesticides in the adjoining paddy field of Ousteri lake would leach out and affect the species diversity in the lake. Large influxes of phosphorous generated primarily from agricultural activities and detergents remain a critical management concern. The primary productivity when compared with other lakes of India, is tending towards hyper-eutrophy. Thus, it is strongly suggested / proposed to stop chemical farming in the villages which are at the bank of Ousteri lake. Thus, organic farming should be promoted initially and be a must later on. Incentive programme for developing organic farming must be planned. Publicity material with respect to organic farming in the area will be useful in maintaining healthy environment.

Nature education and interpretation centre

Owing to the rich flora and fauna the lake harbours, necessary arrangements need to be made available for displaying important species of birds, butterflies, aquatic vegetation, etc. Signage and display boards depicting their picture and brief information about them may be placed along the walkways for better understanding and appreciation by the visitors / tourists. These displays should be designed in appropriate sizes and placed non-obtrusively. Regular staffs should be appointed for nature education and outreach activities and space need to be identified for establishing an interpretation centre. The staff designated for outreach should include a nature education officer / fellows and assistants.

Training and awareness programmes

- There is a need to create awareness among the officials as well as general public regarding environmental aspects of the Ousteri lake. Appropriate training programmes for the officials, general public as well as the members of local non-government organizations have to be formulated and should be carried out on a regular basis.
- Small film shows or slide shows can be conducted on floral and faunal wealth and their conservation implications in the region. The printed hand books, posters and brochures can be circulated to the tourists visiting the area. These materials will

be designed to propagate the message of conservation to the public and student communities.

- During the socio-economic survey several deprived people had shown interest to learn about biodiversity of the area especially avifauna. Thus, training on nature and environment should be given to them so that they can serve as tourist guide / bird watchers and improve their livelihood. Further this can also be one of the alternate livelihood options for them.

Information Management System

A detailed Information Management System (IMS) need to be kept on boards by covering all the information regarding the environment of the lake. The information collected, stored and analysed should include meteorological data, short details about biodiversity, land use and settlement details, industrial details located around lake, water use, sewage flows, tank water levels, ground water data, lake depth details and water quality.

Public participation

There is a need to involve the people residing near or around the Ousteri lake for the management purposes. This can be done by forming a committee for the lake. The committees should monitor the status of the lake and protect it against encroachment by public and dumping of solid wastes into the water bodies. These committees can also generate funds for the maintenance of parks, walkways, fountains, lighting, etc.

Plantation for habitat improvement

Naturally occurring species should be selected for plantation along the lake embankments. Tree species which are likely to attract birds for nesting and also the herbs which attract butterflies and birds may also be planted. These species are commonly seen in and around the present study site, fast growing and drought resistant. Seedlings / saplings of these species can be easily procured from local nurseries. A well managed green belt of these trees all along the sides of the lake may improve the local environment

by reducing the noise and dust pollution. A thick layer of green belt near the vehicle parking lot is also advised which will help reducing sound. Appropriate parking space has to be provided buffered around by a green belt of thick bushes and trees with thick and low canopy. A total of 25 tree species that can be considered for planting are given in Table 17. The selection of plant species for the development depends on various factors such as climate, elevation and soil. The plants should exhibit the following desirable characteristic in order to be selected for plantation.

- The species should be fast growing and providing optimum penetrability.
- The species should be wind-firm and deep rooted.
- The species should form a dense canopy.
- As far as possible, the species should be indigenous and locally available.
- Species tolerance to air pollutants like SPM, SO₂ and NO_x should be preferred.
- The species should be permeable to help create air turbulence and mixing within the belt.
- There should be no large gaps for the air to spill through.
- Trees with high foliage density, leaves with larger leaf area and hairy on both the Surfaces.
- Ability to withstand conditions like inundation and drought.
- Soil improving plants, such as nitrogen fixing plants, rapidly decomposable leaf litter.
- Attractive appearance with good flowering and fruit bearing.
- Bird and insect attracting tree species.
- Sustainable green cover with minimal maintenance

Species which can trap / sequester more carbon can also be a criterion for selection.

Butterfly Park

Rich assemblage of butterflies is present in the area. A butterfly park may be developed as an added tourist attraction, preferably sans-enclosure, depending on land and resource availability. Several of these attractive butterflies can be attracted to a selected area through developing a properly planned and managed butterfly park with required nectar

resources and larval food plant for the butterflies. A suggestive list of plant species for attracting more butterflies to the park is given in **Error! Reference source not found.**

Table 17. List of tree species suggested for planting in and around the Ousteri lake

S. No.	Scientific Name	Family	Common Name
1	<i>Albizia lebbek</i>	Caesalpiniaceae	Vaagai
2	<i>Azadirachta indica</i>	Meliaceae	Veppamaram
3	<i>Bauhinia raceamosa</i>	Caesalpiniaceae	Aathi
4	<i>Bombax malabaricum</i>	Bombacaceae	Mul Ilavu
5	<i>Borassus flabellifer</i>	Arecaceae	Panai
6	<i>Butea monosperma</i>	Fabaceae	Porusamaram
7	<i>Calophyllum inophyllum</i>	Clusiaceae	Punnai
8	<i>Cassine clauca</i>	Celastraceae	Keeri maram
9	<i>Ceiba pentandra</i>	Bombacaceae	Ilava maram
10	<i>Diospyros montana</i>	Ebenaceae	Vakkanathi
11	<i>Erythrina stricta</i>	Fabaceae	Kalyana murungai
12	<i>Ficus benghalensis</i>	Moraceae	Aala maram
13	<i>Ficus religiosa</i>	Moraceae	Arasamaram
14	<i>Gmelina arborea</i>	Verbenaceae	Kumizham
15	<i>Mangifera indica</i>	Anacardiaceae	Mamaram
16	<i>Madhuca longifolia</i>	Sapotaceae	Iluppai
17	<i>Mimusops elengi</i>	Sapotaceae	Makizham
18	<i>Pongamia pinnata</i>	Fabaceae	Pungam
19	<i>Syzygium cuminii</i>	Myrtaceae	Naaval
20	<i>Tamarindus indicus</i>	Caesalpiniaceae	Puliya maram
21	<i>Tectona grandis</i>	Verbenaceae	Thekku
22	<i>Terminalia arjuna</i>	Myrtaceae	Vellai Maruthu: Neermathi
23	<i>Thespesia populnea</i>	Malvaceae	Poovarasu
24	<i>Vitex altissima</i>	Verbenaceae	Mayiladi

25	<i>Ziziphus mauritiana</i>	Rhamnaceae	Ilanthai
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Table 18. List of plants suggested for planting in Butterfly Park

Sr No	Common Name	Scientific Name	Habit
1	Wild Cotton	<i>Callotropis gigantea</i>	Shrub
2	Lantana	<i>Lantana Camara</i>	Shrub
3	Shoe flower (Gudhal)	<i>Hibiscus rosa sinensis</i>	Shrub
4	Pedilanthus Variegated	<i>Pedilanthus tithymalooides variagatus</i>	Shrub
5	Wadelia	<i>Wadelia triolobata</i>	Ground cover
6	Menya	<i>Menya erecta</i>	Shrub
7	Lemon	<i>Citrus limon</i>	Tree
8	Singapori Ixora	<i>Ixora singaporensis</i>	Shrub
9	Allamanda	<i>Allamanda cathartica</i>	Shrub
10	Gardenia	<i>Gardenia lucida</i>	Shrub
11	Plumbago	<i>Plumbago capensis</i>	Shrub
12	Tagar (Chandani)	<i>Tabernaemontana divericata</i>	Shrub
13	Kachnar- Blue	<i>Bauhinia purpurea</i>	Tree
14	Kachnar- yellow	<i>Bauhinia tomentosa</i>	Tree
15	Golden bamboo	<i>Bambusa goldeana</i>	Shrub
16	Kaner	<i>Nerium oleander roseum</i>	Shrub
17	Tapioca	<i>Manihot exculenta</i>	Shrub
18	Justicia	<i>Justicia aurea varigata</i>	Shrub
19	Gardenia varigated	<i>Gardenia lucida variegata</i>	Shrub
20	Russelia	<i>Russelia juncia</i>	Shrub
21	Chinese Ixora	<i>Ixora chinensis</i>	Shrub
22	False Heather	<i>Cuphea hyssopifolia</i>	Ground cover
23	Periwinkle	<i>Vinca rosea</i>	Ground cover
24	Lantana	<i>Lantana sellowinana</i>	Ground cover
25	Kaner	<i>Nerium divericatum</i>	Shrub
26	Cassia	<i>Cassia bicapsularis</i>	Tree
27	Kadipatta	<i>Murraya koeningi</i>	

Sustainable lake management through community participation

- After desilting and eviction of encroachments it is necessary to keep the lakes clean and green. This job cannot be done by department and so the responsible community participation is proposed. The word community participation has wide

meaning and the responsible stress that the public who become member shall have the social and environmental responsibility.

- Responsible NGO's, Self Help Group (SHG), welfare associative entrepreneurs under the coordination of concerned departments can jointly manage the maintenance of the lakes. During the initial period, awareness creation, education and capacity building of the core groups and public are most essential. It is not enough to do the awareness for just target oriented and namesake. Hence, series of continuous programme have to be proposed under this section.
- Additionally engaging local people in the development and conservation initiatives will make more engaged in activities for lake restoration and in turn activities such as poaching and hunting can be minimized.
- People from communities like narikruva may be employed for cleanliness works around the lake and as watch and/or security guards for watch tower and other facilities as suggested. This would reduce their activities of killing birds for their subsistence.

Formation of anti poaching camps

Since poaching of birds for routine livelihood is very common practice around the lake especially by the members of Narikurva community, engaging anti poaching watchers are important. The local people can be engaged to assist in organizing special camps in the remote area and for regular patrolling of the area to prevent poaching activities. A few members from Narikurva community may be included as antipoaching watchers.

Database on Biodiversity

- A data base on plant species, insect, butterflies fish, herpetofauna, birds and mammals should be maintained by the Department.
- The data base on the available population size and the distribution of native fauna should be prepared through extensive survey.

Eco-friendly approach

Tourism and construction activities can be in a more eco-friendly way. A few suggestions in this regard are given below:

- Benches, chairs, etc. are suggested to be made of local rocks, bamboo or such items for people visting the area.
- Native plant species for plantation purposes should be preferred to exotic ones.
- Striking colours may be avoided for the buildings and other structures.
- Striking, bright and attractive lights may deter birds hence, the same should be avoided.
- Lights at banks of the wetland near road side may be fixed at low heights focussing towards the paths and bright lights directed upwards should be avoided.
- Compact fluorescent lamps may be used to meet light requirements, inorder to save energy.
- In eateries and interpretation centres sky windows and strategically placed windows may reduce lighting requirements.
- The watch towers should be sufficiently camouflaged so that visitors would not affect the nesting birds.
- A portion of earnings from tourism should be earmarked for improvement of the local livelihood, environment and biodiversity which would directly help conserve the biodiversity of the Ousteri lake.
- Special stalls for selling / promoting local eco-friendly products produced by self-help groups and others should be installed.
- Nature education camps can be arranged for students/ teachers, in collaboration with education institutes, research institutes and schools.

Environmental Monitoring and Management Cell

The purpose of environmental monitoring is to evaluate the effectiveness of implementation of Comprehensive Management Action Plan (CMAP) by periodically monitoring the important environmental parameters in and around the lake area. Several monitoring and executing groups can be constituted and the same in hierarchical order are as below:

- The Forest department in collaboration with Tourism department might develop a Local Environmental Monitoring Group (LEMG) that can monitor the all activities related to the lake, closely to safeguard the environment in general and avifauna in particular. The monitoring group mainly manned by in-house officials may also include experts in the field along with officials responsible for wildlife protection
- An Environmental Monitoring Cell (EMC) operated by officials supervised by an '*Environmental Monitoring Panel*' may also be constituted. The Environment Monitoring Panel may involve members from agencies such as the Puducherry Forest Department, Pollution Control Board and Academic / Research institutions. The broad mandate of this panel may be to oversee the EMC and LEMG, and advise them on management of lake and surrounding environment related matter as and when required.
- The EMC should directly over see and ensure that the measures to be taken under the EMP is implemented strictly and to ensure the pollution parameters are within the prescribed limits. The cell in consultation with the local environmental group and environmental panel may also suggest appropriate changes in CMAP and its execution if found necessary in due course of time. Some of the responsibilities of the EM cell are as follows:
 - i. Conduct environmental awareness program to the workers, supervisory staff engaged in lake conservation.
 - ii. Regularly monitor the environmental parameters and recommend necessary measures to improve the environmental conditions.

- iii. Advise on any negligence or derelictions on the part of concerned staff or workers in observing CMAP and to advice on the necessary steps to be adopted.
- iv. To implement the CMAP.
 - v. To assure regulatory compliance with all relevant rules and regulations.
 - vi. To minimize environmental impacts of operations by strict adherence to the EMP.
 - vii. To initiate environmental monitoring as per approved schedule.
- viii. Review and interpretation of monitored results and corrective measures in case monitored results are above the specified limit as applicable in local case scenario.
- ix. Coordination with regulatory agencies, external consultants, monitoring agencies.

Inetr-state environmental panel

- There is a need for constituting an inter state panel including members from Puducherry and Tamil Nadu part, for coordinating conservation and management efforts for long-term sustainability of the lake.
- Representatives of the villages surrounding the lake may be identified to form Local Environmental Conservation Committee. This committee would act as bridge between local communities and administration and discuss all issues pertaining to environmental problem and solutions. A committee comprising of representatives of officials and people of both the states (Puducherry and Tamil Nadu) may be formed to look at issues pertaining to interest of people and environmental conservation at a broader scale.

BUDGET PROVISIONS

The budget requirements for the Environment Management Plan for the Puducherry portion of the wetland are given below. The budget estimate is made for the first five year period. Further justification for each of the major heads is also provided.

ABSTRACT ESTIMATE

The abstract estimate given below summarises total estimate for duration of five years (Table 19) for the environment management and eco-restoration of the Ousteri lake. The estimated amount is Rs. 917.4 lakhs for the first five year period with annual break-ups. The major portion of the projected budget is envisaged to meet the expenditure towards project

Table 19: Summary of the budget estimate (in lakhs) for the EMP of Ousteri lake

	Heads	1 Year	2 Year	3 Year	4 Year	5 Year	Total
A	Threat identification, Minimization and Control	58	43	13	11	10	135
B	Protection	59	26	19	19	22	145
C	Eco-restoration	167	109	43	26	27	372
D	Research and monitoring	22	22	23	23	23	113
E	Outreach / nature education	64	54	20	15	15	168
	Sub total	370	254	118	94	97	933
F	Contingency (10% of the above heads)	37.0	25.4	11.8	9.4	9.7	93.3
	Gross Total	407	279.4	129.8	103.4	106.7	1026.3

DETAILED ESTIMATE

The detailed estimate given below (Table 20) provides detailed break-ups of the estimate under different heads mentioned above in Table 19.

Table 20. Details of the aspects covered under each head of the Budget estimation (in lakhs) for the Environmental Management Plan

No.	Head/ Category	1 Year	2 Year	3 Year	4 Year	5 Year	Total
A	Identification, management and minimization of threats						
1	Survey and demarcation of boundaries by marking and erection of concrete pillars, Inter-state Joint investigations & public consultations	20	20	5	3	2	50
2	Promotion of Eco-tourism, bird watching, Groups and Local Environment Committees	10	5	1	1	1	18
3	Stopping the unsaustsinable usge of the lake and facilitation of sustainable Alternative livelihoods for them. Eg: for Narikkuravas	25	15	5	5	5	55
4	Pollution source identification and monitoring	3	3	2	2	2	12
							135
B	Protection						
1	Office ???????????	8	2			1	11
2	Check post (2 nos.),	2					2
3	Watch towers (2 nos.)	2	2				4
4	Hanging bridge	3					3
5	Patrolling path	2					2
6	Forest Department Staff (8)*	13	13	14	14	15	69
7	Vehicle (2 nos.) & fuel	14	2	2	2	2	22
8	Boats (5 nos) & maintenance	10	2	1	1	1	15
9	Communication (arms, wireless, etc)	5	5	2	2	3	17
							145
C	Eco-restoration						
1	Cleaning the channels, drainage system	25	20	15	10	10	80
2	Culverts, bridges, sluice gates and maintenance	50	30	3	3	3	89
3	Bay for vehicles	10	1	1	1	1	14

4	Green belts / tree planting, nursery development	10	10	3	2	2	27
5	Butterfly Park development	25	10	5	5	5	50
6	Removal of aquatic weeds	5	5	3	3	3	19
7	Excavation to restore gradients in certain areas	10	5	3		1	19
8	Creation of earthen mounds for birds (7 nos.)	7	3				10
9	Sanitation / public health facilities and maintenance	15	15	5	1	1	37
10	Promotion of organic farming and reduction of agricultural chemicals in the immediate catchment areas of the lake	10	10	5	1	1	27
							345
D	Research and monitoring						
1	Long term Ecological Monitoring	7	7	7	7	7	35
2	Data management systems and analyses	5	5	5	5	5	25
3	Habitat Monitoring – GIS Change detection analysis	5	5	5	5	5	25
4	Hiring of biologists (2 no.)	5	5	6	6	6	28
							125
E	Outreach / Nature Education						
1	Nature interpretation centre- Plan, design, construction and maintenance	25	15	3	3	3	49
2	Gallery, diorama, museum, hall, library, minor laboratory, equipments and maintenance	25	25	10	5	5	70
3	Signage, nature trail, lightings, publicity materials	10	10	3	2	2	27
4	Nature interpreters (3)	4	4	4	5	5	22
							168
	Total of above 'Heads'	370	254	118	94	97	933
F	Contingency (10% of the above Heads)	37.0	25.4	11.8	9.4	9.7	93.3
G	Gross Total	407	279.4	129.8	103.4	106.7	1026.3

JUSTIFICATIONS FOR THE BUDGET PROVISIONS

A. Identification, management and minimization of threats

The survey

A detailed survey is important to execute an environment management programme as issues such as exact boundary and area of control between Tamil Nadu and Puducherry administration with respect to Ousteri is unclear. The expenditure projected, under the survey, is to meet the wages for the surveyors, hiring charges for vehicles / boats and gadgets for surveys. Several joint meetings may be required between the officials of Puducherry and Tamil Nadu governments

Marring of boundary with concrete pillars

The proposed expenditure is to meet the following expenses

- Production of concrete pillars to be erected at regular intervals along the boundary,
- Consultancy charges payable to the engineers or consultants,
- Transportation charges for men and materials, and
- Wages for the employees.

Eco clubs, Groups and Joint Management Committees

These local groups are required for long term conservation of the area.

B. Protection

Protection is the first step which is necessary for restoration of the wetland. Appropriate patrolling pathways are also envisaged in the EMP. The expenditure proposed under this head meet up the expenses for constructions of the office, check posts and patrolling path. The following are included in projecting the expenses towards construction and maintenance of structures envisaged for the protection.

Currently, facilities such as office and check posts are not available near Ousteri. The forest and wildlife department of Puducherry does not have sufficient man power to

patrol the area and protect the same. Vehicles, boats and communication network facilities need to be developed as the wetland is located bordering two states.

C. Eco-restoration

The expenditures envisaged under this head include those towards

- Restoring / de-silting / cleaning the channels that are connected to the wetland and construction of culverts / sluices.
- Identifying and restoring channels linking the wetland with the adjacent wetlands
- Wages, material charges, transportation charges, hiring charges for earth moving machinery like JCB, dredgers, tippers, etc.
- Expenditure towards developing Green belt, mounts with trees suitable for colonial nesters.
- Collection and transportation of planting materials, planting the saplings and their maintenance
- Raising nurseries, seed treatment charges etc.
- Conservation of the existing greenery / trees
- Weed removal from the wetland and flood plains
- Consultation charge for experts, materials, wages, and transportation charge, hiring machinery supports.

D. Research and Monitoring

The expenditures envisaged in this head are to meet:

- Procuring computers, image processors, software and library with internet facilities.
- Salary and wages for consultants, Research / Laboratory / field assistants and drivers.
- Equipment purchase, insurance and annual maintenance charges of the equipments, and maintenance charges for other infrastructure
- Expenditures for items such as chemicals and consumables for analyzing physical, chemical, and biological parameters / samples.

- Expenditures towards outsourcing scientific studies and expertise
- Acquiring imageries and other remote sensed data sources.

E. Outreach / nature education

The expenditures envisaged here include those to be spent on:

- Construction and maintenance of the interpretation centre
- Signage and other information materials
- Nature trail – construction and maintenance
- Charges for purchasing minor laboratory equipments
- Salary for the staffs - Nature interpreters

REFERENCES

- Abbasi SA and Chari KB (2008). Environmental management of urban lakes: with special reference to Oussudu. Discovery Publishing House, New Delhi. 269 pp.
- Ahmedullah, M. and M.P. Nayar (1987). Endemic Plants of the Indian Region. Vol. 1. Botanical Survey of India, Howrah.
- Alexander R and Pusharaj P (2010). Resettlement of weaver birds (*Ploceus philippinus*) in Ousteri Lake. *Current Science*. 99(1): 10.
- Anon, 1990. *A Directory of wetlands in India*. Ministry of Environment, Govt. of India, New Delhi.
- Anon, 2009. National Wetland Conservation Programme Guidelines for Conservation and Management of Wetlands in India. Ministry of Environment, Govt. of India, New Delhi.
- Azeez PA, S Bhupathy, J Ranjini, R Dhanya, PP Nikhil Raj (2008). Management Plan for the Eco-restoration of Pallikaranai Reserve Forest. Report submitted to SACON, pp. 1-62.
- Azeez, NR Nadarajan and BAK Prusty (2007). Macrophyte decomposition and its impact on the water quality. Edited Book on “Environmental Degradation and Protection” Volume – II, MD Publications, New Delhi, pp. 115-156.
- Azeez, PA, S. Bhupathy, Nikhil Raj and R. Chandra (2009). Conservation of Kottuli Wetlands, Calicut, Kerala. Report submitted to Tourist Resorts (Kerala) Limited. pp. 1-66.
- Balachandran S and Alagarrajan R (1995) An ecological survey of the wetlands of Pondicherry with special reference to Ousteri lake. Institute of Restoration of Natural Environment. Nagercoil. Pp. 40.
- Balasubramanian, P and Lalitha Vijayan, 2004. Conservation Strategies and Action Plans for the Avifauna of Tamil Nadu: in Tamil Nadu Biodiversity Strategy and Action Plan-Cordate Diversity (Edr. R. Annamalai). 76-99.
- Bang P, P Dhalstrom and G Vevers (1972). Collins guide to animal tracks and signs. Collins, London. 100pp.

- Bava SK, A Das, J Krishnaswamy, KU Karanth, NS Kumar and M Rao (2007). Ecosystem profile Western Ghats and Srilanka Biodiversity hotspots Western Ghats region. Critical Ecosystem Partnership Fund.
- Bibby, C.J., N.D. Burgess and D.A. Hill (1992). Bird Census Techniques. Academic Press publishers, 257p.
- Chandra R, Prusty BAK and Azeez PA (2009). Impact of *Prosopis juliflora* on Herbaceous Diversity in Keoladeo National Park, Bharatpur. Pp. 09-13. In: "Proceedings of the National Symposium on Prosopis: Ecological, Economic Significance and Management Challenges" (Eds. Thivakaran GA, Kumar A, Prusty BAK and Sunderraj SFW), Gujarat Institute of Desert Ecology, Bhuj, India. 115 pp.
- Chari KB and Abbasi SA (2003). Ecology, habitat and bird community structure at Oussudu lake: towards a strategy for conservation and management. Aquatic Conservation: *Marine Freshwater Ecosystem*. 13: 373-86.
- Colwell RK (1994-2004). EstimateS: Statistical estimation of species richness and shared species from samples. Version 7. Persistent URL <purl.oclc.org/estimates>.
- Curtis J.T. & R.P. McIntosh (1950). The interrelations of certain analytic and synthetic phytosociological characters. *Ecology* 31: 434-455.
- Gamble, J.S. and C.E.C. Fischer (1915-1936). The Flora of the Presidency of Madras. Part 1-11. (Part 1-7 by Gamble and 8-11 by Fischer). Adlard & Sons Ltd., London. (repr. ed. Vols. 1-3. 1957).
- Grimmet R, C. Inskipp, & T. Inskipp (2000) Pocket guide to the birds of the Indian subcontinent. Oxford University Press., New York, 384pp.
- Grimmett, R., C. Inskipp and T. Inskipp, 1998. Birds of the Indian Subcontinent. Christopher Helm Publishers Ltd. London. p. 888.
- Grimmett, R., C. Inskipp and T. Inskipp, 2001 (repr. ed.). Pocket Guide to the Birds of the Indian Subcontinent. Oxford University Press, New Delhi. p. 1-384.
- Henry AN, G.R. Kumari and V. Chitra (1987). Flora of Tamil Nadu, India. Ser. 1: Analysis. Vol. 2. Botanical Survey of India, Coimbatore.

- Henry AN, K. Vivekananthan and N.C. Nair (1978). Rare and threatened flowering plants of South India. *J. Bomb. Nat. Hist. Soc.* 75:695-696.
- Henry AN, V. Chitra and N.P. Balakrishnan (1989). Flora of Tamil Nadu, India. Ser. 1: Analysis. Vol. 3. Botanical Survey of India, Coimbatore.
- Heyer WR, M. Donnelly, R.W. Mc Diarmid, L.C. Hayek and M.S. Foster (1994). Measuring and Monitoring Biological Diversity. Standard Methods for Amphibians. Smithsonian Institution Press, Washington, 364p.
- Hooker JD (ed.) (1897). The Flora of British India. Vols. 1-7. Reeve & Co., London.
- <http://www.kerenvis.nic.in/biodiversity/Wetlands>. Pdf.
- Hussain SA (2007). Integrated management of wetlands: A case study on Asan Conservation Reserve, Uttarakhand, India. *Indian Forester*. 133(10): 1305-1311.
- Islam MZ and Rahmani AR (2004). Important Bird Area in India; Priority sites for conservation. Indian Bird Conservation Network, Bombay Natural History Society and Birdlife International, UK.
- IUCN (1971). The Ramsar Convention. The Final Act of the International Conference on the Conservation of wetlands and Waterfowl: *IUCN Bulletin 2* (Spl. Supplement): 1-4.
- Jayaram KC (1999). *The freshwater fishes of the Indian region*. Narendra Publishing House, Delhi. 551 pp.
- Jhunjhunwala S (1998) The Ornithological importance of Ousteri lake and Bahour lake: A study of the habitat preferences of their waterfowl and waders. M.Sc. Dissertation. Salim Ali School of Ecology and Environmental Sciences, Pondicherry University.
- Kehimkar I (2008). The book of Indian Butterflies. Sponsored by Tata Social Welfare Trust. BNHS, Oxford University Press, Bombay, India, 497 pp.
- Krishnan V and Srinivasan R (1996). Geo-Environmental Impact studies along the Tamilnadu coast between Ramanathapuram and Kollencode and Madras and Pulicate lake. In Project: Environmental Geological Studies (OP: Tamil Nadu and Pondicherry), Records of Geological survey of India, vol. 130. Pt-5.

- Kunte K (2000). India-a landscape butterflies of Penninsular India. Ed. Madhav Gadgil. Foreward Professor. E O, Wilson. Indian Academy of Sciences. University Press (India) Limited. 254 pp.
- Matthew KM (1996). Illustrations on the Flora of the Palni Hills, South India. The Rapinat Herbarium, St. Joseph's College, Tiruchirappalli.
- Matthew KM (1999). The Flora of the Palni Hills, South India. The Rapinat Herbarium, St. Joseph's College, Tiruchirappalli.
- Menon V (2003). A field guide to Indian Mammals. Dorling Kindersley (India) Pvt. Limited. pp. 1-200.
- Mitsch WJ and Gosselink JG (2000). Wetlands (Third Edition). John Wiley & Sons, New York.
- Nair NC and Henry AN (1983). Flora of Tamil Nadu, India, Ser. 1: Analysis Vol. 1. Botanical Survey of India, Coimbatore.
- Nayar MP (1996). Hotspots of Endemic plants of India, Nepal and Bhutan. Tropical Botanic Garden and Research Institute, Thiruvananthapuram. New Delhi.
- Nayar MP and Sastry ARK (1987-1990). Red Data Book of Indian plants. Vols. 1-3. Botanical Survey of India, Howrah.
- Nobi EP, Umamaheswari R, Stella C and Thangaradjou T (2009). Land use and Land cover assessment along Pondicherry and its surroundings using Indian Remote Sensing Satellite and GIS. American-Euresian Journal of Scientific Research. 4 (2): 54-58.
- Philips EA (1959). Methods of vegetation study. Henry Holt & Co., New York.
- Prasad SN, Ramachandra TV, Ahalya N, Sengupta T, Kumar A, Tiwari AK, Vijayan VS. and Vijayan L (2002). Conservation of wetlands of India – a review. *Tropical Ecology*. 43 (1): 173-186.
- Prusty BAK, Azeez PA and Jagadeesh EP (2007). Alkali and transition metals in macrophytes of a wetland system. *Bulletin of Environmental Contamination and Toxicology*. 78 (5): 405-410 (May 2007).
- Talwar PK and Jhingran AG (1991). Inland fishes of India and adjacent countries. Oxford and IBH publishing Co., New Delhi.

- Tam NFY and Wong WS (2000). Spatial variation of heavy metals in surface sediments of Hong Kong mangrove swamps. *Environmental Pollution*. 1: 195-205.
- Treewek Jo (1999). Ecological Impact Assessment. Blackwell Science publishers, 351 p.
- Turner RK (1991). Economics and Wetland Management. *Ambio*. 20.
- Vijayan, V.S., Prasad, S.N., Vijayan, L. and Muralidharan, S. (2004). Inland Wetlands of India – Conservation Priorities. Sálím Ali Centre for Ornithology & Natural History, Coimbatore. pp. xxiv + 532.

APPENDICES

Appendix 1. Quantum of water received by Ousteri in each month from January 1999 to August 2010

Year	Month	Tank Water Reading in Million m ³)	Inflow (Mcft)	Outflow (Mcft)	Tank Capacity (Mcft)
1999	January	3.55	Nil	Nil	522.89
	February	3.37	Nil	39.56	483.33
	March	3.12	Nil	59.97	423.36
	April	2.76	Nil	77.62	345.74
	May	2.42	Nil	70.46	275.28
	June	2.11	Nil	60.43	214.86
	July	1.81	Nil	60.43	154.42
	August	1.45	Nil	51.40	103.02
	September	1.47	28224	Nil	105.84
	October	1.36	Nil	13.41	92.43
	November	1.18	Nil	23.75	68.68
	December	1.63	603360	Nil	129.02
2000	January	2.17	96.77	Nil	225.79
	February	2.00	Nil	48.69	177.11
	March	1.91	Nil	12.35	164.76
	April	1.61	Nil	39.16	125.60
	May	1.40	Nil	28.93	96.67
	June	1.17	Nil	29.43	67.24
	July	0.95	Nil	27.72	39.51
	August	0.60	Nil	22.58	16.94
	September	0.33	Nil	3.66	13.27
	October	0.28	Nil	0.75	12.52
	November	0.77	12.17	Nil	24.70
	December	1.00	21.87	Nil	46.57
2001	January	1.21	29.29	Nil	75.86
	February	1.14	Nil	12.98	62.88
	March	0.87	Nil	31.13	31.75

	April	0.76	Nil	7.76	23.99
	May	0.57	Nil	8.11	15.88
	June	Nil	Nil	15.88	Nil
	July	Nil	Nil	Nil	Nil
	August	Nil	Nil	Nil	Nil
	September	Nil	Nil	Nil	Nil
	October	0.87	31.75	Nil	31.75
	November	0.88	0.71	Nil	32.46
	December	0.94	5.64	Nil	38.10
2002	January	0.88	Nil	Nil	32.46
	February	0.80	Nil	16.23	26.81
	March	0.69	Nil	10.23	20.11
	April	0.56	Nil	6.39	15.53
	May	0.32	Nil	13.72	13.23
	June	0.07	Nil	Nil	9.70
	July	Nil	Nil	Nil	Nil
	August	Nil	Nil	Nil	Nil
	September	Nil	Nil	Nil	Nil
	October	0.51	14.08	Nil	14.08
	November	1.00	32.49	Nil	46.57
	December	0.96	Nil	5.64	40.92
2003	January	1.00	5.64	Nil	46.57
	February	0.85	Nil	16.23	30.34
	March	0.65	Nil	10.23	20.11
	April	0.43	Nil	6.39	13.72
	May	Nil	Nil	13.72	Nil
	June	Nil	Nil	Nil	Nil
	July	Nil	Nil	Nil	Nil
	August	Nil	Nil	Nil	Nil
	September	Nil	Nil	Nil	Nil
	October	Nil	Nil	Nil	Nil
	November	0.98	43.75	Nil	43.75
	December	1.20	27.84	Nil	71.59

2004	January	1.16	Nil	4.80	66.78
	February	1.10	Nil	8.92	57.86
	March	0.91	Nil	23.28	34.57
	April	0.71	Nil	13.77	20.81
	May	0.49	Nil	6.82	13.99
	June	1.14	48.89	Nil	62.88
	July	1.01	Nil	14.90	47.98
	August	0.78	Nil	22.58	25.40
	September	0.64	Nil	7.06	18.34
	October	0.81	9.17	Nil	27.52
	November	2.11	187.34	Nil	214.86
	December	3.43	281.18	Nil	496.04
2005	January	3.12	Nil	72.68	423.36
	February	2.86	Nil	58.56	364.80
	March	2.62	54.14	50.80	313.99
	April	2.38	Nil	Nil	368.13
	May	2.25	Nil	127.87	240.26
	June	2.05	Nil	48.69	191.57
	July	1.93	Nil	24.34	167.23
	August	1.53	Nil	52.92	114.31
	September	1.46	Nil	9.88	104.43
	October	1.39	Nil	8.82	95.61
	November	1.46	8.80	Nil	104.43
	December	3.12	318.93	Nil	423.36
2006	January	3.50	87.49	Nil	510.85
	February	3.37	Nil	27.53	483.33
	March	3.11	Nil	62.79	420.54
	April	2.90	Nil	47.28	373.26
	May	2.66	Nil	49.39	323.87
	June	2.37	Nil	57.51	266.36
	July	2.07	Nil	67.03	199.33
	August	1.86	Nil	39.87	159.47
	September	1.74	Nil	10.72	148.74
	October	1.65	Nil	15.70	133.04

	November	2.34	128.03	Nil	261.07
	December	3.01	132.30	Nil	393.37
2007	January	3.05	10.23	Nil	403.60
	February	2.77	Nil	56.10	347.51
	March	2.67	Nil	21.17	326.34
	April	2.37	Nil	59.98	266.36
	May	2.00	Nil	89.26	177.11
	June	1.83	Nil	20.82	156.29
	July	1.74	Nil	7.55	148.74
	August	1.51	Nil	37.26	111.48
	September	1.33	Nil	22.23	89.26
	October	1.17	Nil	22.03	67.23
	November	1.91	97.53	Nil	164.76
	December	2.11	50.10	Nil	214.86
2008	January	2.83	135.59	Nil	350.44
	February	2.90	22.82	Nil	373.26
	March	2.78	Nil	23.99	349.27
	April	2.84	11.29	Nil	360.76
	May	2.60	Nil	50.80	309.76
	June	2.35	Nil	43.92	262.84
	July	2.13	Nil	42.69	220.15
	August	1.89	Nil	57.51	162.64
	September	1.80	Nil	9.03	153.61
	October	1.63	Nil	24.59	129.02
	November	1.95	41.03	Nil	170.05
	December	3.51	345.04	Nil	515.09
2009	January	3.51	Nil	Nil	515.09
	February	3.32	Nil	42.34	472.75
	March	3.07	Nil	63.50	409.25
	April	2.91	Nil	33.87	375.38
	May	2.65	Nil	53.98	321.40
	June	2.37	Nil	55.04	266.36
	July	2.08	Nil	63.15	203.31

	August	1.88	Nil	41.63	161.58
	September	1.71	Nil	16.47	145.11
	October	1.59	Nil	22.33	122.77
	November	1.50	Nil	12.70	110.07
	December	3.11	310.48	Nil	420.56
2010	January	3.52	94.53	Nil	FTL
	February	3.38	Nil	29.64	485.45
	March	3.15	Nil	54.68	430.77
	April	2.86	Nil	65.97	364.80
	May	2.62	Nil	50.80	313.99
	June	2.40	Nil	42.34	271.66
	July	2.37	Nil	5.29	266.36
	August	2.18	Nil	39.16	227.20

Source: Irrigation Division, Public Works Department, Government of Puducherry

Appendix 2. Questionnaire used for household survey during the present study

Comprehensive Management Action Plan for Conservation of Ousteri Lake

Socio-Economic Survey in Puducherry, Puducherry

Household Level Questionnaire

Name of the Surveyor:

Date:

General

1. Name of the Respondent:
2. Village:
3. Taluk:
4. Type of Family: Nuclear/Joint
5. Family members:

Name	Age	Sex	Educational qualification	Occupation		Annual expenditure	
				Main	Other	Food	Other

6. Type of House: a. Kuchcha: b. Pakka: c.
Semi pakka:

7. Owned/ Rented

8. Electricity: Yes/No

9. Sanitation: Yes/No

Agriculture

10. Landholdings: Agriculture/Housing Plot/Other.....

11. Type of Land (ha):

- Irrigated land
- Non- irrigated
- Wasteland
- Other, Pls. specify.....

12. Type of Irrigation:

1. Groundwater:

Source:

Duration:

2. Surface water:

Source:

Duration:

13. Cropping Pattern:

a. Monoculture

b. Polyculture

Season	Name of the crop	Cropping area (ha)	Product (Yield kg/ha)

Livestock

14. Do you have any livestock? Yes/No

Live-stock	Male	Female	Total	Income from livestock
Sheep				
Goat				
Cow				
Buffalo				
Bull				
Poultry				
Others (Specify)				

15. Annual Income:

Agriculture	Expenditure	Income
1. Monsoon		
2. Winter		
3. Summer		
4. Milk & Milk products		
5. Daily wages		
6. Others (Specify)		

16. Any health related problems: Yes/No

If Yes, then

17. Energy resource:

Energy source	Amount	Source	Expenditure (yearly)
Firewood			
Charcoal			
Cow dung cake			
Gobar gas			
LPG gas			
Solar store			
Electric Heater			
Others Plz(specify)			

18. Any improvements in resources accessibility and/or availability in recent past?

Yes/No

If yes, then pls. Specify the type of improvement/benefit and source...

a. Income increased b. Transportation facility c. Electricity d. Others (specify)...

19. What are the problems you are facing in recent years?

- 1. Diseases.....
- 2. Problem in agriculture land.....
- 3. Reduction in quality of crops.....
- 4. Others (specify).....

19. Problem from Wildlife: Yes/No

If yes then

Animal	Nature of Damage	Annual Loss(Rs)

20. What do you suggest for improving the environment quality in your village?

.....

21. What are the lakes around your village?

.....

22. How much you are dependent on lake for your needs: Partially/Fully

Partially...

Fully.....

23. Distance between your home and lake:

24. Location you go for fishing-Lake/Dam:

25. Area you cover while fishing - (Near bank/ middle of lake)

Location-1:

Location-2:

Location-3:

26. How frequently you go for fishing: Daily/Weekly/Monthly/ Seasonally

a. Time of fishing: Morning/Noon/Evening/ Night/

b. Which season: Summer/Winter/Monsoon/All season

c. Quantum of fish catch:.....

27. What are the Fish species you have collected so far?

.....
.....

Species from Ossudu lake:

.....
.....
.....
.....

28. Other species you have observed in and around your village:

Birds:.....
.....
.....

Mammals:.....
.....
.....

Turtles:.....

.....

.....

30. Your opinion about tourism potential of Ousteri lake:

.....

.....

31: Interest of village folk towards of wildlife:

.....

.....

Appendix 3. List of plant species in and around Ousteri lake

Sl. No.	Name of the plant species	Family	Habitat
1	<i>Andrographis alata</i>	Acanthaceae	Herb
2	<i>Asystasia dalzeliiana</i>	Acanthaceae	Herb
3	<i>Asystasia gangetica</i>	Acanthaceae	Herb
4	<i>Barleria acuminata</i>	Acanthaceae	Shrub
5	<i>Barleria buxifolia</i>	Acanthaceae	Herb
6	<i>Barleria cristata</i>	Acanthaceae	Shrub
7	<i>Barleria prionotis</i>	Acanthaceae	Shrub
8	<i>Blepharis molluginifolia</i>	Acanthaceae	Herb
9	<i>Blepharis tetraphylla</i>	Acanthaceae	Herb
10	<i>Crossandra infundibuliformis</i>	Acanthaceae	Herb
11	<i>Ecbolium viride</i>	Acanthaceae	Herb
12	<i>Indoneesiella echioides</i>	Acanthaceae	Herb
13	<i>Justicia betonica</i>	Acanthaceae	Shrub
14	<i>Justicia gendarussa</i>	Acanthaceae	Shrub
15	<i>Justicia procumbens</i>	Acanthaceae	Herb
16	<i>Justicia simplex</i>	Acanthaceae	Herb
17	<i>Justicia tranquebariensis</i>	Acanthaceae	Herb
18	<i>Ruellia patula</i>	Acanthaceae	Herb
19	<i>Ruellia tuberosa</i>	Acanthaceae	Herb
20	<i>Strobilanthus consanguinea</i>	Acanthaceae	Shrub
21	<i>Agave americana</i>	Agavaceae	Shrub
22	<i>Mollugo cerviana</i>	Aizoaceae	Herb
23	<i>Mollugo nudicaulis</i>	Aizoaceae	Herb
24	<i>Mollugo pentaphylla</i>	Aizoaceae	Herb
25	<i>Trianthema decandra</i>	Aizoaceae	Herb
26	<i>Caldesia parnassifolia</i>	Alismataceae	Herb
27	<i>Limnophytum obtusifolium</i>	Alismataceae	Herb
28	<i>Aloe vera</i>	Aloeaceae	Herb
29	<i>Achyranthes aspera</i>	Amaranthaceae	Herb
30	<i>Achyranthes bidentata</i>	Amaranthaceae	Herb
31	<i>Aerva lanata</i>	Amaranthaceae	Herb
32	<i>Aerva persica</i>	Amaranthaceae	Herb
33	<i>Alternanthera paronychioides</i>	Amaranthaceae	Herb
34	<i>Alternanthera pungens</i>	Amaranthaceae	Herb
35	<i>Alternanthera sessilis</i>	Amaranthaceae	Herb
36	<i>Alternanthera tenella</i>	Amaranthaceae	Herb
37	<i>Amaranthus spinosus</i>	Amaranthaceae	Herb
38	<i>Amaranthus viridis</i>	Amaranthaceae	Herb
39	<i>Celosia polygonoides</i>	Amaranthaceae	Herb
40	<i>Digera muricata</i>	Amaranthaceae	Herb

41	<i>Gompherena decumbens</i>	Amaranthaceae	Herb
42	<i>Nothosaerva brachiata</i>	Amaranthaceae	Herb
43	<i>Psilotrichum elliotii</i>	Amaranthaceae	Herb
44	<i>Pupalia lappacea</i>	Amaranthaceae	Herb
45	<i>Trichurus monsoniae</i>	Amaranthaceae	Herb
46	<i>Crinum asiaticum</i>	Amaryllidaceae	Shrub
47	<i>Pancratium triflorum</i>	Amaryllidaceae	Herb
48	<i>Buchanania axillaris</i>	Anacardiaceae	Tree
49	<i>Mangifera indica</i>	Anacardiaceae	Tree
50	<i>Semecarpus anacardium</i>	Anacardiaceae	Tree
51	<i>Artabotrys odoratissimus</i>	Annonaceae	Straggler
52	<i>Polyalthia longifolia</i>	Annonaceae	Tree
53	<i>Polyalthia suberosa</i>	Annonaceae	Tree
54	<i>Centella asiatica</i>	Apiaceae	Herb
55	<i>Carissa carandas</i>	Apocynaceae	Shrub
56	<i>Carissa spinarum</i>	Apocynaceae	Shrub
57	<i>Rauwolfia tetraphylla</i>	Apocynaceae	Shrub
58	<i>Thevetia peruviana</i>	Apocynaceae	Tree
59	<i>Wrightia tinctoria</i>	Apocynaceae	Tree
60	<i>Aponogeton natans</i>	Aponogetanaceae	Herb
61	<i>Colocasia esculenta</i>	Araceae	Shrub
62	<i>Cryptocoryne retrospiralis</i>	Araceae	Herb
63	<i>Cryptocoryne spiralis</i>	Araceae	Herb
64	<i>Pistia stratiotes</i>	Araceae	Herb
65	<i>Borassus flabellifer</i>	Arecaceae	Tree
66	<i>Cocos nucifera</i>	Arecaceae	Tree
67	<i>Corypha umbraculifera</i>	Arecaceae	Tree
68	<i>Phoenix loureirii</i>	Arecaceae	Shrub
69	<i>Phoenix sylvestris</i>	Arecaceae	Tree
70	<i>Aristolochia bracteolata</i>	Aristolochiaceae	Climber
71	<i>Aristolochia indica</i>	Aristolochiaceae	Climber
72	<i>Asclepias curassavica</i>	Asclepiadaceae	Herb
73	<i>Calotropis gigantea</i>	Asclepiadaceae	Shrub
74	<i>Calotropis procera</i>	Asclepiadaceae	Shrub
75	<i>Gymnema montanum</i>	Asclepiadaceae	Climber
76	<i>Hemidesmus indicus</i>	Asclepiadaceae	Climber
77	<i>Ichnocarpus frutescens</i>	Asclepiadaceae	Climber
78	<i>Leptadania reticulata</i>	Asclepiadaceae	Climber
79	<i>Oxystelma esculentum</i>	Asclepiadaceae	Climber
80	<i>Pentstemonis microphylla</i>	Asclepiadaceae	Climber
81	<i>Pergularia daemia</i>	Asclepiadaceae	Climber
82	<i>Sarcostemma brunonianum</i>	Asclepiadaceae	Climber
83	<i>Sarcostemma intermedium</i>	Asclepiadaceae	Climber
84	<i>Tylophora benthamii</i>	Asclepiadaceae	Climber

85	<i>Tylophora indica</i>	Asclepiadaceae	Climber
86	<i>Wattakaka volubilis</i>	Asclepiadaceae	Climber
87	<i>Acanthospermum hispidum</i>	Asteraceae	Herb
88	<i>Ageratum conyzoides</i>	Asteraceae	Herb
89	<i>Chromolaena odorata</i>	Asteraceae	Shrub
90	<i>Eclipta alba</i>	Asteraceae	Herb
91	<i>Parthenium hysterophorus</i>	Asteraceae	Herb
92	<i>Synedrella nodiflora</i>	Asteraceae	Herb
93	<i>Wedelia urticifolia</i>	Asteraceae	Herb
94	<i>Millingtonia hortensis</i>	Bignoniaceae	Tree
95	<i>Spathodea campanulata</i>	Bignoniaceae	Tree
96	<i>Tecoma stans</i>	Bignoniaceae	Tree
97	<i>Bombax ceiba</i>	Bombacaceae	Tree
98	<i>Ceiba pentandra</i>	Bombacaceae	Tree
99	<i>Carmona retusa</i>	Boraginaceae	Shrub
100	<i>Coldenia procumbens</i>	Boraginaceae	Herb
101	<i>Cordia obliqua</i>	Boraginaceae	Tree
102	<i>Cordia sebastiana</i>	Boraginaceae	Tree
103	<i>Ehretia pubescens</i>	Boraginaceae	Shrub
104	<i>Glinus lotoides</i>	Boraginaceae	Herb
105	<i>Glinus oppositifolius</i>	Boraginaceae	Herb
106	<i>Heliotropium indicum</i>	Boraginaceae	Herb
107	<i>Lepidagathis cristata</i>	Boraginaceae	Herb
108	<i>Commiphora berryi</i>	Burseraceae	Tree
109	<i>Lannaea coromandelica</i>	Burseraceae	Tree
110	<i>Opuntia stricta</i>	Cactaceae	Shrub
111	<i>Albizia amara</i>	Caesalpiniaceae	Tree
112	<i>Albizia lebbeck</i>	Caesalpiniaceae	Tree
113	<i>Bauhinia racemosa</i>	Caesalpiniaceae	Tree
114	<i>Caesalpinia bonduc</i>	Caesalpiniaceae	Straggler
115	<i>Cassia alata</i>	Caesalpiniaceae	Shrub
116	<i>Cassia auriculata</i>	Caesalpiniaceae	Shrub
117	<i>Cassia fistula</i>	Caesalpiniaceae	Tree
118	<i>Cassia javanica</i>	Caesalpiniaceae	Tree
119	<i>Cassia montana</i>	Caesalpiniaceae	Tree
120	<i>Cassia obtusa</i>	Caesalpiniaceae	Herb
121	<i>Cassia occidentalis</i>	Caesalpiniaceae	Herb
122	<i>Cassia siamea</i>	Caesalpiniaceae	Tree
123	<i>Cassia tora</i>	Caesalpiniaceae	Shrub
124	<i>Delonix elata</i>	Caesalpiniaceae	Tree
125	<i>Delonix regia</i>	Caesalpiniaceae	Tree
126	<i>Peltophorum pterocarpum</i>	Caesalpiniaceae	Tree
127	<i>Pithecellobium dulce</i>	Caesalpiniaceae	Tree
128	<i>Samanea saman</i>	Caesalpiniaceae	Tree

129	<i>Tamarindus indica</i>	Caesalpinaceae	Tree
130	<i>Cadaba indica</i>	Capparidaceae	Straggler
131	<i>Capparis aphylla</i>	Capparidaceae	Tree
132	<i>Capparis grandis</i>	Capparidaceae	Tree
133	<i>Capparis sepiaria</i>	Capparidaceae	Straggler
134	<i>Capparis zeylanica</i>	Capparidaceae	Straggler
135	<i>Cleome aspera</i>	Capparidaceae	Herb
136	<i>Cleome monophylla</i>	Capparidaceae	Herb
137	<i>Cleome viscosa</i>	Capparidaceae	Herb
138	<i>Crateva adansonii</i>	Capparidaceae	Tree
139	<i>Crateva magna</i>	Capparidaceae	Tree
140	<i>Gynandropsis pentaphylla</i>	Capparidaceae	Herb
141	<i>Maerua oblongifolia</i>	Capparidaceae	Straggler
142	<i>Polycarpha corymbosa</i>	Caryophyllaceae	Herb
143	<i>Polycarpon prostratum</i>	Caryophyllaceae	Herb
144	<i>Cassine glauca</i>	Celastraceae	Tree
145	<i>Celastrus paniculatus</i>	Celastraceae	Straggler
146	<i>Maytanus emarginata</i>	Celastraceae	Shrub
147	<i>Ceratophyllum demersum</i>	Ceratophyllaceae	Herb
148	<i>Ceratopteris thalictroides</i>	Ceratopteridaceae	Herb
149	<i>Calophyllum inophyllum</i>	Clusiaceae	Tree
150	<i>Combretum ovalifolium</i>	Combretaceae	Straggler
151	<i>Terminalia arjuna</i>	Combretaceae	Tree
152	<i>Terminalia bellirica</i>	Combretaceae	Tree
153	<i>Terminalia catappa</i>	Combretaceae	Tree
154	<i>Commelina benghalensis</i>	Commelinaceae	Herb
155	<i>Commelina clavata</i>	Commelinaceae	Herb
156	<i>Commelina longifolia</i>	Commelinaceae	Herb
157	<i>Cynotis tuberosa</i>	Commelinaceae	Herb
158	<i>Cuscuta reflexa</i>	Convolvulaceae	Climber
159	<i>Evolvulus alsinoides</i>	Convolvulaceae	Herb
160	<i>Evolvulus nummularius</i>	Convolvulaceae	Herb
161	<i>Ipomoea cornea</i>	Convolvulaceae	Shrub
162	<i>Ipomoea hederifolia</i>	Convolvulaceae	Climber
163	<i>Ipomoea pescarpae</i>	Convolvulaceae	Climber
164	<i>Ipomoea pestigiridis</i>	Convolvulaceae	Climber
165	<i>Merremia emarginata</i>	Convolvulaceae	Herb
166	<i>Merremia tridentata</i>	Convolvulaceae	Herb
167	<i>Coccinia grandis</i>	Cucurbitaceae	Climber
168	<i>Cucumis</i> sp.	Cucurbitaceae	Climber
169	<i>Diplocyclos palmatus</i>	Cucurbitaceae	Climber
170	<i>Kedroasis foetidissima</i>	Cucurbitaceae	Climber
171	<i>Luffa aegyptiaca</i>	Cucurbitaceae	Climber
172	<i>Mukia maderaspatana</i>	Cucurbitaceae	Climber

173	<i>Bulbostylis barbata</i>	Cyperaceae	Herb
174	<i>Cyperus articulatus</i>	Cyperaceae	Herb
175	<i>Cyperus corymbosus</i>	Cyperaceae	Herb
176	<i>Cyperus difformis</i>	Cyperaceae	Herb
177	<i>Cyperus digitatus</i>	Cyperaceae	Herb
178	<i>Cyperus distans</i>	Cyperaceae	Herb
179	<i>Cyperus exaltatus</i>	Cyperaceae	Herb
180	<i>Cyperus iria</i>	Cyperaceae	Herb
181	<i>Cyperus nutans</i>	Cyperaceae	Herb
182	<i>Cyperus pangorei</i>	Cyperaceae	Herb
183	<i>Cyperus pilosus</i>	Cyperaceae	Herb
184	<i>Cyperus procerus</i>	Cyperaceae	Herb
185	<i>Cyperus rotundus</i>	Cyperaceae	Herb
186	<i>Fimbristylis argentea</i>	Cyperaceae	Herb
187	<i>Fimbristylis bisumbellata</i>	Cyperaceae	Herb
188	<i>Fimbristylis cinnamometorum</i>	Cyperaceae	Herb
189	<i>Fimbristylis complanata</i>	Cyperaceae	Herb
190	<i>Fimbristylis cymosa</i>	Cyperaceae	Herb
191	<i>Fimbristylis dichotoma</i>	Cyperaceae	Herb
192	<i>Fimbristylis miliaceae</i>	Cyperaceae	Herb
193	<i>Fimbristylis ovata</i>	Cyperaceae	Herb
194	<i>Kyllinga nemoralis</i>	Cyperaceae	Herb
195	<i>Mariscus paniceus</i>	Cyperaceae	Herb
196	<i>Scirpus littoralis</i>	Cyperaceae	Herb
197	<i>Diospyros montana</i>	Ebenaceae	Tree
198	<i>Maba buxifolia</i>	Ebenaceae	Shrub
199	<i>Bergia ammanioides</i>	Elatinaceae	Herb
200	<i>Acalypha indica</i>	Euphorbiaceae	Herb
201	<i>Acalypha fruticosa</i>	Euphorbiaceae	Shrub
202	<i>Breynia vitis-idaea</i>	Euphorbiaceae	Shrub
203	<i>Croton sparsiflorus</i>	Euphorbiaceae	Herb
204	<i>Drypetes roxburghii</i>	Euphorbiaceae	Tree
205	<i>Drypetes sepiaria</i>	Euphorbiaceae	Tree
206	<i>Euphorbia hirta</i>	Euphorbiaceae	Herb
207	<i>Euphorbia microphylla</i>	Euphorbiaceae	Herb
208	<i>Euphorbia rosea</i>	Euphorbiaceae	Herb
209	<i>Fluggea leucopyros</i>	Euphorbiaceae	Shrub
210	<i>Fluggea virosa</i>	Euphorbiaceae	Shrub
211	<i>Jatropha curcus</i>	Euphorbiaceae	Shrub
212	<i>Jatropha glandulifera</i>	Euphorbiaceae	Shrub
213	<i>Jatropha gossypifolia</i>	Euphorbiaceae	Shrub
214	<i>Jatropha tanjorensis</i>	Euphorbiaceae	Shrub
215	<i>Mallotus philippensis</i>	Euphorbiaceae	Tree
216	<i>Micrococca mercurialis</i>	Euphorbiaceae	Herb

217	<i>Phyllanthus emblica</i>	Euphorbiaceae	Tree
218	<i>Phyllanthus gardenerii</i>	Euphorbiaceae	Herb
219	<i>Phyllanthus maderaspatensis</i>	Euphorbiaceae	Herb
220	<i>Phyllanthus polyphyllus</i>	Euphorbiaceae	Shrub
221	<i>Phyllanthus reticulatus</i>	Euphorbiaceae	Shrub
222	<i>Phyllanthus uliginosa</i>	Euphorbiaceae	Herb
223	<i>Phyllanthus wightianus</i>	Euphorbiaceae	Herb
224	<i>Ricinus communis</i>	Euphorbiaceae	Tree
225	<i>Sebastiania chamaelea</i>	Euphorbiaceae	Herb
226	<i>Tragia involucrata</i>	Euphorbiaceae	Climber
227	<i>Tragia plukenetii</i>	Euphorbiaceae	Climber
228	<i>Abrus precatorius</i>	Fabaceae	Straggler
229	<i>Aeschynomene aspera</i>	Fabaceae	Herb
230	<i>Alysicarpus monilifer</i>	Fabaceae	Herb
231	<i>Alysicarpus rugosus</i>	Fabaceae	Herb
232	<i>Alysicarpus vaginalis</i>	Fabaceae	Herb
233	<i>Butea monosperma</i>	Fabaceae	Tree
234	<i>Canavalia gladiata</i>	Fabaceae	Climber
235	<i>Clitoria ternatea</i>	Fabaceae	Climber
236	<i>Crotalaria evolvuloides</i>	Fabaceae	Herb
237	<i>Crotalaria juncea</i>	Fabaceae	Herb
238	<i>Crotalaria mysorensis</i>	Fabaceae	Herb
239	<i>Crotalaria verrucosa</i>	Fabaceae	Shrub
240	<i>Dalbergia paniculata</i>	Fabaceae	Tree
241	<i>Derris scandens</i>	Fabaceae	Straggler
242	<i>Desmodium gangeticum</i>	Fabaceae	Herb
243	<i>Glychirrhiza glabra</i>	Fabaceae	Straggler
244	<i>Indigofera linnaei</i>	Fabaceae	Herb
245	<i>Indigofera tinctoria</i>	Fabaceae	Shrub
246	<i>Indigofera trifoliata</i>	Fabaceae	Herb
247	<i>Indigofera trita</i>	Fabaceae	Herb
248	<i>Pongamia pinnata</i>	Fabaceae	Tree
249	<i>Pseudarthria viscida</i>	Fabaceae	Herb
250	<i>Rhynchosia minima</i>	Fabaceae	Herb
251	<i>Rothia indica</i>	Fabaceae	Herb
252	<i>Sesbania procumbens</i>	Fabaceae	Herb
253	<i>Stylosanthes fruticosus</i>	Fabaceae	Herb
254	<i>Tephrosia purpurea</i>	Fabaceae	Herb
255	<i>Tephrosia villosa</i>	Fabaceae	Herb
256	<i>Vigna trilobata</i>	Fabaceae	Herb
257	<i>Zornia gibbosa</i>	Fabaceae	Herb
258	<i>Flacourtia indica</i>	Flacourtiaceae	Tree
259	<i>Flacourtia</i> sp.	Flacourtiaceae	Tree
260	<i>Enicostemma littorale</i>	Gentianaceae	Herb

261	<i>Salacia chinensis</i>	Hippocrateaceae	Straggler
262	<i>Loseneeriella obtusifolia</i>	Hippocratiaceae	Straggler
263	<i>Hydrilla verticillata</i>	Hydrocharitaceae	Herb
264	<i>Ottelia alismoides</i>	Hydrocharitaceae	Herb
265	<i>Anisomeles indica</i>	Lamiaceae	Herb
266	<i>Anisomeles malabarica</i>	Lamiaceae	Shrub
267	<i>Hyptis suaveolens</i>	Lamiaceae	Herb
268	<i>Leanotis nepetifolia</i>	Lamiaceae	Herb
269	<i>Ocimum sanctum</i>	Lamiaceae	Herb
270	<i>Orthosiphon pallidus</i>	Lamiaceae	Herb
271	<i>Cassytha filiformis</i>	Lauraceae	Climber
272	<i>Barringtonia acutangula</i>	Lecythidaceae	Tree
273	<i>Lemna minor</i>	Lemnaceae	Herb
274	<i>Gloriosa superba</i>	Liliaceae	Herb
275	<i>Sansevieria roxburghiana</i>	Liliaceae	Herb
276	<i>Hugonia mystax</i>	Linaceae	Straggler
277	<i>Strychnos nux-vomica</i>	Loganiaceae	Tree
278	<i>Dendrophoea falcata</i>	Loranthaceae	Shrub
279	<i>Ammania baccifera</i>	Lythraceae	Herb
280	<i>Abutilon hirtum</i>	Malvaceae	Shrub
281	<i>Abutilon indicum</i>	Malvaceae	Shrub
282	<i>Hibiscus micranthus</i>	Malvaceae	Herb
283	<i>Hibiscus vitifolius</i>	Malvaceae	Shrub
284	<i>Pavonia procumbens</i>	Malvaceae	Herb
285	<i>Pavonia zeylanica</i>	Malvaceae	Herb
286	<i>Sida acuta</i>	Malvaceae	Herb
287	<i>Sida cordata</i>	Malvaceae	Herb
288	<i>Sida cordifolia</i>	Malvaceae	Herb
289	<i>Sida rhomboidea</i>	Malvaceae	Herb
290	<i>Thespesia populnea</i>	Malvaceae	Tree
291	<i>Urena lobata</i>	Malvaceae	Shrub
292	<i>Memecylon edule</i>	Melastomataceae	Shrub
293	<i>Memecylon umbellatum</i>	Melastomataceae	Shrub
294	<i>Azadirachta indica</i>	Meliaceae	Tree
295	<i>Khaya senegalensis</i>	Meliaceae	Tree
296	<i>Melia azaderach</i>	Meliaceae	Tree
297	<i>Swietenia macrophylla</i>	Meliaceae	Tree
298	<i>Cissampelos pereira</i>	Menispermaceae	Climber
299	<i>Cocculus hirsutus</i>	Menispermaceae	Climber
300	<i>Pachygone ovata</i>	Menispermaceae	Climber
301	<i>Tiliacora acuminata</i>	Menispermaceae	Straggler
302	<i>Tinospora cordifolia</i>	Menispermaceae	Climber
303	<i>Acacia auriculiformis</i>	Mimosaceae	Tree
304	<i>Acacia caesia</i>	Mimosaceae	Straggler

305	<i>Acacia chundra</i>	Mimosaceae	Tree
306	<i>Acacia leucophloea</i>	Mimosaceae	Tree
307	<i>Acacia mangium</i>	Mimosaceae	Tree
308	<i>Acacia nilotica</i>	Mimosaceae	Tree
309	<i>Acacia torta</i>	Mimosaceae	Straggler
310	<i>Adenanthera pavoniana</i>	Mimosaceae	Tree
311	<i>Dicrostachys cinerea</i>	Mimosaceae	Shrub
312	<i>Prosopis juliflora</i>	Mimosaceae	Tree
313	<i>Ficus benghalensis</i>	Moraceae	Tree
314	<i>Ficus hispida</i>	Moraceae	Tree
315	<i>Ficus racemosa</i>	Moraceae	Tree
316	<i>Ficus religiosa</i>	Moraceae	Tree
317	<i>Streblus asper</i>	Moraceae	Tree
318	<i>Syzygium cuminii</i>	Myrtaceae	Tree
319	<i>Najas indica</i>	Najadaceae	Herb
320	<i>Najas minor</i>	Najadaceae	Herb
321	<i>Boerhavia diffusa</i>	Nyctaginaceae	Herb
322	<i>Boerhavia erecta</i>	Nyctaginaceae	Herb
323	<i>Nelumbo nucifera</i>	Nymphaeaceae	Herb
324	<i>Nymphaea nouchalii</i>	Nymphaeaceae	Herb
325	<i>Ochna ontusata</i>	Ochnaceae	Shrub
326	<i>Jasminum rigidum</i>	Oleaceae	Straggler
327	<i>Biophytum sensitivum</i>	Oxalidaceae	Herb
328	<i>Pandanus odoratissimus</i>	Pandanaceae	Tree
329	<i>Passiflora foetida</i>	Passifloraceae	Climber
330	<i>Martynia annua</i>	Pedaliaceae	Herb
331	<i>Pedaliium murex</i>	Pedaliaceae	Herb
332	<i>Plumbago zeylanica</i>	Plumbaginaceae	Shrub
333	<i>Alloteropsis cimicina</i>	Poaceae	Grass
334	<i>Andropogon pumilus</i>	Poaceae	Grass
335	<i>Apluda mutica</i>	Poaceae	Grass
336	<i>Aristida adscensionis</i>	Poaceae	Grass
337	<i>Aristida funiculata</i>	Poaceae	Grass
338	<i>Aristida hystrix</i>	Poaceae	Grass
339	<i>Arundo donax</i>	Poaceae	Grass
340	<i>Axonophus compressus</i>	Poaceae	Grass
341	<i>Bambusa arundinacea</i>	Poaceae	Tree
342	<i>Bothriochloa pertusa</i>	Poaceae	Grass
343	<i>Brachiaria ramosa</i>	Poaceae	Grass
344	<i>Brachiaria remota</i>	Poaceae	Grass
345	<i>Cenchrus ciliaris</i>	Poaceae	Grass
346	<i>Centotheca lappacea</i>	Poaceae	Grass
347	<i>Chloris barbata</i>	Poaceae	Grass
348	<i>Chloris dolichostachya</i>	Poaceae	Grass

349	<i>Chrysopogon aciculatus</i>	Poaceae	Grass
350	<i>Chrysopogon asper</i>	Poaceae	Grass
351	<i>Coelachyrum lagopoides</i>	Poaceae	Grass
352	<i>Cymbopogon citratus</i>	Poaceae	Grass
353	<i>Cymbopogon flexuosus</i>	Poaceae	Grass
354	<i>Cymbopogon martinii</i>	Poaceae	Grass
355	<i>Cynodon barberi</i>	Poaceae	Grass
356	<i>Cynodon dactylon</i>	Poaceae	Grass
357	<i>Dactyloctenium aegyptium</i>	Poaceae	Grass
358	<i>Dactyloctenium aristatum</i>	Poaceae	Grass
359	<i>Echinochloa colona</i>	Poaceae	Grass
360	<i>Eleusine indica</i>	Poaceae	Grass
361	<i>Eragrostis amabilis</i>	Poaceae	Grass
362	<i>Eragrostis plumosa</i>	Poaceae	Grass
363	<i>Eragrostis unioloides</i>	Poaceae	Grass
364	<i>Eragrostis viscosa</i>	Poaceae	Grass
365	<i>Iseilema antheporoides</i>	Poaceae	Grass
366	<i>Iseilema laxum</i>	Poaceae	Grass
367	<i>Leptochloa chinensis</i>	Poaceae	Grass
368	<i>Manisurus myoros</i>	Poaceae	Grass
369	<i>Mnesithea laevis</i>	Poaceae	Grass
370	<i>Ophiuros exaltatus</i>	Poaceae	Grass
371	<i>Oplismenus compositus</i>	Poaceae	Grass
372	<i>Oropetium thomaeum</i>	Poaceae	Grass
373	<i>Oryza sativa</i>	Poaceae	Grass
374	<i>Panicum notatum</i>	Poaceae	Grass
375	<i>Panicum psilopodium</i>	Poaceae	Grass
376	<i>Panicum trypheron</i>	Poaceae	Grass
377	<i>Paspalidium flavidum</i>	Poaceae	Grass
378	<i>Paspalidium geminatum</i>	Poaceae	Grass
379	<i>Paspalidium punctatum</i>	Poaceae	Grass
380	<i>Paspalum longifolium</i>	Poaceae	Grass
381	<i>Paspalum scrobiculatum</i>	Poaceae	Grass
382	<i>Paspalum vaginatum</i>	Poaceae	Grass
383	<i>Perotis indica</i>	Poaceae	Grass
384	<i>Phragmites karka</i>	Poaceae	Shrub
385	<i>Saccarum spontaneum</i>	Poaceae	Grass
386	<i>Sacciolepis indica</i>	Poaceae	Grass
387	<i>Sehima nervosa</i>	Poaceae	Grass
388	<i>Setaria verticillata</i>	Poaceae	Grass
389	<i>Setaria pumila</i>	Poaceae	Grass
390	<i>Sporobolus coromandelianus</i>	Poaceae	Grass
391	<i>Sporobolus indicus</i>	Poaceae	Grass
392	<i>Sporobolus maderaspatanus</i>	Poaceae	Grass

393	<i>Sporobolus spicatus</i>	Poaceae	Grass
394	<i>Typha angustata</i>	Poaceae	Shrub
395	<i>Vetiveria zizanioides</i>	Poaceae	Grass
396	<i>Zoysia matrella</i>	Poaceae	Grass
397	<i>Antigonon leptopus</i>	Polygonaceae	Climber
398	<i>Polygonum glabrum</i>	Polygonaceae	Herb
399	<i>Polygonum hydropiper</i>	Polygonaceae	Herb
400	<i>Monochoria vaginalis</i>	Pontederiaceae	Herb
401	<i>Potamogeton nodosus</i>	Potamogetonaceae	Herb
402	<i>Ziziphus mauritiana</i>	Rhamnaceae	Tree
403	<i>Ziziphus oenoplia</i>	Rhamnaceae	Straggler
404	<i>Ziziphus trinervia</i>	Rhamnaceae	Tree
405	<i>Ziziphus xylopyrus</i>	Rhamnaceae	Tree
406	<i>Borreria hispida</i>	Rubiaceae	Herb
407	<i>Borreria ocymoides</i>	Rubiaceae	Herb
408	<i>Borreria pusilla</i>	Rubiaceae	Herb
409	<i>Ixora arborea</i>	Rubiaceae	Tree
410	<i>Mitragyna parvifolia</i>	Rubiaceae	Tree
411	<i>Morinda tinctoria</i>	Rubiaceae	Tree
412	<i>Oldenlandia biflora</i>	Rubiaceae	Herb
413	<i>Oldenlandia umbellata</i>	Rubiaceae	Herb
414	<i>Pavetta indica</i>	Rubiaceae	Shrub
415	<i>Randia brandisii</i>	Rubiaceae	Tree
416	<i>Randia dumetorum</i>	Rubiaceae	Tree
417	<i>Randia malabarica</i>	Rubiaceae	Shrub
418	<i>Tarenna asiatica</i>	Rubiaceae	Shrub
419	<i>Aegle marmelos</i>	Rutaceae	Tree
420	<i>Atalantia monophylla</i>	Rutaceae	Tree
421	<i>Atalantia racemosa</i>	Rutaceae	Tree
422	<i>Chloroxylon swietenia</i>	Rutaceae	Tree
423	<i>Clausena dentata</i>	Rutaceae	Shrub
424	<i>Glycosmis mauritiana</i>	Rutaceae	Shrub
425	<i>Glycosmis pentaphylla</i>	Rutaceae	Shrub
426	<i>Toddalia asiatica</i>	Rutaceae	Straggler
427	<i>Azima tetracantha</i>	Salvadoraceae	Shrub
428	<i>Salvadora persica</i>	Salvadoraceae	Tree
429	<i>Salvinia molesta</i>	Salviniaceae	Herb
430	<i>Santalum album</i>	Santalaceae	Tree
431	<i>Allophylus serratus</i>	Sapindaceae	Tree
432	<i>Cardiospermum halicacabum</i>	Sapindaceae	Climber
433	<i>Dodonaea viscosa</i>	Sapindaceae	Shrub
434	<i>Lepisanthes tetraphylla</i>	Sapindaceae	Tree
435	<i>Sapindus emarginata</i>	Sapindaceae	Tree
436	<i>Madhuca longifolia</i>	Sapotaceae	Tree

437	<i>Mimusops elengi</i>	Sapotaceae	Tree
438	<i>Bacopa monnieri</i>	Scrophulariaceae	Herb
439	<i>Lindernia antipoda</i>	Scrophulariaceae	Herb
440	<i>Scoparia dulcis</i>	Scrophulariaceae	Herb
441	<i>Stemodia viscosa</i>	Scrophulariaceae	Herb
442	<i>Striga asiatica</i>	Scrophulariaceae	Herb
443	<i>Datura innoxia</i>	Solanaceae	Shrub
444	<i>Datura metel</i>	Solanaceae	Shrub
445	<i>Physalis minima</i>	Solanaceae	Herb
446	<i>Solanum surrattense</i>	Solanaceae	Herb
447	<i>Solanum torvum</i>	Solanaceae	Shrub
448	<i>Solanum trilobatum</i>	Solanaceae	Tree
449	<i>Melochia corchorifolia</i>	Sterculiaceae	Herb
450	<i>Sterculia foetida</i>	Sterculiaceae	Tree
451	<i>Waltheria indica</i>	Sterculiaceae	Herb
452	<i>Corchorus aestuans</i>	Tiliaceae	Herb
453	<i>Corchorus capsularis</i>	Tiliaceae	Herb
454	<i>Corchorus olitorius</i>	Tiliaceae	Herb
455	<i>Corchorus tridens</i>	Tiliaceae	Herb
456	<i>Grewia hirsuta</i>	Tiliaceae	Shrub
457	<i>Grewia tenax</i>	Tiliaceae	Shrub
458	<i>Muntingia calabura</i>	Tiliaceae	Tree
459	<i>Triumfetta rhomboidea</i>	Tiliaceae	Herb
460	<i>Triumfetta rotundifolia</i>	Tiliaceae	Herb
461	<i>Elastostemma</i> sp.	Urticaceae	Herb
462	<i>Vallisneria spiralis</i>	Vallisneriaceae	Herb
463	<i>Gmelina arborea</i>	Verbenaceae	Tree
464	<i>Gmelina asiatica</i>	Verbenaceae	Shrub
465	<i>Lantana camara</i>	Verbenaceae	Shrub
466	<i>Phyla nodiflora</i>	Verbenaceae	Herb
467	<i>Stachytarpheta jamaicensis</i>	Verbenaceae	Herb
468	<i>Tectona grandis</i>	Verbenaceae	Tree
469	<i>Vitex altissima</i>	Verbenaceae	Tree
470	<i>Vitex leucoxylon</i>	Verbenaceae	Tree
471	<i>Vitex negundo</i>	Verbenaceae	Tree
472	<i>Vitex trifolia</i>	Verbenaceae	Tree
473	<i>Hybanthus ennaespermus</i>	Violaceae	Herb
474	<i>Viscum articulatum</i>	Viscaceae	Herb
475	<i>Viscum ramosissimum</i>	Viscaceae	Herb
476	<i>Cayratia pedata</i>	Vitaceae	Climber
477	<i>Cissus quadrangularis</i>	Vitaceae	Climber
478	<i>Cissus trifolia</i>	Vitaceae	Climber
479	<i>Cissus vitigenea</i>	Vitaceae	Climber
480	<i>Tribulus terrestris</i>	Zygophyllaceae	Herb

Appendix 4. List of butterflies in and around the study area

Sl. No.	Common name	Scientific name	Family	Status
Family I. Papilionidae				
1	Blue Mormon	<i>Papilio polymnestor</i>	Papilionidae	Endemic
2	Common Banded Peacock	<i>Papilio crino</i>	Papilionidae	Endemic
3	Common Jay	<i>Graphium doson</i>	Papilionidae	
4	Common Mormon	<i>Papilio polytes</i>	Papilionidae	
5	Common Rose	<i>Pachliopta aristolochiae</i>	Papilionidae	
6	Crimson Rose	<i>Pachliopta hector</i>	Papilionidae	Schedule I & Endemic
7	Lime Butterfly	<i>Papilio demoleus</i>	Papilionidae	
8	Southern Birdwing	<i>Troides minos</i>	Papilionidae	Endemic
9	Tailed Jay	<i>Graphium agamemnon</i>	Papilionidae	
Family II. Pieridae				
10	Common Emigrant	<i>Catopsilia pomona</i>	Pieridae	
11	Common Jezebel	<i>Delias eucharis</i>	Pieridae	
12	Common Grass yellow	<i>Eurema hecabe</i>	Pieridae	
13	Common Gull	<i>Cepora nerissa</i>	Pieridae	Schedule II
14	Common Wanderer	<i>Pareronia valeria</i>	Pieridae	
15	Crimson Tip	<i>Colotis danae</i>	Pieridae	
16	Great Orange Tip	<i>Hebomoea glaucippe</i>	Pieridae	
17	Mottled Emigrant	<i>Catopsilia pyranthe</i>	Pieridae	
18	Psyche	<i>Leptosia nina</i>	Pieridae	
19	Small Grass Yellow	<i>Eurema brigitta</i>	Pieridae	
20	Small Orange Tip	<i>Colotis etrida</i>	Pieridae	
21	Spotless Grass Yellow	<i>Eurema laeta</i>	Pieridae	
22	White Orange Tip	<i>Ixias marianne</i>	Pieridae	
23	Yellow Orange Tip	<i>Ixias pyrene</i>	Pieridae	
Family III. Nymphalidae				
24	Angled Castor	<i>Ariadne ariadne</i>	Nymphalidae	
25	Baronet	<i>Euthalia nais</i>	Nymphalidae	
26	Chocolate Pansy	<i>Precis iphita</i>	Nymphalidae	
27	Common Bush Brown	<i>Mycalesis perseus</i>	Nymphalidae	
28	Common Castor	<i>Ariadne merione</i>	Nymphalidae	
29	Common Crow	<i>Euploea core</i>	Nymphalidae	Schedule IV
30	Common Evening Brown	<i>Melanitis leda</i>	Nymphalidae	

31	Common Leopard	<i>Phalanta phalantha</i>	Nymphalidae	
32	Common Sailer	<i>Neptis hylas</i>	Nymphalidae	
33	Common Sergeant	<i>Athyma perius</i>	Nymphalidae	
34	Danaid Eggfly	<i>Hypolimnas misippus</i>	Nymphalidae	Schedule II
35	Dark Blue Tiger	<i>Tirumala septentrionis</i>	Nymphalidae	
36	Double-branded Crow	<i>Euploea sylvester</i>	Nymphalidae	Endemic
37	Glassy Tiger	<i>Parantica aglea</i>	Nymphalidae	
38	Great Eggfly	<i>Hypolimnas bolina</i>	Nymphalidae	
39	Lemon Pansy	<i>Junonia lemonias</i>	Nymphalidae	
40	Peacock Pansy	<i>Junonia almana</i>	Nymphalidae	
41	Plain Tiger	<i>Danaus chrysippus</i>	Nymphalidae	
42	Striped Tiger	<i>Danaus genutia</i>	Nymphalidae	
43	Tawny Coster	<i>Acraea violae</i>	Nymphalidae	
44	Yellow Pansy	<i>Junonia hierta</i>	Nymphalidae	
Family IV. Lycaenidae				
45	African Babul blue	<i>Azonus jesus</i>	Lycaenidae	
46	Banded Blue Pierrot	<i>Discolampa ethion</i>	Lycaenidae	
47	Common Cerulean	<i>Jamides celeno</i>	Lycaenidae	
48	Common Pierrot	<i>Castalius rosimon</i>	Lycaenidae	Schedule I
49	Common Silverline	<i>Spindasis vulcanus</i>	Lycaenidae	
50	Dark Cerulean	<i>Jamides bochus</i>	Lycaenidae	
51	Plains Cupid	<i>Chilades pandava</i>	Lycaenidae	
52	Slate Flash	<i>Rapala manea</i>	Lycaenidae	
53	Tiny Grass Blue	<i>Zizula hylax</i>	Lycaenidae	
54	Zebra Blue	<i>Lepotes plinius</i>	Lycaenidae	
Family V. Hesperidae				
55	Brown Awl	<i>Badamia exclamatoris</i>	Hesperidae	
56	Bush Hopper	<i>Ampittia dioscorides</i>	Hesperidae	
57	Chestnut Bob	<i>Iambrix salsala</i>	Hesperidae	
58	Common Banded Owl	<i>Hasora chromus</i>	Hesperidae	
59	Common Grass Dart	<i>Taractrocera maevius</i>	Hesperidae	
60	Dark Palm Dart	<i>Telicota ancilla</i>	Hesperidae	
61	Indian Palm Bob	<i>Suastus gremius</i>	Hesperidae	
62	Indian Skipper	<i>Spialia galba</i>	Hesperidae	
63	Rice Swift	<i>Borbo cinnara</i>	Hesperidae	
*Schedule of Wildlife Protection Act 1972				

Appendix 5. List of bird species observed in and around Ousteri Lake

Sl. No.	Family	Common name	Scientific name	Habitat	Status	IUCN status	Legal Status
1.	Podicipedidae	Little Grebe	<i>Tachybaptus ruficollis</i>	A	R	-	S-IV
2.	Pelicanidae	Great White Pelican	<i>Pelecanus onocrotalus</i>	A	M	NT	S-IV
3.		Spot-billed Pelican	<i>Pelecanus philippensis</i>	A	R	NT	S-IV
4.	Phalacrocoracidae	Little Cormorant	<i>Phalacrocorax niger</i>	A	R	-	S-IV
5.		Indian Cormorant	<i>Phalacrocorax fuscicollis</i>	A	R	-	S-IV
6.		Great Cormorant	<i>Phalacrocorax carbo</i>	A	R	-	S-IV
7.		Darter	<i>Anhinga melanogaster</i>	A	R	NT	S-IV
8.	Ardeidae	Grey Heron	<i>Ardea cinerea</i>	A	R	-	S-IV
9.		Indian Pond Heron	<i>Ardeola grayii</i>	A	R	-	S-IV
10.		Little Heron	<i>Butorides striata</i>	A	R	-	S-IV
11.		Purple Heron	<i>Ardea purpurea</i>	A	R	-	S-IV
12.		Black-crowned Night Heron	<i>Nycticorax nycticorax</i>	A	R	-	S-IV
13.		Greater Egret	<i>Casmerodius albus</i>	A	R	-	S-IV
14.		Intermediate Egret	<i>Mesophoyx intermedia</i>	A	R	-	S-IV
15.		Little Egret	<i>Egretta garzetta</i>	A	R	-	S-IV
16.		Cattle Egret	<i>Bubulcus ibis</i>	A	R	-	S-IV
17.		Great Bittern	<i>Botaurus stellaris</i>	A	M	-	S-IV
18.		Black Bittern	<i>Dupetor flavicollis</i>	A	R	-	S-IV
19.	Ciconiidae	Painted Stork	<i>Mycteria leucocephala</i>	A	R	-	S-IV
20.		Asian Openbill	<i>Anastomus oscitans</i>	A	R	-	S-IV
21.		Woolly-necked Stork	<i>Ciconia episcopus</i>	A	R	-	S-IV
22.	Threskiornithidae	Black Headed Ibis	<i>Threskiornis melanocephalus</i>	A	R	NT	S-IV
23.		Black Ibis	<i>Pseudibis papillosa</i>	A	R	-	S-IV
24.		Eurasian Spoonbill	<i>Platalea leucorodia</i>	A	R	NT	S-I
25.	Phoenicopteridae	Greater Flamingo	<i>Phoenicopterus ruber</i>	A	M	NT	S-IV
26.		Lesser Flamingo	<i>Phoenicopterus minor</i>	A	M	NT	S-IV

27.	Anatidae	Common Poachard	<i>Aythya ferina</i>	A	M	-	S-IV	
28.		Cotton Pygmy-Goose	<i>Nettapus coromandelianus</i>	A	R	-	S-IV	
29.		Eurasian Wigeon	<i>Anas penelope</i>	A	M	-	S-IV	
30.		Common Teal	<i>Anas crecca</i>	A	M	-	S-IV	
31.		Gargany Teal	<i>Anas querquedula</i>	A	M	-	S-IV	
32.		Mallard	<i>Anas platyrhynchos</i>	A	M	-	S-IV	
33.		Northern Pintail	<i>Anas acuta</i>	A	M	-	S-IV	
34.		Northern Shoveler	<i>Anas clypeata</i>	A	M	-	S-IV	
35.		Spot-billed Duck	<i>Anas poecilorhyncha</i>	A	R	-	S-IV	
36.		Unidentified Duck	<i>Anas sp.</i>	A	M	-	-	
37.		Accipitridae	Besra	<i>Accipiter virgatus</i>	T	M	-	S-I
38.			Shikra	<i>Accipiter badius</i>	T	M	-	S-I
39.	Black Eagle		<i>Ictinaetus malayensis</i>	T	R	-	S-I	
40.	Crested Serpent Eagle		<i>Spilornis cheela</i>	T	R	-	S-I	
41.	White-bellied Sea Eagle		<i>Haliaeetus leucogaster</i>	A	R	EN	S-I	
42.	Black Kite		<i>Milvus migrans</i>	T	R	NT	S-I	
43.	Black-shouldered Kite		<i>Elanus caeruleus</i>	T	R	-	S-I	
44.	Brahminy Kite		<i>Haliastur indus</i>	T	R	-	S-I	
45.	Eurasian Marsh Harrier		<i>Circus aeruginosus</i>	A	M	-	S-I	
46.	Pallid Harrier		<i>Circus macrourus</i>	T	M	NT	S-I	
47.	Pied Harrier		<i>Circus melanoleucos</i>	T	M	-	S-I	
48.	Osprey		<i>Pandion haliaetus</i>	T	M	-	S-I	
49.	Falconidae	Common Kestrel	<i>Falco tinnunculus</i>	T	R	-	S-IV	
50.	Phasianidae	Grey Francolin	<i>Francolinus pondicerianus</i>	T	R	-	S-IV	
51.		Indian Peafowl	<i>Pavo cristatus</i>	T	R	-	S-I	
52.	Rallidae	Common Coot	<i>Fulica atra</i>	A	R	-	S-IV	
53.		Common Moorhen	<i>Gallinula chloropus</i>	A	R	-	S-IV	
54.		Purple Swamphen	<i>Porphyrio porphyrio</i>	A	R	-	S-IV	
55.		White-breasted Waterhen	<i>Amaurornis phoenicurus</i>	A	R	-	S-IV	
56.	Jacanidae	Bronze-winged Jacana	<i>Metopidius indicus</i>	A	R	-	S-IV	

57.		Pheasant Tailed Jacana	<i>Hydrophasianus chirurgus</i>	A	R	-	S-IV
58.	Charadriidae	Grey-headed Lapwing	<i>Vanellus cinereus</i>	A	M	-	S-IV
59.		Red-wattled Lapwing	<i>Vanellus indicus</i>	A	R	-	S-IV
60.		Yellow-wattled Lapwing	<i>Vanellus malabaricus</i>	A	R	-	S-IV
61.		Grey Plover	<i>Pluvialis squatarola</i>	A	M	-	S-IV
62.		Little Ringed Plover	<i>Charadrius dubius</i>	A	M	-	S-IV
63.		Common Redshank	<i>Tringa totanus</i>	A	M	-	S-IV
64.		Marsh Sandpiper	<i>Actitis hypoleucos</i>	A	M	-	S-IV
65.		Green Sandpiper	<i>Tringa ochropus</i>	A	M	-	S-IV
66.		Wood Sandpiper	<i>Tringa glorioles</i>	A	M	-	S-IV
67.		Regurvirostridae	Black-winged Stilt	<i>Himantopus himantopus</i>	A	R	-
68.	Laridae	Black-bellied Tern	<i>Sterna acuticauda</i>	A	M	NT	S-IV
69.		Black-naped Tern	<i>Sterna sumatrana</i>	A	M	-	S-IV
70.		Common Tern	<i>Sterna hirundo</i>	A	M	-	S-IV
71.		River Tern	<i>Sterna aurantia</i>	A	R	-	S-IV
72.		Whiskered Tern	<i>Chlidonias hybridus</i>	A	M	-	S-IV
73.		White-winged Tern	<i>Chlidonias niger</i>	A	M	-	S-IV
74.	Pteroclididae	Dunlin	<i>Calidris alpina</i>	A	M	-	S-IV
75.		Broad Billed Sandpiper	<i>Limicola falcinellus</i>	A	M	-	S-IV
76.		Curlew Sandpiper	<i>Calidris ferruginea</i>	A	M	-	S-IV
77.		Spoon Billed Sandpiper	<i>Eurynorhynchus pygmeus</i>	A	M	CE	S-IV
78.		Ruff	<i>Philomachus pugnax</i>	A	M	-	S-IV
79.		Little Stint	<i>Calidris minuta</i>	A	M	-	S-IV
80.		Common Snipe	<i>Gallinago gallinago</i>	A	M	-	S-IV
81.	Columbidae	Rock Pigeon	<i>Columba livia</i>	T	R	-	S-IV
82.		Laughing Dove	<i>Streptopelia senegalensis</i>	T	R	-	S-IV
83.		Red Collared Dove	<i>Streptopelia tranquebarica</i>	T	R	-	S-IV
84.		Spotted Dove	<i>Streptopelia chinensis</i>	T	R	-	S-IV
85.	Psittacidae	Rose-ringed Parakeet	<i>Psittacula krameri</i>	T	R	-	S-IV
86.	Cuculidae	Chestnut-winged Cuckoo	<i>Clamator coromandus</i>	T	M	-	S-IV

87.		Common Hawk Cuckoo	<i>Hierococcyx varius</i>	T	R	-	S-IV
88.		Drongo Cuckoo	<i>Surniculus lugubris</i>	T	R	-	S-IV
89.		Pied-crested Cuckoo	<i>Clamator jacobinus</i>	T	R	-	S-IV
90.		Asian Koel	<i>Eudynamys scolopacea</i>	T	R	-	S-IV
91.		Blue-faced Malkoha	<i>Phaenicophaeus viridirostris</i>	T	R	-	S-IV
92.		Greater Coucal	<i>Centropus sinensis</i>	T	R	-	S-IV
93.		Lesser Coucal	<i>Centropus bengalensis</i>	T	R	-	S-IV
94.	Strigidae	Barn Owl	<i>Tyto alba</i>	T	R	-	S-IV
95.		Spotted Owlet	<i>Athene brama</i>	T	R	-	S-IV
96.	Caprimulgidae	Indian Nightjar	<i>Caprimulgus asiaticus</i>	T	R	-	S-IV
97.	Apodidae	Asian Palm Swift	<i>Cypsiurus balasiensis</i>	T	R	-	-
98.		Crested Tree-swift	<i>Hemiprocne coronata</i>	T	R	-	-
99.		House Swift	<i>Apus affinis</i>	T	R	-	-
100.	Alcedinidae	Black-capped Kingfisher	<i>Halcyon pileata</i>	A	R	-	
101.		Common Kingfisher	<i>Alcedo atthis</i>	A	R	-	S-IV
102.		Pied Kingfisher	<i>Ceryle rudis</i>	A	R	-	S-IV
103.		Stork-billed Kingfisher	<i>Halcyon capensis</i>	A	R	-	S-IV
104.		White-breasted Kingfisher	<i>Halcyon smyrnensis</i>	A	R	-	S-IV
105.	Meropidae	Blue-tailed Bee-eater	<i>Merops philippinus</i>	T	R	-	-
106.		Chestnut-headed Bee-eater	<i>Merops leschenaulti</i>	T	R	-	-
107.		Green Bee-eater	<i>Merops orientalis</i>	T	R	-	-
108.	Coraciidae	Indian Roller	<i>Coracias benghalensis</i>	T	R	-	S-IV
109.	Upupidae	Common Hoopoe	<i>Upupa epops</i>	T	R	-	S-IV
110.	Capitonidae	Coppersmith Barbet	<i>Megalaima haemacephala</i>	T	R	-	S-IV
111.		White-cheeked Barbet	<i>Megalaima viridis</i>	T	R	-	S-IV
112.	Picidae	Black-rumped Flameback	<i>Dinopium benghalense</i>	T	R	-	S-IV
113.		Common Flameback	<i>Dinopium javanense</i>	T	R	-	S-IV
114.	Pittidae	Indian Pitta	<i>Pitta brachyura</i>	T	R	-	S-IV
115.	Alaudidae	Ashy-crowned Sparrow Lark	<i>Eremopterix griseus</i>	T	R	-	S-IV
116.		Rufous-winged Bushlark	<i>Mirafra assamica</i>	T	R	-	S-IV

117.	Hirundinidae	Barn Swallow	<i>Hirundo rustica</i>	T	M	-	-
118.		Pacific Swallow	<i>Hirundo tahitica</i>	T	R	-	-
119.		Red-rumped Swallow	<i>Hirundo daurica</i>	T	R	-	-
120.	Laniidae	Bay-backed Shrike	<i>Lanius vittatus</i>	T	R	-	-
121.		Southern Grey Shrike	<i>Lanius meidionalis</i>	T	R	-	-
122.	Oriolidae	Black-hooded Oriole	<i>Oriolus xanthornus</i>	T	R	-	S-IV
123.		Eurasian Golden Oriole	<i>Oriolus oriolus</i>	T	R	-	S-IV
124.	Dicruridae	Ashy Drongo	<i>Dicrurus leucophaeus</i>	T	M	-	S-IV
125.		Black Drongo	<i>Dicrurus macrocercus</i>	T	R	-	S-IV
126.		White-bellied Drongo	<i>Dicrurus caerulescens</i>	T	R	-	S-IV
127.	Artamidae	Ashy Wood Swallow	<i>Artamus fuscus</i>	T	R	-	-
128.	Sturnidae	Brahminy Starling	<i>Sturnus pagodarum</i>	T	R	-	S-IV
129.		Common Myna	<i>Acridotheres tristis</i>	T	R	-	S-IV
130.		Rosy Starling	<i>Sturnus roseus</i>	T	M	-	S-IV
131.	Corvidae	House Crow	<i>Corvus splendens</i>	T	R	-	S-IV
132.		Jungle Crow	<i>Corvus macrorhynchos</i>	T	R	-	S-IV
133.		Rufous Treepie	<i>Dendrocitta vagabunda</i>	T	R	-	S-IV
134.	Campephagidae	Common Wood Shrike	<i>Tephrodornis pondicerianus</i>	T	R	-	S-IV
135.	Irenidae	Common Iora	<i>Aegithina tiphia</i>	T	R	-	S-IV
136.	Pycnonotidae	Red-vented Bulbul	<i>Pycnonotus cafer</i>	T	R	-	S-IV
137.		White-browed Bulbul	<i>Pycnonotus luteolus</i>	T	R	-	S-IV
138.	Muscicapidae	Jungle Babbler	<i>Turdoides striatus</i>	T	R	-	S-IV
139.		White-headed Babbler	<i>Turdoides affinis</i>	T	R	-	S-IV
140.		Tawny-bellied Babbler	<i>Dumetia hyperythra</i>	T	R	-	S-IV
141.		Paradise flycatcher	<i>Terpsiphone paradisi</i>	T	R	-	S-IV
142.		White-browed Fantail	<i>Rhipidura aureola</i>	T	R	-	S-IV
143.		Blyth's Reed Warbler	<i>Acrocephalus dumetorum</i>	T	M	-	S-IV
144.		Greenish Warbler	<i>Phylloscopus trochiloides</i>	T	M	-	S-IV
145.		Common Tailorbird	<i>Orthotomus atrogularis</i>	T	R	-	S-IV
146.		Pied Buschat	<i>Saxicola caprata</i>	T	R	-	S-IV

147.		Indian Robin	<i>Saxicoloides fulicata</i>	T	R	-	S-IV
148.		Oriental Magpie Robin	<i>Copsychus saularis</i>	T	R	-	S-IV
149.		Paddyfield Pipit	<i>Anthus rufulus</i>	T	R	-	S-IV
150.		Ashy Prinia	<i>Prinia socialis</i>	T	R	-	S-IV
151.		Franklin's Prinia	<i>Prinia hodgsonii</i>	T	M	-	S-IV
152.		Jungle Prinia	<i>Prinia sylvatica</i>	T	R	-	S-IV
153.		Plain Prinia	<i>Prinia inornata</i>	T	R	-	S-IV
154.	Motacillidae	Grey Wagtail	<i>Motacilla cinerea</i>	A	M	-	S-IV
155.		White-browed Wagtail	<i>Motacilla maderaspatensis</i>	A	R	-	S-IV
156.		Yellow Wagtail	<i>Motacilla flava</i>	A	M	-	S-IV
157.	Dicaeidae	Thick-billed Flowerpecker	<i>Dicaeum agile</i>	T	R	-	S-IV
158.		Tickell's Flowerpecker	<i>Dicaeum erythrorhynchus</i>	T	R	-	S-IV
159.	Nectariniidae	Loten's Sunbird	<i>Nectarinia lotenia</i>	T	R	-	S-IV
160.		Purple Sunbird	<i>Nectarinia asiatica</i>	T	R	-	S-IV
161.		Purple-rumped Sunbird	<i>Nectarinia zeylonica</i>	T	R	-	S-IV
162.	Ploceidae	House Sparrow	<i>Passer domesticus</i>	T	R	-	S-IV
163.		Baya Weaver	<i>Ploceus philippinus</i>	T	R	-	S-IV
164.	Estrildinae	Black-headed Munia	<i>Lonchura malacca</i>	T	R	-	S-IV
165.		Scaly-breasted Munia	<i>Lonchura punctulata</i>	T	R	-	S-IV
166.		Indian Silverbill	<i>Lonchura malabarica</i>	T	R	-	S-IV

Where- A-Aquatic; T-Terrestrial; M-Migratory; R-Resident; CE-Critically Endangered; EN-Endangered; NT-Near Threatened; S-I-Schedule I; S-IV- Schedule IV.

Appendix 6. Water depth profile of Ousteri lake (January 2011)

Transect -Sampling point No.	Longitude	Latitude	Water depth (m)	
Transect No. 1: from boat house to western bank of lake	1	11° 56' 29.6''	79° 44' 46.4''	0.0
	2	11° 56' 30.0''	79° 44' 48.6''	3.6
	3	11° 56' 34.1''	79° 44' 48.8''	3.0
	4	11° 56' 36.0''	79° 44' 48.3''	4.0
	5	11° 56' 39.6''	79° 44' 47.1''	3.0
	6	11° 56' 42.8''	79° 44' 46.0''	3.0
	7	11° 56' 45.7''	79° 44' 44.4''	3.0
	8	11° 56' 48.6''	79° 44' 43.4''	3.1
	9	11° 56' 51.9''	79° 44' 42.0''	3.2
	10	11° 56' 55.0''	79° 44' 41.1''	3.2
	11	11° 56' 58.1''	79° 44' 40.7''	3.2
	12	11° 56' 01.5''	79° 44' 39.9''	3.1
	13	11° 57' 04.6''	79° 44' 39.2''	3.1
	14	11° 57' 08.3''	79° 44' 38.5''	3.0
	15	11° 57' 10.9''	79° 44' 38.0''	3.0
	16	11° 57' 14.1''	79° 44' 37.5''	2.9
	17	11° 57' 17.4''	79° 44' 36.9''	2.9
	18	11° 57' 20.9''	79° 44' 36.0''	2.8
	19	11° 57' 23.8''	79° 44' 35.6''	2.7
	20	11° 57' 27.0''	79° 44' 35.1''	2.5
	21	11° 57' 30.2''	79° 44' 34.3''	2.5
	22	11° 57' 36.4''	79° 44' 32.6''	2.4
	23	11° 57' 39.7''	79° 44' 31.3''	2.4
	24	11° 57' 45.7''	79° 44' 29.6''	2.1
	25	11° 57' 13.0''	79° 44' 27.5''	1.9
	26	11° 57' 41.8''	79° 44' 5.91''	0.0
Transect No. 2: from western bank of lake to entry of canal	1	11° 57' 41.8''	79° 44' 5.91''	0.0
	2	11° 57' 13.0''	79° 44' 27.5''	2.6
	3	11° 57' 17.2''	79° 44' 00.4''	2.9
	4	11° 57' 14.5''	79° 44' 57.6''	2.9
	5	11° 57' 10.7''	79° 44' 52.7''	3.0
	6	11° 57' 08.4''	79° 44' 50.2''	3.1
	7	11° 57' 06.0''	79° 44' 47.4''	3.1
	8	11° 57' 04.1''	79° 44' 45.1''	3.1
	9	11° 57' 02.0''	79° 44' 42.8''	3.1
	10	11° 56' 59.8''	79° 44' 39.9''	3.1
	11	11° 56' 57.9''	79° 44' 37.5''	3.1
	12	11° 56' 56.0''	79° 44' 35.2''	3.1
	13	11° 56' 53.5''	79° 44' 32.3''	3.0

	14	11° 56' 51.6"	79° 44' 29.9"	2.9
	15	11° 56' 49.9"	79° 44' 27.4"	3.0
	16	11° 56' 47.7"	79° 44' 24.9"	2.8
	17	11° 56' 45.3"	79° 44' 22.3"	2.9
	18	11° 56' 43.6"	79° 44' 20.2"	2.8
	19	11° 56' 40.9"	79° 44' 17.2"	2.6
	20	11° 56' 39.0"	79° 44' 15.1"	2.4
	21	11° 56' 36.6"	79° 44' 12.7"	2.3
	22	11° 56' 34.3"	79° 44' 10.0"	2.1
	23	11° 56' 32.0"	79° 44' 07.3"	2.0
	24	11° 56' 29.8"	79° 44' 04.4"	2.1
	25	11° 56' 29.0"	79° 44' 02.1"	3.4
	26	11° 56' 28.2"	79° 44' 01.6"	0.0
Transect No. 3: Canal entry to boat house	1	11° 56' 28.2"	79° 44' 01.6"	0.0
	2	11° 56' 26.9"	79° 44' 08.9"	2.5
	3	11° 56' 26.4"	79° 44' 15.3"	3.3
	4	11° 56' 28.3"	79° 44' 22.6"	2.6
	5	11° 56' 28.3"	79° 44' 22.6"	2.9
	6	11° 56' 29.2"	79° 44' 28.6"	4.5
	7	11° 56' 30.7"	79° 44' 37.5"	4.4
	8	11° 56' 31.4"	79° 44' 43.3"	4.2
	9	11° 56' 30.9"	79° 44' 47.9"	3.6
	10	11° 56' 30.0"	79° 44' 48.6"	3.6
	11	11° 56' 29.6"	79° 44' 46.4"	0.0
Average water depth of the lake was found to be 3.0 meter. The locations with water depth of 0.0 mtr are lake banks				