



**STATUS OF WETLANDS
AND WETLAND BIRDS
IN SELECTED DISTRICTS OF TAMILNADU**



SÁLIM ALI CENTRE FOR ORNITHOLOGY & NATURAL ISTORY

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&
NATURAL HISTORY**

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1. INTRODUCTION

The term “wetland” has been used in the broad sense as defined in the text of the convention on wetlands of international importance, especially as waterfowl habitat (The Ramsar Convention). Wetlands are one among the most important ecosystems on earth. Wetlands also have been called “biological supermarket” because of the extensive food chain and rich biodiversity that they support (Mitsch and Gosselink, 2000). Wetlands are one of the most complex ecosystems of the world, unique in many aspects and are as old or older than the rivers (Unni, 2002). Wetlands are described as “kidney of the landscape” because they function as the downstream receivers of water and waste from both natural and human resources (Mitsch and Gosoelink, 2000). They are one of the most productive ecosystems of the world (Maltby, 1986) and occupy about 6% of the earth’s surface (Maltby and Turner, 1983).

The term wetland refers to lowlands covered with shallow and some times temporary or intermittent waters. They are referred to by such names as marshes, swamps, bogs, wet meadows, potholes, sloughs and river. Overflow lands, shallow, lakes, and ponds usually with emergent vegetation as a conspicuous feature are included in the definition.

“Wetlands” have been defined as swamps and other damp areas of land but in common parlance the word is used interchangeably with “Lakes”, which denotes a large body of water surrounded by land. However internationally accepted term of wetlands describes them (Ramsar convention) as “Area 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 does not exceed six meters”(Chatrath, 1992)

Wetlands are the important bird habitats and they use them for feeding, roosting and breeding (Weller, 1999 and Stewart, 2001). Birds need functional access to the wetland or wetland products during their life cycle, especially during breeding season, can be

called “wetland dependent”. Other birds getting wetland for some of their needs might use both wetlands and upland habitats (Stewart, 2001).

When the rainfall is average and above the wetland supports a large congregation of wetland birds (Balachandran and Alagar Rajan, 1994-1995). Wetlands are among the highly vulnerable natural habitats and are not easily replaced. As in many tropical countries, thousands of acres of natural wetlands were lost in India due to various factors. Such loss of wetland habitat affects birds and replaces other wildlife resulting in elimination of vulnerable species and loss of biodiversity. Therefore, it is necessary and most urgent to conserve these wetlands and restore natural habitats where necessary.

Natural wetlands are in decline throughout the world as the human population grows. Attendant land use changes such as increased urbanization and conversion of open space to agriculture are primary causes for the loss of wetlands. It is estimated that over 50% of world’s wetlands have been lost since 1900 (Finlayson and Davidson, 1999). A recent study has shown about 38% loss of inland wetland in India during 1971 to 2001 (Prasad *et al.*, 2004).

Wetlands are integral to a healthy environment. They help to retain water during dry periods, thus keeping the water table high and relatively stable. During periods of flooding, they act to reduce flood levels and to trap suspended solids and nutrients to the lakes than if they flow directly into the lakes. The removal of such wetland systems because of urbanization or other factors typically causes lake water quality to worsen. In addition, wetlands are important feeding, breeding, and drinking areas for wildlife and provide a stopping place 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 recent millenium assessment of ecosystems puts freshwater biodiversity as the most threatened of all types of biodiversity.

Wetlands have unique biotic communities involving diverse plants and animals that are adapted to shallow and often-dynamic water regimes. Here we focus on these systems as habitats for birds, viewing them as providers of the resources that birds need to survive and reproduce, but also as major forces in the evolution of their life history strategies.

Birds are one of the best indicators of the status of wetland. It is transitional zone between terrestrial and aquatic ecosystems nursing unique flora and fauna. Despite their widespread use as biological indicators (Custer and Osborn 1977, Kushlan, 1993), wetlands reflected local conditions. Foraging patterns of wading birds indicate that some species integrate information about habitat quality and prey availability over large areas on a daily basis (Kushlan, 1986).

Management of impounded, seasonal wetland for water birds commonly involves manipulation of water depth to influence the production and availability of food (e.g., plants and invertebrates). The relationship between water depth and foraging habitat use of individual species of wetland birds has been well documented (e.g., Baker, 1979, Poysa, 1983, Dubowy, 1988, Safran *et al.*, 1977) and this relationship served as the basis for wetlands management prescription.

The International Waterfowl and Wetlands Research Bureau (IWWRB) in U.K. initiated a census of winter water birds in 1967 to collect useful data on distribution of bird species, the courses (flyways) followed in their migratory flights and to identify important site. Estimation of population size and analysis of population trends carried out over a number of years (>5 years) gives valuable information in all the above respects and helps in formulating conservation measures for protection of threatened species.

Such counts of waterbirds coordinated by the Asian Wetland Bureau are being conducted in India during mid-winters. However, these counts are not systematically done covering same sites in different years (Vijayan *et al.*, 2004). Counts of birds in selected sites (45 wetlands) in 2002 in Tamilnadu were used to prioritize important wetlands and identified five sites as internationally important (Vijayan *et al.*, 2004).

Among the inland wetlands, the freshwater wetland includes river system, streams, irrigation canals as well as reservoirs, lakes, ponds and marshes including rice fields. Tanks, reservoirs and other water bodies and marshes, freshwater lakes and reservoirs the stagnant as lentic ecosystem and the running water bodies' fall into the lentic ecosystem category. There are 32 river systems 11 major reservoirs 2,679 canals and 38, 863 tanks in Tamil Nadu. The rivers of Tamil Nadu flow eastwards from the Western Ghats and are entirely rainfed. The perennial rivers are Cauvery, Palar, Cheyyar, Ponnaiyar, Moyar, Bhavani, Amaravathi, Vaigai, Chittar and Tamiraparani. The non-perennial rivers are the Vellar, Noyal, Suruli, Guar, Vaipar, Valparai and Varshali. The 760-km long cauvery is the longest river of the state. The total length of the rivers of Tamil Nadu is 7420 km, the area of reservoirs is 0.52 lakhs ha the area of tanks and ponds 6.92 lakhs ha and 63,000 ha estuaries, back waters and swamps (Venkataramanan, 2005). Tamil Nadu has 31 natural wetlands covering an area of 58,068 ha and 20,030 man made wetlands with an area of 2, 01,132 ha. The important reservoirs in Tamil Nadu are tabulated (Table-1).

Table-1: Important reservoirs in Tamil Nadu (Venkataraman, 2005.)

S.No	Reservoirs	River on which Reservoirs are situated	Location	Area (ha)
1	Bhavanisagar	Bhavani	Coimbatore	7,861.840
2	Stanley reservoir	Cauvery	Salem	15,343.750
3	Poondi reservoir	Koraliyar	Chingelpet	3,263.400
4	Other reservoirs	-	-	23,408.163
<i>Total</i>				49,877.153

Those animals, which live in and use freshwater ecosystem at some stage in their life cycle, should be considered in the context of faunal diversity of freshwater ecosystems. The major groups of freshwater fauna occurring in Tamil Nadu are provided in Table-2. It is evident that 9 % of the total freshwater fauna of India is represented in Tamil Nadu. (Venkataraman, 2005). In general, insects dominate the freshwater.

The Western Ghats (spread over Southern States) exhibits a rich diversity of freshwater fish fauna. Of the 446 primary freshwater fishes known from India,

230 species are found in the Western Ghats, of which 118 are endemic to this region. Tamil Nadu has as many as five endemic freshwater fishes such as *Puntius sharmai* Menon and Remadevi, *P. arulius*, *Thambrabaraniensis silas*, *Heralabiosa palaniensis* Remadevi and Menon, *Heteropheustes longipectorialis* Remadevi and Raghunathan and *Homoloptera santhampariensis* Arunachalam, Johnson and Remadevi (according to Dr. R.J.Ranjit Daniels there are more endemic species in Tamil Nadu). These figures are expected to increase manifold especially those of micro invertebrates and parasitic groups if these groups are extensively explored all over Tamil Nadu.

Table-2: Number of animal groups and species occurring in freshwater wetlands in India and Tamil Nadu. (Venkataraman 2005.)

Sl.No	Taxonomic groups	India Total	Indian wetlands	Indian freshwaters	Tamil Nadu wetlands
1	Porifera	486	400	33	6
2	Chidaria	852	540	10	*
3	Platyhelminthes	622	1200	50	*
4	Rotifera	330	330	320	26
5	Gastrotricha	100	80	23	*
6	Nematoda	2850	500	150	*
7	Acanthocephala	229	150	50	*
8	Mollusca	5070	2300	183	49
9	Annelida	840	500	350	*
10	Arthropoda	68389	7302	4050	268
11	Crustacea	2934	2000	800	100
12	Insecta	59353	5000	3000	18
13	Arachnida	5818	300	250	*
14	Bryozoa (Ectoprocta)	200	100	35	*
15	Tarigrada	32	20	10	*
16	Chordata	4833	2260	966	229
17	Pisces	2546	2000	742	153
18	Amphibia	209	150	150	25
19	Reptilia	456	50	24	9
20	Aves	1232	30	25	36
21	Mammalia	390	30	25	1
	Total	85549	15680	6230	595

* = Data not available / Not studied

Animals belonging to all the taxonomic categories, from protozoa to mammals occur in wetlands. The avifauna (commonly referred to as waterfowl) is particularly prominent and often occurs in large flocks. However, bird's import seeds from other countries, and have also played a major role in the dispersal of many aquatic organisms especially species of *Anostraca*, *Conchostraca* and *Cladocera*. During that study many wetlands were not surveyed, hence this project was taken up with the following **OBJECTIVES:**

1. To assess the status of the wetland birds in the selected wetlands in Tamil Nadu.
2. To evaluate the quality of wetlands based on the status of the birds.

2. STUDY AREA

TAMIL NADU

Tamil Nadu, endowed with bountiful and benign nature, has a tradition of preserving the ponds and tanks, dating back to the 4th and 5th centuries. With its long coasts, the state offers a wide variety of habitats. Situated on the southeast of the Indian peninsula, Tamil Nadu can be divided physiographically into (i) The eastern coastal plain and (ii) The hilly region along the north and the west. The coastal plain further divided into (a) The coromandel plain in the north (b) The alluvial plain of the cauvery delta and (c) The dry southern plains. Along the whole length of the western part, at a distance from the sea varying from 80 to 150km run the range of Western Ghats, a steep and rugged landmass averaging 1,220m above the sea level and rising up to 2,440m at the highest point.

The state has a number of rivers, all flowing from west to east, the Western Ghats to the Bay of Bengal. The rivers are entirely rain fed and short in length. The main river of the state is cauvery, which flows across Tamil Nadu cutting the state into two halves. Some of the major rivers are Amaravathi, Bhavani, Tamaraparani and Vaigai.

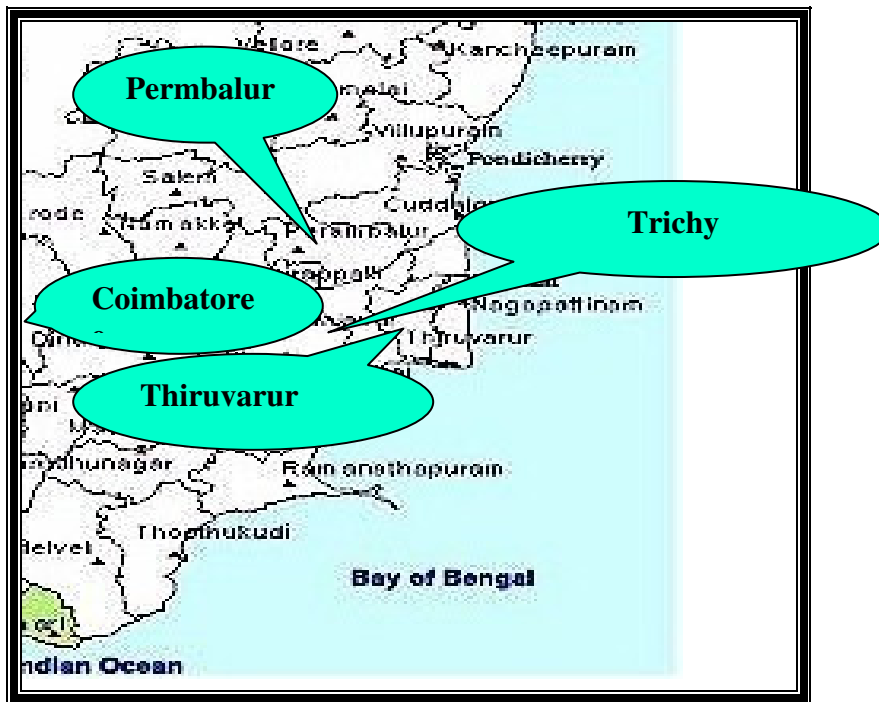
The climate of Tamil Nadu is of tropical type, summers are not too hot and winters not too cold. The temperature varies from 21.5 to 37.7°C. Rainfall is fairly widespread throughout the year. The state gets full benefit of the northeast monsoon, which brings rainfall in October to November and sometimes in December also. The south –west

monsoon also serves the state from June to September. The average annual rainfall varies from 670 to 1,200mm.

INTENSIVE STUDY AREA

TRICHY DISTRICT

It is located between 10° to $11^{\circ} - 30'N$ and $77^{\circ} - 45'$ to $78^{\circ} - 50'E$. Maximum temperature $37.7^{\circ} C$ and minimum $18.9^{\circ} C$. Rainfall varied from 778 to 821mm. Woraiyur, a part of present day Tiruchirappalli, was the capital city of Cholas from 300 B.C. onwards. This district has the major river Cauvery flowing through it, many wetlands are present and only six major wetlands were surveyed. These are 1.Asur Lake, 2.Thenirpatti Lake, 3.Palanganankudi Lake, 4.Nilamuthi Lake, 5.Thuvakudi Lake, and 6.Valavanthankottai.



Map.1 Study Area

THIRUVARUR DISTRICT

Thiruvavarur district is located between 10° 20' and 10° 07'N; 79° 15' and 79° 45' E. The total area is about 2097.09 Sq. Km. It receives both monsoons. The total rainfall varies from 659 to 118mm. The major rivers are Odampokki, Vettar, Vennar Mudikondan, Nandalar, Nattar Tirumalairayanar, Koraiyar, Valavaikkal, Kaattar, Pandavaiaiar, Arichandranathi, Mullaiyar, Pamaniyar. In this district two wetlands were selected for the present study, Udhaya Marthandapuram and Thirumeni lakes.

COIMBATORE DISTRICT

The third largest city of the state, Coimbatore, is one of the most industrialized cities in Tamil Nadu. It is known as the textile capital of South India or the Manchester of the South India. The city is situated on the banks of the river Noyyal. Coimbatore existed even prior to the 2nd or 3rd century AD, ruled by Karikalan, the first of the early Cholas. Among its other great rulers were Rashtrakutas, Chalukyas, Pandyas, Hoysalas and the Vijayanagara kings. When Kongunad fell to the British along with the rest of the state, its name was changed to Coimbatore and it is by this name that it is known today, except in Tamil, in which it is called Kovai. This district has lot of wetlands in which eight major wetlands were covered during the study. These are 1.Ukkadam lake, 2. Kuruchi lake 3.Valankulam,4.Sulurlake,5.Singanallur lake,6.Ramachandrapuram lake,7.Uppachiputhur lake, and 8.Vettaikaranputhur lake

PERAMBALUR DISTRICT

Perambalur District is a centrally located inland district of Tamil Nadu, spread over 3690 sq.kms, which was trifurcated from the erstwhile composite Tiruchirappalli district and was formed on 1st November 1995. This district is bounded by Cuddalore district in the North, Tiruchirappalli district in the South, Thanjavur in the East and Namakkal & Tiruchirappalli districts in the West. The district lies in the Southern plateau & hill zone of Agro-climate regional planning with characteristics of semi arid climate. The soil is predominantly red loamy and black soil. The normal rainfall of the district is 908 mm which is less than 946.9 mm, the normal rainfall of the State. The precipitation during

northeast monsoon, southwest monsoon and remaining winter & hot weather period account for 52 percent, 34 percent and 14 percent of annual rainfall respectively.

Cauvery is the major river flowing in the region and the composite district has a canal system covering just 47 Kms stretch and ayacut of 11610 ha. The Ground water resource through tube wells and wells contribute nearly 68% of irrigated area command. The major crops grown in the district are paddy, groundnut, sugarcane and millets. Cashew is the major plantation crop.

KANYAKUMARI DISTRICT

Kanyakumari is the southern most district of Tamil Nadu. The district lies between $77^{\circ} 15'$ and $77^{\circ} 36'$ of the eastern longitudes and $8^{\circ} 03'$ and $8^{\circ} 35'$ of the northern Latitudes. Thirunelveli District on the North and the east binds the District. The southeastern boundary is the Gulf of Mannar. On the South and the South- west, the boundaries are the Indian Ocean and the Arabian Sea. On the West and North- west it is bound by Kerala. There are 6 reservoirs and 88 water bodies are present. In this district 15 wetlands were selected in the present study, namely 1.Suchindram pond I, 2. Parakkai pond II, 3.Parakkai pond III, & I 4. Theroor pond I, 5. Manikkaputheri, 6. Thathiar, 7.Theroor pond II, 8. Suchindram pond II, 9.Thalakudi pond I, 10. Thalakudi pond II, 11.Putheri, 12. Periakulam, 13. Veeranikulam, 14. Chunkakadai and 15. Vembanur.

THANJAVUR DISTRICT

Thanjavur District lies as the East Coast of Tamil Nadu. It is situated between $9^{\circ} 50'$ and $11^{\circ} 25'$ of the northern latitude and $78^{\circ} 45'$ and $70^{\circ} 25'$ of the Eastern longitude. It extents to an area of 3396.57 sq.kms. The delta region covers the whole northern and eastern portions of the district where the Cauvery with its wide network of branches irrigate more than half of the district. The annual rainfall varies from 320 to 525mm.Number of pond/ lake/Tank is about 311.Area is about 22.75Sq.km.Number of water logged site is 479.Area is about 43.36Sq.km. During the study 24 wetlands were surveyed, namely 1. Vaduvor lake, 2. Kallaperambur lake, 3. Arampundan lake, 4. Ellachi lake or Maruthuri lake, 5. Uppankuzhi lake, 6. Andal lake, 7. Aramundan lake, 8. Kotra lake, 9. Sembian lake, 10. Kumman lake, 11. Sayakudi lake, 12. Alakapat lake, 13.

the area was about. 73.47 Sq.km. In this district two wetlands were selected namely Wellington lake and Veeranam lake.

NAGAPATTINAM DISTRICT

The Nagapattinam district lies on the east coast to the south of Cuddalore district and another part of the Nagapattinam district lies to the south of Karaikkal and Tiruvarur districts. The district lies between 10.25° and 11.40° north longitude and 76° 49° and 80.01° east longitude. The Cauvery and its offshoots are the principal rivers. All along the course of Cauvery and its tributaries, on both the banks numerous narrow strips of poromboke lands called Paduagais. Exist the total geographical area of the district is about 3536.38 sq. km.

Northeast monsoon, which starts in October and ends in December, contributes about 60% of the total annual rainfall. The southwest monsoon rains from June to September and from March to May accounts equally for the rest of the annual rainfall. The monthly average rainfall in the district was 108.87 mm in 1991-96. In this district Perumthottam wetland has selected for the present study.

3. SOME OF THE COMMON WETLAND BIRDS IN THE STUDY AREA

Family: Phalacrocoracidae

Darter or snakebird *Anhinga melanogaster* (*Anhinga rufa*)

A black water bird like Cormorant, with longer, slender snake like neck, narrow, and straight, pointed stiletto-shaped bill, Tail long, stiff, fan shaped. Adult: Above black, the back and wings longitudinally streaked and speckled with silver-grey; head and neck velvety chocolate-brown with white chin, throat, and a narrow white line from behind eye halfway down each side of the neck. Below, shiny black. Sexes alike.

Little Cormorant *Phalacrocorax niger*

Smaller size comparatively shorter, stouter bill, domed forehead, longer tail and absence of yellow gular skin distinguish it from the Shag. Size difference perceptible only when the two seen together. Adult (breeding): black overall with a bluish or greenish sheen. Upperback and wing coverts dark silvery grey, scalloped with black. A short crest on occiput and nape and a few scattered silky white feathers and plumes on fore crown and sides of head. In non-breeding plumage crest and white feathers in head disappear, and throat becomes white. Sexes alike. Young (immature): above, brown, the black with paler scalloping. Below, paler with white throat.

Family :Ardeidae

Purple Heron *Ardea purpurea*

A lanky marsh bird. Indirect sunlight upperparts, including dorsal surface of wings, bright purple, a shade darker than the Purple Moorhen. Adult: above, purplish blue or purplish slaty: bluish on wing and tail. Crown and crest slaty black, rest of head and long thin neck ferruginous boldly striped with black. Below, chin and throat white, long drooping plumes on upper breast buffy white with black and chestnut streaks. Rest of underparts slaty black and rich chestnut; under wing chiefly ferruginous. Sexes alike; female with crest and pectoral plumes less developed. Young (immature): Uniform cinnamon brown edges masking the purplish slaty feathers.

Indian Pond Heron *Ardeola grayii*

An egret like water side bird largely snow white and prominent when in flight, effectively camouflaged earthy brown when at rest. Adult (non-breeding): Drab. Above, head and neck dark brown streaked with yellowish buff. Back, scapulars and tertiaries, ashy brown with pale yellow shaft stripes on scapulars. Below, chin and throat white; upper breast white, streaked with brown. Rest of plumes including tail, white. Adult (breeding): Very handsome. Above, head and neck lights yellowish brown; crown browner. Long recumbent white or buff occipital crest of lanceolate plumes. Back deep maroon with very long decomposed feathers extending over the tail. Below, chins and throat white;

upper breast ashy brown, the feathers long and somewhat disintegrated. Rest of body, wings and tail white; tips of first primaries tinged brownish. Sexes alike in breeding and non-breeding plumages.

Large or Great or Large-white Egret *Casmerodius albus* (*Ardea* or *Egretta alba*)

Size variable and deceptive; thus in non-breeding plumage confusion between some individuals and Intermediate egret easily possible. In breeding season, especially during various nest ceremonies, the diaphanous lacelike plumes of the back are often erected and spread out in showers. No crest and sexes alike. In breeding season iris bright lemon yellow. Bill black, yellow at base. Orbital skin and lores bright verdigris green. Legs: tibia bright rose pink; tarsus and feet pinkish brown or black. Non-breeding: bill orange-yellow. Orbital and facial skin greenish yellow. Legs, feet and claws black.

Intermediate or Smaller or Median Egret *Mesophoyx* (*Egretta*) *intermedia*

Slightly smaller, otherwise very like to Large Egret; non-breeding birds often indistinguishable from it. In breeding plumage presence of decomposed filamentous plumes on back as well as breast diagnostic. No crest. Sexes alike. Less solitary than large Egret, less gregarious than Little Egret. In breeding plumage iris lemon yellow. Bill black and yellow at base, necked lores and infra-orbital skin yellowish green. In non-breeding plumage iris lemon yellow, bill dusky at tip, browner at base. Naked lores and infra-orbital skin yellowish in non-breeding season. Legs and feet dusky black, greenish on the joints and tibia.

Little egret *Egretta garzetta*

A lanky snow white waterside bird. Smaller replica of large and intermediate egrets. Similar also to non-breeding cattle egret but distinguished from it at all seasons by black yellow bill, parti - coloured legs and feet (black and yellow), and also usually by habitat. In breeding season develops a drooping nuchal crest of two long narrow plumes in addition to filamentous ornamental feathers on both back (scapulars) and breast; the later less decomposed.

Black-crowned night heron *Nycticorax nycticorax*

A stocky grey, white and black marsh bird of the same general effect as the pond heron, with a markedly stouter bill. adult: above, ashy grey with metallic greenish black back and scapulars. Forehead and streak over eye white; crown, nape, and drooping occipital crest black, the last with a few long narrow white plumes. Below, white, sides of body ashy grey. Sexes alike.

Family: Rallidae

White-breasted Waterhen *Amaurornis phoenicurus*

Dark grey stub-tailed skulking swamp bird with prominent white facial mark and under parts. Adult: Above, forehead, supercilia and sides of the head pure white; hind neck, crown and rest of upperparts dark slaty grey. Below, from chin to vent pure white; sides of breast and flanks slaty grey; posterior flanks, vent and under tail-coverts rufous. Young (immature): White facial mask obscured by slaty – tipped feathers. Upperparts more olive-brown than slaty grey. Sexes alike.

Family: Anatidae

Spotbilled duck: *Anas poecilorhyncha*

A Large duck about 61cm in length the male weighs 1230-1500 gms and female 790-1360 gms. *Anas (Poecilorhyncha Poecilorhyncha)* is distributed throughout India. There are two more subspecies, the Burmese spot bill duck is distributed mainly in eastern Assam.

Family: Podicipedidae

Little Grebe: *Tachybaptus(Podiceps) ruficollis*

It is present in all lakes. The size is about 330 mm. half submerged nest in reeds or on floating aquatic lands. Nest may tilt and spill eggs if water levels accede abruptly.

Breeding season April to September clutch size 3 to 7, colour is white becoming muddy through contact decaying vegetation. Their presence of the water body indicates a rich aquatic fauna like aquatic insects, crustaceans and amphibians.

4. METHODOLOGY

Birds were counted using a wide variety of reason by a bewildering range of methods. For direct counting a suitable vantage point is selected and all visible birds are counted. This method is very useful for water birds. This counting is very accuracy.

The method followed for bird census was “total count” wherever possible, walking round the wetlands or from specific vantage points (Vijayan, 1991). If not completely covered, the percentage of coverage was marked.

Systematic water birds count has been carried out at different sites each during January to March 2006. During counts, each site was divided into many sections and each section was counted. All the birds on the ground or in the water were counted using binocular, as were any birds flying from in front of the observer. Birds flying from behind were not counted. Migratory, wintering, breeding/ summering and resident water birds were commonly encountered in the wetlands during the winter season (Huner, *et al.*, 2002).

DATA ANALYSIS

Diversity

Species diversity has two components: The species richness in the community and species evenness or equitability (Ludwig and Reynolds, 1998). The diversity may be measured most directly as number of species and expressed as an index that incorporates the interplay of species richness and relative abundance of species into single value for given community (Wiens, 1989). A number of indices have been used to calculate diversity.

Among them most widely used one is the Shannon-Weaver index (1963) given as follows:

$$H' = - \sum_{i=1}^S P_i \log_e P_i$$
$$\log_e = \ln; P_i = n_i / N$$

Where H' = Diversity

S = Number of Species

P_i = Proportion of individuals of the total sample belonging to the i th number

Commonness

The commonness of each bird species in different habitats was found out by calculating commonness index, which is the average sighting frequency of a species in one sample.

Dominance

The relative dominance of each bird species in the different habitats was determined by calculating Dominance index using the following formula.

$$\text{Relative dominance} = n_i * 100 / N$$

Where n_i = number of individuals in i Species

N = means the total number of individual of all species seen during the Study period

5. LITERATURE REVIEW

The nesting colonies of Ciconiiformes and Pelecaniiformes waterbirds, popularly knowns as heronries or egrettries, are spatio-temporal aggregation of nests at favourable location during the breeding season. A wide variety of water birds breed during monsoon, when food resources are abundant. Nesting colonies could be of multi- species composition and varying size (Manoj Balakrishnan and K. Thomas 2004).

Oriental White Ibis (*Threskiornis melanocephalus*) is a near-threatened resident uncommon and nomadic Ciconiiform waterbird of the subcontinent, gregariously frequenting shallow wetland habitat. It roosts and nests in colonies situated in and around wetlands, often in association with other Ciconiiforms as well as Pelicaniform waterbirds (Manoj Balakrishnan and K. Thomas 2004)

In addition to the declines in wading bird numbers, there has also been a shift in the location and the size of wading bird colonies over the past 70 years (Ogden 1994). Analyzing trends in wading bird numbers is an important tool in assessing the health of wetland ecosystem. Wading birds are good indicator species because they are conspicuous, relatively easy to survey, occur in large numbers, and are intimately connected with the hydrologic condition of the ecosystem (Ogden 1994; Frederick and Ogden 2003).

Local measures of vegetative structure have long been known to affect use by prairie wetland birds. Whereas more recent research has indicated that landscape-level attributes also may influence local species abundance and diversity (Naugle *et al* 1999).

The Purple Heron *Ardea purpurea* is a widely distributed species, which breeds very locally in wetlands (Cramp 1992, del Hoyo *et al* 1992). Although the feeding habits and foraging habitats used by adults during the breeding season have been studied extensively in several countries (e.g., Owen & Phillips 1956, Tomlinson 1974, Amat & Herrera 1978, Laszlo 1986, Fasola, 1994, Campos & Ikuona 1997).

High-density feeding aggregations are well documented for herons and egrets, and are usually explained as forming in areas of high prey availability (Kushlan 1981). Proposed benefits include decreasing search time between patches of food items, increasing likelihood of successful foraging in a suitable location, decreasing the risk of obtaining no food, and perhaps having more food available (Kushlan 1981). A general assumption is that individual birds locate a site with good feeding condition, and flocks form at these sites. Egrets, for example, are attracted to other feeding birds (Smith 1995), or even model birds (Kushlan 1977; Caldwell 1981), Perhaps because they signal high food level. Capture rates for birds have been shown to increase with flock size (Krebs 1974; Smith 1995) indicating either that social foraging affects foraging success or that better sites attract more birds.

Eand herons also jointed socially foraging wetland bird flocks, though they sometimes instigated t grets heir own social flocks. Most of the feeding flocks were composed of a single species, for both social and non-social flocks. Social foraging flocks were typically larger and denser than non-social flocks and primarily (probably entirely) involved fish-eating birds (Battley *et al* 2003).

Nagarjan (1990) studied factors influencing wader (Ciconiformes and Charadriiformes) population in the Pichavaram wetland, Tamilnadu. Bhupathy (1991) studied population and resource utilisation of waterfowl in Keoladeo National Park, Bharathpur. Paramanandam (1991) studied the ecology of wetlandbird of Udayamarthandam Lake. Manakadan (1992) studied ecology of waterbirds of the Point Calimere sanctuary with special reference to impact of salt production activities.

Ciconiiformes are among the most thoroughly studied groups of birds. Several studies emphasized the diet and trophic niche variation in the different species (Kushlan 1978; Fasola and Ruiz 1996).

6. RESULTS

Distribution of Wetland birds

During the study period 69 wetlands were surveyed in eight districts and 29,824 birds were recorded belonging to 85 species 33 families with (Figure 1). There was 53 species are fully dependent and 32 species are terrestrial bird. Maximum number of species and individuals were recorded in Karavetti bird sanctuary from Perambalur district, and minimum was recorded in Nagapattinam district (Table 3). Ardeidae contributed the maximum species of seven in all the districts followed by Anatidae and Scolopaciidae contributed five each. The list of birds observed in the study area is annexed (Appendix 1). The maximum number of birds recorded was in Karavetti lake (8091) followed by Wellington Lake (2783), Vaduvloor Lake (1457), Theroor lake (1184), Uthayamarthandapuram (1086) and Thirumeni lake (906). The maximum species was also in Karaivetti Lake (31) followed by Wellington Lake (27), Theroor Lake (25) and Uthayamarthandapuram (22). Little Cormorant Egret (2428), was the most abundant species followed by Cattle Egret (2393), Garganey Teal (2335), Little Egret (1656),

Common Teal (1200), Garganey Teal (1177), and Cattle Egret (1107) recorded in the entire wet lands surveyed.

Table 3: Abundant species observed in the study areas.

Districts	Cattle egret	little Cormorant	Litle egret	Open-billed Stork	Garganey Teal	Commom teal	Bar headed goose
Kanyakumari	1612	903	613	71	450	0	0
Cuddalore	264	96	219	288	1850	0	0
Nagapattinam	0	0	0	46	0	0	0
Coimbatore	555	363	275	0	0	0	0
Thiruvarur	352	219	0	568	0	0	0
Thanjavur	517	256	824	534	35	310	
Trichy	200	0	0	0	0	0	0
Perambalur	0	1846	447	0	1177	1200	826

Figure 1. Number of family observed in the study area

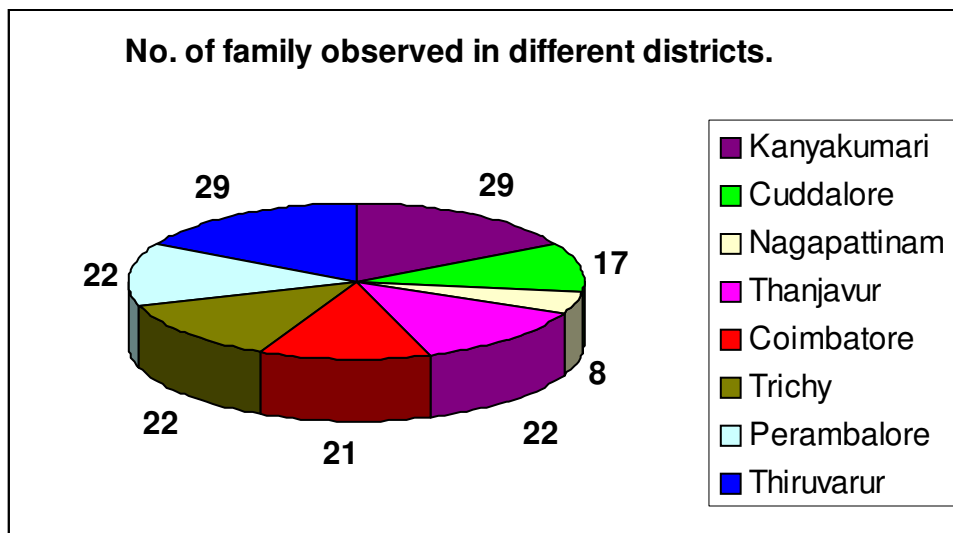


Figure 2. Number of species observed in the study area

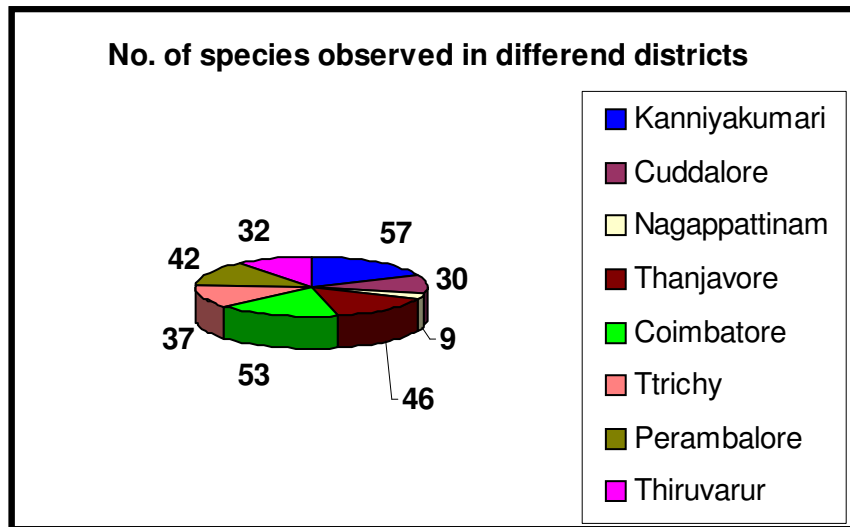
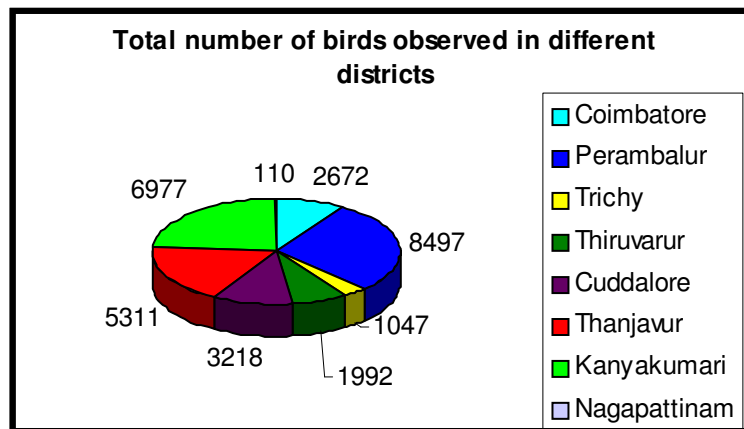


Figure 3. Total number of birds, species in the study area



Spot – billed pelican (VU), and Near Threatened Darter (or) Snakebird (NT) were recorded in this district. The wetland wise details are given below.

COIMBATORE DISTRICT

In this district ten wetlands were surveyed and 2672 birds of 28 species were recorded out of which 2358 are water dependent birds. Maximum birds were recorded in Vettaikaran pudhur wetland (928) and minimum in Uppachipudhur wetland (46). Maximum birds were belonging to Ardeidae family. Threatened

UKKADAM LAKE [N 10° 59' 05.6" E 76° 57' 36.9"]

Ukkadam Lake is located in Coimbatore district. The total area was about 1600 sq.m. . It receives water in both southwest and northeast monsoon. Totally 461 birds of 27 species were recorded. The common waterfowl species are Garganey, Little Cormorant, Open - Billed Stork, Purple Moorhen, Spotbilled Pelican, and Cattle Egret. The threatened Spot-billed Pelican was recorded. The dominant plant species are *Ipomea carnea*, *Lemna* sp, *Ipomea aquatica*, and *Eichhornia*. The water is mainly used for irrigation and fishing. The lake is surrounded by residence and sewage mixing with water is the major problem of this area.

KURUCHI LAKE [N 10° 57' 76.8" E 76° 58' 26.9"]

It is located in Coimbatore district and covers an area of 1,800 sq.m. It receives water in both southwest and northeast monsoon. Totally 423 birds of 16 species were recorded. The common bird species are Little Grebe, Garganey Teal, Little Cormorant, Purple Moorhen, Spot-billed Pelican, Night Heron, Common Coot and Common Teal. *Ipomea carnea*, *lemna* *Ipomea aquatica*, and *Eichhornia* are the dominant plant species. It is mainly used for irrigation and fishing. The lake is surrounded by residence and sewage mixing with water is the major problem of this area.

VALANKULAM [N 10° 59' 36.5" E 76° 58' 0.54"]

It is a 900 sq. area located in Coimbatore district and it receives water in both southwest and northeast monsoon but mainly between October and January. Totally 56 birds of 12 species were recorded. The common bird species are Little Cormorant, Purple Moorhen, Little Egret and Purple Heron. Diverse plant species are present and the dominant ones

are *Ipomea carnea*, *lemna*, *Ipomea aquatica*, *Eichhornia*. People mainly used this for fishing. Houses surrounded the lake.

SULUR LAKE [N 11° 01' 48.6'' E 77° 07' 15.6'']

This place is located in Coimbatore district of Tamil Nadu. The nearest city Coimbatore is located 6km away from Sular. This lake area is 1500 sq.m. This lake is subject to northeast monsoon with most of the rain falling between October to January. Totally in Big lake 169 birds of 19species and in small lake 164 birds of 14 species were recorded. In this area bird species enumerated are Little Cormorant, Pond Heron, Purple Heron, Little Egret, and Night Heron. The threatened Spot-billed Pelican was recorded. The lake contains high population of aquatic plant diversity mostly, *Ipomea carnea*, *Lemna sp*, *Ipomea aquatica*, *Eichhornia sp*. The lake is basically used for irrigation and fishing.

SINGANALLUR LAKE [N 10° 59' 53.6'' E 77° 01' 12.1'']

It is located in Coimbatore. The water cover area was about 1400 sq.m and it recives water in both northeast and southwest monsoon. Totally in big lake 293 birds of 15 species and in small lake 73 birds of 8 species were recorded. Little Cormorant, Purple Heron, Pond Heron, Purple Moorhen, Spotbilled Pelican, Cattle Egret, Little Egret and Night Heron were the dominant bird species. Diverse plants species were recorded and the dominant ones are *Ipomea carnea*, *Lemna sp*, *Ipomea aquatica*, *Eichharnia sp*. The lake is basically an irrigation tank for surrounding areas and the local people were using for fishing also. The lake is surrounded by residence

RAMACHANDRAPURAM POND [N 10° 35' 54.2'' E 76° 53' 88.6'']

Ramachandrapuram is located in Pollachi taluk and water spread area was about100 sq.m. It receives water in both northeast and southwest monsoon. Totally 59 birds of 12species were recorded. The dominant bird species were Little Cormorant, Pond Heron, Cattle Egret, and Little Egret. The plant diversity was high and the dominant ones are *Ipomea carnea* and *Ipomea aquatic*. The lake was mainly used for irrigation and for fishing also.

UPPUCHIPUTHUR POND [N 10° 34' 89.4'' E 76° 55' 45.8'']

Uppuchiputhur located in Pollachi Taluk .The nearest town is Anaimalai. This lake area covered in 200 sq.m. It receives water in both northeast and southwest monsoon. Totally 46 birds of 8 species were recorded. The dominant bird species are Little Cormorant, Pond Heron, Cattle Egret, and. Little Egret. The plant diversity was high and the dominant ones are *Ipomea carnea* and *Ipomea aquatica*. The water was mainly used for irrigation and fishing.

VETTAIKARANPUTHUR LAKE [N 10° 32' 93.5'' E 76° 55' 73.8'']

Vkttaikararan puthur lake is located in Pollachi Taluk and the nearest town is Anaimalai. The water cover area was 1200 sq.m. It receives water in both northeast and southwest monsoon. Totally 928 birds of 228 species were recorded. The dominant bird species are Little Cormorant, Pond Heron, Cattle Egret, Common Coot and Little Egret. The lake contains great plant diversity mostly *Ipomea carnea*, *Lemna sp*, *Ipomea aquatica*, *Eichharnia sp*. The lake is basically an irrigation tank for surrounding areas and the local people were using for fishing also. The lake is surrounded by agriculture.

TRICHY DISTRICT

In this district seven wetlands were surveyed and 1047 birds of 20 species were recorded out of which 939 are water dependent birds. maximum birds recorded were in Asur lake (355) and minimum in Nilamuthy weland(50). Maximum birds were belonging to Aredidae family. In Trichy district, the following wetlands were studied. Wetland wise details are given below

ASUR LAKE [N 10° 43' 145'' E 78 ° 51' 683'']

This place is located in Trichy district. It receives water from the northeast monsoon from October to January. Totally 355 birds of 20 species were recorded. The common bird species were Garganey, Little Cormorant, and Open-billed Stork. Both submerged and floating vegetation was seen and the dominant trees in the surroundings are *Acacia sp* and

Prosopis juliflora trees. Tamil Nadu forest department protects it. The lake is basically used for irrigation and also used for fishing, domestic use and cattle grazing.

THENIRPATTI LAKE [N 10 ° 42' 648'' E 78 ° 50' 671'']

This place is located in Trichy district of Tamil Nadu. The water level will increase subject to northeast monsoon. Totally big lake had 84birds of 17species and small lake 202 birds of 18 species during the study. The dominant waterfowl species were Garganey, Little Cormorant and Open- billed Stork. This lake contains great plant diversity with mostly, *Lemna*, *Algae*, *Saccharum*, and trees *Accacia* and *Prosopis juliflora*. Tamil Nadu forest department protects this site. The lake is basically an irrigation tank but is used for fishing also.

PALANGANANKUDI [N 10° 42' 581'' E 78° 50' 252'']

This place is located in Trichy district. It receives water through the northeast monsoon between October and January. Totally 56 birds of 9 species were recorded. The dominant bird species were Garganey, Little Cormorant and Open- billed Stork. Poaching of birds was common. The dominant vegetation are *Ipomea carnia*, *Ipomea aquatica*, *Acacia* sp and *Prosopis juliflora*. Tamil Nadu forest department protects this site. The lake is basically an irrigation tank, and also people used for fishing, domestic purposes and cattle grazing.

NILAMUTHY LAKE [N 10 ° 43' 66'' E 78° 49' 255'']

This place located in Trichy district. It receives water through the northeast monsoon between October and January. Totally 50 birds of 8 species were recorded. The dominant bird species were Garganey, Little Cormorant and Open- billed Stork. Poaching of birds was common. The dominant vegetation are *Ipomea carnea*, and *Acacia* and *Prosopis juliflora* trees. Tamil Nadu forest department protects this site. The lake is basically an irrigation tank, and also people used for fishing, domestic purposes and cattle grazing.

THUVAKUDI LAKE [N 10° 44' 113'' E 78° 49' 113'']

This place located in Trichy district. It receives water through the northeast monsoon between October and January. Totally 78 birds of 10 species were recorded. The dominant bird species were Garganey, Little Cormorant and Open-billed Stork. Poaching of birds was common. The dominant vegetation are *Ipomea carnea*, *lemna*, *Acacia* and *Prosopis juliflora* trees. Tamil Nadu forest department protected this site. The lake is basically an irrigation tank, and also people used for fishing, domestic purposes and cattle grazing.

VALAVANTHANKOTTAI [N 10° 44' 578'' E 78° 50' 191'']

This place is located in Trichy district. It receives water through the northeast monsoon between October and January. Totally 222 birds of 16 species were recorded. The dominant bird species were Garganey, Little Cormorant and Open-billed Stork. Poaching of birds was common. The dominant vegetation is *Eichhornia*. The lake is basically an irrigation tank, and also people used for fishing, domestic purposes and cattle grazing. The wetland is surrounded by agricultural lands.

PERAMPALUR DISTRICT

In this district eight wetlands were surveyed and 8497 birds of 31 species were recorded out which 8438 are water dependent birds. Maximum birds were recorded in Karaivetti wetland (8091) and minimum in Thamarai kulam (2). Maximum birds were belonging to Ardeidae family. Threatened and Near Threatened species are recorded in this district. They are Spot-billed Pelican (VU), Painted Stork (NT) and Darter (or) Snake birds (NT) were recorded in this district. The wetland-wise details were given below.

KARAIVETTI LAKE (Vettangudi) [N 10° 58' 152'' E 79 02' 654'']

This Bird Sanctuary is located north of Thanjavur. The total area of the sanctuary is about 454 ha. It attracts the largest congregation of water birds and the peak congregation observed in the month of November. Totally 8091 birds of 31 species were recorded. The important birds were Bar-headed Goose, Grey Pelican, White-necked Stork, Spoonbill,

Ibis, Shoveller. Throughout the year water is available and it supports most of the resident birds.

KALINGA ERI [N 10° 08' 520'' E 79 ° 07' 062'']

Kalinga eri is located in Ariyalore taluk and it covers an area of 200 sq.m. . It receives water through the northeast monsoon between October and January. Totally 59 birds of 13 species were recorded. The dominant bird species were Pond Heron and Little Egret. The dominant plants are *Ipomea carnea*, *Ipomea aquatica*,. It is mainly used for irrigation of the surrounding areas.

KALLANKURUCHI ERI [N 11° 09' 019'' E 79° 06' 882'']

Kallankuruchi eri is located in Perambalur district and it covered an area of 100 sq.m. It receives water through the northeast monsoon between October and January. Totally the big pond had 79 birds of 9 species and small ponds 100 birds of 11 species. The dominant bird species were Little Grebe, Pond Heron, Cattle Egret and Little Egret. Water was very clear and vegetation was absent.

AYYAN ERI [N 11° 10' 225'' E 79° 06' 612'']

Ayyan eri is located in Ariyalore taluk and it covers 200 sq.m. It receives water through the northeast monsoon between October and January. Totally 95 birds of 9 species were recorded. This dominant species were Pond Heron, Garganey Teal Spot billed Duck Common Coot, Little Egret .The lake contains a plant diversity mostly *Ipomea carnea*, *Ipomea aquatica*,. It is mainly used for irrigation and fishing.

THAMARAIKULAM ERI [N 11° 10' 4.46'' E 79° 06' 3.69'']

Thamaraikulam is located in Perambalur district and the nearest town is Ariyalore. The water spread area was about 100sq. m. It receives water through the northeast monsoon between October and January. Only 2 birds of Podicipedidae were recorded. Water was mainly used for irrigation to the surrounding areas.

SRINIVASAPURAM ERI [N 11° 09' 9.97'' E 79° 07' 0.74'']

Srinivasapuram is located in Perambalur district and the nearest town is Ariyalore. The water-spread area was 100 sq.m. It receives water through the northeast monsoon between October and January. Totally 14 birds of 5 species were recorded. The dominant bird species were Pond Heron, Little Egret and Common Coot. The dominant vegetation was *Ipomea carnea*, *Ipomea aquatica*, and *Acacia* trees the pond was mainly used for irrigation and fishing.

CHETTI ERI [N 11° 08' 1.62'' E 79° 04' 6.62'']

It is located in Ariyalore town and the water spread area was 200 sq.m. It receives water through the northeast monsoon between October and January. Totally 58 birds of 4 species were recorded. The dominant bird species were Pond Heron, Little Egret and Pheasant-tailed Jacana. The lake contains a great diversity of vegetation mainly *Nelumbo nucifera*. The lake water was basically used for irrigation of the surrounding areas.

THIRUVARUR DISTRICT

In this district two wetlands were surveyed and 1992 birds of 21 species were recorded out of which 1939 were water dependent birds. Maximum birds were recorded in Udhyamarthandapuram wetland (1086). Maximum birds were belonging to Ardeidae family. Threatened and Near Threatened species are recorded in this district. The near threatened Darter (or) Snake bird (NT) was recorded in this district. The wetland wise details were given below.

THIRUMENI LAKE [N 10° 33' 41.5'' E 79° 27' 31.8'']

Thirumeni Lake is located in Mannarkudi taluk. It covers an area of 800 acres with irrigation capacity of 250 ha. This lake receives water through the Pamani and Vathi canal. Vegetation cover is very high in this lake the dominant species are *Ipomea* sp, *Acacia* sp and *Prosopis juliflora*. These trees were mainly used for roosting and nesting by birds. The lake supports a wide variety of avifauna with both migrant and resident species. Totally 906 birds of 21 species were recorded. Dominant bird species were

Open-bill Stork, Common Coot, Cattle Egret, Garganey Teal and Little Grebe. People mainly use this lake for fishing, cattle grazing, drinking and wallowing by cattle, sewage disposal and domestic purposes.

UDAYAMARTHANDAPURAM LAKE [N 10° 26' 49.4'' E 79° 33' 12.8'']

Udayamarthandapuram Lake is a bird sanctuary and it is located in Thiruthuraipoondi taluk. Water spread area of this lake is about 40 hectares. Ayacut is about 2,500 acres. It supports a good number of resident and migratory birds. Vegetation is high and the dominant plants are Lilly and *Ipomea* and *Acacia* Sp and *Prosopis juliflora* trees occur in the corners. Totally 1086 birds of 22 species were recorded. The common birds were Little Cormorant, Open-bill Stork, Night Heron, Purple Swamphen, Pheasant-tailed Jacana and Common Coot.

KANYAKUMARI DISTRICT

In this district 15 wetlands were surveyed and 6977 birds were counted which belonging to the 29 families with 57 species were recorded. Maximum number of birds recorded in Theroor pond I (1184) belonging to the 15 families. Minimum number of birds was recorded in Manikkaputheri (151) belonging to 13 families. Maximum number of birds occurs in *Ardeidae* (2933) this family includes 7 species. Number of water birds recorded in this district is about (6151) and Terrestrial birds are about (826). Threatened and Near Threatened species are recorded in this districts. They Spot – billed pelican (VU), Painted Stork (NT) and Darter (or) Snake bird (NT) were recorded in this district. The wetland wise details were given below.

SUCHINDRAM COMPLEX [N 08° 09', E 77° 27']

Suchindram kulam is located in Agastheeswaram taluk, Kanyakumari district. A great number of birds roosting and nesting were present in and around the lake. Water spread is about 216 acres. Ayacut is about 87.4 hact. Totally 784 birds of 27 species were recorded in Suchindram I pond and 298 birds of 19 species were recorded in Suchindram II pond. *Ipomea carnea*, *Ipomea aquatica*, *Eicchornia* was present. Important bird species are

Lesser- whistling Duck, Garganey Teal, Bronze-winged Jacana, Pheasant-tailed Jacana, Purple Swamphen, and Spot-billed Duck. Excessive growth of weeds and encroachment were observed.

PARAKKAI KULAM [N 08° 08', E 77° 27']

Parakkai kulam is located in Agastheeswaram taluk, Kanyakumari district. It is Suchindram wetland complex. Nearest town is Nagarcoil. Distance between Nagarcoil to Parakkai kulam is about 5km. Water spread is about 213 acres. Ayacut is about 2,412 acres. Totally 134 birds of 20 species were recorded in Parakkai I&II pond and 736 birds of 22 species were recorded in parakkai III pond. Submerged and floating vegetation is very high. It is one of best roosting site like Pheasant-tailed jacana, Bronze-winged jacana, Spot-billed Duck, Garganey Teal, Cotton pygmy-Goose, Spot-billed Pelican, Lesser whistling- Duck and Purple Swamphen. Excessive growth of weeds and also encroachment is there. Socio economical value of this pond is agriculture, fish culture, drinking / wallowing by cattle.

VEERANI KULAM [N 08° 11', E 77° 22']

Veerani kulam is located in Kalkulam taluk, Kanyakumari district. Village is Aloor. Water spread is about 50 acres. Ayacut is about 200 acres. Totally 323 birds of 19 species were recorded.

Important bird species are Little Egret, Median Egret, Bronze-winged jacana, Pheasant-tailed jacana, Open-bill stork and Little Cormorant also seen. Excessive growth of weeds and also encroachment is there. Socio economical value of this wetland is agriculture, fish culture and drinking / wallowing by cattle.

VEMBANUR KULAM [N 08° 11', E 77° 22']

Vembanur kulam is located in Kalkulam taluk, Kanyakumari district. Village is Peruselvilai. Nearest town is Nagarcoil. Water spread is about 51 acres. Ayacut is about 647km. Totally 163 birds 15 species were recorded. Submerged and floating vegetation is there. Pheasant-tailed Jacana, Bronze-winged Jacana, Cotton pygmy-Goose. Excessive growth of weeds and also encroachment is there. It is mainly used for

irrigation and also encroachment is there. This wetland is mainly used for agriculture, fish culture and wallowing by cattle.

THEROOR COMPLEX [N08° 10', E 77° 27']

Theroor complex is located in Kanyakumari district. Village is Theroor. Water spread is about 419 acres. Ayacut is about 2728 acres. It is a protected area. The local people were extensively using this wetland for irrigation. Totally 1184 birds of 25 species were recorded in Theroor I pond and 644 birds of 28 species were recorded in Theroor II pond. Most of the migratory birds were found. Good Number of Painted Stork, Gull-billed Tern, Spot-billed Pelican, Darter, Black-winged Stilt and White-necked Stork were present. Excessive growth of weeds and also encroachment is there. Encroached area is being used for agriculture and squatters. Socio economic value of this wetland is agriculture, fish culture and wallowing by cattle.

THATHIAR KULAM AND MANIKKAPUTHERI KULAM [N08° 11', E 77° 27']

Thathiar and Manikkaputheri kulam is located in Kanyakumari district. Water spread is about 199 acres. Ayacut is about 1252 acres. This wetland prime function is irrigation. Totally 678 birds of 22 species were recorded in Thathiar and 151 birds of 18 species were recorded in Manikkaputheri kulam. Submerged, merged and floating vegetation is there. It is good adaptation for roosting and nesting of water birds. Large number of Purple Moorhen, Pheasant-tailed Jacana, Bronze-winged Jacana, Garganey Teal, Cotton pygmy-Goose and Common Coot is found there. Excessive growth of weeds and also encroachment is there. Encroachment is used for agriculture. It is used for agriculture, fish culture, wallowing by cattle.

CHUNGANKADAI KULAM [N08° 12', E77° 22']

It is located in Kalkulam taluk, Kanyakumari district. Village is Aloor. Distance between Nagarcoil to Aloor is about 6km. Local people perceive, as the prime function of wetland is irrigation. Totally 276 birds of 20 species were recorded. Degradation of wetland due to bottom soil is regularly removed for pottery clay. Encroachment of wetland area is

used for agriculture and squatters. Socio economic value of this wetland is agriculture and wallowing by cattle.

MANAVALAKURUCHY KULAM OR PERIAKULAM [N 08° 10',E77° 18']

Periakulam is located in Kalkulam taluk, Kanyakumari district. Water spread of this lake is about 58.7ha/ 145 Acres. Ayacut is about 1500 acres. Totally 347 birds of 27 species were recorded. Submerged and merged plant is there. So Pheasant-tailed jacana and Bronze-winged jacana is present. This birds roosting and nesting there. This wetland degraded due to the excessive lotus farming has blackened the water and causes itching while bathing. Also encroachment on one side reduces shore area. It mainly used for grazing, agriculture, religious such temple and wallowing of cattle.

THANJAVUR DISTRICT

VADUVOOR BIRD SANCTUARY: [N10° 41', E79° 19']

Vaduvoor bird sanctuary is located in Thanjavur District of Tamil Nadu. The nearest city, Thanjavur, is located 25 kilometers from the sanctuary. Taluk is Needamangalam. Thanjavur with an area of 316 acres and irrigates 1356 acres of agricultural land. Totally 1457 birds of 24 species were recorded. Important bird species of this lake is open- bill stork, painted stork, black -winged stilt, Little egret and night heron. Night heron is roosted in the dense *Accacia* forest. Socio economic value of this lake is sewage disposal, drinking / wallowing by cattle, grazing, domestic purpose and agriculture.

KALLAPERAMBUR BIRDS SANCTUARY [N10° 47' - E79° 01']

The Kallaperumbur lake is located in Kallaperambur taluk, Thanjavur district. Nearest town is Thanjavur. It has an area of 639.94acres, which a maximum waters, level of 47.46m. The total capacity of the tank is 41.82mc ft, which supports the irrigation 2662 acres. The lake is surrounded by a long, and wide sand bund covers a distance of 3218m. Totally 992 birds of 30 species were recorded.

The lake supports a variety of avifaunal diversity, which are either migrant or resident. The common migrant species of the lake are Garganey, little cormorant, open-bill stork,

Little Grebe. *Ipomea aquatica* and floating vegetation are seen in different parts of the lake. The people mainly use the lake for fishing, domestic use and cattle grazing, fuel-wood collection and agriculture. The birds are shot by tribal people and also local people trap the birds using baiting.

CUDDALORE DISTRICT

WELLINGTON LAKE

Wellington Lake is located in Thittakudi taluk, Cuddalore district. (N11° 24', E79° 05') The water-spread area was about 6.5 Sq. km. This lake supports 24,059 acres of agricultural fields. This lake is surrounded by a long, wide and bund along the sides. Totally 2783 birds of 27 species were recorded.

A good number of avifauna was reported. The dominant bird species are Pintail Duck, Garganey Teal, Open-billed Stork, Cotton Pygmy-Goose, Little Cormorant and Little Egret. People were mainly using for fishing, drinking / wallowing by cattle and cattle grazing.

VEERANAM LAKE

Veeranam Lake is located in Chidambaram taluk, Cuddalore district. (N11 ° 17'- 11 ° 24', E79 ° 31'- 79 ° 32').The Lake is about 16 km length and 8 km breadth with the water holding capacity of about 15 Sq. km. It is mainly used for irrigation and it supports nearly 40,000 acres of two taluks viz., Chidambaram and Kattumannarkudi. The lake receives water from the river Vadavar and the Sengal Stream. Totally 435 birds of 17 species were recorded. People mainly use this lake for fishing, cattle grazing and domestic purposes. The dominant bird species are Open-billed Stork, Little Cormorant, Little Grebe, Cattle Egret, and Common Sandpiper.

NAGAIATTINAM DISTRICT

Only one pond was studied in Nagaipattinam district, a total of 110 species of birds comprising of 8 families. Vegetation of the lake comprises of *Ipomea carnea*, *Ipomea*

aquatica, *Saccharam sp* these are the very dominant species. Teak (*Tectona grandis*) commonly found in the corner side of this lake.

PERUNTHOTTAM [N 11° 11'; E 79°49']

Perunthottam lake is located in Sirkali taluk it supporting a good number of birds. Socioeconomic value of this lake is Cattle grazing, Fuel wood collection and fishing.

FREQUENCY

During the study the birds found were classified according to the frequency of observation Birds that were recorded < 10 times are grouped in to the very rare category, from 10-19 formed the rare category, between 20 and 30 formed the occasional category and above 30 were grouped as common (Table 4).

Table 4. Frequency of wetland birds in the study area

Category	No of species
Very rare	51
Rare	11
Occasional	10
Common	13

MIGRATORY BIRDS

The migratory status of bird species showed that 79.92 % were resident and 20.08 % migrant birds. Trichy, Perambalur, Thanjavaur and Kanyakumari districts had maximum migratory birds. Whereas Thiruvarur only four species were recorded and Nagapattinam only one species were recorded. Karaivetti Lake in Perambalur district supported the maximum of 9 migratory species followed by Putheri Lake in Kanniyakumari district supported the maximum of 7 migratory species, Nangi eri in Thanjavur district, Wellington in Cuddalore district, Vettaikaranpudhur and Ukkadam in Coimbatore district with 5 species. The common migratory species recorded in the wetlands are Common

Sandpiper (21) followed by Spotted Sandpiper (15) and Garganey Teal (9). Out of the 85 species of birds 53 are wetland and 32 terrestrial.

COMMON BIRD SPECIES

The most common bird species in Ukkadam Lake, Ramachandrapuram and Vettaikaran pudhur was Cattle Egret. whereas in Kuruchi wetland Common Coot was the dominant species. In Sulur and Singanullur, at Coimbatore Little Cormorant was dominant (0.41).

In Trichy district, Open-bill Stork was dominant in Thenairpatti pond, whereas in Thuvakudi, Smaller Egret was the common one. In Vallavanthan kottai Cattle egret was common.

In Perambalur district, Garganey teal was the dominant in Ayyaneri and Common Coot in Srinivasapuram. In Chettieri, Pheasant-tailed Jacana was recorded as a common species. The most common bird family in the study area was Ardeidae (0.33) followed by Anatidae (0.27).

DOMINANT BIRD SPECIES

In Kanniyakumari district Cattle Egret (23.10 %) and Little Cormorant (13 %) were the dominant bird species while in Thanjavur Little Egret (15.51 %), Open-bill stork (10.05%) and Cattle Egret were dominant (9.73 %). In Cuddalore district Garganey Teal (57.49 %) and in Nagapattinam district, Open – billed Stork (41.81%) were the dominant bird species in the surveyed wetlands.

District wise dominant bird species

In Kanyakumari district Cattle Egret was the dominant species. Cattle Egret was the dominant species in Suchindram Complex, Theroor, Thalakudi, Putheri, Periyakulam, Veeranikulam and Chunkankadai. Little Cormorant was dominant in Parakkai kulam, Theroor, Suchindharam Complex, Thalakudi, Periyakulam, and Vambanur Kulam, whereas Pond Heron was dominant in Parakkai kulam, Manika putheri, Thazhakudi,

Veeranikulam and Vambanur Kulam (Table 5). Darter was dominant in Parakkai Kulam and Purple Moorhen in Thalakudi. Garganey was dominant in Thatthiar.

Table5. Dominance index observed in different wetlands at Kanyakumari district

Bird Species	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Little Grebe	*	*	0.28	*	*	*	*	*	*	*	*	1.66	*	*	*
Spottedbilled Pelican	0.27	2.48	1.13	0.60	*	*	1.64	*	*	*	0.24	*	*	*	*
Little Cormorant	5.55	30.58	35.21	5.51	10.78	5.38	18.98	30.23	19.38	8.31	12.29	16.60	13.52	12.55	25.00
Darter	*	15.70	3.94	1.70	0.98	0.90	0.91	6.98	2.25	0.96	1.42	0.41	*	7.06	*
Grey Heron	0.54	*	0.28	0.20	*	0.30	*	*	*	*	0.24	*	*	*	*
Purple Heron	0.27	4.96	2.68	0.20	0.98	0.75	*	3.10	0.84	0.96	0.47	1.24	0.71	*	*
Pond Heron	4.47	14.88	4.65	2.00	17.65	4.63	8.21	6.98	3.65	16.29	6.38	9.13	20.64	5.49	19.85
Cattle Egret	58.46	9.92	*	12.41	9.80	5.83	22.99	33.72	65.17	35.46	37.35	28.22	25.62	50.59	8.82
Large Egret	*	*	*	0.40	*	0.30	*	*	*	*	*	*	*	*	*
Smaller Egret	1.35	2.48	1.13	5.11	11.76	1.49	5.66	1.55	0.84	4.47	2.84	2.90	12.10	3.14	*
Little Egret	7.98	9.92	5.77	17.32	28.43	1.79	26.28	5.04	4.49	3.51	3.31	6.64	15.66	7.84	6.62
Painted Stork	*	*	*	0.10	*	*	6.57	*	2.53	1.28	*	*	*	*	*
Openbilled Stork	0.27	0.83	0.28	0.30	2.94	3.74	1.28	1.94	0.56	1.60	1.42	*	1.07	2.75	*
Whitenecked Stork	*	*	*	*	*	*	0.18	*	*	*	*	*	*	*	*
Lesser Whistling Teal	4.33	*	13.80	*	*	*	*	*	*	*	*	*	*	*	*
Spotbill Duck	*	*	1.69	*	*	*	*	*	*	*	0.47	*	*	*	*
Garganey Teal	2.98	*	1*	*	*	49.93	*	*	*	*	3.31	3.73	*	*	*
Cotton Teal	*	*	6.20	*	*	5.53	*	*	*	*	1.42	*	*	*	6.62
Whitebreasted Waterhen	0.27	*	*	*	*	*	*	0.39	*	*	*	1.24	*	*	2.21
Indian Moorhen	0.41	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Indian Purple	3.11	0.83	5.49	0.10	1.96	10.16	*	3.49	*	19.81	11.35	6.22	*	*	*

Moorhen															
Common Coot	*	*	*	*	*	1.79	*	*	*	*	0.47	*	*	*	*
Pheasant-tailed chirurgus	4.19	*	2.96	*	7.84	2.24	*	*	*	1.60	1.18	5.39	0.71	*	11.76
Bronzewinged Jacana	5.14	3.31	4.23	*	5.88	4.78	0.36	5.43	*	0.64	2.60	9.96	3.56	5.10	14.71
Redwattled Lapwing	*	*	*	0.30	*	0.30	1.09	*	*	0.64	0.95	*	*	0.78	*
Yellowwattled Lapwing	*	*	*	*	*	*	*	*	*	*	*	*	*	0.39	*
Little Ringed Plover	*	*	*	3.50	*	*	*	*	*	*	1.42	*	*	*	*
Marsh Sandpiper	*	*	*	0.20	*	*	*	*	*	0.64	1.42	*	*	*	*
Spotted Sandpiper	*	*	*	*	*	*	0.18	*	*	0.64	2.84	*	*	*	*
Common Sandpiper	*	*	*	0.80	*	*	0.91	*	*	1.28	3.55	1.24	*	1.57	*
Common or Fantail Snipe	*	*	*	*	*	*	0.18	*	*	*	0.71	*	*	*	*
Blackwinged Stilt	*	*	*	*	*	*	0.18	*	*	*	*	*	*	*	**
Gullbilled Tern	*	*	*	49.25	*	*	2.37	*	*	*	*	0.41	2.14	*	*
Common Tern	*	1.65	*	*	*	*	*	*	*	*	*	*	*	*	*
Indian Pied Kingfisher	*	*	*	*	*	*	0.36	*	*	0.64	0.71	2.07	1.42	1.18	*
Small Blue Kingfisher	*	0.83	0.28	*	*	*	*	*	0.28	*	*	0.41	1.07	*	1.47
Whitebreasted Kingfisher	0.41	1.65	*	*	0.98	0.15	1.64	1.16	*	1.28	1.65	2.49	1.78	1.57	2.94

* = 00

1. Suchindram pond I, 2. Parakkai pond II, 3. Parakkai pond III, & 4. Theroor pond I, 5. Manikkaputheri, 6. Thathiar, 7. Theroor pond II, 8. Suchindram pond II, 9. Thalakudi pond I, 10. Thalakudi pond II, 11. Putheri, 12. Periakulam, 13. Veeranikulam, 14. Chunkakadai and 15. Vembanur.

THANJAVUR DISTRICT

In Thanjavur district Common Coot was the dominant species followed by Pond Heron. Common Coot was dominant in Uppan kuli, Kotra eri, Kumman eri, Alakapat eri, Pagadakudi eri, Pethamathira eri, Petari eri, Nangi eri, Raja eri, Vadavali eri, Bala eri and Karamba eri. Pond Heron was dominant in Andal eri, Aramundan eri, sembian eri, Kuman eri, Alakapat eri, Pethamathira eri, Marudhakudi eri, Raja eri, Bala eri and Ela eri. Pied Kingfisher was dominant only in Muruthur eri (Table 6).

CUDDALORE AND NAGAIPATTINAM DISTRICT

In Cuddalore district Cattle Egret, Open billed Stork and Garganey Teal were the dominant birds. Cattle Egret and Open-billed Stork were dominant in Veeranam Lake (Table 6). Whereas in Perumthottam wetland Nagapattinam district, Open- billed Stork and Pond Heron were the dominant bird species (Table 7).

Table7. Dominance index of birds in Cuddalore and Nagapattinam district

Bird Species	1	2	3
Little Grebe	1.92	1.24	3.53
Spotted-billed Pelican	*	0.04	*
Little Cormorant	12.50	3.50	*
Darter	*	0.11	*
Grey Heron	*	0.07	*
Purple Heron	0.48	*	*
Pond Heron	8.89	2.11	30.59
Cattle Egret	23.08	6.12	*
Large Egret	0.48	0.62	*
Smaller Egret	1.68	1.17	*
Little Egret	4.09	7.36	*
Open-billed Stork	42.31	4.08	54.12
Pintail	*	0.84	*
Spot-bill Duck	*	0.44	*
Garganey Teal	*	67.44	*

Cotton Teal	*	3.17	*
Red wattled Lapwing	0.24	0.11	*
Spotted Sandpiper	*	0.69	*
Common Sandpiper	1.44	0.77	2.35
Indian River Tern	1.44	*	*
Small Blue Kingfisher	0.48	0.04	2.35
White-breasted Kingfisher	0.96	0.07	7.06

* = 0

1&2 = Cuddalore district and 3= Nagappattinam district

COIMBATORE DISTRICT

In Coimbatore district, Little Cormorant (21.38) and Little Egret (17.23) were the dominant species whereas in Trichy district Little Cormorant and Cattle Egret were the dominant ones. Thiruvarur district Open bill Stork was the dominant one Cattle Egret was dominant in Ukkadam, Ramachandapuram and Vettaikaran pudhur wetlands whereas in Asur in Trichy District Common Coot was the Dominant species (Tables 8).

Table8. The dominant bird species in Coimbatore district

Bird Species	1	2	3	4	5	6	7	8	9	10
Little Grebe	*	2.94	*	*	*	*	*	*	*	0.36
Spotted billed Pelican	7.86	*	*	*	*	9.85	*	*	*	*
Little Cormorant	14.52	12.99	9.30	41.13	20.62	15.33	68.97	4.65	17.14	9.18
Darter	0.48	*	*	1.42	*	*	0.00	*	*	2.15
Grey Heron	0.48	*	*	*	*	0.36	*	*	*	*
	* 2.14	1.23	11.63	1.42	*	1.09	*	*	*	0.36
Pond Heron	5.48	1.47	4.65	14.89	14.43	28.83	12.07	16.28	28.57	3.34
Cattle Egret	45.00	*	*	*	*	*	*	55.81	*	40.76
Smaller Egret	0.48	1.96	4.65	6.38	18.56	6.20	1.72	*	11.43	4.41
Little Egret	8.81	1.23	48.84	9.22	24.74	31.75	*	4.65	34.29	8.82
Night Heron	*	*	*	10.64	*	4.38	*	*	*	*
Openbilled Stork	*	*	*	*	*	*	*	*	*	12.40
Whitenecked Stork	*	*	*	*	*	*	*	*	*	0.36
Lesser Whistling Teal	0.48	1.47	*	*	*	*	*	*	*	*
Common Teal	7.62	7.35	*	*	*	*	*	*	*	*

Spotbill Duck	*	*	*	*	*	*	*	*	*	2.74
Garganey Teal	*	15.69	*	*	7.22	*	*	*	8.57	6.08
Whitebreasted Waterhen	*	*	*	*	*	*	3.45	*	*	0.36
Indian Purple Moorhen	1.19	*	11.63	6.38	*	0.73	13.79	*	*	1.67
Common Coot	2.62	52.45	4.65	*	*	*	*	*	*	*
Pheasant-tailed Jacana	*	0.49	*	*	*	*	*	*	*	*
Redwattled Lapwing	*	*	*	*	6.19	*	*	13.95	*	1.55
Grey Plover	0.24	*	*	*	*	*	*	*	*	*
Kentish Plover	0.48	*	*	*	*	*	*	*	*	*
Common Redshank	*	*	*	*	*	*	*	*	*	0.12
Common Sandpiper	1.67	0.74	*	3.55	6.19	*	*	*	*	1.07
Blackwinged Stilt	0.24	*	*	*	*	*	*	*	*	*
Gullbilled Tern	*	*	*	*	*	*	*	*	*	3.10
Indian Pied Kingfisher	0.24	*	*	2.84	*	0.36	*	*	*	0.24
Small Blue Kingfisher	*	*	*	2.13	*	0.36	*	*	*	*
Storkbilled Kingfisher	*	*	*	*	*	*	*	*	*	0.24
Whitebreasted Kingfisher	*	*	4.65	*	2.06	0.73	*	4.65	*	0.72

1- Ukkadam lake, 2-Kuruchi lake,3- Valankulam,4- Sulur lake-1, 5-Sulur lake-II, 6- Singanallur lake-1, 7- Singanallur lake-II, 8- Ramachandrapuram, 9-Uppuchiputhur, 10- Vettaikaran puthur.

TRICHY DISTRICT

In Trichy district Cattle Egret was the dominant species. Cattle Egret was the dominant species in Valavanthankottai and Thaneerpatti lake II. Little Cormorant was dominant in Planganangudi lake and Thuvakudi lake whereas Smaller Egret was dominant in Nilamuthy lake (Table 9). Open billed Stork was dominant in Thaneerpatti lake-1and Common Coot in Asur lake and Planganangudi lake.

Table9. The dominant bird species in Trichy district

Bird Species	1	2	3	4	5	6	7
Little Grebe	15.43	2.56	*	*	*	9.52	*
Little Cormorant	5.14	3.85	9.68	39.29	*	38.10	5.61
Purple Heron	0.96	1.28	0.54	7.14	4.08	*	6.12
Pond Heron	15.11	6.41	15.05	14.29	16.33	3.17	17.86
Cattle Egret	*	2.56	38.71	*	*	*	64.29
Smaller Egret	3.86	10.26	0.54	3.57	46.94	*	1.02
Little Egret	11.25	7.69	1.61	3.57	12.24	3.17	*

Openbilled Stork	8.36	41.03	2.15	*	*	*	*
Garganey Teal	11.58	*	24.19	*	*	*	*
Whitebreasted Waterhen	*	*	*	3.57	*	*	*
Indian Moorhen	*	*	*	*	4.08	3.17	*
Indian Purple Moorhen	*	*	*	*	*	14.29	0.51
Common Coot	23.79	*	*	21.43	10.20	19.05	*
Pheasant-tailed Jacana	*	*	*	*	*	9.52	*
Redwattled Lapwing	0.64	6.41	1.08	*	*	*	*
Little Ringed Plover	*	*	1.08	*	*	*	*
Greenshank	0.32	1.28	*	*	*	*	*
Spotted Sandpiper	*	2.56	0.54	*	6.12	*	*
Common or Fantail Snipe	*	3.85	*	*	*	*	1.53
Blackwinged Stilt	*	*	1.08	*	*	*	*
Gullbilled Tern	0.64	*	*	*	*	*	*
Indian Pied Kingfisher	*	3.85	*	5.36	*	*	1.02
Small Blue Kingfisher	0.96	2.56	1.61	1.79	*	*	0.51
Whitebreasted Kingfisher	1.93	3.85	2.15	*	*	*	1.53

1 -Asur lake, 2- Thaneerpatti lake-1, 3- Thaneerpatti lake II, 4- Planganangudi lake, 5- Nilamuthy lake, 6-Thuvakudi lake, 7-Valavanthankottai

PERAMBALUR DISTRICT

In Perambalur district Little Grebe and Spotbill Duck was the dominant species. Little Grebe was the dominant species in Kallankuruchi lake-1, Ayyan lake and Chetti lake. Spotbill Duck was dominant in Kalinga lake, Kallankuruchi lake-1, Kallankuruchi lake-II whereas Common Coot was dominant in Srinivasapuram lake and Chetti lake. Garganey Teal was dominant in Srinivasapuram lake and Pond Heron in Kalinga lake and Thamaraikulam lake (Table10).

Table 10. The dominant bird species in Perambalur district

Bird Species	1	2	3	4	5	6	7	8
Little Grebe	3.44	*	24.49	8.25	100.00	*	21.43	*
Spotbill Pelican	0.33	*	*	*	*	*	*	*
Little Cormorant	22.65	7.32	12.24	5.15	*	*	*	*
Darter	0.05	*	*	*	*	*	*	*

Grey Heron	0.49	*	*	*	*	*	*	*
Purple Heron	0.01	*	*	*	*	*	*	*
Pond Heron	0.44	34.15	10.20	2.06	*	4.35	7.14	23.08
Large Egret	2.00	*	*	*	*	*	*	*
Little Egret	5.39	4.88	6.12	*	*	4.35	*	3.85
Night Heron	5.34	*	*	*	*	*	*	*
Painted Stork	0.38	4.88	*	*	*	*	*	*
Openbill Stork	1.50	*	*	*	*	*	*	*
Whitenecked Stork	0.04	*	*	*	*	*	*	*
White Ibis	1.01	*	*	*	*	*	*	*
Spoon bill	0.27	*	*	*	*	*	*	*
Garganey Teal	13.92	*	*	*	*	55.43	*	*
Barheaded Goose	10.21	*	*	*	*	*	*	*
Pintail	4.40	*	*	*	*	*	*	*
Common Teal	14.83	*	*	*	*	*	*	*
Spotbill Duck	2.90	14.63	22.45	59.79	*	8.70	*	*
Cotton Teal	4.33	*	*	*	*	*	*	*
Whitebreasted Waterhen	*	*	*	*	*	2.17	21.43	*
Common Coot	1.38	*	14.29	4.12	*	20.65	42.86	*
Pheasant-tailed Jacana	*	*	6.12	*	*	*	*	73.08
Redwattled Lapwing	0.26	19.51	4.08	7.22	*	*	*	*
Yellowwattled Lapwing	*	*	*	4.12	*	*	*	*
Blacktailed Godwit	1.66	*	*	*	*	*	*	*
Spotted Sandpiper	0.35	*	*	*	*	*	*	*
Common Sandpiper	0.15	*	*	*	*	*	*	*
Blackwinged Stilt	1.95	*	*	*	*	*	*	*
Whiskered Tern	0.01	*	*	1.03	*	*	*	*
Indian River Tern	0.22	*	*	*	*	*	*	*
Indian Pied Kingfisher	*	*	*	4.12	*	*	*	*
Small Blue Kingfisher	0.07	4.88	*	*	*	*	*	*
Whitebreasted Kingfisher	*	7.32	*	4.12	*	4.35	7.14	*
Little Bittern	*	2.44	*	*	*	*	*	*

1-Karaivetti lake, 2-Kalinga lake, 3-Kallankuruchi lake-1, 4-Kallankuruchi lake-II, 5-Ayyan lake, 6-Srinivasapuram lake, 7- Chetti lake, 8-Thamaraikulam

THIRUVARUR DISTRICT

In Thiruvarur district Openbilled Stork was the dominant species. Little Grebe was the dominant species in Uthayamarthandapuram lake, Thirumeni lake. Common Coot was

dominant in Uthayamarthandapuram lake. Night Heron was dominant in Thirumeni lake (Table 11).

Table 11. The dominant bird species in Thiruvarur district

Bird Species	1	2
Little Grebe	1.81	*
Little Cormorant	2.60	18.61
Darter	*	0.57
Purple Heron	*	0.09
Pond Heron	1.47	2.47
Cattle Egret	25.51	11.97
Smaller Egret	0.68	*
Little Egret	3.27	6.93
Night Heron	*	16.14
Openbilled Stork	23.25	34.38
Indian Black Ibis	*	0.09
Garganey Teal	8.13	*
Whitebreasted Waterhen	*	0.66
Indian Purple Moorhen	0.34	3.04
Common Coot	30.70	4.37
Pheasant-tailed Jacana	*	0.19
Redwattled Lapwing	0.45	*
Spotted Sandpiper	0.56	*
Indian River Tern	0.45	*
Small Blue Kingfisher	0.23	0.28
Whitebreasted Kingfisher	0.56	0.19

1- Uthayamarthandapuram lake, 2- Thirumeni lake

SPECIES DIVERSITY

Bird species diversity was calculated by using Shannon Wiener's index. The maximum species diversity was observed in Periyakulam (2.70) followed by Putheri (2.66), Kallakurchi lake II (2.5), Arampundan eri (2.47), Asur lake (2.39) and Sular (2.35). (Table 12). The species diversity was least in Kada eri (0.41) and Thamaraikulam wetlands diversity (nil)

Table12. Total Bird species and diversity in wetland wise

S. No	Name of the wetlands	No of species	No of birds	Species Diversity
1	Suchindram I pond	27	784	1.85
2	Parakkai I&II pond	20	134	2.37
3	Parakkai III pond	22	736	2.29
4	Theroor I pond	25	1184	2.07
5	Manikkaputheri	18	151	2.42
6	Thathiar	22	678	1.97
7	Theroor II pond	28	644	2.40
8	Suchindram II pond	19	298	2.21
9	Thazhakudi I pond	15	424	1.59
10	Thazhakudi II pond	27	351	2.34
11	Putheri	35	484	2.66
12	Periakulam	27	347	2.70
13	Veeranikulam	19	323	2.31
14	Chunkakadai	20	276	2.03
15	Vembanur	15	163	2.37
16	Vaduvor Lake	24	1457	2.04
17	Kalleperambur	30	992	2.40
18	Arampundan	17	246	2.47
19	Maruthuru eri or Elachi eri	3	21	0.94
20	Uppankuzhi eri	12	80	1.78
21	Andal eri	11	98	2.08
22	Aramundan eri	5	15	1.43
23	Kotra eri	16	179	1.85
24	Sembian eri	5	38	1.25
25	Kumman eri	14	77	2.04
26	Sayakudi eri	11	423	1.08
27	Alakapat eri	6	26	1.58
28	Pagadakudi eri	3	34	0.96
29	Pethamathiran eri	9	71	1.44
30	Maruthakudi eri	16	309	2.34
31	Pidari eri	16	202	2.35
32	Nangi eri	23	446	2.24
33	Raja eri	9	77	1.89
34	Vadavali eri	13	107	2.05
35	Bala eri	7	36	1.68
36	Ela eri	9	116	1.86
37	Karamba eri	8	145	1.42

38	Kada eri	2	14	0.41
39	Valambakudi eri	11	102	2.09
40	Veeranam Lake	17	435	1.85
41	Wellington Lake	27	2783	1.45
42	Perunthottam Lake	9	110	1.64
43	Ukkadam lake	27	461	2.17
44	Kuruchi lake	16	423	1.7
45	Valankulam	12	56	2.08
46	Sulur lake-1	19	169	2.3
47	Sulur lake-II	14	164	2.35
48	Singanallur lake-1	15	293	1.9
49	Singanallur lake-II	8	73	1.48
50	Ramachandrapuram	12	59	2.01
51	Uppuchiputhur	8	46	1.92
52	Vettaikaran puthur	28	928	2.35
53	Asur lake	20	355	2.39
54	Thaneerpatti lake-1	17	84	2.28
55	Thaneerpatti lake II	18	202	1.96
56	Planganangudi lake	9	56	1.74
57	Nilamuthy lake	8	50	1.38
58	Thuvakudi lake	10	78	1.31
59	Valavanthankottai	16	222	1.65
60	Karaivetti lake	31	8091	1.63
61	Kalinga lake	12	59	1.98
62	Kallankuruchi lake-1	9	79	1.59
63	Kallankuruchi lake-II	11	100	2.5
64	Ayyan lake	9	94	2.25
65	Srinivasapuram lake	5	14	1.85
66	Chetti lake	4	58	1.59
67	Thamaraikulam	1	2	*
68	Uthayamarthandapuram lake	22	1086	1.47
69	Thirumeni lake	21	906	1.4

THREATENED BIRDS

Threatened Spot-billed Pelican and two near threatened species namely Darter and Painted stork were recorded during the survey. The Spot-billed Pelican was recorded in Suchindram complex, Parakkai complex, Theroor complex and Putheri in Kanyakumari

district, Wellington in Cuddalore district, Ukkadam and Singanallur lakes in Coimbatore district, and Karaivetti lake in Perambalur district. Darter was recorded in Kanyakumari at Theroor complex, Parakkai, Manika putheri, Thathiar, Suchindram, Thalakudi, Putheri, Periyakulam, Chunkakadai; in Thanjavur at Kallaperambur in Cuddalore at Wellington, Coimbatore district such as Ukkadam lake, Sular lake, and Vettaikaranputhur, in Perambalur district at Karaivetti lake and Thiruvarur district in Uthayamarthandapuram lake. Painted Stork was recorded in Theroor complex and Thalakudi complex in Kanyakumari, Vaduvor in Thanjavur district, Kallankuruchi lake and Karaivetti lake in Perambalur district.

VEGETATION

Vegetation cover was recorded in all the wetlands. The proportion of the vegetation cover was recorded in percentage. In most of the wetlands *Ipomea carnea* was the dominant species. *Nelumbo Nuceifera* was present in all the wetlands of Kanyakumari district.

In Thanjavur district and Trichy district *Accacia* and *Prosopis julifera* was observed in all the wetland corners and the surroundings. *Saccharam* was common in the swamp areas of the wetlands. Like Kanyakumari, Trichy district Perambalore district here also *Ipomea carnea* was the dominant floaing vegetaion in most of the wetlands. In putheri and Palanganankudi Lake diverse vegetation was observed. Pakadakudi eri, Chunganakadi wetland and Thamaraikulam lake vegetation cover was very poor and the water was clearer (Table13-20).

Table13. Vegetation cover in different wetlands at Kanyakumari District

S. No	SPECIES NAME	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	<i>Ipomea carnia</i>	10	20	20	50	15	20	30	20	40	15	20			5	
2	<i>Nelumbo Nuceifera</i>	20	10	15	20	40		15	30	10	20	10	20	75	35	50
3	<i>Eichhornia</i>	15	35	25		10	20	15	10		10	10	15			5
4	<i>Polygonum pelibium</i>	5										5	3			
5	<i>Phragmites*</i>	5		5		2		5			3	2				5
6	<i>Ipomea aquatica</i>	20	15	20	10	25	40	20	20	20	5	3				
7	<i>Algae</i>											5		5		
8	<i>Polygonum limbactum</i>										5	5	10			
9	<i>Sacharam</i>		10			3	5	5		10	2	2	10	5	5	5

10	<i>Cyperus Sp</i>	10	10	5	10	5	5		10	5		3	2				
11	<i>Lemna Sp</i>	10		10					5	10	10		5	10	3	20	
12	<i>Nymphaea nouchali</i>												10	20		35	10
13	<i>Hydrilla</i>							5					5		10		10
14	<i>Grass</i>				10				5		5		15	10	2		15
15	<i>Accacia</i>	5						5									
16	<i>Trapa natans</i>											40					

1. Suchindram pond I, 2. Parakkai pond II, 3. Parakkai pond III, & I 4. Theroor pond I, 5. Manikkaputheri, 6. Thathiar, 7. Theroor pond II, 8. Suchindram pond II, 9. Thalakudi pond I, 10. Thalakudi pond II, 11. Putheri, 12. Periakulam, 13. Veeranikulam, 14. Chunkakadai and 15. Vembanur.

Table 14. Vegetation cover in different wetlands at Thanjavur District

Species name	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
<i>Ipomea carnia</i>	15	15	10	20	20		20	5	50	20	60		40	70		40	20	20	10	40	10	10	30	20	
<i>Nelumbo Nuceifera</i>													20												
<i>Polygonum pelibium</i>				5	10	15				5			5				10	15		10	5				
<i>Phragmites*</i>	10	10																							
<i>Ipomea aquatica</i>	10																								
<i>Algae</i>							5	10	30	25							30		25				20	15	
<i>Sacharam</i>	10	5	5	10	10	10		15	10	5	5		10	5	10	10	10	10	10	20	10	10	10	10	10
<i>Cyperus</i>																			5	5		10			
<i>Lemna</i>		10													40			5	5						
<i>Weeds</i>	10	20					5				10	5		5	5	20	5	5		10	10			5	
<i>Hydrilla</i>				20	10		10	10																	
<i>Grass</i>		5		5	10	10		5		5								10	10	5	5				
<i>Accacia</i>	25	20	60	20	20	30	60	20		20	15	90	20	10	30	25	10	15	10	20	60	40	20	40	
<i>Prosopis julifera</i>	20	15	25	20	20	35	5	20	10	20	20			15	15	10		10	20			20	20	10	
<i>Hygrophila auriculata</i>							10											10							
<i>Eucalyptus</i>																10									

1. Vaduvor lake, 2. Kallaperambur lake, 3. Arampundan lake, 4. Ellachi lake or Maruthuri lake, 5. Uppankuzhi lake, 6. Andal lake, 7. Aramundan lake, 8. Kotra lake, 9. Sembian lake, 10. Kumman lake, 11. Sayakudi lake, 12. Alakapat lake, 13. Pagadakudy lake, 14. Pathamathiran lake, 15. Maruthakudy lake, 16. Pidari lake, 17. Nangi lake, 18. Raja lake, 19. Vadavali lake, 20. Bala lake, 21. Ela lake, 22. Karamba lake, 23. Kada lake and 24. Valambakudy lake.

Table.15. Vegetation cover in different wetlands in Cuddalore and Nagapattinam district

S. No	Species name	1	2	3
1	<i>Ipomea carnia</i>	5		40
6	<i>Ipomea aquatica</i>	20		
7	<i>Algae</i>	10		
8	<i>Polygonum limbatum</i>			
9	<i>Sacharam</i>	5		5
10	<i>Cyperus Sp</i>	50		
14	<i>Grass</i>		25	10
15	<i>Acacia</i>		75	15
17	<i>Weeds</i>	5		10
18	<i>Lilly</i>			10
19	<i>Teak</i>			10

Table 16: Average Vegetation cover of wetlands in different districts.

Kanyakumari		
S.No	Species name	%
1	<i>Ipomea carnia</i>	10.38
2	<i>Nelumbo Nuceifera</i>	12.72
3	<i>Eichhornia</i>	8.77
4	<i>Polygonum pelibium</i>	2.02
5	<i>Phragmites?</i>	1.80
6	<i>Ipomea aquatica</i>	8.26
7	<i>Algae</i>	3.10
8	<i>Polygonum limbatum</i>	3.10
9	<i>Sacharam</i>	2.79
10	<i>Cyperus</i>	3.17
11	<i>Lemna</i>	4.29
12	<i>Weeds</i>	3.10
13	<i>Nymphaea nouchali</i>	8.73
14	<i>Hydrilla</i>	3.49

Thanjavur		
S.No	Species name	%
1	<i>Ipomea carnia</i>	11.70
2	<i>Nelumbo Nuceifera</i>	9.11
3	<i>Polygonum pelibium</i>	3.87
4	<i>phragmites?</i>	4.56
5	<i>Ipomea aquatica</i>	4.56
6	<i>Algae</i>	8.61
7	<i>Sacharam</i>	4.36
8	<i>Cyperus</i>	3.04
9	<i>Lemna</i>	6.83
10	<i>Weeds</i>	3.90
11	<i>Hydrilla</i>	5.69
12	<i>Grass</i>	3.19
13	<i>Accacia</i>	13.38
14	<i>Prosopis julifera</i>	8.09

15	<i>Grass</i>	3.32
16	<i>Accacia</i>	2.33
17	<i>Trapa natans</i>	18.62
	Total	100

15	<i>Hygrophila auriculata</i>	4.56
16	<i>Eucalyptus tree</i>	4.56
	Total	100

Cuddalore

S.No	Species name	%
1	<i>Ipomea carnia</i>	5.00
2	<i>Ipomea aquatica</i>	13.33
3	<i>Algae</i>	3.33
4	<i>Sacharam</i>	3.33
5	<i>Weeds</i>	5.00
6	<i>Grass</i>	13.33
7	<i>Accacia</i>	23.33
8	<i>Vazhal?</i>	33.33
	Total	100

Nagapattinam

S.No	Species name	%
1	<i>Ipomea carnia</i>	40
2	<i>Sacharam</i>	10
3	<i>Weeds</i>	10
4	<i>Grass</i>	10
5	<i>Accacia</i>	15
6	<i>Lilly</i>	5
7	<i>Tectona grandis</i>	10
	Total	100

A. Perambalur

S.No	Species name	%
1	<i>Ipomea carnea</i>	15.28
2	<i>Nelumbo nucifera</i>	12.07
3	<i>Eichhornia crassipes</i>	13.42
4	<i>Polygonum pelibium</i>	2.39
5	<i>Phragmites sp</i>	7.06
6	<i>Ipomea aquatica</i>	2.63
7	<i>Algae</i>	5.67
8	<i>Saccharum</i>	3.81
9	<i>Cyperus</i>	4.24
10	<i>Lemna</i>	4.09
11	<i>Weeds</i>	3.08
12	<i>Hydrilla</i>	3.14
13	<i>Grass</i>	2.84
14	<i>Accacia</i>	7.51
15	<i>Prosopis julifera</i>	7.42
16	<i>Hygrophila auriculata</i>	2.40
17	<i>Eucalyptus tree</i>	2.95
	Total	100

B. Coimbatore

S.No	SPECIES NAME	%
1	<i>Ipomea carnea</i>	16.01
2	<i>Nelumbo nucifera</i>	11.35
3	<i>Eichhornia crassipes</i>	16.98
4	<i>Polygonum pelibium</i>	3.37
5	<i>Phragmites sp</i>	6.65
6	<i>Ipomea aquatica</i>	2.81
7	<i>Algae</i>	5.67
8	<i>Saccharum</i>	3.50
9	<i>Cyperus</i>	3.90
10	<i>Lemna</i>	3.11
11	<i>Weeds</i>	3.34
12	<i>Hydrilla</i>	2.21
13	<i>Grass</i>	3.72
14	<i>Accacia</i>	6.66
15	<i>Prosopis julifera</i>	6.83
16	<i>Hygrophila auriculata</i>	1.71
17	<i>Eucalyptus tree</i>	2.17
	Total	100

Trichy		
S.No	Species name	%
1	<i>Ipomea carnea</i>	18.31
2	<i>Eichhornia crassipes</i>	19.27
3	<i>Polygonum pelibium</i>	3.08
4	<i>Phragmites sp</i>	4.82
5	<i>Ipomea aquatica</i>	2.41
6	<i>Algae</i>	7.23
7	<i>Saccharum</i>	4.13
8	<i>Cyperus sp</i>	6.75
9	<i>Lemna sp</i>	6.26
10	<i>Weeds</i>	3.85
11	<i>Grass</i>	4.82
12	<i>Acacia</i>	4.13
13	<i>Prosopis juliflora</i>	12.05
14	<i>Hygrophila auriculata</i>	2.89
	Total	100

Thiruvarur		
S.No	Species name	%
1	<i>Ipomea carnea</i>	27.59
2	<i>Eichhornia crassipes</i>	3.45
3	<i>Phragmites sp</i>	6.90
4	<i>Ipomea aquatica</i>	6.90
5	<i>Algae</i>	2.41
6	<i>Saccharam</i>	6.90
7	<i>Weeds</i>	6.90
8	<i>Grass</i>	3.45
9	<i>Acacia</i>	13.10
10	<i>Lilly</i>	5.17
11	<i>Kodukkai tree</i>	17.24
	Total	100

Table 17. vegetation covers different wetlands in Trichy District

S.No	Species name	1	2	3	4	5	6	7
1	<i>Ipomea carnea</i>	10			50	40	60	30
2	<i>Eichhornia</i>							40
3	<i>Polygonum pelibium</i>	10	10		2		5	5
4	<i>phragmites*</i>	10			10	10		
5	<i>Ipomea aquatica</i>				5		5	5
6	<i>Algae</i>	10	20	15				
7	<i>Saccharum</i>	10	10	10	5	10	10	5
8	<i>Cyperus Sp</i>	20	20	20	5		5	
9	<i>Lemna Sp</i>	5	20	25	5		10	
10	<i>Weeds</i>	10	5	5	10			10
11	<i>Grass</i>	10						
12	<i>Accacia</i>	5	10	15	5	15	5	5
13	<i>Prosopis juliflora</i>					25		
14	<i>Hygrophila auriculata</i>		5	10	3			

1 -Asur lake, 2- Thaneerpatti lake-1, 3- Thaneerpatti lake II, 4- Planganangudi lake, 5- Nilamuthy lake, 6-Thuvakudi lake, 7-Valavanthankottai

Table.18. Vegetation cover in different wetlands in Perambalur district.

S.No	Species name	1	2	3	4	5	6	7	8
1	<i>Ipomea carnia</i>	30	70	60		80	Nil	70	30
2	<i>Nelumbo Nuceifera</i>			10			Nil		
3	<i>Phragmites*</i>				80		Nil		
4	<i>Ipomea aquatica</i>			15			Nil		
5	<i>Sacharam</i>	10	15	10			Nil	5	10
6	<i>Cyperus Sp</i>	5				10	Nil		
7	<i>Lemna Sp</i>	5		5		5	Nil		
8	<i>Weeds</i>		5		15	5	Nil	5	10
9	<i>Hydrilla</i>				5		Nil		
10	<i>Accacia</i>	30	10				Nil	20	50
11	<i>Prosopis julifera</i>	20					Nil		

1-Karaivetti lake, 2-Kalinga lake, 3-Kallankuruchi lake-1, 4-Kallankuruchi lake-II, 5-Ayyan lake, 6-Srinivasapuram lake, 7- Chetti lake, 8-Thamaraikulam

Table.19. Vegetation cover in different wetlands in Coimbatore District.

S.No	Species name	1	2	3	4	5	6	7	8	9	10
1	<i>Ipomea carnia</i>		20	2				10	70	Nil	3
2	<i>Nelumbo Nuceifera</i>									Nil	2
3	<i>Eichhornia</i>	30	5	80	10	80	60	70		Nil	
4	<i>Polygonum pelibium</i>	15	15							Nil	
5	<i>Phragmites*</i>			5	10		5			Nil	2
6	<i>Ipomea aquatica</i>	10	5	3	5		5	10		Nil	10
7	<i>Algae</i>		25							Nil	
8	<i>Sacharam</i>	3		5	10	5	10	5	10	Nil	3
9	<i>Cyperus Sp</i>	5	5		20	10	10			Nil	10
10	<i>Lemna Sp</i>		10				5			Nil	10
11	<i>Weeds</i>				10				10	Nil	
12	<i>Hydrilla</i>									Nil	5
13	<i>Grass</i>	30	5		20	5	5	5		Nil	2
14	<i>Accacia</i>	2	10	5	15				10	Nil	25
15	<i>Prosopis julifera</i>	5								Nil	25
16	<i>Hygrophila auriculata</i>									Nil	3

1- Ukkadam lake, 2-Kuruchi lake, 3- Valankulam, 4- Sular lake-1, 5-Sular lake-II, 6-Singanallur lake-1, 7- Singanallur lake-II, 8- Ramachandrapuram, 9-Uppuchiputhur, 10-Vettaikaran puthur.

Table.20. Vegetation cover in different wetlands in Thiruvarur District

S.No	Species name	1	2
1	<i>Ipomea carnia</i>	40	*
2	<i>Eichhornia</i>		5
3	<i>Phragmites*</i>	5	15
4	<i>Ipomea aquatica</i>	10	10
5	<i>Algae</i>	5	2
6	<i>Sacharam</i>	10	*
7	<i>Weeds</i>	10	*
8	<i>Grass</i>	5	5
9	<i>Accacia</i>	10	28
10	<i>Trapa natans</i>		*
11	<i>Lilly</i>	5	10
12	<i>Kodukkai tree</i>		25

1- Uthayamarthandapuram lake, 2- Thirumeni lake

7. DISCUSSION

In Indian wetlands 318 species of birds were recorded out of which 193 species are fully dependent on to wetlands (Vijayan 1986). In our study 85 species were recorded out of which 53 were fully dependent on wetlands. In the KTDC complex it was only 11 species (Narayanan 2004). Ardiidae contributed the maximum family as in many other studies (Vijayan 1991, Narayanan 2004, Urfi & Sharma 1992).

The total number of birds was different in each location and most of the location water level is the most important. Tamil Nadu is a drought-prone state and due to vagaries of monsoon has experienced recurrent drought over the years (Nathan, 1998). Majorities of wetlands are irrigation tanks. In years of poor monsoon or monsoon failure birds number and their breeding activity also was different (Paulraj 1985, Santharam 1981, Perennou and Santharam 1991).

Nineteen of the 26 species of colonially nesting large water birds that are known to breed in Indian heronries (Subramanya, 1996), namely Spot-billed Pelican, Little Cormorant,

Indian Shag, Great Cormorant, Darter, Little Egret, Grey Heron, Large Egret, Median Egret, Cattle Egret, Indian Pond-Heron, Black-crowned Night-Heron, Painted Stork, Asian Openbill-Stork, White Ibis, Black Ibis, Glossy Ibis, Eurasian Spoonbill nest in Tamil Nadu (Subramanya 2005) out of which during our survey only eight species recorded were breeding in different wetland sites. These were Karavetti, Thirumeni, Sulur, Vaduvloor, Kallaperambur, and Vettaikaranputhur.

More than 51 species of birds were recorded as very rare and nearly 10 species are recorded as occasional based on the sightings. The post winter season like January to March most of the migratory birds started moving and also the water level started decreasing in the wetlands, which are possible reasons for the less sighting frequency. Various studies reported that water level and the bird abundance are inter related ones (Colwell & Taft 2000).

In the study area only 20.08 % of birds were migratory and the remaining ones are local migrant or resident, whereas in Bharathpur bird sanctuary it was 60 %. (Vijayan 1991). The Common Sandpiper and Spotted Sandpiper were recorded in most of the wetland sites. Sandpipers mostly preferred the edges of the wetlands for feeding.

Cattle Egret, Little Egret, Little Cormorant and Garganey Teal are the some of the common species in the study site. This species are the resident and the food abundance of this species was high in most of the sites. Wetland utilization by migratory waterfowl was studied in Kaoladeo National Park, Lambardini *et al.*, (2001), found that rice fields and other agricultural habitats were used more by Cattle Egrets than other habitats. Gerhard and Tailaferro (2003) showed density-dependent patch selection by foraging Cattle Egrets.

During the study period one globally threatened and two near threatened species are recorded; namely Spotbilled Pelican, Darter and Painted Stork (Bird Life International, 2001). Totally 87 Spot-billed Pellican was recorded out of which maximum of 37 birds was recorded in Coimbatore district at Ukkadam. Any areas that possess 1% of its world

population in a regular manner can be declared as an Important Bird area (Rahmani, 2002). Darter was recorded except in Trichy district and maximum of 18 birds were recorded in Vattaikaran pudhur. Depends and more open water is require for the Dartar for fishing. When wetlands are covered with weeds such as *Ipomea* and *Eichhornia*, these species and many others are unable to use the site. reported that the *Anhinga melanogaster* poulation has declined in Kerala during the last three decades. This population is important and the areas must be protected and monitored. Similar type of result was observed at KTDC Complex also (Narayanan 2004).

However, the birds variously use the lily pond ecosystem. The breeding wetland birds of this habitat do not feed in the pond, but gather at the pond to seek relief from heat stress. Natural wetlands continue to decrease in area and throughout world (Czech and Parsons 2002). Wetlands are important conservation sites due to the extensive food chain and rich biodiversity they support (Getzner 2002). However, the fast degradation of these ecosystems produces an urgent need for ecological studies to develop conservation programs. Almost half of the world's wetlands have disappeared in the last century due to agriculture and urban development. One of the main hydrological characteristics of South America is the existence of large wetlands. Approximately 95% of the inventoried wetland in South America are in Six countries and Brazil has half of the total wetlands (Naranjo 1995). However, the Brazilian wetland, inventory is not up dated and it is restricted to only three scientific surveys (Maltchik 2003). South Brazil has approximately 3,441 wetlands and approximateluy 72% of them are smaller than 1 km.sq.

Agricultural wetlands are primary foraging sites for many species water birds, and as natural wetlands continue to decrease in area and quality, they have become increasingly important refugia for water birds throughout world (Czech and parsons 2002).

Colwell and Taft (2000) evaluated relationships between winter water birds use and average depth, variation in depth and size of 25 wetlands in the northern san Joaquin valley of California. Battley (2003) sfudied social foraging waterbirds in the shollow

coastal lagoons in Ghana. However, for Egrets as mean colony size was not determined by the water depth at the site. Reeds may provide suitable feeding patches includes pools or small areas of open water with in dense vegetation, where water level fluctuation and oxygen deficiency may provide access to food (Kushlan, 1976; Kersten *et al.*, 1991).

Recent studies on the inland wetlands of India (Prasad *et al.*, 2004, Vijayan *et al.*, 2004) have brought out the loss of these wetlands to the extent of 38 % during the ten year period of 1991 to 2001 and it was even up to 88 % in some of the districts. These losses affect not only the wetland biodiversity but also drinking water and life of the people.

THREATS TO WETLANDS

These wetland values are increasingly facing several anthropogenic pressures. The rapidly expanding human population, large scale changes in land use/landcovers and burgeoning development projects and improper use of watersheds have all caused a substantial decline of wetland resources of the country. Absence of reliable and updated information and data on extent of wetlands, their conservation values and socioeconomic importance has greatly hampered development of policy, legislation and administrative interventions by the state.

CONSERVATION

Wide varieties of birds use wetland habitats for all or part of their life (Weller, 1981) and these birds form one of the major components of the wetland ecosystem (Vijayan, 1995). Management of the wetlands are crucial for conservation, since the resident waterfowl spend most part of their life, including breeding in the wetlands. So conservation should be priority in the management of wetlands (Vijayan, 1995). As a wetland ecosystem this area is important for the breeding and roosting birds and several other taxa of fauna and flora. This region is the biggest and the premier roosting and nesting grounds for many wetland wading birds including globally near threatened bird – *Anhinga melanogaster*.

Conservation decisions concerning endangered or vulnerable bird species are often based on data about population size or trend (Tucker and Heath, 1994; IUCN species Survival commission, 1994), although factors such as breeding parameters are important to consider (Delord *et al.*, 2003). Wetlands and reed beds in particular are most often considered of conservational interest for its bird communities. The study area has a good area of reeds also and it has crucial part in the breeding of the *Ardea purpurea*, *Mesophoyx intermedia* and *Nycticorax nycticorax*.

Bibby and Lunn (1982) considered minimum reedbed size for the conservation relevance to be 2 ha. Studies of Rodgers and Smith (1995) throws light to both intraspecific and interspecific variation in the flushing response of birds to the human disturbance. In general they recommended setback distance of about 100m for wading bird colonies.

During this study in the four districts 69 wetlands were covered. Analysis of the data showed that wetlands in Kanyakumari district at Theroor, in Cuddalore at Wellington Lake, in Thanjavur at Vaduvor Lake, in Coimbatore Singanallur, Sular Vettikaranputhur and Thirumeni in Thiruvarur district had a good population of birds. In karaivetti bird sanctuary, Vaduvor bird sanctuary and Udamarthandapuram was also supporting more birds were recorded and it is protected also. Successful conservation of the species will depend on an improved understanding of its ecological requirements and moving patterns (Fellowes *et al.*, 2001). Further surveys and intensive studies in different seasons of the year will bring out better results for the conservation of these wetlands.

Appendix-1. Check list of birds is observed during the study area

S.No	Families	Common Name	Scientific Name
1	Podicipedidae	Little Grebe	<i>Podiceps ruficollis</i>
2	Pelicanidae	Spottedbilled Pelican	<i>Pelicanus philippensis</i>
3	Phalacrocoridae	Little Cormorant	<i>Phalacrocorax niger</i>
4	Anhingidae	Darter	<i>Anhinga rufa</i>
5	Ardeidae	Grey Heron	<i>Ardea cinerea</i>
6	Ardeidae	Purple Heron	<i>Ardea purpurea</i>
7	Ardeidae	Pond Heron	<i>Ardeola grayii</i>
8	Ardeidae	Cattle Egret	<i>Bubulcus ibis</i>
9	Ardeidae	Smaller Egret	<i>Egretta intermedia</i>
10	Ardeidae	Large Egret	<i>Ardea alba</i>
11	Ardeidae	Little Egret	<i>Egretta garzetta</i>
12	Ardeidae	Night Heron	<i>Nycticorax nycticorax</i>
13	Ardeidae	Little Bittern	<i>Lxobrychus minutus</i>
14	Ciconiidae	Openbilled Stork	<i>Anastomus oscitans</i>
15	Ciconiidae	Painted Stork	<i>Mycteria leucocephala</i>
16	Ciconiidae	Whitenecked Stork	<i>Ciconia episcopus</i>
17	Threskiornidae	White Ibis	<i>Threskiornis aethiopica</i>
18	Threskiornidae	Spoonbill	<i>Platalea leucorodia</i>
19	Threskiornidae	Black ibis	<i>Pseudibis papillosa</i>
20	Anatidae	Lesser Whistling Teal	<i>Dendrocygna javanica</i>
21	Anatidae	Common Teal	<i>Anas crecca</i>
22	Anatidae	Spotbill Duck	<i>Anas poecilorhyncha</i>
23	Anatidae	Garganey Teal	<i>Anas querquedula</i>
24	Anatidae	Barheaded Goose	<i>Anser indicus</i>
25	Anatidae	Pintail	<i>Anas acuta</i>
26	Anatidae	Cotton Teal	<i>Nettapus coromandelianus</i>
27	Rallidae	Common Moorhen	<i>Gallinula chloropus</i>
28	Rallidae	Whitebreasted Waterhen	<i>Amaurornis phoenicurus</i>
29	Rallidae	Indian Purple Moorhen	<i>Porphyrio porphyrio</i>
30	Rallidae	Common Coot	<i>Fulica atra</i>
31	Jacaniidae	Pheasant-tailed Jacana	<i>Hydrophasianus chirurgus</i>

32	Jacanidae	Bronze- winged Jacana	<i>Metopidius indicus</i>
33	Charadriidae	Redwattled Lapwing	<i>Vanellus indicus</i>
34	Charadriidae	Yellowwattled Lapwing	<i>Vanellus malabaricus</i>
35	Charadriidae	Little Ringed Plover	<i>Charadrius dubius</i>
36	Charadriidae	Grey Plover	<i>Pluvialis squatarola</i>
37	Charadriidae	Kentish Plover	<i>Charadrius alexandrinus</i>
38	Scolopaciidae	Common Sandpiper	<i>Tringa hypoleucos</i>
39	Scolopaciidae	Spotted Sandpiper	<i>Tringa glareola</i>
40	Scolopaciidae	Marsh Sandpiper	<i>Tringa stagnatilis</i>
41	Scolopaciidae	Common or Fantail Snipe	<i>Gallinago gallinago</i>
42	Scolopaciidae	Greenshank	<i>Tringa nebularia</i>
43	Scolopaciidae	Common Redshank	<i>Tringa totanus</i>
44	Recurvirostridae	Blackwinged Stilt	<i>Himantopus himantopus</i>
45	Scolopaciidae	Black- tailed Godwit	<i>Limosa limosa</i>
46	Laridae	Gullbilled Tern	<i>Gelochelidon nilotica</i>
47	Laridae	Whiskered Tern	<i>Chlidonias hybrida</i>
48	Laridae	Common Tern	<i>Sterna hirundo</i>
49	Laridae	River Tern	<i>Sterna aurantia</i>
50	Alcedinidae	Indian Pied Kingfisher	<i>Ceryle rudis leucomelanura</i>
51	Alcedinidae	Small Blue Kingfisher	<i>Alcedo atthis pallasii</i>
52	Alcedinidae	Storkbilled Kingfisher	<i>Pelargopsis capensis</i>
53	Alcedinidae	Whitebreasted Kingfisher	<i>Halcyon smyrnensis</i>
54	Corvidae	Common Crow	<i>Corvus splendens</i>
55	Corvidae	Jungle Crow	<i>Corvus macrorhynchos</i>
56	Hirundinidae	Common Swallow	<i>Hirundo rustica</i>
57	Hirundinidae	Red rumped Swallow	<i>Hirundo daurica</i>
58	Muscicapidae	Common Tailor bird	<i>Orthotomus sutorius</i>
59	Muscicapidae	Ashy Prinia	<i>Prinia socialis</i>
60	Muscicapidae	Bluethroat	<i>Luscinia svecica</i>
61	Cuculidae	Pied Crested Cuckoo	<i>Clamator jacobinus</i>
62	Cuculidae	Greater coucal	<i>Centropus sinensis</i>
63	Dicruridae	Black Drango	<i>Dicrurus macrocercus</i>
64	Motacillidae	Large pied wagtail	<i>Motacilla maderaspatensis</i>
65	Motacillidae	Yellow wagtail	<i>Motacilla flava</i>

66	Accipitridae	Brahminy kite	<i>Haliastur indus</i>
67	Accipitridae	Black Kite	<i>Milvus migrans</i>
68	Accipitridae	Black Shoulder kite	<i>Elanus caeruleus</i>
69	Sturnidae	Common Myna	<i>Acridotheres tristis</i>
70	Psittacidae	Rose Ringed Parakeet	<i>Psittacula krameri</i>
71	Nectariniidae	Purple Sunbird	<i>Nectarinia asiatica</i>
72	Columbidae	Spotted Dove	<i>Streptopelia chinensis</i>
73	Coraciidae	Indian Roller	<i>Coracias benghalensis</i>
74	Meropidae	Small Bee-eater	<i>Merops orientalis</i>
75	Meropidae	Blue tailed Bee eater	<i>Merops philippinus</i>
76	Megapodiidae	Indian Peafowl	<i>Pavo cristatus</i>
77	Corvidae	Indian treepie	<i>Dendrocitta vagabunda</i>
78	Estrilididae	Black headed Munia	<i>Lonchura malacca</i>
79	Oriolidae	Golden Oriole	<i>Oriolus oriolus</i>
80	Passeridae	Baya Weaver bird	<i>Ploceus philippinus</i>
81	Sturnidae	Brahminy Starling	<i>Sturnus pagodarum</i>
82	Pycnonotidae	Red vented bulbul	<i>Pycnonotus cafer</i>
83	Columbidae	Ring Dove	<i>Streptopelia tranquebarica</i>
84	Alaudidae	Singing bush Lark	<i>Mirafra cantillans</i>
85	Capitonidae	Brown- headed Barbet	<i>Megalaima zeylanica</i>

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Table5. Dominance index for different bird species observed in different wetlands at Thanjavur district (1= 2=Kallaperambur lake;3=Arapundan lake; 4=Maruthuri lake;5= Uppankuzhi lake;6=Andal lake;7=Aramur 8=Kotra lake;9=Sembian lake;10=Kumman lake;11=Sayakudi lake;12=Alakapat lake;13= Pagadakudi lake; 14=Pethamathiran lake;15=Maruthakudy lake; 16=Pidari lake;17=Nangi lake;18=Raja lake;19=Vadavali lak 20=Bala lake;21=Ela lake;22=Karamba lake;23=Kada lake and 24=Valambakudi lake).

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	
					7.29		6.98	34.29	21.43	*	*	*	11.27	2.85	9.33	8.62	23.38	14.00	*	18
0.15	0.33	11.20			25.00	45.45	6.98	11.43	*	5.69	*	42.86	*	7.47	19.69	12.35	25.97	18.00	*	*
*	0.11	*			*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
0.15	*	*			*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
0.08	1.77	1.66			1.04	*	0.58	*	*	0.50	*	*	*	*	2.07	0.23	2.60	4.00	*	*
4.40	11.73	7.47		8.97	15.63	36.36	12.21	51.43	37.14	*	47.62	*	18.31	19.93	11.40	3.73	15.58	14.00	35.29	27
5.76	23.45	14.94		2.56	*	*	47.67	*	*	*	*	*	*	9.61	*	*	*	*	*	*
7.13	4.65	4.98		*	5.21	9.09	0.58	*	*	0.74	*	*	*	4.98	6.74	*	*	*	*	1.
36.09	19.03	12.45		2.56	13.54	*	*	*	2.86	4.46	23.81	*	*	11.39	4.15	0.47	3.90	2.00	*	22
24.56	19.47	*		*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
0.91	*	*		*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
18.80	10.84	11.20	81.82	41.03	16.67	*	*	*	1.43	1.73	*	*	*	24.56	*	3.26	6.49	*	*	*
*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	34.03	*	*	*	*
1	*	*	*	*	*	*	*	*	*	76.73	*	*	*	*	*	*	*	*	*	*
*	0.77	3.32	*	*	5.21	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
*	*	14.52	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	5.59	*	*	*	*
1	*	0.44	*	*	3.85	1.04	*	*	*	*	*	*	*	*	*	1.17	*	2.00	*	*
*	*	*	*	1.28	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
2	*	*	*	*	*	*	1.16	*	*	*	*	*	*	*	*	*	*	*	*	*
*	*	9.54	*	28.21	9.38	*	15.12	*	17.14	8.91	19.05	57.14	54.93	5.69	16.58	19.58	15.58	32.00	23.53	*