



FIRST DETAILED SURVEY OF WATERBIRDS IN TIRUNELVELI AND TUTICORIN DISTRICTS, TAMIL NADU, INDIA

K. Abhisheka¹, J. Patrick David², M.B. Prashanth³, K.S. Seshadri⁴ & T. Ganesh⁵

^{1,2,3,4,5} Ashoka Trust for Research in Ecology and the Environment, Royal Enclave, Srirampura, Jakkur post, Bengaluru, Karnataka 560064, India

Present address: ² Careearth Trust, 8/15, 2nd Main Road, Thillaianga Nagar, Chennai, Tamil Nadu 600061, India

Present address: ⁴ Department of Biological Sciences, National University of Singapore, 14 Science Drive 4, Singapore 117543

¹ abhishekagopal@gmail.com (corresponding author), ² patdavid28@gmail.com, ³ prashanth.mb@atree.org,

⁴ seshadri.ali@gmail.com, ⁵ tganesh@atree.org

ISSN

Online 0974–7907

Print 0974–7893

OPEN ACCESS

Abstract: The semi-arid districts of Tirunelveli and Tuticorin in the southern Indian state of Tamil Nadu consist of numerous wetlands in the form of irrigation tanks, interconnected by an ancient network of canals, and fed by the rivers originating from the Western Ghats. While these irrigation tanks have socio-economic and cultural significance, very little is known of their ecological importance. These tanks have the potential to harbor good populations of resident and wintering waterbirds but no studies have been done to confirm this. A survey was carried out in 230 irrigation tanks of various sizes in the two districts from November 2008 to January 2011. A total of 83 waterbird species were recorded. Indian Pond Heron *Ardeola grayii* occurred in most of the surveyed tanks. Large concentrations of wintering waterfowl such as Eurasian Wigeon *Anas penelope*, Northern Pintail *Anas acuta*, Garganey *Anas querquedula* were recorded in tanks closer to the coast. Based on our survey, six sites with large waterbird concentrations have been identified, one of which is Vagaikulam, an active heronry currently under threat from tree felling. These sites along with associated wetlands are important for the long term conservation of waterbirds in the region.

Keywords: Heronry, irrigation tanks, long term monitoring, waterfowl.

DOI: <http://dx.doi.org/10.11609/JoTT.o3125.4641-52> | ZooBank: urn:lsid:zoobank.org:pub:5ECC9346-22C9-42BF-A4A4-99B859FDB906

Editor: K.S. Gopi Sundar, International Crane Foundation, Baraboo, USA.

Date of publication: 26 August 2013 (online & print)

Manuscript details: Ms # o3125 | Received 16 March 2012 | Final received 07 July 2013 | Finally accepted 07 August 2013

Citation: Abhisheka, K., J.P. David, M.B. Prashanth, K.S. Seshadri & T. Ganesh (2013). First detailed survey of waterbirds in Tirunelveli and Tuticorin districts, Tamil Nadu, India. *Journal of Threatened Taxa* 5(12): 4641–4652; <http://dx.doi.org/10.11609/JoTT.o3125.4641-52>

Copyright: © Abhisheka et al. 2013. Creative Commons Attribution 3.0 Unported License. JoTT allows unrestricted use of this article in any medium, reproduction and distribution by providing adequate credit to the authors and the source of publication.

Funding: This study was funded by the Ecosystem Grant Programme of the International Union for Conservation of Nature, Netherlands.

Competing Interest: Authors declare no competing interest.



Acknowledgements: We thank Dr. Aravind N A, Dr. Chetana H C and Mr. Samuel Jacob for their valuable inputs; Mr. M. Mathivanan and other staff of the Agasthyamalai Community based Conservation Centre, at Manimutharu for help and logistic support. We are grateful to Ms. Deepa Ruth Varkey, Mr. Saleem Hameed and all other volunteers and vehicle drivers who lent invaluable support during the field work.

Author Contribution: TG designed the study. KA, JPD, MBP, KSS and TG collected the data, analysed and wrote the manuscript. MBP designed the map.

Author Details: K. ABHISHEKA, Ecologist, trained artist and also an urban wildlife rehabilitator. She uses her experience in field ecology and the medium of art to reach out to people on conservation related issues. She is currently a freelancer.

J. PATRICK DAVID, Ecologist, currently working as project co-ordinator with Care Earth Trust, Chennai. His responsibility is to survey for birds in the Eastern Ghats of Tamil Nadu and identify birding hotspots.

M.B. PRASHANTH, interested in avian diversities in wetlands and is currently working on the mapping of wetlands and their habitat characteristics in relation to diversity and abundance of waterbirds. Has been involved in the co-ordination, surveying and compiling reports of the mid-winter waterbird census in the Tamiraparni river basin. Currently with ATREE.

K.S. SESHADRI, Ecologist, primarily interested in understanding how human actions alter the ecosystems. As a Graduate student, he is studying the ecology and behavior of red-listed amphibians in the Western Ghats. Currently pursuing PhD at Department of Biological Sciences, National University of Singapore.

T. GANESH, Ecologist, for over three decades, he has worked and advised students on various ecological aspects primarily focussing on plant-animal interaction; bird and primate ecology; ecological restoration and long term monitoring of forests. He has also authored a bilingual multi taxa field guide. He is currently a senior fellow at ATREE.

INTRODUCTION

Wetlands, both natural and artificial, support a high diversity of resident and migrant waterbirds (Amezaga et al. 2002). Though there are numerous such habitats for birds across India, very few have been systematically surveyed to understand their importance for birds. This is especially true for many small ones that are in an agricultural landscape often fed by man-made irrigation networks and collectively supporting large populations of waterbirds. As part of conservation efforts, isolated wetlands or heronries in the agricultural areas get listed as important bird areas (IBA). Though such efforts are important, they provide inadequate coverage, and are of limited value unless the surrounding habitat matrix such as swamps, canals, wet agricultural areas - which effectively sustain a good population of birds are included in the conservation plans (Elphick et al. 2010; Sundar 2011). It, therefore becomes imperative that a landscape approach is used to establish the importance of wetlands for waterbirds.

The districts of Tirunelveli and Tuticorin in the semi-arid landscape of southern Tamil Nadu have many man-made, small- to large-sized, irrigation tanks (henceforth called tanks). These inland tanks were built a few centuries ago and are interconnected by canals that bring water from the rivers originating in the Western Ghats (Vaidyanathan 2001). These rivers and associated tanks support a rich social and cultural heritage and economically support agriculture that is the main source of livelihood for the people in these districts.

The tanks in these two districts are known to support large populations of the Near Threatened Spot-billed Pelican *Pelecanus philippensis*, and Painted Stork *Mycteria leucocephala* (Kannan & Manakandan 2005; Subramanya 2005). They also provide suitable habitat for the Greater Flamingo *Phoenicopterus roseus* (Sathan & Pandi 2009) and sustain a variety of migrant water birds during the winter. Not surprisingly, the area has also been known to sustain heronries like Koonthankulam, Gangaikondan, Moondradaippu, Tirupudaimarathur, Vijayanarayanam, Karungulam and Ariyakulam (Krishnan 1978; Nagulu & Rao 1983; Subramanya 1996). However, past reports were based on small-scale surveys and are outdated as some of the aforementioned heronries do not exist today.

Though there are studies on birds in the two districts, most have been restricted to forest birds in the neighboring Kalakad-Mundanthurai Tiger Reserve (KMTR) (Johnsingh & Joshua 1989, 1994; Johnsingh 2001; Raman & Sukumar 2002), whereas in the semi-

arid plains, focus has been on Koonthankulam and other heronries (Rhenius 1907; Webb-Peploe 1945; Wilkinson 1961; Subramanya 2005). While Koonthankulam is notified as an IBA, scant attention is given to the other tanks in this network which potentially harbor a high diversity of resident and migratory waterbirds. There are over 3000 tanks here and some of them are large (over 1700 acres). There is a need to identify tanks important for resident and migrant waterbirds, and prioritize them for conservation. Moreover, the tanks and agricultural fields in these two districts along with the neighbouring Kanyakumari District are located towards the southern tip of the Indian peninsula and therefore provide critical wintering habitats for many migrant species. Several of these tanks are, however, threatened by various anthropogenic factors (Abhisheka et al. 2012). In this context, robust baseline information on waterbird diversity and populations can provide a starting point for future monitoring, conservation planning and developing pertinent management interventions.

In this paper we provide the results of a survey of 230 tanks to document the diversity and abundance of waterbirds in Tirunelveli and Tuticorin districts of Tamil Nadu. We identify key sites that harbor large populations of resident and migrant waterbirds that will be useful for waterbird conservation.

STUDY AREA AND METHODS

Located in the southern most part of India, the two districts, Tirunelveli (8°08'–9°23'N & 77°09'–77°54'E) and Tuticorin (8°49'N & 78°8'E) are encompassed by the Western Ghats on the west and the Bay of Bengal on the east. This region is known as the rice bowl of southern Tamil Nadu, made possible by the many rivers that originate in the Agasthyamalai Hills, and also as a biosphere reserve and a proposed world heritage site (Rehman & Shrivastava 2012). The numerous tanks (~3000) that lie in the semi-arid plains of these two districts are fed by seven perennial rivers viz., Thamiraparani and its tributaries: Manimuthar, Pachaiyar, Kodumudiyar, Gadanathi, Ramanathi and Nambiar which form the lifeline of about five million people living in the immediate landscape (Gazetteer 2002). The Thamiraparani is a major river, which plays a vital role by providing water for irrigation and sustaining the people living in its basin. The river originates from the catchments of the Periya Pothigai hills in the Agasthyamalai region of the Western Ghats and traverses through the two districts before joining the Gulf of Mannar in the Bay of Bengal

at Punnaikayal.

The river-canal-tank network in the semi-arid landscape sustains extensive paddy agriculture in the region. The old trees and plantations in the region support heronries while the *Borassus flabellifer* palm traditionally planted around the tanks offers roosting sites for numerous resident birds. A survey of 230 small to large tanks (10–1705 acres) based on size and logistics was carried out in three phases in the districts of Tirunelveli and Tuticorin from November 2008 to January 2011 (Appendix 1). A very large proportion (>50%) of small tanks close to the forests were surveyed during this period. Surveys were carried out between September to February for two reasons: one, it included the wintering period for migrant waterfowl and second, the September to October period is a dry period with very few tanks having water. This allowed us to identify critical tanks where waterbirds could be found during water shortage in the larger landscape. Though this is biased against migratory birds these water bodies can be critical for resident species which experience seasonal water shortages on a regular basis. Indian Remote Sensing Satellite, Google Earth images, maps from the Survey of India and information from Public Works Department, Government of Tamil Nadu were

used to locate wetlands for the survey. These sources of information were also used to determine the extent of each tank in acres.

During the first phase, 177 tanks were surveyed along the foothills of KMTR spread over a distance of 65km from November 2008 to September 2010. Nearly all tanks close to the rivers Gadananathi, Thamiraparani, Manimuthar, Pachaiyar and Nambiar were surveyed. In the second phase, all the tanks on the banks of the Thamiraparani river in both districts were surveyed (n=22) in the month of September 2010. In the third phase, a mid-winter waterfowl census was conducted across the two districts in Jan 2011 (n=42). Eleven tanks surveyed in the earlier two phases were part of the 42 tanks. Only large tanks were chosen for the mid-winter survey as many volunteers were available for the survey and it could be done in 2–3 days (Fig. 1). All large tanks in the dry areas of the districts away from the river basin were also surveyed. In total, 230 individual tanks were covered during the two phases and the mid-winter waterfowl census.

In each of the tanks, the number of bird species and the number of individuals were recorded. The total number of birds was enumerated by walking along the periphery of the tanks in the mornings from 06:30–09:30

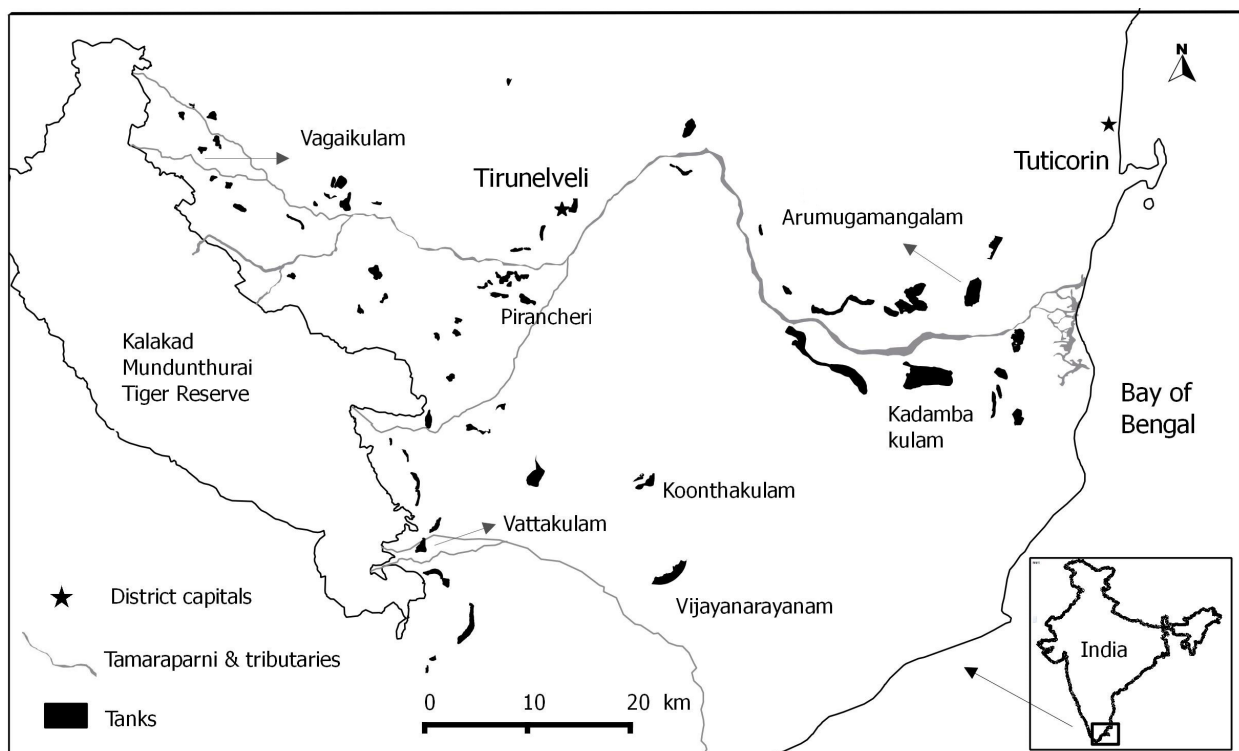


Figure 1. Large Tanks surveyed in Tirunelveli and Tuticorin districts. Map compiled from Survey of India topo sheets, 58 H 1-13, 1970-80 and Google Earth, IRS Liss III images Dec 2009, Jan 2012,

hr or in the evenings from 16:00–18:00 hr as this time period was found to be most appropriate during pilot surveys. Large tanks were divided into blocks to simplify counting and sometimes were surveyed beyond 09:30 hr due to their size. Waterbirds were counted from a few vantage points, as gaining access to all sides of the tank was difficult in a few cases. A minimum of two members for small to medium tanks and four members, split into two groups, for large tanks, counted the birds. All members of the team were experienced bird watchers and familiar with water bird counting. The mid-winter waterfowl census was carried out by over 30 people split into two or four groups, with each group having at least one experienced birdwatcher. Often, in large wetlands complete counts were biased by the presence of vegetation and large distance from bird to the shore and may have led to underestimates of counts but not so in smaller wetlands. We also recognize that abundance estimates can be biased by observer, year, day of count, potential double counting, and other factors, but were unable to account for these in our study.

All surveys were carried out using binoculars (8X40, 10X50) or using spotting scopes (10X100). Geographic coordinates (latitude and longitude) were obtained at one arbitrary point for each tank using a Garmin® hand-held global positioning system.

Tanks critical for water bird conservation was decided based on the presence of heronry, high species richness, greater abundance of waterbirds, habitat diversity present in the wetland, and availability of water during the dry seasons spanning from March to October. Local villagers around the tanks were consulted about the tank's history, source of water and the availability of water in it. Grouping of birds, classification, common and

latin names were based on international ornithological committee (IOC) World Bird Names (Gill & Donsker 2012). Species' global status was ascertained using the IUCN classification (IUCN 2010).

RESULTS AND DISCUSSION

A total of 83 species of waterbirds were recorded in the 230 tanks surveyed (Appendix 2). Of the 83 species about 41% were migrants, 26% local migrants and 33% residents. More than 13,164 individuals and 69 species were recorded during the phase one survey of 177 small tanks in the foothills of KMTR. In phase two 20,406 individuals of 58 species were recorded in 22 tanks and finally 32,379 birds of 71 species were recorded in 42 tanks during the mid winter waterbird census. These variations were mostly due to the size of tanks, since tanks surveyed in phase one were smaller than in other phases.

Indian Pond Heron *Ardeola grayii* was the most common species and occurred in 76% of the 230 tanks surveyed, followed by Little Egret *Egretta garzetta* (75%) and Little Cormorant *Phalacrocorax niger* (71%). A few species were recorded in only one tank, and some examples of these are Black-capped Kingfisher *Halcyon pileata*, Common Tern *Sterna hirundo*, Great Thick-Knee *Esacus recurvirostri*, Lesser Sand Plover *Charadrius mongolus*, Little Stint *Calidris minuta*, Oriental Pratincole *Glareola maldivarum*, Ruff *Philomachus pugnax*, Small Pratincole *Glareola lactea*, Watercock *Gallix cinerea* and Whimbrel *Numenius phaeopus*. Four bird species in the Near Threatened category; Black-headed Ibis *Threskiornis melanocephalus*, Oriental Darter *Anhinga*

Table 1. Bird diversity in key sites. Total counts listed under respective orders. These are maximum counts recorded during the study period.

Tank Name	Coordinates	Order								No. of Species	Total count
		<i>Anseri formes</i>	<i>Podicipedi formes</i>	<i>Phoenicopteriformes</i>	<i>Ciconii formes</i>	<i>Pelecani formes</i>	<i>Suliformes</i>	<i>Grui formes</i>	<i>Charadriiformes</i>		
Arumugamangalam	08°39.432'N 78°02.149'E	3008	-	-	-	157	63	236	131	26	3603
Kadamba Kulam	08°34.576'N 77°58.637'E	10170	-	-	205	471	74	10048	344	44	21354
Pirancheri Periyakulam	08°39.496'N 77°37.203'E	401	49	-	15	1209	351	408	158	45	2626
Vagai Kulam	08°47.672'N 77°22.729'E	196	80	-	5	1907	610	386	145	45	3371
Vattakulam	08°26.283'N 77°33.621'E	1852	22	-	45	1061	218	240	141	33	3611
Vijayanarayanan Periyakulam	08°24.639'N 77°45.890'E	2097	-	413	11	420	214	155	2717	38	6227

Table 2. Population of water bird species that exceeds Ramsar criteria (Islam & Rahmani 2004, 2008; Li et al. 2009). These are maximum counts during the survey.

Species	Tanks	Count	1% population threshold (2006)
Bar-headed Goose	Vijayanarayananam Periyakulam	667	560
Black-headed Ibis	Vagaikulam	359	250
Cotton Pygmy-goose	Arumugamangalam	1,200	1,000

melanogaster, Painted Stork and Spot-billed Pelican were recorded in large numbers in these tanks. Some species like the Black-capped Kingfisher was restricted to the foothills while Ruff, Whimbrel, Eurasian Wigeon *Anas penelope* and Lesser Sand Plover were seen more often in tanks closer to the coast.

The Common Pochard *Aythya ferina*, Eurasian Wigeon, Great Thick-Knee, Pied Avocet *Recurvirostra avosetta*, Ruff, Whimbrel and Watercock were sighted for the first time during the survey. Though all of these species are expected to occur in the region (Grimmett et al. 1999), there have been no prior reports from the focal districts.

Among the tanks surveyed, six were prioritized for conservation attention (Table 1). Three tanks were chosen on the basis of having waterbird abundance greater than 1% population threshold as per Ramsar criteria (Table 2). The other three were chosen based on the high abundance and species richness of birds. While we highlight only six tanks, all the tanks have a great potential to support large waterbird congregations, and they are also existing and potential nesting/roosting sites. The six tanks are represented in Fig. 1 along with all the large tanks.

Vagaikulam (81 acres) situated at Nanalkulam near Alwarkurchi in Tirunelveli district was found to support 45 species. It has no other heronries in a radius of 65 km and is one of the largest heronries in the district of Tirunelveli after the Koonthankulam bird sanctuary. The tank comprises of semi submerged *Acacia nilotica* trees and is an important nesting and roosting site for several non-migratory species of birds like Black-crowned Night Heron *Nycticorax nycticorax*, Black-headed Ibis, Little Cormorant, Indian Cormorant *Phalacrocorax fuscicollis*, Great Cormorant *Phalacrocorax carbo*, Little Egret, Indian Pond Heron, Little Grebe *Tachybaptus ruficollis*, Common Moorhen *Gallinula chloropus*, Pheasant-tailed Jacana *Hydrophasianus chirurgus* and Bronze-winged Jacana *Metopidius indicus*. The tank also supports roosting populations of Glossy Ibis *Plegadis falcinellus*, Spot-billed Pelican and ducks like Cotton Pygmy-Goose

Nettapus coromandelianus, Garganey *Anas querquedula*, Northern Pintail *Anas acuta*, and Lesser Whistling-Duck *Dendrocygna javanica*. The water in the tank is seasonal and the heronry is active from November to March. The heronry is under threat from the felling of *Acacia nilotica* trees planted by the forest department.

Pirancheri Periyakulam (94 acres) situated on the Tirunelveli-Ambasamudram main road supported 45 species during this survey. The floating vegetation in the tank along with grass and reeds makes this a suitable habitat for dabbling as well as wading birds. The vegetation provides nesting habitat for Moorhens, Jacanas and Herons. Water from Thamiraparani feeds this tank and it is perennial. Weed infestation and dumping of garbage is posing significant threat to this tank. Expansion of a road in future is another possible threat to the tank.

Vattakulam (125 acres) situated on the Cheranmadevi-Nagercoil Road is a large tank close to Tirukurangudi Village at the southern end of Kalakad Mundanthurai Tiger Reserve. During the survey 33 species were recorded. Pelicans, storks, and egrets congregate here in large numbers to feed on the fish in the shallow water when the tank starts to dry out. The tank shore line is used by several small waders like the Common Sandpiper *Actitis hypoleucos*, Black-winged Stilt *Himantopus himantopus*, Little Ringed Plover *Charadrius dubius* and Marsh Sandpiper *Tringa stagnatilis*. The tank is seasonal and fed by the Nambiar River. We did not document any major threat to the tank during our survey.

Kadamba Kulam was the largest tank surveyed (1705 acres) and is situated close to the town of Sirivaikuntam in Tuticorin District. It is a mini reservoir which feeds about 14 smaller tanks. The highest number of birds was recorded here (21,354) and about 44 species. Very large concentrations of wintering waterbirds, especially waterfowl are found here from December through February, especially large numbers of ducks such as Eurasian Wigeon, Northern Pintail, and Northern Shoveler *Anas clypeata*. During the dry season when all tanks fed by the Thamiraparani river go dry, birds congregate at this tank in huge numbers. At present this tank does not experience any major threat.

Arumugamangalam tank (786 acres) is situated on the Sirivaikuntam-Eral Road in Tuticorin District and supported about 26 species. This is also an important tank for migratory ducks. Large concentrations of Eurasian Wigeons were seen here. The *Borassus flabellifer* palm trees planted around the tank are used for nesting by a small population of Spot-billed Pelicans. Birds in this tank are threatened by poaching and more

recently, the water was let out to Tuticorin City for nonagricultural purposes during the dry season, which was not done earlier.

Vijayanarayanan Periyakulam is one of the biggest tanks (819 acres) in Tirunelveli District. The second highest numbers of birds were recorded here (6,227) and about 38 species. This tank is situated close to Bird Sanctuary and hundreds of Greater Flamingoes frequent this tank occasionally. Large numbers of Bar-headed Goose were seen here and along with Koonthakulam, Nanguneri Periakulam close to Nanguneri Town, and Ponnakudi Kulam on the highway provide important wintering habitat for the geese and Common Pochards and is therefore an important tank for them in the arid landscape of south Tirunelveli District.

Along with the irrigation network, the vast expanses of salt-pans near Tuticorin and the estuarine regions of Thamiraparani are important bird habitats that need further scrutiny. The salt-pans also attract flamingoes and several species of shorebirds. In September 2010, over a few thousand waders were spotted circling in the sky in the Sagupuram area which is close to the coast and a pair of Greater Flamingoes was spotted in the salt pan in the same area in January 2011.

CONSERVATION IMPLICATIONS

We list only six tanks as high priority sites because of the potential of these tanks in supporting high waterbird diversity and abundance. A total of 40,792 individuals and 67 species were recorded from these six tanks. Some of the birds seen in heronries like Vagaikulam fly off to several smaller tanks along the foothills of KMTR. Birds like the Bar-headed Goose move across a network of large tanks around Vijayanarayanam Periyakulam. There is a need to monitor these and other tanks in the region on a regular basis to identify more important sites and understand the ecological importance of the tanks better. Such monitoring has to involve a more landscape approach that would help understand the dynamics of bird movement especially related to water shortages and rainfall variability that would be relevant in the context of climate change. We could not assess how detectability due to various factors affected bird counts during our survey. Future studies designed to incorporate more robust counting techniques can assist in providing improved waterbird estimates.

Threats like poaching, over fishing, land use change, drying out tanks for agriculture by excessive pumping of water using motors which was not done earlier, etc could

pose threats to waterbirds in the small tanks harboring low bird abundances. The tanks need protection since they are getting choked by invasive species like *Ipomea* and water hyacinth, polluted by small industrial units, tank beds are encroached on for agricultural and nonagricultural purposes. For sustaining waterbirds in the arid landscape we need to conserve such water bodies in conjunction with a network of large and/or small tanks in the near vicinity.

Our survey showed that very few tanks had trees within which serve as islands when the tank is inundated and can provide safe nesting and roosting sites. The few tanks which had trees consisted of *Acacia nilotica* planted by the Forest Department or Panchayat earmarked for harvesting under the social forestry scheme. These trees, used by birds for nesting and roosting are eventually harvested making the tank devoid of nesting habitats as in the case of Vagaikulam. It is imperative that forestry practices are carried out incorporating the breeding and roosting requirements of waterbirds in the area. The foreshore plantations by the forest department, that are inundated when the tank has water, have not been taken up in tanks which are either known for their heronries or have a high potential for being so. It is, therefore, necessary to revive such planting programs within the tank and its periphery with more diversity of trees and to ensure that not all trees are harvested. In smaller tanks, such plantations should be limited to a portion of the tank so that the rest of the tank is left open to be used by dabbling and diving waterbirds, and also for human activities like fishing, grazing, removal of silt for agricultural purposes during the dry season, and for domestic purposes.

Though most tanks in the areas do not require any management for bird conservation, tanks that are potential habitat (heronry) of birds are at risk. The heronry at Moondraiadippu near Tirunelveli was lost to excessive poaching, tree felling, road widening and the forest department could not intervene in time. On the other hand, the heronry at Vagaikulam was protected from contract felling by initiatives of the local communities and an NGO (Abhisheka et al. 2012). There are also some well known initiatives from local communities to protect and conserve birds in the wetlands of the region. The Koonthakulam Bird Sanctuary in Tirunelveli which is recently being protected by the State Forest Department was a community protected area (Rhenius 1907; Wilkinson 1961). Whereas in the neighboring district of Kanyakumari the forest department itself is taking initiatives to make select wetlands as conservation reserves (Kumar 2012). We need to think of various

innovative measures that prevent loss of heronry and wetlands to rapid urbanization happening in the region along with improved monitoring and documentation.

REFERENCES

- Abhisheka, K., K.S. Seshadri, M.B. Prashanth & T. Ganesh (2012). The Agasthyamalai landscape: Land of mountains, wetlands and biodiversity. *Sanctuary Asia* XXXII(4): 44–47
- Amezaga, J.M., L. Santamaría & A.J. Green (2002). Biotic wetland connectivity - supporting a new approach for wetland policy. *Acta Oecologica* 23(3): 213–222; [http://dx.doi.org/10.1016/S1146-609X\(02\)01152-9](http://dx.doi.org/10.1016/S1146-609X(02)01152-9)
- Baskaran, T.S. (2006). Visitors at Koondhankulam. The Hindu. <<http://www.hindu.com/mag/2006/12/17/stories/2006121700060200.htm>>. Downloaded on 19 Aug 2012.
- BirdLife International (2001). *Threatened Birds of Asia: The BirdLife International Red Data Book*. BirdLife International, Cambridge, UK.
- Elphick, C.S., P. Baicich, K.C. Parsons, M. Fasola & L. Mugica (2010). The Future for Research on Waterbirds in Rice Fields. *Waterbirds* 33 (Special Publication 1): 231–243; <http://dx.doi.org/10.1675/063.033.s117>
- Gill, F. & D. Donsker (eds). (2012). IOC World Bird Names (v 3.1). Available at <http://www.worldbirdnames.org> [Accessed 16th August 2012].
- Grimmett, R., C. Inskipp & T. Inskipp (1999). *Pocket Guide to the Birds of Indian Subcontinent*. Oxford University Press, New Delhi, 384pp.
- Islam, M.Z. & A.R. Rahmani (2004). *Important Bird Areas in India. Priority Sites for Conservation*. Network: Bombay Natural History Society and Bird Life International (UK), xviii+1133pp.
- Islam, M.Z. & A.R. Rahmani (2008). Potential and Existing Ramsar Sites in India. Network: Bombay Natural History Society, Bird Life International and Royal Society for the protection of Birds. Oxford University Press, New Delhi, 592pp.
- IUCN (2010). IUCN Red List of Threatened Species. Version 2010.4. <www.iucnredlist.org>. Downloaded on 03 August 2011.
- Johnsingh, A.J.T. (2001). The Kalakad-Mundanthurai Tiger Reserve: A global heritage of biological diversity. *Current Science* 80: 378–388.
- Johnsingh, A.J.T. & J. Joshua (1994). Avifauna in three vegetation types on Mundanthurai Plateau, south India. *Journal of Tropical Ecology* 10(3): 323–335; <http://dx.doi.org/10.1017/S0266467400007999>
- Johnsingh, A.J.T. & J. Joshua (1989). The threatened gallery forest of the River Tamirabharani, Mundanthurai Wildlife Sanctuary, south India. *Biological Conservation* 47: 273–280.
- Kannan, V. & R. Manakadan (2005). The status and distribution of Spot-billed Pelican *Pelecanus philippensis* in southern India, *FORKTAIL* 21: 9–14
- Krishnan, M. (1978). The availability of nesting materials and nesting sites as vital factors in the gregarious breeding of Indian water-birds. *Journal of the Bombay Natural History Society* 75(supplement): 1143–1152.
- Kumar, P.S.S. (2012). Hearts aflutter as Kumari gets wetland bird reserve. <http://www.thehindu.com/todays-paper/tp-features/tp-editorial/features/article3671341.ece>. Downloaded on 23 July 2012.
- Li, Z.W.D., A. Bloem, S. Delany, G. Martakis & J.O. Quintero (2009). Status of Waterbirds in Asia - Results of the Asian Waterbird Census: 1987–2007. Wetlands International, Kuala Lumpur, Malaysia
- Nagulu, V. & J.V.R. Rao (1983). Survey of south Indian pelicanries. *Journal of the Bombay Natural History Society* 80 (1): 141–143.
- Raju, K.V., G.K. Karanth, M.J. Bhende, D. Rajasekhar & K.G. Gayathridevi (2003). *Rejuvenating Tanks - A Socio-ecological approach*. Collaborative initiative of Institute for Social and Economic Change and Books for Change, Bangalore, 331pp.
- Raman, T.R.S. & R. Sukumar (2002). Responses of tropical rainforest birds to abandoned plantations, edges and logged forest in the Western Ghats, India. *Animal Conservation* 5(3): 201–216; <http://dx.doi.org/10.1017/S1367943002002251>
- Rehman, S. & K.S. Shrivastava (2012). Western Ghats get World Heritage Site tag. <<http://www.downtoearth.org.in/content/western-ghats-get-world-heritage-site-tag>>. Downloaded on 7th July 2012.
- Rhenius, C.E. (1907). Pelicans breeding in India. *Journal of the Bombay Natural History Society* 17(3): 806–807.
- Sathan, C. & B. Pandi (2009). *Diary on the Nesting Behaviour of Indian Birds*. Sugeeth Publishers, Coimbatore, Tamil Nadu, 223pp.
- Sreenivasan, R. & P.A. Kumar (2004). *Vision for Village Tanks of Tamil Nadu*. DHAN Foundation, Madurai, Tamil Nadu, 34pp.
- Subramanya, S. (1996). Distribution, Status and Conservation of Indian Heronries *Journal of the Bombay Natural History Society* 93(3): 459–486.
- Subramanya, S. (2005). Heronries of Tamil Nadu. *Indian Birds* 1(6): 126–140.
- Sundar, K.S.G. (2011). Agricultural intensification, rainfall patterns, and large waterbird breeding success in the extensively cultivated landscape of Uttar Pradesh, India. *Biological Conservation* 144(12): 3055–3063; <http://dx.doi.org/10.1016/j.biocon.2011.09.012>
- Vaidyanathan, A. (2001). *Tanks of South India*. Centre for Science and Environment, New Delhi, 178pp.
- Velmani, K.S.K. (2002). Tirunelveli District Gazetteer, Chennai.
- Webb-Peplow, C.G. (1945). Notes on a few birds from south of the Tinnevely district. *Journal of the Bombay Natural History Society* 45: 425–426.
- Wetlands International (2012). Waterbird Population Estimates, Fifth Edition. Summary Report. Wetlands International, Wageningen, The Netherlands
- Wilkinson, M.E. (1961). Pelicanry at Kundakulam, Tirunelveli District. *Journal of the Bombay Natural History Society* 58: 514–515.
- Web sources:
- Bird Sanctuaries in Tamil Nadu: Koonthankulam Bird Sanctuary. <http://www.forests.tn.nic.in/WildBiodiversity/bs_kkbs.html>. Downloaded on 19 Aug 2012
- Bird biodiversity: Kalakad Mundanthurai Tiger Reserve. <http://www.forests.tn.nic.in/WildBiodiversity/tr_kmtr.html>. Downloaded on 19 Aug 2012
- Tirunelveli District, Official website. < <http://www.nellai.tn.nic.in>>. Downloaded on 15 July 2011.
- Thoothukudi District: Official website. < <http://thoothukudi.tn.nic.in>>. Downloaded on 15 July 2011.

Appendix 1. List of tanks surveyed in Tirunelveli and Tuticorin districts, Tamil Nadu.

	Name of the tank	Latitude	Longitude		Name of the tank	Latitude	Longitude
1	Aaladi kulam	8.487133	77.57203	45	Karadi kulam	8.649389	77.45622
2	Aathiyar kulam	8.666889	77.49428	46	Karamperi	8.66725	77.61335
3	Aathiyar kulam	8.66961	77.46096	47	Karisan Kulam	8.421267	77.55553
4	Aatoor kulam	8.612817	78.0709	48	Karungulam	8.673778	77.47486
5	Adaikarunkulam	8.714417	77.41043	49	Karunkulam	8.7518	77.48875
6	Adithyaperi kulam	8.6027	77.58125	50	Kaveri kuthan kulam	8.758533	77.3845
7	Adityaperi kulam	8.5676	77.59088	51	Keel kadayam	8.815306	77.37706
8	Aladi kulam	8.6545	77.45785	52	Kelethalaimalai kulam	8.631817	77.57245
9	Alwarkarunkulam	8.657633	77.87857	53	Kerlakulam	8.518383	77.52157
10	Ammachiyar kulam	8.651778	77.47403	54	Kesavaneri	8.40705	77.57828
11	Ananda kulam	8.63884	77.51762	55	Kil Cheval kulam	8.677917	77.62353
12	Arasapathu kulam	8.535333	77.50992	56	Koondodeyar kulam	8.68875	77.49644
13	Arumugamangalam	8.657365	78.03727	57	Koonthankulam	8.495447	77.75351
14	Athiyankulam	8.595433	77.57217	58	Koothadi kulam	8.669278	77.49792
15	Ayyampillai kulam	8.815067	77.38013	59	Kothan kulam	8.6733	77.65023
16	Ayyanar kulam	8.733222	77.40447	60	Kottakulam	8.769233	77.77752
17	Ayyanarkulam/Samiarkulam	8.717067	77.40213	61	Kovankulam	8.754	77.39945
18	Brahmanar kulam	8.483783	77.56648	62	Kovil kulam	8.567367	77.59637
19	Chekkadikulam	8.780867	77.42482	63	Krishnaperi	8.665283	77.60982
20	Chetti kulam	8.78665	77.36517	64	Kulankulam	8.6298	77.57738
21	Chetti kulam	8.663139	77.49789	65	Kulichankulam	8.463167	77.57013
22	Chinna parapaneri	8.747683	77.36975	66	Kuripaan kulam	8.681778	77.50747
23	Cholan kulam	8.643278	77.51517	67	Kuripan Kulam	8.670833	77.61595
24	Chuchankulam	8.63805	77.58337	68	Kuthalampillai	8.824467	77.35955
25	Devanallur	8.54384	77.6002	69	Kutti kulam	8.821796	77.36065
26	Edappattai kulam	8.673472	77.4655	70	Kuttikarichankulam	8.417467	77.55995
27	Eddayankulam	8.664567	77.6126	71	Kuttikulam	8.662283	77.47453
28	Elanirkulam	8.517967	77.52608	72	Kuttikulam	8.76705	77.36228
29	Erukalpatti periyakulam	8.56785	77.58308	73	Kuttuvan Kulam	8.47725	77.56972
30	Eswaran Kulam	8.6351	77.57597	74	Maatudaiyar kulam	8.647972	77.50325
31	Etrankulam	8.673267	77.5592	75	Madakulam	8.535033	77.5285
32	Ettakulam	8.842205	77.63406	76	Madan kulam	8.679117	77.50307
33	Iddayan kulam	8.5805	77.57275	77	Malayaneri kulam	8.520433	77.5209
34	Ilupaikurichi	8.74415	77.48221	78	Mandakulam	8.593633	77.57617
35	Kadamba Kulam	8.576267	77.97728	79	Manjalodai kulam	8.770217	77.35853
36	Kaduvetti	8.561933	77.62695	80	Manuvankulam	8.651433	77.58355
37	Kalathi kulam	8.774767	77.35423	81	Mapilai kulam	8.667333	77.5635
38	Kalatti kulam	8.747783	77.40837	82	Marthanda periya kulam	8.812367	77.34397
39	Kalidaipulikulam	8.668556	77.41103	83	Maruthan kulam	8.653111	77.48028
40	Kalkurichi Kulam	8.8023	77.79645	84	Mattada kulam	8.664333	77.40675
41	Kamalayn kulam	8.67195	77.45762	85	Mel pudukudi sunai	8.55643	78.05345
42	Kamaneri kulam	8.480883	77.57397	86	Melan kulam	8.656133	77.45745
43	Kanganan kulam	8.623583	77.57265	87	Modalan kulam	8.56595	77.56925
44	Kannipothai kulam	8.665194	77.51256	88	Moolachi kulam	8.660917	77.48283

	Name of the tank	Latitude	Longitude
89	Mudinayyanar kulam	8.67745	77.45195
90	Mukkudal tank	8.7384	77.52013
91	Mullai kulam (Narasinganallur)	8.697533	77.6524
92	Mungiladi kulam	8.520667	77.52
93	Nacchiar kulam	8.666417	77.47153
94	Nadar kulam	8.668639	77.41706
95	Nadukambara	8.424183	77.54493
96	Nadukulam	8.741583	77.41527
97	Nadumundu kualm	8.736383	77.3822
98	Nainarkulam	8.730717	77.69083
99	Nallamarathan Kulam	8.47005	77.56673
100	Nallur mel and keel kulam	8.582717	78.0655
101	Nambi adi kulam	8.8141	77.33502
102	Nambikarai kulam	8.678167	77.63757
103	Nambineri kulam	8.67526	77.62452
104	Nandupudithankulam	8.666633	77.63747
105	Nanguneri	8.501611	77.65601
106	Nathakulam (Sonaganavilai 1 & 2)	8.553789	78.07583
107	Navarai kulam	8.351283	77.5778
108	Neelakandayan kulam	8.664028	77.41311
109	Nocchi / Pirundadikulam	8.656722	77.52706
110	Nocchi kulam	8.65696	77.52675
111	Nocchikulam	8.71	77.41813
112	Odayappan kulam	8.77935	77.38133
113	Omanallur kUlam	8.652717	77.65642
114	Onankulam	8.618433	77.55837
115	Padaliyarkulam	8.420333	77.56387
116	Padmaneri periyakulam	8.553889	77.56469
117	Pampankulam	8.548217	77.5466
118	Pampankulam	8.63355	77.58482
119	Paniyar kulam	8.662972	77.47444
120	Panjari kulam	8.738155	77.46619
121	Pannikar kulam	8.651222	77.5135
122	Papankulam	8.5379	77.53038
123	Parai Kulam	8.654833	77.47408
124	Parasuriyan kulam	8.3449	77.5659
125	Parayan kulam	8.623967	77.5677
126	Parayar kulam	8.506867	77.55963
127	Parayarkulam	8.75695	77.38988
128	Part of kangana kulam	8.617667	77.57523
129	Patapattu kulam	8.706983	77.66337
130	Pathai	8.52074	77.54369
131	Pattadhiar kulam	8.418763	77.56865
132	Pattalam kulam	8.677056	77.47103

	Name of the tank	Latitude	Longitude
133	Pattankadu	8.624267	77.56132
134	Pattankadu	8.626067	77.55495
135	Pattar kulam	8.67509	77.45636
136	Peekulam	8.474083	77.57395
137	Peekulam	8.5912	77.57285
138	Periyakulam	8.531017	77.55373
139	Periyakulam	8.64065	77.97607
140	Perumal puthu kulam	8.665861	77.50319
141	Perungulam	8.650667	77.98918
142	Peykulam	8.698053	78.05654
143	Pilankuli kulam	8.516417	77.5312
144	Pillai / Punnai kulam	8.614617	77.56678
145	Pillai kulam	8.81185	77.35185
146	Pillala kulam	8.7474	77.38868
147	Pinnankulam	8.675017	77.53608
148	Pirakaal kulam	8.681194	77.49319
149	Piravilan kulam/Alankulam	8.534133	77.53088
150	Pookuli kulam	8.65425	77.46477
151	Poongudayar	8.627017	77.58578
152	Pottaikulam	8.798217	77.39445
153	Pottaisutti	8.540138	77.61195
154	Prancheri	8.658267	77.62005
155	Pulankulam	8.5457	77.5509
156	Pulavankudiyirrupu	8.595783	77.56275
157	Puliampatti	8.7437	77.40565
158	Pungadapathai kulam	8.634767	77.58813
159	Puraan kulam	8.672667	77.52878
160	Puthu kulam	8.579083	77.58603
161	Puthukulam	8.762683	77.37788
162	Ramar kulam	8.573717	77.58468
163	Salaipudurkulam	8.477683	77.55988
164	Samandhan kulam	8.6137	77.55923
165	Samiar kulam	8.74145	77.37625
166	Saralkulam	8.732667	77.4948
167	Sengulam	8.75395	77.48058
168	Sennir kulam	8.351183	77.58433
169	Settaikathan kulam	8.491567	77.56828
170	Silayam	8.49949	77.7464
171	Singampatti North kulam	8.668133	77.44505
172	Singampatti South kulam	8.663833	77.44442
173	Sivagalai	8.639483	77.97178
174	Sivalaperi kulam	8.500067	77.5538
175	Sivasailaperi pudukulam	8.799117	77.3632
176	Sonaganavilai 3 & 4	8.553789	78.07583
177	Suttamalli Kulam	8.696317	77.64047

	Name of the tank	Latitude	Longitude
178	Tamarakulam	8.437983	77.53543
179	Tamarakulam	8.518233	77.54583
180	Tharmakulam	8.66695	77.53328
181	Thatavarayan kulam	8.74495	77.39278
182	Thayarmadam kulam	8.663694	77.40633
183	Theruku Valimarichi kulam	8.641444	77.50944
184	Thevar kulam	8.67025	77.42153
185	Thevi kulam	8.5559	77.59147
186	Thiruviruthapillai kulam	8.6198	77.56475
187	Thondemaankulam	8.782283	77.40203
188	Tirupilayan kulam	8.5166	77.5297
189	Ulagan kulam	8.584983	77.58133
190	Unnamed 1	8.634167	77.46733
191	Unnamed 2	8.629417	77.47756
192	Unnamed 3 (kalakkad town)	8.515117	77.55472
193	Unnamed 4	8.5883	77.56485
194	Unnamed 5	8.617717	77.57777
195	Unnamed 6	8.629617	77.57008
196	Unnamed 7	8.64115	77.57245
197	Unnamed 8	8.670533	77.5506
198	Unnamed 9	8.679783	77.53662
199	Uppukarai kulam	8.63875	77.52294
200	Uppukarai kulam	8.644861	77.46386
201	Urisan kulam	8.630194	77.51864
202	Urunda para kulam	8.655139	77.52142
203	Urunthudayar kulam	8.800133	77.33027

	Name of the tank	Latitude	Longitude
204	Vadakan kulam	8.819683	77.33433
205	Vadavaneri	8.483984	77.55383
206	Vadavanerikulam	8.478717	77.5536
207	Vaddakku Pichakaran Kulam	8.625867	77.56128
208	Vagaikulam	8.794733	77.36972
209	Vagha kulam	8.577417	77.57613
210	Vagha kulam	8.794533	77.37882
211	Valimarichan kulam	8.644778	77.50919
212	Valimarichankulam	8.7319	77.41103
213	Vallathi kulam	8.793933	77.34458
214	Vallathunambi kulam	8.658417	77.50631
215	Vallioor periyakulam	8.3727	77.60162
216	Valudhur kulam	8.745228	77.47666
217	Vannakulam	8.721167	77.45448
218	Vattakulam	8.437367	77.55605
219	Vattankulam	8.766683	77.78278
220	Veerapandiyakulam	8.335033	77.56071
221	Veetirundan kulam	8.677333	77.52036
222	Velanthangi kulam	8.599633	77.57822
223	Vepam kulam	8.683417	77.50069
224	Veppamkulam	8.797517	77.36878
225	Vijayanarayanam	8.415574	77.77283
226	Vijayanarayanaperi kulam	8.677067	77.54758
227	Vinayakathan kulam	8.52555	77.55437
228	Viravikulam	8.675483	77.44412
229	Vottan kulam	8.598033	77.5782
230	Yelandakulam	8.485083	77.56

Appendix 2. Checklist of water birds recorded in the inland wetlands of Tirunelveli and Tuticorin districts, Tamil Nadu. Percentage of occurrence relates to the proportion of the 83 tanks, the species was observed in, during the surveys.

	Order/Family/Species	Residential Status	Percentage of occurrence *
	Order: Anseriformes		
	Family: Anatidae		
1	Lesser Whistling Duck <i>Dendrocygna javanica</i>	LM	12%
2	Bar-headed Goose <i>Anser indicus</i>	M	2%
3	Comb Duck <i>Sarkidiornis melanotos sylvicola</i>	LM	4%
4	Cotton Pygmy Goose <i>Nettapus coromandelianus</i>	LM	14%
5	Eurasian Wigeon <i>Anas penelope</i>	M	1%
6	Indian Spot-billed Duck <i>Anas poecilorhyncha</i>	LM	44%
7	Northern Shoveler <i>Anas clypeata</i>	M	3%
8	Northern Pintail <i>Anas acuta</i>	M	11%
9	Garganey <i>Anas querquedula</i>	M	9%

	Order/Family/Species	Residential Status	Percentage of occurrence *
10	Eurasian Teal <i>Anas crecca</i>	M	1%
11	Common Pochard <i>Aythya ferina</i>	M	2%
	Order: Podicipediformes		
	Family: Podicipedidae		
12	Little Grebe <i>Tachybaptus ruficollis</i>	R	41%
	Order: Phoenicopteriformes		
	Family: Phoenicopteridae		
13	Greater Flamingo <i>Phoenicopterus roseus</i>	M	1%
	Order: Ciconiiformes		
	Family: Ciconiidae		
14	Painted Stork <i>Mycteria leucocephala</i>	LM	21%
15	Asian Openbill <i>Anastomus oscitans</i>	LM	24%

	Order/Family/Species	Residential Status	Percentage of occurrence *
	Order: Pelecaniformes		
	Family: Threskiornithidae		
16	Black-headed Ibis <i>Threskiornis melanocephalus</i>	R	38%
17	Red-naped Ibis <i>Pseudibis papillosa</i>	R	52%
18	Glossy Ibis <i>Plegadis falcinellus</i>	LM	23%
19	Eurasian Spoonbill <i>Platalea leucorodia</i>	LM	9%
	Family: Ardeidae		
20	Yellow Bittern <i>Ixobrychus sinensis</i>	LM	2%
21	Cinnamon Bittern <i>Ixobrychus cinnamomeus</i>	LM	2%
22	Black Bittern <i>Dupetor flavicollis</i>	LM	2%
23	Black-crowned Night Heron <i>Nycticorax nycticorax nycticorax</i>	R	6%
24	Striated Heron <i>Butorides striata</i>	R	1%
25	Indian Pond Heron <i>Ardeola grayii</i>	R	76%
26	Western Cattle Egret <i>Bubulcus ibis</i>	R	60%
27	Grey Heron <i>Ardea cinerea</i>	LM	27%
28	Purple Heron <i>Ardea purpurea</i>	LM	26%
29	Great Egret <i>Ardea alba</i>	LM	20%
30	Intermediate Egret <i>Egretta intermedia</i>	LM	49%
31	Little Egret <i>Egretta garzetta</i>	R	75%
	Family: Pelecanidae		
32	Spot-billed Pelican <i>Pelecanus philippensis</i>	LM	21%
	Order: Suliformes		
	Family: Phalacrocoracidae		
33	Little Cormorant <i>Microcarbo niger</i>	R	71%
34	Indian Cormorant <i>Phalacrocorax fuscicollis</i>	R	25%
35	Great Cormorant <i>Phalacrocorax carbo</i>	LM	3%
	Family: Anhingidae		
36	Oriental Darter <i>Anhinga melanogaster</i>	R	30%
	Order: Accipitriformes		
	Family: Pandionidae		
37	Western Osprey <i>Pandion haliaetus</i>	M	1%
	Family: Accipitridae		
38	Brahminy Kite <i>Haliaastur Indus</i>	R	27%
39	Western Marsh Harrier <i>Circus aeruginosus</i>	M	7%
	Order: Gruiformes		
	Family: Rallidae		
40	White-breasted Waterhen <i>Amaurornis phoenicurus</i>	R	26%

	Order/Family/Species	Residential Status	Percentage of occurrence *
41	Watercock <i>Gallix rex cinerea</i>	R	<1%
42	Purple Swamphen <i>Porphyrio porphyrio</i>	R	21%
43	Common Moorhen <i>Gallinula chloropus</i>	R	13%
44	Eurasian Coot <i>Fulica atra</i>	LM	24%
	Order: Charadriiformes		
	Burhinidae		
45	Great Stone-curlew <i>Esacus recurvirostris</i>	LM	<1%
	Family: Recurvirostridae		
46	Black-winged Stilt <i>Himantopus himantopus</i>	LM	19%
47	Pied Avocet <i>Recurvirostra avosetta</i>	M	1%
	Family: Charadriidae		
48	Yellow-wattled Lapwing <i>Vanellus malabaricus</i>	R	11%
49	Red-wattled Lapwing <i>Vanellus indicus</i>	R	70%
50	Little Ringed Plover <i>Charadrius dubius</i>	M	13%
51	Kentish Plover <i>Charadrius alexandrinus</i>	M	3%
52	Lesser Sand Plover <i>Charadrius mongolus</i>	M	<1%
	Family: Jacanidae		
53	Pheasant-tailed Jacana <i>Hydrophasianus chirurgus</i>	R	20%
54	Bronze-winged Jacana <i>Metopidius indicus</i>	R	17%
	Family: Scolopacidae		
55	Pin-tailed Snipe <i>Gallinago stenura</i>	M	3%
56	Common Snipe <i>Gallinago gallinago</i>	M	1%
57	Black-tailed Godwit <i>Limosa limosa</i>	M	3%
58	Whimbrel <i>Numenius phaeopus</i>	M	<1%
59	Common Redshank <i>Tringa totanus</i>	M	1%
60	Marsh Sandpiper <i>Tringa stagnatilis</i>	M	13%
61	Common Greenshank <i>Tringa nebularia</i>	M	5%
62	Green Sandpiper <i>Tringa ochropus</i>	M	14%
63	Wood Sandpiper <i>Tringa glareola</i>	M	31%
64	Common Sandpiper <i>Actitis hypoleucos</i>	M	29%
65	Little Stint <i>Calidris minuta</i>	M	<1%
66	Ruff <i>Philomachus pugnax</i>	M	<1%
	Family: Glareolidae		
67	Oriental Pratincole <i>Glareola maldivarum</i>	LM	<1%
68	Small Pratincole <i>Glareola lactea</i>	LM	<1%
	Family: Laridae		

	Order/Family/Species	Residential Status	Percentage of occurrence *
69	Gull-billed Tern <i>Gelochelidon nilotica</i>	M	14%
70	Little Tern <i>Sternula albifrons</i>	M	3%
71	River Tern <i>Sterna aurantia</i>	R	3%
72	Common Tern <i>Sterna hirundo</i>	M	<1%
73	Whiskered Tern <i>Chlidonias hybrida</i>	M	11%
	Order: Coraciiformes		
	Family: Alcedinidae		
74	Stork-billed Kingfisher <i>Pelargopsis capensis</i>	R	<1%
75	White-throated Kingfisher <i>Halcyon smyrnensis</i>	R	53%
76	Black-capped Kingfisher <i>Halcyon pileata</i>	R	<1%

	Order/Family/Species	Residential Status	Percentage of occurrence *
77	Common Kingfisher <i>Alcedo atthis</i>	R	20%
78	Pied Kingfisher <i>Ceryle rudis</i>	R	29%
	Family: Meropidae		
79	Blue-tailed Bee-eater <i>Merops philippinus</i>	M	30%
	Order: Passeriformes		
	Family: Motacillidae		
80	Western Yellow Wagtail <i>Motacilla flava</i>	M	13%
81	Grey Wagtail <i>Motacilla cinerea</i>	M	4%
82	White Wagtail <i>Motacilla alba</i>	M	1%
83	White-browed Wagtail <i>Motacilla maderaspatensis</i>	R	29%

Key: Residential Status: R - Resident, M - Migrant, LM - Local Migrant (missing some time of the year, depending on water availability and other resources).

* Percentage of occurrence: proportion of tanks in which waterbird was detected out of the total 230 tanks

Common names, scientific names and classification: Gill & Donsker (eds). 2012. IOC World Bird Names (v 3.1).

