International Journal of Zoology Studies
ISSN: 2455-7269; Impact Factor: RJIF 5.14
www.zoologyjournals.com
Volume 1; Issue 2; February 2016; Page No. 35-39

Birdlife monitoring in Kole lands: A habitat based evaluation system for waterbird and wetland conservation

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Abstract
Monitoring is needed both to assess the effectiveness of conservation measures and to provide caution of impending problems. A standard framework that can be effectively used to compile data at the sub-regional, regional and global levels is being exploited by Wetlands International to coordinate Asian Waterbird Census, which monitor the status of waterbirds and wetlands. Kole wetlands form a highly threatened habitat which provides multiple services to society. Palakkal kole of Thrissur, a Ramsar site, is a unique highly productive ecosystem which supports large population of resident and migratory birds. Asian Waterbird Census-2016 reported 3797 birds of thirty species from Palakkal. Charadriiformes and Pelecaniformes were the most represented groups. *Ciconia episcopus*, a bird with vulnerable status was recorded from the area. *Anhinga melanogaster*, *Threskiornis melanocephalus* and *Mycteria leucocephala* found in the area belong to near threatened category. Ten species recorded from the area were trans-continental migrants. *Mycteria leucocephala* evaluated earlier as a vagrant visitor to the area was seen in large numbers during this survey. *Porphyrio poliocephalus* was seen in hundreds. *Microcarbo niger*, *Anastomus oscitans* and *Nettapus coromandelianus* were well represented.

Keywords: AWC, Kole wetlands, waterbirds, ramsar site

Introduction

Despite birds being one of the best known class of living organisms, there are still substantial gap in our knowledge of the distribution, abundance and density of species. Birds have been demonstrated to serve as good indicators of biodiversity and environmental change and as such can be used to make strategic conservation planning decisions. To make the best decisions, it is most important that the information available is accurate, systematic and representative as possible.

The most important data are population size, range and trends. Trends are impossible to measure unless some baseline has previously been set. For most species this has yet to be done. In addition, threat might be measured as known or inferred change of extent or condition of habitat. This can only be applied if the habitat requirements of the target species are reasonably well known. For the majority of bird species, and especially for many threatened species, these most basic parameters are simply unknown.

Habitat is likely to be an important determinant of the distribution and number of birds [1]. For sites which are not protected, habitats keep changing. As birds have general habitat requirements, so do they have microhabitat requirement. Adequate management obviously depends on understanding the relationship between birds and their habitats. While much about a bird's ecology might be studied directly in terms of its diet, foraging behaviour or population dynamics, important knowledge of habitats can be gleaned from good census studies. The ubiquity of human influence is the constant refrain of conservation. Humans can influence birds and their habitats directly by modifying vegetation or by hunting. They can also have indirect impacts since habitat change can alter the impact of predators or allows the spread of invasive species. Indirect measures such as distance from road or village might be used as surrogate measure of human impact on habitat.

Asian Waterbird Census (AWC) started in the year 1987, is an annual event coordinated by Wetlands International and it forms part of the global waterbird monitoring programme called the International Waterbird Census (IWC). Thousands of volunteers across Asia and Australasia take part in this event. The main focus of the event is to monitor the status of waterbirds and wetlands. AWC also aims to create public awareness on various issues concerning wetlands and waterbird conservation.

2016 marked the 50th global International Waterbird Census and it has become the world's longest running biodiversity monitoring programme [2]. 2016 also marked the 30th year of AWC. The main objective of the programme is to obtain information on waterbirds during their non-breeding season. The annual process of monitoring helps to evaluate the population and status of waterbirds and to assess the condition of wetlands. The census has created greater interests amongst the people on habitat and biodiversity conservation. Researchers focus their attention on the data generated from four Ramsar sites of the state – Sasthamkotta Lake, Ashtamudi Lake, Vembanad Lake and Kole wetlands and also other important wetland habitats to analyse the population trends of wetland avifauna.

Kole wetlands are highly fragile, complex ecosystems that provide variety of services to mankind. They are influenced by the fluctuating water levels and provide habitat for a large number of organisms, including many resident as well as migratory birds. They are the transitional zones between permanently aquatic and dry terrestrial ecosystems [3]. Recent years have seen the attempt to improve the understanding of wetlands which were once considered as wastelands.

Kole wetlands of Thrissur are a part of the Vembanad kole, which forms one of largest, highly productive and threatened Ramsar site. This area comes under the "Central Asian Flyway" of migratory birds. Kole wetlands provide multiple microhabitats which attract different species of birds belonging to different ecological groups. This study is based on the data available from Palakkal kole wetland as part of the Asian Waterbird Census -2016.

Census area

The census was conducted in kole wetlands of Palakkal, which is part of Thrissur kole lands of Thrissur district. Thrissur kole is a unique ecosystem lying interconnected throughout the district. Palakkal is situated at the distance of 6 km from Thrissur, at geographical coordinates of 10^0 28' 15'' N and 76^0 12' 40''E.

The study site has many different habitats such as deep and shallow waters, open mudflats, grassland and paddy fields. It also include bunds, dykes and trees which provide different types of microhabitat for the birds.

Methodology

The AWC- 2016 was organized on 10th January 2016. The data was collected by national network of volunteers and recorded in standardized forms and the information was submitted to the regional and national coordinators. In India, Bombay Natural History Society is assisted by the regional coordinators for coordinating the census activity. The data collected is forwarded to Wetlands International, South Asia Office for maintaining the IWC's database.

Bird survey was mainly based on line transect method [4] and direct counting. Point count method [5] was also employed by observing the birds from an elevated area. Block count method was used for large aggregations of birds. The time of observation was from 0630 hrs to 1030 hrs. Birds were identified with the help of 8x40 binoculars and classified according to the hand books and checklist of [6, 7, 8]. The common and scientific names are after Manakadan and Pittie [9] and taxonomy according to Ripley and Dillon [10] and Inskipp *et al.* [11].

The birds were categorized based on their IUCN status. The habit and habitat of birds were recorded and categorization into different ecological groups was done. The feeding habit and guild of different species were collected from available literature. Bird species were classified as resident, local migrant, migrant and vagrant.

Results

The Kole lands support large number of waterbirds, both resident and migratory. During the census conducted in the Palakkal kole area, a total number of 3797 birds were counted. Thirty species of birds recorded during the study were categorized according to their IUCN status (Table1). Twenty six belonged to the least concern category, three had near threatened status and one species belonged to vulnerable category. *Ciconia episcopus*, commonly called the Wooly necked stork is the vulnerable species recorded from the area. *Anhinga melanogaster*, *Threskiornis melanocephalus* and *Mycteria leucocephala*, are the near threatened species. Out of the thirty species, ten were migrants showing trans-continental migration, seven showed local movement and thirteen species were resident to the area.

Availability of food in good quantity and quality constitutes one of the prime requisite of birds. Wetlands being a highly productive area attract birds with varying feeding habits. Birds were categorized according to their feeding guild. Twenty species (66.67%) were carnivorous, four (13.33 %) were herbivorous and six (20%) omnivorous. Aquatic carnivores topped the list in Palakkal kole (Table1).

The waterfowls of Palakkal Kole were ecologically grouped on the basis of their activities and feeding habit. The common divers found in the Kole are *Microcarbo niger*, *Phalacrocorax carbo*, and *Anhinga melanogaster*. The small waders and large waders were represented by eleven species each. The swimmers consisted of four species. The data regarding the feeding habit of birds is given in the Fig 1.

The study showed Charadriiformes to be the most represented order in the study area followed by Pelecaniformes. Charadriiformes comprise small waders, while Pelecaniformes include large waders. Fig 2 shows the representation of various orders of avian fauna recorded from the Palakkal kole. Anatidae family was represented by four species of aquatic herbivores. The presence of Asian open billed stork in large numbers was noted. *Mycteria leucocephala*, the painted stork with a population of seventy eight was a rare sighting. *Porphyrio poliocephalus*, the Grey headed swamphen was seen in hundreds and is a menace for the farmers of the area. Other birds seen in large numbers during the study included *Microcarbo niger* and *Nettapus coromandelianus*. Large groups of egrets, cormorants and ducks noted at far off distance could not be identified.

Table 1: Details of waterbirds of Palakkal kole wetland

Slno	Scientific name	Common name	Number	IUCN status	Residential status	Feeding habit	Feeding guild
Order: Suliformes							
Family: Phalacrocoracidae							
1	*Microcarbo niger*	Little cormorant	300	LC	R	Diver	Carnivore
2	*Phalacrocorax carbo*	Great cormorant	10	LC	LM	Diver	Carnivore
Family: Anhingidae							
3	*Anhinga melanogaster*	Oriental darter	8	NT	R	Diver	Carnivore
Order: Pelecaniformes							
Family: Ardeidae							
4	*Ardea cinerea*	Grey herons	20	LC	LM	Large wader	Carnivore
5	*Ardea purpurea*	Purple herons	25	LC	R	Large wader	Carnivore
6	*Egretta garzetta*	Little egret	35	LC	R	Large wader	Carnivore

7	*Mesophoyx intermedia*	Intermediate egret	6	LC	R	Large wader	Carnivore
8	*Ardea alba*	Great egret	30	LC	R	Large wader	Carnivore
9	*Bubulcus ibis*	Cattle egret	7	LC	R	Large wader	Carnivore
10	*Ardeola grayii*	Indian pond heron	40	LC	R	Large wader	Carnivore
Family: Threskiornithidae							
11	*Threskiornis melanocephalus*	Black headed ibis	3	NT	LM	Large wader	Carnivore
Order: Anseriformes							
Family: Anatidae							
12	*Dendrocygna javanica*	Lesser whistling duck	10	LC	R	Swimmer	Herbivore
13	*Nettapus coromandelianus*	Cotton teal/Cotton pygmy goose	300	LC	LM	Swimmer	Herbivore
14	*Anas acuta*	Northern pintail	11	LC	M	Swimmer	Herbivore
15	*Anas poecilorhyncha*	Spot-billed duck	60	LC	LM	Swimmer	Herbivore
Order: Ciconiiformes							
Family:Ciconiidae							
16	*Mycteria leucocephala*	Painted stork	78	NT	M	Large wader	Carnivore
17	*Anastomus oscitans*	Asian openbill stork	200	LC	M	Large wader	Carnivore
18	*Ciconia episcopus*	Wooly necked stork	2	V	LM	Large wader	Carnivore
Order: Gruiformes							
Family: Rallidae							
19	*Porphyrio poliocephalus*	Grey headed swamphen	500	LC	R	Small wader	Omnivore
20	*Amaurornis phoenicurus*	White breasted waterhen	1	LC	R	Small wader	Omnivore
Order: Charadriiformes							
Family: Jacanidae							
21	*Metopidius indicus*	Bronze winged jacana	25	LC	R	Small wader	Carnivore
22	*Hydrophasianus chirurgus*	Pheasant-tailed jacana	60	LC	LM	Small wader	Carnivore
Family:Charadriidae							
23	*Vanellus indicus*	Red wattled lapwing	10	LC	R	Small wader	Omnivore
24	*Pluvialis fulva*	Pacific Golden plover	16	LC	M	Small wader	Omnivore
25	*Charadrius dubius*	Little ringed plover	20	LC	M	Small wader	Omnivore
Family: Scolopacidae							
26	*Tringa glareola*	Wood sandpiper	2	LC	M	Small wader	Carnivore
27	*Tringa ochropus*	Green sandpiper	6	LC	M	Small wader	Carnivore
28	*Actitis hypoleucos*	Common sandpiper	12	LC	M	Small wader	Omnivore
29	*Tringa nebularia*	Common green shank	20	LC	M	Small wader	Carnivore
Family: Sternidae							
30	*Chlidonias hybrida*	Whiskered tern	100	LC	M	Aerial aquatic forager	Carnivore
31	Duck sps. (Unidentified)		80	-	-	-	-
32	Cormorant sps. (Unidentified)		500	-	-	-	-
33	White egret sps. (Unidentified)		1200	-	-	-	-
34	Shorebird sps. (Unidentified)		100	-	-	-	-
	Total		3797	-	-	-	-

Migrant (M), Local migrant (LM), Resident (R)
Vulnerable (V), Near Threatened (NT), Least Concern (LC)

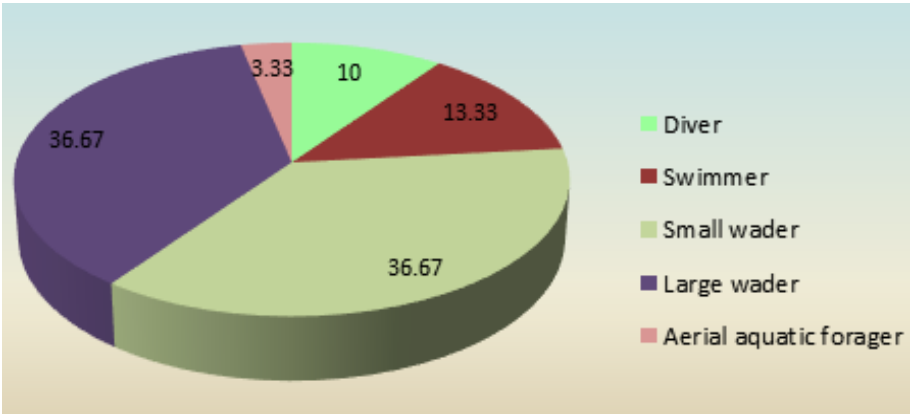

Fig 1: Percentage representation of feeding habit of birds of Palakkal kole

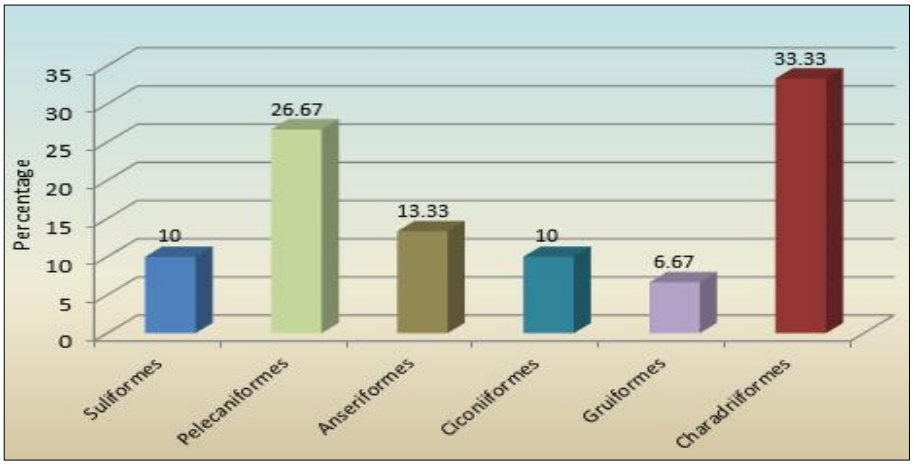

Fig 2: Order wise distribution of waterbirds from Palakkal kole

Discussion

The wetland classification system suggested by CED, for Kerala [12], includes 'Kole' and 'Pokkali' fields under coastal wetlands. Wetlands form centers of biotic networking for migratory birds, offering a welcome pit stop, providing protection and surplus food. In many developed countries there have been concerted attempts to preserve wetland habitats. The co-ordinated use of these water saturated land for agricultural purposes along with its conservation as habitat for birds is being practiced. An integrated wetland management comprising agriculture, pest control and bird protection has been discussed by Dolbeer [13]. Certain activities carried out with an objective of intensification of agriculture have increased the pressure on wetland and nearby areas.

Multiple feeding guilds offered by kole wetlands attract large number of birds. Aquatic carnivores topped the list in Palakkal kole. Avian feeding guilds have been suggested as a suitable indicator to monitor all components and interactions of an ecosystem [14]. Avian visitors help in the renewal of resources resulting in the sustenance of kole wetlands. *Mycteria leucocephala*, a near threatened species was seen in large numbers during this survey. The painted stork, earlier evaluated as a vagrant visitor to wetlands of Malabar and south Kerala has spread beyond the region they are generally found. Wooly necked stork recorded during the survey is a vulnerable species according to IUCN categorisation. The conservation of these birds and their habitat requires prioritization.

Sivaperuman and Jayson [15] studied birds of kole wetlands in Thrissur district during 1998 to 1999. Jayson [16] and Nameer [17] conducted detailed ecological studies on the avifauna of Vembanad kole wetland. The habitat diversity of wetlands promotes species diversity [18]. The kole area has diverse habitats such as deep and shallow waters, open mudflats, grassland and paddy fields. Birds belonging to different ecological groups make use of these areas for feeding in addition to their activities like breeding, resting, nesting and social interactions which has been reported by previous workers [19].

AWC happens to be the first country-wide citizen science activity. The data collected from AWC is used in identifying and monitoring of wetlands of national and international importance. It helps in designating wetlands as Ramsar sites, nationally protected areas and Important Bird and Biodiversity areas (IBAs) as well as in identification and protection of new sites of importance for waterbirds. The data paves way for the protection and knowledge enhancement about the waterbirds and also helps to keep track of their population size and status. With increasing anthropogenic pressure on wetlands, it becomes essential to monitor the state of wetlands regularly, for which birds act as good bio-indicators. Collecting quantitative data on as many species as possible is often a sensible approach.

Ornithologists from Kerala have evaluated the bird data from the Asian Water bird Census (AWC) held between 1987 and 2014 [20]. Purple swamphen has thrived in Kerala during the last decade in spite of the widespread destruction of its habitat. The population of Asian open bill, extremely rare during the 1970s, has remarkably increased since 2001, with at least four census reporting the presence of more than 3,000 birds. So is the case of Eurasian spoonbill and Black headed Ibis. Indian spot-billed duck, Glossy ibis, Oriental darter, Asian woolly neck and Spot-billed pelican recorded increased presence whereas the population of the River terns and cormorants remained stable. The population of whiskered tern has fallen significantly. Gulls too painted a gloomy picture as they were sighted in lesser number during the past few censuses. The BirdLife International has recorded 11 water bird species of Kerala under the IUCN Red list threatened category. Reports of Black bellied tern, one of the endangered waterbird was from the kole wetlands.

The 'Central Asian Flyway' covers a large continental area of Eurasia bounded by the Arctic and Indian Oceans, connecting the breeding grounds in Siberia and temperate Eurasia with non-breeding grounds in West and South Asia. Species that breed in wetlands of Arctic and northern latitudes of Central Asia migrate along different routes, stopping to rest and refuel in wetlands, grasslands or even deserts on their way to non-breeding grounds. Over 180 species of waterbirds use the Central Asian Flyway, among which are pelicans, ducks, geese, swans, cranes, herons, storks and cormorants. Due to the destruction and degradation of coastal and inland wetlands, many of these species are now threatened with extinction. Strict habitat protection, adaptive management and restoration are essential to maintaining functional wetland ecosystems and combating declines of wetland-dependent bird species for which constant monitoring serves as a strong driver.

Conclusion

Monitoring is one of the most crucial and fundamental practice for biodiversity conservation. It is essential in all aspects of conservation from tracking of species and their distribution to evaluating priorities for future land protection and restoration. As new threats and unfavorable conditions, such as changes in land use and climate patterns intensify, data are needed for the management of natural resources appropriately and sustainably.

Acknowledgements

This study was conducted based on the data available from AWC-2016, of which the author was a member of Palakkal census team. The expertise of L.Namassivayan and other team members are duly acknowledged.

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