International Journal of Academic Research and Development
ISSN: 2455-4197; Impact Factor: RJIF 5.22
Received: 05-02-2019; Accepted: 09-03-2019
www.academicjournal.in
Volume 4; Issue 3; May 2019; Page No. 87-90

Impact of anthropogenic activities on abundance and distribution of birds in and around Kayalana Lake

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Abstract
A study of avian species abundance and distribution was conducted during July 2018 to September 2018 in the Kayalana lake. It is a major hotspot of Jodhpur (Raj.) as it is the major source of drinking water for city and provides habitat to the many floral and faunal species. However conservation to this area is challenging due to the increase in habitat destruction by man-made activities. Increased anthropogenic effect is the major threat to the environment. We examined the effects of these anthropogenic activities on avian diversity and highlights the potential conservation value of the unprotected area in and near Kayalana lake. Birds were assessed in 4 selected patches out of which 2 chosen was under unprotected region and other 2 was in the protected region. By using point count method we recorded total of 78 species in study area. Applying statistical analysis highest abundance and evenness was observed in protected area. This suggests that unprotected area with major anthropogenic effect needs helps or to be undertaken by management for conservation to minimise the loss.

Keywords: Kayalana lake, avian diversity, point count, abundance, anthropogenic effect, conservation.

1. Introduction
Birds occupy many levels of trophic webs, from mid-level consumer to top predators as with other native organisms, birds help maintain sustainable population levels of their prey and predator species and, after death, provide food for scavengers and decomposers. They are considered keystone species as their presence or absence from ecosystem affects other species indirectly. Birds appear in ancient art and mythology worldwide. Bird indicators are likely to form an important component of sets of indicator for biodiversity and habitat. The present condition of man-made pollution had an adverse effect on bird diversity as well as ecological balance. So it is the high time to save birds and maintain the biodiversity. Rapid increase in human population has adversely affected diversity around the globe [1]. Abundances of many bird species adapted to disturbance-mediated habitat have declined as well [2].
Asia was considered among the most diversity rich continents; however increase in human population has adversely affected the diversity of the region. Due to increased urbanisation the birds are adversely affected as their count decreasing in response to the pollution caused by human population. Birds are considered to be biodiversity and environmental indicator. Birds are excellent bio indicators for the health of environment. The cause-and-effect link between an environment and birds are direct and simple one [3]. Biodiversity conservation in urban areas has become significant not only because of increasing human population in urban centre's but also it is one of the innovative ways to conserve biodiversity as suggested by various global environmental convections [4]. So a study was done to know the anthropogenic effect on the abundance and diversity of birds in Kayalana.

2. Past Scenario
Kayalana, A perennial water body with rocky areas is the major source of potable water for the Jodhpur population. Several migratory birds are common visitors to these water bodies, Kayalana lake with 156 species of 51 families and 70 wetland dependent species of 20 families is reported. In contrast to the Kayalana in its vicinity the birds species and its diversity are reportedly noted by several workers including Agramoorthy, S.M. Mohnot (1986, 1989); HC Bohra, SP Goyal - Pavo(1992); S.Dookia (2002);C Sivaperuman, S Kumar, NS Rathore (2004). Species richness in Jodhpur amounted to 73 species reported in the vicinity of Sardarsamand Lake (1987), and 123 species of 38 families in the Machia Safari Park area [5]. Bird diversity was 100–125 species [5], and included endemic species adapted to xeric environments—the lark, peafowl, wheatear, pigeon, partridge, sand grouse, courser, demoiselle crane, and rare birds like the great Indian bustard, lesser florican and houbara [6].

3. Material and methods
3.1 Study area: The study of anthropogenic effects on avian diversity was carried out in and nearby Kayalana lake located in Jodhpur (Raj.). Jodhpur,the second largest city in the state of Rajasthan, India. It is the gateway to the Thar, as it is literally on the edge of the Thar Desert. Kayalana lake is located 8 km west of Jodhpur (Raj.). It is an artificial lake made in 1872 by Pratap Singh. It receives its water from Hati Nahar, which is further connected to the Indira Gandhi Canal. The drinking water needs of Jodhpur and nearby villages is fulfilled by this lake. It's surface area is 84 km2 (32 sq in) with an average depth of approximately 35 to 40 feet (11 to 12 m). It's coordinate 26017' N 720 58' E. It is hot and semi-arid during dry season. Temperature varies from 490 in summer to 10 in winters. Average rainfall is 302 mm/yr. The soil is sandy, with a natural vegetation of trees and shrubs comprising of Prosopis cineraria, Capparis deciduas, Caligonum polygonides, Acacia senegal, Zizipus

nummularia, S.persica, Euphorbia caducifolia, Calotropis procera, Dactyloctenium aegyptium. The fauna of this area mainly include Mangoose, Jackal, Nilgai, Desert hair, Cobra, Cat, Dog, etc.

3.2 Materials: Binocular(8X42) was used to study the avian species and observations. For identification of species 'The book of Indian Bird's by Salim Ali and websites was considered. The digital camera Nikon D 3400 was used for photography.

3.3 Methods: In the present study observations were made throughout the study area. Point count method were used to record birds within study area [7,8]. This method allows the observer to travel within the area and to stop at particular point, allows the birds to settle and then record the bird's diversity. Thereby recording birds at predefined area within Kayalana lake and hills nearby. A recent map was used to evaluate the landscape along with Google Earth. GPS was used to mark the points by moving along the site. Total of 4 patches, with an area of 500 square hectares for each was carried out across the lake. Out of which two patches (i.e. point 1and 2) were taken in the area that were not as intensively protected by any management body or government (referred to as unprotected site) and the other two patches (i.e. point 3 and 4) for comparison choosen were thus in heavily managed and protected parts of the area. Each point was given the time of 20 min with a time gap of 5 min between each point. The radial distance from the point to detected birds was recorded. As the distance increased the probability of observing birds decreased [8]. The data regarding diversity and distribution was collected from July 2018 to September 2018. Time schedule chosen was from 6:00h to 9:00 h in morning and 16:00h to 18:00h in the evening. At each site an area of 400 square hectares was selected and marked. Anthropogenic activity such as Aquatic vegetation, Ethical activities, Boating, Dumping of wastes, Domestic uses in and around the lake were recorded using visual observation.

3.4 Statistical analysis: The data of all observations was pooled and community characteristics were calculated to quantify the bird's abundance and distribution at selected locations. Species diversity was calculated by Shannon-Weiner Index; $H= -\sum Pi \log Pi$, where Pi is the proportion of the ith species of birds. 'H' is referred as 'Shannon's index'. This formula is known as Shannon- Wiener index of bird's diversity. Simpson's index may be defined as it is the probability that two individuals drawn at random from an assemblage will belong to the same species [9]. It is calculated as $D= 1/ \sum Pi2$, where is the proportion of the ith species. Species evenness is about how well distributed abundance or biomass is among species within a community [10]. Species evenness is also known as equitability and denoted as E (which ranges between 0-1).

4. Result and Discussion

During the present study, total of 78 birds species were identified for the points along Kayalana lake (Table 1). From the given table 2 of computed statistical analysis shows Species richness was highest at point 4 followed by point 3, 2 and lowest richness was recorded from point 1(Table 2). Computed statistical data show that Shannon's index (H) provides a quantitative report of diversity which was highest at point4 followed by point 3,2 and least in point 1. Similarly, Simpson's index shows diversity measure for avian fauna. Bigger the value of D, lower the diversity and vice versa. The lowest value of point 4 followed by point 3, 2 and highest in point 1 (Table 2).

Table 1: Scientific name, common name and number of birds in points studies from study area during the study period.

Scientific name	Common name	Point 1	Point 2	Point 3	Point 4
Pavo cristatus	Indian Peafowl	0	1	5	7
Anastomus oscitans	Asian Openbill	1	0	6	9
Francolinus pondicerians	Gray Francolin	1	0	1	5
Trachybaptus ruficollis	Little Grebe	4	8	22	15
Appus affinis	Little Swift	6	0	7	3
Microcarbo niger	Little cormorant	3	5	16	20
Phalacrocorax carbo	Great Cormorant	4	2	6	9
Phalacrocorax fuscicollins	Indian Cormorant	5	10	20	21
Neophron percnopterus	Egyptian Vulture	0	0	1	0
Aquile nipalensis	Steppe Eagle	1	0	0	1
Milvus migrans	Black Kite	2	0	2	7
Phylloscopus humei	Hume's Warbler	0	0	3	5
Aythya farina	Common Pochard	9	11	28	21
Aythya fuligula	Tufted Duck	7	15	21	15
Streptopelia decaocta	Eurasian Collard Duck	5	3	11	14
Gallinula chloropus	Eurasian Moorhen	5	0	4	2
Fulica atra	Eurasian Coot	8	5	12	10
Porphyrio poliocephalus	Gray-headed Swamphen	0	1	4	3
Sterna aurantia	River Tern	0	0	1	0
Mycteria leucocephala	Painted Stork	0	0	0	1
Ardea purpurea	Purple Heron	2	1	1	0
Egretta garzetta	Little Egret	0	0	0	1
Bubulcus ibis	Cattle Egrte	2	0	1	1
Threskiornis melanocephalus	Black-headed ibis	0	1	0	0
Buteo rufinus	Long legged Buzzard	1	0	4	6
Ceryle rudis	Pied Kingfisher	0	0	0	1
Gracupica contra	Asian Pied Starling	0	0	0	0
Acridotheres ginginianus	Bank Myna	1	0	3	4

Passer domesticus	House Sparrow	16	18	25	36
Sarkidiornis melanotos	Knob billed Duck	5	7	15	18
Anas clypeata	Northern Shoveler	2	4	8	5
Anas poecilorhyncha	Indian Spot billed Duck	5	10	16	17
Anas carolinensis	Green-winged Teal	0	0	2	0
Columba livia	Rock Pigeon	17	15	20	29
Streptopelia orientalis	Oriental Turtle Dove	0	0	2	5
Spilopelia chinensis	Spotted Dove	0	0	1	0
Spilopelia senegalensis	Laughing Dove	7	10	12	11
Teron phoenicoptera	Yellow footed Pigeon	0	0	0	0
Himantopus himantopus	Black-winged Slit	2	4	4	6
Vanellus indicus	Red-wattled Lapwing	9	11	13	17
Charadrius dubius	Little Ringed Plover	0	0	0	1
Philomachus pugnax	Ruff	0	0	0	0
Actitus hypoleucos	Common Sandpiper	5	8	12	19
Tringa nebularia	Common Greenshank	0	0	0	0
Alcedo atthis	Common Kingfisher	2	1	4	6
Halcyon smyrnensis	White-Throated Kingfisher	0	0	2	0
Merops orientalis	Green Bee Eater	0	0	4	6
Falco tinnunculus	Eurasian Kestrel	0	0	0	1
Psittacula krameri	Rose-ringed Parakeet	5	12	18	20
Lanius isabellinus	Isabeline Shrike	0	0	2	1
Lanius excubitor	Great Gray Shrike	0	0	0	0
Dicrurus macrocercus	Black Drongo	0	0	1	2
Dendrocitta vagabunda	Rufous Tree pie	0	0	0	0
Corvus splendens	House Crow	2	6	17	23
Eremopterix griseus	Ashy-crownedSparrow- Lark	9	13	20	29
Galerida cristata	Crested Lark	1	0	2	0
Cecropis daurica	Red-rumped Swallow	0	0	0	0
Pycnonotus cafer	Red-vented Bulbul	3	0	8	12
Pycnonotus leucotis	Whited Eared bulbul	0	5	12	16
Iduna caligata	Booted Warbler	0	1	0	0
Acrocephalus dumetorum	Blyth's Reed Warbler	0	0	0	0
Orthotomus sutorius	Common Tailorbird	0	0	4	7
Prinia socialis	Ashy Prinia	0	0	0	1
Sylvia curruca	Lesser Whitethroat	0	0	1	3
Zosterops palpebrosus	Oriental White-eye	0	0	1	0
Turdoides caudate	Common Babbler	5	9	13	14
Turdoides malcolmi	Large Gray Babbler	8	1	10	13
Saxicoloides falicatus	Indian Robbin	19	17	29	35
Copsychus saularis	Oriental Magpie-Robin	0	0	0	0
Phoenicurus ochruros	Black Redstart	2	1	2	3
Oenanthe isabellina	Isabelline Wheatear	1	4	9	5
Pastor roseus	Rosy Starling	0	0	0	0
Sturnia pagodarum	Brahminy Starling	0	0	1	2
Acridotheres tristis	Common Myna	0	0	0	1
Cinnyris asiaticus	Purple sunbird	4	8	9	12
Nettapus coromandelianus	Cotton Pygmy goose	0	1	8	18
Dendrocygna javanica	Lesser Whisteling Duck	8	11	21	19

Table 2: Statistical analysis of avifauna of study areas.

Statistical analysis	Point 1	Point 2	Point 3	Point4
Species no.	40	35	57	57
Individual no.	204	275	507	594
Simpson index(D)	0.04	0.031	0.03	0.028
Shannon index (H)	3.38	3.26	3.67	3.68
Evenness	0.91	0.918	0.908	0.910

Our results reveals that avian species that are mainly found in the study area are dependent on protected area with little human disturbance than in the unprotected region mainly due to the better habitat, vegetation composition, better availability of food, better environment for nesting. The research says that the birds use to prefer the area with least pollution, human interference and the area safe from anthropogenic activities. Many studies support the fact that vulnerable species require rich habitat [11]. There is the direct role disturbance and successional processes in structuring avian habitats and community. Slightly disturbed areas have relatively high diversity and dominance of avian species. This result supports the findings of numerous studies around the globe that shows the avian diversity most susceptible to the human disturbance.

5. Conclusion

The anthropogenic activities are continuously affecting the Kayalana lake which in turn affecting the natural ecosystem and balance of nature, which is harmful for all the animals occupying that habitat as well as affecting the diversity and distribution of avian species. Changes in the natural habitat and vegetation structure and composition caused by human disturbance in our study area have led to considerable changes in bird abundance, richness and composition.as habitat destruction increases species are predicted to become

extinct. Moreover, the more fragmented a habitat is , the greater is the number of extinctions caused by added destructions [12]. Based on our statistical analysis we can predict the declining diversity of avian fauna in the given study area as compared to the area with the least disturbance. Avian species react rapidly to the anthropogenic activities. It is therefore foremost important to obtain a better understanding of conservation and management of unprotected area. Crucial steps should be taken for conservation of avian species and their habitat and problem should be brought to the eyes of the management. Our study highlights the proper protection of intact ecosystem to maximise the diversity.

6. References

1. Blom A, Van Zalinge R, Mbea E *et al*. Human impact on wildlife populations within a protected Central African forest. African Journal of Ecology. 2004; 42:23-31.
2. Brawn JD, Robinson SK, Thompson III FR. The role of disturbance in the ecology and conservation of birds. Annual Review of Ecology and Systematics. 2001; 32(1):251-276.
3. Sefi Mekonen A, Chivasho K, Berham S, Tesfaye. Threats and conservation challenges of wildlife in Harenna Forest, Harenna Buluk District, South Ethiopia. 2017; 9(7):246-255.
4. Khera N, Mehta V, Sabata BC. Interrelationship of birds and habitat features in urban green spaces in Delhi, India. Urban forestry and urban greenings. 2009; 8(3):187-196.
5. Bohra HC, Goyal SP. Checklist of the birds of Machia Safari Desert Park, Jodhpur (Rajasthan). Pavo. 1992; 30(1):87-97.
6. Prakash I, Ghosh PK. The Great Indian Bustard breeding in Rajasthan. Ibid, 1964, 3:2.
7. Buckland ST, Anderson DR, Burnham KP, Laake JL. Distance sampling estimating abundance of biological populations, Chapman & Hall, London, 1993.
8. Buckland ST, Anderson DR, Burnham KP, Laake JL, Borchers DL, Thomas L. Introduction to Distance Sampling. Oxford University Press, Oxford, 2001.
9. Sivaperuman C, Kumar S, Rathore NS. Avifauna of desert regional station, Zoological Survey of India campus, Jodhpur (Raj.). Zoo's Print Journal. 2004; 19(2):1718-1719.
10. Wilson BJ, Potwin C. Biodiversity and ecosystem functioning: importance of species evenness in an old field. Ecology. 2004; 8(4):887-892.
11. Carrasco L *et al.* Effects of forest disturbance and habitat loss on avian communities in a Neotropical biodiversity hotspot. Biological Conservation, 2013; 166:203-211.
12. David Tilman, Robert M May, Martin A. Nowak. Habitat destruction and the extinction dept. Nature. 1994; 371(6492):65-66.
13. Morante-Filho JC, Faria D, Mariano Neto E, Rhodes J. Birds in anthropogenic landscapes the response of ecological group to forest loss in the Brazilian Atlantic Forest. PLoS ONE. 2015; 10(6):e0128923.
14. Agoramoorthy G, Mohnot SM. Migratory water birds around Jodhpur (India). Tigerpaper. 1986; 13(1):4.
15. Agoramoorthy G, Mohnot SM. Checklist of birds around Jodhpur. Tigerpaper. 1989; 16(1):11-13.
16. Ali S. On some birds of Indian Desert. In: Gupta RK, Prakash I(eds) Environmental analysis of the Thar Desert. English Book Depot, Dehradun, 1975, 423-431.
17. Prakash I. Desert Ecology. Scientific, Jodhpur, 1988.
18. Somerfield PJ, Clarke KR, Warwick RM. Encyclopedia of Ecology. Elsevier, Oxford, UK, 2008, 3252-3255.
19. Dookia S. A Checklist of birds of New Campus, Jai Narain Vyas University, Jodhpur, Rajasthan. Zoo's Print Journal. 2002; 17(19):883-885.