International Journal for Multidisciplinary Research (IJFMR)
E-ISSN: 2582-2160 ● Website: www.ijfmr.com ● Email: editor@ijfmr.com

Impact of Environmental and Anthropogenic Disturbance on Nesting Success of a Small Passerine Bird, Indian Robin Saxicoloides fulicatus

Manasi Khatri[1], Fatima Sultana[2]

[1]Research Scholar, Department of Zoology, J.D.B. Govt. Girls College, Kota, Rajasthan, India,
[2]Professor, Department of Zoology, Government College, Antah, Rajasthan, India,

Abstract

The present study engrossed on nesting success of an endemic passerine bird the Indian Robin Saxicoloides fulicatus. This bird species is the member of family Muscicapidae. Indian Robin is a territorial, resident and non-migratory bird; mostly found in dry habitats, scrub forests, rocky areas, in open grasslands, near cultivated sites and in the vicinity of human habitation. On the onset of breeding period male and female both individuals together select the nesting site and initiates the formation of nest. Robins are very sensitive to any environmental and anthropogenic disturbance during the breeding phase. If they ponder that their nest has been discovered by any predator or human, or feel any disturbance due to environmental conditions then, they leave the nest and start searching new nesting site. This paper is based on authors' field observations. We have examined the nesting success and survival rate of bird over the two breeding seasons at various nesting sites and over the course of this period found some abandoned nests of Robin; those were left by bird due to anthropogenic and environmental disturbance. This monitoring concluded that, Robin is greatly affected by presence of human during nesting phase, which enhances the threat or fear in bird and they leave their nest, sometimes even after egg laying. It decreases the nesting success of bird and also the survival of eggs & nestlings; causes declining the population of Robin bird in future. In this study we have found that overall nesting success of bird was significantly reduces due to anthropogenic and environmental disturbance as well.

Keywords: Anthropogenic disturbance, Environmental disturbance, Nesting success, Survival rate, Endemic, Predator

Introduction

The reduction of many species has been explicitly and implicitly linked with the outcome of human activities. Major cause of decline in population is destruction of habitat of any species. Besides, many other human activities also may cause population numbers to dwindle in a specific area over the time. Anthropogenic disturbance can be elucidated as any kind of human activity that affects/alters the behaviour of an animal; directly or indirectly disrupt the existance of a species. It is forecast that this interference cause a negative impact on size of population for some species. Several research

observations have shown that human disturbance in form of walking can instigate anti-predatory behavior in birds. Previous studies have also demonstrated a negative effect of human disturbance, in the form of dog walking, on the diversity and abundance of bird species in an area **(Banks and Bryant 2007).** While it is acknowledged that studies demonstrating the consequences of disturbance on population size, rather than effects on behavior, are most useful for providing evidence of impacts on a species **(Drewitt 2007).** This research article emphasize on nesting success of passerine bird Indian Robin. Nesting success is defined as the proportion of nesting or laying pairs that raise young to the age of fledging (i.e., the age when a fully-feathered offspring voluntarily leaves the nest for the first time). According to some authors' for determining nesting success investigator should signify a standard minimum age of nestling at which they can esteem nests to be successful.

Indian Robin is a common, endemic, small passerine, territorial, insectivorous, and human loving bird. It is common visitors to gardens, green areas, boundaries of cultivated sites, dry rock and shrub areas; found in all climatic zones, but absent from dense forest and high rainfall areas. This bird is belongs to the family Muscicapidae. There is a crystalline sexual dimorphism in their plumage, shoulder wing pattern, and coloration. Males of bird are black in colour with a white shoulder patch and the females of bird species are brownish above and grayish below or completely brownish without any shoulder patch. Both individuals of species have a long tail that is raised in upright position and showing undertail chestnut coverts. This passerine bird is a solitary mover and forms pairs only during the breeding season. Robins are well known for nesting in all kinds of improbable locations. Generally they built nests between rocks, in wall holes, tree hollow, house windows, and any other small space in gardens or human habitation. They also use artificial nest boxes hanged by humans in outdoor or indoor areas. Their nests are round or oval in shape. Cup shaped nests of robin are made-up of dead leaves and moss, dry twigs of old broom, bristles of coconut, plant materials, dead leaves, threads, and lined with animal hair and feathers.

Figure:1- Indian Robin Bird (Female)

Figure:2 – Indian Robin Bird (Male)

Breeding is a vital phase in birds' life. Birds spend more time and energy to perform courtship and breeding activities during the entire breeding season. The breeding populations of birds completely depend on the availability of food, nesting material & nesting site, environmental & anthropogenic safety and other requisite resources. Both sexes search for a suitable nesting place and participate in nest formation. Indian Robin is a seasonal breeder and breeding season of this bird is generally initiates during onset of summer, but they start their courtship activities in a mild winter. They make pair only for the duration of the breeding season; both individuals select nesting site, collect nesting material, build nest and after egg laying incubate them and together raise their nestlings. Chicks of Robin are altricial and need extensive parental care and attention for survival.

Research Methodology

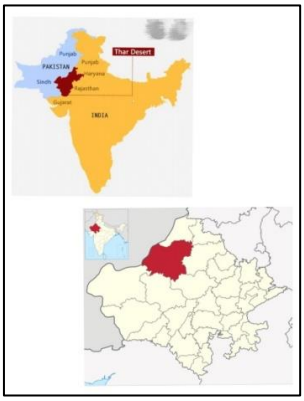
The present study deals with impact of anthropogenic and environmental factors on nesting success and survival rate of Indian Robin and is completely based on the field observations. For the data collection frequent field visits were carried and observations of several bird pairs were done during the breeding season; with Olympus Binocular 10x50 and Canon EOS M50 Mark II Mirrorless Camera. Direct observation and various sampling methods were used during the monitoring of peculiar behaviours such as- pair formation, nesting site selection, collection of nesting material, nest formation, egg laying and parental care of the bird. The study takes places at several different sites in Bikaner (28.0229^{o} N, 73.3119^{o} E) region of Thar Desert. The study sites were public places and gardens near human habitation. Regular field visits were took place in the early morning and evening, when bird is fully active to perform behaviours. We had collected data about nesting and nestlings of Robin bird over 2 breeding seasons. Additionally, reports and research articles of previous studies related to this paper were consulted, and their observations were compared with the present study to draw an authentic conclusion.

Study Area

Bikaner (28.0229^{o} N, 73.3119^{o} E) is a city in the north-west of the Rajasthan state, India. It is encircled by the Thar Desert and located 330 km north-west of capital of the state of rajasthan. Bikaner is located in the center of the Thar Desert and has a hot Desert climate, enclosing on a very hot semi arid climate, with very less rainfall and supreme temperatures. In summer, temperatures of this region can surpass

48 °C, and during the winter temprature may submerge below freezing. A variety of bird species, reptiles and mammals are resident of Bikaner's semi-Arid climate. There are approx 600 or more resident vultures at Jorbeer conservation area, Bikaner. This region is provides habitat to another around 1,200 and many more migratory vultures. Local varieties of vultures include Egyptian Vulture and King Vultures. The most common migratory vulture of this area is Eurasian Griffon native of Spain and Turkey. Other migratory vultures are Cinereous Vulture and Himalayan Griffons. Saw-scaled Viper is also native species of Bikaner. Gajner Wildlife Sanctuary is also situated 32 kilometers west of the Bikaner.

Map of Study area- Bikaner (India)



Results and Discussion

Over the 2 breeding seasons, we have found and monitored 13 nests of Indian Robin bird. Out of these 13 nests, 5 nests were succesfully proceeded with nestlings, and 8 nests were abandoned; out of them 3 nests were left by bird after egg laying and 5 nests were left at the nest builing stage (Table-1).

Table-1: Results from direct observation of nesting success & survival rate of nestlings, and factors which influence the nesting behaviour of robin bird across 2 breeding seasons showing a significant impact of anthropogenic and environmental disturbance.

S. No.	Nesting site	Clutch size	Number of destryoed eggs	Number of surviving nestlings	Survival rate of nestlings	Nesting success	Major influencing factor
1.	Human residance	2 eggs	-	2 young	100%	100%	-
2.	Human resedance	3 eggs	-	2 young	66.67%	66.67%	Unknown
3.	Human residance	2 eggs	-	2 young	100%	100%	-
4.	University campus	3 eggs	2 eggs	1 young	33.33%	33.33%	Environment
5.	Road side	2 eggs	1 egg	1 young	50%	50%	Environment
6.	House	2 eggs	2 eggs	-	0%	0%	Anthropogenic

	backyard						
7.	Collage campus	2 eggs	2 eggs	-	0%	0%	Anthropogenic
8.	Construction site	3 eggs	3 eggs	-	0%	0%	Anthropogenic
9.	University garden	-	-	-	0%	0%	Anthropogenic
10.	House roof-top	-	-	-	0%	0%	Anthropogenic
11.	Colonial garden	-	-	-	0%	0%	Anthropogenic/Environment
12.	Colonial garden	-	-	-	0%	0%	Anthropogenic/Environment
13.	Colonial garden	-	-	-	0%	0%	Anthropogenic/Environment

Out of 5 succesful nests, 3 nests were found in human residence, 1 nest was found in university campus area, and 1 nest was found at road side in an open ground. Clutch size of these nests was 2-3 eggs and all 5 nests were commendably proceeds with nestlings. Those 3 nests which were formed in human residence, all eggs of these nests were hatched as nestlings; but one young is found dead in a nest after 3-4 days of hatching. The reason behind the death of young was unknown. Inspite of human presence at these sites, they raise their nestlings without any pressure or threat and survival rate of their nestlings was not much affected by anthropogenic factors.

Figure:3- Eggs of Indian Robin

Figure:4- Nestlings of Indian Robin

Figure:5- Nestling of Indian Robin

Figure: 6- Juvenile of Indian Robin

Figure: 7- Young of Indian Robin

Figure: 8- Nestlings of Indian Robin

Nest which was found in university campus area, was situated in a tree hollow and had clutch size of 3 eggs. Out of these only 1 egg is raise as juvenile; other 2 eggs were eaten by squirrel. Nest found at road side had clutch size of 2 eggs, out of which 1 egg is developed as young the other one was destroyed by dog. As we are familiar with the prey-predator relationship, which is a part of ecological/environmental factor; affects the breeding success of various animals. Above mentioned nests' were in predatory pressure and survival rate of nestlings of these nests were reduced due to predatory effect. Predation is a principle source of nest failure in most avian species.

The 3 nests which were left by bird during incubation stage, the first one was at house backyard, second one was in a college building, and third one was at a construction site. From these sites incompletly incubated eggs were spotted, some of them were intact while some were destryoed. These nesting sites were at public places and birds definitely must have experience hinderance by anthropogenic factors. The first nest (found at house backyard) and third nest (found at construction site) were thrown by owner. Nesting success of these nests is purely decline by anthropogenic disturbance.

Figure: 9-14= Abandoned nests of Robin at Incubation stage

Figure - 9

Figure - 10

Figure - 11

Figure - 12

Figure - 13

Figure–14

5 abandoned nests were at nest building stage. First nest was found in university garden, disrupted by heavy rain and outcast by bird. Second nest was found on roof-top of a house and left by bird due to human disturbance. Other 3 nests were found in gardens of colonial area and possible reason for failure of these nests was anthropogenic and environmental factors as well.

Figure: 15-19= Abandoned nests of Robin at Nesting stage

Figure -15

Figure -16

Figure -17

Figure -18

Figure -19

It was also noted in some bird pairs, if the existing nest is disrupted by environmental disturbance or due to any kind of human influence and adequate time was left in the breeding season then, they prepare new nest at new safe nesting place and laid a new clutch of eggs. Clutch size of bird was not affected by any kind of disturbance. Clutch size of bird was 2-3 eggs. Due to the supermacy of anthropogenic activities the chances of nesting failure is greater than nesting success. A deviant observation were noticed that, those birds who synthesize nests in human residence, where human influences are too common; they do not affected by human activites and no such impact occurred on nesting success and suvival rate of youngs. But, birds those build nests far from human residence, where no or very less human influence occurred; their breeding success affected by anthropogenic disturbance. It is concluded in this research paper that reproductive success of an individual or bird pair is depends upon their specified habitat. As per their circumstances of habitat and environmental conditions, nesting success of a bird pair can be fluctuated. Previous research articles postulated this fact that, population density of any species is playing a crucial role in the relative reproductive success of that species. Any kind of disturbance may mainly affect the fate of eggs, young and juvenile birds; breeding pair may be remains unaffected, though more energy is wasted of a bird pair (mostly female) on nesting failure. Eggs and nestlings may suffer too much mortality at the time when disturbance at its peak, which would gradually reduces the population viability over the time. Other studies related to this paper also concluded that, during the

study of nesting behaviour of Robin bird 71 % of 1,426 eggs hatched, and 77 % of 1,865 young were fledged. The "average success from egg to leaving nest" was 55 % in birds **(Lack, 1948c).**

Conclusion

In this study we scrutinized some factors those harshly influencing the nesting success, survival rate and population density of bird. Through this study it is speculated that, areas of the gardens near human residence that are subjected to increased human influence would show depletion in diversity of birds, and would show a greater rate of nest failure as compared with regions those are less frequently disturbed by humans. The presence of researchers at the habitat of species may also cause reduction of the reproductive success of birds. Disturbance by biologists has been deemed a major threat to seabirds because their activities have caused desertion and mortality of eggs and young **(Nisbet 1978, Schreiber 1979).** Determining the influence of observer in any habitat is also important, because the viability of outcomes and conclusions drawn from research exploration is shrinked when an observer accidently and inadvertently affects the results. Pure knowledge of this occurrence can also help to minimize the terrible effects on the birds. Natural losses of eggs and chicks cannot be wholly separated from artificial ones because the presence of observers may increase losses. However, the stage at which losses are most likely to occur can be determined **(Ollason and Dunnet 1980)**, and this information can be used to minimize disturbance. During the study it was noted that, as clutch size of bird is two to three eggs, but survival rate of nestlings is avarage zero to one. Environmental factors and predators of the habitat directly reduce the survival chances of young. Robin seems to be susceptible to human and environment disturbance during their breeding season. Our findings concluded that human disturbance, predatory effect and environmental conditions may drastically decline the nesting success and survival rate of nestlings. A great variety of enemies might be comprised under "predators". Usually predators includes are reptiles, avian species, and mammals, native and migrants of the habitat; those eat eggs and young of birds, Nest competitors of a species that chase off the parents of chicks and destroy eggs and young, brood parasites and arhropod parasites those prey on the nestlings. Humans also included in the category of predators as they involve in the destruction of habitat of species, eggs, and young. More incidence of predation decreases the rate of breeding succes and survival. Even though, activities of humans are sometimes fruitful in the provision of nesting sites and elimination of some predators from habitat of species. Open nesting sites of passerine birds typically loses more eggs or young. This study also highlights the effect of environmental changes on birds. Long term monitoring of birds nesting success pay negative impact on their survival and disturbance on broad scale that direcly affects the fecundity of bird pair. Success of nesting in passerines is influence by the safety of the nesting site and the percentage of eggs that hatched and are fledged generally falls.

Acknowledgement

Nothing is possible without God’s blessings, in absence of which I would not have been able to complete this work. A formal statement of acknowledgement will hardly meet the ends of justice in the manner of expression of deep sense of gratitude and obligation towards my mentors. I express my heartfelt regards and infinite indebtedness towards CSIR; who equip fellowship for research, faculty of zoology department, my colleagues, and supervisor cum co-author, without their guidance, insight, and suggestions I would never have been able to complete this work.

References

1. "Vultures find abode in Bikaner". The Times of India. 7 January 2018. Retrieved 28 December 2018.
2. Banks, P. B., and J. V. Bryant. 2007. Four-legged friend or foe? Dog walking displaces native birds from natural areas. Biology Letters 3:611–613. http://dx.doi.org/10.1098/rsbl.2007.0374
3. Das, K., Maheshwar, R. and Mandrik, I., 2017. Some behavioural observations of the Indian robin,(Saxicoloides fulicata). Indian Journal of Science Research, 12(2), pp.107-110.
4. Drewitt, A. L. 2007. Birds and recreational disturbance. Ibis 149:1-2. http://dx.doi.org/10.1111/j.1474-919X.2007.00663.x
5. Khatri, M. and Sultana, F., 2024. Ecological role of Indian robin (Saxicoloides fulicatus) in agricultural insect management.
6. Kumar, N. Shiva (1 June 2018). "Charming serpents to safety". Business Line. Retrieved 28 December 2018.
7. LACK, D. 1948c. Further notes on clutch and brood size in the Robin. Brit. Birds, 41: 98-104, 130-137.
8. Lowe, A., Rogers, A.C. and Durrant, K.L., 2014. Effect of human disturbance on long-term habitat use and breeding success of the European Nightjar, Caprimulgus europaeus. Avian Conservation & Ecology, 9(2).
9. Nice, M.M., 1957. Nesting success in altricial birds. The Auk, 74(3), pp.305-321.
10. NISBETI,. C. T. 1978. Direct human influences: hunting and the use by birds ofman's wasted eposits. Ibis 120: 134
11. OLLASON, J. C., AND G. M. DUNNET. 1980. Nest failures in the Fulmar: the effect of observers.J . Field Orni- thol. 5 1:39-54.
12. Prasad, R. (15 March 2018). "Antibiotic resistance: vultures wintering in India show pattern". The Hindu. Retrieved 28 December 2018.
13. Safina, C. and Burger, J., 1983. Effects of human disturbance on reproductive success in the Black Skimmer. The Condor, 85(2), pp.164-171.
14. SCHREIBERR,. W. 1979. Reproductive performance of the EasternB rown Pelican Pelecanuso ccidentahs. Nat. Hist. Mus. Los Ang. Cty. Contrib. Sci. 3 17:1-43.
15. Steenhof, K. and Newton, I., 2007. Assessing nesting success and productivity. Raptor research and management techniques, pp.181-192.