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Breeding success of Black kite (*Milvus migrans*) on Mobile Towers of Malappuram and Calicut Districts of Kerala

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ABSTRACT

Adaptive selection and utilization of the nesting and foraging resources utilized by *Milvus migrans* makes them more successful predators. High degree of nest loss due to predation is the major threatening in natural habitat, easiness in nest construction and camouflage from predators leads to a high degree of nest success and fledging success on the mobile tower is observed to be the major factor to such a selection behavior. Survival rate of fledglings on mobile tower in 2013- 74 %, 2014- 81%, 2015- 96 % and in 2016 - 100% with total of 89 % survival for all four years. In natural habitat 2013- 65%, 2014 -63%, 2015-65%, 2016 -55% and the black kites (*Milvus migrans*) conventionally use nesttrees as *Cocosnucifera*, fig species, *Azadirachta indica*, *Tamarindus indica*, *Mangifera indica* etc., while nowadays due to various anthropogenic stress including wetland depletion, drastic urbanization leads to habitat fragmentation and shortage of appropriate nest trees would compel them to select an alternative remedy to tolerate the short comings in the breeding ground. Shrinkage of ideal habitat make their life more competitive in both intraspecifically and interspecifically. As a part of that there would be a strong trend to select mobile towers as nesting habitat among black kites. Test association between nest type and survival has a chi-square value of 19.44 with P value <0.0001. Therefore, there is strong association between survival and nest type (tower/tree) i.e., nests in tower have significantly higher survival rate. The higher survival rate in the tower is mainly due to low predation rate, while it is higher in natural habitat. Black kites considering as potential scavengers and their ecosystem services also considerably high. So, retaining and protection of natural habitat is a strong recommendation initiative to protect these umbrella species insitu.

Key words : *Black kite, Mobile tower, Breeding success, Fledglings*

Introduction

Avian nest studies shows variations in reproductive success in relation with their choice of substratum. Nesting sites of kites spread over varied habitats like road side, city premises and agriculture areas and wetland associated areas (Donald, 1918). There is a more affinity towards cliffs, tall trees, thick vegetation for nesting kites. preferences are there to select areas with least predation risk and other anthropogenic stresses (Powell, 2009). Raptors are often solitary breeders (Lack, 1968). While colonial nesting behavior also reported among them.

Urbanisation, land leveling and wetland depletion leads to the shrinkage of black kite (*Milvus migrans*) habitat though they mostly depend on thick canopy and tall trees as nest trees (D' Abreu; 1911). A huge pair observed to be preferred unusual

breeding sites; Flood light, mobile tower and masjid top (Sharma and Soni, 2016). The nest tree selection of black kites demands lots of parameters (Bhuiyan and Khan, 1981), (Cain and Hallgarth (1974), colonial nesting behavior is a unique system among black kites (Desai and Malhotra (1979) Another behaviors like territory change to avoid natural predation and anthropogenic stress were also noticed in black kites (Donazar and Hiraido (1999).

The re-use of old nesting area and nest trees was common among birds (Catchpole, 1972; Greenwood and Harvey, 1976; Newton and Marquiss, 1982). Site fidelity to certain nesting area increases breeding success (Reyolds and Linkhart, 1987). While reuse of old nest as such or after repairing woks lightens the scarcity of nest sites and nest materials (Burger, 1978). The effect of fragmentation of habitats on cities is also compel them to utilize minimum resources (Miller and Hobbs (2002), Senma and Acharya (2010). Food availability is a major signal to select certain nesting areas regularly (Ali, 1926; Kushlan, 1976; Dykstra *et al.,* 2002 and Munjpara *et al.*, 2013). The reason to build a nest on certain specific locations is discussed (Kushlan, 1976; Nilson, 1984). The roleof scavenging items in breeding Black kites is reported by Delibes (1975), Sergio and Boto (1999). Studies on habitat features and nest tree choices are also conducted (Davis *et al.,* 2006). Even though birds mostly prefer low predation risk areas as nest locations (Ames and Merserau, 1964; Kelley, 1993; Haralson, 2008) they face large number of anthropogenic stress (Mathisen, 1968). In India, studies on factors determining the successful breeding of black kites is lacking.

Active mobile towers of Malappuram and Calicut districts are monitored (Table 1). All the towers inaccessible under study were to get a clear picture of the eggs through binoculars. So, the hatchlings which perform slight movements within one week after hatching were thoroughly observed till fledgling stage from the nearest building and the number of fledglings is analyzed for calculating breeding success.

Methodolgy

Extensive surveys in the above selected study sites are conducted to count the nests ofblack kites. The nest trees are identified by using standard field guides (Sahni, 2000). Nest on towers and on trees in kottuli wetlands were monitored for three seasons from 2013 January to 2016 June. For observing nesting activities, Nikon (10 x 40) binoculars are utilized. Nest height, tree height and GBH (Girth at Breast Height) are measured by using a measuring tape. Likewise, line transect method is adopted to count active nests on mobile towers from Manjeri town to Calicut new bus stand premises. Totally 16 active

Table 1. Showing location of active mobile towers in Malappuram and Calicut district

Sl. No	Location of Mobile towers	Co-ordinates	Proximity to food source (Approximate distance in meters)
1	Manjeri Govt Medical college Hospital-BSNL Tower	10.82^0 N and 75.95^0 E	70
2	Kondotty Air port road – BSNL Tower	11.14^0 N and 75.96^0 E	100
3	Kondotty Vaidiar smarakam(Neerad road)-Vodafone Tower	11.14^0 N and 75.96^0 E	80
4	Viadiarangadi- Air Tel Tower	11.14^0 N and 75.96^0 E	150
5	Ramanattukara near busstand –BSNL Tower	10.17^0 N and 75.86^0 E	50
6	Ramanattukara-Air Tel Tower	11.17^0 N and 75.86^0 E	70
7	Koyas- Vodafone Tower	11.18^0 N and 75.84^0 E	140
8	Sarada Mandiram- BSNL Tower	11.20^0 N and 75.81^0 E	200
9	Meenchantha Byepass-BSNL Tower	11.21^0 N and 75.79^0 E	100
10	Meenchantha byepass-Air Tel Tower	11.21^0 N and 75.79^0 E	100
11	Puthiyara-BSNL Tower	11.25^0 N and 75.79^0 E	250
12	Mankakavu Junction- BSNL Tower	11.23^0 N and 75.80^0 E	150
13	BSNL Tower -Mankavu	11.23^0 N and 75.80^0 E	70
14	Air TelTower-Calicut city	11.25^0 N and 75.78^0 E	40
15	Jafarkhan Colony-AirTel Tower	11.26^0 N and 75.78^0 E	30
16	Calicut new busstand –BSNL Tower	11.59^0 N and 75.59^0 E	40

mobile towers (towers having at least one hatchling) extending over 10 transects each of 5km distance (total distance - 50kms) were analyzed in this study. Data on the height of mobile towers (BSNL, Vodafone and Airtel) are collected from the departmental staff of various mobile companies.

Fledgling and hatchling success of both the species in natural habitats i.e. on trees in kottuli wetlands were studied. The tower height and nest height were measured by comparing the height of nearest building trees. Fledgling success of Black kites on trees and mobile towers were statistically analyzed by t-test to compare the fledging success on towers and natural habitats.

Results

With an advent of mobile towers, Black kites make use of its platform as a man- made substratum for nesting. The mean number of fledglings on mobile towers shows 29± 3.37 (Table 2) and the survival rate in the year 2013 is 74 %, 81% in 2014, 96 % in 2015 and 100 % in 2016 (Table 3). Total 89 % of fledgling success was observed on mobile towers and also nestling survival increased year by year. The correlation between fledgling survival rate and tower height shows a correlation co efficient of 0.38 and significance 0.147 and shows that there is no significant correlation between fledging survival and tower height. That is survival rate is not changing because of the increase in tower height. Whereas survival rate of fledging on trees in 2013 was 65%, 63 % in 2014, 65 % in 2015, 55 % in 2016 and a mean total of 62 % (Table 4) of survival rate among these years. Fledging survival rate decreased in 2016 as 55 %. The mean mortality is 38 % and mean survival is 62 %. Correlation coefficient is -0.063 and a significance of 0.679 (Table 5) and there is no significant correlation between fledgling survival and nest

Table 5. Correlation between fledgling survival rate and nest height

Correlation Coefficient	Significance
-0.063	0.679

There is no significant correlation between fledgling survival and nest height. That is survival is not changing due to increase in nest height.

Table 2. Showing location of mobile towers with number of fledglings on each tower during 2013-16.

Location	2013	2014	2015	2016
Manjeri Govt.hospital BSNL tower	2	2	2	2
Kondotty airport round BSNL tower	2	2	0	2
Kondotty Vaidiar smarakam Vodafone tower	2	2	0	2
Vaidyarangadi AirTel tower	2	2	2	2
Ramanattukara near bus stand BSNL tower	2	0	2	2
Air Tel tower	3	2	2	2
Koyas Vodafone tower	2	2	2	2
Sarada Mandiram BSNL tower	2	2	2	2
Meenchantha byepass BSNL tower	0	1	2	2
Meenchantha byepass Air Tel tower	2	2	2	3
Puthiyara BSNL tower	2	2	2	3
Mankavu junction BSNL tower	0	2	2	2
BSNL tower	2	2	2	2
Air tel tower	2	2	2	2
Jafarkhan colony Air Tel tower	2	0	2	2
Calicut Mofusal stand BSNL tower	0	2	2	2
Total fledglings per year	27	27	28	34
Average (Yearly)	29			
Standard Deviation	3.37			

Table 3. Survival rate by year on mobile towers

Year	2013	2014	2015	2016
Survival	74%	81%	96%	100%

Table 4. Survival rate by year on trees

Year	2013	2014	2015	2016	Total
Survival	65%	63%	65%	55%	62%

height, that is survival is not changing because of the increase in nest height. On towers total dead 13 survived 103 among 116(Table 6) and on trees dead 28 and survive 45 a total of 73 young ones.

The test of association between nest type and survival has a Chi-square value of 19.44 with p- value <0.0001 (Table 7). Therefore, there is association between survival and nest site. Nests in tower have significantly higher survival rate.

Discussion

The breeding season of Black kite is starting from January and ending in June attested in the present study is also pointed out in certain other studies (Sivakumar and Jayabalan, 2004, Desai and Malhotra, 1979). Both partners of the study species engaged in nest building and parental caring noticed present study also pointed out (Ricklefs, 1974; Ridley, 1978; Subhendu *et al.*, 2017). The present study is also approves it. studies revealed by Sivakumar and Jayabalan (2004) and Gupta and

Fledgling survival rate decreased in 2016.

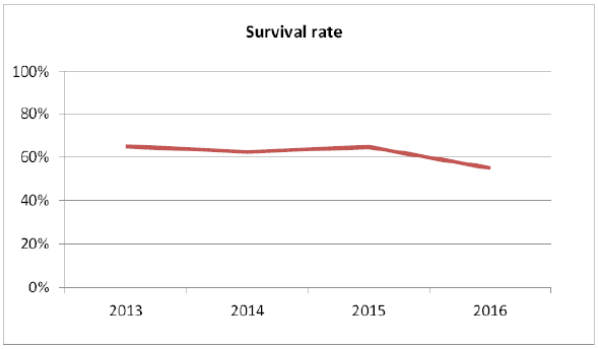

Fig. 1. Fledgling survival percentage of Black kite

Table 6. Tower height and fledgling survival during (2013-16).

Tower Height	2013	2014	2015	2016	Survived	Dead	Total	Rate
30	0	0	1	0	7	1	8	0.88
18	0	1	0	0	5	1	6	0.83
25	1	1	0	0	4	2	6	0.67
25	0	0	0	0	8	0	8	1.00
18	1	0	0	0	5	1	6	0.83
25	0	1	0	0	8	1	9	0.89
30	1	0	0	0	7	1	8	0.88
25	0	0	0	0	8	0	8	1.00
30	0	0	0	0	5	0	5	1.00
25	1	0	0	0	8	1	9	0.89
20	1	0	0	0	8	1	9	0.89
30	0	0	0	0	6	0	6	1.00
25	0	1	0	0	7	1	8	0.88
30	1	0	0	0	7	1	8	0.88
25	1	0	0	0	5	1	6	0.83
20	0	1	0	0	5	1	6	0.83
Total	7	5	1	0	103	13	116	

Mean	Standard Deviation
18.25	2.06

Table 7. Association between nest location and survival of fledglings

Nest Location	Survive Dead	Total Survive	Asymp.Sig.(2-sided)
Tree	28	45	73
Tower	13	103	116
Total	41	148	189
		Value	df
Person Chi-Square	19.441[a]	1	0.000

Image 1, 2, 3. Breeding of Black kites on Mobile Towers

Kanaujia (2012). During nesting the birds demands appropriate nest sites, which in turn depend on the available resources (Sergio *et al.,* 2003). The present study attest the same by the selection of mobile towers as nesting platform. The Mobile towers assures them strict security feeling from predators due to camouflage and other stresses. Moreover that the method of nest building on mobile towers is a strategy to conserve energy and enhance fledgling success.

The Black kites generally prefers Coconut palms, Neem tree, Ficus species and Teak trees for nesting. The availability of these trees is the major reason behind it. Moreover, that Black kites make use of mobile towers for nesting. The suitable height, less anthropogenic stress and excellent camouflage are the main reason for the selection of mobile towers for nesting. Breeding success is observed to be high on mobile towers than on trees. The reuse of old nest as such on mobile towers is another factor to focus on towers than on trees, old nest preferring is a strategy to conserve energy and time (Bhuiyan and Khan, 1981).

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