

## Intelligent Use of Food Resources by Indian Blue Rock Pigeons (*Columba livia*) in the Urban Habitats-An Acclimatisation Strategy

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**Abstract:** *The study was designed to gain more precise information about the way Indian Blue Rock Pigeons use the urban habitat to procure food. Pigeons are found in almost all major cities and despite the proximity of pigeons to humans, there is a lack of a detailed knowledge of usage of the feeding habitat in urban areas and employed individual foraging strategies by Indian Blue Rock Pigeons. This columbid species was found to utilize both volunteer food and waste food. However, the different variables like foraging, vigilance and movement differed for both types of food exploited by Indian Blue Rock Pigeons. They were detected to spend  $198.77 \pm 9.29$  sec. for foraging and  $60.28 \pm 1.38$  sec. for moving but only  $28.72 \pm 1.90$  sec. in vigilance with  $5.85 \pm 1.27$  sec. devoted for scanning bouts and  $5.07 \pm 0.84$  sec. in each bout of scan (scan duration) in case of waste food whereas in case of volunteer food, pigeons spent  $172.33 \pm 11.69$  sec. for foraging,  $53.76 \pm 1.38$  sec. for moving,  $11.20 \pm 1.0$  sec. for vigilance and  $5.39 \pm 1.37$  sec. in scanning.*

**Keywords:** *Urban habitat, Foraging, Vigilance, Scanning Bouts, Indian Blue Rock Pigeons.*

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### 1. INTRODUCTION

The flexible behavior reflected by Indian Blue Rock Pigeons belonging to family Columbidae and order Columbiformes enables them to acclimatize to diverse situations. The risk of life and uncertain food availability in the natural habitat makes Indian Blue Rock Pigeons to achieve this acclimatization to man-made structures. The population of the pigeon has increased worldwide in larger cities, due to the availability of variety of food, mostly due to feeding by pigeon enthusiasts, food discarded by humans, accidental food spillage and seasonally occurring natural food [1, 2].

The food resources dictate the increase, decrease or stability in populations. The management of pigeons in urban areas is a serious issue in various countries because the regular supply of food encourages the population of pigeons. This may cause problems like direct losses to structure of buildings, human health and food [3, 4, 5]. It is likely that information about their pattern of usage of feeding habitats in urban areas and strategies for exploiting the food available and facilitating reasons for the abundant food supply in these habitats may help manage their population in urban environments as food resources and human buildings are the key ecological factors that bring them into most cities and towns worldwide [2], extensively in agricultural habitats and wherever man has constructed suitable recoveries to dwell

in, forming stable or increasing populations of sometimes millions of individuals.

The present study is an attempt of its first kind in the study area as no such errand has been accomplished before to analyze the utilization of food resources by Indian Blue Rock Pigeons in the urban dwellings which included the residential colonies, parks and city squares where there was the availability of the abundant artificial food provided by the humans directly or indirectly.

### 2. MATERIALS AND METHODS

#### 2.1 Study Area

The study was carried out from June, 2009 to June 2011 in the urban areas of Jammu, winter capital of the state of Jammu and Kashmir (India). The city of Jammu sprawls on a hillock, on both the banks of picturesque River Tawi in the foothills of Himalayas and has a geographical area of 3097 sq.km. Besides, it lies between  $32^{\circ} 27'$  and  $33^{\circ} 50''$  North latitudes and  $74^{\circ} 19''$  and  $75^{\circ} 20''$  east longitudes. Altitudinally, it extends from 250 to 410 m above the mean sea level. The climatic conditions in and around the study area are dry sub-humid to arid. There are four well marked seasons in a year namely winter, summer, monsoon and autumn.

## **2.2 Methodology**

Recurrent surveys were performed from 0630 to 1200 h in the morning and 1300 to 1900 h in evening during summer and 0730 to 1200 h in morning and 1400 to 1830 h in evening during winter. In addition to it, several erratic excursions were also conducted during different hours of the day, before sunrise to sunset. The birds were observed with naked eye and through binoculars (Bushnell 7 X 50 U. S. A. made) whenever found necessary to record the data from quite a long distance in order to avoid any interference to birds due to the presence of observers. Photographic evidence was collected with the aid of digital camera and video camera.

## **2.3 Dominant Vegetation**

The study area possessed dominant plant species like *Acacia nilotica* (Babul), *Acacia modesta* (Kramishatrav), *Dalbergia sissoo* (Sheesham), *Morus alba* (Shahtoot), *Eucalyptus tereticornis* (Safeda), *Mangifera indica* (Aam), *Zizyphus* spp.(Ber), *Butea monosperma* (Pallash), *Adhatoda vasica*, *Grewia optiva* (Dhamin), *Emblica officinalis* (Amla), *Cannabis sativa* (Bhang), *Ficus bengalensis* (Barghad), *Ficus religiosa* (Peepal), *Calotropis procera* (Akvan) etc. Agriculture included predominantly *Oryza sativa* (Rice), *Triticum aestivum* (Wheat), *Zea mays* (Maize), vegetables and fruit trees.

## **3. RESULTS AND DISCUSSION**

The present section explores the various facets of the habitat use pattern of Indian Blue Rock Pigeons noted during the study period. In the study area, pigeons were viewed to be largely dependent upon two types of food resources enumerated as under:

### **3.1 Volunteer Food**

It included the sorghum seeds and rice (raw as well as cooked) along with the bread provided by the people. This type of food, however, was provided daily at the same place and time by the same people.

### **3.2 Waste Food**

Small particles of waste produced by human activity constituted the waste food and it was discerned to be available for a long time and widely dispersed but comparatively at low concentrations.

The above mentioned two food sources differed in be concluded that Indian Blue Rock Pigeons spent

the way they were distributed in time and space. The foraging tactics for the exploitation of each type of food was found to be different. It was noticed that the pigeons only pecked at food items while consuming volunteer food whereas searching accompanied pecking while foraging on waste food items. Volunteer food was found to attract larger pigeon flocks than waste food as depicted in Table 1. It was observed during the study period that when both the sources of food were available simultaneously, most Indian Blue Rock Pigeons were discerned to feed on volunteer food, although as mentioned earlier, the volunteer food was available for very short times. A total of 1101 Indian Blue Rock Pigeons (n=751 at volunteer food sites and n=350 at waste food sites) were taken into consideration for the study. Also, the percentage of feeding Indian Blue Rock Pigeons was deduced to be 78.43% at the site of volunteer food which was higher than the waste food site (60.28%) as shown in Table1.

On the other hand, Table 2 reflects foraging, vigilance and moving variables (mean  $\pm$  SE) of 800 focal Blue Rock Pigeons observed in the volunteer and waste food category in the study area. When the data of all the sample sizes were combined in case of waste food sites, it was found that the pigeons spent  $198.77 \pm 9.29$  sec for foraging and  $60.28 \pm 1.38$  sec for moving during a 3-minute recording period, but only  $28.72 \pm 1.90$  sec in vigilance with  $5.85 \pm 1.27$  sec. in scanning bouts and  $5.07 \pm 0.84$  sec in each bout of scan (scan duration). Moreover, the pigeons were observed pecking at the food for about  $187.57 \pm 6.0$  sec. in case of waste food. On the contrary, in case of volunteer food, on combining data of all the group sizes, it was observed that where the volunteer food was provided, pigeons spent less time for foraging as compared to waste food i.e.  $172.33 \pm 11.69$  sec. In addition to this, pecking duration was recorded to be  $206.83 \pm 11.60$  sec. i.e. much more than at the sites of waste food. Similar observations were recorded by [6]. But the vigilance duration and scanning bouts were found to be less as compared to the waste food i.e. only  $11.20 \pm 1.0$  sec and  $5.39 \pm 1.37$  respectively with comparatively less sec in each bout of scan (scan duration). At volunteer sites providing food, Indian Blue Rock Pigeons were also noted to reflect less moving duration than at the sites of waste food i.e.  $53.76 \pm 1.38$  sec.

Therefore, from the foregoing account, it may less time in foraging accompanied by a higher rate

of pecking at volunteer food sites as the food was discerned to be superabundant. Moreover, Indian Blue Rock Pigeons contributed less time in high density of pigeons at the sites providing volunteer food reduces the vigilance as the availability of abundant food promotes the congregation of more pigeons to the site thereby reducing the time of scanning by each individual. During the period of investigation, it was analysed that pigeons reflected a clear preference for foraging

on food provided by the public rather than on waste food as volunteer food provided higher intake rates to pigeons accompanied by minimum expenditure of energy. Same findings have been put forth by [6].

Individuals are able to store large quantities of food in their crops and need only a few minutes to fill the crop, which means that feeding rate is not limited by handling time [7]. Thus pigeons can efficiently exploit ephemeral, abundant food sources, including those provided by the public or obtained by spillage in grain stores. By exploiting these ephemeral, abundant food sources, however, pigeons increase the level of intra specific competition.

In the study area also, the use of volunteer food was found to yield high levels of competition between the individuals. This type of food was an abundant, highly predictable resource and Indian Blue Rock Pigeons were observed often perching on roosting sites like wires waiting until it became available. A large number of Indian Blue Rock

vigilance behavior and scanning bouts at volunteer food sites as compared to waste food sites because with the Pigeons were noted to throng to the sites of the availability of volunteer food and the food was found to deplete in a few minutes, thereby promoting the existence of scramble competition. The existence of such type of competition was also attested by [8].

During the study, it was reckoned that the foraging in case of volunteer food occurred at high densities thereby involving agnostic encounters and promoting contest competition. The fact that the higher rate of encounters occurred while pigeons foraged on volunteer food supports the hypothesis that contest competition only appears when food is sufficiently abundant to compensate for the costs associated with such encounters [9]. Waste food was reported to be exploited under low pigeon density and also scarce encounters were noticed.

**Table 1.** Mean  $\pm$  SE variables for volunteer and waste food exploited by Indian Blue Rock Pigeons during the study period.

Type of food	Total birds observed	Birds found feeding	% age pigeons feeding
Volunteer food	751birds	589	78.43%
Waste food	350 birds	211	60.28 %
Total	1101	800	

**Table 2.** Foraging, vigilance and moving variables (mean  $\pm$  SE) of 800 focal Blue Rock Pigeons in six group size categories observed in the volunteer and waste food in the study area

Volunteer Food					
Sample sizes	43	76	151	130	189
Total foraging duration (sec)	154.28 $\pm$ 2.90	158.43 $\pm$ 2.49	166.07 $\pm$ 3.89	173.74 $\pm$ 5.00	186.04 $\pm$ 4.41
Number of pecking (no./5-min)	187.98 $\pm$ 5.92	193.78 $\pm$ 5.10	201.92 $\pm$ 4.90	208.16 $\pm$ 5.52	219.36 $\pm$ 5.80
Total vigilance duration (sec)	13.04 $\pm$ 0.49	12.25 $\pm$ 0.43	11.73 $\pm$ 0.43	10.95 $\pm$ 0.25	10.11 $\pm$ 0.40
Number of scanning bouts (bouts/5-min)	8.14 $\pm$ 0.76	7.13 $\pm$ 0.78	5.68 $\pm$ 0.47	4.86 $\pm$ 0.65	4.20 $\pm$ 0.63
Scan duration (sec/bouts)	1.62 $\pm$ 0.18	1.74 $\pm$ 0.21	2.08 $\pm$ 0.20	2.29 $\pm$ 0.32	2.43 $\pm$ 0.40
Total moving duration (sec)	56.42 $\pm$ 0.63	55.15 $\pm$ 0.64	54.41 $\pm$ 0.41	53.48 $\pm$ 0.55	52.26 $\pm$ 0.55
Waste Food					
Sample sizes	06	21	42	61	81
Total foraging duration (sec)	182.83 $\pm$ 5.98	189.62 $\pm$ 5.52	193.83 $\pm$ 6.99	198.26 $\pm$ 7.02	205.27 $\pm$ 7.51
Number of pecking	172 $\pm$ 1.53	178.14 $\pm$ 1.86	183.67 $\pm$ 2.73	188.72 $\pm$ 2.86	192.32 $\pm$ 3.24

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(no./5-min)					
Total vigilance duration (sec)	32.95 ± 0.76	31.18 ± 0.56	30.41 ± 0.66	28.88 ± 0.70	26.76 ± 0.66
Number of scanning bouts (bouts/5-min)	9.17 ± 0.69	8 ± 0.76	6.55 ± 0.50	5.59 ± 0.49	4.89 ± 0.70
Scan duration (sec/bouts)	3.61 ± 0.21	3.93 ± 0.39	4.67 ± 0.38	5.21 ± 0.49	5.59 ± 0.81
Total moving duration (sec)	56.35 ± 0.79	58.47 ± 0.49	59.16 ± 0.51	60.33 ± 0.50	61.58 ± 0.47

**Figure 1. Map of study area (Courtesy: Google Earth)**

**4. CONCLUSIONS**

It has been found during the period of investigation that the availability of ample food resources had caused the excessive proliferation of pigeons in the urban areas. The present piece of study would go a long way as it can aid in suggesting the strategies to mitigate the problems caused by proliferating Indian Blue Rock Pigeons, thereby facilitating their management. The study also unveils firsthand information pertaining to their feeding tactics and preferences to employ these between the two types of food resources present in the study area. Moreover, this study would provide an insight into the evolution of a gradual transition from the agricultural areas to the urban dwellings owing to the good availability and reduced risk of predation.

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