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## Breeding biology of feral pigeon in and around Ludhiana (*Columba livia domestica*)

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**Abstract**

The study was conducted on the breeding biology of feral pigeons (*Columba livia domestica*) in the breeding season from December 2018 to April 2019 in phullanwal and CT University, Ludhiana city. The study of pigeon's breeding biology was done by searching the sites where the pigeons breed. In this project, nesting sites were spotted and on a regular basis, their different- different breeding parameters were recorded. Pigeons bred throughout the year, but the peak point is springs and summers rather than autumn and winters. The pairs of young birds started nesting 2-3 months later than the adult one. The average time of the pair's breeding season was 183 days. Pairs constructed the nest near human habitat but where human activities were not present. Pigeons laid their eggs in two clutch sizes and took 17-21 days for hatchings. Fledging time was 30-35 days or four weeks. Pigeons show their parental care till the fledging time by incubating the eggs and feeding the young ones. The aim of this research is to present feral pigeon breeding biology and various breeding parameters (i.e., mating, parental care, egg laying, hatching, feeding and fledging etc.)

**Keywords:** Breeding biology, breeding parameters, nest, parental care, egg laying, incubation, hatching and fledging

**Introduction**

The most important aspect of an animal's life is the act of leaving offspring to succeeding generations <sup>[1]</sup> and contributing to its gene pool. Successful reproduction is a key for population recovery and stability of a species <sup>[2]</sup>. The success of an individual in breeding is determined by two important features such as time at which it breeds (breeding season) and fecundity <sup>[3]</sup>. Among the bird species, their ecological, classification and behavioural patterns are important to explain for understanding their breeding biology <sup>[4]</sup>. Study of bird breeding gives us very important data for conservation and their management <sup>[5]</sup>. Pigeons (*Columba livia*) belong to order- columbiformes and family- columbidae. There are 308 species found in Columbidae <sup>[6]</sup>. The reproductive strategy of Columbids is characterised by special traits and behaviours such as crop milk production, rapid growth, early maturity, multiple brood and extended breeding season <sup>[7]</sup>. These factors allow them to respond rapidly to environmental fluctuations and offset low survival through increased recruitment rate <sup>[8-11]</sup>. Common names of *Columba livia* are feral pigeon, domestic pigeon, homing pigeon, rock pigeon, house pigeon and street pigeon <sup>[12]</sup>. During a season breeding strategy of the Feral Pigeon is based on having the greatest number of broods to produce many young <sup>[13]</sup>. Laying small clutches and small eggs promoted by Several evolutionary strategies <sup>[14]</sup>, after losing one quickly beginning of another brood <sup>[15]</sup>, with highly nutritious pigeon-milk feeding of their offspring <sup>[16]</sup>, overlapping of clutches <sup>[13]</sup>, and broods bi-parental care <sup>[17]</sup>. Pigeons were originally found wild in Mediterranean bordering countries, on coasts and cliffs of Europe, North Africa, and Western Asia. They were later introduced and colonized in North, Central and South America and all over Europe <sup>[18]</sup> in both tropical and temperate regions <sup>[19-21]</sup>. They are now distributed worldwide and live mainly in urban environments <sup>[22, 23]</sup> where they cause health problems for humans and domestic animals, carrying virus, bacteria, fungi, protozoa and parasites <sup>[24-29]</sup>, and damage buildings and monuments <sup>[22, 30]</sup>. Careful documentation of variations in rock dove morphology and behaviour were key to the development of evolutionary theory <sup>[31]</sup> and, more recently, it has become an important model organism in biological sciences, including genetics <sup>[32, 33]</sup>, evolutionary biology <sup>[33-37]</sup>, neuroscience and behavior <sup>[38-42]</sup>, vision <sup>[43]</sup>, biomimetics <sup>[44]</sup>, developmental biology <sup>[45]</sup>, medicine <sup>[46, 47]</sup> and biomechanics <sup>[48, 49]</sup>, including feeding studies <sup>[50-58]</sup>.

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## Materials and Methods

**Study area:** The study was conducted within the city area Ludhiana and at selected area of CT University, Ferozpur road, Ludhiana from 2018-2019. This project consists of the whole breeding biology of feral pigeons.

## Methodology

1. For the study of the breeding biology of feral pigeon in different areas detected in the city Ludhiana, area has been considered in Phullanwal village, Anand vihar colony and CT University Sidhwan kalan Ferozpur road Ludhiana.
2. Then on a regular basis, I visited the site of nests established in the evening.
3. Overall four months were taken to observe all breeding parameters.
4. Regularly, all findings were recorded and observed.
5. Then, estimated the total averages breeding times, clutch sizes, hatching success, fledgling and breeding success by using statistical methods (by ANOVA method).

## Results and Discussion

The duration of study spanned 4 months, January to April 2019 i.e. from mid-winter to autumn. All nests were founded in Anand Vihar colony, Phullanwal village, Ludhiana. This area is present between rural-urban areas with constant population of humans in Ludhiana district. In CTU, didn't find any nests but found breeding pairs of pigeons (Fig. 1). They may use that place as a roosting place or foraging places. The literature presents markedly different times for the beginning of the breeding season in Feral Pigeons. Some authors stated that the first birds begin breeding as soon as January [59-62], February [63] or March [64]. Others described a continuous, yearlong nesting of their study populations, so that the breeding season was analysed within a calendar year [65-67]. There were also investigators who reported the pigeons' ability to start the breeding season in October or November, directly after moult [21, 68, 69]. Nest building is one of the important parameters of breeding biology, although nests provide protection to the eggs from predators, weather conditions and also improve the health and fitness. Pigeons breed throughout all months but they concentrate on nesting only in a few months [30]. Their roosting, loafing and nesting sites are mainly in farmyards, roofs, food mills, grain markets,

buildings of urban areas and in many more structures [67, 68]. Total four nests were found during the study and three of them are active in the nest but in one nest they are inactive (Table 1, Fig. 2). They didn't lay an egg in the very first nest although observing it for three months still, didn't find any egg in the very first nest. But the breeding pairs came daily in the morning and evening period for half an hour. They produce guttering sounds together while restings. According to previous studies, feral pigeons didn't lay eggs when human interruptions were peasants or may be some environmental issues. Other three nests having proper egg laying and fledglings were done.



**Fig 1:** Showing breeding pair of pigeons



**Fig 2:** Showing Inactive nest found in House No. 50, Anand Vihar, Phullanwaal, Ludhiana

**Table 1:** Showing active and inactive nests of Feral Pigeon in 2019 breeding season at different locations of CTU, Ludhiana

| S. No. | Location   | Active Nest | Inactive Nest | Total % |
|--------|--|-------------|---------------|---------|
| 1.     | House No. 50, Anand Vihar, Phullanwaal, Ludhiana | 0           | 1             | 25%     |
| 2.     | House No.51, Anand Vihar, Phullanwaal, Ludhiana  | 3           | 0             | 75%     |
| 3.     | CT University, Sidhwan, Ferozpur road, Ludhiana  | 0           | 0             | 00      |
|        | Total  | 3           | 1             | 4       |

The feral pigeons were visited on a regular basis every two or three days. The nests were found at different-different times and dates. First two active nests were found in March and last was found in April. As the previous studies says the springs and summers are the peak period of time to breed but this study support the results [15], who claimed that the a smaller group of non-seasonal reproduction time period which begins in the autumn and winters can be differentiated from the that large group with well-defined breeding season which begins in springs in pigeons populations. In the report [13], feral pigeon reproduction is influenced by density and breeding pairs of the pigeons. Breeding success and several breeding

parameters like breeding seasons, time, egg laying, incubations all the parameters influenced by the density, breeding pairs, number of nests in aone pair's territory (minor effect) and also the age of the nests all influence the breeding success or reproductive indicators.

Buildings of nests by pigeons were made up in the balconies or the ledges of windows of the houses and they were found on the maximum height of the houses from the ground level. They made their nest near the humans but where their interruptions were not present. They made their nest with dry leaves or pine leaves, twigs and tiny branches. Nest of feral pigeons were round in shape and cushioned with feathers and

dry fine grasses or straws. Some nests were rounded and some were not properly rounded. There was no difference founded in the male and female pigeon during the reproduction. The feral pigeon laid eggs in the morning. Eggs were laid on 15-16<sup>th</sup> day after mating and copulation within 72 hours after observing the nest. Two eggs were laid (Fig. 3), which were pure white (Table 2). Incubation started immediately after laying and continued until hatching (Table 3). The incubation was done by a pigeon sitting on the eggs.

**Table 2:** Shows the nest number, clutch size, eggs and colour of eggs that were observed during the study

| S. No. | Nest            | Clutch size | Eggs | Colour of eggs |
|--------|-----------------|-------------|------|----------------|
| 1.     | 1 <sup>st</sup> | 0           | 0    | -              |
| 2.     | 2 <sup>nd</sup> | 2           | 2    | White          |
| 3.     | 3 <sup>rd</sup> | 2           | 2    | White          |
| 4.     | 4 <sup>th</sup> | 2           | 2    | White          |

**Table 3:** Showing breeding season and breeding activities of Feral Pigeon in the Phullanwal, Ludhiana and CTU, Ludhiana in both breeding seasons

| S. No. | Breeding activity     | Duration                        |
|--------|-----------------------|---------------------------------|
| 1.     | Nest construction     | 15-18 days                      |
| 2.     | Courtship display     | -                               |
| 3.     | Pairing               | -                               |
| 4.     | Copulation and mating | 12-15 days ( 30-34 mins, daily) |
| 5.     | Egg laying            | 40-48 Hours                     |
| 6.     | Incubation            | 17 days                         |
| 7.     | Hatching              | 18 days                         |
| 8.     | Fledging              | 31 days                         |



**Fig 3:** Showing eggs of nest 2<sup>nd</sup>

In case of all three nests, parents take care about the nest and feed the fledglings till they are grown to fly. After hatching, nude coloured chicks were came out. After 4 days, feathers appeared and yellowish colour. Wings were visible and the colour of the fledglings started showing greyish as the feral pigeons. The young pigeons were now starting to move near the nest. Parents take care about the young ones till 3-4 weeks properly to protect them from predators and other things. Parents feed their squabs from the 3<sup>rd</sup> day (Fig. 4). The first squab was a male, had larger shares then the second squab i.e. female one. (Usually, the second has to survive or compete

for the food with the first squab). The first male squab was larger than the second female squab.



**Fig 4:** Hatched squabs (3<sup>rd</sup> day)

Hatching success of the nest was 100% i.e. all three nests were properly hatched. And fledging success was properly done except one young one of the third nest fell down from the building. Therefore, 100% fledging was not done (Table 4). According to report [70], hatching success and fledging success significantly attempt a role according to the nesting conditions of a pair's territory. The quality of nesting sites i.e. direct or indirect impact of the sites caused impact on the fledgling' number. A properly formed a stable nest and nesting site protects the eggs from falling [71]. This can increase the hatching and fledging success.

**Table 4:** Showing breeding success of the Feral Pigeon studied at CTU, Ludhiana in peak points breeding season

| S. No. | Parameters                             | Breeding Success |
|--------|--|------------------|
| 1.     | Total number of nests                  | 4                |
| 2.     | Number of active nests                 | 3                |
| 3.     | Clutch size<br>Range (Mean±S.E.)       | 2                |
| 4.     | Total number of eggs                   | 2                |
| 5.     | Incubation (days)<br>Range (Mean±S.E.) | 16               |
| 6.     | Hatching success (%)                   | 100%             |
| 7.     | Nesting success (%)                    | 100%             |
| 8.     | Number of Youngones                    | 6                |
| 9.     | Fledgling (days)<br>Range (Mean±S.E.)  | 31               |

## Conclusion

We concluded that the study of the breeding biology of feral pigeons includes various breeding parameters. Breeding season of the feral pigeons goes throughout the year with peak time in springs and summer. Feral pigeons didn't lay eggs when human interruptions were peasants or may be some environmental issues. The eggs were incubated by parents by sitting on it to provide heat to the broods. The Parents care for the pigeons still in the fledging time. The study of breeding biology also improves the status and the number of feral pigeons for economic purposes.

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