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Research Article

COMPARATIVE STUDY ON CLUTCH SIZE AND MORPHOMETRY OF EGGS IN COMMON MYNA (*ACRIDOTHERES TRISTIS*) AND BANK MYNA (*ACRIDOTHERES GINGINIANUS*)IN BHAVNAGAR CITY, GUJARAT, INDIA

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ABSTRACT
Mynas are common Passerine birds distributed throughout India. Aims of the present investigation is to study comparative account of the clutch size and morphometry of eggs in two species of myna i.e. Bank myna (Acridotheres ginginianus) and Common myna (Acridotheres tristis) in Bhavnagar city of Gujarat, India. Study on clutch size and morphometry of eggs could aid valuable data relevant to breeding biology of the birds. During present study breeding season of Common myna were found to be extending from March to September. Bank myna bred during the period of April to August. The average clutch size of Common myna was 5.2 eggs and in Bank myna 4.4 eggs. In Common myna average weight of the egg was 5.39±0.046 gm. The average length and width of the eggs of Common myna were found to be 3.32±0.069cm and 2.12±0.054cm respectively. The average egg shape index was 63.82 ± 1.55 and an average volume of a fresh egg was found 7.76±0.49 cm3. In Bank myna, average egg weight was found 5.55±0.25gm. The average length and width of the eggs were found to be 2.38 ±0.15cm and 1.91 ±0.10 cm. The average egg shape index was 80.48 ±4.06 and an average volume of a fresh egg was 4.57±0.74cm3. In the Common myna hatching success was 82.69% it was lower than Bank myna (84.09%). Fledging success in Common myna and Bank myna was observed 67.30% and 59.09%. The mortality rate was recorded 32.7% in Common myna and 40.91% in Bank myna.

Keywords: *Common Myna, Bank Myna, Clutch Size, Egg Shape Index, Hatching Success, Fledging Success, Mortality Rate*

INTRODUCTION
Mynas are one of the common birds distributed throughout India (Ali and Ripley, 1983). They belong to the family Sturnidae of order Passeriformes (Chris *et al.*, 1999). Mynas are commonly observed in large populations in all climatic conditions where it can survive (Ali and Ripley, 1983). Mostly they are found in the close association of human habitation and their associated neighborhood and they are excellent at taking advantage directly or indirectly supplied by the human being. They are not quite picky about the selection of nest site and will use up any space, hole or cavity whether it be natural or manmade structures (Mukherjee, 1970). Generally, they are considered as threatened pest as they cause damage to fruits and crop plants and also responsible for spreading the disease to people and domestic animals. However, it plays significant role as a biocontrol agent and known ‘friends of farmer’ as it feeds on insects which are harmful to the crop plant.

In the present investigation, two species of myna namely Common myna (*Acridotheres tristis*) and Bank myna (*Acridotheres ginginianus*) are considered. Common myna is a medium sized bird with characteristic yellow patch around the eye (King *et al.*, 1975), it is characterized by a plumpy body, with brown plumage having yellow bill and legs. They commonly breed between March to September. Bank myna is generally found together with Common myna. This species found to breed mostly in residential areas, bridges, wells etc. (Dhandhukiya, 2011). Like Common myna it is also characterized by plumpy with bluish grey body, it is quite smaller than Common myna, with the characteristic deep orange bill and eye patches. Bank myna is gregarious and even during breeding season, they found in groups. Nesting time usually ranges from May to September. They usually select sites which are not only at a distance

from human habitation but even to quite difficult to access (Ali and Ripley, 1983). Generally, we could not distinguish male and female in both the species as both the individual are very much alike in features.
Present communication aims to study comparative account of the clutch size and morphometry of eggs in two species of myna i.e. Common myna (*Acridotheres tristis*) and Bank myna (*Acridotheres ginginianus*). Earlier no empirical study has been carried out on ethology of myna in Bhavnagar cities, thus, this study would be a significant step in the understanding breeding biology of these two species of myna within the urban landscape of Bhavnagar.

Study Area

The study was carried out in Bhavnagar city of Gujarat, India (21º45' and 72º08'E). It is a semi-arid area with three clear seasons in a year viz. monsoon, winter, and summer. The average rainfall in the area is 550mm. For convenience, on the basis of the occurrence of the two species, the area is divided into five various zones to facilitate the study which includes Fulsar, Railway colony, Pill garden, Bortalav, and Anandnagar.

MATERIALS AND METHODS

The study was carried out during the period of January 2014 to December 2015. The study area was surveyed in different periods of the day, during breeding seasons at the five different study sites. Data were collected and analyzed as per standard methodology available from ornithological references. Numbers of eggs were counted at the approachable nest to determine the clutch size in both species of myna and each egg was marked with the marker, assuming nontoxic ink. Selected nest were visited regularly once in a day. Eggs weights were measured with the help of electric weighing scale. Minimum 10 nests of each species of mynas were selected for observation of clutch size as well as randomly 10 eggs were selected for diametric studies in two species of myna within city area of Bhavnagar. Data of egg length and width were recorded with the help of Vernier caliper. Eggs volume, egg shape index were recorded with the help of mathematical equation as per Borad (1999), the formula is as under:
The mathematical estimation is based on the formula of a spheroid.
Volume (V): V = 0.52 LB2, Where V = Volume, L = Maximum length, B = Maximum Breadth, 0.52 is a constant (for external ellipsoidal volume)
Egg shape index (ESI) = B/L X 100, where ESI = Egg shape index, L = Maximum length, B = Maximum breadth.
The rate of hatching success and mortality rate were recorded. Along with this, a period of breeding activities like nest site selection, nest building, egg laying, incubation and chick rearing were observed. All the observations were made from about five-meter distance to avoid any disturbance. Observations made with the help of a pair of binoculars (8X40) and Nikon P 620 digital camera.

RESULTS AND DISCUSSION

Right from the beginning of the studies on avian fauna, researchers have focused on the ecology of eggs. Common myna and Bank myna are monogamous. During present study breeding season of Common myna were found to be extending from March to September. Bank myna bred during the period of April to August. Generally, eggs of both the species are oval in shape and bluish to greenish blue in color. The clutch size of Common myna varied from 4 to 7, but clutches of 4 to 6 eggs were the most frequent average clutch size was 5.2 eggs (Table 1). The clutch size of Bank myna varied from 3 to 5 but clutches of 5 eggs were the most frequent (Table 4) average clutch size was 4.4 eggs. Earlier no empirical study on clutch size and diametric of eggs in these species of myna has been carried out in Bhavnagar. However, impressive study on ecology and behavior of three different species of myna in Junagadh has been carried out by Dhandhukia (2011) in his study he recorded clutch size of Common myna which varied from 3 to 6 eggs whereas in Bank myna it was 3 to 5 eggs during the study, he found 4 to 5 eggs frequently in Common myna and Bank myna. It did not significantly differ from a recent study. It is believed that several factors such as food abundance during the breeding season, a condition of the breeding female, egg laying time during the breeding season as well as various climatic conditions are also responsible for

variation in clutch size (Hussell David and Quinney, 1987; Hogsdt, 1981). The trade-off between number of nestlings and the quality is one of the important theories of the evolution of life history, whereas clutch size represents the trade-offs between the quality and the number of offspring of birds (Simith and Fretwell, 1974; Winkler and Wallin 1987; Zhao *et al.*, 2002). According to Martin (1987), trade-offs also exist between clutch size and egg size, so that females must lay a small clutch when she lays larger eggs or large clutch when she lays smaller eggs. However, during recent investigation no such trade- offs has been observed between clutch size and egg size of Common myna and Bank myna.

Figure 1: Comparison of Hatching, Fledging and Mortality Rate in Common Myna and Bank Myna

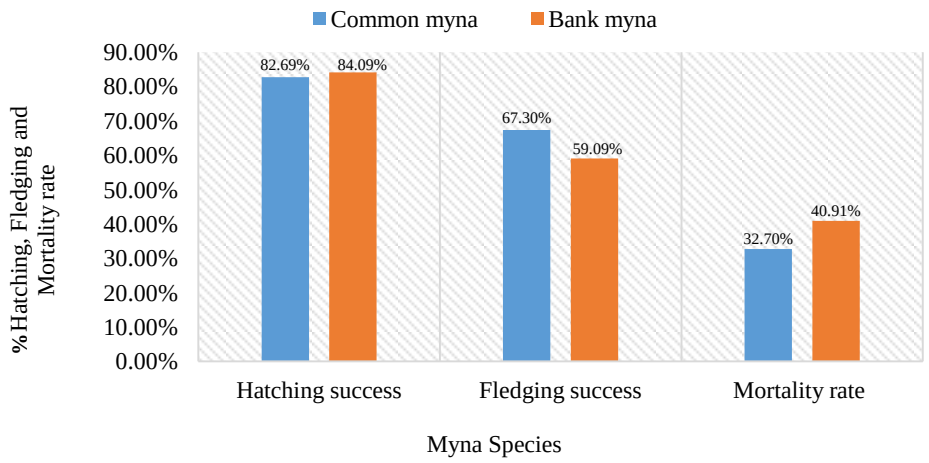

Table- 1 and -3 shows the dimension of the eggs of Common myna and Bank myna respectively. There were no significant variations in egg diametric, among which the breadth was the most constant among all the parameters. This was due to fact that eggs originated in an oviduct whose cross-sectional area has a limited extensibility (Romanoff and Romanoff, 1963). Egg diametric generally used to assess a number of different variables in avian ecology. It is often used as a substitute for the important role of a female in reproduction, as good quality eggs hatched into healthier chicks which have better chances to survive (Troscianko, 2014). The average length and width of the eggs of Common myna were found to be 3.32±0.069cm and 2.12±0.05 cm respectively (Table-1). The average weight of the eggs of Common myna was 5.39±0.046 gm (R: 5.06-5.83gm). The average egg shape index for Common myna was 63.82 ±1.55; average volume of a fresh egg of Common myna was found 7.76±0.49 cm3. Table –3 shows dimensions of the eggs of Bank myna recorded during the study period. The variation in length and breadth was also reflected on egg weight which varied from 5.92 to 6.00g. The average length and width of the eggs of Bank myna were found to be 2.38 ±0.15cm and 1.91 ±0.10 cm respectively. The average egg shape index for Bank myna was 80.47 ±4.06. Average volume of the fresh egg of Bank myna was 4.54±0.77 cm3. In many avian species, egg size is one of the important indexes of egg quality and it is correlated with the survival of their nestling (Amat *et al.*, 2001). In the Common myna hatching success was 82.69% it was quite lower than Bank myna in which hatching success was 84.09%. The higher hatching successes in both the species indicate that there were less disturbances and predator pressure to the birds during incubation. Fledging success in Common myna was observed 67.30% which was higher than Bank myna (59.09%). So that Common myna has less mortality rate (32.7%) than Bank myna (40.91%). Egg shape index of Bank myna was better than that of Common myna as well as hatching success was also high even though mortality rate was observed higher than Common myna. Higher mortality rate was due to predation of chicks by predatory bird like Shikra and the chicks were often

fallen down from the nest. Generally, Bank myna preferred less disturbed area for nesting as well as the food was available in near distance. Hence, it is quite difficult for Bank myna to find proper shelter within an urban landscape. Most of the Common myna's nests were recorded within the human residential area which shows its close association with human habitation. Hence, the more adaptivity of Common myna towards human habitation results in low mortality rate.

Table 1: Morphometric Parameter of Eggs of Common Myna

Sr. No.	Length (cm)	Width (cm)	Fresh Egg Weight (gm)	ESI	Egg Volume (cm^3)
1.	3.38	2.17	5.13	64.20	8.27
2.	3.30	2.11	5.26	63.93	7.63
3.	3.27	2.10	5.06	64.22	7.49
4.	3.47	2.20	5.51	63.40	8.73
5.	3.36	2.16	5.83	64.28	8.15
6.	3.23	2.06	5.41	63.77	7.12
7.	3.29	2.07	5.36	62.91	7.33
8.	3.48	2.20	5.51	63.21	8.75
9.	3.27	2.17	5.13	66.36	8.00
10.	3.37	2.03	5.62	60.23	7.22
11.	3.27	2.09	5.33	63.91	7.42
12.	3.31	2.17	5.13	65.55	8.10
13.	3.28	2.13	5.80	64.93	7.73
14.	3.39	2.12	5.50	62.53	7.92
15.	3.27	2.05	5.49	62.69	7.14
16.	3.25	2.17	5.13	66.76	7.95
17.	3.33	2.18	5.50	65.46	8.22
18.	3.35	2.06	5.41	61.49	7.39
19.	3.27	2.07	5.36	63.30	7.28
20.	3.30	2.09	5.33	63.33	7.49
Range	3.23 – 3.48	2.03-2.20	5.06-5.83	60.23-66.76	7.12-8.75
Average	3.32	2.12	5.39	63.82	7.76
SD	**± 0.069**	**± 0.054**	**± 0.046**	**± 1.55**	**± 0.49**

Table 2: Clutch Size, Hatching of Eggs and Fledging of Bird in Common Myna

Sr. No.	Clutch Size	Hatching of Eggs	Fledging of Bird
1	4	4	2
2	5	4	4
3	6	5	4
4	4	4	3
5	5	5	5
6	6	4	3
7	6	5	3
8	7	5	4
9	4	4	4
10	5	3	3
Range	**4 - 7**	**3-5**	**2-5**
Total	**52**	**43 (82.70%)**	**35 (67.30%)**
Average	**5.2**	**4.5**	**3.5**
SD	**± 1.03**	**± 0.67**	**± 0.84**

Table 3: Morphometric Parameter of Eggs of Bank Myna

Sr. No.	Length (cm)	Width (cm)	Weight (gm)	ESI	Volume (cm^3)
1.	2.45	2.10	5.42	85.71	5.61
2.	2.31	2.00	5.19	86.58	4.80
3.	2.52	1.95	5.25	77.38	4.98
4.	2.13	1.80	5.31	84.51	3.58
5.	2.52	2.15	5.30	85.31	6.05
6.	2.19	1.8	5.35	82.19	3.69
7.	2.12	1.70	5.35	80.19	3.18
8.	2.42	2.00	5.44	82.64	5.03
9.	2.50	1.90	5.37	76.00	4.69
10.	2.40	1.97	5.65	82.08	4.84
11.	2.17	1.87	5.45	86.17	3.94
12.	2.44	1.94	5.44	79.50	4.77
13.	2.35	1.80	5.62	76.59	3.95
14.	2.38	1.80	5.92	75.63	4.00
15.	2.70	2.00	5.85	74.07	5.62
16.	2.49	1.93	6.00	77.51	4.82
17.	2.50	1.93	5.59	77.20	4.84
18.	2.50	1.91	6.01	76.40	4.74
19.	2.17	1.84	5.65	84.79	3.82
20.	2.40	1.90	5.85	79.17	4.50
Range	2.12-2.70	1.7- 2.15	5.19-6.01	74.07-86.58	3.18-6.05
Average	2.38	1.91	5.55	80.48	4.57
SD	± 0.15	± 0.10	± 0.25	± 4.06	± 0.74

Table 4: Clutch Size, Hatching of Eggs and Fledging of Bird in Bank Myna

Sr. No.	Clutch Size	Hatching of Eggs	Fledging of Bird
1	4	4	2
2	5	5	3
3	5	4	4
4	5	4	2
5	4	2	2
6	3	3	3
7	5	3	1
8	4	4	4
9	5	4	3
10	4	4	2
Range	**3-5**	**2-5**	**1-4**
Total	**44**	**37 (84.1%)**	**26 (59.1%)**
Average	**4.4**	**3.7**	**2.6**
SD	**±0.69**	**± 0.82**	± 0.96

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