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BREEDING BIOLOGY OF HIMALAYAN BULBUL (*Pycnonotusleucogenys)* IN DIFFERENT TRANSECTS OF SOUTH KASHMIR

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Abstract

The breeding biology of Himalayan bulbul or white cheecked bulbul (*Pycnonotusleucogenys)* was studied in four transects of Southern landscape of kashmir valley in the year 2021-2022. During the course of study it was observed that 2 to 3 pale white base colors with dense pink speckles toward the broader end or brown spots were laid by the female during single nesting season. The eggs were oval in shape. The weight of one egg of seven days old was 3.10 gm. Average length and breadth of eggs were 17.8 mm ± 0.4378 and 13.6 mm ± 0.3373 (n=40). The mean weight of eggs collected from T3 (Seer) was found to be higher i.e., 3.25±0.30g and lower in the eggs of P. leucogenys collected from T2 (Hutmurah) i.e., 2.87± 0.63. 15 nests were found with 02 clutches, 02 nests were found with 03 clutches and four nests were found with 01 clutch. The incubation period of 11 to 14 days was recorded. The fledging period was recorded as 12 to 16 days. 40 eggs were laid by Pycnonotusleucogenys but only 8 nestlings were fledged. The breeding was poor but the hatching and fledging success was moderate. The breeding success rate was found to be on a higher side In case of aged and experienced breeding pairs and reduced breeding success in case of young and inexperienced breeding pairs. The breeding success was also affected by the density of the breeding pairs.

Keywords: *Himalayan bulbul nesting, breeding biology, egg morphometery, Transect, South Kashmir.*

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INTRODUCTION

The clade Passeriformes embraces more than seventy families and is the largest and most multipart clade of birds. The Passeriformes are often denoted to as "perching birds." A significant radiation known as songbirds are also included within this group. Passerines eat insects, berries, and seeds that they fold from trees and shrubs in the summer. Their feeding manners alter in the winter, and they eat berries and fruits (Roberts, 1992). Members of the Pycnonotidae family of the Passeriformes order, the Himalayan bulbul (Pycnonotusleucogenys) is a resident bird of Kashmir and the northern areas of the Indian Subcontinent.

Pycnonotusleucogenys is nearly 19 cm in length with a wingspan of 25 to 29 cm and a mean weight of 32 grams. The head, throat and crust are black and white. The lateral sides, back and tail are brown, and the ventral side is pale yellow. The eyes of white checked bulbul as detected in different transects are reddish brown lined with yellow eye ring. Sexual dimorphism is totally inadequate in white cheeked bulbul as is thus monomorphic. In contrast to adults, the young ones have lighter browner head (Hoyo et al. 2005). The breeding pair is monogamous, and the breeding activity varies as per climate and place (Whistler, 1930). White checked bulbul is usually observed in pairs or small flocks during the time of breeding season. During the nonbreeding season, they are usually found to form large size flocks of 10 to 13 individuals and were also observed as members of mixed species foraging groups to locate food items. Both the breeding partners have identical plumage (Bird life International, 2016). Pycnonotusleucogenys belongs to a super species along with the White Eared Bulbul, African Red Eyed Bulbul, Cape Bulbul, White Spectacled Bulbul and Common Bulbul (Fishpool and Tobias, 2020). The present study was conducted on population status, feeding and breeding biology of Himalayan Bulbul (Pycnonotusleucogenys) in four transects of South Kashmir from December 2021 to November 2022. The central site of the study was selected as District Anantnag with geographical coordinates 33.7050°N latitude, 75.2479°E longitude at an elevation of 5300 feet (1600 m) above sea level. The district is located at a distance of 53 kilometers (33 miles) from the Union territory capital Srinagar.

Study areas: Four transects (One urban and three rural transects)

1. Main Market LalChowkAnantnag (Urban area).
2. 2. HutmarahAnantnag (Rural Area).
3. 3. Seer Anantnag (Rural area).
4. 4. AkadAnantnag (Rural Area).

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Study Area	Name of the Transect	Geographical coordinates
Southern landscape of Kashmir valley	Transect Ⅰ (Lalchowk)	33.7303°N latitude, 75.1490°E longitude.
	Transect Ⅱ (Hutmarah)	33.772324°N latitude, 75.229134°E longitude.
	Transect Ⅲ (Seer)	33.972335°N latitude, 75.081060°E longitude.
	Transect Ⅳ (Akad)	33.814751°N latitude, 75.249943°E longitude.

RESULT AND DISCUSSION Breeding Biology of Himalayan Bulbul

The Himalayan Bulbul's breeding season ran from April to August throughout the research period. The nests were constructed between April and July. The four transects had a total of 29 nests. Of them, twenty-one were found during the construction phase. The most productive month for constructing nests was May. The first nest was constructed on April 20 and the last on July 15. The nesting months are April, May, and June, according to Bates and Lowther (1952). According to Ali and Ripley (1983), diet and precipitation may have an impact on when the breeding season begins. The nests were formed in low willows (Salix alba), shrubs (Rosa sp., deodara, Salix sp.), bags, and baskets that hung from building ceilings and walls. Most of the nests were made in the bushes. Similar observations were made by Bates and Lowther (1952), while Hsu and Lin (1997) reported majority of natural vegetation. Both the sexes take part in nest making. Nests were made up of dry soft twigs, dry herbs, dry lawn grasses, cotton fiber, nylon fiber, some animal hair and root hairs of plants. Internally the nests were lined by a thin lining of birds down feathers and soft root hairs. Findings have been made by Bates and Lowther (1952) Balakrishnan (2010) for square tailed black bulbul and Hsu and Lin (1997) for styan'sbulbul. Twigs were used on the outside at the start of the nest building but as the nest building progressed, more and more soft material was used.

Courtship

Courtship, a part of reproductive behaviour was observed during breeding season, as early as in April. The phenomenon was frequently observed in pre laying when nest site selection was well underway. They mated several times during the day, mainly early in the morning. This courtship behaviour and mating continued until the day before the last egg was laid. It was observed that males perform courtship displays to females first. The male paces while fluffing the breast feathers, cooing and drag its tail feathers on the ground while threading its feet on the floor. When the female accepts, she nods, to which billing follows. The female then elevates her wings,

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crouches and the male mounts the female and copulation occur. Usually, the ulbuls would make their familiar gurgling noises at their dawn chorus during certain periods of the year. These characteristic sounds can also be heard at the times of the day.

Eggs

Himalayan Bulbul generally lay 2 to 3 eggs. During the study period, it was observed that 2 to 3 pale white base colors with dense pink speckles toward the broader end or brown spots were laid by the female during single nesting season. The eggs were oval in shape. The weight of one egg of seven days old was 3.10 gm. Average length and breadth of eggs were 17.8 mm ± 0.4378 and 13.6 mm ± 0.3373 (n=40. Takagi (2003) stated that the natural selection should favour females that produce larger eggs. According to Horak et al. (1995) high investment into egg size might be in conflict with energetic demands of female and her willingness to produce more offspring. The mean egg shape does not differ significantly in different months (Patel, 1986). Shape index is dependent on weight. A positive correlation between egg size (weight or an index of volume derived from the length and breadth of eggs) and nesting survival, or growth, has been found for most bird species studied by Schifferli (1973). Reddy et al. (1979) observed that there was an adverse relation between decreased shape index and increasing egg weight.

Clutch size

The clutch size means the number of eggs laid in series without any interruption. Normally the upper limit of clutch size is three in Pycnonotusleucogenys however, sometimes two also. 15 nests were found with 02 clutches, 02 nests were found with 03 clutches and four nests were found with 01 clutch.

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Incubation and Nestling period

Incubation period is the interval between laying of first egg and hatching of that egg within clutch. Skutch (1945) and Nice (1954) also considered and define incubation period from the laying of the last egg of a clutch to the hatching of the last nestling. The nestling period is defined as the interval of time the last chick of the brood remained in the nest. As per my observation the incubation period in Pycnonotusleucogenys is 11 to 14 days. Ali and Ripley (1971) have also recorded the incubation period as approximately 11 to 13 days and the nestling period is 12 days.

Hatching, Fledging and Breeding success

The success of hatching is the proportion of eggs in a clutch that produce young ones. The hatching success is seen moderate during the study period, because during hatching period a single adult is mostly found in the nest. Sometime high wind velocity, heavy rainfall as well as predators were responsible for average hatching success. The hatching was followed by parental care. The possible reason of having good parental care may be the defenselessness of the newly hatched young ones, who needed their parents to keep them warm and safe for several weeks after hatching.

All birds are considered to have fledged when the feathers and wing muscles are sufficiently developed for flight. The success of fledging depends on the nestling deaths and predation. Heavy rainfall with high wind velocity and starvation are responsible for loss of fledging success. Fledging is the proportion of chicks that fledge from a brood. The fledging period of Pycnonotusleucogenys is recorded as 12 to 16 days (Table 1).

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Year	Clutches	No. of nests	Incubation days	Nestling period
2022	2	15	11-14	12-16
	3	2	11-14	12-16
	1	4	11-14	12-16

Table 1: Clutch size, incubation days and fledging days in Pycnonotusleucogenys.

Breeding success is defined as 'when one or more young from a clutch of eggs survives to fledging'. 40 eggs were laid by Pycnonotusleucogenys but only 8 nestlings were fledged. The breeding of Pycnonotusleucogenys is poor but the hatching and fledging success is moderate. The nesting places, nesting material and availability of food were looking good in the study areas, but environmental factors like predation and sometimes dearth of food etc are responsible for lower breeding success of Pycnonotusleucogenys (Table 2).

Table 2 :A summary of breeding performance of Pycnonotusleucogenys.

Summary	Year (2022)	Average
Clutches	251	8.50
Total eggs laid	40	5.25
Hatched	17	4.25
% of hatching	42.5	43.86
% of egg loss	57.5	56.11
Fledged	8	2
% of fledged from hatched	47.05	25
% of fledged from total eggs Laid	20	20.79

Morphometry and parameters of eggs of Himalayan Bulbul

Total egg weight (g), Length (mm) and width (mm) of eggs of Pycnonotusleucogenys:

During the study period, the changes in morphometry of eggs and the variation in the weight of eggs and dimensions (length and width) in the study area was also recorded for the eggs collected from four transects (T1, T2, T3 and T4). It was observed that the mean weight of eggs collected from T3 (Seer) was found to be higher i.e., 3.25±0.30g followed by T4 (Akad) and T1(Lalchowk) i.e., 2.96± 0.35 and 2.96±0.15 respectively and lower in the eggs of Himalayan bulbul collected from T2 (Hutmurah) i.e., 2.87± 0.63. Statistical method of analysis of variance (One-way ANOVA) was used and for this experiment the hypothesis (H°) was taken that, there was no significant difference among the mean weight of eggs collected from T1, T2, T3 and T4. The weight of eggs from T1, T2 and T4 was significantly less than the eggs of T3. The mean egg

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weight of eggs of Himalayan bulbul collected from T3 was found to be maximum followed by T4 and minimum in eggs collected from T2 and T3.

Average egg length and breadth measured by Prajapati et al. (2011) was 20.0 and 16.6 mm in BalaramAmbaji Wildlife sanctuary Gujrat, relatively larger than we recorded. Rao et al. (2013) recorded egg length and breadth of 18.8 and 14.6mm in Sikar region, relatively smaller than recorded in Tehsil Manshera. Investment in egg size might be correlated with the total survival energy demand on the female viz-a-viz the pre nesting energy input from food; low input, fewer and smaller eggs, whereas high input more and larger eggs (Horak et al. 1995). They found that the mean egg length and breadth of Himalayan Bulbul was 18.1 and 15.4 respectively. The reason of this differentiation may be genetic or environmental conditions because the egg size in birds is determined genetically with an efficiency factor to 70% while the effects of environmental conditions such as feeding resources altitude and ambient temperature at last 3 to 4 days before egg laying are relatively restrained. In present study egg weight was highest in T3 as the feed was abundant.

It was observed that the mean egg length and egg width of eggs collected from T1 was 19.36±0.61 mm and 15.30 mm respectively. The mean egg length and egg width of eggs collected from T2 was 19.05±0.50 mm and 15.90±0.04 mm respectively. The mean length and egg width of eggs collected from T3 was 19.73±0.52 mm and 16.01±0.21 respectively. The mean length and egg width of eggs collected from T4 was 20.19±0.51 mm and 16.10±0.10 respectively.

Statistical method of Analysis of Variance (one-way ANOVA) was used and for experiment, the hypothesis (H°) was taken that there was no significant difference among the mean egg length and egg width of eggs collected from T1, T2, T3 and T4.

It was concluded that they are no significant difference among the mean as length and egg width of eggs collected from main market Lalchowk, Hutmurah, Seer and Akad areas. According to Saxena et al. (2008) egg length and width of Himalayan bulbul were 19.90±0.21 which were slightly more than the mean and egg width of eggs collected from T3 (Table 3).

Table 3: Total egg weight (g), Length (mm) and width (mm) of Himalayan Bulbul in four different transect areas.

Locations	T1	T2	T3	T4
Weight of egg(g)	2.96±0.15	2.87±0.63	3.25±0.30	2.96±0.35
Length of egg(mm)	19.36±0.61	19.05±0.50	19.73±0.52	20.19±0.51
Width of egg(mm)	15.30±0.60	15.90±0.40	16.01±0.21	16.1±0.10

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Statistical analysis Table 4: Statistical analysis One-Way ANOVA of egg weight, length and breadth in four

Different transects

	Df	F	P value >0.05	F crit
Weight	3,4,7	0.177	0.906	6.591
Length	3,4,7	2.261	0.223	6.591
Width	3,4,7	0.908	0.511	6.591

No statistically significant difference in the weight, length and width of eggs in four different transects as p value is > 0.05(Table 4).

Egg Volume

It was observed that the mean egg volume collected from T1, T2, T3, and T4 was 2.18±0.12mm, 2.19±0.11mm, 2.30±0.05, and 2.39±0.03 respectively. Statistical method of Analysis of Variance (one-way ANOVA) was used and for this experiment, the hypothesis (H°) was taken that there was no significant difference among the mean egg volumes collected from T1, T2, T3 and T4. It was concluded that they are no significant difference among the mean egg volume collected from main market Lalchowk, Hutmurah, Seer and Akad areas (Table 5).

Table 5: Egg volume

Transects	Mean±SD
T1	2.18±0.12
T2	2.19±0.11
T3	2.30±0.05
T4	2.39±0.03

Egg Gravity

It was observed that the mean egg gravity collected from T1, T2, T3, and T4 was 1.35±0.05 mm, 1.29±0.22 mm, 1.40±0.13 mm, 1.23±0.13 mm respectively. Statistical method of Analysis of Variance (one-way ANOVA) was used and for this experiment, the hypothesis (H°) was taken that there was no significant difference among the mean egg gravity collected from T1, T2, T3 and T4. It was concluded that they are no significant difference among the mean egg gravity collected from main market Lalchowk, Hutmurah, Seer and Akad areas (Table 6).

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Table 6: Egg gravity

Transects	Mean±SD
T1	1.35±0.05
T2	1.29±0.22
T3	1.40±0.13
T4	1.23±0.13

Egg Shape Index

It was observed that the mean egg shape index collected from T1, T2, T3, and T4 was 78.98±0.58 mm, 85.90±0.16 mm, 81.22±3.20 mm, 79.71±0.43 mm respectively. Statistical method of Analysis of Variance (one-way ANOVA) was used and for this experiment, the hypothesis (H°) was taken that there was no significant difference among the mean egg gravity collected from T1, T2, T3 and T4. It was concluded that they are no significant difference among the mean egg gravity collected from main market Lalchowk, Hutmurah, Seer and Akad areas (Table 7). **Table 7: Egg Shape Index**

Transects	Mean±SD
T1	78.98±0.58
T2	85.90±0.16
T3	81.22±3.20
T4	79.71±0.43

Overall breeding success rate in selected transects of South Kashmir

During the current study it was observed that both male and female partners were equally involved in selecting the desired nesting sites for the construction of nests. The white cheeked bulbul was observed to build nest on low lying plants especially on Cypress, Evergreen ornamental plants found in the lawns and parks in close proximity of human habitations. The nesting observations of Manju and Sharma (2013) during their investigation on breeding biology of a Red Vented bulbul spanning from 2010 to 2012 from Kurukshetra university campus, Haryana, India have pointed results on expected lines that site of nest selection is a joint effort of both the breeding partners and these researchers have further documented that most of the nests are built on bushes and small trees found in close proximity of human settlements which is very much in tune with the findings of the current studies.

During the field investigation in the selected transects, it was revealed that the time of completion of nest building varied between rural and urban transects. It was found that the

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breeding pair in the rural transects normally completed nest construction in 4 to 6 days, while as in the urbanized transect, the nest construction was completed in 7 to 8 days which is simple clear that there is scarcity of nesting material in such a transect and the breeding pair has to put an extra mile in procuring nesting material from far off places that demands more energy and time than their counterparts in non-urbanized transects. Mazumdar and Kumar (2007), during their avifauna research expedition on nesting ecology of Red whiskered bulbul at city centre at periphery in Lucknow, Northern India have also made nesting observation on expected lines more or less in tune with the findings of the current study. As per their findings, they have revealed that the bulbuls in city centre usually took more time to complete their nest construction in 6 to 8 days, clearly indicating the inadequacy of suitable nesting material in and around nesting site in the city centre region. While as in the peripheral extremities of the city the nest construction was completed in less than 5 days and the ascribed this shorter completion of nest construction to reduce the distance of nest material from nesting sites due to abundance of nesting material in the vicinity of nesting site. They also figured out that the nests in the peripheral region of the city centre were clearly thicker and shorter and literally devoid of synthetic nesting material due to presence of rich vegetation cover which ensures easy accessibility of nesting material.

Haun Li et al. (2015) during their resources expedition on the breeding biology of red whiskered bulbul (Pycnonotusjocosus) in Xishuangbanna, Southwest China have made similar observations on the nesting ecology of the bulbul and revealed that the outside height of the nest (n=75) ranged between 4.5 to 8.6 cm and averaged 6.6 ± 1.0 cm add the outside diameter varied between 6.9 to 14.5 cm averaged 9.1 ±1.2 cm which is not in consonance with the finding of current study as the value outer nest diameter in the present study was observed to range between14-16.4 cm with an average value of 15.11cm. Their findings also revealed that the inner depth of nests varied between 3.3 to 7.0 cm with an average value of 4.8 0.7 cm which roughly close to the range that surfaced during the current steady as per their findings the data pertaining to the inner nested diameter ranged between 4.5 to 9.0 with a mean value of 6.5± 0.7 with is in total contrast with the value range of the current study which revealed the inner nest diameter ranged between 6.3-8.7 cm with mean value of 7.58cm. The depth of nasty depression ranges from 4.2 to 5.1 cm with a mean value of 4.62 cm.

CONCLUSION

The present study on population status, feeding behaviour and breeding biology of Himalayan bulbul (Pycnonotusleucogenys) was carried out in four selected transects of South Kashmir i.e., Lalchowk, Hutmurah, Seer and Akad. The status of Himalayan bulbul was significantly different in different months as well as in different transects. Breeding of Pycnonotusleucogenys, the eggs

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were oval in shape. The weight of one egg of seven days old was 3.10 gm. Average length and breadth of eggs were 17.8 mm ± 0.4378 and 13.6 mm ± 0.3373 (n=40). The mean weight of eggs collected from T3 (Seer) was found to be higher i.e., 3.25±0.30g and lower in the eggs of P. leucogenys collected from T2 (Hutmurah) i.e., 2.87± 0.63. 15 nests were found with 02 clutches, 02 nests were found with 03 clutches and four nests were found with 01 clutch. The incubation period of 11 to 14 days was recorded. The fledging period was recorded as 12 to 16 days. 40 eggs were laid by Pycnonotusleucogenys but only 8 nestlings were fledged. The breeding was poor but the hatching and fledging success was moderate. The breeding success rate was found to be on a higher side In case of aged and experienced breeding pairs and reduced breeding success in case of young and inexperienced breeding pairs. The breeding success was also affected by the density of the breeding pairs.

CONFLICT OF INTEREST DECLERATION

As a corresponding author, I do state that there is no any conflict of interest involved in the research paper.

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