**BREEDING HABITS OF RED VENTED BULBUL (*PYCNONOTUS CAFER*) IN BAJAUR VALLEY: AFFECTED BY HOUSE CROWS**

**\*1 Rahmat Ullah Khan, 1Karim Gabol, 2Waheed Ali Panhwar, 3Hamid Ullah, 4Syed Abid Ullah and 5Muhammad Tufail**

*1Department of Zoology, University of Karachi, Karachi-75270 Pakistan*

*2Department of Zoology Shah Abdul Latif University Khairpur, Sindh-Pakistan*

*3Department of Zoology University of Peshawar, Peshawar Pakistan*

*Department of Botany*

*4Abdul Wali Khan University Khyber Pakhtunkhwa, Mardan-23200, Pakistan*

*5Institute of Biomedical Sciences, Shanxi University, Taiyuan, China*

**Corresponding Author email***:* [*rahmatullahkhanpk@gmail.com*](mailto:rahmatullahkhanpk@gmail.com)

**Abstract**: Red-vented bulbul (*Pycnonotus cafer*) is a typical passeriform and permanent breeder of subcontinent. Though this species is commonly found in all the provinces of Pakistan but information on its status and breeding ecology is not known from Bajaur valley. To provide all the related information about breeding biology and nidology for this bird, a comprehensive study were conducted in agricultural lands of Bajaur, Khyber Pakhtunkhwa Pakistan. The breeding began from mid April to July 2020. Nests were searched systematically in all the potential sites with the help of local farmers. Overall 52 nests were found mainly built on five different type of vegetation at an average height of 2.87±1.3 m above the ground. Nest was cup shaped or somewhat oblong and located in the middle or on the fork of plant species. The dry vegetation used in nest building were grasses (48%) followed by local crops dry leaves (35%), plastic string (10%) and unknown materials (7%) were not identified. The average nest outer diameter was 12.00±1.1 cm, inner diameter was 9.13±2.3 cm and inner cup depth was 4.99±2.1 cm. The red-vented bulbul had one brood in a season. The overall breeding cycle lasted for 90 days. Eggs were oval in shape and pale pinkish in color with darker red spots. The average incubation and nestling periods were 12.03±1.3 and 13.21±1.08 days. The average clutch size was 2.66±0.5 eggs, brood size was 2.66±0.5 nestlings. The average number of young fledged was 2.66±0.98 young, fledging success was 94.2% and overall breeding success was 62.2%. Results suggest that agricultural trees especially thorny plants represent an attractive habitat for bulbul. Factors such as avian predation, nest destruction, heavy storm, nest failure and the presence of potential predators are affecting breeding success of red-vented bulbul in the area.

**Keywords:** Bajaur, Bulbul, Breeding ecology, Clutch, Eggs, Nestlings

**Introduction**

The red vented bulbul belongs to the family pycnonotidae and resident breeder across the Indian subcontinent. It have about 130 species through out the world, out of these 5 species present in Pakistan, (Lepage, 2007; Roberts, 1991). In Pakistan, it is broadly spread throughout the Indus area and agriculture areas of all provinces except Baluchistan or any desert area (Roberts, 1991). The red-vented bulbul is easily known by its small crest giving the head a squarish appearance. The body is covered with dark brown with a scaly pattern while the head is darker or black feathers. The rump is white while the vent is red. This bird is mainly found in dry scrub, open forest, plains and cultivated lands (Dickinson et al. 2002). In its native range it is rarely found in mature forests. A study based on 54 localities in India concluded that vegetation is the single most important factor that determines the distribution of the species. Red-vented bulbuls feed on fruits, petals of flowers, nectar, insects and occasionally house geckos (Hemidactylus flaviviridis). They have also been found feeding on the leaves of alfalfa (Medicago sativa) (Raju et al. 2003). Zia et al. (2014) studied breeding biology of Red vented in the areas of Islamabad and Rawalpindi and found that loss of nesting sites due to rapid urban expansion and pollution negatively affected the population of Red vented bulbul.

Though various studies have been carried out on the breeding biology of Red vented bulbul but information on its breeding status from district Bajaur was neglected for years. For the first time we present information on the breeding parameters such as egg laying date, clutch size, brood size, hatching success, fledging success, breeding success, nest dimensions and nest materials of Red vented bulbul from an agricultural area of district Bajaur located in Khyber Pakhtunkhwa province of Pakistan.

**Materials and Method**

**Study area**

The breeding data were collected from cultivated lands of Khar (34⁰42.921 N, 071⁰27.346 E), Salarzai (34⁰46.091 N, 071⁰34.289 E) and Mamund (34⁰46.623 N, 071⁰25.359 E) in district Bajaur, Khyber Pakhtunkhwa Pakistan. The area is mainly referred to cultivated lands with rainy and a irrigation. The entire area of Bajaur valley excluding mountains is around 1290 Km2. It is situated at a distance of about 120 kilometers from district Peshawar (Khan *et al*., 2021; Khan and Gabol, 2021). Bajaur linking about its 52 (Kilometers) borders with Konar a province of Afghanistan on the Northside and Eastern side bounded by Dir and Malakand division while the South-West side joins district Mohmand. The area contains mountainous locations with tough weather conditions. Bajaur avails all the four seasons, with heavy rainfall during winter and in spring seasons. In the study area diverse type of flora present which provide habitat, feeding, protection and nesting sites. Agricultural landscape includes three components viz., agricultural crops, grasslands and tree species both local indigenous trees and ornamental trees that provide nesting habitats to many bird species. Besides that, ground flora of herbs, shrubs and ground weeds is present that also provide food sources to many birds.

**Field Surveys**

We searched nests systematically in agricultural habitats from early April to the middle of July 2020. Nests were explored by searching all the potential nest sites in the area, flushing the bird from the nest, noted the nest building activity of adults and by accidental encounters in the study area. The local formers and shepherd have also helped us in identification of potential nest sites. A sum of 52 nests were found in the area. All nests were checked after every 2 days to record egg laying date, clutch size, brood size, hatching and nest failures (Marini et al. 2012; Gabol and Khan, 2021; Khan and Gabol, 2021). When the exact egg laying date was not known, it was estimated from the known dates of other eggs or laying interval. To record egg laying date each nest was inspected at morning timing by causing minimal disturbance to birds and nests. Incubation period was estimated as the interval between the dates last egg was laid and the date last egg hatched. When the exact date of incubation was not known then egg laying date was estimated from other known dates or laying interval (Martin 2002). Nest diameter, inner diameter and nest depth of each nest was recorded. Nest site characteristics like nest height from the ground, nesting tree and type of nesting materials were recorded. Eggs disappeared due to nest destruction or nest disappearance were excluded from clutch size calculation.

Nest disappearance was assumed when nest or its contents completely disappeared from the sites. Nest destruction was assumed when the nest was completely damaged at egg laying stage. Some nests were disappeared after night storm. Egg failure was assumed when the laid egg did not hatch. Nestling disappearance was assumed when the hatched nestling did not found in the nest.

Hatching success was defined as number of nestlings hatched/total number of eggs laid. Fledging success was defined as number of nestlings before fledging/nestlings after hatching.

The total breeding success was calculated by using the following formulae:

Breeding success = Hatching success × Fledging success 100%

Breeding success = hatching success x fledging success/100%

**Statistical analysis**

The nests that were missing or destroyed during the breeding period were eliminated from the analysis. Because all nests of Red vented bulbul were found in the same habitat and we could not find enough nests in other habitat type in order to compare breeding parameters for differences. Data are presented in the form of percentage and mean ± SD.

**Results**

The current study was carried out to record the facts about the breeding habits and the main barriers responsible for breeding catastrophe of Red vented bulbul (*Pycnonotus cafer*) in Bajaur valley during breeding its season.

**Habitat and Nest**

Nests were investigated thoroughly by surveying all the targeted sites of agricultural areas during the breeding season April to early July 2020. Most of the nests were found in well-developed stage. Based on the field observation of two nests, both male and females were seen participating in nest building activities by bringing nest materials. Nest building duration lasted for 4 days. Of 52 nest found, 11 nests were failed and remained unattended for the entire season, 6 were destroyed while 5 nests were destroyed in night storm. Nest failure occurred mainly after the disappearance of first egg laid.

Of 52 nests found in which 7 (13.46%) nests were located on the fork of ([*Eucalyptus* *camaldulensi*s](https://www.google.com.pk/search?rlz=1C1CHBF_enPK723PK723&espv=2&biw=649&bih=647&q=Eucalyptus+camaldulensis&spell=1&sa=X&ved=0ahUKEwihurr3raHSAhVBnRQKHQ9XBKwQvwUIFCgA)), 23.07 were positioned on branch of (*Morus* alba), 26.92 on (*Ailanthus altissima)* whereas 9 nests were situated in (*Melia azedarach)* (branch) and 10 on *Acacia modesta* (Fork) plantation (Table 1). All the nests were found at the middle of the trees and none of the nest were found on the top of the trees. Overall highest (60%) nest loss was recorded for the *Acacia modesta* plantation followed by [*Eucalyptus* *camaldulensi*s](https://www.google.com.pk/search?rlz=1C1CHBF_enPK723PK723&espv=2&biw=649&bih=647&q=Eucalyptus+camaldulensis&spell=1&sa=X&ved=0ahUKEwihurr3raHSAhVBnRQKHQ9XBKwQvwUIFCgA) (42.85%) *Ailanthus altissima* (35.71%) and *Melia azedarach* (33.33%) whereas the lowest nest loss (16.66%) was recorded in Morus alba plantation (Table 1).

Nest height from the ground floor ranged from 2 to 6 m with an average of 2.87±1.3. Outer diameter of nest ranged from 4.8 to 18.2 cm with an average of 12.00±1.1, inner diameter of nest was ranged from 4.1 to 15 cm with an average of 9.13±2.3 whereas cup depth of nest was ranged from 2.6 to 8.1 cm with an average of 4.99±2.1 (Table 2). Nests were entirely round or somewhat oval in shape. The dry vegetation used for nest building by Red vented bulbul was Grasses (48%) followed by local crops (35%), Plastic strings (10%), while we could not identify some dry vegetation (7%).

**Egg Production, Clutch range and incubation duration**

Eggs were oval in shape and pale-pinkish in color with darker red spots. Eggs were laid in consecutive days or with one day interval till the completion of clutch. The laying date of first egg was recorded in 15 active nests with active egg laying period ranged from 25 April to 4 July (fig. 2). The clutch size ranged from 1 to 4 eggs with an average of 2.78±0.9 eggs (Table 3). Total 142 eggs were laid in which 11 (7.74%) eggs did not hatch while 37 (26.05%) eggs were disappeared (Table 5).

The incubation period began 1-2 day after completion of clutch. Incubation period ranged from 10 to 14 days with an average of 12.03±1.3 days. Of 52 nests found the incubation commenced in only 28 nests while the rest of the nests were either failed, destroyed or disappeared (Table 4). Likewise the Red-whiskered bulbul has a mean incubation period of 11.9±0.5 days. Similarly Red vented bulbul had a mean incubation period of 12.03±1.3 days whereas mean nestling period 13.21±1.08 days in Bajaur.

**Eggs Hatching and hatchling size**

Total 52 nests were examined during the entire breeding season in which 29 nests were found active. However, 11 nests were failed mainly after the laying of first egg and remain unattended for the rest of period, 6 nests were destroyed whereas 5 nests were destroyed in night storm. Successful hatching rate was expressed in term of number of nests which was 58.12% (Table 6).

Brood size ranged from 1 to 4 chicks with an average of 2.66±0.5 nestlings. During incubation 11 eggs were failed that could not hatch. Overall 94 nestlings were hatched in which 6 (6.38%) were disappeared before fledging (Table 3 and Table 5). Fledging During nestling period both the sexes feed the nestlings. The first fledging was recorded mainly in early June. The nestling period ranged from 10 to 15 days with an average of 13.21±1 days. Total 29 nest were examined in which fledging occurred in 27 nests with an overall success rate of 93.11% while one nest with a brood size of 2 was disappeared before fledging (Table 7). House crow predation on eggs observed. Along with common myna (*Acridotheres tristis*), jungle cates and spotted owlets (*Athene brama*) were abundant in the sites of failed nest which may be consider potential predators of eggs and nestlings. During nest monitoring a snake was also found climbing on the tree nearer to the location of failed nests. Some of the farmers and shepherds of the area revealed that the children of farmers of neighboring village are involved in the nest destruction.

Successful fledging rate was expressed in term of number of nests which fledged at least one young. The number of young fledged per brood in a successful nests ranged from 1 to 4 with an average of 2.66±0.98 young (Table 8).

**Breeding success and productivity**

The breeding success is calculated and presented as a percentage based on total number of laid eggs viz., 142 eggs found during the entire breeding season. Hatching success (number of nestlings hatched/total number of eggs laid) was 66.19%. Fledging success (number of nestlings before fledging/nestlings after hatching) was 94.2%. Overall breeding success (hatching success x fledging success/100%) was 62.2%. Overall breeding period lasted for 3 months approximately. During this period 142 eggs were laid, 94 nestling were hatched and 88 chicks with an average of 2.66±0.98 young were fledged of Red vented bulbul during entire breeding season (Table 9).

No sign of brood parasitism was found in the present study. No evidence that bulbul raised two brood in a single breeding season was obtained. The possible cause of egg disappearance and nest loss was the house crows, hawks, jungle cates and local people intervention correspondingly.

**Discussion**

Red vented bulbul breeding habits and the main barriers responsible for breeding catastrophe were explored in Bajaur. All the nest were recorded on trees. Nests were investigated thoroughly by surveying all the targeted sites of agricultural areas during the breeding season April to early July 2020. Most of the nests were found in well-developed stage. Based on the field observation of two nests, both male and females were seen participating in nest building activities by bringing nest materials. Nest building duration lasted for 4 days. Of 52 nest found, 11 nests were failed and remained unattended for the entire season, 6 were destroyed while 5 nests were destroyed in night storm. Nest failure occurred mainly after the disappearance of first egg laid. This is in agreement with previous study on Red Whiskered bulbul which built nest in cultivated lands (Li et al, 2015). Red vented bulbul preferred to nest at middle position on varieties of trees or even on a single tree. It mainly nest on the branches of the bushes trees (Vijayan 1980). Balakrishnan (2010) reported that black bulbul makes successful nests in the branches of the trees. Light-vented bulbul (Pycnonotus sinensis), built nests in 10 plant species (n=98 nests) (Lan et al, 2013).

Of 52 nests found in which 7 (13.46%) nests were located on the fork of ([*Eucalyptus* *camaldulensi*s](https://www.google.com.pk/search?rlz=1C1CHBF_enPK723PK723&espv=2&biw=649&bih=647&q=Eucalyptus+camaldulensis&spell=1&sa=X&ved=0ahUKEwihurr3raHSAhVBnRQKHQ9XBKwQvwUIFCgA)), 23.07 were positioned on branch of (Morus alba), 26.92 on (*Ailanthus altissima)* whereas 9 nests were situated in (*Melia azedarach)* (branch) and 10 on *Acacia modesta* (Fork) plantation (Table 1). All the nests were found at the middle of the trees and none of the nest were found on the top of the trees. Overall highest (60%) nest loss was recorded for the *Acacia modesta* plantation followed by [*Eucalyptus* *camaldulensi*s](https://www.google.com.pk/search?rlz=1C1CHBF_enPK723PK723&espv=2&biw=649&bih=647&q=Eucalyptus+camaldulensis&spell=1&sa=X&ved=0ahUKEwihurr3raHSAhVBnRQKHQ9XBKwQvwUIFCgA) (42.85%) *Ailanthus altissima* (35.71%) and *Melia azedarach* (33.33%) whereas the lowest nest loss (16.66%) was recorded in Morus alba plantation (Table 1). Zia et al. (2014) reported that nest height of red vented bulbul ranged from 64 to 144 cm with an average of 96.08 ± 20.55 cm.

Nest height from the ground floor ranged from 2 to 6 m with an average of 2.87±1.3. Outer diameter of nest ranged from 4.8 to 18.2 cm with an average of 12.00±1.1, inner diameter of nest was ranged from 4.1 to 15 cm with an average of 9.13±2.3 whereas cup depth of nest was ranged from 2.6 to 8.1 cm with an average of 4.99±2.1 (Table 2). Nests were entirely round or somewhat oval in shape. The dry vegetation used for nest building by Red vented bulbul was Grasses (48%) followed by local crops (35%), Plastic strings (10%), while we could not identify some dry vegetation (7%). The findings of our study is in agreement with the results of studies reported by Watling (1983), Vijayan (1980), Ali and Reply (1987), Balakrishn (2007, 2010) and Parajapati et al. (2011).

Eggs were oval in shape and pale-pinkish in color with darker red spots. Eggs were laid in consecutive days or with one day interval till the completion of clutch. The laying date of first egg was recorded in 15 active nests with active egg laying period ranged from 25 April to 4 July (fig. 2). The clutch size ranged from 1 to 4 eggs with an average of 2.78±0.9 eggs (Table 3). Total 142 eggs were laid in which 11 (7.74%) eggs did not hatch while 37 (26.05%) eggs were disappeared (Table 5). The average clutch size of Red vented bulbul is 2-3 eggs in southern India (Vijayan 1980). Clutches of 2 or 4 are normal for all races of Red vented bulbul (Stuart-Baker 1932; Phillips 1943; Balakrishan 2011; Bates and Russel 2014; Thibault et al. 2018), and for most other species of bulbul (Moreau 1950; Ward 1969; Fogden 1972; Brosset 1971; Stutchbury and Morton 2011). Li et al (2015) recorded that clutch size of Red-Whiskered bulbul ranged from 1 to 4 eggs with an average of 2.50±0.48 eggs but one nest discovered had four nestlings.

The incubation period began 1-2 day after completion of clutch. Incubation period ranged from 10 to 14 days with an average of 12.03±1.3 days. Of 52 nests found the incubation commenced in only 28 nests while the rest of the nests were either failed, destroyed or disappeared (Table 4). Red vented bulbul has an incubation period of 11-13 days and nestling period about 12 days (Watling 1983). Likewise the Red-whiskered bulbul has a mean incubation period of 11.9±0.5 days. The slight variation in the incubation period may be the result of ambient temperature (Li et al. 2015; Groves 2016). Similarly Red vented bulbul had a mean incubation period of 12.03±1.3 days whereas mean nestling period 13.21±1.08 days in Bajaur. This value is corresponding to all the species of Asian and African bulbuls (Vijayan, 1980; Watling, 1983; Hsu and Lin, 1997; Kruger, 2004; Fishpool and Tobias, 2005; Balakrishnan, 2007 and 2010).

Total 52 nests were examined during the entire breeding season in which 29 nests were found active. However, 11 nests were failed mainly after the laying of first egg and remain unattended for the rest of period, 6 nests were destroyed whereas 5 nests were destroyed in night storm. Successful hatching rate was expressed in term of number of nests which was 58.12% (Table 6). Due to arial and aboral predation the hatching success of Asian bulbul is about 64% (Li et al. 2015; Groves, 2016).

Brood size ranged from 1 to 4 chicks with an average of 2.66±0.5 nestlings. During incubation 11 eggs were failed that could not hatch. Overall 94 nestlings were hatched in which 6 (6.38%) were disappeared before fledging (Table 3 and Table 5). Fledging During nestling period both the sexes feed the nestlings. The first fledging was recorded mainly in early June. The nestling period ranged from 10 to 15 days with an average of 13.21±1 days. Total 29 nest were examined in which fledging occurred in 27 nests with an overall success rate of 93.11% while one nest with a brood size of 2 was disappeared before fledging (Table 7). House crow predation on eggs observed. Along with common myna (*Acridotheres tristis*), jungle cates and spotted owlets (*Athene brama*) were abundant in the sites of failed nest which may be consider potential predators of eggs and nestlings. During nest monitoring a snake was also found climbing on the tree nearer to the location of failed nests. This is confirmed by Quan & Li (2015) who reported that snakes were also the potential nest predator. Some of the farmers and shepherds of the area revealed that the children of farmers of neighboring village are involved in the nest destruction.

Successful fledging rate was expressed in term of number of nests which fledged at least one young. The number of young fledged per brood in a successful nests ranged from 1 to 4 with an average of 2.66±0.98 young (Table 8). Our results approximately same that with Zia et al. (2014), who also worked on Red vented bulbul.

The breeding success is calculated and presented as a percentage based on total number of laid eggs viz., 142 eggs found during the entire breeding season. Hatching success (number of nestlings hatched/total number of eggs laid) was 66.19%. Fledging success (number of nestlings before fledging/nestlings after hatching) was 94.2%. Overall breeding success (hatching success x fledging success/100%) was 62.2%. Overall breeding period lasted for 3 months approximately. During this period 142 eggs were laid, 94 nestling were hatched and 88 chicks with an average of 2.66±0.98 young were fledged of Red vented bulbul during entire breeding season (Table 9). Vijayan (1980) reported that rate of survival of eggs and nestlings was lower (9%) due to greater predation. Brosset (1971) reported a mean survival to fledgling of 17% for nine West African Bulbul species and discusses the differing reproductive strategies of 2 of these, Andropadus latirostris and BIeda eximia (Watling 1983). Andropadus latirostris is an irregular but seasonal breeder which attends leks and rears an average of 2.22 young, whereas BIeda eximia breeds every year during an extended breeding season and rears an average 1.24 young. No sign of brood parasitism was found in the present study. No evidence that bulbul raised two brood in a single breeding season was obtained. The possible cause of egg disappearance and nest loss was the house crows, hawks, jungle cates and local people intervention correspondingly.

**Conclusions**

The current study concluded that the breeding pairs of Red vented bulbul (*Pycnonotus cafer*) perform the breeding activity during breeding season in Bajaur valley. But there are some factors which is barriers for the breeding success like predation on eggs and chicks by common crow, common myna (*Acridotheres tristis*), jungle cates spotted owlets (*Athene brama*) and snake. Kids of the local area actively involved in the nest destruction and hunting.

**Conflict of interest:** The authors have declared no conflict of interest. Availability of data: The data used in this paper will be deposit in public repository before publication.

**Acknowledgement**

The author of this paper greatly acknowledge University of Karachi, Pakistan that given a chance of Doctorial degree, the cooperation of local farmers and of all contributors engaged in the investigations and sampling.

**References**

Ali, S., Ripley, S. D., & Dick, J. H. (1987). Compact handbook of the birds of India and Pakistan.

Balakrishnan, P. (2007). Status, distribution and ecology of the Grey-headed Bulbul Pycnonotus priocephalus in the Western Ghats, India. Unpublished). PhD. Thesis. Coimbatore: Bharathiar University.

Balakrishnan, P. (2010). Reproductive biology of the square-tailed Black Bulbul Hypsipetes ganeesa in the Western Ghats, India. Indian Birds, 5(5), 134-138.

Balakrishnan, P. (2011). Breeding biology of the Grey-headed Bulbul Pycnonotus priocephalus (Aves: Pycnonotidae) in the Western Ghats, India. Journal of Threatened Taxa, 3(1), 1415-1424.

Bates, J. H., Spotswood, E. N., & Russell, J. C. (2014). Foraging behavior and habitat partitioning in sympatric invasive birds in French Polynesia. Notornis, 61(1), 35-42.

Brosset, A. (1971). Recherches sur la biologie des Pycnonotidés du Gabon. Biol. Gabonica, 7, 423-461.

Dickinson, E. C., Dekker, R. W. R. J., Eck, S., Somadikarta, S., Loskot, V., Morioka, V., & Voisin, C. (2002). Systematic notes on Asian birds. 26. Types of the Pycnonotidae. Zoologische Verhandelingen, 340, 115-160.

Fishpool, L. D. C., & Tobias, J. A. (2005). Family Pycnonotidae (Bulbuls). Handbook of the Birds of the World, 10, 124-250.

Fogden, M. P. L. (1972). The seasonality and population dynamics of equatorial forest birds est Sarawak. Ibis, 114(3), 307-343.

Gabol, K., and Khan, R. U. (2021). Breeding biology and nidology of Oriental skylark (Alauda gulgula) in district Bajaur, Khyber Pakhtunkhwa, Pakistan. Pure and Applied Biology. Vol. 10, Issue 4, pp1326-1337.

GROVES, C. (2016). The breeding biology of Red-Whiskered Bulbul (Pycnonotus jocosus) in Xishuangbanna, southwest China. Zoological Research, 37(3), 119.

Hsu, M. J., & Lin, Y. S. (1994). The annual cycle of the Chinese Bulbul Pycnonotus sinensis formosae in Taiwan. Acta Zoologica Taiwanica, 5, 33-39.

Huan, L. I., Zhang, M. X., Xiao-Jun, Y. A. N. G., Liang-Wei, C. U. I., & Rui-Chang, Q. U. A. N. (2015). The breeding biology of Red-whiskered Bulbul (Pycnonotus jocosus) in Xishuangbanna, southwest China. Zoological Research, 36(4), 233.

Khan, U. R., Asif, S., and Sajid, M. (2021) Population Ecology of Chakor Partridge (*Alectoris chukar*) in District Bajaur, Khyber Pakhtunkhwa, Pakistan. *Pakistan J. Zool., pp 1-4, 2021.*

Khan, R. U., and Gabol, K. (2020). Breeding Biology of Chakoor partridge (Alectoris chukar) in Bajaur, Khyber-Pakhtunkhwa, Pakistan: Critically affected by eggs collection and predation. Pure and Applied Biology. Vol. 10, Issue 3, pp913-921.

Krüger, O. (2004). Breeding biology of the Cape Bulbul Pycnonotus capensis: a 40-year comparison. Ostrich-Journal of African Ornithology, 75(4), 211-216.

Lan, S. S., Zhang, Q., Huang, Q., & Chen, S. H. (2013). Breeding ecology of Chinese Bulbul in the urban environment of Hangzhou, China.

Marini, M. Â., Borges, F. J., Lopes, L. E., Sousa, N. O., Gressler, D. T., Santos, L. R. & França, L. F. (2012). Breeding biology of birds in the Cerrado of central Brazil. Ornitologia Neotropical, 23, 385-405.

Martin, T. E. (2002). A new view of avian life-history evolution tested on an incubation paradox. Proceedings of the Royal Society of London. Series B: Biological Sciences, 269(1488), 309-316.

Moreau, R. E. (1950). The breeding seasons of African birds—1. Land birds. Ibis, 92(2), 223-267.

PHILLIPS, W. (1943). Notes on birds of Ceylon. Ceylon J. Sci, 21, 243-246.

Prajapati, S. H., PARMAR, C. P. R., & PATEL, M. (2011). 1. BREEDING PERFORMANCE OF RED-VENTED BULBUL (PYCNONOTUS CAFER) BY SH PRAJAPATI, CD PATEL, RV PARMAR AND MI PATEL. Life sciences leaflets, 11, 298-304.

Quan, R. C., & Li, H. (2015). Nest defense by a White-rumped Shama (Copsychus malabaricus) against snakes. The Wilson Journal of Ornithology, 127(3), 538-542.

Raju, A. S., Rao, S. P., Zafar, R., & Roopkalpana, P. (2003). Bird–flower interactions in the Eastern Ghats Forests. EPTRI-ENVIS Newsletter, 9(3), 2-5.

Stutchbury, B. J., & Morton, E. S. (2001). Behavioral ecology of tropical birds. Academic press.

Thibault, M., Vidal, E., Potter, M. A., Dyer, E., & Brescia, F. (2018). The red-vented bulbul (Pycnonotus cafer): serious pest or understudied invader? Biological invasions, 20(1), 121-136.

Vijayan, V. S. (1980). Breeding biology of bulbuls, Pycnonotus cafer and Pycnonoyus luteolus with special reference to their ecological isolation. J. Bom. Nat. Hist. Soc, 75, 1090-1117.

Ward, P. (1969). The annual cycle of the Yellow‐vented bulbul Pycnonotus goiavier in a humid equatorial environment. Journal of Zoology, 157(1), 25-45.

Watling, D. (1983). The breeding biology of the Red-vented Bulbul Pycnonotus cafer in Fiji. Emu, 83(3), 173-180.

Zia, U., Ansari, M. S., Akhter, S., & Rakha, B. A. (2014). Breeding Biology of Red Vented Bulbul (Pycnonotus cafer) in the area of Rawalpindi/Islamabad. Journal of Animal and plant Sciences, 24, 656-659.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Table 1.** Whole nest thrashing and flora types for nesting of red vented bulbul in Bajaur. | | | | |
| **Facts** | **Number of nests** | **% age** | **Failed nests** | **% age** |
| Morus lba (Branch) | 12 | 23.07 | 2 | 16.66 |
| *Ailanthus altissima* (Middle) | 14 | 26.92 | 5 | 35.71 |
| *Melia azedarach* (Middle) | 9 | 17.30 | 3 | 33.33 |
| [*Eucalyptus* *camaldulensi*s](https://www.google.com.pk/search?rlz=1C1CHBF_enPK723PK723&espv=2&biw=649&bih=647&q=Eucalyptus+camaldulensis&spell=1&sa=X&ved=0ahUKEwihurr3raHSAhVBnRQKHQ9XBKwQvwUIFCgA) (Fork) | 7 | 13.46 | 3 | 42.85 |
| *Acacia modesta* (Fork) | 10 | 19.23 | 6 | 60 |
| **Total** | 52 | 100 | 21 | 100 |

|  |  |  |
| --- | --- | --- |
| **Table 2.** Nest site characteristics of red vented bulbul in Bajaur (2020) | | |
| **Facts** | **Mean ± STD** | **Extent** |
| Nest height | 2.87±1.3 | 2-6 m |
| Outer diameter | 12.00±1.1 | 4.8-18.2 cm |
| Inner diameter | 9.13±2.3 | 4.1-15 cm |
| Cup depth | 4.99±2.1 | 2.6-8.1 cm |

|  |  |  |  |
| --- | --- | --- | --- |
| **Table 3**. Clutch Size and brood size of red vented bulbul in Bajaur valley 2020 | | | |
| Clutch range | Nest No | Brood range | Nest No |
| 1 |  | 1 | 4 |
| 2 | 10 | 2 | 9 |
| 3 | 14 | 3 | 10 |
| 4 | 4 | 4 | 3 |
| Mean±SD | 2.78±0.9 | Mean±SD | 2.66±0.5 |

|  |  |  |
| --- | --- | --- |
| **Table 4**. Incubation period and nestling period of red vented bulbul in Bajaur during 2020 | | |
| **Number of Nest** | | |
| **Days** | **Incubation period** | **Nestling period** |
| 10 | 5 |  |
| 11 | 5 | 2 |
| 12 | 6 | 4 |
| 13 | 8 | 12 |
| 14 | 4 | 6 |
| 15 |  | 4 |
| Mean±SD | 12.03±1.3 | 13.21±1.08 |

|  |  |  |  |
| --- | --- | --- | --- |
| **Table 5**.Overall egg and nestling loss in red vented bulbul in Bajaur during 2020 | | | |
|  | **Facts** | **Total No** | **%age** |
| **Egg destroyed** | Total No. of eggs | 142 | 100 |
|  | Unsuccessful eggs | 11 | 7.74 |
|  | Egg disappeared | 37 | 26.05 |
| **Chicks demolished** | Number of nestling | 94 | 100 |
|  | Nestling disappeared | 6 | 6.38 |

|  |  |
| --- | --- |
| **Table 6.** Hatching success and demolished nest in Bajaur Valley during 2020 | |
| **Facts** | **Range of nest** |
| Total nests | 52 |
| Hatching success | 29.71 |
| Success rate % | 58.12 |
| Failed nests | 11 |
| Nest destroyed | 6 |
| Destroy in storm | 5 |
|  |  |

|  |  |
| --- | --- |
| **Table 7.** Nestling fledging and failure in bulbul during 2020 in Bajaur. | |
| **Particulars** | **Number of nest** |
| Nest examined | 29 |
| Fledging Success | 27 |
| Success rate % | 93.11 |
| Nestling disappeared | 2 |

|  |  |
| --- | --- |
| **Table 8.** Number of young fledged in bulbul in Bajaur during 2020 | |
| **No. of chicks fledged** | **range of nest** |
| 1 | 3 |
| 2 | 10 |
| 3 | 7 |
| 4 | 7 |
| Mean ± SD | 2.66±0.98 |

|  |  |
| --- | --- |
| **Table 9.** Entire breeding success and productivity in Bulbul in Bajaur valley during 2020 | |
| No of eggs laid | 142 |
| No of nestlings | 94 |
| Hatching rate % | 66.19 |
| No of young fledged | 88 |
| Fledging rate % | 94.2 |
| Entire breeding success | 62.2 |

Figure 1. Various types of dry vegetations used in the nests of Bulbul

**Figure 2. -Fledging dates of Red vented bulbul chicks**



**Figure 3**. Map of Study area showing agricultural lands.