Bangladesh J. Zool. ***52****(3): 225-235, 2024* *Article*
ISSN: 0304-9027
eISSN: 2408-8455

BREEDING ACCOUNTS OF THE LESSER ADJUTANT (*LEPTOPTILOS JAVANICUS*) IN BANGLADESH

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ABSTRACT: Breeding activities are important behaviour in bird life. A study on the Lesser Adjutant (*Leptoptilos javanicus*) was conducted between February 2020 and April 2024 in northern and northeastern Bangladesh to determine the nesting sites, breeding biology and threats. We identified two nesting sites: one in Haripur, Thakurgaon. A new breeding site in Godagari, Rajshahi was detected where two incomplete nests were found, but no eggs were laid, and six adult Lesser Adjutants were present in the nesting tree. Six occupied nests were counted during 2023 from the known breeding site in Singhari, Haripur. Both the nesting tree was Shimul (*Bombax ceiba*), and the nesting height was 38 m in Godagari and 22-25 m (mean 23.5 ± 0.95 m, N=6) at Singhari. Nest construction requires approximately 12 to 18 days (mean 14.83 ± 2.03 days, N=6) and laid two to three eggs (mean 2.33± 0.51 eggs, N = 6). Both male and female bird incubated the eggs, and incubation period was varied from 30 to 33 days (mean 31.33± 1.10 days, N = 6). The nesting success was 100%, and the incubation success was 78.57%; 1-2 nestlings per nest (mean 1.83± 0.41 nestlings, N = 6). Major threats include the cutting of nesting trees and hunting birds by the local people. Parents cared for the hatchlings, feeding them regurgitated fishes and other aquatic prey organisms. In 2023, fledglings survived 63.64%, and breeding success was 50% in relation to number of eggs laid. In 2022, fledgling survival was 92.85% in relation to nestling; and in 2021 it was 71.42%. After 60 to 70 days, they leave the nest to practice flying while their parents continue to guide them until they can survive independently. This study indicated that Lesser Adjutant successful can breed in Bangladesh if nesting trees are available.

Key words: nesting site, nest, parental care, habitat, nesting tree, breeding.

INTRODUCTION

Lesser Adjutant (*Leptoptilos javanicus*) is globally and nationally Vulnerable (IUCN, 2015). These declines' principal drivers were habitat loss,

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 DOI: https://doi.org/10.3329/bjz.v52i3.80781

modification, and hunting/persecution. Although it is no longer at high risk of extinction, some populations are undoubtedly declining, and the species remains vulnerable due to high level of threats. Now, the global status is uplifted and Near Threatened (BirdLife International, 2024). The global populations of lesser adjutant remain only 5000-15000 mature individuals (BirdLife International, 2024). Lesser Adjutant exclusively breeds in Sri Lanka, Bangladesh, and India (Kerala, Tamil Nadu, section of the Malabar Coast and Assam), according to Ali & Ripley (1987). In the Chitwan National Park in Nepal, the Lesser Adjutant (*Leptoptilos javanicus*) was researched for its nesting ecology and conservation threats (Bhattarai *et al.*, 2021). During the nesting season, 180 adults, 76 nests, and 88 chicks were documented from nine nesting colonies (Bhattarai *et al.*, 2021). Some breeding records were studied by Gratham (2020) in Alas Purwo National Park, East Java; several nests were recorded at the crown of a Kepuh *Sterculia foetida* tree at a height of 25-30 m. This research did not mention how many eggs laid or the clutch size of the nesting birds. Lesser Adjutant (*Leptoptilos Javanicus*) inhabits the eastern lowlands of Nepal where Karki and Thapa (2013) studied their population and did GIS-based habitat assessment. Choudhary and Mishra (2006) documented 31 nests in 2004, 33 in 2005, and 38 in 2006 in the Kishanganj and Katihar districts of northern Bihar. Mishra *et al.* (2005) observed around 42 nests in the Koshi region of northern Bihar. Lesser adjutant breeding has been documented in Assam, West Bengal, Bihar, Odisha, Tamil Nadu, and Karnataka in India (Rahmani, 2012). About 15 colonies of Lesser Adjutants was recorded in greater Sylhet (north-east Bangladesh and part of Assam) in 1885 (Baker, 1929). At least one nesting pair was recorded in Dhaka, Faridpur, Noakhali, Khulna and Chittagong Hill Tracts up to 1982 (Khan, 1987). The nesting pairs of Lesser Adjutants at Whykong in Teknaf and another nesting pair at char bata in Noakhali were extirpated because of shrimp cultivations in those areas in the 1980s (Khan, 1987). There has been no recent nesting record in the above-mentioned historical sites, and the species is scarce elsewhere with records of just one or two individuals, except in the Coastal region and Sundarbans, where up to 25 birds can be seen (Chowdhury and Sourav, 2012); one confirmed breeding site at Singhari, Thakurgaon (Chowdhury and Sourav, 2012). There is at least one young chick or an adult in the nest, it is considered active (Bibby *et al.*, 2000). The local name of Lesser Adjutant is Gagrol at Singhari, Horipur. A new nesting site has also discovered at Godagari, Rajshahi. There is no detailed study regarding the breeding activities of these species in our country. This study revealed to investigate nesting site, nesting tree selection, clutch size, nesting success, and breeding success of this species.

MATERIAL AND METHODS

The study was conducted in northern and northeastern Bangladesh, covering twenty-four districts in Rajshahi, Rangpur, Mymensingh, and Sylhet from February 2020 to April 2024 (Fig. 1). Multi-stakeholder focus group

discussions (FGDs) followed Krueger's (1998) guidelines, with support from local conservation activists, youth groups, and union parishad chairmen to identify nesting sites. Bird identification was conducted using field guides (Grimmet *et al.*, 1999) and involved binoculars, a spotting scope, GPS, measuring tape, a laser rangefinder (Trupulse 200x), a drone, and a digital camera. Population estimates were derived from active or occupied nest counts during the breeding season, conducted at peak nesting season to assess nest numbers and distribution. Observation was made twice daily from early morning (6-10 am) to evening (4-5:45 pm). Opportunistic observation was also used for more information. Camera traps were not installed to minimize the disturbances. The drone was used in 2023 to know the clutch size, incubation and nestling of Lesser Adjutant. Data on nesting biology was collected in accordance with Brave *et al.* (2020). Nesting success means at least one egg hatched per nest successfully. Hatching success means the proportion of eggs hatched successfully (Katuwal *et al.*, 2022), and fledgling success is the proportion of nestlings that successfully fledged (Katuwa *et al.*, 2022). Breeding success is the proportion of fledgling in relation to number of eggs laid (Jaman *et al.*, 2012).

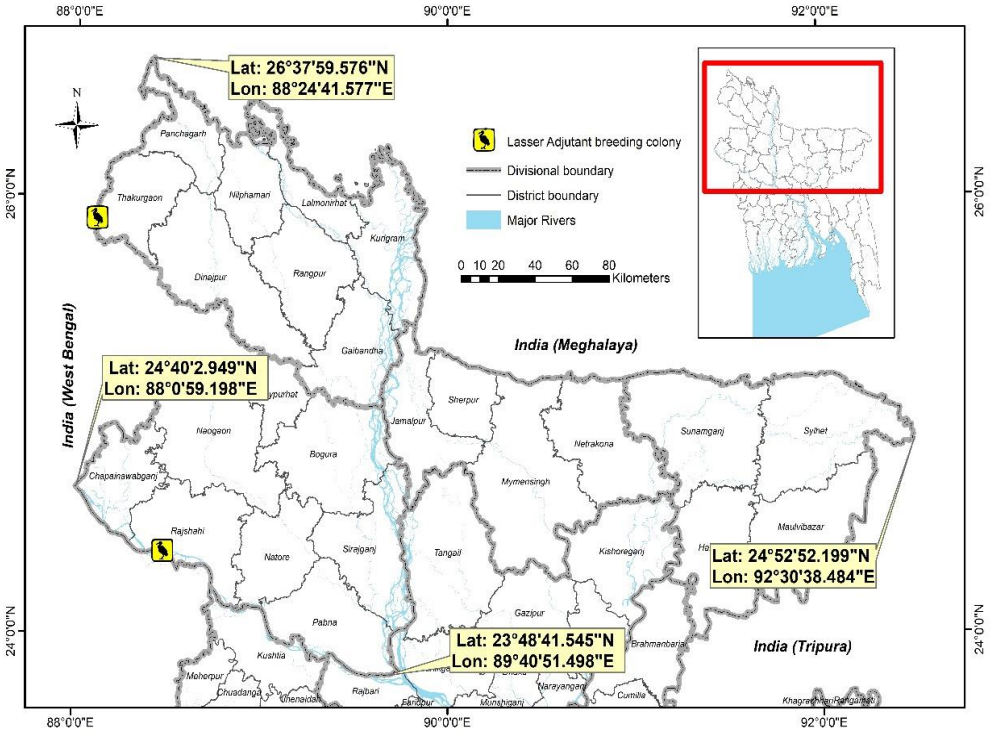

Fig. 1: Map of the study area showing the two nesting colonies and four divisions (Rajshahi, Rangpur, Mymensingh and Sylhet).

RESULTS AND DISCUSSION

Breeding season, habitat and nesting site selection: Breeding occurs from July to December, with nesting in July-August, incubation in September, and fledging from late November to December. Lesser Adjutants inhabit wetlands like marshes and river edges. We identified two nesting sites: one in Haripur, Thakurgaon, and a new site in Godagari, Rajshahi, discovered in 2023, and 250 meters from the Padma River in a 38 m. tall Shimul tree (*Bombax ceiba*). Two incomplete nests were found at this site, but no eggs were laid. Six adult Lesser Adjutants were present, and we anticipate successful breeding next year. The only successful breeding site was in Singhari village, Haripur, where they regularly nest in a Shimul tree at a height of 22-25 meters (mean 23.5 ± 0.95 m, N=6). The appearance of adult birds in nesting trees varies each year, it may be influenced by rainfall and climate, which affect food availability. In 2021, they first arrived or appeared in the second week of May; in 2022, during the first week of June; and in 2023, on July 1. The adult birds with fledgling dispersed the nesting tree after the breeding season each year. The two colonies were in agricultural landscapes with rivers and shallow water bodies.

Similar observation by Sundar *et al.* (2016), Lesser Adjutants commence nesting from August to October in lowland Nepal. Nest construction started in May, as observed by Grantham (2020). The Lesser Adjutant is still found in altered agricultural areas and is widely distributed in South and Southeast Asia, including the Greater Sundas (BirdLife International, 2024); rare in our country, it is mostly found in mangrove woods and infrequently in Dhaka, Khulna, and Sylhet (Siddiqui *et al.*, 2008).

The majority of the known breeding population of Lesser Adjutants has be en found in the agricultural matrix of central (Sundar *et al.*, 2016), and nesting colonies were located close to rivers and areas of cultivated lands, primarily paddy fields in lowland Nepal (Pokharel 1998, Karki *et al.*, 2013). Lesser Adjutants are typically distributed and bred in lowland Nepal (Inskipp *et al.*, 2016). In Java, nests were all in the crown of the tall tree and were at least 25–30 m high. Karki and Thapa (2013) found that *Bombax ceiba* and *Adina cordifolia* were the most common nesting trees in eastern Nepal, with nests averaging over 30 meters high; the average height of these trees was 42.5 ± 6.8 m., and the average nest height was 34.4 ± 4.3 m. In Nepal, 65 active colonies of Lesser Adjutants are found primarily in tall trees, mainly Bombax ceiba (57%), and 51% in agricultural land (Katuwal *et al.*, 2022). A study found 11 tree species in 109 colonies, with Bombax ceiba predominant at 65% (n = 71). The average height of nesting trees is 24.23 ± 9.03 m (Katuwal *et al.*, 2023). Tree species and size greatly impact nest site selection for breeding, highlighting tree

characteristics over locations, often found in human settlements (Katuwal *et al.*, 2022). The Lesser Adjutant prefers nesting in *Bombax ceiba* but also uses *Shorea robusta*, *Ficus racemosa*, and *Terminalia alata* when necessary and recorded 180 adults, 76 nests in 20 trees, and 88 nestlings during the breeding season (Bhattarai *et al.*, 2021). It noted that while another nearby *Bombax ceiba* tree exists at Haripur, it is not used for nesting due to its smaller canopy and lower height.

Courtship, nest building, Egg-laying and incubation: The Males perform elaborate flight displays, including aerial tricks, vocalizations, wing extensions, and neck stretching, to attract mates. They also offer food and nesting materials to females. Courtship behaviors peak in the first month of the breeding season, strengthening pair bonds for nest-building. Males frequently engage in aggressive interactions for access to females and nesting sites. The pair of Lesser Adjutants begin started building the nest. The nest is a large platform made of sticks and plant materials, built on a sturdy tree branch. Females mainly rearrange the nesting material, preferring small branches with leaves from *Eucalyptus* and other trees like Shimul, Ghora Neem, and Mahagoni. Nest development typically starts in July each year. Nest construction requires approximately 12 to 18 days (mean 14.83 ± 2.03 days, N=6) to attain a certain form before egg deposition. They usually laid two to three eggs (mean 2.33± 0.51 eggs, N = 6) (Fig. 2), and both the birds incubated the eggs. Incubation typically lasts around 30 to 33 days (mean 31.33± 1.10 days, N = 6). During incubation, parents keep the eggs warm and protected, allowing one to guard the nest while the other forages for food. The nesting success was 100%, the incubation success was 78.57% (Table 1); and 1-2 nestling observed per nest (mean 1.83± 0.41 nestling, N = 6).

The species performs unique courtship dances in November and January, nests in tree forks, and lays 2 to 5 eggs, which incubate for 30 to 35 days (Siddiqui *et al.*, 2008). Nestlings were found from June to July; the clutch size is unknown (Gratham, 2020). Karki *et al.* (2013) noted that from July to October, fish, reptiles, snakes, and mollusca abundance is expected to increase due to agricultural operations. However, the nesting season of Lesser Adjutant Storks in Nepal's Eastern Lowlands may also be influenced by suitable mates, nesting materials, temperature, and rainfall. At Bangabandhu Sheikh Mujib Safari Park in Gazipur, the Lasser Adjutant has regularly bred since 2017, laying 2-3 eggs from November to December, with breeding occurring from November to March.

Parental care: Both parents cared for the nestlings, feeding them regurgitated fish and aquatic prey. The nestlings grew rapidly, and the adults protected and provided for them until ready to fledge. Fish, frogs, and small

Fig. 2. Clutch size and incubation of the Lesser Adjutant at Singhari, Thakurgaon.

reptiles were observed. Adults catch prey and return to the nest to feed their nestlings by regurgitating the undigested food. This provides essential nutrients for growth, with frogs and small fish being common for nestlings up to 4 weeks old, and non-venomous snakes and ill fishes after that. In 2023, fledglings survived 63.64%, and breeding success was 50%. In 2022, the fledgling survived 92.85%, and in 2021, 71.42% (Table 2). In the last three years at Singhari bird colony, 25 chicks successfully fledged from 16 nests. After 60 to 70 days, they leave the nest and practice flying before becoming independent, while their parents continue to provide guidance until they can survive on their own.

According to Chowdhury and Sourav (2012), adults were observed feeding chicks 19 times with Indian Bull Frog (*Hoplobatrachus tigerinus*) (70%) and the nonvenomous water snake Checkered Keelback *Xenochrophis piscator* (30%). Two pairs nested in 2010, and 10 chicks hatched, six surviving. Six pairs nested and 12 chicks were hatched in 2011, seven surviving. In 2012, five pairs laid eggs and nine chicks hatched with no mortality from the same nesting site (Choudhury and Sourav, 2012). Our observation showed that in 2021, four pairs laid eggs, seven nestlings hatched, and two died. In 2022, six pairs laid eggs and fourteen chicks, and one died at the fledgling stage. Six pairs laid eggs in 2023, eleven chicks hatched, and four chicks (chick mortality: 28.57%) perished due to a strong wind breaking the nest.

A recent study in Nepal revealed that 206 active nests yielded 280 nestlings, with a chick mortality rate of 13% (n = 41) attributed to severe weather condition s (persistent rain, low temperatures, or wind) (Katuwal *et al.* 2022). A total of 346 nests (mean 3.34 ± 3.0) in 109 colonies and 595 chicks (mean 5.45 ± 5.13).

Chick mortality was 2.5% (n = 14), mostly from felling nesting trees (n = 12) and unknown causes. Most of the chicks (97.5%, n = 581; mean 5.33 ± 5.13) successfully fledged from these nests (Katuwal *et al.*, 2023). Numerous variables, including colony size, wetland area, human habitation, and shifting crops, affected breeding success (Sundar *et al.*, 2019).

Fig. 3: A Checkered Keelback fell from the nest while feeding the fledgling.

Predator defense and post-breeding dispersal: Potential predators were Large-billed Crows, House Crows and raptorial birds, i.e., Black Kite, Brahminy Kite, and one unknown buzzard identified. No mammalian predator on nesting tree, but present on the ground. When the nestlings fall on the ground, then, Golden Jackle eat them. Lesser Adjutants prefer tall trees for nesting to reduce predation risk, providing camouflage and protection for their young. The adults are vigilant, using alarm calls to warn of danger and aggressively defending their nests. They collaborate to chase off threats and ensure the safety of their nestlings. After about 50-65 days, they learned to fly and finally left the nesting tree: 83 days in 2023, 97 days in 2022, and 127 days in 2021. After the breeding season, Lesser Adjutants dispersed to different habitats for food. The fledglings came back to the nesting tree, and this phenomenon was observed in 2021 and 2022. Post-breeding dispersal varied from yearly. During the breeding season 2021: fledgling left the nesting tree on 6 December and returned a few days later on 17 December. After that, they fled on 8 February, returned on 19 February, and finally left the nest on 25 March 2022. The breeding season 2022: fledglings left the nests on 16 December; after a few days, they returned and

Table 1: The fate of nest, eggs and breeding success of Lesser Adjutant during 2023 breeding season

Item/Criteria	Number	Breeding success/ failure (%)
Number of nests examined	6	-
Number of eggs counted	14	-
Number of eggs lost to predation	0	0%
Number of eggs to unhatched	3	0%
Number of eggs lost by storm	0	0%
Nest with eggs destroyed by storm	0	0%
Nest predation	0	0%
Number of eggs hatched successfully	11 eggs	78.57%
Nest with viable eggs which hatched successfully	6 nests	100%
Nest with fledgling destroyed by storm	1	16.66%
Nest with viable fledglings	3 nests	50%
Number of nestlings/fledglings lost by storm/fallen from the nests	4 nestling/fledgling	28.57%
Chicks/Fledgling predation	0	0%
The number of fledglings survived	7	63.64%
Breeding success (Number of nestling or fledglings survived successfully in ratio to no. of eggs laid)	7 fledgling/14 eggs	50 %

finally left the nests on 24 January 2023. During the 2023 breeding season, the fledgling left the nests on 8 December 2023 and finally left on 10 January 2024. The fledgling, along with adults, periodically moved from the nesting tree to elsewhere and came back within a short period. It was the learning process of the fledgling how to survive independently. In 2022, two fledglings fell from the nest; one survived and returned to the nest, and another died probably due to the poisonous effects of foods. It was observed that a Checkered Keelback came out of the survived fledgling through vomiting. One fledgling was rescued in December 2023, survived after three days, and came back to the nesting tree. In the 2022 breeding season, two fledglings were rescued from Dinajpur and Joypurhat, followed by three in 2023 from Kurigram, Munshiganj, and Natore, all due to hunting pressure. The birds had been shot with air guns and became sick. Among the five rescued fledgling/juveniles, only three survivors were kept in aviaries at safari parks in Gazipur and Dulahazara; the others (two) died shortly after rescue. It is believed that all fledglings originated from the Singhari colony. The post-fledgling period was critical for Lesser Adjutants because of the large size and the greediness of humans. Lesser Adjutant fledges in February in lowland Nepal (Sundar *et al.*, 2016). Large-billed Crows (*Corvus macrorhynchos*) are the main predator in Southeast Asia (Clements *et al.*, 2013). In Java, the potential predators are White-bellied Sea Eagles *Haliaeetus leucogaster* and

Table 2: Successive breeding accounts of Lesser Adjutant (2021, 2022 and 2023)

Breeding year	Nest no.	No. of eggs/clutch size	No. of nestlings	No. of nestlings fledged	Fate of nestlings (died)	Fate of Nest	Fate of no. of eggs	Fate of Eggs	Fledging time
2021	Nest-1	Unknown	2	2	0	Success	Unknown	Unknown	6 December, 2021 to 25 March, 2022
	Nest-2	Unknown	1	1	0	Success	Unknown	Unknown	
	Nest-3	Unknown	2	1	1	Success	Unknown	Unknown	
	Nest-4	Unknown	2	1	1	Success	Unknown	Unknown	
	Total		**7**	**5**	**2**				
2022	Nest-1	Unknown	2	2	0	Success	Unknown	Unknown	16 December, 2022 to 24 January, 2023
	Nest-2	Unknown	3	3	0	Success	Unknown	Unknown	
	Nest-3	Unknown	2	1	1	Success	Unknown	Unknown	
	Nest-4	Unknown	3	3	0	Success	Unknown	Unknown	
	Nest-5	Unknown	2	2	0	Success	Unknown	Unknown	
	Nest-6	Unknown	2	2	0	Success	Unknown	Unknown	
	Total		14	13	1				
2023	Nest-1	2	2	1	1	Fail	0	Unhatched	8 December 2023 to 10 January 2024
	Nest-2	3	2	2	0	Success	1	Unhatched	
	Nest-3	3	2	2	0	Success	1	Unhatched	
	Nest-4	2	2	1	1	Fail	0	Success	
	Nest-5	2	1	1	0	Success	1	Unhatched	
	Nest-6	2	2	0	2	Broken	0	Success	
	Total	**14**	**11**	**7**	**4**		**3**		

Javan Hawk-eagle *Spizaetus bartelsi* (Gratham, 2020). In April 2009, four chicks were lost due to a thunderstorm and heavy rain with the onset of monsoon. In 2011, five chicks fell off their nests, and in the absence of the owners of the nesting tree, local people collected and ate them at the Singhari bird colony (Chowdhury and Sourav, 2012).

CONCLUSION

The Lesser Adjutant *Leptoptilos javanicus* is a globally threatened (NT) species (Birdlife International, 2024) and Vulnerable (VU) in Bangladesh (IUCN Bangladesh, 2015). The population and ecology of this bird are understudied, and human disturbances lead to nesting degradation. Major threats include the cutting of nesting trees and hunting. Only one successful breeding colony with six adult pairs exists in Haripur, Thakurgaon. To protect these birds, collaboration with local communities is vital, along with compensation for nesting tree landowners. Nest guarding, a care centre for wounded birds and awareness campaigns with law enforcement are also essential.

Acknowledgements: The authors thank the Sustainable Forests and Livelihoods (SUFAL) Project of the Forest Department of Bangladesh for their financial and logistical support in conducting this study. Special thanks to Md. Aijul Islam for helping in data collection during at the breeding seasons. We also thank all the surveyors, conservation activists, journalists, Union Parishad members, and local residents for their active participation in the fieldwork.

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(Manuscript received on 25 September 2024 revised on 20 December 2024)