

**Nesting ecology and breeding behavior of black-winged stilt
(*Himantopus himantopus*) in wetland habitat of Mount Abu
Wildlife Sanctuary, Rajasthan**

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Abstract

Black-winged stilt usually construct nest and breed in open areas around flooded and muddy habitat of seasonal and perennial water bodies. They construct nests on the ground with the help of mud, sand, grass, plant leaves and other vegetation matter. During breeding season, from egg laying to fledging, one adult generally remains close to nest and provide parental care and guard of eggs and nestlings. Both male and female contribute to construct nest and parental care of young once. Egg clutch sizes of black-winged stilt vary from one to four eggs. During study, we observed a total of 109 nests with 339 eggs of black-winged stilts. Out of those, 52 nests have clutch sizes four, followed by 31 nests with clutch sizes three, 12 nests with clutch size two and 14 nests with clutch size only one. Black-winged stilt share nesting grounds, feeding and roosting habitats with other wading birds. During presence of predator, chicks began to make noise and parents gather around the nest and start making loud calls while standing straight. Parents also hide their chicks under their wings and sit down on the ground. Natural predators, human interference, cattle and feral dogs movement around wetlands limit hatchling and breeding success of black-winged stilts.

Key words : Black-winged stilt, Clutch size, Egg, Habitat, Predator, Mount Abu Wildlife Sanctuary.

The black-winged stilt (*Himantopus himantopus*) is a common and widely distributed wading bird, distributed throughout Africa, Australia, Eurasia and Southeast Asia²⁰. They usually breed in marine habitats as well as freshwater habitats^{33,37}. According to Kennedy and Gray²² & Cuervo¹², breeding birds choose suitable habitat to support

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themselves and their offspring on the basis of food availability and abundance. The food availability around nesting habitat plays a crucial role in the survival of nestlings¹⁸. Breeding biology of black-winged stilts has been thoroughly studied by Amat & Masero, Cuervo, Fraga & Amat, Kosztolanyi *et al.*, Norte & Ramos and Tinarelli^{3,13,17,23,27,35}. Breeding biology of the black-winged stilt was also studied in Spain^{13,14}, Indonesia¹⁰, Italy³⁸, Europe^{11,12,13,14,35} and Iran^{5,34}. A black-winged stilt usually breed around shallow freshwater habitats, wetlands with sand, mud and clay areas and open areas of nearby water bodies³¹. They also breed in other suitable habitats like shallow borders of lake, marshes and swamp areas, flooded fields and riverbeds, irrigated areas, sewage and fish ponds, saline habitats such as estuaries and deltas^{15,31}, coastal marshes and swamps¹⁵, coastal lagoons^{21,31} and breed around high altitudinal lakes and alkaline water habitat¹⁵. They usually construct their nests among low vegetation or around single plants, occasionally in open areas of salt marshes, sandstone spits and islands⁶. These birds live in mixed-species colonies and also share habitat and nesting grounds with other Charadriiformes species^{14,36}. Mud was a necessary ingredient in the construction of nests near the water's edge^{5, 12}. Generally, male constructs the nest and both sexes participate in parental care of the young once¹¹. According to Goriup¹⁹, black-winged stilt forms a stable pairs that remain together during the breeding season and courtship and mating occurs only between paired couples. According to Goriup¹⁹, they did not have complex pairing ceremonies and instead exhibited partnership by sharing a feeding

area. Goriup¹⁹ studied copulation behaviour in black-winged stilts. Clutch size in Charadriiformes is known to be consistent, with many species having a clutch size of four eggs^{4, 24}, as in past studies on black-winged stilt^{1, 9}. In Iran, Barati *et al.*⁶ also observed to have a clutch size of four eggs. According to Cuervo¹¹, clutch size of black-winged stilt is ranges from one to five eggs per nest, which hatch in June and chicks leave the nest immediately after hatching and start feeding independently. The present study was carried on the nesting and breeding biology of black winged stilts in and around the wetland habitat of Mount Abu Wildlife Sanctuary.

The study was carried out during the breeding season of the black-winged stilt. The observations were taken from March, 2022 to August, 2022. The observations were regularly taken in the morning (6.00 to 10.00 AM) and afternoon (3.00 to 6.00 PM). Black-winged stilt nests were surveyed by point count and line transect methods and behavioural study done by direct observation and scan and focal animal sampling method². Observation of the nesting ecology and breeding behaviour of black-winged stilt was assisted with the help of a Nikon P1000 camera and Binocular 8x40, from appropriate distance without disturbing them. The nest was considered successful when at least one egg hatched. Hatchling success rate was calculated using the following criteria: A. newly hatched nestlings present near the nests; B. hatchlings that successfully break egg shells present in nests. A nesting failure was considered if eggs remained in nests throughout the study period or nests had been destroyed by predators, livestock and anthropogenic movements.

The black-winged stilt is common and breeding resident bird of Mount Abu Wildlife Sanctuary and its surrounding areas. It shows parental care during the breeding season, from defending nests to eggs to protecting chicks till fledging stages^{5,11,19,25}. Black-winged stilts perform parental care of their young and protect them from predators. They like to live in open areas near food sources where they could see everything around them²¹. During study, we observed black-winged stilt nesting around wetlands, riverine habitats and open areas around the water bodies. Most of nests were built in open areas, while others were built near plants and vegetation, including grasses and some nests were built in flooded and muddy areas. The area selected for nest is generally inaccessible to natural predators; such a place is difficult for feral dogs, domestic animals and other natural predators to reach, increasing the chances and rate of nesting success and nestling survival among black-winged stilt. Some nests were simply constructed on the ground with no extra layers present like grass, twigs, stems or leaves of plants. These types of nest provided greater camouflage and mostly invisible to predators and which in turn enhance chances of hatchling success and nestling survival due to less predation risk. Stems of *Eichhornia* and other aquatic plant matter, some sand and mud matter were also found in the nests of black-winged stilts. During breeding season, copulation is done in water. After copulation, male generally starts doing foraging and feeding activities while female stands in a standing posture and preens for some seconds, during that time male also preens his own body. Generally, male and female both participate in nest construction and

parental care of young-ones^{12, 13}. According to Cuervo¹¹, male spend much more time at the nest during incubation than females, while female spend much time during egg laying period in nests, thus both parents equally invest energy during the breeding season. In contrast, according to Boekel⁷, parental care was primarily carried out by the male and the female left chick before two weeks of complete maturity. According to Cuervo¹³, Toral and Figuerola³⁶ the incubation period of black-winged stilt was 22 days, while Boekel⁷ observed incubation period ranges up to 28 days and fledgling time was 40 days.

During study, a total of 109 nests of black-winged stilt were found and monitored in the study area. During the breeding season from March, 2022 to August, 2022, a total of 339 eggs were recorded in 109 nests at all selected wetlands and surrounding habitats. During the study, clutch size in black-winged stilts ranged from one to four eggs per nest. Elmalki *et al.*,¹⁶ also observed the clutch size of black-winged stilt which ranged from 3 to 4 eggs per nest. During study, the clutch size of black winged stilts was four in (52 nests) followed by three in (31 nests), two in (12 nests) and one in (14 nests). Hatchling success per nest ranged from one hatchling to four hatchlings per black-winged stilt nest. Table-1 represent total number of nests, total number of eggs in specific clutch sizes and total number of hatched and unhatched eggs of black-winged stilts in study area. In 14 nests, clutch sizes of one were observed and 14 eggs were present in nests. Out of those, four eggs were successfully hatched and the remaining 10 eggs were unhatched. In 12 nests, clutch size of

two was found and 24 eggs were present in nests. Out of those, 8 eggs were successfully hatched and the remaining 16 were unhatched. In 31 nests, clutch size of three was found and 93 eggs were present in these nests. Out of those, 45 eggs hatched successfully and the remaining 48 were unhatched. In 52 nests, clutch size of four was found and 208 eggs were present in these nests. Out of those, 140 eggs successfully hatched and the remaining 68 were unhatched. After the hatching chicks leave the nest, they start feeding independently¹¹. After the hatching parent escorted their chicks away from the breeding or nesting sites^{5, 19}. Many bird's species have been observed removing empty egg shells from their nests²⁶. We also observed black winged stilt also removed egg shells from nests and were also previously observed by Sordahl and Sordahl^{32,33}. Sometimes, small fragments of egg shells were also observed in nests, which indicate indirect evidence of hatchling success. Black-winged stilt chicks begin to move inside nests soon after hatching. After two or three days of hatching, the chick left the nest for foraging and feeding with their parents. Parents generally remained in close proximity to their young once during foraging and feeding. When predator birds are flying around nests, parents stand straight and produce loud calls along with that mobbing behaviour were also observed with predators. Sometimes parents hide their chicks under their own wings. Generally, one black-winged stilt individual feeds and forages around the nests while another individual forages and feeds on a distance from the nest. During breeding season, male and female generally remained in close proximity during feeding, foraging, resting and roosting but sometime

later both individuals left nests and went for foraging and feeding away from nest. This is a critical period with greater chances of nesting failure and an increased risk of predation of eggs and nestlings by predators. The black-winged stilt also shares nesting grounds with other breeding birds, including red-wattled lapwing, purple moorhen, common moorhen, white-breasted water hen and spot billed duck etc. Interspecific competitions were observed with red-wattled lapwings, little ring plovers and great thick-knees during the foraging, feeding and roosting time. Most frequently, interspecific competition is observed with red-wattled lapwing. Some other wading birds also roost near the nesting areas of black-winged stilt. These birds like spot-billed duck, knob-billed duck, Indian cormorant, greater cormorant, lesser whistling duck, cattle egret, intermediate egret, little ringed plover, river tern and little grebe are also commonly roost around the nesting habitat of black-winged stilt. Pierce³⁰ observed that mammals were also responsible for nesting failures in pied stilt and black-winged stilt. They observed black-winged stilts eggs as well as chicks eaten by ferrets, feral cats, weasels (*Mustela nivalis*), hedgehogs (*Erinaceus europaeus*), stoats (*Mustela erminea*), Norway rats and harriers³⁰. Feral dogs frequently move around nests of black-winged stilts. Sometimes feral dogs also try to chase and attack on young ones of black-winged stilts. Pugmarks of feral dogs present around the nesting habitat of black-winged stilt were an indirect sign of eggs and nests being destroyed by feral dogs. Grey and ruddy mongoose movements were also observed around the nests of black-winged stilt. Whenever stilt feel threat, it produced loud calls, continuously flying around nests, sometimes attacking

predators and releasing scats on predator. When predators reach the nests, they try to repeal them and they also perform “broken wing show” behaviour when predator movement occurs around the nests. Sometimes the black-winged stilt also perform pseudo-nests or false nests and false incubation behaviour by moving away from the original nests when the predator’s presence is near the nest. According to Pierce³⁰, the majority of black-winged stilt chick deaths happened up to two weeks of hatchling and chicks that have no ability to fledge and are more vulnerable to predator attacks. A fledged chick without a guarding of parent has as a least threat as compare to unfledged chick with guarding of parent due to lack of predator escaping strategies. In the case of mammal predators, fledged chick have ability to fly or jump into air, while unfledged chick not able to flying and jump, they have only capable to run or swim in water but never faster than predators³⁰. Many species of birds, notably water birds breeding in grasslands and farmlands, have reported nest failure as a result of grazing and cattle trampling over their nests⁸. Grazing and frequent cattle movement were also observed around the nesting habitat of black-winged stilt in study area. Some nests of black-winged stilt were also destroyed due to trampling of livestock movement especially

cows and buffaloes. Anthropogenic movement and agricultural practice around wetlands also destroyed nesting habitat and nests of ground nesting birds, including black-winged stilt. According to Pierce^{28,29}, stilts (family: Recurvirostridae) nest on the ground, which makes them vulnerable to mammalian predation. During study, the jungle crow, house crow, crested serpent eagle, shikra, common kestrel and black shoulder kite have been seen flying near to the breeding habitat of black-winged stilts. Some individuals of the black-winged stilts flew up and chased these birds. Frequent movement of other birds, including Indian black ibis, glossy ibis, purple heron, pond heron, grey heron and rufous treepie were observed around the nests of black-winged stilt. Pre-monsoon rainfall, nest and egg flotation in water are also responsible for the declined hatchling and breeding success rate of black-winged stilts. Sudden change in water level due to early monsoons washes out breeding ground and stilt lost nests, eggs and young ones. The black and white coloration of the black-winged stilt body also enhances their chance of predation because these colours are easily visible to predators. Various nesting and breeding aspects of the black-winged stilts are shown in figures 1–15.

Table-1. Total number of nests, total number of eggs in specific clutch size and total number of hatched and unhatched eggs of black-winged stilt in study area

Clutch size	Number of nests	Total number of eggs	Number of eggs hatched	Number of unhatched eggs
1	14	14	4	10
2	12	24	8	16
3	31	93	45	48
4	52	208	140	68



Figure 1: Black-winged stilt nest submerged in water



Figure 4: Black-winged stilt nest with egg clutch size one.



Figure 2: Black-winged stilt nesting in grasses



Figure 5: Black-winged stilt incubating eggs.



Figure 3: Black-winged stilt nest with clutch size four.



Figure 6: Fledgling and black-winged stilt incubating eggs.



Figure 7: Black-winged stilt nestlings feeding in shallow water.



Figure 10: Foraging and feeding activities of black-winged juveniles around the wetland habitat.



Figure 8: Adult black-winged stilt and its fledgling foraging in water.



Figure 11: Black-winged stilt hiding nestling under its own body.



Figure 9: Adult and juvenile of black-winged stilt resting around the nest.



Figure 12: Nest and egg destroyed due to high wind velocity.



Figure 13: Nestling of black-winged stilt hides in cryptic location for escaping from predator.



Figure 14: Feral dog's movement around the nesting area of black-winged stilt.



Figure 15: Black-winged stilt displaying aggressive protection behaviour during predator movement around nesting.

We are extremely thankful to the University Grant Commission (UGC) for providing financial support to successfully conduct the present research work. We would also like to thank the Department of Forest, Rajasthan (India) for granting research permission in the protected area.

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