VOLUME 11 ISSUE 2 2025

ISSN 2454 – 3055

INTERNATIONAL JOURNAL OF ZOOLOGICAL INVESTIGATIONS

Forum for Biological and Environmental Sciences

Published by Saran Publications, India

International Journal of Zoological Investigations Vol. 11, No. 2, 586-595 (2025)

International Journal of Zoological Investigations

Contents available at Journals Home Page: www.ijzi.net

Editor-in-Chief: Prof. Ajai Kumar Srivastav

Published by: Saran Publications, Gorakhpur, India

ISSN: 2454-3055

Eco-Biology and Behavioral Aspects of Black-Winged Stilt: A Review

Gurjar Pooja and Chishty Nadim*

Wildlife, Limnology and Toxicology Research Laboratory, Department of Zoology, Government Meera Girl's College (Mohanlal Sukhadia University) Udaipur, Rajasthan, India

**Corresponding Author*

Received: 21st December, 2024; **Accepted:** 22nd April, 2025; **Published online:** 30th September, 2025

https://doi.org/10.33745/ijzi.2025.v11i02.054

Abstract: Black-winged stilt (BWS) is included among the shorebird category, which inhabits the wetland habitat primarily. It feeds upon invertebrate animals especially aquatic insects and their larvae. Stilts are monogamous birds, both parents actively participate in parental care activities such as incubation, protection, and chick rearing. Prey preference of Black-winged stilt can also vary on the basis of areas which they inhabit. Clutch size of Black-winged stilt ranges in-between one to five eggs but clutch size of four eggs is more frequently observed. Breeding season is generally between March to May but it may vary along with the geographical regions. Black-winged stilt actively protects its territory from predators and other possible threats. It generally builds nests on the islets in aquatic habitat for the safety purpose but on the contrary the rise in water level sometimes induces the direct threat to the nest and eggs.

Keywords: Black-winged stilt, Foraging, Habitat, Breeding biology, Nest, Wetland, Clutch size

Citation: Gurjar Pooja and Chishty Nadim: Eco-biology and behavioral aspects of Black-winged stilt: A review. Intern. J. Zool. Invest. 11(2): 586-595, 2025.

https://doi.org/10.33745/ijzi.2025.v11i02.054

Introduction

Black Winged Stilt (BWS) (*Himantopus himantopus*) belongs to the order Charadriiformes which consists of different families and the birds of this order were initially known as waders and later on as shorebirds (Gochfield *et al*., 1984). According to Baker and Pereira (2009) the order Charadriiformes consists of 3 suborders, 19 families, 90 genera and 366 species. Despite being highly debatable taxonomy of Black-winged stilt (BWS, *Himantopus himantopus*) there are at least five sub-species which are accepted worldwide. The word '*Himantopus*' is derived from Greek word that means "strap foot" or "thong foot" (Boyd, 1987). The Black-winged stilt migrate to long distances and is commonly found in Europe, Asia, North Africa, Australia and South America (Pierce, 1996; Pizzey, 1997). According to del Hoyo and Collar (2014), BWS can also be observed in central Asia, central part of China, subcontinent of India, Sri Lanka, Indonesia and Taiwan. During

the winter season the BWS population of Palearctic region migrated mainly to the West Africa and some migrate to the south of Sahara (Delany *et al.*, 2009).

The BWS is indeed known for its gregarious nature but in contrast in the breeding season it displays aggressive behaviour (Cramp and Simmons, 1983). Reportedly in south-eastern Spain Black-winged stilt occupy 35 irrigation ponds which shows that BWS can have very dense population in smaller areas also (Luisa *et al.,* 2011). BWS is a wader of the Recurvirostridae family, it contains quite long, thin, and pink legs; it also has thin and long black bill, with body covered by below white and black upper wings. Chicks are grey instead of black; females lack black color on the head and neck throughout the year whereas males are black in these areas, especially in summer, but their heads turn white in winter (Boyd, 1987).

The legs of BWS contribute about 60% of its body weight (Parveen *et al*., 2018). BWS are also involved in preening, sleeping, and bathing behaviour. On an average BWS sleeps about 10 min at a time, and comparatively females have longer bath sessions of about 9 min which includes wading in shallow water, dipping the head into the water, flapping wings to splash water on the whole body, and ultimately dry the body by flapping of wings, preening, and jumping toward the dry place. Interspecific behaviour of BWS includes aggression, tolerance or escape behaviour as primary response towards their neighbour. Once a territory is established aggression can be observed around nesting area. Territory intruders like humans, dog and sheep usually get distracted through mob display. Tolerance was observed toward individuals maintaining a safe distance of 1-2 meters from the nest (Goriup, 1982). The population of BWS found to be affected by the artificial wetland, decrease in water level and threats towards eggs and chicks (Pigniczki *et al.*, 2019).

Other than these BWS species also faces global factors like climate change which affects the abundance and distribution of different species in wildlife; in fact, the recent climate changes have led to reduction in population size, survival rates and productivity as well as northward shift of countless organisms (Figuerola, 2007).

Foraging:

Taylor and Taylor (2005) studied the feeding behaviour of BWS in relation to wind conditions but due to various disturbances and distance mainly, they found it was difficult to obtain prey capture rate in open water habitat and windy conditions. They also determined that the prey size usually less than 3-4 mm in length were difficult to identify through direct observation. Moreover, fluctuation in water level also hampers the feeding behaviour and population of wading birds (Maheswaran and Rahmani, 2001).

According to Cramp and Simmons (1983) invertebrates, primarily aquatic insects, their larvae (i.e. Trichoptera, Hemiptera, Diptera, Coleoptera and Odonata), spiders, crustaceans, molluscs, worms, amphibian (tadpoles, eggs), small fishes and rarely some plants compose the food of Black-winged stilt (BWS). Weather conditions directly affect the foraging activities of waders in numerous ways. Consequently, in winter season feeding rate increases due to increase in high-energy demands for maintenance or to store fat additionally at low temperature and harsh conditions (Kersten and Piersma, 1987; Swann and Etheridge, 1989; Wiersma and Piersma, 1994).

On the basis of stomach study, the diet of BWS mainly includes aquatic insects (98% dry weight of gut content) which is about 92% of the total diet. The remaining diet was composed of aquatic larvae of adult like *Zygoptera*, *Cicadellid, Hemiptera*, and least abundant food material was of emergent plant species. The diet analysis also concluded that BWS feeds upon species of 33 different invertebrate families whereas on the basis of dry weight Mollusc constitute the highest weight. Similarly on the basis of number, mollusc and insect orders like Coleoptera, Trichoptera and

Hemiptera were highest. Further study revealed that during mid-dry and late-dry season the mollusc were highest among food composition. In mid dry season percentage number of Coleoptera and Hemiptera were 16.9%, 5.1% and in late dry season 49.8%, 22.7% respectively; Number of taxa identified during mid-dry season was 42 and 48 in late dry season (Dostine and Morton, 1989).

In Australia, BWS had been observed eating diatoms, brine shrimps (Artemia), small mollusc, brine fly larvae (Ephydridae), insects like dragonflies and water beetles (Cleland, 1911; Blakers *et. al.*, 1984; Lane, 1987).

In New Zealand, their diet comprised of amphipods, caddis fly, mayflies, crabs, molluscs, chironomid larvae, brine flies, oligochaete worms and some small fishes (Pierce, 1985, 1986). In North America the species consumed brine shrimps, fishes, brine flies and different kind of insects (Wetmore, 1925; Hamilton, 1975). In European and North African region, the taxon that chose to be eaten were mainly insects and their larvae (Cramp and Simmon, 1983).

Ueng *et al.* (2009) examined data of 305 stomachs and found animals as food items (12,176) that belonged to seven classes with 17 orders having 39 families and 48 species; in their food items aquatic invertebrate were found including water scavenger beetle (Hydrophilidae), chironomid midges (Chironomidae), biting midges (Ceratopogonidae), brine shrimp (Artemiidae), house fly (Muscidae) and shore flies (Ephydridae).

Feeding techniques for BWS described by Hamilton (1975) included- pecking, plunging, and snatching; other two new methods used by Portuguese stilts: bill pursuit which was recorded exclusively in Avocets, similarly found in stilt. BWS also used a semi scythe-like technique; the birds were found in territory of individuals or pairs which were defended from the intruders of the same species (Goriup,1982).

During the early days when clutch was still not complete the BWS focused on the pool and paid attention on feeding, wading and showed very less reproductive activities (Yeates, 1941).

BWS preferred saltpans of Sidi Moussa-Oualidia, Morocco as a successful feeding area in autumn; based on depth of water, immature and adult birds implemented different feeding strategies (Tinarelli, 1987).

Different kind of prey and prey density had caused longer duration of feeding e.g. individuals of BWS spent average 5 h on feeding at Grande Daya and 9.9 h at Sebkha Sedjoumi. At Sebkha Sedjoumi due to rain feeding activity was stopped, after the pause the feeding rate seemed to be higher. In Morocco, 40% individuals observed were found to be paired in first half of February. Also, during the winter season a male was seen feeding near a female and two immatures at Sidi Moussa who were protected from every stranger within 20-30 m, this behaviour shows that the parental bond lasts whole winter (Tinarelli, 1987).

Habitat preference and breeding behaviour

Salt pans, dammed ponds, lagoons, and sugar factories settling ponds were chosen from 1983 to 1987 for the breeding study purpose. In Mediterranean region, Italy, utmost study was carried out on BWS (Bologna *et al.*, 1978; Tornielli, 1979; Romè and Travison, 1982; Casini, 1986). The settling pond and sugar factories were most favourable habitat for breeding. Sudden changes in the water level, predation and anthropogenic disturbances were the main threats to breeding success. Due to production activities in the salt-pans and sugar factories water level used to vary, which impacted the breeding (Tinarelli, 1991).

Rice fields serve as important breeding and foraging habitats for various water birds (Fasola and Ruiz, 1996; Baouab, 2008); which served as an alternate habitat for BSW also (Fasola and Ruiz, 1996). Most breeding records of BSW in the Ogan Komering Lebak floodplain (Southern Sumatra) were reported to be in northern summer season (May to October), which aligned with the breeding period of the Black-winged stilt in the Thai-Malay Peninsula (Abdillah *et al.*, 2012).

Human actions had indeed caused significant changes in estuarine and coastal habitats, impacting dispersion and the abundance of birds (Davidson and Rothwell, 1993; Catry *et al.*, 2004). Yet, the research revealed that human made habitats can serve as substitute habitats of water birds (El Malki *et al.*, 2013). Natural and artificial habitats of BWS must be evaluated comparatively which is crucial for better habitat conservation (Davidson and Evans, 1986; Czech and Parsons 2002; Catry *et al.*, 2004). Black-winged stilts commonly nested besides Collared Pratincoles in both natural habitats (marshes, sandy or rocky field) as well as in artificial habitats such as Salinas and fields of crop (Cuervo, 2005). Breeding of BWS has been observed in challenging marshy substrates also (Cuervo, 2005).

Water birds often utilize anthropogenic and agricultural habitats found near natural wetlands (fishponds, rice fields and saltpans). The stilts were found near floodwater on dried mud flats with stumpy bushes of salicornia, clumps of lavenders, in dry tussocks (Yeates, 1941). These were widely spaced on the ground, often among grasses and sedges, sometimes consisted of floating masses of waterweeds with well-lined interiors (Pierce, 1996).

BWS showed protective behaviour towards their territories. Any intrusion of human was not welcomed at any stage of the breeding cycle even if it was 10 days before the egg laying. The invasion caused yelping and anxiety in them. The pair were close in air and made "kik-kik-kik," two-three sound with short interval between each sound. The pair while landing made calls like "ky-ick" or "Kyack" from time to time. In anxiety fight they used their long legs (Yeates, 1941).

According to Kitagawa (2009) during the breeding season, they made nests in loose colonies in marshes, shallow lakes, and ponds. Both parents participate in nest building, incubating eggs and raising the young. Some interesting finding shows that though most offspring disperse from their parents after breeding season some may stay longer as exception.

Homosexual behaviour had been documented in numerous bird species, both in captivity and in the wild. The main cause for the female-female pair formation could be shortage of males. There were considerable chances of extra pair copulation occurring in Black-winged stilt. If a female from a homosexual pair mate with a male from a normal pair or a solitary male, her eggs can be fertilized. In a population with more females such female-female pairs can be beneficial in offspring care hence contributing in increasing offspring number (Kitagawa, 1988).

For copulation, BWS attain erect posture before mounting; the male BWS flexed his legs in the process to place its tarsi on the back of the female, to attain cloacal contact, maintained balance by wing flapping. They made solitary nest over a long period (Goriup, 1982).

Copulation was performed in the water during the breeding period; after the copulation female stood straight or preened for few seconds while the male started foraging and feeding (Chishty and Choudhary, 2023).

Egg laying started when the daily temperature reached around 15º C, typically in April-May with no significant yearly difference. Most clutches had 4 eggs however occasionally observed clutches contained 3 eggs (2.9-5.6%). Due to worsening hydrological conditions, traits like mass, length, breadth and volume decreased. Hatching was asynchronous average 1.84 days per clutch. The smaller final egg and asynchronous hatching propose adaptive brood reduction, a phenomenon that was not recorded previously in this species (Adamou *et al.*, 2009).

Depending on the weather, feeding and the breeding period can vary. For instance, egg laying period spanned from early May to early July with hatching of chicks from late May to June in Kharkov, Ukraine. The mean clutch size was around 3.8 eggs in 2020 and about 3.5 eggs in 2021. The success rates of reproduction were about 35.6% in 2020 and about 38.8% in 2021.They stayed in the area till August before the

time of migration (Mamedova and Chaplygina, 2021).

BWS typically bred in colonies of 2-50 pairs, both parents shared incubation duties, incubation period lasted 22-26 days (Pierce, 1996). Their nests were usually on ground near water (Cuervo, 2003), which can be simple scrap or a proper structure made up of available vegetation (Cramp, 1983). Clutch size in Charadriiformes, including Black-winged stilt, tend to be quite consistent around four eggs (Studer-Thiersch, 1968; Cramp and Simmon, 1983; Cuervo, 1993; Arnold, 1999).

In wetlands in Hamedan Province, AghGol and Shirinsou, the period of egg laying was late compared to March–May for most Western Palearctic colonies (Snow and Perrins, 1998); April–May for North African populations (Adamou *et al.*, 2009). As reported by Ashoori (2011) nest building of BWS was between 28 April and 10 May in Iran (Barati *et al.*, 2012).

Each pair maintains about 90 square meters territory. Eggs in clutch were usually four. Parents usually started incubating from the beginning of the egg laying yet it was prominent after the third egg laying. Hatching took place 26 days after the first egg laid. After the hatching, parents did not leave the territory and stayed close to the chicks. (Kitagawa, 1988). Goutner (1989) studied 34 nests of BWS, out of which 71% were isolated and built on small islets or pond and remaining nests were built on vegetation surrounded by shallow water.

During the hatching, parents never left the nest unattended and immediately after hatching of chicks, parents removed the shell from the nest. Sordahl (1994) and Ashoori (2011) also observed the same phenomenon in Black-winged stilt and Kumar *et al*. (2020) found such behaviour in Red wattled lapwing (Thind *et al.*, 2022).

Chishty and Choudhary (2023) observed that chicks of Black-winged stilt started moving around in nest soon after the hatching. Chicks were seen foraging and feeding with parents after two to three days of hatching. When ever encountered the predators, parents stood straight and made loud sound with mobbing movement. Parents were seen hiding their chicks under the wings. One of parent was feeding near nest while another was at some distance.

The nests were having mean depth of 1.85 cm, with 15.3 cm outer diameter, an inner diameter of 11.6 cm; most of the structure made up of aquatic plants. The breeding season prolonged till May. About 92% of nests contained 4 eggs. Chicks hatched after about 25 days and after roughly 3 weeks the groups of about 14–18 individuals left the area (Ashoori, 2011).

Male was more involved in agonistic behaviour, encounter, locomotion and nest building compared to female. During egg laying period, comparatively male spent more time in nest constructing and egg covering than female that spent most of its time in foraging. During incubation female took over the nest duties and gave more time than male. Both sexes invest equally in parental care. During the reproductive period of female, male spent time in nest. Females usually aggressive toward other males and did not get involved in extra pair copulation to ensure male parental investment. Egg formation is indeed a highly energy-intensive process for female birds. This causes female to spend its 70% of time in foraging during the egg laying period (Cuervo, 2003). In monogamous species female would invest more energy in breeding in the beginning of incubation (Trivers, 1972), while male balances the cost by largely contributing in parental care (Burger, 1981).

Nest near the water were large and included mud as one of its elements. Breeding failure was due to flooding and predation by rats. In BWS success of nesting was not affected by location and its composition (Cuervo, 2004).

The nest materials were rootlets of wheat, the straw pieces, and some mollusc shells in the dry ploughed field. Around pond or pools the nest building materials were rotting leaves, small dry branches and sometimes even pieces of thermocol.

The choice of building material depended on availability of different type of nesting material at the nesting ground (Cuervo, 2004; Barati *et al.*, 2012).

Few nests were constructed on the bars of vegetation which were linked to mainland and surrounded by shallow body. The water depth varied significantly from 20 cm and 200 cm from the nests centre, that were present above water. The data showed that the nests were built on elevated areas. Most of nests were constructed near the vegetation, the plant species were of habitat like salt marsh with temporarily brackish water (Goutner, 1989).

Small islets and elevated areas around water were the preferred breeding sites for BWS if it is available (Tinarelli, 1986). Some other researchers such as Robin (1968a, b), Naurois and Bonnaffoux (1969), and Bologna *et al.* (1978) reported similar habitat preference in which breeding near or above water was seen. In dry conditions, small wetlands played a crucial role as breeding sites for these birds (Joensen and Jerrentrup, 1988). Rice fields, with their abundant water and invertebrates, serve as breeding sites for various waterbirds (Fasola and Ruiz 1996). The successful nests of BWS were higher in number in natural marshes (Toral and Figuerola, 2012).

In cases where the breeding population was small or the nesting territory had poor feeding conditions, such as high-water levels, the family may abandon the nesting territory and established a new one elsewhere for rearing the chicks. Birds that bred successfully at Shinhama Imperial Preserve left the site once their chicks could fly, between mid-June and early July. Families that had unsuccessful breeding, losing their eggs due to flood or predators like snakes and crows left immediately or the next day unless they attempted to nest again (Kitagawa, 1988).

Paz and Eshbol (2002) discussed various instances of BWS adoption among the various species in relation to interspecies and intraspecies adoption. In the observed cases of adoption, the behaviour and diet were merely different in the adopting species and adopted species. These adopted chicks were fed by breeding males but neglected once the host chicks hatched. Chicks were growing fine until the five days but started dying after their legs grew longer and got defected cause of unable to crouched under adoptive parents (Paz and Eshbol, 2002).

The bigamous trios were observed in Black-winged stilt consisting one male and two females. Between 1997 and 2006 six such cases were observed. These trios were post breeding groups having a parent and a female offspring of previous year or a family with unrelated to enter into bigamous trios as mating strategy during non-breeding season (Kitagawa, 2009).

During incubation daily nest survival of BWS increased, due to higher predation risk at early stages, effectiveness of species conservation requires understanding of distribution of reproducing individuals, their breeding success and the productivity in these habitats (Donovan and Thompson, 2001).

In the first week nest survival probability was 89.6%, dropped to 53.1% by fourteenth week. Anthropogenic activity and rise in water caused decreasing survival rates. Position and density of the nest decided the success of hatching and survival. Experienced and older birds preferred centre for nesting, pushed the younger pairs to the periphery. BWS form nest in small colonies like 2-50 pairs which defend their nests and territory vigorously. Nests were observed on rocks and pile of stones. Nests have shallow depression, found on vegetation piles, aquatic weed or near water. Early hatching shows significantly more success rate than the late hatching. Nesting period is usually April-June but during the study it extended till end of the August (Diallo *et al.*, 2019).

The comparison of the data collected from drone and traditional method revealed that the data collected from the drone flight is lesser. Drone found 18.1% less breeding pairs than the ground traditional method. So, the population

count is 2% lesser as compared to the ground method. The drone counted false breeding pair as well. However, drone count took lesser time (Valle and Scarton, 2020).

Breeding pairs were observed active at nesting site about a week before nest were spotted. Near the shallow water edge, solitary nests were located on the floating garbage. The same polluted area was used as both nesting and feeding site. Most of the nests were colonial; few solitary nests were located near the edge of pond, soil mound and ploughed fields. In both solitary and colonial nesting ground, the ground was utilized by both Black-winged stilt and Red-wattled lapwing (Thind *et al*., 2022).

Black-winged stilt chose such areas which were hard to locate by natural predators. Feral dogs, domestic animal and other natural predators were not able to access the nest so the nesting success and nesting survival of Black-winged stilt increased. Occasionally, nest was so simply built without the use of multilayer grass, twigs, stems or leaves. Such nest increased the nesting and hatching success because these were built with great camouflage properties. Rain caused unexpected change in water level which washed out breeding ground so the stilt lost its nest, eggs and young ones. Having black and white coloration which is easily noticeable increased the chances of predation (Chishty and Choudhary., 2023).

Conclusion

Black-winged stilt (BWS) is a wader from Charadriiformes family. The bird prefers wetland habitat and can also utilize human made or polluted habitat for foraging and breeding. Food of BWS consists invertebrates primarily mollusc, aquatic insects and their larvae. Breeding period lasts from March to May for utmost Western Palaearctic region, April-May for Africa and Iran. However, in southern Sumatra and Thai- Malay Peninsula breeding season lasts from May to October. Clutch size is mostly about four and the incubation period is of 25-26 days. Nests are usually made on islets in water or at the edge of water and can be solitary or colonial. Both parents contribute in nests building and parental care. The stilt shares its breeding ground with other birds like Red-wattled lapwing and Avocets. Post hatching chicks start moving around in nest and start feeding. Parents stay nearby and provide protection from predators and show aggressive behaviour by flying around the intruder and creating loud sounds. Homosexual behaviour, bigamous trios, and adoption kind of phenomenon were also reported in BWS. Black-winged stilt is a wader that is an important part of wetland ecosystem and provide enthusiastic view for birding and eco-tourism. It is under threat cause of anthropogenic activities (pollution, habitat destruction etc.), irregular rise of water level, predation, free roaming animal destruct eggs and thus cause low hatching rate. Wetland need to be protected to conserve whole wetland ecosystem as well as Black-winged stilt.

Ethical Statement

This is a review article hence no Ethical Approval needed.

Author Contributions

Each author has contributed equally to the study's planning, analysis, writing, and editing. All authors have read and agreed to the published version of the manuscript.

Conflict of Interest

The authors declare no conflicts of interest.

References

Abdillah H, Iqbal M and Amrul HM. (2012) First breeding records of Black-winged stilt *Himantopus himantopus himantopus* in Indonesia. Stilt 62: 18-21.

Adamou AE, Kouidri M, Chabi Y, Skwarska J and Bańbura J. (2009) Egg size variation and breeding characteristics of the Black-winged Stilt, *Himantopus himantopus*, in a Saharan oasis. Acta Ornithologica 44: 1-7.

Arnold TW. (1999) What limits clutch size in waders? J Avian Biol. 30: 216-220.

Ashoori A. (2011) Breeding ecology of the Black-winged Stilt *Himantopus himantopus* in Boujagh National Park, Gilan Province, Northern Iran. Podoces 6(1): 87-91.

Baker AJ and Pereira SL. (2009) Shorebirds (Charadriiformes). In: The timetree of life, (eds.) Hedges S.B. and Kumar S., Oxford University Press, pp. 432-435.

Baouab RE. (2008) Composition avifaunistique et fonctionnement des rizières de la province de Sidi Kacem (Maroc). Bull de l'InstitutScientifique, Rabat, section Sciences de la Vie 30: 37-44.

Barati A, Etezadifar F and Sharikabad VN. (2012) Contrasting reproductive ecology of Black-winged Stilt *Himantopus himantopus* at two colonies in W Iran. Wader Study Group Bull. 119(2): 120-124.

Blakers M, Davies SJJF and Reilly PN. (1984) The Atlas of Australian Birds. RAOU and Melbourne University Press, Melbourne.

Bologna G, Calchetti L and Petretti F. (1978) La nidificazione del cavalier d'Italia *Himantopus himantopus* nella laguna di Orbetello: datipreliminari. Avocetta 1: 25-39.

Boyd B. (1987) The Black-winged Stilts at Holme Norfolk Naturalists' Trust reserve. Twitching 1(6):148-150.

Burger J. (1981) Sexual differences in parental activities of breeding black skimmers. The American Naturalist 117: 975-984.

Casini L. (1986) Nidificazione di cavaliere d'Italia, *Himantopus himantopus*, ed avocetta, Recurvirostraavosetta, nella Salina di Cervia (Ravena). Riv Ital Ornitol. 56: 181-196.

Catry,T., Ramos, J.A., Catry, I., Allen-Revez, M. and Grade, N. (2004). Are salinas a suitable alternative breeding habitat for Little Terns *Sterna albifrons*?. *Ibis.* 146(2): 247–257.

Chishty N and Choudhary NL. (2023) Nesting ecology and breeding behavior of black-winged stilt (*Himantopus himantopus*) in wetland habitat of Mount Abu Wildlife Sanctuary, Rajasthan. Indian J Appl Pure Biol, 38(2): 652-660.

Cleland JB. (1911) Examination of contents of stomachs and crops of Australian birds. Emu-Austral Ornithol. 11(2): 79-95.

Cramp S. (1983) The birds of the Western Palearctic. Vol. 3. Oxford University Press, Oxford, pp. 913.

Cramp S and Simmons K. (1983) Handbook of the Birds of Europe, the Middle East and North Africa. The Birds of the Western Palearctic. Vol III, Waders to Gulls, Oxford University Press, Oxford.

Cuervo JJ. (1993) Biology of reproduction of the Avocet, *Recurvirostra avosetta*, and the Black-winged Stilt, *Himantpous himantopus*, in Spain. Ph.D. Thesis. Universidad Complutense de Madrid, Madrid.

Cuervo JJ. (2003) Cigüeñuelacomún – *Himantopus himantopus*. In: Enciclopedia virtual de los Vertebrados Españoles, (eds.) Carrascal L. M. and Salvador A., Museo Nacional de Ciencias Naturales. Madrid. http://www.verte bradosibericos.org

Cuervo, JJ. (2004) Nest-site selection and characteristics in a mixed-species colony of Avocets, *Recurvirostra avosetta*, and Black-winged Stilts, *Himantopus himantopus.* Bird Study 51: 20-24.

Cuervo JJ. (2005) Hatching success in Avocet *Recurvirostra avosetta* and Black-winged Stilt (*Himantopus himantopus*). Bird Study 52(2): 166-172.

Czech HA and Parsons KC. (2002) Agricultural wetlands and waterbirds: A review. Waterbirds 25(Special Publication 2): 56–65.

Davidson NC and Evans PR. (1986) The role and potential of man-made and man-modified wetlands in the enhancement of the survival of overwintering shorebirds. Colonial Waterbirds 9: 176-188.

Davidson NC and Rothwell P. (1993) Human disturbance to waterfowl on estuaries. Wader Study Group Bull. (Special Issue) 68: 97-106.

del Hoyo J and Collar NJ. (2014) HBW and Bird Life International illustrated checklist of the birds of the world, Vol 1, Non-passerines, Lynx Editions, Barcelona, pp. 422.

Delany S, Scott D, Dodman T and Stroud DA. (2009) An atlas of wader populations in Africa and Western Eurasia. Wetlands International, pp. 524.

Diallo AY, Ndiaye PI and Ndiaye S. (2019) Spatial distribution and nesting behavior of the Black-winged Stilt *(Himantopus himantopus,* Linnaeus 1758) in the peri-urban wetland of Dakar Technopôle (Senegal, West Africa). Int J Biold Chem Sci. 13(1): 34-48.

Donovan TM and Thompson FR. (2001) Modeling the ecological trap hypothesis: A habitat and demographic analysis for migrant songbirds. Ecol Applications11: 871-882.

Dostine PL and Morton SR. (1989) Food of the Black-winged Stilt *Himantopus himantopus* in the Alligator Rivers region, Northern Territory. Emu-Austral Ornithol. 89: 250-253.

El Malki S, Hanane S, Joulami L and El Hamoumi R. (2013) Nesting performance of the Black-winged Stilt and Collared Pratincole on a Moroccan coastal

wetland: a comparison between natural and artificial habitats. Wader Study Group Bull, 120(1): 47-52.

Fasola M and Ruiz X. (1996) The value of rice fields as substitutes for natural wetlands for waterbirds in the Mediterranean region. Colonial Waterbirds 19: 122-128.

Figuerola J. (2007) Climate and dispersal: Black-Winged Stilts disperse further in dry springs. PLoS One 2(6): e539.

Gochfield M, Burger J, Joseph R and Jehl JR. (1984) The classification of the shorebirds of the world. Shorebirds, Springer, Boston, MA. pp. 1-15.

Goriup PD. (1982) Behaviour of Black-winged Stilts. British Birds 75: 12-24.

Gounter V. (1989) Habitat selection by Black -winged stilts *Himantopus himantopus* in a Macedonian wetland, Greece. Avocetta 13: 127-131.

Hamilton RB. (1975) Comparative behaviour of the American Avocet and the Black-necked Stilt (Recurvirostridae). Ornithol Monographs17: 1-98.

Joensen AH and Jerrentrup H. (1988) The Agios Mamas Lagoon, Halkidiki, Greece, an area of international importance for breeding waders. Natura Jutlandica 22: 185-188.

Kersten M and Piersma T. (1987) High levels of energy expenditure in shorebirds: metabolic adaptations to an energetically expensive way of life. Ardea 75(2): 175-187.

Kitagawa T. (1988) Ethosociological studies of the Black-winged Stilt *Himantopus himantopus himantopus* II. Social structure in an overwintering population. Japanese J Ornithol. 37: 45-62.

Kitagawa T. (2009) Bigamous Trios in the Black-winged Stilt *Himantopus himantopus himantopus*: I. Pathways to form Bigamous Trios. J Yamashina Institute Ornithol. 40: 73-82.

Kumar CK, Thind SK, Joshua and Kaleka APS. (2020) Breeding behaviour of Red-wattled Lapwing, *Vanellus indicus* (Boddaert, 1783) in agricultural landscape of Punjab. Uttar Pradesh J Zool. 41(8): 27-51.

Lane BA. (1987) Shorebirds in Australia. Nelson, Melbourne, pp. 187.

Luisa AK, Esther SG, Francisco B and Antonio SZJ. (2011) Occupancy patterns of irrigation ponds by Black-winged Stilts *Himantopus himantopus*. Ardeola 58(1): 175-182.

Maheswaran G and Rahmani AR. (2001) Effects of water level changes and wading bird abundance on the foraging behaviour of black-necked storks *Ephippiorhynchus asiaticus* in Dudwa National Park, India. J Biosci. 26: 373-382.

Mamedova YP and Chaplygina AB. (2021) Breeding of black-winged stilt *Himantopus himantopus* in muddy sites of a wastewater treatment plant. Biosystems Diversity 29(3): 286-293.

Naurois de R and Bonnaffoux D. (1969) L'avifaune de L'Ile du Sel (Ilha Do Sal, Archipeldy Cap Vert). Alauda 37: 93-113.

Parveen S, Qadiri AH, Ursan TJ and Afshan (2018) Morphology and taxonomic study of black-winged stilt from district Larkana. Int J Fauna Biol Stud. 5(5): 1-2.

Paz U and Eshbol Y. (2002) Adoption of black-winged stilt chicks by common terns. The Wilson Bulletin 114(3): 409-412.

Pierce RJ. (1985) Feeding methods of stilts (*Himantopus spp.).* New Zealand J Zool. 12(4): 467-472.

Pierce RJ. (1986) Foraging responses of stilts (*Himantopus* spp.: Aves) to changes in behaviour and abundance of their riverbed prey. New Zealand J Mar Freshwater Res. 20: 17-28.

Pierce RJ. (1996) Family Recurvirostridae (stilts and avocets). Handbook of the Birds of the World 3: 332-347.

Pigniczki C, Nagy T, Oláh J, Nagy GG, Karcza Z and Schmidt A. (2019) Breeding, dispersal, migration and conservation of the Black-winged Stilt (*Himantopus himantopus*) in Hungary. Ornis Hungarica 27(2): 1-19.

Pizzey G and Knight F. (1997) 'The Graham Pizzey and Frank Knight field guide to the birds of Australia. Harper Collins: Sydney.

Robin AP. (1968a) Nidifications sur l'Iriki, dayatemporaire du sud Marocain en 1965. Alauda 34: 81-101.

Robin AP. (1968b) L'avifaune de l'Iriki (Sud-Marocain). Alauda 36: 237-253.

Romè A and Travison G. (1982) Nuovidatisul Cavaliere d'Italia (*Himantopus himantopus*) in Italia. Rivista Italiana di Ornitologia 52: 85-90.

Snow DW and Perrins CM. (1998) The Birds of the Western Palearctic. vol. 1. Non-passerines. Oxford University Press, Oxford.

Sordahl R. (1994) Eggshell removal behavior of American avocets and Black-necked Stilt. J Field Ornithol. 62: 461-465.

Studer-Thiersch AP. (1968) Notes on waterbirds of a lagoon in Andalusia (observations in March–June 1967). Ardeola 14: 167-174.

Swann RL and Etheridge B. (1989) Variations in mid-winter weights of Moray Basin waders in relation to temperature. Ringing Migration 10(1): 1-8.

Taylor IR and Taylor SG. (2005) The effect of wind on the foraging behaviour of Black-winged Stilts in SE Australia. Wader Study Group Bull. 106: 47-50.

Thind SK, Kumar C and Kaleka AS. (2022) Breeding behaviour of Black-winged stilt, *Himantopus himantopus* (Linnaeus, 1758) in agricultural landscape of Punjab, India. Intern J Zool Invest. 8(2): 695-709.

Tinarelli R. (1986) II Progetto Cavaliere d'Italia: primirisultati e proposte future. Boll Museo Storia Naturale Lungiana 4: 43-52.

Tinarelli R. (1987) Wintering biology of the Black-winged Stilt in the Maghreb region. Wader Study Group Bull. 50: 30-34.

Tinarelli R. (1991) Habitat preference and breeding performance of the Black-winged Stilt *Himantopus himantopus* in Italy. Wader Study Group Bull. 65: 58-62.

Toral GM and Figuerola J. (2012) Nest success of Black-winged Stilt *Himantopus himantopus* and Kentish Plover *Charadrius alexandrinus* in rice fields, southwest Spain. Ardea100: 29-36.

Tornielli A. (1979) Nidificazione del Cavaliere d'Italia*Himantopus himantopus* (L.) in provincial di Parma. Rivista Italiana di Ornitologia 49: 286-289.

Trivers RL. (1972) Parental investment and sexual selection. In: Sexual selection and the descent of man, (ed.) B. Campbell. Heinemann, London. pp. 136-179.

Ueng YT, Wang ZP, Hou PCL and Perng JJ. (2009) Diet of Black-winged stilt chicks in coastal wetlands of Southwestern Taiwan. Waterbirds 32(4): 514-522.

Valle RG and Scarton F. (2020) Feasibility of counting breeding Pied Avocets and Black-winged Stilts using drones. Wader Study 127(3): 257-265.

Wetmore A. (1925) Food of American phalaropes, avocets and stilts. US Department of Agriculture, 1359, 1-20.

Wiersma P and Piersma T. (1994) Effects of microhabitat, flocking, climate and migratory goal on energy expenditure in the annual cycle of red knots. The Condor 96(2): 257-279.

Yeates GK. (1941) Some breeding-habits of the black-winged stilt. British Birds 35: 42-46.