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A Comprehensive Analysis: Ecology, Distribution, Dietary Habits, Foraging and Roosting Behaviors, Reproductive Biology and Survival Threats of the Black Kite

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Abstract: Black kite (*Milvus migrans*) is a medium-sized raptor belonging to the family Accipitridae and order Accipitriformes. It is a widely distributed raptor species found across Europe, Asia, Africa and Australia. Black kite exhibits dark brown plumage and a subtly forked tail, which creates a distinctive silhouette during flight. This adaptable raptor's widespread distribution and distinctive appearance renders it a familiar sight in many parts of the world, where it plays a significant role in various ecosystems. The species exhibits extensive dispersion and adaptability to a variety of habitats, including forests, grasslands and agricultural lands, nearby wetland habitats, urban areas, woodlands and open countryside's. It is an opportunistic feeder that consumes small mammals, birds, fish, carrions and anthropogenic food waste. Black kites exhibit two distinct roosting strategies: pure communal roosts, where only black kites occupy the trees, and mixed communal roosts, which comprise other species such as *Corvus splendens*, *Acridotheres tristis*, *Psittacula krameria*, *Bubulcus ibis* and *Ardeola grayii* cohabiting with black kites. Black kites typically breed in a variety of habitats, such as agricultural, forest, and grassland, as well as in urban areas. They are also known to nest on tall trees and human-constructed structures like mobile towers. Usually, both males and females participate in the construction of nests, incubation of eggs and nourishing of hatchling and nestling. The remarkable ability of black kite to adapt to urban environments has led to notable behavioral changes, including the use of artificial materials in nest construction and novel foraging strategies in and around human settlements areas. These adaptations demonstrate the species' cognitive flexibility and capacity for problem-solving in response to environmental challenges. The IUCN classifies it as the least concerning due to its extensive range and stable population. The species faces ongoing threats from pollution, pesticide use and collisions with anthropogenic structures, including electrocutions and road kills, underscoring the need for conservation initiatives to ensure its long-term survival.

Keywords: Black kite, Raptor, Habitats, Opportunistic feeder, Nesting, Tree, Human settlements, Threat, Conservation

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Introduction

Birds serve as effective ecological indicators and exhibit sensitivity to environmental degradation (Clergeau *et al*., 2001; Lin *et al*., 2008). Black Kite is a medium-sized predatory bird or raptor species. This gregarious scavenging avian species attains a length of 55–60 cm and is readily identifiable by its distinctively streaked dark brown coverts, angled wings and bifurcated tail (Kiama *et al*., 2001; Salakij *et al*., 2019). From a distance, it appears nearly black, with a faint brown stripe on the shoulder. Due to the presence of a bifurcated tail, this species also has an alternative name, such as fork-tailed kite. Eye of the black kite is dark brown, while the bill, the area of skin surrounding the nostrils, black, with a yellow hue. Both sexes exhibited similarities in external appearance and morphology such as other Acciptirformes birds including Indian Vulture (*Gyps indicus*) (Choudhary and Chisthy, 2020; Choudhary *et al*., 2023). Juveniles of black kites often have a lighter coloration than adults and possess a relatively shallower forked tail. Black kites frequently aggregate in communal roosts and breeding colonies. These communal assemblages can range from small groups to extensive congregations numbering in the thousands, particularly during non-breeding seasons. The formation of these colonies often occurs in proximity to abundant food sources, such as landfills or agricultural areas, which provide substantial foraging opportunities for the kites. Furthermore, these social behaviors may confer benefits such as enhanced protection from predators and facilitated information sharing about food resources among conspecifics (Bernis, 1980; Cramp and Simmons, 1980; Shiraishi *et al*., 1990).

Black kite exhibits opportunistic foraging behavior, which compels them to consume the most abundant and accessible prey, particularly slow-moving and injured animals, as well as food acquired through scavenging (Arroyo, 1978; Cramp and Simmons, 1980; Shiraishi *et al*., 1990). These opportunistic raptors are known to adapt their diet according to local availability, frequently congregating near human settlements and landfills to exploit abundant food sources (Shiraishi *et al*., 1990). Black kites also demonstrate remarkable agility in flight, enabling them to capture prey from the ground. Their scavenging behavior not only contributes to their survival but also plays a crucial role in ecosystem health by facilitating the removal of carrion and regulating populations of small animals including insects in agro ecosystem (Shiraishi *et al*., 1990).

This review focuses on comprehensive analysis on various ecological and behavioral aspects of the black kite (*Milvus migrans*).

(1) *Taxonomy*

Kingdom – Animalia; Phylum- Chordata; Class- Aves; Order– Accipitrifomes; Family– Accipitridae; Scientific Name: *Milvus migrans* (Boddaert, 1783); IUCN Status: Least Concern (BirdLife International, 2024).

(2) *Distribution and population status of black kite*

Black kite (*Milvus migrans*) is a widespread and globally distributed raptor found across Eurasia, Africa, Asia and Australia (Ferguson-Lees and Christie, 2001). Black kite (*Milvus migrans*) is potentially the most abundant raptor species globally, with the exception of the Nearctic and Neotropic regions (Ferguson-Lees and Christie, 2001). It is also widely distributed across the Palearctic, Afro-Malagasy, Indomalayan and Australian regions (Panuccio *et al*., 2013; Nunes *et al*., 2015; BirdLife International, 2024). It is ubiquitous in the Palearctic, Afro-Malagasy, Indomalayan and Australian regions (Panuccio *et al*., 2013; Nunes *et al*., 2015). Wider distribution of the black kite is attributed to its adaptability to diverse habitats and its opportunistic feeding behavior including scavenging and hunting. This species has demonstrated remarkable resilience in urban environments, frequently thriving in close proximity to human settlements. Its success across such vast geographical areas renders it an ideal subject for investigating avian adaptation and

ecological plasticity in response to environmental changes (Kostrzewa, 1991; BirdLife International, 2024). Global population of black kite is estimated to be between 1,470,000- 1,980,000 adults, with the European population constituting 11% of this total, comprising 81,200-109,000 breeding pairs (BirdLife International, 2016). The black kite (*Milvus migrans*) has also been ranked among the most ubiquitous and numerous raptors on a global scale (Kostrzewa, 1991; BirdLife International, 2024). Numerous studies show that this species demonstrate a broad distribution across the temperate and tropical zones of Europe (Dombrovski and Ivanovski, 2005; Literak *et al*., 2017, 2019), Asia (Desai and Malhotra, 1979; Wassink and Oreel, 2007; Vaishnav *et al*., 2022; BirdLife International, 2024) and Africa (Hille and Thiollay, 2000; Dowsett-Lemaire and Dowsett, 2009, 2013). Additionally, the black kite's range extends to Australia, New Guinea and New Zealand (McGill, 1955; Andreyenkova *et al*., 2021) as well as the Atlantic Islands (Hille and Collar, 2011; Nunes *et al*., 2015), Oceania (Wiles *et al*., 2004; Nagai and Tokita, 2022) and the West Indies (Gallardo and Thorstrom, 2019; Raffaele *et al*., 2020).

(3) *Habitat, ecology and adaptation towards urban areas*

Black kite is a medium-sized prey bird that is extremely adaptable and can be found in various habitats. In some regions, they prefer the proximity of wetlands to other habitats, such as forest, agricultural and urban areas (Choudhary and Chishty, 2023, 2024). It has been observed that temperate populations are migratory, whereas tropical populations are resident (Goriup and Tucker, 2007). Black kites are found to be prevalent scavengers in tropical villages and communities that generally have low sanitation standards and are tolerant to human beings (Schreiber *et al*., 2000). It is typically a gregarious species, with birds frequently migrating to dispersed flocks and roosting communally (Ferguson-Lees and Christie, 2001). Mazumudar *et al*. (2017a, b) observed that black kites exhibited the maximum pre-roosting variables during the monsoon season followed by summer and lowest in the winter. Raptors exhibit temporal fluctuations in habitat preferences, with certain species utilizing specific habitats throughout the designated times of the year (Tapia *et al*., 2007). Furthermore, mating and roosting habitats have been documented to affect raptor populations at the micro scale (Bevers and Flather, 1999). Numerous studies have been undertaken regarding habitat utilization and the selection of nesting and roosting sites (Squires and Kennedy, 2006).

Black kites inhabit a diverse range of environments and favor areas with a modest degree of human influence (Sanchez-Zapata *et al*., 2003; Bustamante and Seoane, 2004; Vaishnav *et al*., 2022). Within their breeding range, they predominantly favor mature forests (Thiollay, 1996; Handrinos and Akriotis, 1997), open landscapes, including agricultural areas (Lang *et al*., 2007, 2019; Choudhary and Chishty, 2024), grasslands (Mendelsohn, 1997), regions of human habitation (Spierenburg, 2005; Vaishnav *et al*., 2022) and frequently in proximity to water and extensive networks of aquatic habitats (Lang *et al*., 2007, 2019). Contrary to patterns identified in other regions, Palomino and Carrascal (2007) found that in central Spain, this species eschewed locations significantly modified by human activity, such as urban centers, suburban locales and deforested pastures. Moreover, raptors demonstrate temporal variations in habitat preferences, with certain species utilizing specific habitats throughout the designated times of the year (Tapia *et al*., 2007). Post-breeding aggregations of numerous birds have also been documented at urban and rural refuse sites cohabiting with other conspecifics (Shirihai, 1996; Handrinos and Akriotis, 1997; Dahal and Bhuju, 2008; De Giacomo and Guerrieri, 2008; Sharma and Soni, 2017). Sarker (1986), Chowdhury (2020) and Mallick (2023) found that prevalent resident scavengers in Sunder bans often inhabit the

forest's edge, congregate at fishing and fish drying sites, roost in trees and generally disperse once the fishing season concludes (Shirihai, 1996).

(4) N*esting and breeding behaviors of black kite*

Nests are found to be constructed on a platform-like structure at the fork or branch of a tree and are sometimes observed on mobile towers in Southern Rajasthan including Udaipur district and Mount Abu Wildlife Sanctuary (Vaishnav *et al*., 2023; Choudhary and Chishty, 2024). Khand *et al*. (2021) conducted a study on the breeding biology and population status of the black kite in Pokhara valley, Nepal and found that the species typically breeds from March to May or June. Breeding activities commence with nest preparation and egg-laying in March followed by the incubation phase in April and the nesting season extending from March to June. They observed a black kite constructing a solitary nest in a single tree, favoring the reuse of an older, larger nest situated on a tall *Bombax ceiba*. The Black kite constructs its nest in tall trees and the selection of plant species for nest construction typically relies on indigenous flora. Additionally, nests have been observed on anthropogenic structures such as mobile towers (Chishty *et al*., 2022; Vaishnav *et al*., 2022; Choudhary and Chishty, 2024). Choudhary and Chishty (2024) observed black kite nests on plant species such as *Azadirachta indica* and *Eucalyptus* trees in and around Mount Abu Wildlife Sanctuary. Black kite nest locations are distributed throughout several habitats, including roadside areas, urban environments, agricultural regions and wetlands (Chishty and Choudhary, 2020a; Vaishnav *et al.,* 2022; Choudhary and Chishty, 2024). In Morocco, this species is a common migrant and widely distributed, with breeding populations extending from the Mediterranean coast to the southern High Atlas (Bannerman and Priestley, 1952; Literák *et al*., 2017; Onrubia and Martín, 2021). Black kites typically re-utilize existing nests when feasible; similarly, other raptors, such as Indian Vultures (*Gyps indicus*), generally re-use nests in consecu-tive breeding seasons (Chishty and Choudhary, 2020b; Choudhary and Chishty, 2020; Choudhary *et al.,* 2023). Zoochi *et al.* (2004) conducted a study on the characteristics of black kite nest trees in two Italian colonies, documenting the presence of nests, a significant reduction in nest size and twig dimensions (exceeding those observed in crow nests), the occurrence of eggshell fragments on the ground, and the incorporation of artificial materials in the nests or their immediate vicinity. It was also found that 90.6% of all nests were situated on oak trees, and black kites preferen-tially construct their nests on "Chandelier" type branch platforms.

The black kite had a robust positive connection between nest height and tree height. The black kite positioned its nests higher on larger trees to evade predation (Zoochi *et al*., 2004). Both males and females participate in nest construction, incubation and chick rearing; however, females reportedly allocate more time to nests (Naoroji, 2007; Malhotra, 2007). The male supplies the majority of the nesting materials, whereas the female organizes them within the nest (Gupta and Kanaujia, 2012). During the late nest-building phase, the female predominantly stays in the nest to incubate the eggs and nurture the chicks, while the male gathers nesting and food supplies (Gupta and Kanaujia, 2012). Black kites typically protect a territory 100–200 m around their nests and engage in communal foraging in adjacent regions (Sergio *et al*., 2005). In India, the mating season for black kites commences in winter, and the fledglings depart prior to the onset of monsoons (Vaisnav *et al*., 2023; Choudhary and Chishty, 2024). Gupta and Kanaujia (2012) observed courtship behavior in Black kite and found that black kites, involve impressive aerial displays of synchronized soaring, diving and foot touching, with mating typically occurring on perches or nests. Extra-pair copulations are prevalent in black kites (Koga and Shiraishi, 1994). The adult birds typically defend their nest vigorously and swoop viciously at intruders. Study on breeding ecology has demonstrated that the timing and

duration of nest construction, egg deposition, incubation, fledging and overall breeding phenology significantly differ among various subspecies and across different regions of their distribution (Adamian and Klem, 1999; Sergio and Boto, 1999;Vaishnav *et al*., 2022; Choudhary and Chishty, 2024). Very little investigation has been conducted on the eggs of black kite (Adamian and Klem, 1999; Malhotra, 2007). The clutch of black kites typically comprises two to three eggs, occasionally one and infrequently four (Adamian and Klem, 1999; Malhotra, 2007). Numerous studies on raptors demonstrate that food availability is a critical factor influencing reproduction, with supplementary feeding often resulting in earlier egg-laying (Aparicio and Bonal, 2002), increased clutch sizes (Korpimaki and Wiehn, 1998) and improved breeding success (Wiehn and Korpimaki, 1997). Several investigations have indicated that older individuals typically initiate nesting earlier, produce larger clutches and exhibit higher reproductive success as compared to young once (Nielsen and Drachmann, 2003). Furthermore, reproductive outcomes are influenced by habitat quality and meteorological conditions (Sergio, 2003). Veiga and Hiraldo (1990) investigated the growth of nestlings, whereas Forero *et al.* (2002) examined natal dispersal distance. Behavioral studies on black kites indicate the presence of parent-offspring conflict concerning brood size. Black kites demonstrate hatching asynchrony (Vinuela, 1999), facultative siblicide and cannibalism (Vinuela, 1991), along with sluggish growth and elevated mortality rates of the last-hatched chicks (Vinuela, 1991). Siblings frequently exhibit hostility against one another, potentially resulting in the death of the weaker chick; yet, parent birds have been observed to preferentially feed the smaller chicks in experimentally modified nests (Vinuela, 1999). Desai and Malhotra (1979) and Malhotra (2007) thoroughly examined the breeding characteristics of black kite in the Delhi Zoological Park. Malhotra (2007), Naoroji (2007), Gupta and Kanaujia (2011), Vaishnav *et al.* (2022) and Chishty *et al.* (2022) have also made observation regarding breeding phenology, breeding behavior, nest structures and nest sites and substrates of the black kite.

(5) B*lack kite studies scenario in India*

In India, few studies have been devoted to habitat and substrate utilization by black kites. There are virtually no publications that have examined the habitat requirements and criteria of black kite on a spatial scale throughout the Indian subcontinent. Ali and Ripley (1983) extensively characterized the habitat of the black kite, noting its presence in urban areas and rural human settlements, including the encampments of nomadic herdsmen. Additionally, sporadic observations by multiple investigators have clarified the habitat utilization of *Milvus migrans govinda* for nesting foraging, and roosting in this country (Mahabal and Bastawade, 1985; Malhotra, 1990; Sharma and Soni, 2017; Vaishnav *et al*., 2022; Chishty *et al*., 2022; Choudhary and Chishty, 2024).

(6) *Foraging, feeding and roosting behavior of black kite*

Breeding and non-breeding divisions of raptor populations frequently utilize identical foraging sites (Newton, 1979). Nonbreeding, non-territorial adults and sub-adults have broader home ranges and enhanced mobility compared to breeders, typically congregating in food-abundant locations (Newton, 1979). Black kite exhibits remarkable dietary adaptability, consuming carrion as well as live birds, mammals, fish, lizards, amphibians and invertebrates. Additionally, it is observed that black kite forage on plant matter, including palm oil fruits and human-generated waste (Shiraishi *et al*., 1990; Blanco, 1997; De Giacomo and Guerrieri, 2008). Moreover, the black kite preys on rodents, squirrels, fish, insects, amphibians, reptiles, smaller birds and arthropods species including grasshoppers (Kedar, 2020). The presence of mouse body pieces, rabbit remains and a pigeon feather around black kite nests suggests their diverse prey consumption. The black kite is also known to pilfer food from children's hands (Sharma and Soni, 2017; Chishty *et al*., 2022). Sharma and Soni (2017) conducted a study on the

feeding behavior of black kites in the arid region of Rajasthan and found that these birds exhibit seven distinct types of feeding behaviors across various microhabitats:

(i) *Standing on the ground*: Black kites are frequently observed monitoring their prey while either standing fixed on the ground, walking, or feeding while vocalizing.

(ii) *Snatching*: Black kite is frequently observed capturing airborne insects and small birds. (iii) *Hovering*: This practice is performed by kites or birds to locate their prey. The birds soared in a circular pattern above the anticipated location of their prey.

(iv) *Perch hunting*: Birds settle or rest, usually on a branch or horizontal bar, and pursue their prey.

(v) *Gliding and soaring*: This refers to a form of hovering wherein birds ascend effortlessly and remain suspended in the atmosphere at considerable altitudes.

(vi) *Intraspecific kleptoparasitism*: A feeding behavior characterized by thievery among conspecific birds.

(vii) *Interspecific kleptoparasitism*: Feeding behavior characterized by thievery among avian species (Sharma and Soni, 2017).

Black kites are documented to prey on small and injured avian species (Hussain *et al*., 2016) including parakeets (Lowther and Detroit, 1944), white-throated kingfishers *Halcyon smyrnensis* (Narayanan, 1989), palm swifts *Cypsiurus parrus*, rock pigeons *Columba livia* (Naoroji, 2007) and bats (Ali and Ripley, 1983). Blanco (1997) conducted a study on the role of trash as sustenance for migrating, floater and breeding Black kites. They categorized the food of the black kite into two primary categories: (a) Wild food material acquired through hunting and scavenging (*e.g.,* wild birds, mammals, fish); (b) Food materials receiving from garbage's and dumps sites (*e.g.,* food items deliberately thrown by humans, including household garbage, offal from abattoirs and butcher establishments and marine fish) (Blanco, 1997). Refuse ingested by both breeding and non-breeding black kites primarily comprised small food fragments, including fish and poultry parts (predominantly heads, wings and legs) as well as animal bones. It is concluded that breeding black kites typically roost near their places of nesting during the breeding season. Following the breeding season, black kites congregated at communal roosts. Kaushik and Gupta (2014) observed that black kite predominantly roosts *Ficus* species (*Ficus religiosa* and *Ficus bengalensis*) and mango trees (*Mangifera indica*) in the Kurukshetra region of Haryana state. It is observed that feeding opportunities for black kites in this region have also diminished due to urban expansion, the formation of new housing developments, and the removal of waste disposal sites from the city. Mazumdar *et al.* (2017a, b) investigated the communal roosting behavior of the black kite in urban metropolitan areas of India, revealing a preference for roosting on 21 tree species, including *Samanea saman*, *Parkia biglandulosa*, *Roystonea regia*, *Terminalia arjuna*, *Polyalthia longifolia*, *Mangifera indica*, *Bombax cieba*, *Ficus religiosa*, *Cocos nucifera*, *Ficus benghalensis*, *Swietenia sp.*, *Azadirachta indica*, *Terminalia catappa*, *Eucalyptus sp.*, *Dalbergia sissoo*, *Anthocephalus chinensis*, *Erythrina variegata*, *Borassus flabellifer*, *Pterygota alata*, *Areca catechu* and *Delonix regia***.** Mazumdar *et al.* (2017a, b) also found that the black kites display two distinct roosting strategies: pure communal roosts, where only black kites inhabit the trees, and mixed communal roosts, which include other species such as *Corvus splendens*, *Acridotheres tristis*, *Psittacula krameria*, *Bubulcus ibis* and *Ardeola grayii* cohabiting with black kites.

(7) *Flight and vocalization behavior of black kite*

Mukundan *et al.* (2014) identified three flight modes of the black kite: flapping, soaring and gliding. They observed that during periods of rest and relaxation, significant amounts of time are allocated or spend to preening the various body regions. Mukundan *et al.* (2014) primarily documented two distinct forms of calls: one, a

prolonged and drawn-out sound, which seems to be linked to communication with other members or the exhibition of territoriality. The second call was found to be more piercing and briefer and indicative of hostility, agitation, or intimidation. Vocalization was observed during both flight and rest periods. Young individuals were seen to be louder than adults, likely because of their continued dependence on parents for food materials and protection from predators (Mukundan *et al*., 2014).

(8) E*cological importance of black kite*

Black kites play an essential role as scavengers in their environment. The structure and diversity of avian populations serve as bio-indicators of habitat alteration. Raptors indirectly enhance seed production and regulate pest populations by preying on various vertebrates, thus facilitating long-distance seed dissemination and biodegradation by breaking down and decomposing plant and animal matter. Black kite preys on numerous agricultural pests that damage crops. Furthermore, raptors including black kite consume road kill, which may mitigate disease transmission (Meyer and Francle, 1995; Choudhary and Chishty, 2020; Chishty *et al*., 2021). Black kite has emerged as a favored subject for bird and ecotourism in some regions globally. The black kite holds significance from both environmental and sociocultural perspectives. Certain religious sects in India provide sustenance for black kites (Kumar *et al*., 2019). It is a facultative scavenger avian species that consumes carrion, thereby contributing to environmental hygiene. In the absence of obligate scavengers, such as vultures, the responsibility for carcass disposal has shifted to facultative vertebrate scavengers, particularly in urban environments (Inger *et al*., 2016). The black kite is crucial for urban biodiversity and planning because of its skill at utilizing urban resources and landscapes (Srinidhi and Pramod, 2021).

(9) G*lobal level threat of black kite survival*

Black kite's favored habitats, a variety of habitats, including forest, agricultural, wetlands, and grasslands, are in jeopardy from anthropogenic activities such as agriculture, urbanization and industrial expansion (Chishty and Choudhary, 2020a; Choudhary and Chishty, 2024). Currently, their populations are diminishing because of predation by numerous crop-destroying pests. The number of black kites is decreasing because of rodenticide consumption, illicit poisoning and alterations in agricultural practices (Heneberg *et al*., 2016; Hong *et al*., 2018). Black kites host various external parasites including *Colpocephalum turbinatum*, *Laemobothrion maximum* and *Degeeriella regalis* lice species (Saxena, 2017). Notwithstanding the considerable flexibility of black kites, human activities during the latter half of the 20th century have significantly diminished their populations in certain regions of world. European population has been adversely affected by rapid economic growth, which has led to the loss of nesting habitats, chemical pollution and direct slaughter of raptors. The population of black kites began to decline significantly in the 1970s and in Western Europe, this decline persisted throughout the 1980s (Bijleveld, 1974; Ferguson–Lees and Christie, 2001; Andreyenkova *et al*., 2021). During the 1990s, economic downturns in Russia resulted in a significant reduction in environmental exploitation. Black kites saw a drop in consumption due to rodenticide, unlawful poisoning and alterations in agricultural practices (Heneberg *et al*., 2016). Habitat loss and fragmentation, along with several other anthropogenic hazards, have been linked to detrimental effects on raptors (Thiollay and Rahman, 2002; Choudhary *et al*., 2021). Black kites, although infrequent, have been documented as victims of electrocution (Forero *et al*., 1999; Janss, 2000; Forero *et al.,* 2002; Choudhary and Chishty, 2022) and lethal collisions with vehicles (Bayle, 1999; Choudhary and Chishty, 2022). Mendelssohn and Paz (1977) documented extensive death in kites resulting from consumption of poisoned voles in agricultural areas. A significant reduction in kite populations has been attributed to extensive pesticide application in

Java (Van-Balen *et al*., 1993). Pesticide pollution is a significant issue that contributes to the decline of various raptor populations in North America and Europe, particularly among certain countries. This decline, attributed to reproductive failures in the 1960s and the early 1970s, has been linked to the bioaccumulation of organochlorine pesticides (Cade *et al*., 1988; Noble *et al*., 1993). Dhananjayan and Muralidharan (2010) observed that despite an upward trend, the concentration of DDE in the plasma of *Milvus migrans govinda* in Ahmedabad remained within the range previously documented by Kaphalia *et al.* (1981) in the urban population of Lucknow, with both levels of DDE significantly below toxic concentrations. Godshe *et al*. (2012) investigated the heavy metal concentrations in the feathers of scavengers in Gujarat, which indicated that the levels were within a non-toxic range. Naoroji (2007) recorded the predation of black kite eggs by house crows and large-billed crows. Additionally, nest disturbance (Gupta and Kanaujia, 2011), rising ambient temperatures (Gupta and Kanaujia, 2012) and indiscriminate killing for amusement or superstitious beliefs (Gupta and Kanaujia, 2011, 2012) have been identified as further risks to black kites survival. Kaushik and Gupta (2014) noted a significant decrease in the black kite population in Kurukshetra, Haryana, attributing this decline to insufficient roosting sites and foraging grounds resulting from the removal of large trees and the elimination of garbage dump sites in urban areas.

Conclusion

Black kite (*Milvus migrans*) is a medium-sized raptor in the family Accipitridae. It is prevalent in Europe, Asia, Africa and Australia and is among the most abundant raptor species worldwide. In certain locales, it exhibits migratory behavior, with populations relocating to warmer areas in winter. It exhibits significant adaptability, inhabiting several environments: urban locales, including cities and towns; woods, woodlands and open countryside; coastal areas and wetlands; frequently in proximity to human populations due to scavenging prospects. Nesting season differs by region; often occurring from spring to early summer. The species constructs nests in trees, or on anthropogenic constructions structures such as mobile tower, often laying 1-4 eggs each clutch. Both parents engage in nest construction, incubation and the nurturing of chicks. Significant threats to the species include habitat destruction due to urbanization and deforestation, vehicle and structural collisions, electrocution from power lines, poisoning from pesticides and other toxins in certain regions, and competition with other scavengers in urban area. The black kite is a highly adaptable bird and it is able to consume a wide variety of foods, including fish, frogs, reptiles, carrion, live birds, mammals and invertebrates. They also feed on human waste products, fruits that contain palm oil and plant detritus. Rodents, squirrels, fish, insects, amphibians, reptiles, smaller birds and arthropods are among the prey of black kites. They have been known for stealing food from kids' hands. Feeding behaviors observed in a variety of microhabitats include gliding and soaring, perch hunting, snatching, hovering, standing on the ground, intraspecific kleptoparasitism, and interspecific kleptoparasitism. They mostly consume small pieces of food, such as animal bones, heads, wings, legs and portions of fish and poultry. During the mating season, breeding black kites usually roost close to their nesting locations; after the season, they gather at communal roosts.

To protect black kite populations, conservation efforts must address the following key challenges -- Develop urban planning strategies that protect and conserve green spaces and arboreal resources; Conserve and restore forest; woodland and wetland ecosystems and help in bird conservation. Implement avian-friendly architectural designs to mitigate collision risks. Enhance electricity infrastructure by incorporating insulation and visual indicators to prevent electrocution. It is imperative to regulate and monitor the application of agricultural pesticides and to promote sustainable agricultural practices. Educate populations regarding the ecological significance of black kites and enforce

regulations that protect raptors from hunting or intentional harm. Protect and conserve mature trees in both urban and rural environments; install artificial nesting structures in appropriate ecosystems. Conduct regular population censuses to monitor demographic trends; examine migration patterns and habitat utilization to inform conservation measures. Develop trans-boundary conservation strategies for migratory populations and facilitate the exchange of knowledge and best practices among nations within the species' distribution. Establish educational initiatives emphasizing the ecological importance of black kites. Promote citizen science efforts for the monitoring and documentation of observations. By addressing these factors, conservation initiatives can enhance the long-term viability and well-being of black kite populations across their distribution range.

Conflict of Interest

The authors declare no conflicts of interest.

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