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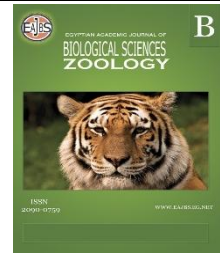


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Recording of Mite Ectoparasites Associated with House Crows (*Corvus splendens*) in Canal Cities, Egypt

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ABSTRACT

A survey was conducted in the three Canal cities of Suez, Ismailia, and Port Said to record the diversity of external animal parasites associated with crows. These birds occur in exceptionally high densities, particularly in Suez and Ismailia, raising significant public health and veterinary concerns. Crows harbour numerous acarine parasites that may be transmitted within residential areas such as restaurants, schools, homes, playgrounds, hospitals, and food storage facilities (grain and meat warehouses). In addition, their presence along the Suez Canal, on commercial ships, and in other transport settings facilitates the spread of these parasites across regions and countries. Crows also impose serious risks to poultry, cattle, and sheep farms, where they are considered important vectors of both external and internal parasites, especially acari. The results of the current study demonstrated that crows in these cities are infested with a wide variety of ectoparasites, primarily mites and ticks. In total, 24 species were collected, comprising four tick species and 20 mite species. These findings highlight the urgent need for further comprehensive studies on ectoparasites of both resident and migratory birds, given the current and future importance of this issue for animal health, human health, and biosecurity.

INTRODUCTION

Crows are highly adaptable birds that thrive in a wide variety of environments, including urban, rural, and agricultural areas. They are omnivorous in nature, feeding on grains, fruits, insects, small animals, and carrion, which makes them closely associated with human settlements and waste sources (Hornok *et al.*, 2013). Their social behaviour, tendency to form large flocks, and their ability to roost in populated areas further increase the chances of spreading ectoparasites. This close interaction with both humans and domestic animals enhances the risk of parasite transmission, emphasizing the importance of monitoring crows as potential reservoirs of various parasitic species (Keskin and Erciyas-Yavuz, 2016).

Egypt hosts remarkable biodiversity and serves as a major crossroads for bird migration between Africa and Europe. Along these migratory routes, many birds are vulnerable to injuries caused by vehicle collisions, powerlines, wind turbines, or poisoning. Both wild and domestic

birds are frequently exposed to infestations with a variety of ectoparasites, including ticks, mites, bugs, fleas, and chewing lice, with feather mites and lice being especially common. Several groups of ectoparasites, such as mites, ticks, and certain flies in either larval or adult stages, are known to parasitize avian hosts (Chege *et al.*, 2014). These parasites can trigger allergic responses, irritation, anorexia, reduced productivity, and myiasis, and they also act as vectors for parasitic, rickettsial, bacterial, and viral pathogens affecting both migratory and domestic birds (Patel *et al.*, 2025; Girişgin *et al.*, 2023).

Ticks are of particular concern since they are responsible for transmitting a wide range of viral, rickettsial, and parasitic diseases (Estrada-Pena *et al.*, 2004; Santos-Silva *et al.*, 2006; Bursali *et al.*, 2012; Keskin and Erciyas-Yavuz, 2019). While adult ticks of the family *Ixodidae* typically parasitize mammals, their larval and nymphal stages often exploit birds, mammals, and reptiles as hosts (Skoracki *et al.*, 2024). Surveys in several European countries have confirmed the presence of numerous tick species infesting wild birds (Santos-Silva *et al.*, 2006; Coipan *et al.*, 2012; Hornok *et al.*, 2013).

Birds are also host to a broad range of ectoparasites such as mites, flies, and ticks (Yadav *et al.*, 2021). For instance, White storks have been found to harbor nine different species of ectoparasites, Western Marsh harriers eight species, Steppe eagles seven species, and Cattle egrets six species. Among these, feather mites (Acari: Astigmata: Analgoidea, Pterolichoidea) represent the most diverse group of arthropods associated with birds (Clayton *et al.*, 2010), comprising about 2,500 described species across more than 30 families (Mironov *et al.*, 2023). Villa *et al.* (2013) reported eight genera of feather mites, with *Mesalgoides* being the most prevalent (53–55%), followed by *Trouessartia* (40–45%), *Amerodectes* and *Proctophyllodes* (26–33%), *Xolalgoides* (21–27%), *Analges* and *Strelkoviacarus* (0–6%), and *Dermoglyphus* (2–4%). Silva *et al.* (2015) identified 15 feather mite taxa belonging to the families Analgidae, Proctophyllodidae, Psoroptoididae, Pteronyssidae, Xolalgidae, Trouessartiidae, Falculiferidae, and Gabuciniidae. Similarly, Rodrigues *et al.* (2015) recorded 19 feather mite species from four families within the superfamily Analgoidea (Analgidae, Proctophyllodidae, Psoroptoididae, and Trouessartiidae).

Despite this diversity, studies on bird mites in Egypt remain scarce. The earliest accounts were provided by Rakha (1980) for Astigmata order, and Zaher *et al.* (1986) for other mite orders. Later, Abd-Alla (1993) contributed taxonomic insights into mites collected from wild birds, while Sakr (2017) documented 32 feather mite species from 15 families. However, there is still no comprehensive taxonomic resource compiling the mite fauna of Egyptian birds, making it difficult to assess which taxa have been reported and their distribution. Therefore, the present study aimed to investigate and record the prevalence of ectoparasites in selected crow species inhabiting the Canal cities of Egypt.

MATERIALS AND METHODS

Mites were collected from freshly killed crows obtained from multiple habitats, including agricultural lands, urban areas, and wetlands, across the Canal cities of Egypt, where the average temperature ranged between 20–28 °C and the mean wind speed was approximately 10–15 km/h.

A total of 150 crows were examined, which had been trapped in various habitats within and around these urban areas. To ensure comprehensive sampling, the plumage of each bird was carefully brushed with a fine camelhair brush over a white tray, enabling the visualization and collection of detached mites. In addition, feathers were systematically sampled from different body regions including the head, neck, underwings, body, legs, and cloacal area and each set of feathers was placed individually in modified Berlese funnels for 24 hours. This technique facilitated the extraction of both motile mites and quill-inhabiting forms into Petri dishes (Patel *et al.*, 2025).

For the recovery of immotile or dead mites, a method adapted from Lipovsky (1951) was applied. Feathers were immersed in a beaker containing a mild detergent solution and agitated for approximately 30 minutes. Following this process, the feathers were separated, and the resulting sediment was carefully examined under a stereomicroscope to isolate the mites.

For permanent slide preparations, specimens were cleared in lactic acid, rinsed in a graded series of ethyl alcohol, and subsequently mounted in Hoyer's medium, following the protocols described by Krantz (1978). The prepared specimens were counted, examined, and identified using a phase-contrast microscope, ensuring the detection of fine morphological details. Taxonomic identification to the species level was achieved by consulting standard and widely accepted identification keys, including those of Baker *et al.* (1956), Fain (1965), Kethley (1970), Smiley (1970), Hughes (1976), and Krantz (1978).

RESULTS AND DISCUSSION

Mites Associated with Crows in Canal Cities, Egypt:

During the present investigation, a total of 150 crows were examined for mite infestations, resulting in the identification of a diverse assemblage of mite taxa (Table 1). The family Macronyssidae represented the dominant group, with four distinct species recorded. Members of this family are hematophagous mites frequently parasitizing birds and mammals, often associated with respiratory disorders and anemia in heavily infested hosts.

The second most represented families were Pyroglyphidae and Rhinonyssidae, each contributing three species. Pyroglyphid mites are generally keratinophagous, feeding on feathers and skin debris. In contrast, rhinonyssid mites are typically endoparasitic, inhabiting the nasal cavities and respiratory tract of birds, potentially causing rhinitis and other respiratory complications.

In addition, two species were identified from the family Laelapidae, a group known for its wide ecological diversity, with members occurring as ectoparasites on birds and mammals or as free-living predators in nests. A single species was also recorded from the family Dermanyssidae, which includes the well-known poultry red mite *Dermanyssus gallinae*, an important pest causing blood loss, irritation, and transmission of pathogens.

Further examination revealed that several other families were represented by only one species each, highlighting the broad taxonomic spectrum of mite fauna associated with crows (Table 1). These included Trematuridae, Uropodidae, Cheyletidae, Acaridae, Glycyphagidae, Dermoglyphidae, and Falculiferidae. While some of these families are less commonly associated with avian hosts, their occurrence in this study underscores the ecological diversity of mites utilizing crows as hosts or carriers. Overall, the results demonstrate that crows in the Canal cities harbour a rich variety of mite families, ranging from blood-feeding parasites to feather- and skin-associated taxa, as well as opportunistic or nest-dwelling forms. This diversity reflects both the ecological adaptability of crows and the complex host-parasite relationships shaping avian ectoparasite communities.

Table (1): Incidence of mites associated with crows in Canal cities, Egypt

Suborder /Order	Superfamily / Family	Mite species
Sub order: Parasitiformes (Leach,1815) Order: Gamasida Sub order: Dermanyssina	Superfamily: Dermanyssoidea Dermanyssoidae	<i>Dermanyssus gallinae</i> <i>Dermanyssus alaudae</i>
	Family: Rhinonyssidae	<i>Rhinonyssidus</i> sp.
	Laelapidae	<i>Eulaelaps novus</i> <i>Hypoaspis orientalis</i>
	Macronyssidae	<i>Macronyssus japonicus</i> <i>Ornithonyssus bacoti</i> <i>Ornithonyssus pipistrelli</i> <i>Ornithonyssus</i> sp.
Sub order: Uropodina	Trematuridae	<i>Trichouropoda patavine</i>
	Uropodidae	<i>Chiropturopoda bakeri</i>
Sub order: Acariformes (Zakhvatkin,1952) Order: Tida Sub order: Actenidina	Cheyletidae	<i>Cheletomorpha</i> <i>lepidopterom</i>
Order: Sarcoptiformida Sub order: Acarina	Superfamily: Acaroidea Acaridae	<i>Tyrophagus putrescentiae</i>
	Superfamily: Glycyphagoidea Glycyphagidae	<i>Glycyphagus domesticus</i>
	Dermoglyphidae	<i>Dermoglyphus</i> sp.
	Falculiferidae	<i>Atyeonia bifurcata</i> Guad
	Superfamily: Pyroglyphoidea Pyroglyphoidae	<i>Dermatophagoides farinae</i> <i>Euroglyphus maynei</i> <i>Pyroglyphus</i> sp.

Ticks Associated with Crows in Canal Cities, Egypt:

In the present study, only one tick family was recorded from crows collected in the Canal cities (Table 2). The identified ticks belonged to the Order *Ixodida* and Suborder *Argasina*. The family *Argasidae* was represented by four species: *Ixodes redikorzei*, *Hyalomma anatolicum*, *Hyalomma marginatum rufipes*, and *Argas (Persicargas) arabireus*.

Table (2): Ticks associated with crows in Canal cities, Egypt

Sub order /Order	Superfamily: / Family	Mite species
Order: Ixodida Sub order: Argasina	Family: Argassidae	<i>Ixodes redikorzei</i> <i>Hyalomma anatolicum</i> <i>Hyalomma marginatum rufipes</i> <i>Aragas (Persicarga)arabireus</i>

The current findings on mite diversity are largely consistent with previous reports on domestic and wild birds, as documented by several researchers including Fain and Philips (1977), Fain *et al.* (1977), Rakha (1980), El-Kammah *et al.* (1982, 1990, 2007), Hoogstraal (1984), Abd-Allah (1993), Fain and Drugmand (1993), Gaud (1996), Fan (2000), Fan and Zhang (2004), Abdel-Gawad (2008), and Metwally *et al.* (2019). These studies collectively

highlight the wide distribution and host specificity of avian mites, particularly within the Mesostigmata, which are frequently associated with the feathers, skin, and nests of birds. Similarly, the tick species identified on wild, brown-necked ravens in the present study belonged to two families and encompassed ten species. This is in close agreement with earlier investigations reporting a comparable spectrum of ticks parasitizing both domestic and wild avifauna (Hoogstraal, 1956; Taylor *et al.*, 1966; El-Kammah *et al.*, 1982, 1990, 2007; Hoogstraal, 1984; Guglielmone *et al.*, 2010). Taken together, these findings confirm that corvids and other wild birds play an important role as reservoirs and dispersal hosts for a diverse array of mites and ticks, with potential implications for veterinary and public health.

Conclusion

The present findings emphasize that crows act as significant reservoirs and vectors of diverse ectoparasites, posing substantial threats to public health, veterinary health, and regional biosecurity. The detection of 24 acarine species, including mites and ticks, underlines the ecological complexity of crow–parasite interactions and their potential role in the transmission of pathogens to humans, livestock, and wildlife. Strengthening monitoring programs, implementing targeted control strategies, and expanding future research on parasite diversity in both resident and migratory bird populations are essential steps to mitigate the risks associated with these highly adaptable avian hosts.

Declarations:

Ethical Approval: The experiments were processed using the animal ethical rules issued by the Faculty of Agriculture, Al-Azhar University. Furthermore, all tests adhered to the ARRIVE standards and EU Directive 2010/63/EU regarding animal research.

Competing interests: The authors declare that they have no conflicts of interest.

Author's Contributions: All authors contributed equally to this work.

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Availability of Data and Materials: The data supporting the findings of this study are available from the corresponding author upon reasonable request.

Acknowledgments: This research was conducted in compliance with Egyptian laws and the guidelines of the Supreme Council of Universities. All procedures were approved by the Faculty of Agriculture, Al-Azhar University, Cairo, Egypt.

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ARABIC SUMMARY

تسجيل الطفيليات الخارجية الاكاروسية على الغربان في مدن القناة بمصر

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في مدن القناة الثلاثة السويس والإسماعيلية وبورسعيد، أجريت هذه الدراسة والتي كان الهدف منها هو تسجيل الأنواع والأجناس المختلفة للطفيليات الحيوانية الخارجية المرتبطة بالغربان، حيث تنتشر هذه الطيور بكثافة كبيرة جداً وبشكل غير مسبوق في مدن القناة مقارنة بباي مكان بمصر، خاصة مدينتي السويس والإسماعيلية. وتحظى هذه المسألة بأهمية كبيرة نظراً لتواجد هذه الغربان المحملة بتلك الطفيليات الاكاروسية والتي تنتقل منها داخل المناطق السكنية مثل المطاعم والمدارس والمنازل والملاعب والمستشفيات ومستودعات الحبوب واللحوم وغيرها، فضلاً عن المنطقة الملاحية لقناة السويس والسفن التجارية وغيرها، التي تنقل هذه الطيور وما عليها من بلد إلى آخر، وكذلك مزارع الدواجن والماشية والاعنام والتي تعاني أكثر من تواجد الغربان خاصة في انها اهم الوسائل لأصابتها بالطفيليات الخارجية والداخلية خاصة الاكاروسية منها. وأظهرت النتائج أن الغربان في هذه المدن مرتبطة بالعديد من هذه الطفيليات الخارجية، بما في ذلك العث والقراد. تم تسجيل عدد أربعة وعشرون نوعاً من الطفيليات الخارجية الاكاروسية، تنتمي أربعة منها الى القراد وعشرين نوعاً من الاكاروسات. وخلص إلى ضرورة إجراء المزيد من الدراسات التي تهدف إلى دراسة الطفيليات الخارجية على كافة أنواع الطيور المقيمة والمهاجرة لما لهذا الموضوع من أهمية بالغة في الوقت الحاضر وفي المستقبل.