BIHAREAN BIOLOGIST 16 (2): 87-90
Article No.: e221304

http://biozoojournals.ro/bihbiol/index.html

Interactions between birds and mammals in Turkey - documentation of symbiotic relations

Melisa BAL[1]* and Kiraz ERCİYAS YAVUZ[1]

1. Ornithology Research Center, Ondokuz Mayıs University, 55139, Atakum, Samsun, Turkey
* Corresponding author: M. Bal, E-mail: melisaaabal@gmail.com

Received: 24 June 2022 / Accepted: 22 August 2022 / Available online: November 2022 / Printed: December 2022

Abstract. Various bird species belonging to more than one family interact with mammals. In this study, we investigated bird and mammal interactions in Turkey based on photograph databases. We found that eight bird species of four families directly interact with five mammal species, particularly grazing mammals. Birds were observed picking the ectoparasites on the mammals' bodies. The interactions were recorded in spring more than in the other seasons. As the photos demonstrate only a moment, detailed and systematic site-based studies are required to understand these interactions better.

Keywords: birds and mammals, interactions, symbiosis, commensalism, citizen science.

Introduction

Symbiosis is the term used to describe the interactions between organisms (Boucher et al. 1982). Mutualism, one of these interactions, is a type of relationship where both organisms benefit from each other, whereas commensalism is a relationship in which one side benefits while the other is not affected positively or negatively (Odum & Barrett 2005). Through these interactions, organisms can easily access food sources, expand their food and habitat ranges, avoid potential predators, and eliminate ectoparasites (Lang & Benbow 2013). Mutualistic and commensal relationships are seen among many different vertebrates (Dickman 1992); it is also common among birds and mammals. The relationship of many different bird species with mammals has been investigated, mainly in Africa, oxpecker (*Buphagus*) species have been observed in interactions with mammals, feeding on ectoparasites (Dean & MacDonald 1981, Ndlovu & Combrink 2015, Mikula et al. 2018, Péron et al. 2019). Apart from studies in Africa, some studies have demonstrated ectoparasite feeding from mammals' bodies by birds (Gijsman & Guevara 2020, Mesquita et al. 2020). Many studies have revealed the relationship between Cattle Egrets with large mammals (Heatwole 1965, Kioko et al. 2016, Mikula et al. 2018, Verma et al. 2021). Furthermore, some members of the family Corvidae have been observed interacting with cattle, feral hogs, and deers (Baber & Morris 1980, Kilham 1982, Isenhart & Desante 1985).

In Turkey, some species of birds and mammals' interaction is known through individual observations and photograph records. However, no comprehensive study has been conducted to reveal these relationships and their reasons. Citizen scientists, such as bird photographers and birdwatchers, provide a valuable data source by sharing photos of birds, their natural habitats, and behaviors. Through the support of citizen scientists, citizen science has become an integral part of ecological studies in recent years (Silvertown 2009). Because of cost-effective and rapid data collection, citizen science contributes to expanding scientific knowledge (Leighton et al. 2016). In this study, we aimed to reveal bird-mammal interactions in Turkey using citizen science data

Material and methods

The theses, articles, and grey literature have been checked using the keywords "bird mammal interaction in Turkey", "mutualistic relationships in birds and mammals", "mutualism in birds", and "commensalism in vertebrates" in databases such as Google Scholar, Google, and YÖKSİS (Higher Education Information System) to understand if there have been other studies performed to describe the interaction with birds and mammals.

Photograph search was biased towards birds reported in the literature to interact with mammals and their own experience. Therefore, an internet-based search for photos was performed on bird photograph databases (Trakuş 2022, Dogalhayat 2022, Ornito 2022, Macaulay Library 2022) to document the bird-mammal interaction in all family members of those bird species. All photographs of birds in direct contact (pecking, sitting, perching on the bodies of host mammals) with a mammal have been selected. Interacting birds and mammals have been identified at the species level. In addition, interviews were carried out with people who took the photos and asked what kind of relationship was observed while they took the picture. Photographs of birds next to mammals were not subject to this study and have not been considered.

Results

The Google Scholar, Google, and YÖKSİS search regarding the studies and publications about the bird mammal interactions in Turkey did not produce any results. So far, there has been no study conducted to demonstrate these interactions.

As a result of this study, a total of 20.863 photos belonging to 37 bird species in the Ardeidae, Corvidae, Motacillidae, and Sturnidae families were examined, and this interaction has been observed in 56 photos. We found that eight bird species of four families are in a direct relationship with five mammal species (Table 1). Based on pictures and the interviews with the photo owners, the most dominant behaviors between birds and mammals were sitting or riding on the back of the host and picking flies from the hosts' body.

The interaction was documented in every season during the year; however, it was most prominent in spring (29 interactions), followed by autumn (13 interactions), summer (7 interactions), and winter (7 interactions). Most of the

photographs were taken from grassland habitats (85%), followed by lake habitats (11%) and reedbeds (4%).

All the photographs examined demonstrated that bird species prefer grazing mammals. The most favored mammal was the water buffalo. All eight bird species had a direct relationship with the water buffalo. The Western Jackdaw (*Coloeus monedula*), Hooded Crow (*Corvus cornix*), and Eurasian Magpie (*Pica pica*) were observed while picking insects from the buffalos' body. The White Wagtail (*Motacilla alba*), Common Starling (*Sturnus vulgaris*), Cattle Egret (*Bubulcus ibis*), Little Egret (*Egretta garzetta*) and Common Raven (*Corvus corax*) were sitting and riding on the buffalo's body (Figure 1). The following most recorded relation was the horse (Figure 2) and sheep, and four bird species were in relation with each of these mammals.

Other bird species that interact with mammals are members of the family Corvidae. The most frequent relation was observed between Eurasian Magpie and the water buffalo, followed by the association between the Western Jackdaw and the sheep (Figure 3).

The Western Jackdaw interacts with all mammals identified within this study.

Table 1. Bird species interactions with different mammals and frequency of interactions

Family	Species	Water buffalo	Cattle	Horse	Sheep	Goat
Ardeidae	*Egretta garzetta*	2	-	-	-	-
Ardeidae	*Bubulcus ibis*	4	-	2	4	2
Motacillidae	*Motacilla alba*	2	-	-	-	-
Sturnidae	*Sturnus vulgaris*	2	-	1	1	-
Corvidae	*Pica pica*	9	1	1	-	-
Corvidae	*Coloeus monedula*	5	5	2	5	2
Corvidae	*Corvus cornix*	3	-	-	1	
Corvidae	*Corvus corax*	2	-	-	-	-

Figure 1. Two individuals of the White Wagtail (*Motacilla alba*) on the body of water buffalo

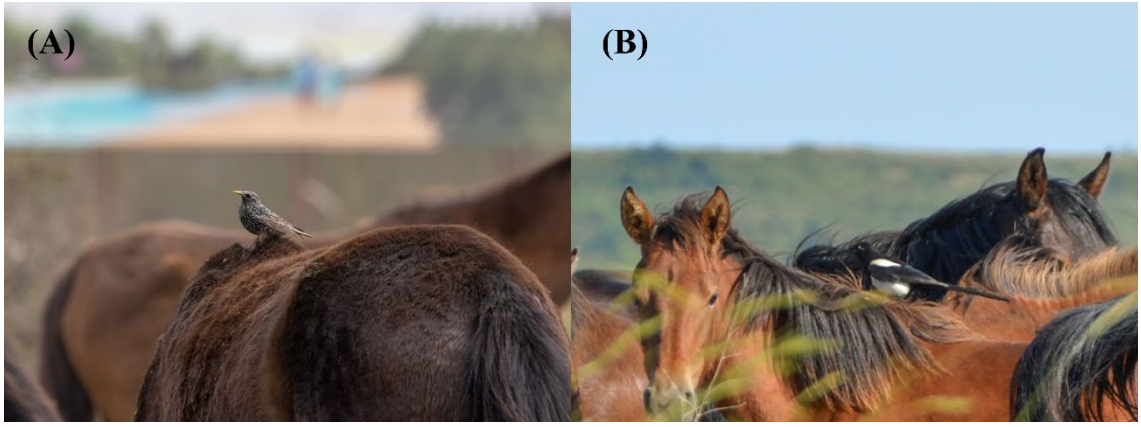

Figure 2. Common Starling (*Sturnus vulgaris*) (A) and Eurasian Magpie (*Pica pica*) (B) on the body of a horse

Figure 3. (A) A Eurasian Magpie (*Pica pica*) x water buffalo interaction (B) A Western Jackdaw (*Coloeus monedula)* x sheep interaction.

Discussion

Most photographs showed birds sitting/riding on the host and picking flies from the hosts' body. This behavior is explained by the birds` benefit from feeding ectoparasites and flies flushed around the mammals. Birds benefit from this interaction, while it is unclear whether mammals benefit from it. However, it is difficult to determine whether the host mammal benefits directly or indirectly. Considering that birds help mammals in getting rid of ticks, flies, and any ectoparasites, this interaction appears to be more of a win-win case and can be evaluated as facultative mutualism (Lang & Benhow 2013). Individual fitness is affected as the birds' food intake rate increases and their energy expenditure decreases (Heatwole 1965, Smith 1971, Dickman 1992). Besides, the birds easily access food on the bodies of the host mammals, and they obtain more energy from the food they receive as movement is reduced (Källander 1993).

Interactions were mostly observed in the spring, autumn, summer, and winter. Since insect density is the lowest in winter, less interaction is expected, which is the case here. Several interactions were recorded in the lake habitat. Ruggiero & Eves (1998) reported that Cattle Egrets ride on the back of buffalos and elephants to pass over the swamps. In our case, the White Wagtail and Common Starling observed on the buffalo in the lake were terrestrial species, which may benefit from riding on the back of buffalo as it passes through dense insect prey.

In our study, grazing mammals are the most preferred mammals for birds. Previous studies have revealed the interaction between birds and grazing mammals (Källander 1993, Kioko et al. 2016). It is explained that large grazing mammals provide a safe area for birds in grassland habitats to protect themselves from predators (Morris & Thompson 1998). Furthermore, grazing mammals increase invertebrate abundance while improving the habitat quality, increasing bird species. Besides, the mammal dung attracts insects, which also attracts birds feeding from there (Goguen & Mathews 1999). Otherwise, this is explained by the fact that herbivores act as a beater or flusher in commensal relationships, allowing insects to flush and thus making it easier for birds to detect these insects (Källander 2004, Kioko et al. 2016). Birds were recorded with goats in addition to grazing mammals. Goats, unlike sheep, do not graze and feed mostly in forests, maquis, and open forest edges in Turkey (Çürek & Özen 2010). The goat documented in this study with Western Jackdaw was tied in front of the house, in an open area where the Western Jackdaws were around and on it. However, the interaction between the goat and the Cattle Egret was quite unexpected, demonstrating that detailed studies will reveal novel results. As the goat is not a frequent grazer, the interaction with the birds seems to be restricted.

Corvidae members were frequently recorded with mammals. According to Sazima (2011), many species from the family Corvidae serve as cleaners on the bodies of host mammals. Many studies have determined that this family's members feed on ectoparasites on mammals (Gijsman & Guevara 2020, Mesquita et al. 2020). The Western Jackdaw has been reported to seek ticks and insects from mammal hosts (Madge & Burn 1999). Broad niche and opportunistic feeding behaviors of Corvidae members explain their feeding with mammalian ectoparasites (Sazima 2011). Besides feeding, Western Jackdaws have been observed collecting wool or hair from various mammals to provide nesting material, which may be the main reason for interaction with different mammal species (Dean & MacDonald 1981).

Cattle Egrets and mammals have been recorded interacting. Cattle Egrets feed on insects flushed by cattle rather than feeding on ticks directly on the cattle (Dean & MacDonald 1981). As a result, they spend less energy foraging (Seedikkoya et al. 2005), and prey-catching rates increase (Heatwole 1965, Grubb 1975, Verma et al. 2021).

Many large-bodied herbivore mammals live in the wetlands and grasslands in Turkey, where the symbiotic relationship can be studied. Few photographs have been available than expected, indicating that there may be less interest in documenting these interactions or that people are unaware of the necessity of understanding and describing these relationships. Besides feeding, the main documented pattern in birds and grazing mammals is the provision of nesting materials by the host. As a result, this study is a baseline for more detailed and systematic studies on multi-species interactions and their causes.

Acknowledgments

We are grateful to Arda Dönerkayalı and Nizamettin Yavuz for sharing their photos and to all the citizen scientists who contributed to citizen science with their photos in the databases. We also thank the reviewers and the editor for their valuable comments.

References

Baber, D.W., Morris, J.G. (1980): Florida scrub jays foraging from feral hogs. The Auk 97(1): 202-202.

Boucher, D.H., James, S., Keeler, K.H. (1982): The ecology of mutualism. Annual Review of Ecology and Systematics 13(1): 315-347.

Çürek, M., Özen, N. (2010): Keçi meralarında bulunan bazı maki türlerinin otlatma mevsimi boyunca yem değerlerinin saptanması. pp. 324-327. In: Ulusal Keçicilik Kongresi. Çanakkale Onsekiz Mart Üniversitesi, Çanakkale, Türkiye. [in Turkish with English summary]

Dean, W.R.J., MacDonald, I.A.W. (1981): A review of African birds feeding in association with mammals. Ostrich 52(3): 135-155.

Dickman, C.R. (1992): Commensal and mutualistic interactions among terrestrial vertebrates. Trends in Ecology & Evolution 7(6): 194–197.

Dogalhayat (2022): Foto Galeri. <dogalhayat.org, accessed at 2022.08.15>

Gijsman, F., Guevara, M. (2020): Yellow-headed caracara as a cleaner of white-tailed deer in urban park. Journal of Raptor Research 54(3): 319-321.

Goguen, C.B., Mathews, N.E. (1999): Review of the causes and implications of the association between cowbirds and livestock. Studies in Avian Biology 18: 10-17.

Grubb, T.C. (1975): Adaptiveness of foraging in the cattle egret. The Wilson Bulletin 88(1): 145-148.

Heatwole, H. (1965): Some aspects of the association of cattle egrets with cattle. Animal Behaviour 13(1): 79-83.

Isenhart, F.R., Desante, D.F. (1985): Observations of scrub jays cleaning ectoparasites from black-tailed deer. The Condor 87(1): 145-147.

Källander, H. (1993): Commensal feeding associations between yellow wagtails *Motacilla flava* and cattle. Ibis 135(1): 97-100.

Källander, H. (2004): Starlings *Sturnus vulgaris* and cattle–a widespread feeding association. Ornis Svecica 14(1-2): 11-20.

Kilham, L. (1982): Cleaning/feeding symbioses of common crows with cattle and feral hogs. Journal of Field Ornithology 53(3): 275-276.

Kioko, J., Boyd, E., Schaeffer, E., Tareen, S., Kiffner, C. (2016): Cattle egret *Bubulcus ibis* interactions with large mammals in the Tarangire-Manyara ecosystem, Northern Tanzania. Journal of East African Ornithology 36(1):

15-20.
Lang, J.M., Benbow, M.E. (2013): Species interactions and competition. Nature Education Knowledge 4(4): 8.
Leighton, G.R., Hugo, P.S., Roulin, A., Amar, A. (2016): Just Google it: assessing the use of Google Images to describe geographical variation in visible traits of organisms. Methods in Ecology and Evolution 7(9): 1060-1070.
Macaulay Library (2022): Search. <https://www.macaulaylibrary.org/?doing_wp_cron=1661231450.7393150329589843750000, accessed at 2022.08.15>
Madge, S., Burn, H. (1999): Crows and jays: a guide to the crows, jays and magpies of the world. Helm Identification Guides Series, London.
Mesquita, G.B., Silva, W.L., Fecchio, A., Martins, T.F., Labruna, M.B., Dias, R.I. (2020): *Amblyomma* ticks consumed by a giant cowbird, *Molothrus oryzivorus*. Ticks and Tick-borne Diseases 11(4): 101424.
Mikula, P., Hadrava, J., Albrecht, T., Tryjanowski, P. (2018): Large-scale assessment of commensalistic-mutualistic associations between African birds and herbivorous mammals using internet photos. PeerJ 6: 4520.
Morris, D.L., Thompson III, F.R. (1998): Effects of habitat and invertebrate density on abundance and foraging behavior of brown-headed cowbirds. The Auk 115(2): 376-385.
Ndlovu, M., Combrink, L. (2015): Feeding preferences of oxpeckers in Kruger National Park, South Africa. Koedoe: African Protected Area Conservation and Science 57(1): 1-6.
Odum, E.P., Barrett, G.W. (2005): Fundamentals of ecology. Thomson Brooks/Cole. Belmont, California.
Ornito (2022). Galeri. <https://ornito.org/Gallery, accessed at 2022.08.15>
Péron, G., Bonenfant, C., Gagnon, R., Mabika, C.T. (2019): The two oxpecker species reveal the role of movement rates and foraging intensity in species coexistence. Biology Letters 15(10): 20190548
Ruggiero, R.G., Eves, H.E. (1998): Bird-mammal associations in forest openings of Northern Congo (Brazzaville). African Journal of Ecology 36: 183-193.
Sazima, I. (2011): Cleaner birds: a worldwide overview. Revista Brasileira de Ornitologia 19(1): 32-47.
Seedikkoya, K., Azeez, P.A., Shukkur, E.A.A. (2005): Cattle egret *Bubulcus ibis* habitat use and association with cattle. Forktail 21: 174.
Silvertown, J. (2009): A new dawn for citizen science. Trends in Ecology & Evolution 24(9): 467-471.
Smith, S.M. (1971): The relationship of grazing cattle to foraging rates in anis. The Auk 88(4): 876-880.
Trakuş (2022): Foto galeri. <https://www.trakus.org/kods_bird/uye/?fsx=2fsdl5@d, accessed at: 2022.08.15>
Verma, M., Elangovan, V., Dwivedi, A., Kumar, M. (2021): Foraging behaviour and host selection of cattle egret (*Bubulcus ibis*) among different host species in Lucknow (Uttar Pradesh). Bulletin of Pure & Applied Sciences-Zoology 40(1): 6-14.