



BioBacta

Journal of Bioscience and Applied Research
www.jbaar.org

SPBH

Survey of Avian Diversity in Wadi Al-Arj, Taif, Saudi Arabia

Abdulrahman K. Aljuaid^{1,2*}, Hassan M. Felemban¹, Isam M. Abu Zeid^{1,3,4}

¹Department of Biological Sciences, King Abdulaziz University, Jeddah, Saudi Arabia

²Education Department in Sarat Abidah Governorate - Ministry of Education - Kingdom of Saudi Arabia

³Centre of Excellence in Bionanoscience, King Abdulaziz University, Jeddah, Saudi Arabia

⁴Princess Dr. Najla Bint Saud Al-Saud Center for Excellence Research in Biotechnology, King Abdulaziz University, Jeddah, Saudi Arabia

Corresponding author*: Abdulrahman K. Aljuaid; E.amil: aaljuaid0083@stu.kau.edu.sa

DOI:10.21608/jbaar.2024.389629

ABSTRACT

A survey of bird species richness was conducted at three sites in Wadi Al-Arj, north of Taif, Saudi Arabia. Each site was visited once every two weeks during the period November 2022 - May 2023. Eighty-one species of birds belonging to 31 families were recorded during the autumn, winter, and spring seasons. The list included 33 resident species of which 6 were endemic and 2 were semi-endemic species to the Arabian Peninsula, as well as 48 migratory species. The total recorded population consisted of 2220 birds, with the House sparrow (*Passer domesticus*) being the most abundant species representing 15% of the total population density followed by the Laughing dove (*Spilopelia senegalensis*), the Rüppell's weaver (*Ploceus galbula*), and the White-spectacled bulbul (*Pycnonotus xanthopygos*). It is recommended that the Wadi Al-Arj region receives environmental attention, particularly the reed beds and other places that are significant bird habitats.

Keywords: Avian, Diversity, Resident, Migratory, Population density, Taif, Endemic bird

Simple Summary: The current study investigates the abundance and biodiversity of birds in Wadi Al-Arj, Taif governate, Saudi Arabia. During the field visits conducted from November 2022 to May 2023, 2220 birds belonging to 81 species were recorded. Of them, 1948 birds belonging to 33 species were resident of which 8 species were of the Arabian Peninsula endemic species. The most abundant resident birds were House sparrow (*Passer domesticus*), Laughing Dove (*Spilopelia senegalensis*), White-spectacled bulbul (*Pycnonotus xanthopygos*), Rüppell's weaver (*Ploceus galbula*), Spur-winged Lapwing (*Vanellus spinosus*), and Cattle egret (*Bubulcus ibis*). 48 species were migratory with White Wagtail (*Motacilla alba*), Black-winged stilt (*Himantopus himantopus*), Little Egret (*Egretta garzetta*), and Green sandpiper

(*Tringa ochropus*) being the most abundant. There were statistically significant differences in the number of bird species among the three seasons ($p < 0.05$). birds' abundance was highest in the Winter season, followed by Spring then Autumn. During the three seasons, resident bird species were significantly more abundant as compared to migratory species. The recorded birds belonged to 31 families. Columbidae and Passeridae were the most abundant families. Due to the birds' species richness and the supporting environment present in Wadi Al-Arj, it is recommended that the birds.

Introduction

Taif is located in the west of the Kingdom of Saudi Arabia and is administratively affiliated with the Makkah Al-Mukarrmah Region. Taif is a famous

summer tourist attraction for its moderate weather and cultivation of fruits and roses. The city of Taif has many diverse terrains, including arid areas and high mountains [1]. It is important to note that Taif city includes about 400 mountain peaks. The city's highest point is situated at a height of 2585 meters above sea level, with an average elevation of 1800 meters [2]. Throughout this region, many different habitats and terrains encourage different forms of biodiversity, which is an important indicator of the extent of the prosperity of an area.

Birds are the first creatures that can be observed in any environment, and bird diversity can be used as a vital indicator to monitor the condition of the ecosystem [3,4]. The Kingdom of Saudi Arabia (KSA) is of great importance in terms of bird diversity. There were confirmed recordings of 499 bird species, comprising 401 migratory and resident species, 87 vagrant species, and 11 invasive species that turned into wild species [5]. One hundred and two bird species were assigned as high conservation priority [6]. The importance of the city of Taif lies in the presence of many endemic bird species of the Arabian Peninsula [7]. Taif does not receive significant attention in environmental research, as there are no records of birds in the northern valleys of the Taif region.

In the Aldesa Valley, Tabuk region, the occurrence of 2906 birds was recorded in 2014, and 3954 birds were observed in 2015. The observed birds belonged to 19 species, 15 families, and 5 orders. The most frequently found species were *Passer domesticus*, *Onychognathus tristramii*, *Spilopelia senegalensis*, *Pycnonotus xanthopygos*, *Carpodacus synoicus*, and *Cinnyris osea* [8]. Alrumman et al [9] compiled a list of 63 wild bird species in the Aseer region, which included 36 residential birds, 17 winter visitor migratory birds, 9 indigenous birds, and 1 introduced bird. It was found that elevation above sea level had an impact on the distribution of the birds.

Throughout 12-month research, the Wadi Fatimah dam area in the Makkah region was found to have 87 different kinds of birds, 40 of which were migratory.

The Little egret, Black kite, Rock dove, Palm dove, Black-bush chat, Little green bee-eater, Graceful warbler, Crested lark, House sparrow, and Rüppell's weaver were the most frequently occurring bird species [10]. A study on migratory passerine birds in Wadi Harjal, Al-Shifa, Saudi Arabia, recorded a total of 41 migratory bird species as passage migrants and winter visitors [11]. The literature related to birds' richness and diversity in the Taif region and its valleys is still scarce. This study conducted a survey to determine the extent of bird diversity in Wadi Al-Arj in the Taif governate. This is the first study on bird diversity conducted in this region.

Wadi Al-Arj is characterized by a diverse terrain that includes many different bird-attracting habitats, such as sandy habitats, mountain habitats, wetland habitats, and reed bed habitats. Wadi Al-Arj is characterized by many types of plants spread along the valley course. These plants include southern cattail (*Typha domingensis*), horse mint (*Mentha longifolia*), ragged mallow (*Abutilon pannosum*), small crown flower (*Calotropis procera*), thorn apple (*Solanum incanum*), Italian senna (*Cassia italica*), moonflower (*Datura innoxia*), Arabian boxthorn (*Lycium shawii*), daga (*Acacia laeta*), heartleaf (*Xanthium strumarium*), salam (*Acacia ehrenbergiana*), Nile tamarisk (*Tamarix nilotica*), and moss (*filamentous algae*) [12]. When compared to most other parts of the Kingdom, the city of Taif is thought to have a unique climate, particularly during the summer. Taif experiences temperate weather, with an average yearly rainfall of 171 mm and a 16.4 °C - 30.3 °C temperature range (National Center of Meteorology).

Material and methods

The city of Taif in the Makkah Al-Mukarramah region in the KSA (21.3602025, 40.5023948) was chosen to conduct this research. The study was conducted at three selected sites based on the following criteria: dense vegetation and lack of human activities (Figure 1). Field visits to the research locations occurred between November 2022 and May 2023.

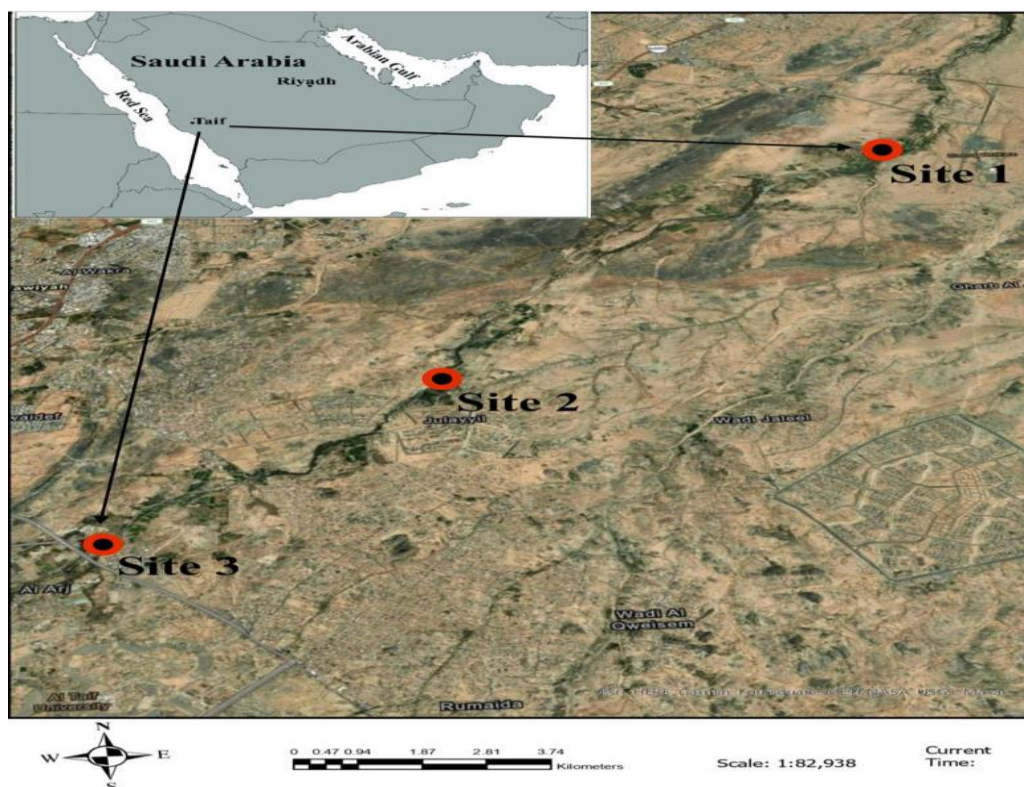


Figure 1: Aerial photograph showing the study sites in Wadi Al-Araj. Data sources: Esri, HERE, Garmin, Foursquare, METI/NASA, USGS, Maxar.

The survey plan was made to include a trip every two weeks during the period November 2022 - May 2023. Field trips were launched before sunrise, and the observation lasted for about 6 to 8 hours. A transect survey was conducted, wherein the species and number of birds were systematically recorded while traversing a linear route, with subsequent divergent excursions perpendicular to the primary axis, enabling comprehensive coverage of the surrounding area. Birds were observed by the naked eye or using binoculars with a magnification of 7x5 mm and were photographed using a camera (Nikon P1000) with 125x magnification. An audio recorder was used to record notes in the field for each visit.

Mist nets were used to catch birds and examine them closely, following the protocols and recommendations that ensure birds' safety. The nets were checked every 10 minutes to detect any trapped birds and ensure that they were not harmed by the sun's rays or by cats and other predators [12]. After studying them, birds were gently released, ensuring that the silk threads were not wrapped around any part of their body. The Field Guide to the Birds of the

Middle East was used to identify and categorize the birds [13], while the IUCN Red List of Threatened Species was used to confirm scientific names and families.

Results

During the study period (November 2022 to May 2023), 81 bird species were documented in the studied areas (Table 1). Of the 81 species, 59.26% were migratory birds (48 species) and 40.74% were resident birds (33 species), including 6 endemic and 2 semi-endemic species to the Arabian Peninsula.

During the survey, the total number of the different observed birds reached 2,220, belonging to 81 species, and 31 families (Figure 2). In the autumn season, 335 birds were recorded, representing 15.09% of the total number of birds. During winter, 1,096 birds (49.46%) were recorded, and 789 birds (35.59%) were recorded during spring. Regarding their status, 1,976 birds (89.09%) were resident while 244 birds (11.01%) were migratory. The House sparrow (*Passer domesticus*) was the most abundant species, constituting 333 out of the total observed birds.

Table 1. List of birds recorded in the study areas of Wadi Al-Arj, Taif, during the study period (November 2022 to May 2023).

Family	Common name	Scientific name	Status in Wadi Al-Arj
Phasianidae	Philby's Partridge	<i>Alectoris philbyi</i>	BR
	Sand Partridge	<i>Ammoperdix heyi</i>	BR
Ardeidae	Black-crowned Night Heron	<i>Nycticorax nycticorax</i>	PM
	Cattle egret	<i>Bubulcus ibis</i>	BR
	Squacco Heron	<i>Ardeola ralloides</i>	PM
	Grey heron	<i>Ardea cinerea</i>	W
	Purple Heron	<i>Ardea purpurea</i>	PM
	Little Egret	<i>Egretta garzetta</i>	PM+W
Pandionidae	Osprey	<i>Pandion haliaetus</i>	PM
Accipitridae	European Honey Buzzard	<i>Pernis apivorus</i>	PM
	Black-winged Kite	<i>Elanus caeruleus</i>	PM
	Black kite	<i>Milvus migrans</i>	W
	Western Marsh Harrier	<i>Circus aeruginosus</i>	W
	Common buzzard	<i>Buteo buteo</i>	W
	Long-legged Buzzard	<i>Buteo rufinus</i>	W
Falconidae	Lesser kestrel	<i>Falco naumanni</i>	W
	Common kestrel	<i>Falco tinnunculus</i>	W
Rallidae	Moorhen	<i>Gallinula chloropus</i>	BR
Recurvirostridae	Black-winged Stilt	<i>Himantopus himantopus</i>	PM
Charadriidae	Spur-winged Lapwing	<i>Vanellus spinosus</i>	BR
	Common Ringed Plover	<i>Charadrius hiaticula</i>	W
	Little Ringed Plover	<i>Charadrius dubius</i>	W
Scolopacidae	Common Snipe	<i>Gallinago gallinago</i>	W

	Common Greenshank	<i>Tringa nebularia</i>	PM
	Green Sandpiper	<i>Tringa ochropus</i>	PM+W
	Wood Sandpiper	<i>Tringa glareola</i>	PM
	Common sandpiper	<i>Actitis hypoleucos</i>	W
	Temminck's stint	<i>Calidris temminckii</i>	PM
Columbidae	Rock Dove	<i>Columba livia</i>	BR
	Bruce's green pigeon	<i>Treron waalia</i>	BR
	Eurasian collared dove	<i>Streptopelia decaocto</i>	BR
	Laughing dove	<i>Spilopelia senegalensis</i>	BR
	Namaqua Dove	<i>Oena capensis</i>	BR
Apodidae	Little Swift	<i>Apus affinis</i>	PM
Upupidae	Eurasian Hoopoe	<i>Upupa epops</i>	BR
Meropidae	Little green bee-eater	<i>Merops orientalis</i>	BR
	European bee-eater	<i>Merops apiaster</i>	PM
Laniidae	Masked Shrike	<i>Lanius nubicus</i>	PM
	Red-backed shrike	<i>Lanius collurio</i>	W
	Red-tailed Shrike	<i>Lanius phoenicuroides</i>	PM+W
Leiotrichidae	Arabian Babbler	<i>Turdoides squamiceps</i>	BR
Pycnonotidae	White-spectacled bulbul	<i>Pycnonotus xanthopygos</i>	BR
Alaudidae	Crested Lark	<i>Galerida cristata</i>	BR
Hirundinidae	Eurasian Crag Martin	<i>Ptyonoprogne rupestris</i>	PM
	Pale Crag Martin	<i>Ptyonoprogne obsoleta</i>	BR
	Common House Martin	<i>Delichon urbicum</i>	PM

	Red-rumped Swallow	<i>Cecropis daurica</i>	PM
Cisticolidae	Graceful Prinia	<i>Prinia gracilis</i>	BR
Acrocephalidae	Sedge Warbler	<i>Acrocephalus schoenobaenus</i>	PM
	Eastern Olivaceous Warbler	<i>Iduna pallida</i>	PM
	Upcher's Warbler	<i>Hippolais languida</i>	PM
Phylloscopidae	Willow Warbler	<i>Phylloscopus trochilus</i>	PM
	Chiffchaff	<i>Phylloscopus collybita</i>	W
Sylviidae	Blackcap	<i>Sylvia atricapilla</i>	PM
	Arabian Warbler	<i>Curruca leucomelaena</i>	BR
	Lesser Whitethroat	<i>Curruca curruca</i>	PM
	Yemen Warbler	<i>Curruca buryi</i>	BR
Zosteropidae	Abyssinian white-eye	<i>Zosterops abyssinicus</i>	BR
Sturnidae	Common myna	<i>Acridotheres tristis</i>	BR
Muscicapidae	Blue Rock Thrush	<i>Monticola solitarius</i>	W
	Bluethroat	<i>Luscinia svecica</i>	PM
	Black Bush-Robin	<i>Cercotrichas podobe</i>	BR
	Black Redstart	<i>Phoenicurus ochruros</i>	W
	Common redstart	<i>Phoenicurus phoenicurus</i>	W
	European Stonechat	<i>Saxicola rubicola</i>	W
	Siberian Stonechat	<i>Saxicola maurus</i>	W
	Black start	<i>Cercomela melanura</i>	BR
Nectariniidae	Nile Valley Sunbird	<i>Hedydipna metallica</i>	BR
	Shinning Sunbird	<i>Cinnyris habessinicus</i>	BR
Passeridae	House sparrow	<i>Passer domesticus</i>	BR
Ploceidae	Rüppell's weaver	<i>Ploceus galbula</i>	BR

Motacillidae	Grey Wagtail	<i>Motacilla cinerea</i>	PM
	White Wagtail	<i>Motacilla alba</i>	W
	African Pipit	<i>Anthus cinnamomeus</i>	BR
	Tawny Pipit	<i>Anthus campestris</i>	W
	Long-billed Pipit	<i>Anthus similis</i>	W
Estrildidae	Arabian Waxbill	<i>Estrilda troglodytes</i>	BR
	African silverbill	<i>Euodice cantans</i>	BR
Fringillidae	Arabian Serin	<i>Crithagra rothschildi</i>	BR
	Yemen serin	<i>Crithagra menachensis</i>	BR
	Yemen Linnet	<i>Linaria yemenensis</i>	BR

BR = Breeding Resident; PM = Passage Migrant; W = Winter Visitor

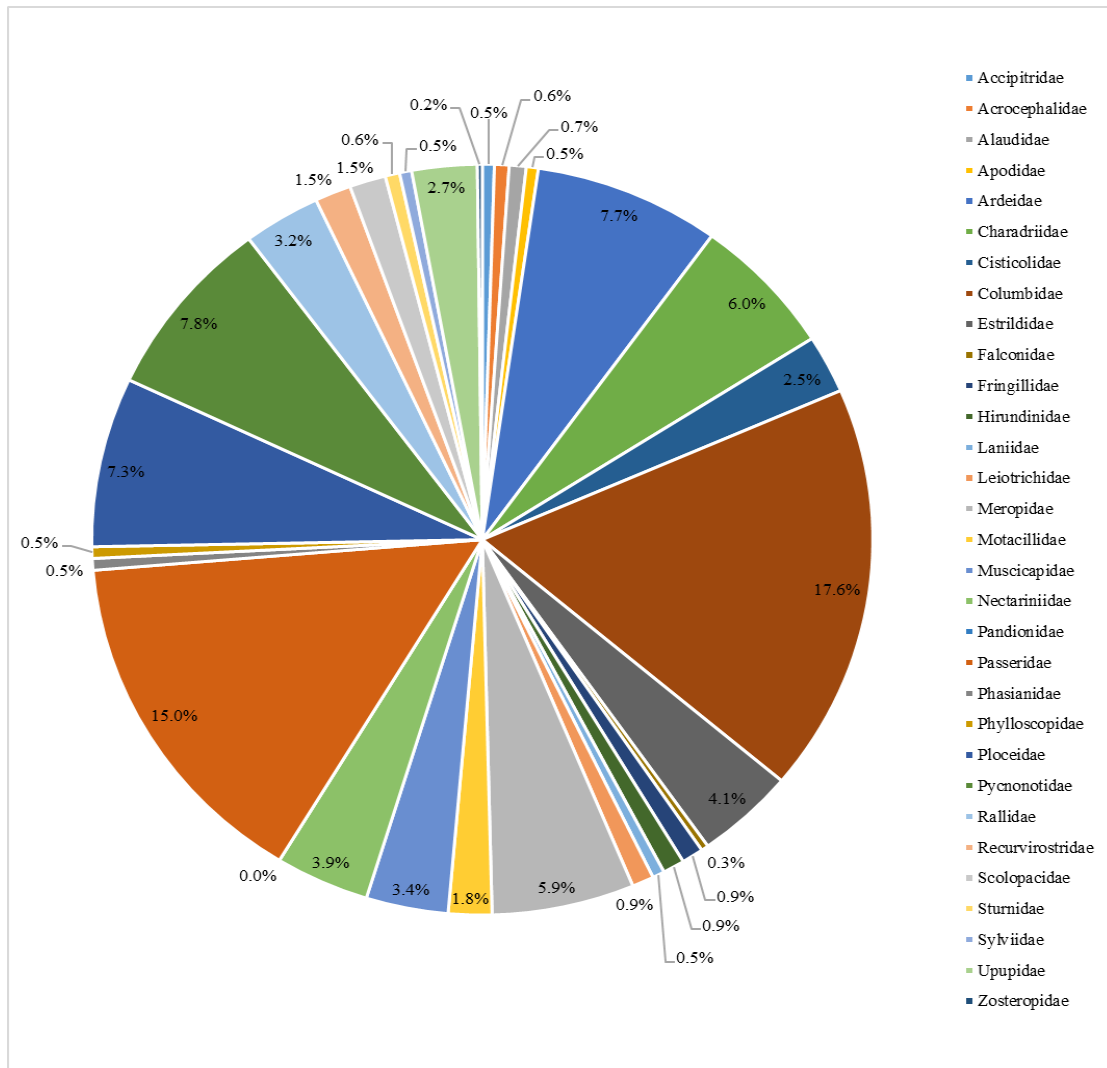


Figure 2: Family-wise composition of bird species (percentage) recorded in the study area.

Discussion

The importance of bird records lies in identifying bird species, knowing their migration seasons, and estimating the number of birds in a specific area. Bird records play a vital role in understanding a particular ecosystem and preserving biodiversity. The significance of documenting bird species lies in providing a rich database that helps researchers, research centers, and nature conservation organizations understand the extent of species richness in a particular area and track nesting areas, migration areas, and endemic bird species. Records contribute to the preservation of threatened species by providing information about their geographical distribution and migration paths.

The city of Taif is famous for its biological diversity, including birds' diversity. In this study, 81 different species of birds were recorded. A study on migratory passerine birds in Wadi Harjal, Al-Shifa, recorded a total of 41 migratory bird species as passage migrants and winter visitors [11]. Another study conducted in the Aldesa Valley, Tabuk region, recorded 19 bird species [8]. In the Wadi Fatimah dam area, Makkah region, 87 species of birds were documented, of which 40 species were migratory [10]. By comparing the studies in different regions, it can be concluded that Taif exhibits rich bird diversity.

The diversity of habitats, moderate temperatures, and the presence of various water sources make Taif an attractive area for various bird species, whether resident or migratory. Plant diversity supports the life of many bird species in the valleys of the city of Taif. About 165 species of plants belonging to 128 genera and 47 families were found in Taif's major valleys at high altitudes; perennial plants made up 69.7% of them, while annual plants made up 30.3% [15]. Asir magpie (*Pica asirensis*) is the only endemic bird species in KSA. In the Arabian Peninsula, 14 endemic and 4 semi-endemic bird species exist [5]. The current survey recorded 6 of the Arabian Peninsula endemic species: *Alectoris philbyi* (Philby's Partridge), *Curruca buryi* (Yemen

Warbler), *Estrilda troglodytes* (Arabian Waxbill), *Crithagra rothschildi* (Arabian Serin), *Crithagra menachensis* (Yemen serin), and *Linaria yemenensis* (Yemen Linnet). Also, 2 semi-endemic species of the Arabian Peninsula, *Turdoides squamiceps* (Arabian Babbler) and *Merops orientalis* (Little green bee-eater) were observed in Wadi Al-Arj.

Due to the richness of species and the supportive environment present in the Taif region, specifically Wadi Al-Arj, it is recommended that bird diversity be protected by the concerned departments and authorities. Regulations must be established to prevent hunting, overgrazing, and other human activities that threaten the wildlife in the area. Additionally, it is recommended that the National Wildlife Center conduct studies in this area to evaluate its biodiversity and provide recommendations that help in the prosperity of its wildlife. The current survey is the first survey that conducted research on the diversity of birds in the north of Taif, specifically in Wadi Al-Araj. However, additional studies are required to comprehensively understand the temporal and spatial dynamics of bird diversity and migration in this area, necessitating multi-seasonal and longer investigations.

Conflicts of interest

The authors have no conflicts of interest.

Funding: None

References

- [1] K. Abdelrahman, A. M. Al-Amri, K. Al-Kahtany, and N. Al-Otaibi, "Landslide susceptibility mapping of Al Taif urban area, Saudi Arabia, using remote sensing data and microtremor measurements: integrated approach," *Front Earth Sci (Lausanne)*, vol. 11, p. 1270061, 2023.
- [2] B. Alharthi and T. A. El-Damaty, "Study the urban expansion of Taif City using remote sensing and GIS techniques for decision support system," *Advances in Remote Sensing*, vol. 11, no. 1, pp. 1–15, 2022.

- [3] S. Mekonen, "Birds as biodiversity and environmental indicator," *Indicator*, vol. 7, no. 21, 2017.
- [4] Soliman, A., Sheta, B., Bahnasway, M., Orabi, G. Avifaunal updated survey in St. Catherine protectorate, Egypt. *Journal of Medical and Life Science*, 2022; 4(1): 9-17. doi: 10.21608/jmals.2022.230513
- [5] C. Boland, A. Abdullah, J. Babbington, M. Shobrak, and A. Al-Boug, *The Birds of Saudi Arabia*. Saudi Aramco, 2020.
- [6] C. R. J. Boland and B. O. Burwell, "Ranking and mapping the high conservation priority bird species of Saudi Arabia.," *Avian Conservation & Ecology*, vol. 15, no. 2, 2020.
- [7] M. C. Jennings, "Atlas of the breeding birds of Arabia," 2010.
- [8] A. S. Alatawi, F. Bled, and J. L. Belant, "An inventory of avian species in Aldesa Valley, Saudi Arabia," *Check List*, vol. 14, no. 5, pp. 743–750, 2018.
- [9] S. A. Alrumman, A. G. Alaofi, H. S. Al-Nasser, and A. S. Al-Saif, "A Rapid Survey of Wild Birds in Different Habitats in the Aseer Region, Saudi Arabia," 2023.
- [10] A.-R. A. Alasiri, H. M. Felemban, and M. I. Mujallid, "Bird's diversity of Wadi Fatimah Dam area, Makkah region, Saudi Arabia," *Ukr J Ecol*, vol. 11, no. 2 (Оценка экологического риска), pp. 47–54, 2021.
- [11] H. Al-Gorashi, "Ecological Study on Migratory Passerine Birds in Wadi Harjal, AlShifa Area," AlShifa Area, 1995.
- [12] M. Hassan, H. Mahmoud, M. Habashy, and K. A. El-Wakeil, "Effect of sewage disposal in some torrents streams on zooplankton community structure.," *Egypt J Aquat Biol Fish*, vol. 26, no. 4, 2022.
- [13] B. E. Keyes and C. E. Grue, "Capturing birds with mist nets: a review," *North American Bird Bander*, vol. 7, no. 1, p. 1, 1982.
- [14] Porter R and Aspinall S, *Birds of the Middle East*, 2nd edition. Princeton University Press: Princeton, 2010.
- [15] Y. Al-Sodany, S. Bazaid, H. Alyasi, A. Majrashi, and K. Elharthi, "Plant diversity and community structure of the main wadis at high altitudes of the western mountains at Taif, Saudi Arabia," *Egyptian Journal of Botany*, vol. 60, no. 2, pp. 325–346, 2020.