



Research Article

Bird Diversity of Nemrut Caldera Natural Monument (Bitlis)

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Abstract: This research was carried out between March 2020 and November 2021 to determine bird fauna of Nemrut Caldera Natural Monument located within the borders of Bitlis Province. As a result of field studies conducted in the caldera and its surroundings, a total of 72 bird species belonging to 29 families from 13 ordo were identified in the area. Of these species, 24 (33.3%) were determined as resident, 41 (57%) as summer migrant and 7 (9.7%) as transit migrant. When the threat levels of the bird species observed in the area were examined according to the IUCN (International Union for Conservation of Nature) criteria; 1 species was in the VU "Vulnerable=Sensitive" (*Aythya ferina*) category. When the IUCN Red List Categories of the species in Europe evaluated, 2 species in the area were VU (*Tringa totanus* ve *Corvus frugilegus*) and 4 species were NT (*Fulica atra*, *Coturnix coturnix*, *Apus apus*, *Lanius senator*). According to Bern Convention Red List Categories, all of observed species were categorized as; 43 in Annex II and while 24 in Annex III.

Keywords: Avifauna, Biodiversity, Birds, Wetland

Nemrut Kalderası Tabiat Anıtı'nın (Bitlis) Kuş Çeşitliliği

Öz: Bu araştırma, Bitlis ili sınırları içinde bulunan Nemrut Kalderası Tabiat Anıtı'nın kuş faunasını belirlemek amacıyla Mart 2020-Kasım 2021 tarihleri arasında gerçekleştirilmiştir. Kaldera ve çevresinde yürütülen arazi çalışmaları sonucunda alanda toplam 13 takım ve 29 familyaya ait 72 kuş türü tespit edilmiştir. Bu türlerden 24'ü yerli (%33.3), 41'i yaz ziyaretçisi (%57) ve 7'si transit göçer (%9.7) olarak tespit edilmiştir. Alanda gözlemlenen kuş türlerinin IUCN (Uluslararası Doğa Koruma Birliği) kriterlerine göre tehdit dereceleri incelendiğinde; 1 tür VU "Zarar görebilir=Duyarlı" (*Aythya ferina*) kategorisinde yer almaktadır. Türlerin Avrupa'daki IUCN tehlike kategorileri incelendiğinde ise 2 tür VU (*Tringa totanus* ve *Corvus frugilegus*) ve 4 tür NT "Tehdide açık" (*Fulica atra*, *Coturnix coturnix*, *Apus apus*, *Lanius senator*) kategorisindedir. Bern Sözleşmesine göre ise alandaki 43 kuş türü Ek II listesinde, 24 kuş türü de Ek III listesinde yer almaktadır.

Anahtar Kelimeler: Avifauna, Biyoçeşitlilik, Kuşlar, Sulak alan

1. Introduction

Biodiversity, which forms the basis of the ecosystem, is the reason for the rich and diverse natural life of the world. It is very important for both humans and all other living things in terms of the continuation of human activities and natural balance. Habitat quality is an important indicator for assessing biodiversity. Birds are the key indicators of habitat quality and the most obvious forms of animal life worldwide, from the poles to the tropical forests, from the deserts to the cores of the oceans and from the highest mountains to the heart of the cities (Tabur and Ayvaz, 2010).

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The diversity of living species is greater in habitats in transitional locations where different ecosystems meet. Extinct volcanoes in the world constitute vital habitats for living species. These structures, which contain different ecosystems, are important as breeding, feeding, and accommodation areas for living things (Primack, 2010).

The Nemrut Caldera formed as a result of the filling of the craters formed as a result of the eruption of the Nemrut Volcano with water from the surrounding area. Caldera lakes are both an important subject for scientific research and have remarkable features in terms of ecosystem. The Nemrut Caldera is an area that covers both wetland and land ecosystems and is highly rich in plant and animal biodiversity. The harmony of living and non-living beings has not disturbed the nature of the caldera from the last eruption of the Nemrut Volcano until today (Alaeddinoğlu et al., 2011; Özdemir & Tuğ, 2015).

In this study, the characteristics of birds breeding and feeding in the Nemrut Caldera Natural Monument which is among the important areas both in our country and internationally such as the number of individuals, migration status and habitat preferences. Furthermore, the study also included environmental problems that threaten bird diversity in the caldera.

2. Material and Method

2.1. Geographical features and location of research area

The Nemrut Caldera Natural Monument is located west of the Lake Van basin, bordering the Tatvan, Ahlat and Güroymak districts of Bitlis province. It is located on the highest hill of the Van and Bitlis Plains, 2250 to 2300 m above sea level. It has a surface area of 4589 ha (Eken et al., 2006; Kasaroğlu & Güler, 2021) (Figure 1).



Figure 1. Nemrut Caldera Natural Monument (Google Earth).

There are two crater lakes inside the caldera, the “Cold Lake” and the “Hot Lake” (Lake Ilık), holding permanent water and three other small lakes that dry up during the summer months. The largest lake in the caldera is Nemrut Crater Lake known as Cold Lake located in the west. The average depth of the lake is 100 m and its deepest part is 155 m. The water of the lake, nourished by precipitation and spring waters, is freshwater. The area of Lake Ilık—the second largest lake—is 30 m², and its depth reaches 8 m. The lake, which does not freeze in winter, is filled with freshwater. The water temperature can reach 40 °C in winter and 60 °C in summer. The small lake on the road to Ahlat

is the third largest lake in the caldera. Like the other two small lakes in the area, it also dries up during summer months in some years (Özhatay et al., 2005; Eken et al., 2006; Bulum, 2017; Yakupoğlu & Özcan-Selçuk, 2020).

In terms of size, Nemrut Caldera ranks first in Türkiye, fourth in Europe and sixth in the world. Besides being a natural monument, the area is under protection as a First Degree Natural Protected Site, Tourism Zone, Wetland of International Importance and Ramsar Site due to its natural features. Nemrut Caldera was designated as a World Heritage Site in 1987, a Natural Monument in 2003, an Important Plant Area (IPA) in 2005, an Important Nature Area (INA) in 2006 and a Ramsar Site in 2013.

Continental climate prevails in and around Nemrut Caldera, where winters are cold and snowy and summers are hot and dry. Although it features typical continental climate characteristics, the moderating effect of the lake has been felt in the areas close to Lake Van. The annual average temperature recorded for many years is 9°C, and the average precipitation is 958 mm (Bulum, 2017; Anonymous, 2020).

The Nemrut Caldera hosts different habitat types due to its unique microclimate. There are around 500 plant species identified in the area so far. 8.4% of these are endemic. Silver Birch (*Betula pendula*) communities grow on the slopes on the inner side of the caldera. Eurasian Aspen (*Populus tremula*) and Oak (*Quercus spp.*) dominate the mountain steppes and many plant species, such as Crater Buttercup (*Ranunculus crateris*), an endemic species for the area, are known to be spread throughout the area (Tatlı, 1982; Avcı, 2005; Eken et al., 2006).

It is also known that three fish species (Iridescent killifish-*Aphanius mento*, barbel fish-*Barbus ercisianus* and Eurasian carp-*Cyprinus carpio*), one of which is endemic to the area, are found in Nemrut Crater Lake. Eurasian Carp constitutes the common fish species in the area (Elp et al., 2016; Bulum, 2017; Adizel et al., 2017).

2.2. Method

Field studies were conducted in monthly periods between March 2020 and November 2021. Bird species were generally observed between 6⁰⁰ -19⁰⁰ when they are active. The populations, arrival and departure times of the bird species in the study area, their habitat preferences, migration status, and threats in the area were determined. The birds in the study area were identified using Dobinson's (1976) "Squares (Raster Carding)" method and "Line Transect Method" (Point Counts). The number of individuals was counted by scanning the whole study area through telescopes, binoculars and the naked eyes from the dominant points of the area, taking into account a certain line. In order to determine the breeding grounds and nesting sites of the species, observations were made by walking along a line in the area, taking into account a certain width.

Field observation cards, binoculars (8 x 40), telescope (100 mm), a numerator, camera and lens (400 mm) and identification books (Heinzel et al., 1995; Harrison & Greensmith, 2000; Kiziroğlu, 2008; Svensson et al., 2011) were used in the studies.

3. Results and Discussion

As a result of the field studies carried out in the Nemrut Caldera Natural Monument between March 2020 and November 2021, a total of 72 bird species belonging to 13 orders and 29 families were determined. 24 of these species were resident (33.3%), 41 were summer migrants (57%) and 7 were transit migrants (9.7%) (Table 1).

Table 1. Birds of Nemrut Caldera Natural Monument and their red list categories

Ordo	Family	Species	Status	IUCN	Bern	CITES
PODICIPEDIFORMES	PODICIPEDIDAE	<i>Podiceps nigricollis</i>	R	LC	Annex II	-
		<i>Tachybaptus ruficollis</i>	"	"	"	-
PELECANIFORMES	ARDEIDAE	<i>Ardea purpurea</i>	SM	"	"	-
		<i>Ardea cinerea</i>	"	"	Annex III	-
		<i>Egretta garzetta</i>	"	"	Annex II	-
ANSERIFORMES	ANATIDAE	<i>Anas platyrhynchos</i>	R	"	Annex III	-
		<i>Aythya ferina</i>	"	VU	"	-

Table 1. Birds of Nemrut Caldera Natural Monument and their red list categories (continued)

Ordo	Family	Species	Status	IUCN	Bern	CITES	
ACCIPITRIFORMES	ACCIPITRIDAE	<i>Accipiter nisus</i>	SM	LC	Annex II	Annex II	
		<i>Buteo buteo</i>	"	"	"	"	
		<i>Buteo rufinus</i>	"	"	"	"	
FALCONIFORMES	FALCONIDAE	<i>Falco naumanni</i>	T	"	"	"	
		<i>Falco tinnunculus</i>	SM	"	"	"	
		<i>Falco subbuteo</i>	"	"	"	"	
		<i>Falco peregrinus</i>	T	"	"	"	
GRUIFORMES	RALLIDAE	<i>Fulica atra</i>	R	"	Annex III	-	
	PHASIANIDAE	<i>Alectoris chukar</i>	"	"	"	-	
		<i>Tetraogallus caspius</i>	"	"	"	Annex I	
		<i>Perdix perdix</i>	"	"	"	-	
		<i>Coturnix coturnix</i>	SM	"	"	-	
CHARADRIIFORMES	RECURVIROSTRIDAE	<i>Himantopus himantopus</i>	"	"	Annex II	-	
	SCOLOPACIDAE	<i>Tringa totanus</i>	"	"	Annex III	-	
	LARIDAE	<i>Larus armenicus</i>	R	"	"	-	
COLUMBIFORMES	COLUMBIDAE	<i>Larus ridibundus</i>	SM	"	"	-	
		<i>Columba livia</i>	R	"	"	-	
		<i>Streptopelia decaocto</i>	SM	"	"	-	
STRIGIFORMES	STRIGIDAE	<i>Bubo bubo</i>	R	"	Annex II	Annex II	
		<i>Athene noctua</i>	"	"	"	"	
CAPRIMULGIFORMES	APODIDAE	<i>Apus apus</i>	SM	"	Annex III	-	
		<i>Tachymarpis melba</i>	"	"	Annex II	-	
CORACIIFORMES	MEROPIDAE	<i>Merops apiaster</i>	"	"	"	-	
	CORACIDAE	<i>Coracias garrulus</i>	"	"	"	-	
BUCEROTIFORMES	UPUPIDAE	<i>Upupa epops</i>	"	"	"	-	
PASSERIFORMES	ALAUDIDAE	<i>Alauda arvensis</i>	R	"	Annex III	-	
		<i>Melanocorypha bimaculata</i>	T	"	Annex II	-	
		<i>Riparia riparia</i>	SM	"	"	-	
	HIRUNDINIDAE	<i>Hirundo rustica</i>	"	"	"	-	
		<i>Delichon urbicum</i>	"	"	"	-	
		<i>Motacilla flava</i>	"	"	"	-	
		<i>Motacilla cinerea</i>	"	"	"	-	
		<i>Motacilla alba</i>	"	"	"	-	
		<i>Motacilla flava</i>	"	"	"	-	
	TROGLODYTIDAE	<i>Anthus campestris</i>	T	"	"	-	
		<i>Troglodytes troglodytes</i>	SM	"	"	-	
	MUSCICAPIDAE	<i>Erethacus rubecula</i>	"	"	"	-	
		<i>Phoenicurus phoenicurus</i>	"	"	"	-	
		<i>Phoenicurus ochruros</i>	T	"	"	-	
		<i>Saxicola torquatus</i>	SM	"	"	-	
		<i>Saxicola rubetra</i>	"	"	"	-	
		<i>Oenanthe hispanica</i>	"	"	"	-	
		<i>Oenanthe isabellina</i>	"	"	"	-	
		<i>Oenanthe oenanthe</i>	"	"	"	-	
		<i>Monticola saxatilis</i>	T	"	"	-	
		<i>Parus major</i>	R	"	"	-	
		<i>Cyanistes caeruleus</i>	"	"	"	-	
		LANIIDAE	<i>Lanius collurio</i>	SM	"	"	-
			<i>Lanius minor</i>	"	"	"	-
			<i>Lanius senator</i>	T	"	"	-
		CORVIDAE	<i>Corvus corone</i>	R	"	-	-
	<i>Corvus corax</i>		"	"	Annex III	-	
	<i>Corvus frugilegus</i>		"	"	"	-	
	<i>Pica pica</i>		"	"	-	-	
	<i>Garrulus glandarius</i>		"	"	-	-	
	<i>Sturnus vulgaris</i>		"	"	-	-	
	<i>Passer domesticus</i>		"	"	-	-	
	<i>Passer montanus</i>		"	"	Annex III	-	
PASSERIDAE	<i>Petronia petronia</i>	R	"	Annex II	-		
FRINGILLIDAE	<i>Fringilla coelebs</i>	SM	"	Annex III	-		
	<i>Carduelis carduelis</i>	"	"	"	-		
EMBERIZIDAE	<i>Emberiza calandra</i>	"	"	"	-		
	<i>Emberiza melanocephala</i>	"	"	"	-		
	<i>Emberiza cia</i>	"	"	"	-		
	<i>Emberiza hortulana</i>	"	"	"	-		

R: Resident SM: Summer migrant T: Transit migrant

The bird species in the area according to their orders are as follows: Podicipediformes 2, Pelecaniformes 3, Anseriformes 2, Accipitriformes 3, Falconiformes 4, Gruiformes 5, Charadriiformes 4, Columbiformes 2, Strigiformes 2, Caprimulgiformes 2, Coraciiformes 2, Bucerotiformes 1 and Passeriformes 40 species. Passeriformes is the largest order represented in Nemrut Caldera Natural Monument, while Podicipediformes, Anseriformes, Columbiformes, Strigiformes, Caprimulgiformes, Coraciiformes and Bucerotiformes are the orders with the lowest number of species (Figure 2).

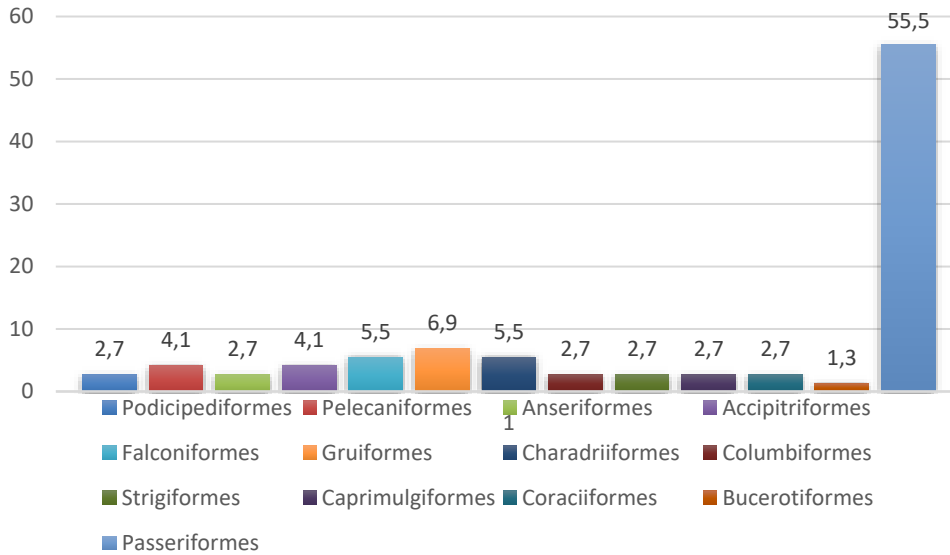


Figure 2. Percentage rates of species in the area according to orders.

When the IUCN endangerment categories of the species identified in the Nemrut Caldera Natural Monument were considered, it was observed that one species was involved in VU “Vulnerable” category (*Aythya ferina*- common pochard). The other 71 species were regarded as LC (Least Concern=Low Risk). Also, when the IUCN endangerment categories of the species in Europe were analyzed, it was observed that two species were involved in VU category (*Tringa totanus*-common redshank and *Corvus frugilegus*-rook), and four species were involved in NT “near threatened” category (*Fulica atra*-Eurasian coot, *Coturnix coturnix*-common quail, *Apus apus*-common swift, and *Lanius senator*-woodchat shrike) (IUCN, 2022). When the birds in the caldera were analyzed according to the Bern Convention, 43 species were found to be listed in Annex II, i.e., among the “Importantly Protected Species”. These species were observed to belong to the Falconidae, Hirundinidae, Motacillidae, and Muscicapidae families. 7 of these species were resident, 29 were summer migrant and 7 were transit migrant. 24 of the species in the area are listed in Annex III of the same convention. When analyzed according to the criteria of the CITES, it is seen that one of the species in the area is listed in Annex I and 9 species are listed in Annex II.

4. Conclusion

The distribution area and migration status of 72 bird species identified in and around Nemrut Caldera Natural Monument are compatible with the data of Kiziroğlu (2008), Green & Moorhouse (1995), and Kirwan et al. (1998).

In a study conducted by Adızel (1998) on the bird fauna of Van Lake Basin, it was reported that 213 bird species were inhabiting the basin. When the results of the present study are compared with the results of that study, it was observed that the composition of the species in Lake Van Basin was richer. However, the species identified in the present study and their status are compatible with the results of that study.

In a study conducted by Adızel & Durmuş (2009) on the bird fauna of Lake Erçek, they revealed that species such as the Lesser Kestrel (*F. naumanni*), the tawny pipit (*A. campestris*), the

Black Redstart (*P. ochruros*) and the rufous-tailed rock thrush (*M. saxatilis*), the status of which was identified as summer migrant for the region, were transit migrants in the area.

Eurasian wren (*T. troglodytes*) and European robin (*E. rubecula*), the status of which was assigned as winter migrant for the region by Avcı et al. (2017), were observed as summer migrant in the area.

We did not find any evidence that the velvet scoter (*M. fusca*), which Eken et al. (2006) reported to breed in the Nemrut Caldera, fed or bred in the study area.

The Nemrut Caldera Natural Monument holds an important place both nationally and internationally for animal and plant biodiversity when its habitat structure, topographical features and climatic conditions are taken into consideration. The caldera is located at the intersection of ecosystems such as lake, forest and mountain ecosystems. This intersection positively affects bird fauna as well as the diversity of species. Bird species occupy an important place among the diversity of species in Nemrut Caldera. The caldera, which hosts summer migratory and transit migratory bird species as well as resident birds, provides a favorable structure for bird habitats.

Since the caldera is situated in an important geological and biodiversity location, it is frequently visited by people when the climatic conditions are favorable. The intensive recreational use of this area by people has increased environmental pollution. This pollution, generated in the summer months, has negatively affected the diversity of species as well as the bird fauna. Although hunting activities are banned in this area, these activities still take place in a limited area. Controls about illegal hunting in the area should be increased. The caldera has also attracted local and foreign tourists for sightseeing or research purposes. The tours organized in the summer months, especially for excursions, have a negative effect on the biodiversity and bird fauna. It is necessary to inform people about bird species in the area and to place warning signs. If these problems continue and no measures are taken, Nemrut Caldera may be no longer qualified as a 'Natural Monument'.

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