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Birds of Mount Nemrut National Park Area, Turkey

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Abstract

Bird species diversity at Mount Nemrut (Adıyaman province, south-eastern Turkey) and in the surrounding areas was studied during the period 2009–2010. Data was collected using the point-count method at predefined observation sites. Birds of 107 different species were recorded, of which 20 were certainly breeding, 17 were probably breeding, and 29 were possibly breeding in the study area. Including species reported by other sources, a total of 160 bird species has so far been detected in the Mount Nemrut area, while the white-throated dipper was recorded for the first time. Diversity was calculated by using the Shannon-Wiener diversity index. Highest diversities were detected in woodland habitats (including oak groves), rocky areas and woodland habitats. Bird diversity showed peaks corresponding to spring and autumn passage migrations, and bird numbers were highest in mid-winter. Although part of Mount Nemrut has been declared one of Turkey's key biodiversity areas and has already been given the status of a National Park, threats occur, notably the harmful effects of mass tourism and illegal hunting, because of ineffective protection measures. Better knowledge of local avifauna and its habitat requirements may help to ensure better protection of this unique area.

Profile

Protected area

Mount Nemrut National Park

Mountain range

Taurus mountains

Country

Turkey

Introduction

The South-eastern Taurus range represents a geographical border between the relatively flat terrain of south-eastern Anatolia and the more elevated areas in the north. Mount Nemrut, with a peak of 2134 m a.s.l. and extending into Adıyaman and Malatya provinces, is a part of the Taurus range. The site at the top of the mountain has gained worldwide attention due to its archaeological significance. An area that includes the Tumulus of Antiochos (69 to 40 BC) on the summit, as well as world-famous monumental statues (Lobell 2002), and various other archaeological sites covering 13850 ha were declared a National Park (NP) in 1988 (UNESCO 2016).

In addition to its historical value, at a regional level Mount Nemrut has for decades been considered an important nature area, albeit a fragmented one, though some large sections of it are intact. Hence, it is acknowledged both as an Important Bird Area (IBA No.: TR145/GDA008; Kılıç & Eken 2004) and as a Key Biodiversity Area (KBA No.: DOG003; Eken et al. 2006).

Despite the exceptional nature of the Mount Nemrut area, the birds sheltering there have never before been studied in a methodical way. Published information on the bird diversity of this region and its neighbourhood is limited to fairly anecdotal records of birding trips made by various observers. Selected records are evaluated at fairly regular intervals, mainly in the Turkey Bird Reports (e.g. Kirwan et al. 2003, 2008, 2014).

Protected areas, with their multiple functions, are central to all nature conservation efforts (Erol et al. 2011). However, effective management in a NP needs reliable information on its biodiversity. The present paper details the bird diversity of Mount Nemrut and its surrounding area throughout a complete year. Compiling a virtually complete list of bird species with their local status as well as their preferred habitats will help to develop appropriate management plans for the protection of avian habitats.

Material and Methods

Study Area

The study area is located in Adıyaman province, encompassing the district between the south-eastern slopes of Mount Nemrut (approximate coordinates of the summit: 37° 58' N, 38° 44' E) and the Atatürk Dam reservoir (formerly Euphrates river) (Figure 1). The region is sparsely populated, and the main sources of income are livestock farming and agriculture, which for the most part are practised in a fairly traditional manner.

The south-eastern Anatolian region has a typical steppe climate, with an annual average temperature of 17.2°C, mean maximum of 37.8°C (July), and mean minimum of 1.2°C (January). Precipitation primarily occurs in winter and spring, averaging 678 mm annually (data from Turkish State Meteorological Service, www.mgm.gov.tr). The mean annual temperatures in the study area correlate inversely with elevation, and range from around 7°C to around 16°C. In summer, dry tropical air masses from the south result in high temperatures; from autumn on, however, polar air from eastern Anatolia leads to frontal activities and

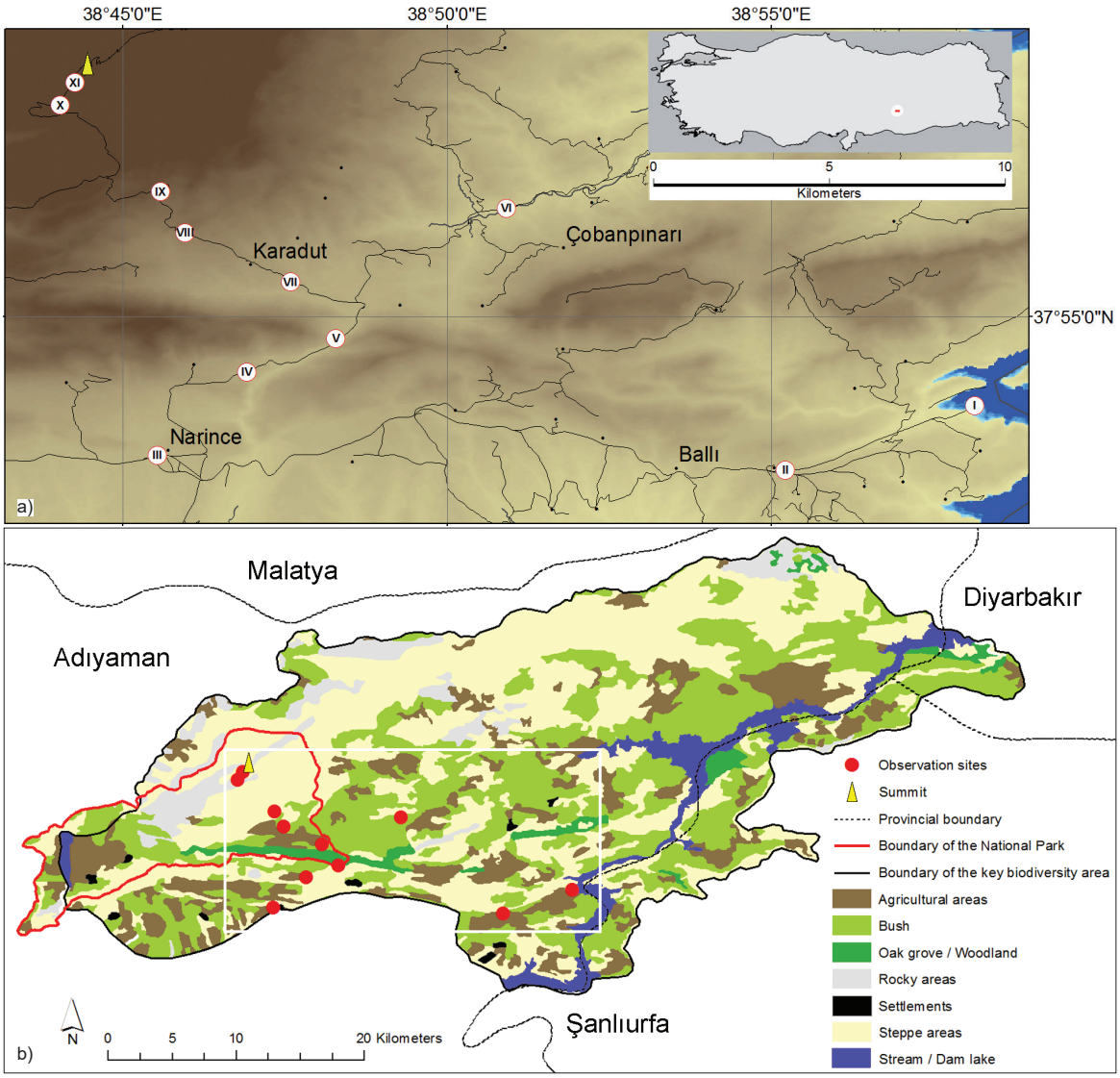

Figure 1 – The study area. (a) Locations of the observation sites with the road network (site numbers I–XI correspond to the site IDs in Table 1). Inset: Location of the map area within Turkey. Elevation in the terrestrial area ranges between 530 and 2 134 m a.s.l., shown as lighter and darker areas respectively. (b) Map showing the Nemrut Mountain National Park (NP) area, the Nemrut Mountain Key Biodiversity Area (KBA), and the main areas of diverse habitat types in the KBA (the habitat classifications used in Table 2). The extent of the National Park is outlined in red. Geospatial data were obtained (and processed as required), for: the NP area (source: General Directorate of Nature Conservation and National Parks (www.milliparklar.gov.tr)); KBA (source: Eken et al. 2006); land cover (source: European Environment Agency CLC 2006 (www.eea.europa.eu)).

precipitation, mainly on the southern slopes of the mountain (Atalay et al. 2002). The study area has a continental climate as a whole, yet a semi-arid Mediterranean climate is found at lower elevations as a result of the proximity of the Mediterranean region (Atalay et al. 1999). Consequently, prevailing plant communities in the study area may be classified in three elevation bands: (1) Mediterranean scrub vegetation, up to some 800 m; (2) a Mediterranean mountain woodland belt of oaks (*Quercus brandii, Q. cerris, Q. infectoria, Q. libani*), up to about 1 800 m; (3) a subalpine zone of shrubs (such as *Astragalus*, *Genista* and *Prunus*) or herbs (such as *Thymus*) above 1 800 m (Atalay et al. 2002). 250 taxa of seed plants were detected in the area, of which 40.7% were Irano-Turanian, 10.5% were Mediterranean, and 0.04% were Euro-Siberian elements, while 41.5% were widespread plants, having an overall endemics proportion of 17.2% (Tel 2009). Natural vegetation is extensively degraded in some areas, due to forest destruction, overgrazing, and inappropriate land use (Atalay et al. 2002). There is a network of permanent streams, mainly fed by rainfall, which reach their maximum levels in early springtime (Karadoğan 2005).

Data Collection

Field surveys were generally conducted once a month, over the course of one year, between October 2009 and September 2010. Two additional field trips were made in both April and June, and one further trip was made in both September and October; the numbers

*Table 1 – Overview of the main characteristics of the observation sites, indicating elevation (metres above sea level), habitat diversity (number of different habitat types), number of bird species detected, and proportion of the total number of birds counted during the whole study. * Site IDs correspond to those on Figure 1. ** Numbers of distinct habitat types. Habitat ID's in parentheses refer to the habitat types in Table 2 below.*

ID*	Site	Elevation [m]	Habitat diversity**	Species #	Birds [%]
I	Atatürk Dam	530	8 (1–7, 9)	49	21.0
II	Çobanpınarı	700	7 (1–2, 4-5, 7–9)	43	5.6
III	Güzelsu	780	6 (1, 4–7, 9)	29	3.9
IV	Narince	820	6 (1–2, 4–7)	12	2.0
V	Kâmboğazı	830	7 (2, 4–9)	47	11.8
VI	Aydınpınar	900	6 (1–2, 4–5, 7, 9)	58	14.5
VII	Karadut	930	8 (1–2, 4–9)	72	15.4
VIII	Hotel	1 210	7 (2, 4–9)	44	8.7
IX	Restaurant	1 420	5 (1–4, 4–5, 9)	40	8.2
X	Valley	1 610	4 (2, 4–5, 7)	31	5.0
XI	Summit	1 940	3 (2, 5, 7)	23	3.9

of birds and species for these extra visits were later averaged during analysis. Observations were performed at predefined observation sites (Figure 1, Table 1) for a period of about 20 minutes in each case, using point-count methodology (Bibby et al. 1992). However, some sites could not be visited an equal numbers of times, for example due to unfavourable weather conditions or to inaccessibility because of snow cover, which resulted in a reduction of sample sizes in the related data. Ornithological equipment consisted of field glasses (8×40), telescopes (20–60×80), and a camera with 300-mm lens. Bird species were identified in the field, occasionally using a field guide (Mullarney et al. 1999). For the systematic list of birds, we followed Kirwan et al. (1999). The breeding status of birds was determined by applying the European Bird Census Council (EBCC) criteria: individual birds were assessed according to 16 different categories, and classified as possible breeding (categories 1–2), probable breeding (3–9), and confirmed breeding (10–16) (Hagemeijer & Blair 1997). Habitat types in the study area had been identified and were associated with individual bird records (Table 2).

Data Analysis

Species richness and species evenness were calculated from the census data and field observations. Species richness was defined as the total number of bird species observed throughout an observation period. Species diversity for a given observation point was assessed using Shannon-Wiener index *H'* (Shannon & Weaver 1949; Spellerberg & Fedor 2003). Species evenness (*J'*), which is a measure of the relative abundance of different species, was assessed using $J' = H' / ln(S)$, where S is the total number of species (Begon et al. 1990).

The relative abundance of a given species was calculated by dividing the total number of individuals for that species observed throughout the study by the total bird number (n=7 898). Habitat diversity was defined for individual observation sites as the maximum number of different habitat types where at least one bird was observed during the whole study; the number of habit types present at the sites varied between three and eight. The Bray-Curtis similarity index (Bray & Curtis 1957) was calculated to compare observation sites regarding their species richness and bird diversity.

*Table 2 – Main habitat types in the study area, associated with bird observations. * Habitat IDs correspond to those in Table 1. Also see Figure 1b.*

ID*	Habitat type	Typical bird groups
1	Agricultural area	Larks
2	Bushes	Warblers
3	Dam lake	Waterfowl
4	Oak grove	Shrikes, buntings
5	Rocky area	Raptors, nuthatches, some thrush species, some crow species
6	Settlement	Doves, pigeons, sparrows
7	Steppe	Partridges, wheatears
8	Stream	Pipits, wagtails
9	Woodland	Finches, tits

Variables were tested for normality. Differences in diversity indices among observation sites, or habitat types, were analysed using one-way ANOVA, as long as related data met conditions for this test. Differences among groups of observation sites and of habitat types tested were located using *post hoc* tests. In cases of associated data not meeting the assumptions of one-way ANOVA, we performed a Kruskal-Wallis test as the non-parametric option. For recording and grouping of data, we used MS Excel® (2007), and statistical tests were conducted using SPSS® (ver. 11.5).

Results

A total of 107 bird species belonging to 14 orders and 39 families were observed during the study period, of which 20 (18.7 %) were verified as breeding species in the study area, while 17 (15.9 %) and 29 (27.1 %) of them were probably and possibly breeding species respectively (Table 3). Five species were assessed as globally threatened (IUCN 2016), of which *Neophron percnopterus* (EN) was possibly breeding, *Streptopelia turtur* (VU) and *Emberiza cineracea* (NT) were probably breeding species, while *Aythya ferina* (VU) and *Larus armenicus* (NT) were transient migratory species or wintering in the area. 27 further species were in SPEC categories (Tucker & Heath 1994; Birdlife 2004), of which 16 were threatened species for Turkey. Of these 16, *Ceryle rudis* is evaluated as CR, and *Gyps fulvus* as EN (Kılıç & Eken 2004).

The most abundant species were *Passer domesticus*, *Fulica atra*, *Hirundo rustica*, *Apus apus* and *Carduelis carduelis* (Table 3). However, some species occurred only as a single individual; these included *Circus cyaneus*, *Ciconia nigra*, *Cinclus cinclus* and *Petronia brachydactyla*.

*Table 3 – Bird species and families recorded in the Mount Nemrut area during the study period, highest breeding categories detected, seasonal status, and relative abundances. * EBCC categories (Hagemeijer & Blair 1997): 0 non-breeding, 1–2 possible breeding, 3–9 probable breeding, 10–16 confirmed breeding. ** R – resident, S – summer migrant, W – winter visitor, PM – passage migrant; lowercase letters denote species which are generally uncommon during the season in which they were observed (Kirwan et al. 1999). In the absence of exact observational data for all species throughout the entire study area, statuses for some species were assigned as estimations only (shown by question marks).*

Species	Breeding category*	Seasonal status** for		Relative abundance [%]
		Turkey	Mount Nemrut	
Podicipedidae				
Podiceps cristatus	0	R, W	W	0.30
Phalacrocoracidae				
Phalacrocorax carbo	0	R, W	w	0.73
Ardeidae				
Ardea cinerea	0	R, W	R	1.15
Ciconiidae				
Ciconia nigra	0	S, PM, w	pm	0.01
Ciconia ciconia	9	r, S, PM	S	0.13
Anatidae				
Aythya ferina	0	R, W	W	0.01
Accipitridae				
Milvus migrans	0	S, PM, w	pm	0.06
Neophron percnopterus	1	S, pm	S	0.11
Gyps fulvus	0	R, s	r?	0.19
Circaetus gallicus	1	S, PM	pm	0.03
Circus cyaneus	0	s, W	pm	0.01
Accipiter nisus	1	R, PM, W	R	0.10
Buteo buteo	0	R, PM, W	pm	1.03
Buteo rufinus	6	R	R	0.42
Falconidae				
Falco tinnunculus	9	R, W	R	0.99
Falco subbuteo	12	S, PM	s	0.06
Phasianidae				
Alectoris chukar	2	R	R	0.75
Rallidae				
Fulica atra	0	R, W	W	8.60
Scolopacidae				
Actitis hypoleucos	0	S, w, PM	pm	0.01
Laridae				
Larus ichthyaetus	0	W	W	0.05
Larus ridibundus	0	R, W	W	4.24
Larus armenicus	0	R	W, r	2.70
Sternidae				
Sterna hirundo	0	S, PM	pm	0.04
Columbidae				
Columba livia	9	R	R	1.66
Columba palumbus	3	R, W, PM	R	0.06
Streptopelia decaocto	1	R	R	0.86
Streptopelia turtur	3	S, PM	s	0.11
Streptopelia senegalensis	2	R	R	0.10
Strigidae				
Athene noctua	1	R	R	0.01
Apodidae				
Apus apus	1	S, PM	S	6.24
Apus melba	1	S, PM	S	0.30
Alcedinidae				
Alcedo atthis	1	r, W, PM	w	0.01
Ceryle rudis	1	R	r	0.04
Meropidae				
Merops apiaster	1	S, PM	S	2.36
Upopidae				
Upupa epops	5	S, PM, w	S	0.15
Picidae				
Dendrocopos syriacus	1	R	R	0.27
Alaudidae				
Galerida cristata	1	R	R	1.16
Alauda arvensis	0	R	W	0.16
Eremophila alpestris	3	R	s?	0.16
Hirundinidae				
Hirundo rustica	13	S, PM	S	7.79
Hirundo daurica	13	S, PM	S	1.00
Delichon urbica	1	S, PM	S	3.67

Species	Breeding category*	Seasonal status** for		Relative abundance [%]
		Turkey	Mount Nemrut	
Motacillidae				
Motacilla flava	0	S, PM	W	0.13
Motacilla cinerea	1	R, PM, W	s?, pm?	0.15
Motacilla alba	1	R, PM, W	R	0.33
Cinclidae				
Cinclus cinclus	0	R	w	0.01
Troglodytidae				
Troglodytes troglodytes	0	R	W, R?	0.04
Prunellidae				
Prunella modularis	0	R, PM, W	PM	0.15
Turdidae				
Cercotrichas galactotes	14	S, PM	S	0.53
Erithacus rubecula	0	R, W, PM	W	0.37
Luscinia megarhynchos	1	PM	pm	0.01
Irania gutturalis	14	S	S	0.72
Phoenicurus ochruros	0	S, W, PM	W	0.53
Phoenicurus phoenicurus	0	S, PM	PM	1.03
Saxicola torquata	0	R, W	W	0.04
Oenanthe isabellina	1	S, PM	S	0.48
Oenanthe oenanthe	12	S, PM	S	0.41
Oenanthe hispanica	1	S, PM	S	0.28
Oenanthe finschii	12	S, w	S, R?	0.60
Oenanthe xanthoprymna	12	S	S	1.32
Monticola saxatilis	0	S, PM	pm?, s?	0.03
Monticola solitarius	14	R	R	0.20
Turdus merula	4	R, W	R	0.52
Turdus philomelos	0	R, W, PM	PM	0.03
Sylviidae				
Hippolais pallida	3	S, PM	S	0.52
Sylvia mystacea	3	S, PM	S	0.13
Sylvia hortensis	12	S, PM	S	0.19
Sylvia communis	0	S, PM	PM	0.01
Sylvia borin	0	S, PM	S	0.08
Phylloscopus collybita	0	S, PM, W	W, PM	1.09
Phylloscopus trochilus	0	PM	PM	0.01
Muscicapidae				
Muscicapa striata	1	S, PM	PM, s?	0.15
Ficedula semitorquata	0	S, PM	PM	0.03
Aegithaliidae				
Aegithalos caudatus	1	R	W, R?	0.47
Paridae				
Parus lugubris	3	R	W	1.53
Parus caeruleus	0	R	w	0.03
Parus major	12	R	R	2.37
Sittidae				
Sitta neumayer	14	R	R	5.09
Tichodroma muraria	0	R	w	0.03
Oriolidae				
Oriolus oriolus	1	S, PM	PM, s?	0.16
Laniidae				
Lanius collurio	1	S, PM	PM, s?	0.24
Lanius senator	12	S, PM	S	1.27
Lanius nubicus	1	S, PM	S	0.03
Corvidae				
Garrulus glandarius	12	R	R	1.53
Pica pica	1	R	R	0.15
Pyrrhocorax graculus	0	R	R?	0.03
Pyrrhocorax pyrrhocorax	6	R	R	0.51
Corvus monedula	9	R	R	3.10
Corvus corone pallescens	12	R	R	1.58
Sturnidae				
Sturnus vulgaris	0	R, W	W	0.25
Passeridae				
Passer domesticus	14	R	R	8.70
Passer hispaniolensis	13	S, pm, w	S	0.86
Petronia brachydactyla	1	S	s	0.01
Petronia xanthocollis	1	S	s	0.05
Petronia petronia	6	R	R	1.44
Fringillidae				
Fringilla coelebs	0	R, W	W	2.72

Species	Breeding category*	Seasonal status** for		Relative abundance [%]
		Turkey	Mount Nemrut	
Carduelis chloris	12	R	R	0.08
Carduelis carduelis	12	R	R	5.76
Carduelis cannabina	0	R	W	0.32
Rhodospiza sanguineus	1	R	r?	0.06
Coccothraustes coccothraustes	0	S, PM	w	0.03
Emberizidae				
Emberiza citrinella	0	r, W	W	0.05
Emberiza cia	0	R	W	0.67
Emberiza cineracea	3	S	S	0.33
Emberiza schoeniclus	0	R, W, PM	W	0.76
Emberiza melanocephala	14	S, PM	S	1.76
Miliaria calandra	5	R	PM, R?	0.09

The highest numbers of species in a single observation day (45) was detected in May, while the lowest number (26) occurred in November (Figure 2). In contrast, observed bird numbers fluctuated, with several peaks arising in February, May, October and December (December being the highest); the smallest number of birds was recorded in August. At all sites, both species richness ($F_{(11.103)} = 2.760$; $P < 0.01$) and the Shannon-Wiener diversity index ($F_{(11.103)} = 2.475$; $P < 0.01$) differed between months; evenness, however, was similar throughout the year ($F_{(11.103)} = 0.465$; $P = 0.92$).

A comparison of observation sites revealed that species richness ($F_{(10.104)} = 6.677$; $P < 0.001$), the Shannon-Wiener diversity index ($F_{(10.104)} = 6.373$; $P < 0.001$), and evenness ($F_{(10.104)} = 2.440$; $P = 0.012$) revealed differences among them (Table 4). The Bray-Curtis similarity indices calculated for each observation site also revealed differences between sites (Kruskal-Wallis test, $\chi^2_{(10)} = 31.388$, $P = 0.001$), see Table 5.

Maximum similarities (39.5%) were detected between sites III and VI, while total dissimilarity was found between localities VII and IX, as well as between IX and X (Table 5).

A comparison of the habitat types which were most used by birds showed that species richness ($F_{(8.80)} = 16.481$), the Shannon-Wiener diversity index ($F_{(8.80)} = 12.126$) and evenness ($F_{(8.80)} = 4.909$) differed among them ($P < 0.001$ for all). The highest species richness and diversity were detected for oak groves and rocky areas, followed by woodland, while the lowest values were calculated for agricultural fields (Figure 3). Most of the breeding birds were using rocky area (37.9%), oak groves (31.9%) and woodland (9.1%), followed by bushes, steppe and streams / rivers.

Discussion

Mount Nemrut was declared a Turkish Important Bird Area because the area shelters significant numbers of *Falco cherrug*, *F. naumanni*, and *Emberiza cineracea* (Kılıç & Eken 2004). The 107 bird species detected during the study did not include 53 additional species which had previously been reported in the Mount Nemrut area (or they were possibly ignored, because they could not be indubitably identified in the field) (Table 6). On the other hand, *Cinclus cinclus* was recorded in the area for the first time during this work. When comparing lists for detected and undetected species, it should be noted that other observers might have visited different sites from those in the present study. Note, for example, the relatively larger propor-

Table 4 – Mean (± SD) values of species richness, diversity and evenness for observation sites in the Mount Nemrut area. Site IDs correspond to those in Figure 1 and Table 1. Values with the same superscript letter are not significantly different at a level of $p < 0.05$ (one-way ANOVA).

Site ID	n	Species richness	H′	Evenness
I	12	10.3 ± 3.5^a	1.57 ± 0.34^a	0.70 ± 0.12
II	12	5.0 ± 3.4^b	1.09 ± 0.43^b	0.77 ± 0.07
III	6	2.7 ± 0.8^b	0.83 ± 0.19^b	0.92 ± 0.06
IV	13	8.1 ± 3.6^a	1.56 ± 0.45^a	0.81 ± 0.21
V	11	11.5 ± 4.4^a	1.89 ± 0.46^a	0.80 ± 0.12
VI	12	6.8 ± 3.5^b	1.46 ± 0.43^a	0.84 ± 0.11
VII	12	12.3 ± 3.4^a	1.96 ± 0.25^a	0.80 ± 0.08
VIII	12	7.3 ± 3.1^b	1.63 ± 0.30^a	0.87 ± 0.08
IX	12	6.8 ± 3.2^b	1.48 ± 0.48^a	0.84 ± 0.13
X	6	8.7 ± 3.0^a	1.87 ± 0.44^a	0.91 ± 0.03
XI	7	6.1 ± 2.7^b	1.33 ± 0.47^b	0.80 ± 0.15

Table 5 – Bray-Curtis similarity indices calculated for each observation site with respect to the indices of the other sites. Site IDs correspond to those in Figure 1. Rows were sorted by ascending mean rank values. SE: Standard error.

Site ID	Mean similarity	SE	Mean rank
IX	0.057	0.016	28.1
XI	0.085	0.027	35.8
X	0.089	0.026	37.1
I	0.100	0.019	45.5
VII	0.139	0.034	53.9
V	0.122	0.018	55.2
IV	0.134	0.028	56.4
II	0.178	0.039	64.5
VIII	0.208	0.033	75.9
VI	0.213	0.035	77.5
III	0.219	0.033	80.6

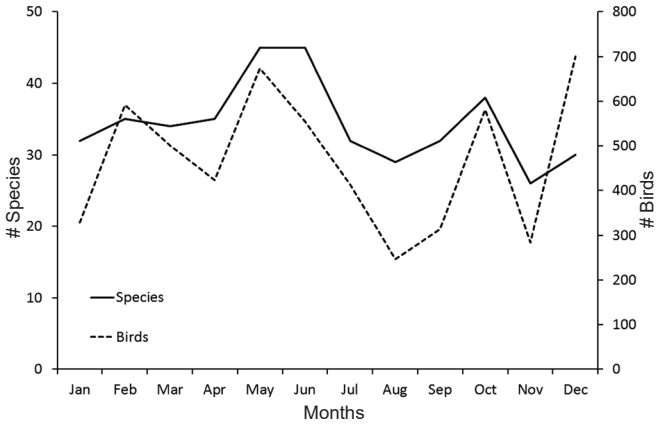

Figure 2 – Monthly distribution of species numbers (solid line, left ordinate) and bird numbers (dashed line, right ordinate) recorded in the Mount Nemrut area during the study period.

tion of waterfowls in Table 6, which may be the result of a preference for wetland habitats by birdwatchers. It should also be noted that the majority of the birds listed in Table 6 are probably transient migratory species. These species occur in the area for quite a short period, and therefore have a limited probability of detection. However, these apparent *inconsistencies* could suggest that the actual bird diversity in the area is higher than already known; more research is required here.

The more diverse the habitat, the greater the biodiversity expected in a given area (Eken et al. 2006). In the study area, higher avian diversity was detected in observation sites where the habitat diversity was also high. This is especially true for sites which included oak groves, rocky areas and woodland. Most species that are indicated as being (at least possibly) breeders in the study area use mainly oak groves, rock cliffs and bushes as nesting places. A good number of raptor species use rocky areas, not only the globally threatened *Neophron percnopterus*, but also *Buteo rufinus*, *Falco tinnunculus* and *F. subbuteo*. Rock cliffs are also important for some other groups of birds, such as *Apus* species, as well as *Monticola solitarius*, *Sitta neumayer* and *Petronia petronia*. Generally speaking, the breeding birds with the largest populations in the study area tend to prefer oak groves; these species include *Streptopelia turtur*, *Irania gutturalis*, *Sylvia hortensis*, *Parus major*, *Lanius senator* and *Garrulus glandarius*. Several birds of steppe habitat are characteristic of the area, including *Oenanthe* species, especially *Oe. xanthoprymna*. Bushes and steppe are also important for *Alectoris chukar*, and for *Emberiza* species, including the near threatened *E. cinerea*.

Biodiversity in Turkey is under threat from a variety of unsustainable land and natural resource use pressures, including conversion of wetlands and other critical natural habitats to agriculture or other land development, unsustainable agricultural practices and use of forests, interference with the hydrological regime of wetlands for agriculture, municipal and industrial use of water, pollution, overgrazing, hunting and unsustainable harvesting of wild plants (Güçlü & Karahan 2004; Şekercioğlu et al. 2011). These detrimental effects may not be considered particularly applicable to the area studied, which is sparsely populated, and where the main sources of income are livestock farming and largely traditional agriculture. However, pollution can be apparent around residential areas as a result of insufficient removal of domestic waste. Poaching was also observed in the protected area during the study, although its extent is unknown.

The effective conservation of sites which hold exceptional features would ensure the survival of large numbers of animal and plant species. In this respect, NPs may be important and effective tools. Conservation efforts should focus on the special habitats rather than on single species; this would not only help to protect a species or group but also serve the conservation of the ecosystem as a whole, which includes many biotic and abiotic elements (Shwartz 1999). Nevertheless, as part of the protected area management plan, local populations of endangered bird species that possibly breed in the study area (the Egyptian vulture, the European turtle dove and the Cinereous bunting), as well as of game species such as the Chukar partridge (alongside the wild goat as a mammal species), should be monitored regularly.

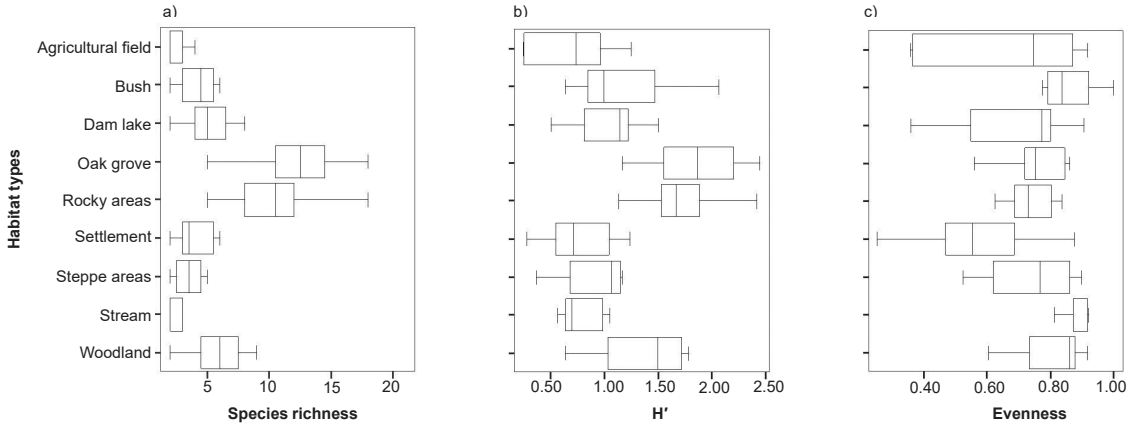

Figure 3 – (a) Species richness, (b) diversity, and (c) evenness calculated for major habitat types in the Mount Nemrut area. Median, SD and marginal values are shown, while outliers and extreme values have been removed.

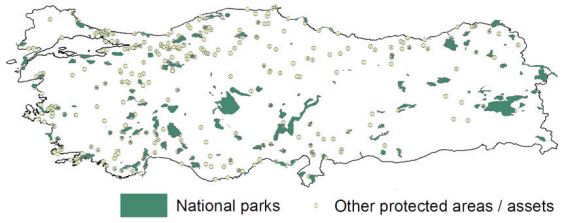

Figure 4 – Distribution of protected areas and other natural assets in Turkey (2013 data from the General Directorate of Nature Conservation and National Parks; www.milliparklar.gov.tr).

If we look at the distribution of the protected areas in Turkey, such as NPs or nature conservation areas in geographical regions, there is a clear lack of nature protection efforts in south-eastern Anatolia (Figure 4); thus, conservation programmes should be increased in this part of Turkey (Güçlü & Karahan 2004). The extent of protected areas in Turkey generally is insufficient for the effective conservation of natural areas and habitats. There are 41 NPs covering an area of 898 044 ha, or approximately 1 % of the total surface area of the country. Although these NPs represent mainly culture-oriented resources, they also contain natural features and could, therefore, provide different types of recreational opportunities. However, many protected areas in Turkey lack effective protection and management; major problems in managing the country's NPs include inadequate planning, the requirements of local people, the lack of baseline data, and inappropriate uses such as unregulated tourism (Erol et al. 2011). On the other hand, the promotion of localized and controlled tourism could increase income and contribute towards regular financing for the maintenance of the areas as well as education programmes. Improving ecotourism in the region would increase public awareness of nature conservation, promote the growth of rural economies, and firmly transfer local values to future generations.

Part of Mount Nemrut has already been declared a NP, based on its recreational significance, and historical and cultural features. While information about the biophysical features of Turkish NP resources is generally inadequate (Erol et al. 2011), it has already been acknowledged that in the Mount Nemrut area, there are also natural assets such as karstic topography (including dells, karstic pavements, sink holes and canyons) and extraordinary rock formations, as well as possibilities for various activities including tourist flights, trekking, hiking or rock-climbing (Atalay et al. 2002). This diversity of recreational opportunities may induce tourism activities, the impacts of which on local wildlife, however, have not been studied. Sustainable tourism is considered to be beneficial for economic development, while unsustainable tourism is not growth-enhancing in the long run (Freytag & Vietze 2013). Currently, mass tourism constitutes a major threat for Mount Nemrut, at least for the core zone that attracts visitors.

Table 6 – Bird species reported by other birdwatchers in the Mount Nemrut area.

Species	Source
Ardeola ralloides	eBird 2017
Bubulcus ibis	eBird 2017
Ardea purpurea	eBird 2017
Tadorna ferruginea	eBird 2017
Anas platyrhynchos	eBird 2017
Pernis apivorus	eBird 2017
Circus aeruginosus	eBird 2017
Accipiter brevipes	eBird 2017
Aquila fasciatus	Kirwan et al. 2014
Falco naumanni	Kılıç & Eken 2004, eBird 2017
Falco cherrug	Beaman 1986, Kılıç & Eken 2004
Falco biarmicus	Kirwan & Martins 1994
Coturnix coturnix	eBird 2017
Glareola pratincola	eBird 2017
Gelochelidon nilotica	eBird 2017
Chlidonias leucopterus	eBird 2017
Pterocles orientalis	Welch 2004
Clamator glandarius	eBird 2017
Cuculus canorus	eBird 2017
Otus scops	eBird 2017
Strix aluco	Kirwan & Martins 1994
Coracias garrulus	Welch 2004, eBird 2017
Melanocorypha calandra	eBird 2017
Calandrella brachydactyla	eBird 2017
Alaudala rufescens	eBird 2017
Lullula arborea	eBird 2017
Riparia riparia	Welch 2004, eBird 2017
Ptyonoprogne rupestris	Welch 2004, eBird 2017
Anthus campestris	eBird 2017
Anthus trivialis	eBird 2017
Anthus spinoletta	eBird 2017
Pycnonotus xanthopygos	eBird 2017
Saxicola rubetra	eBird 2017
Oenanthe pleschanka	eBird 2017
Cettia cetti	eBird 2017
Acrocephalus palustris	eBird 2017
Hippolais languida	Welch 2004, eBird 2017
Hippolais olivetorum	eBird 2017
Sylvia nisoria	eBird 2017
Sylvia curruca	eBird 2017
Sylvia communis	eBird 2017
Ficedula albicollis	eBird 2017
Sitta europaea	eBird 2017
Sitta tephronota	Welch 2004, eBird 2017
Lanius minor	eBird 2017
Corvus corax	eBird 2017
Sturnus vulgaris	eBird 2017
Pastor roseus	eBird 2017
Montifringilla nivalis	Welch 2004, eBird 2017
Fringilla montifringilla	eBird 2017
Carduelis spinus	eBird 2017
Rhodospiza obsoleta	Welch 2004, eBird 2017
Emberiza hortulana	Welch 2004, eBird 2017

Official administration in the area is complex: the World Heritage area is directly under the responsibility of Ministry of Culture and Tourism; however, the NP, which covers the tumulus and its vicinity, is under several authorities, including the Ministry of Environment and Forests, the Ministry of Environment and Urban Planning (formerly the Ministry of Public Works and Housing), the Administrative Chairmanship for the South-eastern Anatolian Project, and

others. Effective conservation is therefore difficult because of the dispersion of power and authority, expertise on different subjects residing in the various institutions, and their lack of widespread and effective experience in developing joint programmes and projects. To solve this problem, the *Commagene Nemrut Conservation and Development Programme* was created in 2011, and is currently still being implemented. The programme proposes a series of research and application projects to secure the architectural, archaeological, historical, economic, social, cultural, natural and ecological assets of Mount Nemrut (Şahin-Güçhan, 2013). In this context, improved knowledge of the local avifauna and its habitat requirements will help lead to better protection of this unique area.

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