

The ornithological importance of Dalaman (Muğla, Turkey) wetlands and threats to the bird population

Aziz ASLAN^{1,*}, Yakup KASKA², Ali ERDOĞAN³

¹Akdeniz University, Faculty of Education, Dept. of Primary Education, Campus, 07058 Antalya - TURKEY

²Pamukkale University, Faculty of Arts and Science, Dept. of Biology, Kınıklı Campus, 20017 Denizli - TURKEY

³Akdeniz University, Faculty of Science and Arts, Dept. of Biology, Campus, 07058 Antalya - TURKEY

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Abstract: The study, conducted from May 2002 to December 2004, aimed to provide scientific baseline data about avifaunal richness, species of breeding birds, and threats that affect both bird species and ecosystems, and to support attempts to get official protection status for the Dalaman (Muğla, Turkey) wetlands. A total of 215 bird species were recorded using point counts throughout transect lines. The species' statuses were determined as follows: 56 residents, 78 summer visitors, 44 winter visitors, 22 passage migrants, and 15 undetermined. Of the 215 species, 93 (43%) were non-breeders. According to EBCC (European Bird Census Council) criteria, the 122 breeding species were determined as 32 (15%) possible, 24 (11%) probable, and 66 (31%) confirmed breeders. Moreover, 49 (40%) of the breeding species were in SPEC (Species of European Conservation Concern) categories. The main observed threats for bird populations and habitats in the area were illegal hunting, cutting reed beds, uncontrolled agricultural pesticide and insecticide usage, agricultural and touristic activities, domestic waste, and noise from the airport. This study showed that the wetland ecosystems and the surrounding marshland, farmland, and forest ecosystems of Dalaman provide a good refuge for many bird species. Therefore, we think that the study area must urgently be protected by laws to reduce the human impact on the area.

Key words: Birds of Turkey, coastal wetlands, Dalaman, wetland conservation, IBA

Dalaman (Muğla, Türkiye) sulakalanlarının ornitolojik önemi ve kuş popülasyonunu tehdit eden faktörler

Özet: Çalışmanın amacı, bölgenin avifaunal zenginliğini, üreyen kuş türlerini, kuş türleri ve ekosistemlerini tehdit eden tehlikeleri belirleyerek bilimsel bir bilgi altyapısı kurmak ve bu bilgiler ışığında koruma girişimlerini destekleyerek çalışma alanının yasal koruma statüsü kazanmasını sağlamaktır. Çalışma, Mayıs 2002 ile Aralık 2004 tarihleri arasında Dalaman (Muğla, Türkiye) Sulakalanlarında gerçekleştirilmiştir. Veriler, çalışma alanında belirlenen gözlem hatları (transekt) üzerindeki nokta sayımları ile elde edilmiştir. Arazi çalışmaları sonunda bölgede, 56'sı yerli, 78'i yaz ziyaretçisi, 44'ü kış ziyaretçisi, 22'si transit göçer ve statüsü belirlenemeyen 15 olmak üzere toplam 215 kuş türü tespit edilmiştir. EBCC (European Bird Census Council) kriterlerine göre, gözlenen türlerin 24 (% 11)'nin alanda üremesinin yüksek olasılık, 32 (% 15)'nin olası, 66 (% 31)'nin kesin ürediği ve 93 (% 43)'nün ise üremediği tespit edilmiştir. Alanda üreyen (yüksek olası, olası ve kesin üreme) kuşlardan 49 (% 40)'nun, SPEC (Avrupa Ölçeğinde Korunmada Öncelikli Türler) kategorilerinde olduğu belirlenmiştir. Kaçak avcılık, saz kesimi, tarımsal ilaç (pestisit ve insektisit) kullanımı, turistik ve tarımsal aktiviteler, evsel atıklar ile havaalanındaki gürültü, kuş popülasyonlarını olumsuz etkileyen başlıca faktörlerdir. Dalaman sulak alan ekosistemi ile çevresindeki sazlık, tarımsal ve ormanlık alanların, birçok kuş türüne barınma olanağı sağladığı bu çalışma ile belirlenmiştir. Çalışma alanının acil olarak yasal koruma altına alınarak insanların alandaki bozucu etkilerinin giderilmesi sağlanmalıdır.

Anahtar sözcükler: Dalaman, kıyı sulak alanları, sulakalan koruma, Türkiye kuşları, ÖKA

* E-mail: aaslan@akdeniz.edu.tr

Introduction

Anatolia's biogeography supports a rich bird fauna within a wide range of habitats, hosting approximately 460 species (Kirwan et al., 1998; KUSTR, 2008; Kiziroğlu, 2009). The Dalaman Plain, situated on the eastern coast of the Aegean region of Turkey, is home to diverse ecosystems encapsulating the aquatic (lakes, channels, swamps, and marshes) and the terrestrial (scrub, red pine forest, agropastoral, and rocky).

There have been several studies conducted in various parts of the Dalaman Plain that have mainly focused on species richness and their habitats. Işık et al. (1998) reported that there were 475 plant (23 endemic to the region), 100 insect, 7 fish, 4 amphibian, 30 reptile, 21 mammal, and 137 bird species. In addition, 54 bird species were reported in the study area over 7 separate field trips by birdwatchers (www.kustr.org). Threats reported for the studied area were pollution, persecution, incorrect land usage, agricultural practices, touristic activities, and uncontrolled use of natural sources (Işık et al., 1998; Kaska, 2004; Eken et al., 2006; Erdoğan and Aslan, 2007).

Dalaman Plain is classified as an Important Nature Area (INA) due to the endemic and endangered species found in the region. These species include 4 plants, 1 butterfly, 3 fish, 1 amphibian, 4 reptiles, 1 bird, and 3 mammals (Eken et al., 2006). The eastern end of the region (Fethiye/Göcek) is designated as a Special Environment Protection Area due to the rich and endemic structure of the flora; Eken et al. (2006) classified the region as Natural SİT Area (a conservation category according to Turkish law).

As Turkey is a candidate for membership of the European Union (EU), it needs to upgrade its laws to comply with EU standards. IBAs (Important Bird Areas) are sites internationally recognised as conservation priorities and officially supported by the EU. Birdlife International has highlighted the necessity for IBAs in areas defined as having regional/global conservation concerns. An EC Council Directive on the conservation of wild birds (79/409/EEC) stipulates that each member must define and protect their international bird areas by applying the IBA criteria. Before acquiring full membership of the EU, Turkey needs to enact a preliminary preparation and integration initiative to satisfy this directive.

IBAs have scientifically supported criteria that act as practical tools for the conservation of bird life. A total of 184 IBAs have been defined in Turkey (Kılıç and Eken, 2004) and the majority still lack official protection status (Onmuş, 2006). The Doğa Derneği (www.dogaderneği.org), which is a non-government organisation (NGO) in partnership with BirdLife International, has described the Dalaman Plain, including the study area, as a probable IBA. The IBAs' definitions need to be applied by law to officially define and protect threatened areas. To do this, both public institutions and NGOs have to work together, as recommended by the EC Council Directive.

The aim of our study was to investigate birds of the Dalaman wetlands and near environments; (1) to provide scientific baseline data about avifaunal richness and breeding bird species, (2) to determine the threats that affect both bird species and ecosystems, and (3) to support attempts to get official protection status for the area.

Materials and methods

Our survey was conducted from May 2002 to December 2004 in the wetlands of Dalaman (Muğla, Turkey), which consists of 3 lakes (Kocagöl, Tersakan, and Kükürtlü), 3 rivers (Dalaman, Sarısu, and Tersakan), and the beaches of Dalaman and Sarıgerme, and includes all farmland, woodland, mountain, and settlement areas (Figure 1). The total studied area is approximately 9517 ha, consisting of approximately 850 ha (9%) wetland and marshland, 4000 ha (42%) farmland, 2500 ha (26%) woodland and mountainous areas, 1500 ha (16%) settlement, 500 ha (5%) airport, and 167 ha (2%) river bed. The total length of the beach in the study area is approximately 10.4 km. The studied area consists of forests, heath, rush or reed beds, water drainage channels, marshes, saline-alkaline areas, and meadows in the hinterland of the beaches.

The Dalaman region has a typical Aegean climate—dry and hot summers and mild winters with high precipitation. According to the Muğla-Dalaman Airport Meteorology Station, the mean annual temperature, rainfall, and average humidity of the study area are 17.9 °C, 1044.5 mm, and 72.5%, respectively. The altitude ranges from 0 to 130 m above sea level.

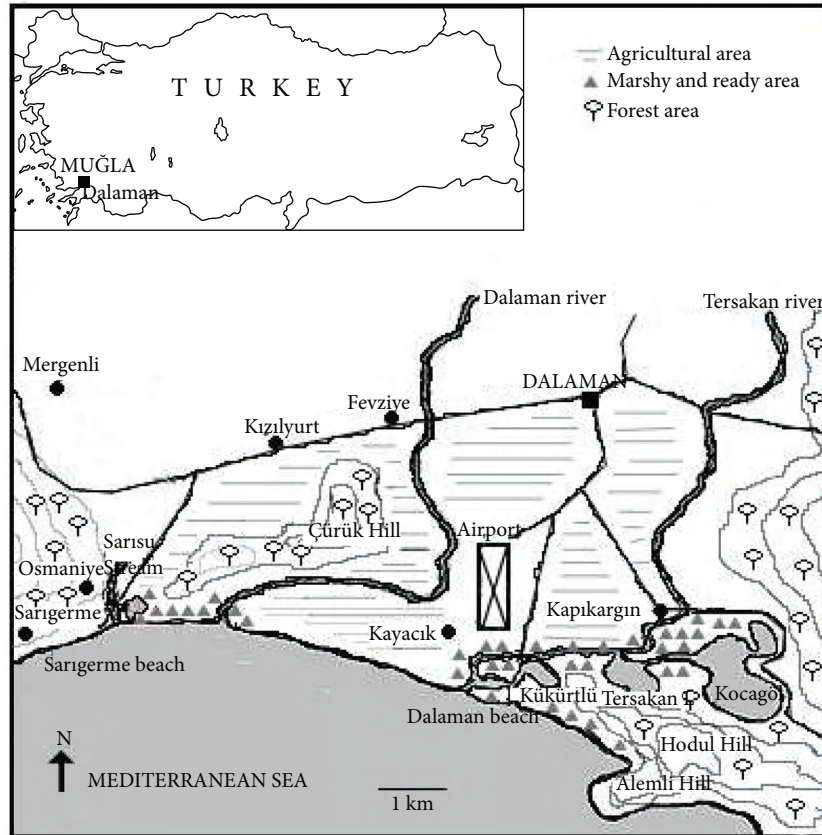


Figure 1. The geographical location of the study area at Dalaman Plain, Turkey.

Weekly surveys were carried out during the summer months of 2003 and 2004, and twice per month in 2002. In spring (March to May) and autumn (September to November), we visited the study site irregularly, but monthly visits were scheduled in winter months (Table 1). Point counts (pc) were carried out along transect lines in accordance with Bibby et al. (1992). Transects were from:

1. Kükürtlü Lake to Sarısu Stream (beach zone, 10.3 km, 52 pc), Dalaman District (5 km, 25 pc), Hodul Hill (1 km, 5 pc), and Tersakan Lake (1 km, 5 pc).
2. Tersakan Lake to Kapıkargın (1.5 km, 7 pc).
3. Kapıkargın to Kocagöl (3.5 km, 18 pc).
4. Kapıkargın to Dalaman District (4 km, 20 pc).
5. Dalaman District to Sarısu Stream (6 km, 30 pc).

Along each transect, we conducted 15-min point counts every 200 m, and each point was visited once per observation time between 06.00 and 11.30 am and 13.00 and 18.30. A single round of surveys took a minimum of 3 days to complete, but could take longer if surveys were postponed due to the rain. Counts were made by 2 teams and each team surveyed separate transects; Kükürtlü Lake to Sarısu Stream (beach zone) and Dalaman to Sarısu Stream transects were counted by the first team and the remainder by the second. To avoid double-counting, we tried to eliminate individuals that were detected at more than one point, but determining with certainty that an individual had been counted previously is difficult, and thus some individuals may have been counted more than once along a transect. Equipment used for the observations included binoculars, telescopes, cameras, and a variety of field guides (e.g. Mullarney et al., 1999). This study follows the OSME (Ornithological Society of the Middle East) Region

Table 1. Number of transects conducted by month and year at the Dalaman Plain, Turkey.

Year	Months												Total
	J	F	M	A	M	J	J	A	S	O	N	D	
2002					1	2	2	2	1	1	1	1	11
2003	1	1	2	2	4	4	4	4	3	2	1	1	29
2004	1	1	1	1	3	4	4	4	1	1	1	1	23
Total	2	2	3	3	8	10	10	10	5	4	3	3	63

List (Blair et al., 2007) for taxonomic sequence of species and for scientific and English names. In this paper, the regional status codes for the species, namely RD = Resident, SV = Summer Visitor, WV = Winter Visitor, PM = Passage Migrant, and UN = Undetermined, were also evaluated during the observation periods. We applied threat categories (Critically Endangered, Endangered, Vulnerable, Rare, Declining, Depleted, Localised, Secure, Near Threatened, Least Concern, Not Evaluated, and Data Deficient) as cited by Burfield and Van Bommel (2004) for Europe, and Kiziroğlu (2008) and Kılıç and Eken (2004) for Turkey. We applied Kılıç and Eken (2004) and Kiziroğlu (2008) for the threat status, when they gave the same threat categorisation to species in Turkey; when this was not the case, we applied Burfield and Van Bommel (2004) to avoid discrepancies between sources. For the breeding species of the area, we used the SPEC (Species of European Conservation Concern) categories, which consist of 1) European species of global conservation concern, 2) species whose global population is concentrated and which have unfavourable conservation status in Europe, and 3) Species whose global population is not concentrated but have an unfavourable conservation status in Europe. We also applied Burfield and Van Bommel (2004) and Kılıç and Eken (2004) to show breeding and wintering population trends.

We used EBCC (European Bird Census Council) criteria to categorise the breeding status of bird species we encountered during surveys as possible, probable, or confirmed (Hagemeijer and Blair, 1997).

During each observation period, the number of threats present in the area was also noted and evaluated in terms of sources and annual appearance time.

Results

A total of 215 bird species was recorded during the surveys: 56 residents, 78 summer visitors, 44 winter visitors, and 22 passage migrants. The remaining 15 species (7%) were observed only a few times and thus their status was given as undetermined. Of the 215 species, 88 (41%), were determined as under threat (Figure 2) and 123 (57%) as secure, while 4 (2%) were classified as data deficient. According to EBCC criteria, 66 (31%) species were determined as confirmed, 24 (11%) probable, 32 (15%) possible breeders (Table 2), and 93 (43%) non-breeders

Among the breeding species (possible-confirmed), 49 (40%) species are listed in SPEC categories (Figure 3). Of these 49 species, 13 (27%) are residents and

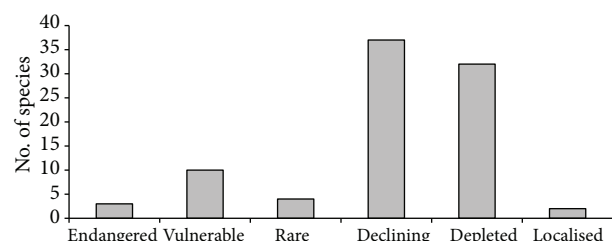


Figure 2. The threat status of bird species observed at the Dalaman Plain, Turkey (Threat status derived from Kılıç and Eken, 2004 and Burfield and Van Bommel, 2004).

Table 2. Breeding species listed in SPEC categories that we encountered at the Dalaman Plain, Turkey (NBP: number of observed breeding pairs, MN: maximum number counted at a single round of surveys, OT: observation time of maximum number counted, B/W: breeding and wintering population trend).

Possible Breeding Species	NBP	MN	OT	Trend* (B / W)	Trend** (B / W)
Eurasian Spoonbill <i>Platalea leucorodia</i>	1	15	April 2004	↓ / ~	↓ / ~
Lesser Kestrel <i>Falco naumanni</i>	1	2	March 2003	↓ / -	↓ / ↑
Ruff <i>Philomachus pugnax</i>	2	6	August 2003	NTD / ↔	- / ↔
Wood Sanpiper <i>Tringa glareola</i>	1	6	August 2002	NTD	- / ~
Common Sanpiper <i>Actitis hypoleucos</i>	2	14	August 2004	↓ / -	-
Black Tern <i>Chlidonias niger</i>	1	4	May 2004	↓ / -	↓ / -
Barn Owl <i>Tyto alba</i>	1	2	April 2003	↓ / -	↓ / -
Calandra Lark <i>Melanocorypha calandra</i>	3	12	April 2003	↔ / -	↔ / -
Lesser Short-toed Lark <i>Calandrella rufescens</i>	1	18	April 2004	↓ / -	↓ / -
Greater Short-toed Lark <i>C. brachydactyla</i>	2	8	June 2003	↑ / -	↑ / -
Eurasian Skylark <i>Alauda arvensis</i>	1	20	March 2003	↓ / -	↓ / -
Tawny Pipit <i>Anthus campestris</i>	2	8	April 2004	↓ / -	↓ / -
Common Redstart <i>Phoenicurus phoenicurus</i>	2	7	June 2003	↓ / -	↓ / -
Olivaceous Warbler <i>Hippolais pallida</i>	1	3	September 2003	↑ / -	↑ / -
Ortolon Bunting <i>Emberiza hortulana</i>	1	4	August 2003	↔ / -	↔ / -
Probable Breeding Species					
Night-heron <i>Nycticorax nycticorax</i>	2	7	August 2003	↑ / -	↑ / ↑
Purple Heron <i>Ardea purpurea</i>	1	21	August 2003	↓ / -	↓ / -
Long-legged Buzzard <i>Buteo rufinus</i>	2	9	January 2003	↓ / -	↓ / -
Kentish Plover <i>Charadrius alexandrinus</i>	2	16	September 2003	↓ / ↓	↓ / ↓
Common Scops-owl <i>Otus scops</i>	1	2	June 2003	↓ / -	↔ / ↓
Eurasian Nightjar <i>Caprimulgus europaeus</i>	1	4	August 2003	↓ / -	↓ / -
Common Kingfisher <i>Alcedo atthis</i>	4	23	September 2003	↓ / -	↓ / ↓
Krueper's Nuthatch <i>Sitta krueperi</i>	2	12	August 2004	↓ / -	↓ / -
Confirmed Breeding Species					
Little Bittern <i>Ixobrychus minutus</i>	1	3	August 2004	↓ / -	↑ / -
White Stork <i>Ciconia ciconia</i>	16	113	July 2003	↓ / -	↓ / ↔
Garganey <i>Anas querquedula</i>	7	37	May 2003	↓ / -	↓ / ~
Common Kestrel <i>Falco tinnunculus</i>	2	8	April 2004	NTD	↓ / -
Chukar <i>Alectoris chukar</i>	10	40	September 2003	↓ / -	↓ / -
Common Quail <i>Coturnix coturnix</i>	6	30	August 2003	↓ / -	↓ / -
Spur-winged Lapwing <i>Vanellus spinosus</i>	4	17	August 2003	↓ / -	↓ / -
European Turtle-dove <i>Streptopelia turtur</i>	8	48	April 2004	↓ / -	↓ / -
Little Owl <i>Athene noctua</i>	3	7	July 2003	↓ / -	↓ / -
European Bee-eater <i>Merops apiaster</i>	7	37	September 2003	↓ / -	↓ / -
European Roller <i>Coracias garrulus</i>	1	7	July 2003	↓ / -	↓ / -
Crested Lark <i>Galerida cristata</i>	18	75	January 2003	↔ / -	↔ / -
Sand Martin <i>Riparia riparia</i>	21	86	April 2003	↓ / -	↓ / -
Barn Swallow <i>Hirundo rustica</i>	72	750	September 2002	↔ / -	↔ / -
Northern House-martin <i>Delichon urbicum</i>	24	82	April 2004	↓ / -	↓ / -
Rufous-tail Scrubrobin <i>Erythropgia galactotes</i>	4	19	June 2004	↓ / -	↓ / -
Northern Wheatear <i>Oenanthe oenanthe</i>	3	9	July 2003	↓ / -	↓ / -
Black-eared Wheatear <i>O. hispanica</i>	4	21	September 2003	↔ / -	↔ / -
Blue Rock-thrush <i>Monticola solitarius</i>	1	3	November 2003	↔ / -	↔ / -
Orphean Warbler <i>Sylvia hortensis</i>	1	3	June 2003	↓ / -	↓ / -
Red-backed Shrike <i>Lanius collurio</i>	6	150	September 2003	↓ / -	↓ / -
Woodchat Shrike <i>L. senator</i>	2	7	June 2003	↔ / -	↔ / -
Masked Shrike <i>L. nubicus</i>	2	6	June 2003	↓ / -	↓ / -
House Sparrow <i>Passer domesticus</i>	93	1000	September 2003	↓ / -	↓ / -
Black-headed Bunting <i>Emberiza melanocephala</i>	11	26	June 2003	↑ / -	↑ / -
Corn Bunting <i>Miliaria calandra</i>	15	157	November 2003	↓ / -	↓ / -

Trend*: According to Burfield and Van Bommel (2004) and Trend**: According to Kılıç and Eken (2004), NTD: No Turkish Data, ↓: Decrease, ↑: Increase, ↔: Stable, ~: Fluctuate

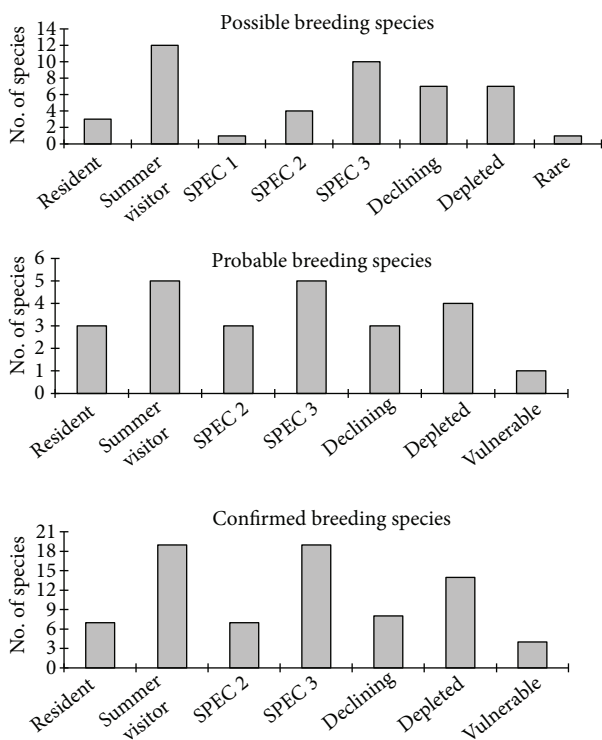


Figure 3. Seasonal occurrences, SPEC categories, and threat status of breeding birds detected at the Dalaman Plain, Turkey (Threat status derived from Kılıç and Eken, 2004 and Burfield and Van Bommel, 2004).

36 (73%) are summer visitors (Figure 3). Their threat statuses are classified as 5 (10%) vulnerable, 1 (2%) rare, 18 (37%) declining, and 25 (51%) depleted (Figure 3). As suggested by Burfield and Van Bommel (2004), the breeding population trend of 35 (71%) species was decreasing, of 4 (8%) was increasing,

and of 7 (14%) was stable, and, according to Kılıç and Eken (2004), the breeding population trend of 33 (67%) species was decreasing, of 4 (8%) was increasing, and of 8 (16%) was stable (Table 2).

Forty non-breeder species (43%) are in SPECs, the majority being winter visitors (SPEC 3), and classified as declining and/or depleted species (Figure 4). According to Burfield and Van Bommel (2004), the wintering population trend was given as 1 species in decline and 1 stable, while, according to Kılıç and Eken (2004), the trend of 3 (6%) species was decreasing, of 2 (4%) was increasing, of 2 (4%) was stable, and of 3 (6%) was fluctuating (Table 2). There was no information or data given regarding the remaining species.

The potential threats to the bird fauna in the region are as follows: cutting reed beds, pollution of lakes and streams by agricultural pesticides and insecticides, domestic waste, noise from the airport, habitat destruction for agriculture and tourism activities, and persecution by hunters. There are differences between the occurrence and frequency of threats that are observed at various times in the study area (Table 3).

Discussion

The Dalaman Wetlands have been referred to within ornithological studies since 1977 (Cramp et al., 1977-94). Recently, Işık et al. (1998) studied the biological diversity of the Dalaman Lowland and recorded 137 bird species over a short period of time (roughly 30% of the total listed in Kirwan et

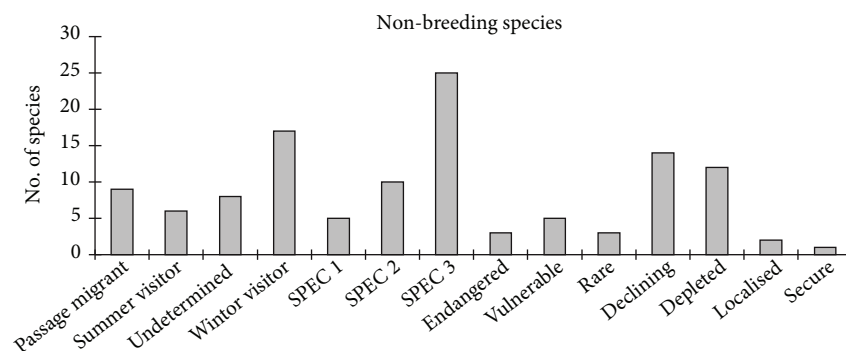


Figure 4. Seasonal occurrences and threat status of non-breeding bird species listed by SPEC that we encountered at the Dalaman Plain, Turkey.

Table 3. The types and numbers of threats per year and their seasonal occurrence at the Dalaman Plain, Turkey.

Threats	2002 (11)*	2003 (29)*	2004 (23)*	Total (63)*	Seasonal occurrence
Cutting reed beds	7	15	12	34	June-September
Agricultural pesticide usage**	9	19	15	43	May-August
Agricultural insecticide usage	9	22	16	47	April-October
Domestic wastes	11	29	23	63	Year round
Tourism activities	8	19	16	43	May-October
Agricultural activities	8	21	18	37	May-October
Noise from airport	11	29	23	63	Year round
Hunting	3	13	11	27	October-March

*: The number of surveys per year, **: Pesticide means herbicide and rodenticide

al., 1998 and Erdoğan et al., 2002). We were able to record 119 of the 137 bird species listed by Işık et al. (1998), and 50 of the 54 species that were reported by birdwatchers from the area (www.kustr.org). When all studies are combined, the number of observed bird species in this area goes up to 237.

The large variety of birds present in the area is due to the diverse ecosystems available (Işık et al., 1998; Kaska, 2004). The variety of seasons and habitat types, which provides feeding, resting, and breeding possibilities for many species, is the reason visitors (summer and winter) and passage migrant species frequent the area. However, a wide range of the birds observed in this study (see Figure 2) and others are classified in threatened categories (Eken et al., 2006). Consequently, we can clearly state that there should be an all-encompassing evaluation of the various ecosystems and its inhabitants (flora and fauna) to ascertain the area's biological importance and determine a precise protection classification.

Dalaman Plain is accepted as an Important Nature Area (INA) for plants, herpetofauna, and dragonflies and has been recommended as a Special Protected Area and Natural Protected Area by Eken et al. (2006). It has also been recommended as an Important Bird Area (IBA) and Zero Extinction Area with urgent protection priority by Doğa Derneği

(www.dogadernegi.org). However, the area does not have adequate official protection status (a limited part of the beach is a Special Environmental Protection Area for the loggerhead sea turtle (*Caretta caretta*) as a breeding area and only 30% of the lowland is under protection).

In our study, we inventoried bird species, determined their breeding status and abundance, and ascertained threats to their existence. During the surveys, we found that a quarter of the birds we determined were breeding in the study area were listed as species of conservation priority (see Table 2). It is well known that some bird species are dependent on a specific area to maintain their existence and/or stop population decline (Kılıç and Eken, 2004). It can be seen as represented in Table 2 that the population trend of one third of breeding species is declining and they need legislative protection. The nesting areas of some species, e.g. *Ixobrychus minutes*, *Nycticorax nycticorax*, *Platalea leucorodia*, and *Hoplopterus spinosus*, have been allocated for hotel and golf-course construction, which will force breeding individuals to abandon these sites when construction begins. The study area is not only important for the birds but also for nesting turtles (i.e. *Caretta caretta* and *Tryonix tryonix* (Kasperek, 1994; Kaska, 2004) and other species (e.g., plants, butterflies, fish, amphibians,

reptiles, and mammals) listed by Eken et al. (2006). For these reasons, we emphasise that the study area (especially beaches, lakes, marshes, sedges, and forest areas) has an important biological diversity and must be entirely protected. Our findings should be referenced to advance the argument for official protection status for the area.

In Turkey, the researchers' primary conservational tasks are to compile inventories of species communities and to conserve biological diversity through the designation of more National Parks, Natural Conservation Reserves, and IBAs. The wetland and surrounding marshland, farmland, and forest ecosystems provide a good refuge for resting, feeding, and breeding for many bird species. Turkey, in particular, has witnessed a significant decline over the last decade in the number, spatial extent, and integrity of wetlands; this is all the more distressing as many of these sites are designated as Ramsar and IBAs (Yarar and Magnin, 1997; BirdLife International, 2001; Kılıç and Eken, 2004). The selection of IBAs has been a particularly effective way of establishing conservation priorities, as they identify key sites for conservation that contain 1 of 3 things: they have significant numbers of one or more globally threatened species, they are one of a set of sites that together hold a suite of restricted-range species or biome-restricted species, or they have exceptionally large numbers of migratory or congregator species.

According to Kılıç and Eken (2004), there are 5 main requirements for protecting IBAs: scientific, human sources, institutional, communication, and individual infrastructure. Defining an IBA is the first step towards protection. However, the above-mentioned 5 main requirements have to be fulfilled to attain the best protection, both for Dalaman and other IBAs in Turkey. There are 184 IBAs defined in Turkey (Kılıç and Eken, 2004) and the majority do not have official protection status. As a candidate for the EU, Turkey has accepted EU regulations and must designate Nature 2000 Sites (network of the protected sites of EU). IBAs are potential Nature 2000 Sites and therefore Turkey needs to perform studies, together with NGOs, in these areas to develop conservation and monitoring activities (Onmuş, 2006).

Unfortunately, the potential threats for the ecosystems and bird fauna of the area declared by

Işık et al. (1998) and Kaska (2004) still exist, as shown in this study (see Table 3). Similar threats were also reported for many other wetlands of Turkey (Green et al., 1996; Erdoğan and Aslan, 2007), and have resulted in habitat damage, population decrease, and species loss (Kızıroğlu, 1987). Therefore, if we want to remove these threats, we have to adopt a holistic approach and provide educational resources to emphasise the significance of the natural areas and encourage the cooperation of the local people and official societies. Eco-tourism should be used as diversity conservation with an emphasis on local community participation as an adjunct to developing awareness of the importance of protecting the natural environment.

Of particular and immediate concern are the proposed hotel, golf course, and yacht marina constructions. We recommend these works be prohibited and environment impact studies undertaken. Any construction that affects the wetland water level, including the airport, should also be prohibited, because waterbirds may respond to changes in wetland distribution at local and catchment scale and to changes that occur at scales that extend beyond those of individual catchments (Roshier et al., 2002). For example, waterbird species richness has been significantly affected by a 19.5 m lowering of the water level in Armenia (Balian et al., 2002). Furthermore, the pollution of the lakes and wetlands by nearby greenhouses and other agricultural resources should be stopped or minimised by educating farmers, local residents, and businesses.

In conclusion, we think that we have taken a major step toward protecting the area by providing significant scientific data regarding the bird species, and have shown that the Dalaman wetland ecosystems are important as nesting (see Table 2), wintering (e.g. *Phalacrocorax* sp.), resting (e.g. *Lanius collurio* and *Hirundo rustica*), and feeding sites. Although our count data can provide an index for population trends, a 3-year study period is too short to determine whether bird population are actually declining, increasing, or simply undergoing a cyclic change. To obtain conclusive results for the trend of bird population sizes, a longer term study is necessary. In summary, the Dalaman wetland ecosystems and its environments must be studied more extensively

in the manner of a breeding bird atlas survey (e.g. Onmuş et al., 2009).

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