

Occurrence and Seasonal Variation of the Avifauna at Domate Al-Jandal Lake, Al-Jouf Province of Saudi Arabia

Mansour I. Almansour¹ and Bashir M. Jarrar^{2*}

¹Department of Zoology, College of Science, King Saud University, Saudi Arabia

²Department of Environmental Health Sciences, Al-Jouf University, Saudi Arabia

Abstract.- Forty six bird species belonging to 22 families and 12 orders were observed at Domate Al-Jandal lake during the study period (December 2010 to November 2011). Among these 11 species were resident, 10 species were resident migrant and 25 species were migrant. Highest occurrence was seen during winter with a peak in January when insectivorous birds were dominant. Common Moorhen (*Gallinula chloropus*), Little Grebe (*Tachybaptus ruficollis*) and Eurasian Collared Dove (*Streptopelia decaocto*) showed the highest occurrence whereas Cormorant (*Phalacrocorax carbo*), Common Shelduck (*Tadorna tadorna*) and White Stork (*Ciconia ciconia*) occurred less frequently. Suggestions were made on the bases of the results of the present study to increase the number of aquatic birds and also to promote eco-tourism.

Key words: Avifauna, Domate Al-Jandal lake, seasonal variation, Saudi Arabia

INTRODUCTION

Birds' population is a sensitive indicator of the wetland ecosystem quality that helps in understanding the abundances or otherwise of various species of other organisms (Turner, 2003). Domate Al-Jandal lake is fed from the surplus of agricultural irrigation water through two reservoirs from where the water is pumped through large pipes directly to the lake. The storage capacity of the lake is about 35 million cubic meters of water. The lake receives about three million cubic meters water annually and almost the same amount is evaporated (Irrigation and Drainage Project, 2011). The lake has no outlet and loses water only by evaporation leading to a high salinity of 43 g/l as total salinity (Jarrar and Al-Rowaili, 2010). Ecological studies on Domate Al-Jandal lake revealed a biodiversity of water birds, fishes, snails, insects, algae and zooplankton (Green, 1984; Bazzaz and Al-Manea, 2010; El-Bassat and Touliaba, 2010; Jarrar and Al-Rowaili, 2010).

Domate Al-Jandal lake is considered to be one of the important wetlands used by the millions of water birds every year for staging and wintering while passing through the country on their way from the cold climate of Europe and Western Asia to the

warmer regions of Africa (Jarrar and Al-Rowaili, 2011a). Some avifauna of Domate Al-Jandal lake have been recorded (Bazzaz and Al-Manea, 2010; Jarrar and Al-Rowaili, 2011b), however their seasonal variations have not been thoroughly studied. The primary purpose of this study is to record the seasonal variation of aquatic birds on this lake.



Fig. 1. Location of Domate Al-Jandal Lake, Al-Jouf Province of Saudi Arabia (Google Earth, 2011).

MATERIALS AND METHODS

The study lake

The present study was conducted at Domate Al-Jandal lake (29°48' N, 39°54' E), a hyper-saline lake located about 5 km from western Domate Al-Jandal town, 52 km from Skaka city and 15 km from Al-Nafouth desert of Saudi Arabia (Fig. 1). The lake, located at an elevation of 585 m above the mean sea level, has a circumference of about 8 km;

* Corresponding author: bashirjarrar@yahoo.com

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depth of lake varies at different points. The lake is the only artificial lake in the northern part of Saudi Arabia and the largest lake in the Arabian Peninsula.

Al-Jouf Province, spread over 58,425 km², is Saudi Arabia's northern-most province that links the Arabian Peninsula with Jordan and Iraq. The climate of the Province from November to March is cold with little rain; June to October is hot, the minimum temperature ranges between 2-7°C in January and 45°C in August with an annual average of 30°C. The humidity ranges from 11 to 34% in summer and 57 to 70% in winter with 30-60 mm annual rainfall.

The study protocol

The present study was carried out for a period of 12 months from December 2010 to November 2011. The birds were observed from 05:00 am to 16:00 pm by walking along the lake. The lake was visited once a week for 53 weeks. The birds were observed and numbers estimated with the help of FUJIFILM Fujinon FMTR-SX (7x50) Binocular with zoom and digital video camera (Sony Handycam, HDR-SR11E) during dawn, midday and dusk for one day in a week for 53 weeks. The birds were identified with the help of field guides such as Silsby (1980), Mahdi (1983), Bundy *et al.* (1989), Fathel (2002) and Jennings (2010).

RESULTS

Occurrence, group composition, and residential status of birds at Domate Al-Jandal lake as recorded from December 2010 to November 2011 are given in Tables I and II. The study recorded 46 bird species belonging to 22 families and 12 orders; of these, 11 species (23.9%) were resident, 10 species (21.8%) resident migrants and 25 species (54.3%) passage migrants. The number of birds observed varied; the highest in winter and the lowest in summer.

Of various passage migrant species, Black-winged Stilt (*Himantopus himantopus*), Swallow (*Hirundo rustica*) (Fig. 2A,B), together with 3 Wagtail species (*Motacilla cinerea*, *M. alba* and *M. flava*) (Fig. 2C) showed the highest occurrence. On the other hand, Cormorant (*Phalacrocorax carbo*) and White Stork (*Ciconia ciconia*) were the least prevalent of the passage migrant birds. The passage

migrant birds stayed at the lake up to 32 days during the year. The White Stork and Mute Swan (*Cygnus olor*) stayed at the lake for one day at least before resuming their onward flight to the north or south.

Common moorhen (*Gallinula chloropus*), Little Grebe (*Tachybaptus ruficollis*), and two dove species (*Streptopelia decaocto* and *Columba livia*) were the most abundant. The species seen regularly on the lake include desert wheatear (*Oenanthe deserti*) (Fig. 2D), yellow-spectacled bulbul (*Pycnonotus xanthopygos*) and white-eared bulbul (*Pycnonotus leucogenys*) (Fig. 2E). Most of the bird species observed were insectivorous or grainivorous, followed by herbivores and omnivores; piscivorous birds were the least common

DISCUSSION

The presence of aquatic birds is considered to be an indicator of the quality of wetland ecosystem. The present study documented 46 bird species associated with Domate Al-Jandal lake. This abundance of avifauna may indicate the health status of the lake as a feeding and resting place for the resident and migratory birds. Forty-two species of water birds were identified in the lakes of north Bangalore during 2008-2009 (Rajashekera and Venkatesha, 2011; Manjunath *et al.*, 2005). On the other hand, 310 species of birds were recorded in Poyang lake in China belonging to 6 orders and 19 families (Weitao *et al.*, 2007). The results of the present study indicate that 25 species (54.3%) of the identified birds use Domate Al-Jandal lake as a staging area. The number of avifauna was the highest during winter compared to other seasons due to the arrival of migratory birds. This indicates that the lake provides feeding and staging habitat for the migratory birds.

Exploitation of lake resources by the birds of differing feeding habits like Moorhen that feeds on fresh plants and small invertebrates, and the Little Grebe that feeds on fish, insects and aquatic vegetation (Zafar-ul-islam and Rahmani, 2004) indicates rich biodiversity on the lake. Insectivorous and grainivorous birds were the most common on the lake which indicated an abundance of insects and grains in and around the lake. Four dominant plant species naturally growing around the lake are:

**A****B****C****D****E**

Fig. 2. A, Flock of Black-winged Stilt (*Himantopus himantopus*); B, Swallow (*Hirundo rustica*); C, White Wagtail (*Motacilla alba*); D, Desert Wheatear (*Oenanthe deserti*); E, White-eared Bulbul (*Pycnonotus leucogenys*).

tamarisk (*Tamarix aucheriana*), common reed (*Phragmites australis*), athel pine (*Tamarix aphylla*) and the desert forb (*Zygophyllum simplex*) (Bazzaz and Al-Manea, 2010). The seeds of these plant species may be the source of food for grainivorous birds seen at the lake. On the other hand, both terrestrial and aquatic insects are diverse and abundant in the lake but are not well identified/described. Common coot (*Fulica atra*) was recorded

in small numbers in the present study, while large flocks of common coot (1,346 out of a total of 2,294 water birds) were recorded in January 1993, and up to 10,000 occurred in the cooler winter of 1991/92 (Newton and Symens, 1994).

Six species of egrets were recorded in the present work out of 12 species reported to occur in Saudi Arabia (Alyousifi, 2006). These egrets roam between the lake and 63 km long supporting

Table I.- Occurrence, group composition and residential status of birds at Domate Al-Jandal lake.

Scientific name	Common name	Family	Order	Occurrence	Residential status
<i>Anas querquedula</i>	Garganey	Anatidae	Anseriformes	+	PM
<i>Tadorna tadorna</i>	Common shelduck	Anatidae	Anseriformes	+	PM
<i>Cygnus olor</i>	Mute swan	Anatidae	Anseriformes	+	PM
<i>Bubulcus ibis</i>	Western cattle egret	Ardeidae	Ciconiiformes	+	PM
<i>Ardeola ralloides</i>	Squacco heron	Ardeidae	Ciconiiformes	++	PM
<i>Egretta alba</i>	Western great egret	Ardeidae	Ciconiiformes	+	RM
<i>Egretta garzetta</i>	Little egret	Ardeidae	Ciconiiformes	++	PM
<i>Ardea cinerea</i>	Grey heron	Ardeidae	Ciconiiformes	+	PM
<i>Ciconia ciconia</i>	White stork	Ciconiidae	Ciconiiformes	+	PM
<i>Gallinula chloropus</i>	Common moorhen	Rallidae	Gruiformes	+++	R
<i>Tachybaptus ruficollis</i>	Little grebe	Podicipedidae	Podicipediformes	+++	R
<i>Phalacrocorax carbo</i>	Cormorant	Phalacrocoracidae	Pelecaniformes	+	PM
<i>Circus aeruginosus</i>	Marsh harrier	Acciptridae	Acciptriformes	+	PM
<i>Himantopus himantopus</i>	Black-winged stilt	Recurvirostridae	Charadriiformes	++	RM
<i>Charadrius hiaticula</i>	Common ringed plover	Charadriidae	Charadriiformes	++	RM
<i>Charadrius alexandrinus</i>	Kentish plover	Charadriidae	Charadriiformes	++	RM
<i>Tringa stagnatilis</i>	Marsh sandpiper	Scolopacidae	Charadriiformes	+	PM
<i>Philomachus pugnax</i>	Ruff	Scolopacidae	Charadriiformes	+	PM
<i>Larus ridibundus</i>	Black-headed gull	Laridae	Charadriiformes	++	PM
<i>Chroicocephalus genei</i>	Slender-billed gull	Laridae	Charadriiformes	+	PM
<i>Chlidonias leucopterus</i>	White-winged black tern	Laridae	Charadriiformes	+	PM
<i>Columba livia</i>	Rock dove or pigeon	Columbidae	Columbiformes	++	R
<i>Streptopelia turtur</i>	Turtle dove	Columbidae	Columbiformes	+	PM
<i>Streptopelia decaocto</i>	Eurasian collared dove	Columbidae	Columbiformes	+++	R
<i>Streptopelia senegalensis</i>	Palm dove	Columbidae	Columbiformes	+	R
<i>Merops apiaster</i>	European bee-eater	Meropidae	Coraciiformes	++	PM
<i>Galerida cristata</i>	Crested lark	Alaudidae	Passeeriformes	+	R
<i>Hirundo rustica</i>	Swallow	Hirundinidae	Passeeriformes	+++	RM
<i>Acrocephalus scirpaceus</i>	Eurasian reed warbler	Sylviidae	Passeeriformes	++	PM
<i>Motacilla cinerea</i>	Grey wagtail	Motacillidae	Passeeriformes	++	PM
<i>Motacilla alba</i>	White wagtail	Motacillidae	Passeeriformes	+++	RM
<i>Motacilla flava</i>	Yellow wagtail	Motacillidae	Passeeriformes	+++	RM
<i>Anthus campestris</i>	Tawny pipit	Motacillidae	Passeeriformes	+	R
<i>Fulica atra</i>	Eurasian coot	Rallidae	Gruiformes	+	R
<i>Athene noctua</i>	Little owl	Strigidae	Strigiformes	+	R
<i>Coracias garrulus</i>	European roller	Coraciidae	Coraciiformes	++	PM
<i>Upupa epops</i>	Hoopoe	Upupidae	Coraciiformes		RM
<i>Lanius collurio</i>	Red-backed Shrike	Laniidae	Passeeriformes		RM
<i>Pycnonotus leucogenys</i>	White-eared bulbul	Pycnonotidae	Passeeriformes	++	RM
<i>Pycnonotus xanthopygos</i>	Yellow-spectacled bulbul	Pycnonotidae	Passeeriformes	+	R
<i>Alaemon alaudipes</i>	Hoopoe lark	Alaudidae	Passeeriformes	+	R
<i>Cercotrichas galactotes syriacus</i>	Rufous-tailed bush chat	Muscicapidae	Passeeriformes	+	PM
<i>Luscinia luscinia</i>	Thrush nightingale	Muscicapidae	Passeeriformes	+	R
<i>Oenanthe oenanthe</i>	European wheatear	Muscicapidae	Passeeriformes	+	R
<i>Oenanthe deserti</i>	Desert wheatear	Muscicapidae	Passeeriformes	++	R
<i>Anthus campestris</i>	Tawny pipit	Motacillidae	Passeeriformes	+	PM

R, resident; PM, passage migrant; RM, resident migrant; +++, Very common; ++, common; +, less common

channels and feed mostly on insects, small fishes, aquatic invertebrates and reptiles together with a wide range of vegetation available in and around the lake and its supporting channels and reservoirs. Piscivorous and wading birds were observed in least numbers at the lake. Low occurrence of white-winged black tern *Chlidonias leucopterus* was recorded in the present study while flocks

numbering over 1,000 were observed passing through the lake in April 1991 (Newton and Symens, 1994). Pallas's fish eagle *Haliaeetus leucoryphus*, and saker falcon, *Falco cherrug*, recorded in 1990 (Newton and Symens, 1994) were not observed. Disappearance of these birds from the lake could be due to the change in the lake ecology that caused the decline of fish population in the lake.

Table II.- Seasonal variation of the birds in Domate Al-Jandal lake, Saudi Arabia.

Scientific name	1	2	3	4	5	6	7	8	9	10	11	12
<i>Anas querquedula</i>	-	-	-	-	-	-	-	○	○	-	-	-
<i>Tadorna tadorna</i>	○	○	○	○	-	-	-	-	-	-	-	-
<i>Cygnus olor</i>	-	-	-	-	-	-	-	-	-	○	○	-
<i>Bubulcus ibis</i>	●	○	-	-	-	-	-	-	○	○	○	●
<i>Ardeola ralloides</i>	-	○	○	●	○	○	○	○	●	○	○	-
<i>Egretta alba</i>	○	○	○	-	-	-	-	-	○	○	○	○
<i>Egretta garzetta</i>	●	○	○	○	○	-	-	○	○	○	●	●
<i>Ardea cinerea</i>	-	-	-	○	○	-	-	-	-	-	-	-
<i>Ciconia ciconia</i>	-	-	-	-	-	-	-	-	-	○	○	○
<i>Gallinula chloropus</i>	●	●	●	●	●	●	●	●	●	●	●	●
<i>Tachybaptus ruficollis</i>	●	●	●	●	●	●	●	●	●	●	●	●
<i>Phalacrocorax carbo</i>	○	○	-	-	-	-	-	-	-	-	-	○
<i>Circus aeruginosus</i>	-	○	○	○	-	-	-	-	○	○	○	○
<i>Himantopus himantopus</i>	●	●	●	○	○	○	○	○	○	○	○	●
<i>Charadrius hiaticula</i>	●	●	●	○	○	-	-	○	○	○	○	●
<i>Charadrius alexandrinus</i>	○	●	●	●	○	○	○	○	●	○	○	○
<i>Tringa stagnatilis</i>	-	-	○	○	○	-	-	○	○	-	-	-
<i>Philomachus pugnax</i>	-	-	○	○	●	○	-	-	○	●	○	○
<i>Larus ridibundus</i>	-	-	●	○	○	-	-	○	-	-	-	-
<i>Chroicocephalus genei</i>	-	-	-	-	-	-	-	-	-	○	○	○
<i>Chlidonias leucopterus</i>	-	-	-	○	○	-	-	-	-	-	-	-
<i>Columba livia</i>	○	○	○	○	○	○	○	○	○	○	○	○
<i>Streptopelia turtur</i>	-	-	-	○	●	-	-	●	●	○	-	-
<i>Streptopelia decaocto</i>	●	●	●	●	●	●	●	●	●	●	●	●
<i>Streptopelia senegalensis</i>	○	○	○	○	○	○	○	○	○	○	○	○
<i>Merops apiaster</i>	-	-	-	○	●	-	-	○	●	○	-	-
<i>Galerida cristata</i>	○	○	○	○	○	○	○	○	○	○	○	○
<i>Hirundo rustica</i>	○	○	○	●	●	○	○	○	○	●	●	○
<i>Acrocephalus scirpaceus</i>	-	-	-	○	●	○	-	-	-	-	-	-
<i>Motacilla cinerea</i>	-	○	○	●	○	○	○	○	○	○	○	-
<i>Motacilla alba</i>	○	●	●	●	○	○	○	○	○	○	○	○
<i>Motacilla flava</i>	○	○	●	●	○	○	○	○	○	●	○	○
<i>Fulica atra</i>	○	-	-	-	-	-	-	-	-	-	-	-
<i>Athene noctua</i>	○	○	○	-	-	-	-	-	○	-	○	○
<i>Coracias garrulous</i>	-	-	-	●	●	-	-	●	○	-	-	-
<i>Upupa epops</i>	-	○	●	●	●	○	○	○	○	○	○	-
<i>Lanius collurio</i>	-	○	○	●	-	-	-	○	○	○	○	○
<i>Pycnonotus leucogenys</i>	○	○	○	●	●	○	○	●	●	○	○	○
<i>Pycnonotus xanthopygos</i>	●	●	●	○	○	○	○	○	●	●	●	●
<i>Alaemon alaudipes</i>	○	○	○	○	○	○	○	○	○	○	○	○
<i>Cercotrichas galactotes syriacs</i>	○	-	○	○	-	-	-	-	○	○	○	-
<i>Luscinia luscinia</i>	○	○	○	○	○	○	○	○	○	○	○	○
<i>Oenanthe oenanthe</i>	○	○	○	○	○	○	○	○	○	○	○	○
<i>Oenanthe deserti</i>	○	○	○	○	○	○	○	○	○	○	○	○
<i>Anthus campestris</i>	-	○	○	○	○	-	-	-	○	○	-	-

Key: ● = common, ○ = less common, - = not seen, 1 = January, 2 = February, 3 = March, 4 = April, 5 = May, 6 = June, 7 = July, 8 = August, 9 = September, 10 = October, 11 = November, 12 = December.

However, the abundance and biomass of ichthyofauna was not found to be significantly related to the abundance of 13 piscivorous bird

species in eastern seaboard of South Africa (Black, 2009).

The nature of threats to avifauna of the lake

and their pattern of migration in the flyways was identified in a recent field investigation on the lake (Jarrar and Al-Rowaili, 2011b). Analysis of main threats shows that high salinity is the main risk to biodiversity of the lake; the total salt content of the lake water is about 43g/l which is even higher than the red sea water (40g/l) (Chang *et al.*, 2008). According to Irrigation and Drainage Project in Domate Al-Jandal of Al-Jouf Province report (2011), the lake annually receives about three million cubic meters of water (salinity level: 4.5g/l) and almost the same amount is evaporated (Jarrar and Al-Rowali, 2010; Irrigation and Drainage Project, 2011). This means that tons of salts are added to the lake annually that can lead to a consequent decrease of aquatic life if measures are not taken soon to stop this drastic ecological transformation).

Habitat degradation and unlawful bird hunting are other key pressures that affect bird populations. Dumping of plastic, glass, vehicle scrape parts and human waste add further hazards to the lake and its biodiversity. Illegal fishing and pollution at Oussudu lake in India was reported to be the reason for decline in the number and density of aquatic birds (Chari *et al.*, 2003). Three coastal lagoons *viz.*, Meja Zerga (Morocco), Ghar El Melh (Tunisia) and Al- Manzala (Egypt) in the southern Mediterranean Region experienced decline in biodiversity during the twentieth century due to human pressures particularly due to the discharge of domestic and industrial waste (Ayache *et al.*, 2009). The current pressures on the lake may affect its bird populations where some of species recorded in the present work are classed as near threatened on the latest IUCN red list of Bird (IUCN, 2012). The list contained 208 of 10,064 globally threatened species with 13% of this list of bird species are nearly threatened.

In conclusion, the results of the present investigation indicate that Domate Al-Jandal lake has a significant biodiversity interest, specially for the resident and passage migratory birds. It is important to take steps to make the lake a destination for bird watching and eco-tourism. Cooperation may be sought of the Birdlife International and other partners to address the current environmental threats to this lake

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