

# The diversity of aquatic birds and breeding of some species in Al-Mallaha, Tripoli

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The presented study started to monitor the breeding and populations dynamics of waterbirds at Al-Mallaha wetland, Libya, in March 2014. Mallaha is a salt marsh, fed by a canal from the sea all year-round and by rainfall during winter. The area is classified as a site of national importance for Black-winged Stilt, Great Cormorant, Dunlin, Greater Flamingo, Shoveler and Teal. Summing up the peak counts of all 47 species observed during the study period results in a figure of 1966 individuals (not a total value as not accounting for turnover in individuals). A peak in numbers occurred during the last week of April 2014. The study also reported nine important waterbirds species that are mentioned in the Annex II, RAC/SPA. Moreover, this study observed a total of 41 and 32 nests with different clutch sizes for Black-winged Stilt and Little Tern, respectively. Breeding success of both species was significantly affected by predation.

**Key words:** breeding, population dynamic, waterbirds, Al-Mallaha, Libya

## 1. Introduction

Libya is characterized by different landscapes leading to a large variety of ecosystems. Accordingly, it has been classified into two eco-regions: a northern region with two parts (the coastal plain and mountainous areas in the north, and the median zone, which is the pre-Saharan region); and a southern region representing the Sahara, with some oases and mountains (BUNDY 1976). Most of these areas are frequented by migratory birds in differing numbers, particularly the areas along the Mediterranean coast, where the variety of wetlands and water bodies and the Mediterranean climate produce favourable conditions.

The Libyan coast, with a length of about 1,700 km, includes many areas used as stopovers by numerous species of migratory birds. These areas provide shelter and food. Wetlands are valuable habitats for birds; especially resident and migratory waterfowl (DEFOS *et al.* 2001). The importance of wetlands is reflected by their relevance for biodiversity in general, the provision of renewable natural resources, as well as endangered species of birds (SHELDON *et al.* 2005).

Libyan wetlands are commonly either shallow salty and open pools which remain dry or semi-dry most of the year, or are connected to the sea. Both types of wetlands are found along the coastal strip. They attract many species of waterbirds, especially in the winter when water levels are high. Here it should be noted that the winter waterbird census, which takes place in most countries of the world during January of each year,

began in Libya in January 2005 (SMART *et al.* 2006). In term of studies of birds, Libya is one of the latest states to take an interest in this matter; preliminary studies were carried out by scientific missions or volunteer ornithologists, mainly foreigners, but there was a lack of information on Libyan birds, especially during the past decades (AZAFZAF *et al.* 2005, 2006).

In this paper we present studies of one of the important wetlands in the Tripoli area, called Al-Mallaha. The study aimed to classify the site according to the standards of the Ramsar Convention on Wetlands, and also to monitor the waterbirds and study the nesting of some species at the site.

## 2. Description of study area

Al-Mallaha is situated in the north-east of the city of Tripoli (at 32° 53' 58 N and 13° 17' 15 E, Fig. 1). It occupies an area of approximately 3.75 hectares. Al-Mallaha is naturally rich in salt. An extraction plant previously exploited salt in the area, but this plant stopped working a long time ago and only ruined buildings remain (Fig. 2). The southern part of the site is semi-moist with dense vegetation and bounded by the runway of Maitiga air base. There are also stacks of many types of solid waste, metals and the remains of military machinery. In addition to housing and the old buildings, there are military construction and dirt roads around the marsh area.



Fig. 1: Map of study area. – Karte des Untersuchungsgebiets.

Although there was no analysis of water quality, the changes in colour and the smell of the water indicate a partial contamination of the area and the soil as a result of leakage of sewage from Maitiga base buildings. The Sabkha (marshy area) is connected to the sea through a channel about 600 meters in length, which supplies water to the Sabkha. Currently it has been blocked due to maintenance and paving of the road located between the sea and the airport of Maitiga.

The Sabkha of Al-Mallaha is divided into a set of rectangles separated by sand embankments, some covered with bushes of tamarisk *Tamarix* and rushes *Scirpus*. During summer these banks are utilized by birds for nesting.



Fig. 2: Old building of salt extraction plant. – Ehemaliges Betriebsgebäude aus Zeiten der Salzgewinnung.

### 3. Materials and methods

This study was conducted from March 2014 to January 2015, omitting the period from August to October when the area was completely dry and the security situation was not appropriate. Visits were twice a week to count the aquatic birds with three visits a week during the nesting period (April to June); 64 survey visits were made in total. Counts were made by walking around the site. An old building overlooking the sites usually acted as starting point. Optolyth, Opticron telescopes and Opticron binoculars (10x50) were used. To identify birds, field guides (HEINZEL *et al.* 1998, MULLARNEY *et al.* 1999) were used, together with a digital camera (Canon D700) with a 70-300 mm zoom lens. At the beginning of each nesting period, sand banks between the marshy flats were numbered and the nests were tagged by plastic tags showing the number of nest and corridor. After the laying of the last egg for each nest, a digital vernier caliper was used to measure the length and width of the eggs.

### 4. Data analysis

To find the egg volume the following equation was used:  $V = K_v LB^2$  (PRESTON 1974, NARUSHIN 2005), where  $V$  = volume,  $K_v = 0.51$ ,  $L$  = length and  $B$  = breadth (width).

A linear regression model was fitted to find the relationship between egg volume and brood (clutch) size (number of eggs in the nest).

### 5. Results

#### 5.1 Area classification

The site is one of eleven Libyan wetlands ranking among the top 20 in regional importance for waterbirds, waterbird species richness and overall abundance (EGA-RAC/SPA 2012). The site is classified as Ramsar types J and R (where J means a seasonal saline marsh with an outlet to the sea, which may be dry or only slightly damp for some parts of the year, and R means an inland seasonal or intermittent saline lake, often in a closed basin with no outlet).

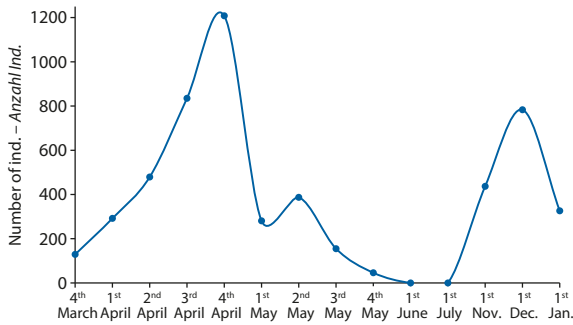
Summing up the peak counts of all 47 species observed during the study period results in a figure of 1966 individuals (not a total value as not accounting for turnover in individuals) from 14 families (Table 1), with a peak in numbers during the last week of April 2014 (Fig. 3). This study also reported nine important species of waterbirds that are mentioned as threatened in Annex II prepared by the Regional Activity Center for especially protected areas in the Mediterranean (RAC / SPA) (Table 1).

**Table 1:** Peak numbers of waterbird species counted during the study period during a single visit. – *Höchste bei einer einzelnen Begehung erfasste Bestände von Wasservogelarten.*

Family – Familie	Common name – Artname	Peak counts – Gebietsmaxima
Phalacrocoracidae	Great Cormorant <i>Phalacrocorax carbo</i> – Kormoran	11
Ardeidae	Squacco Heron <i>Ardeola ralloides</i> – Rallenreiher	1
	Little Egret <i>Egretta garzetta</i> – Seidenreiher	7
	Grey Heron <i>Ardea cinerea</i> – Graureiher	7
Threskiornithidae	Glossy Ibis ** <i>Plegadis falcinellus</i> – Sichler	1
	Spoonbill <i>Platalea leucorodia</i> – Löffler	1
Phoenicopteridae	Greater Flamingo <i>Phoenicopus roseus</i> – Rosaflamingo	93
Anatidae	Shelduck <i>Tadorna tadorna</i> – Brandgans	48
	Gadwall ** <i>Anas strepera</i> – Schnatterente	5
	Pintail <i>Anas acuta</i> – Spießente	9
	Marbled Duck <i>Marmaronetta angustirostris</i> – Marmelente	27
	Garganey ** <i>Anas querquedula</i> – Knäkente	1
Pandionidae	Osprey * <i>Pandion haliaetus</i> – Fischadler	1
Accipitridae	Marsh Harrier <i>Circus aeruginosus</i> – Rohrweihe	1
Recurvirostridae	Avocet <i>Recurvirostra avosetta</i> – Säbelschnäbler	5
	Black-winged stilt <i>Himantopus himantopus</i> – Stelzenläufer	189
Burhinidae	Stone Curlew <i>Burhinus oedicnemus</i> – Triel	1
Charadriidae	Ringed Plover <i>Charadrius dubius</i> – Flussregenpfeifer	95
	Kentish Plover * <i>Charadrius alexandrinus</i> – Seeregenpfeifer	64
	Grey Plover <i>Pluvialis squatarola</i> – Kiebitzregenpfeifer	6
	Golden Plover ** <i>Pluvialis apricaria</i> – Goldregenpfeifer	71
Scolopacidae	Sanderling <i>Calidris alba</i> – Sanderling	4
	Turnstone <i>Arenaria interpres</i> – Steinwäzler	2
	Dunlin <i>Calidris alpina</i> – Alpenstrandläufer	197
	Curlew Sandpiper ** <i>Calidris ferruginea</i> – Sichelstrandläufer	153
	Little Stint <i>Calidris minuta</i> – Zwergstrandläufer	160
	Green Sandpiper <i>Tringa ochropus</i> – Waldwasserläufer	3
	Common Sandpiper <i>Actitis hypoleucos</i> – Flussuferläufer	3
	Greenshank ** <i>Tringa nebularia</i> – Grünschenkel	14
	Redshank <i>Tringa totanus</i> – Rotschenkel	74
	Marsh Sandpiper <i>Tringa stagnatilis</i> – Teichwasserläufer	1
	Bar-tailed Godwit ** <i>Limosa lapponica</i> – Pfuhschnepfe	6
	Curlew <i>Numenius arquata</i> – Großer Brachvogel	43
	Ruff <i>Philomachus pugnax</i> – Kampfläufer	43
	Stercorariidae	Great Skua ** <i>Stercorarius skua</i> – Skua
Laridae	Black-headed Gull <i>Larus ridibundus</i> – Lachmöwe	48
	Slender-billed Gull * <i>Larus genei</i> – Dünnschnabelmöwe	164
	Common Gull <i>Larus canus</i> – Sturmmöwe	2
	Mediterranean Gull * <i>Larus melanocephalus</i> – Schwarzkopfmöwe	25
	Herring Gull ** <i>Larus argentatus</i> – Silbermöwe	80
	Yellow-legged Gull <i>Larus michahellis</i> – Mittelmeermöwe	120
	Audouin's Gull * – <i>Larus audouinii</i> – Korallenmöwe	9
	Lesser Black-backed Gull <i>Larus fuscus</i> – Heringsmöwe	49
Sternidae	Little Tern * <i>Sternula albifrons</i> – Zwergseeschwalbe	51
	Sandwich Tern * <i>Sterna sandvicensis</i> – Brandseeschwalbe	37
	Caspian Tern * <i>Hydroprogne caspia</i> – Raubseeschwalbe	5
	Lesser Crested Tern * <i>Sterna bengalensis</i> – Rüppellseeschwalbe	28

\* Important waterbirds species mentioned in Annex II, RAC/SPA (Protocol concerning specially protected areas and biological diversity in the Mediterranean). – *Wichtige Wasservogelarten des Anhang II des Protokolls hinsichtlich besonders geschützter Gebiete und biologischer Diversität der Mittelmeerregion (RAC/SPA).*

\*\* Species were recorded for first time at this site. – *Arten die erstmals für das Untersuchungsgebiet nachgewiesen wurden.*



**Fig. 3:** Combined counts (sum of weekly peak numbers per species) of the 47 waterbird species recorded at Al-Mallaha, by week. – *Kombinierte wöchentliche Zählungen (Summe der Maximalwerte je Art und Woche) der 47 erfassten Wasservogelarten im Untersuchungsgebiet Al-Mallaha.*

## 5.2 Nesting

During the study period three breeding species were recorded: Black-winged Stilt *Himantopus himantopus*, Little Tern *Sternula albifrons* and Kentish Plover *Charadrius alexandrinus*. The highest abundance of Black-winged Stilt was during the fourth week of April with a total of 189 individuals, whereas nests had been found at the beginning of April; the total number of nests was 41, with differences in clutch size. Nests were found in the aisles with vegetation cover (Fig. 4). Moreover, broken wing behaviour was observed. Nesting of Little Tern started at the end of April; the total number of nests was 32, although the peak number of individuals was 51, during the second week of May. The nests were on the edges of sand banks (Fig. 5). The present study recorded only two nests of Kentish Plover (with one and three eggs). However, this study did not record any hatching of Kentish Plover's eggs. The study found that there was no effect of egg volume on the clutch size in either Black-winged Stilt or Little Tern ( $r^2 = 0.014$ ,  $df = 1$ ;  $32$ ,  $P = 0.510$  and  $r^2 = 0.015$ ,  $df = 1$ ;  $27$ ,  $P = 0.450$ ) respectively. Moreover, the study found



**Fig. 4:** Nest of Black-winged Stilt. – *Nest eines Stelzenläufers.*

that the hatching rate was 4.4 % for Black-winged Stilt and 20.5 % for Little Tern. However, breeding success of both species was nil (0.0 %).

## 6. Discussion

The results of this study showed that Al-Mallaha wetland may be classified under two types of wetland, according to the classification for wetland type of the Ramsar Convention; these are J and R, where J means coastal marine wetlands and waters are salty and contact with the sea, while R means inland wetlands, filled with water at certain seasons of the year and which may be dry, salty, brackish or alkaline (AZAFZAF *et al.* 2005, EGA-RAC/SPA 2012). The site is very important as a stopover for migratory birds and waterfowl. The study of population dynamics and numbers of individuals and species showed that this site receives large numbers of waterbirds, emphasizing the importance of the site. This is probably because Al-Mallaha is the only natural wetland in Tripoli region.

In total 47 species were recorded during the study, representing the highest number of species recorded since 2005 (Table 2). This diversity reflects the importance of the habitat as an area for foraging, nesting and shelter for many waterbird species. When comparing this study and previous studies on this area, we found that nine species were not previously mentioned (Table 1), this may be due to the length of the study period and the number of visits which gave a greater opportunity to count the number of species in the site.

Seabirds feeding on fish have previously been reported to utilize the area for resting (ETAYEB *et al.* 2013). Migratory species stay for a brief period at the site and then resume their journey. The peak in bird numbers was during the last week of April, this perhaps related to the beginning of nesting by species such as Black-winged Stilt. Moreover, the presence of large numbers of some waders such as Dunlin *Calidris alpina*, Curlew Sandpiper *Calidris ferruginea* and Lit-



**Fig. 5:** Nest of Little Tern. – *Nest einer Zwergseeschwalbe.*

tle Stint *Calidris minuta* coincided with the start of dry season, when the shallower water depth meets the requirements of these species.

The results of this study also showed the presence of nine species mentioned in the RAC/SPA Annex II as threatened species in the Mediterranean (UNEP MAP RAC/SPA 2003). The records of these species emphasize the importance of Al-Mallaha wetland as a good refuge and reflect the need to maintain the natural characteristics of the area, and to recommend its inclusion in the list of Important Bird Areas. Al-Mallaha wetland is considered as a favorable habitat for nesting of some waterbirds (ETAYEB *et al.* 2013, 2014), our study recorded nesting of Black winged Stilt, Little Tern and Kentish Plover, as have been recorded previously (ETAYEB *et al.* 2013). Another earlier study reported nesting of Marbled Duck *Marmaronetta angustirostris* (ETAYEB *et al.* 2014), which demonstrates that the area can provide suitable habitat for nesting of these species. In our recent study we could not confirm breeding of this species.

This study found no relationship between clutch size and egg volume, whereas BLACKBURN (1991) reported a significant negative relationship between clutch size and egg volumes in Anatidae species. Moreover, SANCHEZ-LAFUENTE (2004) found the same result in Purple Swamphen *Porphyrio porphyrio* with a tendency to smaller eggs in larger clutches. However, in Shag *Phalacrocorax aristotelis* and Ring-billed Gull *Larus delawarensis* the size of eggs (egg volume) was affected by the bird's age and the timing of egg laying but not by the clutch size (RYDER 1975).

Hatching was very low in comparison to the number of eggs in both species. This was unexpected and perhaps due to high predation rates by gulls, and the presence of a large number of dogs in the site. These species lay their eggs on the ground, thus they are more susceptible to predation than others (PICMAN 1988). Many studies have addressed the issue of predation, either of the eggs or chicks, and its negative impact on the overall success rate of the breeding season (BROWN & MORRIS 1994, THORINGTON & BOWMAN 2003, LANGSTON *et al.* 2007). Our results found a complete failure of the breeding season of birds in Al-Mallaha.

## 8. Zusammenfassung

**Benyezza, E., T. Shanan, A. Berbash & K. Etayeb 2017: Wasservogeldiversität und Brutvogelarten des Al-Mallaha Feuchtgebietes, Tripolis. Vogelwelt 137: 143–148.**

Die im März 2014 begonnene hier vorgestellte Studie befasst sich mit dem Monitoring der Brut- und Populationsdynamiken von Wasservögeln des Al-Mallaha Feuchtgebiets in Libyen. Mallaha ist eine Salzmarsh die das ganze Jahr über durch einen Kanal mit Meereswasser versorgt wird. Darüber hinaus wird das Feuchtgebiet durch winterliche Regenfälle gespeist. Die Salzmarsh ist als Gebiet von nationaler Bedeu-

**Table 2:** Number of waterbirds species at Al-Mallaha from 2005 to 2014. – Anzahl der Wasservogelarten im Untersuchungsgebiet Al-Mallaha zwischen 2006 und 2014.

Study year – Untersuchungsjahr	2005	2008	2009	2011	2012	2014
No. of species – Artenzahl	24	9	19	34	32	47

Fledging failure in Little Tern is probably due to the disturbance of adults (parents) during the period when chicks are being fed, because after hatching the chicks rely on their parents (fed entirely by the parents). However, the frequent disturbance by humans or by animals such as dogs causes abandonment of the chicks. During our visits we observed footprints and shot cartridges in and around the Sabkha (salt marsh), which confirms the presence of human disturbance. Many studies have reported negative effects of disturbance caused by humans and animals on the abundance and breeding of birds (BUNNELL *et al.* 1981, CARNEY & SYDEMAN 1999, FINNEY *et al.* 2005, BURTON 2007)

## 7. Conclusion

The site is classified under Ramsar types J and R (Ramsar Convention wetland classification). The site is important for foraging, roosting and breeding of waterbirds. Moreover, the site is attracting some important (endangered or threatened) bird species. However, this study showed that the highest abundance of birds was during April, which coincides with the breeding of Black-winged Stilt and Little Tern. Egg volumes were not affected by the clutch size in both breeding species. Finally, due to high predation, hatching percentage was very low, and breeding success was 0.0 %.

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tung für Stelzenläufer, Kormoran, Alpenstrandläufer, Rosaflemming, Löffelente und Krickente klassifiziert. Werden die höchsten artspezifisch erfassten Bestände aller 47 im Untersuchungszeitraum nachgewiesenen Arten aufsummiert, erreicht man einen Wert von 1.966 Individuen (bei diesem Wert handelt es sich nicht um eine absolute Anzahl, da der stetige Zu- und Abgang von Individuen nicht berücksichtigt wird).

Ein Gebietsmaximum in Hinblick auf die erfasste Anzahl von Vögeln wurde in der letzten Woche des Aprils 2016 erreicht. Die Studie konnte neun Wasservogelarten nachweisen die in Anhang II des Protokolls zu besonders geschützten Gebieten und biologischer Diversität der Mittelmeerregion (RAC/SPA) aufgeführt sind. Zudem konnten im Rahmen der Studie insgesamt 41 bzw. 32 Nester des Stelzenläufers und der Zwerg-

seeschwalbe mit unterschiedlichen Gelegegrößen festgestellt werden. Der Bruterfolg beider Arten wurde stark durch Prädation durch Möwen und freilaufende Hunde beeinflusst. Die Schlupfraten im Untersuchungszeitraum waren sehr niedrig und es wurde kein einziger Jungvogel flügge. Das Feuchtgebiet ist als Ramsargebiet mit internationaler Bedeutung für Wasservogelarten ausgewiesen.

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