

AN APPRAISAL OF THE STATUS AND DISTRIBUTION OF WATERBIRDS OF ALGERIA: INDICATORS OF GLOBAL CHANGES?

UNA APROXIMACIÓN SOBRE EL ESTATUS Y DISTRIBUCIÓN DE LOS LIMÍCOLOS DE ARGELIA: ¿INDICADORES DEL CAMBIO GLOBAL?

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SUMMARY.—An appraisal of the status and distribution of waterbirds of Algeria: indicators of global changes?

North Africa is generally thought to play a key role for wintering and staging migrant birds. This study presents a detailed assessment of the status of waterbirds of Algeria with an emphasis on changes in species composition and distribution of breeding wetland and marine birds. A total of 97 species of waterbirds were identified with 41 species breeding. Marked environmental changes in North Africa over the past two hundred years that are relevant to waterbirds have included wetland drainage, persecution, introduction of exotic fish, increases in open-air refuse dumps and climate change. These changes have affected waterbirds differentially with some species increasing in numbers and expanding their range and others teetering on the verge of local extinction. When examining changes in the present breeding avifauna since the nineteenth century or the mid-twentieth century, the guild renewal rates were 18.3% (with a net loss of 5 species) and 4.8% (with a net gain of 3 species), respectively. Data suggest that many Mediterranean waterbird populations are structured as metapopulations, prompting the need for international cooperation to study population dynamics on a wider scale and to devise conservation strategies that take into account the interconnectivity of wetlands on a regional level.

Key words: breeding, conservation, distribution, global change, North Africa, stopovers, waterbirds, winter quarters.

RESUMEN.—Una aproximación sobre el estatus y distribución de los limícolos de Argelia: ¿indicadores del cambio global?

El norte de África juega un importante papel durante el paso y la invernada de aves migradoras. Presentamos una valoración del estatus de los limícolos del norte de Argelia, con énfasis en el cambio de

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la distribución y composición de especies que crían en humedales y también en aves marinas. Se identificaron un total de 97 especies de limícolas, de las que 41 se reprodujeron. En los últimos doscientos años se han producido fuertes cambios ambientales que han influido en estas aves, como el drenaje de humedales, persecución, introducción de especies exóticas de peces, aumento del número de basureros al aire libre y el cambio climático. Estas variables han afectado a los limícolas de manera diferencial, existiendo especies que han incrementado su número y ampliado su rango de distribución, mientras que otras están a punto de una extinción local. Analizando los cambios de la avifauna reproductora actual desde el siglo XIX o la mitad del XX, las tasas de renovación fueron del 18.3% (con una extensión de balance de 5 especies) y 4.8% (con una extensión de balance de +3 especies) respectivamente. Estos registros sugieren que muchas especies de limícolas en el Mediterráneo están estructuradas como metapoblaciones, por lo que urge la cooperación internacional para el estudio de la dinámica poblacional a una amplia escala y dirigir las estrategias de conservación con el fin de preservar los humedales a nivel regional.

Palabras clave: cambio global, conservación, cuarteles invernales, distribución, limícolas, lugares de repostaje, norte de África, reproducción.

INTRODUCTION

Ecologists and land managers have a vested interest in monitoring patterns of change in species distribution and population dynamics, especially at a time of global change (Parmesan and Yohe, 2003; Parmesan, 2006). Most studies to date have suggested substantial effects of climate change, exacerbated by anthropogenic pressures, on species and communities (IPCC, 2007). The impact of global warming is reckoned to be complex and far from predictable (Kitayski and Golubova, 2000; Hockey and Midgley, 2009; Mustin *et al.*, 2007) but its effects will influence the physiology, phenology, distribution and evolution of species, with far-reaching consequences (Hughes, 2000; Sanz, 2002). There is thus a real need to employ bioindicators to assess the state of the environment and many such schemes have been implemented throughout the world, for example the wild bird indicator scheme developed in the UK (Gregory *et al.*, 2008). Birds are considered to be good ecological indicators since they respond swiftly to environmental changes over many spatial scales (Temple and Wiens, 1989; Carignan and Villard, 2002).

Although the bird fauna of North Africa is relatively well known, there are still substantial gaps in knowledge regarding the status and distribution of many species and this is undoubtedly true for wetland birds, as highlighted by a previous account of the diversity of Important Bird Areas (IBAs) across Algeria and the anthropogenic pressures that they face (Samraoui and Samraoui, 2008). Although climate models predict an increase in global mean precipitation, some regions, including North Africa, are expected to become drier (Hulme *et al.*, 2001). A thorough knowledge of the status of birds of North Africa and their habitat use is of the utmost importance as it will help predict the effects of global changes and guide conservation efforts. Bird ringing schemes around the Mediterranean have highlighted the fact that many waterbird populations are highly interconnected and act as metapopulations, but there remains a real need to know more both about the movements of these waterbirds and also about the interconnections between the regional wetlands (Haig *et al.*, 1998). There is thus a requirement, for conservation purposes, to identify both the role of key wetlands on a broad geographical scale and their interlinkage,

which may vary seasonally according to the biological processes that underlie waterbird dispersion (Amat *et al.*, 2005). The present study aimed to determine the changes of status and distribution of waterbirds in Algeria, with an emphasis on the likely causes.

MATERIAL AND METHODS

This work reports the results of a survey of waterbirds in Algeria between 2002 and 2010. A first part covering habitats and methodology has already been published (Samraoui and Samraoui, 2008). One IBA included in that account, Garaet Haouas, was wrongly located in the Sahara by Coulthard (2001) and should in fact be placed in western Numidia within the Guerbes-Senhadja complex (Samraoui and de Belair 1997) with the following coordinates: 36° N, 7° 6' E. Another Ramsar site, the Chott of Ain El Beïda, Ouargla (31° 58' 11" N, 5° 22' 02" E), that was not sampled earlier on account of being partly drained and degraded, is included here as there is a slight hope that it will be rehabilitated in future. We have also included a third new site, Sebkhath Safioune (32° 19' 16" N, 5° 22' 6" E), which now collects all the residual water of the town of Ouargla. Coordinates of all other sampled sites are given by Samraoui and Samraoui (2008). The following abbreviations for the different regions sampled are used (figure 1): (EN) = Eastern Numidia, (WN) = Western Numidia, (G) = Guelma wetlands, (JC) = the Jijel complex, (AR) = the Algiers region, (OC) = the Oran complex, (EHP) = Eastern High Plateaux, (CHP) = Central High Plateaux, (WHP) = Western High Plateaux, and (S) = Sahara.

A conservative assessment of status was used and species were moved from 'stable' status only where the data showed definite evidence of a trend (increase or decline). We compare the present breeding avifauna with

that of two earlier periods, in order to estimate the changes that have affected the breeding wetland birds of Algeria. The first interval is based on records (> 50 years) made from the start of the French colonisation (1830) to independence (1962); a period well documented by Heim de Balsac and Mayaud (1962). The second (> 30 years) spans the period between independence and the early 1980s, which marked the start of conservation activity in the country: it has been documented by Ledant *et al.* (1981). We used the formula of Diamond (1969) to calculate the renewal rate (RR) of the avifauna in each period: based on additions (A), extinctions (E) and species richness at the beginning (S1) and at the end (S2) of the period under consideration: $RR = (A + E)/(S1 + S2)$.

A ringing scheme involving chicks of the greater flamingo was started in 2006. This was extended to include the glossy ibis in 2008 and the yellow-legged gull in 2009. Reporting of the field-readable rings was also carried out in Algeria and elsewhere, thanks to the large number of dedicated ornithologists that are active across southern Europe and North Africa.

RESULTS

A total of 101 wetlands were visited during the surveys. Counts at the new site Sebkhath Safioune indicated that it easily qualifies as an IBA and a Ramsar site under the IBA criteria of A1 (the site regularly holds a species of global conservation concern: the marbled teal *Marmaronetta angustirostris*) and A4i (the site regularly holds at least 1% of the global population of a congregatory bird species: the ruddy shelduck *Tadorna ferruginea*). Thus, 41 sampled sites, including the new addition, qualified as IBAs (Samraoui and Samraoui, 2008) since they complied with at least one of the IBA criteria (Fishpool and Evans, 2001).

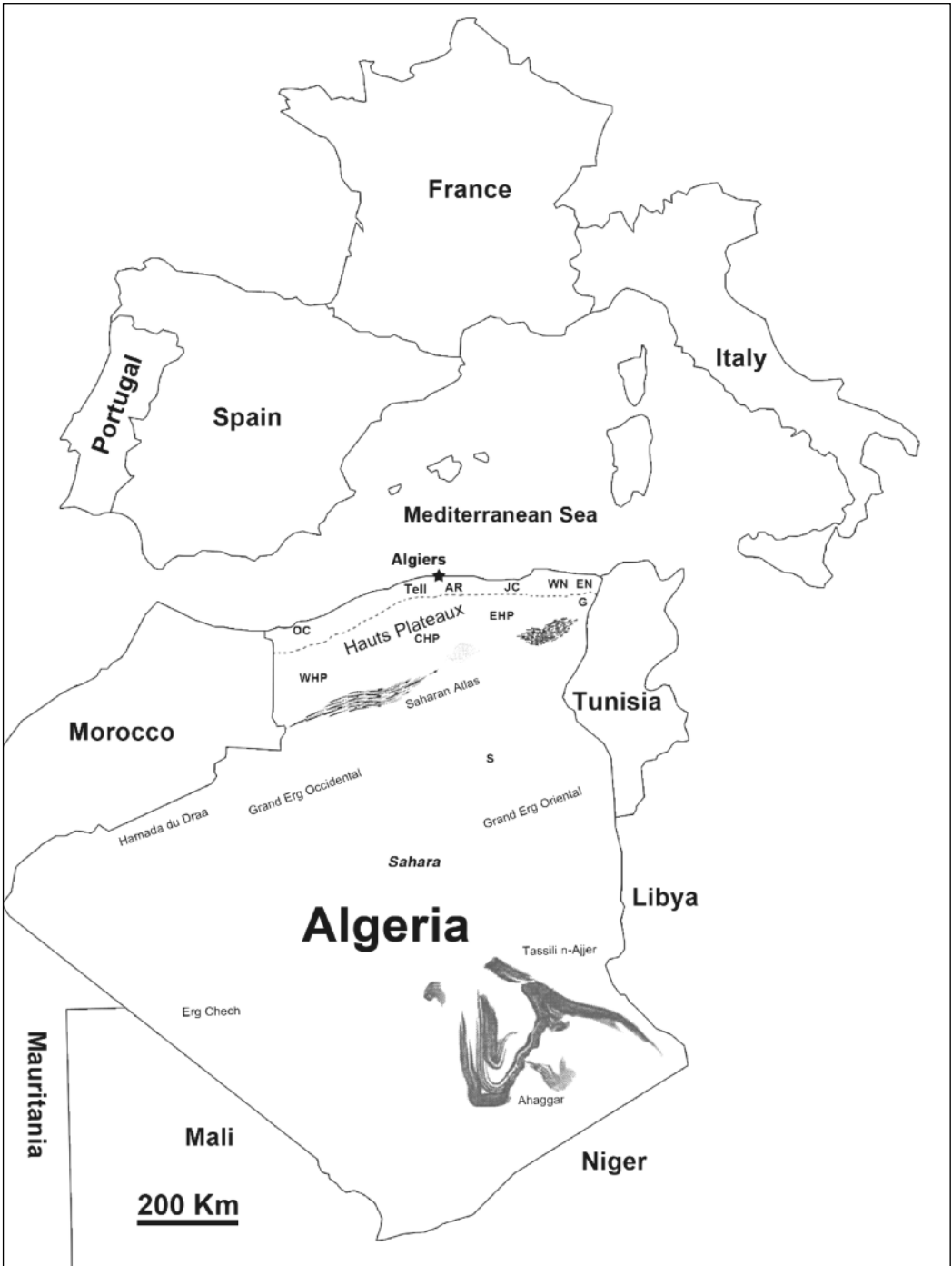


FIG. 1.—The location of the ten regions surveyed across Algeria.
[Localización de las diez regiones examinadas en Argelia.]

In all, 43 of the 99 species of waterbirds identified during the surveys were recorded breeding (tables 1, 2). No proof of breeding was found for a further 56 species (table 3). A total of 11 breeding species are declining or are threatened with local extinction whereas 17 breeding species are on the increase (table 1). These trends may be put into perspective on a larger scale: when we compare the present breeding avifauna with the period stretching back to the nineteenth century and up to the mid-twentieth century [as documented by the work of Heim de Balzac and Mayaud (1962)], we have six new additions (Cory's shearwater *Calonectris diomedea*, European shag *Phalacrocorax aristotelis*, greater flamingo *Phoenicopterus roseus*, mallard *Anas platyrhynchos*, Audouin's gull *Larus audouinii* and slender-billed gull *Larus*

geni), and 11 losses (pygmy cormorant *Phalacrocorax pygmaeus*, red-footed falcon *Falco vespertinus*, great bittern *Botaurus stellaris*, Eurasian spoonbill *Platalea leucorodia*, greylag goose *Anser anser*, gadwall *Anas strepera*, red-crested pochard *Netta rufina*, common pochard *Aythya ferina*, Baillon's crake *Porzana pusilla*, little crake *Porzana parva* and sandwich tern *Sterna sandvicensis*). The guild renewal rate for this period that spanned over 50 years was 18.3%, with a net loss of 5 species (table 5). However, the losses could be relatively smaller since the greylag goose may have bred sporadically in the past and the common pochard may still be breeding at Lake Fetzara. The great bittern is a complex example of a species that is declining throughout its range (Day, 1981).

TABLE 1

List of breeding species with their breeding sites across Algeria.
[Lista de las especies con su localización reproductora en Argelia.]

Species	Breeding sites
Little grebe <i>Tachybaptus ruficollis</i>	(EN): Boussedra, Lac des Oiseaux, Mekhada, Sidi Achour, Tonga, (WN): Fetzara, Hadj Tahar, Sidi Makhoulouf, (OC): Oued el Kihel, (EHP): Timerganine.
Great crested grebe <i>Podiceps cristatus</i>	(EN): Boussedra, Lac des Oiseaux, Mekhada, Tonga, (WN): Fetzara, (EHP): Timerganine.
Black-necked grebe <i>Podiceps nigricollis</i>	(EHP): Tinsilt.
Cory's shearwater <i>Calonectris diomedea</i>	(EN): Kef Amor, (WN): Srigina, (OC): Ile Habibas, Ile Rachgoun.
European shag <i>Phalacrocorax aristotelis</i>	(OC): Iles Habibas
Little bittern <i>Ixobrychus minutus</i>	(EN): Boussedra, Lac des Oiseaux, Sidi Achour, Tonga, (WN): Fetzara, Hadj Tahar, (EHP): Timerganine.
Black-crowned night heron <i>Nycticorax nycticorax</i>	(EN): Dakhla, Mekhada, Tonga, (WN): Fetzara.

TABLE 1 (cont.)

Species		Breeding sites
Squacco heron	<i>Ardeola ralloides</i>	(EN): Bousshedra, Chatt, Mekhada, Sebaa, Tonga, (EHP): Timerganine.
Cattle egret	<i>Bubulcus ibis</i>	(EN): Bou Redim, Chatt, Dakhla, Mekhada, Sidi Achour, Tonga, (G): el Berda, Oued Zenati, Ras el Agba, (WN): Fetzara, Ouajaa, (OC): Boughrara's reservoir, Ile Rachgoun, (EHP): Ain Mlila.
Little egret	<i>Egretta garzetta</i>	(EN): Chatt, Dakhla, Mekhada, Tonga, (WN): Fetzara, (JC): Ile Rachgoun.
Grey heron	<i>Ardea cinerea</i>	(EN): Dakhla, (WN): Fetzara.
Purple heron	<i>Ardea purpurea</i>	(EN): Chatt, Dakhla, Lac des Oiseaux, Mekhada, Tonga, (WN): Fetzara, Hadj Tahar.
White stork	<i>Ciconia ciconia</i>	(EN): Ben Mhidi, Berrihane, Bouteldja, Chatt, Dréan, Lac des Oiseaux, Mekhada, Sidi Kaci, (WN): Fetzara, Loughat, (G): Oued Seybouse, (S): Biskra, El Goléa.
Glossy ibis	<i>Plegadis falcinellus</i>	(EN): Chatt, Dakhla, Tonga, (WN): Fetzara.
Greater flamingo	<i>Phoenicopterus roseus</i>	(EHP): Ezzemoul, (S): El Goléa, Safioune.
Ruddy shelduck	<i>Tadorna ferruginea</i>	(S): Merja Hamraia II, Safioune.
Common shelduck	<i>Tadorna tadorna</i>	(EHP): Guelif, Tarf, Tazougart II, Tinsilt, (S): Safioune.
Mallard	<i>Anas platyrhynchos</i>	(EN): Bou Redim, Bousshedra, Chatt, Mekhada, Sidi Achour, Tonga, (WN): Fetzara, (EHP): Tazougart II, Timerganine, Tinsilt.
Marbled duck	<i>Marmaronetta angustirostris</i>	(WN): Fetzara.
Ferruginous duck	<i>Aythya nyroca</i>	(EN): Bou Redim, Bousshedra, Lac des Oiseaux, Mekhada, Tonga, (WN): Chichaya, Fetzara, Sidi Makhlouf, (EHP): Tinsilt.
White-headed duck	<i>Oxyura leucocephala</i>	(EN): Bousshedra, Tonga, (WN): Fetzara.
Marsh harrier	<i>Circus aeruginosus</i>	(EN): Bousshedra, Lac Noir, Mekhada, Tonga.
Osprey	<i>Pandion haliaetus</i>	(EN): Cap Sigleb, (WN): close to Srigina, (OC): Ile Rachgoun (Pain de Sucre).
Eleonora's falcon	<i>Falco eleonorae</i>	(EN): Kef Amor, (WN): Srigina, (OC): Ile Habibas, Ile Rachgoun.

TABLE 1 (cont.)

Species		Breeding sites
Water rail	<i>Rallus aquaticus</i>	(EN): Fetzara.
Common moorhen	<i>Gallinula chloropus</i>	(EN): Boussedra, Chatt, Lac des Oiseaux, Tonga. (WN): Fetzara, Sidi Makhlouf, (EHP): Jemott.
Purple swamp-hen	<i>Porphyrio porphyrio</i>	(EN): Boussedra, Dakhla, Mekhada, Salines, Sidi Achour, Tonga, (WN): Fetzara, Hadj Tahar, Sidi Makhlouf.
Common coot	<i>Fulica atra</i>	(EN): Boussedra, Bou Redim, Lac des Oiseaux, Mekhada, Oubeira, Sidi Achour, Tonga, (WN): Chichaya, Fetzara, Guelb, Hadj Tahar, Sidi Makhlouf, (EHP): Tazougart I, Tazougart II, Timerganine, Tinsilt, Zaher.
Red-knobbed coot	<i>Fulica cristata</i>	(OC): Boughrara's reservoir, (WHP): Dayet el Ferd.
Black-winged stilt	<i>Himantopus himantopus</i>	(EN): Boussedra, Lac Mellah, (WN): Fetzara, (EHP): Chott Hodna, Guelif, Jemott, Tazougart I, Tazougart II, Tinsilt, (S): El Goléa, Safioune.
Pied avocet	<i>Recurvirostra avosetta</i>	(WN): Fetzara, (EHP): Ezzemoul, Guelif, Tazougart II, Tinsilt, (S): El Goléa, Safioune.
Collared pratincole	<i>Glareola pratincola</i>	(EN): Mekhada, Salines, (WN): Fetzara.
Little ringed plover	<i>Charadrius dubius</i>	(S): Safioune.
Kentish plover	<i>Charadrius alexandrinus</i>	(EN): coastal islets near El Kala, Salines, (EHP): Ezzemoul, Guelif, Tazougart II, (S): El Goléa, Oued Khrouf, Safioune.
Slender-billed gull	<i>Larus genei</i>	(EHP): Ezzemoul, Guelif, Tinsilt.
Audouin's gull	<i>Larus audouinii</i>	(OC): Iles Habibas.
Yellow-legged gull	<i>Larus michahellis</i>	(EN): El Kala, Kef Amor, (WN): Srigina, (OC): Ile Rachgoun, Iles Habibas.
Gull-billed tern	<i>Sterna nilotica</i>	(WN): Fetzara, (EHP): Guelif, Tinsilt, (S): El Goléa.
Common tern	<i>Sterna hirundo</i>	(EN): El Kala.
Little tern	<i>Sterna albifrons</i>	(EN): Salines.
Whiskered tern	<i>Chlidonias hybridus</i>	(EN): Tonga.

TABLE 2

Sites other than the breeding locations at which breeding species were recorded.

[*Especies reproductoras con su localidad de registro (excluidos los lugares reproductores).*]

Species		recorded sites (other than breeding sites)
Little grebe	<i>Tachybaptus ruficollis</i>	(EN): Lac Bleu, Oubeïra, Oued Boukamira, Salines, (WN): Bordj du Cantonnier, Bouina, Chichaya, Garaet Mhamed, Guelb, Marsadelle, Ouajaa, Sidi Fritis, Sidi Lakhdar, (G): Aïn Makhoulouf's reservoir, Beljoudi, Oued Seybouse II, Hammam Debagh, Bekouche Lakhdar, (JC): Beni Belaïd, Kennar, (OC): Oum El Ghelez, Mengoub, Sidi Chami, Dayet Morcelly, Boughrara's reservoir, Mkhaiïssa's reservoir, (EHP): Boulehilet, Fom El Gueiss, Jemott, Tazougart I, (CHP): Boughzoul's reservoir, (S): Hamraïa I, Outaya's reservoir.
Great crested grebe	<i>Podiceps cristatus</i>	(EN): Lac Mellah, Oubeïra, Oued Boukhmira, Sidi Salem, (WN): Hadj Tahar, (G): Aïn Makhoulouf's reservoir, Bekouche Lakhdar, Hammam Debagh, (AR): Lac de Réghaïa, (OC): Boughrara's reservoir, (EHP): Boulehilet, Jemot, Tarf, (S): Outaya 's reservoir.
Black-necked grebe	<i>Podiceps nigricollis</i>	(EN): Lac Mellah, Oubeïra, Oued Boukhmira, Salines, (WN): Fetzara, (EHP): Boulehilet, (OC): Boughrara's reservoir, Dayet Morcelly, Oum El Ghelez, (CHP): Boughzoul's reservoir, (WHP): Boughrara's reservoir, Dayet El Ferd.
Cory's shearwater	<i>Calonectris diomedea</i>	(EN): El Kala, Annaba's coast.
European shag	<i>Phalacrocorax aristotelis</i>	(WN): Kef Amor, Srigina, (OC): Ile Rachgoun.
Little bittern	<i>Ixobrychus minutus</i>	(EN): Chatt, Lac Bleu, Oubeïra.
Black-crowned night heron	<i>Nycticorax nycticorax</i>	(EN): Bou Redim, Boussedra, Chatt, (WN): Sidi Makhoulouf, Srigina, (OC): Boughrara's reservoir, (EHP): Timerganine, (CHP): Boughzoul's reservoir, (S): Oued Khrouf.
Squacco heron	<i>Ardeola ralloides</i>	(EN): Lac Bleu, Oubeïra, Salines, (WN): Chichaya, Hadj Tahar, Srigina, (OC): Boughrara's reservoir, Ouled El Kihel's reservoir, (CHP): Boughzoul's reservoir.

TABLE 2 (cont.)

Species	recorded sites (other than breeding sites)
Cattle egret	<i>Bubulcus ibis</i>
	(EN): Bouhamra, Boussehra, Lac des Oiseaux, Lac Okréa, Oubeïra, Oued Boukhmira, Salines, Sidi Amar, Sidi Kaci, (G): Aïn Makhoulf reservoir, Beljoudi, Boumahra, Hammam Debagh, Oued Seybouse II, (WN): Bouina, Chekaka, Chichaya, Garaet Haouas, Garaet Mhamed, Guelb, Hadj Tahar, Loughat, Marsadelle, Nouar Ezzouaoua, Sidi Fritis, Sidi Lakhdar, Sidi Makhoulf, (JC): Beni Belaïd, Kennar, (AR): Lac de Réghaïa, (OC): La Macta, (EHP): Boulehilet, Guelif, Jemot, Tazougart I, Tazougart II, Timerganine, Tinsilt, (WHP): Dayet El Ferd, (S): Biskra, Meghaïr, Sidi Cheikh.
Little egret	<i>Egretta garzetta</i>
	(EN): Bouhamra, Boussehra, Estah, Lac Bleu, Lac des Oiseaux, Lac Mellah, Mafragh, Mare Gauthier, Mare Sangliers, Mellah, Oubeïra, Oued Boukhmira, Salines, Sidi Achour, Sidi Salem, (WN): Bouina, Chekaka, Chichaya, Garaet Haouas, Garaet Mhamed, Hadj Tahar, Messaoussa, Sidi Makhoulf, (G): Oued Seybouse II, (JC): Kennar, (OC): Iles Habibas, (EHP): Boulehilet, El Guerrah, Foum El Gueiss, Jemot, Timerganine, Tinsilt, (WHP): Chott Chergui, (S): Lac Temacine, Merja Hamraïa I, Oued Khrouf, Outaya's reservoir, Sidi Amrane, Tindla, Ouargla (Aïn El Beïda).
Grey heron	<i>Ardea cinerea</i>
	(EN): Bou Redim, Boussehra, Lac des Oiseaux, Lac Mellah, Mekhada, Oubeïra, Oued Boukhmira, Salines, Sidi Achour, Sidi Kaci, Tonga, (WN): Garaet Haouas, Garaet Mhamed, Guelb, Hadj Tahar, Ouajaa, Sidi Fritis, Tacha, (G): Aïn Makhoulf, Bekouche Lakhdar, Oued Seybouse II, (JC): Beni Belaïd, Kennar, (AR): Lac de Réghaïa, (OC): Boughrara's reservoir, Great Sebkhia of Oran, Ouled El Kihel's reservoir, Beni Bahdel's reservoir, Sidi Chahmi, (EHP): Bazer Sakra, Boulehilet, Ezzemoul, Guelif, Jemot, Tazougart II, Timerganine, Tinsilt, (S): Amzel's reservoir (Ahaggar), El Goléa, Merja Hamraïa I, Oued Khrouf, Outaya's reservoir, Sidi Amrane, Tindla.

TABLE 2 (cont.)

Species		recorded sites (other than breeding sites)
Purple heron	<i>Ardea purpurea</i>	(EN): Bou Redim, Oubeïra, (WN): Chichaya, (EHP): Timerganine, Boulehilet.
White stork	<i>Ciconia ciconia</i>	(EN): Boussedra, Oubeïra, Salines, Tonga, (WN): Bordj du Cantonnier, Bouina, Chekaka, Garaet Mhamed, Guelb, Sidi Makhlouf, (OC): Great Sebkhâ of Oran, (EHP): Jemot, Tazougart II, Timerganine, (WHP): Chott Chergui, Dayet El Ferd, Ezzemoul, Tinsilt.
Glossy ibis	<i>Plegadis falcinellus</i>	(EN): Boussedra, Lac des Oiseaux, Mekhada, Oued Boukhmira, Sidi Kaci, (WN): Hadj Tahar, (EHP): Timerganine, (WHP): Dayet El Ferd, (S): El Goléa, Merja Hamraïa I, Oued Khrouf.
Greater flamingo	<i>Phoenicopterus roseus</i>	(EN): Lac des Oiseaux, Mekhada, Oued Boukhmira, Salines, Tonga, (WN): Fetzara, Hadj Tahar, (JC): Beni Belaïd, (OC): Arzew's salinas, Dayet El Bagrat, Dayet Morcelly, Great Sebkhâ of Oran, La Macta, Oum El Ghelez, Telamine, (AR): Lac de Réghaïa, (EHP): Ank El Djmel, Bazer Sakra, Beïda Bordj, Boucif, Boulehilet, Boumia, El Hamiett, Guelif, Tarf, Tazougart I, Tazougart II, Timerganine, Tinsilt, (WHP): Dayet El Ferd, (S): Chott Merouane, Merja Hamraïa I, Merja Hamraïa II, Oued Khrouf, Sidi Amrane, Ouargla (Sidi Khouiled and Ain El Beïda), Tindla.
Ruddy shelduck	<i>Tadorna ferruginea</i>	(EN): Bazer Sakra, Boulehilet, Tazougart II, Timerganine, Chott Hodna, (CHP): Boughzoul (reservoir and sebkha), Oguila Dar Chioukh, (WHP): Chott Chergui, Dayet El Ferd, Sebkhâ of Naama, (S): Merja Hamraïa I, Merja Hamraïa II, Tindla, Ouargla (Sidi Khouiled, Ain El Beïda and Safioune), El Goléa.
Common shelduck	<i>Tadorna tadorna</i>	(EN): Lac des Oiseaux, Salines, (WN): Fetzara, Garaet Mhamed, (AR): Lac de Réghaïa, (OC): Arzew's salinas, Dayet El Bagrat, Great Sebkhâ of Oran, La Macta, Mengoub, Telamine, (EHP): Ank Djmel, Bazer Sakra, Beïda Bordj, Boucif, Boulehilet, Boumia, El Frain, El Hamiett, Ezzemoul, El Marshel, Tazougart I,

TABLE 2 (cont.)

Species	recorded sites (other than breeding sites)
Common shelduck [cont.]	Timerganine, (WHP): Dayet El Ferd, (S): Chott Merouane, Merja Hamraïa I, Merja Hamraïa II, Oued Khrouf, Tindla, Ouargla (Aïn El Beïda and Safioune).
Mallard	(EN): Bouhamra, Dakhla, Estah, Khoud El Barouk, Lac des Oiseaux, Mare Sangliers, Oubeïra, Salines, (WN): Aïn Magroun, Bouina, Chichaya, Garaet Haouas, Garaet Mhamed, Hadj Tahar, (G): Aïn Makhoulouf's reservoir, Beljoudi, Oued Seybouse II, Bekouche Lakhdar, (JC): Beni Belaïd, (AR): Lac de Réghaïa, (OC): Dayet El Bagrat, Dayet Morcelly, La Macta, Mengoub, Ouled El Kihel, Oum El Ghelez, Sidi Chahmi, Telamine, (EHP): Bazer sakra, Boucif, Boulehilet, Boumia, Foum El Gueiss, Tarf, Tazougart I, Zaher, (CHP): Boughzoul's reservoir, (WHP): dayet El Ferd, Chott Chergui, (S): Merja Hamraïa I, Oued Khrouf, Sidi Amrane, Ouargla (Sidi Khouiled).
Marbled duck	(EN): Bousseadra, Oued Boukhmira, Mekhada, Salines, Tonga, (OC): Dayet Morcelly, Tinsilt, Chott Hodna, (CHP): Boughzoul's reservoir, (S): Merja Hamraïa I, Merja Hamraïa II, Sidi Amrane, Oued Khrouf, Ouargla (Aïn El Beïda).
Ferruginous duck	(EN): Estah, Dakhla, Khoud El Barouk, Salines, Lac Bleu, Sidi Achour, Lac Okréa, Chatt, (WN): Bouina, Guelb, Hadj Tahar, Ouajaa, Sidi Fritis, (G): Beljoudi, (JC): Beni Belaïd, Kennar, (AR): Lac de Réghaïa, (OC): Dayet Morcelly, Sidi Chahmi, (EHP): Tazougart II, Timerganine, Boulhilet, Bazer Sakra, (CHP): Boughzoul's reservoir, (S): El Goléa, Merja Hamraïa I.
White-headed duck	(EN): Oubeïra, Lac des Oiseaux, Salines, Oued Boukhmira, (WN): Hadj Tahar, Garaet Haouas, (OC): Dayet Morcelly, Boughrara's reservoir, (EHP): Tazougart I, Timerganine, Boulehilet, (CHP): Boughzoul's reservoir.
Marsh harrier	(EN): Dakhla, Estah, Khoud El Barouk, Lac des Oiseaux, Lac Mellah, Oubeïra, Oued Boukhmira, Salines, Sidi Kaci,

TABLE 2 (cont.)

Species		recorded sites (other than breeding sites)
Marsh harrier [cont.]	<i>Circus aeruginosus</i>	(WN): Chichaya, Fetzara, Garaet Mhamed, Guelb, Hadj Tahar, Messaoussa, Sidi Makhlof, (JC): Beni Belaïd, (OC): Dayet El Bagrat, Oum El Ghelez, Sidi Chahmi, (EHP): Boulehilet, Guelif, Tazougart II, Timerganine, Zaher, (WHP): Chott Chergui, Dayet El Ferd, (S): Merja Hamraïa I, Oued Khrouf, Sidi Amrane, Tindla.
Osprey	<i>Pandion haliaetus</i>	(EN): Lac Bleu, Lac Mellah, Oubeïra, Oued Boukhmira, Salines, Tonga, Vieille Calle, (S): El Goléa.
Eleonora's falcon	<i>Falco eleonorae</i>	(EN): Annaba (Cap de Garde).
Water rail	<i>Rallus aquaticus</i>	(EN): Lac des Oiseaux, Mekhada, Tonga, (EHP): Bazer Sakra, Timerganine, (S): Merja Hamraïa I, Oued Khrouf, Sidi Amrane.
Common moorhen	<i>Gallinula chloropus</i>	(EN): Bouhamra, Dakhla, Estah, Khoud El Barouk, Lac Bleu, Mare Mafragh, Mare Carrière, Mekhada, Oued Boukhmira, Oued Bounechmaya, Salines, (WN): Chichaya, Guelb, Hadj Tahar, Ouajaa, Oued Maboun, (G): Bekouche Lakhdar, Beljoudi, Oued Seybouse II, (J): Beni Belaïd, (AR): Lac de Réghaïa, (OC): Dayet Morcelly, Oum El Ghelez, Sidi Chahmi, (EHP): Timerganine, (CHP): Boughzoul's reservoir, (S): El Goléa, Merja Hamraïa I, Oued Khrouf, Sidi Amrane, Temacine.
Purple swamp-hen	<i>Porphyrio porphyrio</i>	(EN): Estah, Lac des Oiseaux, Oubeïra, Oued Boukhmira, Sidi Kaci, (WN): Chichaya, Guelb, Ouajaa, (JC): Beni Belaïd, (OC): Sidi Chahmi.
Common coot	<i>Fulica atra</i>	(EN): Bouhamra, Chatt, Lac Mellah, Oued Boukhmira, Salines, (WN): Aïn Magroun, Bordj du Cantonnier, Bouina, Garaet Haouas, Garaet Mhamed, Ouajaa, Sidi Fritis, (G): Aïn Makhlof, Bekouche Lakhdar, Beljoudi, Oued Seybouse II, (JC): Beni Belaïd, Kennar, (AR): Lac de Réghaïa, (OC): Dayet Morcelly, La Macta, Mengoub, Oum El Ghelez, Sidi Chahmi, Telamine,

TABLE 2 (cont.)

Species	recorded sites (other than breeding sites)	
Common coot [cont.]	<i>Fulica atra</i>	(EHP): Bazer Sakra, Boulehilet, Jemot, (CHP): Boughzoul's reservoir, Oguila Dar Chioukh, (WHP): Dayet El Ferd, (S): El Goléa, Hamraïa I, Oued Khrouf.
Red-knobbed coot	<i>Fulica cristata</i>	No sites.
Black-winged stilt	<i>Himantopus himantopus</i>	(EN): Lac des Oiseaux, Mekhada, Oubeïra, Oued Boukhmira, Sidi Achour, Tonga, (WN): Garaet Mhamed, Hadj Tahar, (OC): Boughrara's reservoir, Dayet Morcelly, Great Sebkh of Oran, La Macta, Mkhâïssia's reservoir, Ouled El Kihel's reservoir, Telamine, (EHP): Ank Djmel, Bazer Sakra, El Marshel, Ezzemoul, Tarf, Timerganine, Zaher, (CHP): Boughzoul's reservoir, Oguila Dar Chioukh, (WHP): Chott Chergui, Dayet El Ferd, Sebkh of Naama, (S): Chott El Melghir, El Oued, Merja Hamraïa I, Merja Hamraïa II, Ouargla (Aïn El Beïda, Sidi Khouiled), Oued Khrouf, Sidi Amrane, Temacine, Tindla.
Pied avocet	<i>Recurvirostra avosetta</i>	(EN): Lac des Oiseaux, Salines, (OC): Dayet El Bagrat, Dayet Morcelly, Great Sebkh of Oran, La Macta, Mengoub, Oum El Ghelez, Telamine, (EHP): Ank Djmel, Bazer Sakra, Boumia, Tarf, Tazougart I, Timerganine, (CHP): Boughzoul's reservoir, (WHP): Dayet El Ferd, (S): Chott Merouane, Merja Hamraïa I, Oued Khrouf, Tindla.
Collared pratincole	<i>Glareola pratincola</i>	(OC): Oum El Ghellez, (EHP): Timerganine, (WHP): Dayet El Ferd.
Little ringed plover	<i>Charadrius dubius</i>	(EN): Boussedra, Lac des Oiseaux, Mafragh, Salines, (WN): Chekaka, (G): Bekouche Lakhdar, Beljoudi, (AR): Oued Mouzaïa, (EHP): Tazougart II, Timerganine, (S): El Goléa.
Kentish plover	<i>Charadrius alexandrinus</i>	(EN): Mafragh, Oued Boukhmira, Sidi Salem, (WN): Fetzara, Garaet Mhamed, (OC): La Macta, Oum El Ghelez, (EHP): Bazer Sakra, Boucif, Boumia, Jemot, Tarf, Timerganine, Tinsilt, (CHP): Zahrez Gharbi, (WHP): Chott Chergui, Dayet El Ferd, Sebkh of Naama, (S): Merja Hamraïa II, Ouargla (Aïn El Beïda, Sidi Khouiled), Sidi Amrane, Tindla.

TABLE 2 (cont.)

Species		recorded sites (other than breeding sites)
Slender-billed gull	<i>Larus genei</i>	(EN): Lac Mellah, Mafragh, Oubeïra, Oued Seybouse I, Salines, Sidi Salem, (WN): Fetzara, (EHP): Ank Djmel, Boulehilet, Jemot, Tazougart II, Timerganine.
Audouin's gull	<i>Larus audouinii</i>	(EN): Mafragh, Salines, (OC): La Macta.
Yellow-legged gull	<i>Larus michahellis</i>	(EN): Bousedra, Mafragh, Oubeïra, Oued Boukhmira, Salines, Sidi Achour, Sidi Salem, (WN): Chekaka, Fetzara, Garaet Mhamed, Hadj Tahar, Sidi Fritis, (G): Hammam Debagh, Oued Seybouse II, (JC): Beni Belaïd, (AR): Lac de Réghaïa, (OC): Dayet Bagrat, Dayet Morcelli, Great Sebkha of Oran, Mengoub, Sidi Chahmi, (EHP): Boumia, Ezzemoul, Tarf, (WHP): Dayet El Ferd.
Gull-billed tern	<i>Sterna nilotica</i>	(EN): Mekhada, Oubeïra, salines, (OC): Oum El Ghellez, (EHP): Ezzemoul, Jemot, Tazougart II, Timerganine, (CHP): Boughzoul's reservoir, (WHP): Dayet El Ferd.
Common tern	<i>Sterna hirundo</i>	(EN): Salines.
Little tern	<i>Sterna albifrons</i>	(EN): Oued Boukhmira, Sidi Salem.
Whiskered tern	<i>Chlidonias hybridus</i>	(EN): Lac des Oiseaux, Mekhada, Oubeïra, Salines, (WN): Fetzara, (OC): Dayet Morcellly, (EHP): Bazer Sakra, Timerganine, Tinsilt.

TABLE 3

Sites at which species not known to breed in Algeria were recorded. Species not noted breeding with list of recorded sites.

[Especies con reproducción no registrada con la lista de lugares.]

Species	Recorded sites
Great cormorant	<i>Phalacrocorax carbo</i>
	(EN): Dakhla, Lac des Oiseaux, Lac Mellah, Mafragh, Mekhada, Oubeïra, Oued Boukamira, Salines, Tonga, (WN): Bordj du Cantonnier, Fetzara, Garaet Mhamed, Garaet Haouas,

TABLE 3 (cont.)

Species		Recorded sites
Great cormorant [cont.]	<i>Phalacrocorax carbo</i>	Hadj Tahar, Srigina, (G): Aïn Makhlouf's reservoir, Oued Seybouse II, Hammam Debagh, Bekouche Lakhdar, (JC): Beni Belaïd, (S): Merja Hamraïa 1, Oued Khrouf, Outaya's reservoir.
White Pelican	<i>stellaris</i>	(EN): Lac des Oiseaux.
Great bittern	<i>Botaurus stellaris</i>	(EN): Oued Boukhmira, Boussedra, Mekhada, Oubeïra, Tonga, (WN): Fetzara.
White egret	<i>Ardea alba</i>	(EN): Oued Boukhmira, Lac des Oiseaux, Mekhada, Oubeïra, Salines, Sidi Kaci, Tonga, (WN): Fetzara, Garaet Mhamed, Garaet Haouas, Hadj Tahar, (EHP): Boulehilet, (S): Oued Khrouf, Tindla.
Black stork	<i>Ciconia nigra</i>	(EN): Khoud El Barouk, Lac Fetzara.
Eurasian spoonbill	<i>Platalea leucorodia</i>	(EN): Boussedra, Lac des Oiseaux, Mekhada, Oubeïra, Oued Boukhmira, Salines, Tonga, (WN): Fetzara, Garaet Mhamed, (OC): Dayet Morcelly, (EHP): Tarf, Timerganine, (S): Oued Khrouf.
Greylag goose	<i>Anser anser</i>	(EN): lac des Oiseaux, Mekhada, Oubeïra, Salines, (W): Fetzara, Garaet Mhamed, (OC): La Macta.
Eurasian wigeon	<i>Anas penelope</i>	(EN): Boussedra, Lac des Oiseaux, Mekhada, Salines, Sidi Kaci, Tonga, (WN): Chekaka, Fetzara, Garaet Mhamed, Hadj Tahar, (G): Aïn Makhlouf's reservoir, (JC): Beni Belaïd, (OC): Dayet El Bagrat, La Macta, Mengoub, (EHP): Boucif, Boulehilet, Boumia, Guelif, Tarf, Tazougart II, Timerganine, Tinsilt, (CHP): Boughzoul's reservoir, (WHP): Chott Chergui, Dayet El Ferd, (S): Merja Hamraïa I, Merja Hamraïa II, Oued Khrouf, Sidi Amrane, Tindla.
Gadwall	<i>Anas strepera</i>	(EN): Boussedra, Lac des Oiseaux, Mekhada, Oubeïra, Salines, Sidi Kaci, Tonga, (WN): Bordj du Cantonnier, Chichaya, Fetzara, garaet M'hamed, Guelb, Hadj Tahar, Ouajaa, (G): Aïn Makhlouf's reservoir, (AR): Lac de Réghaïa, (OC): Oum El Ghelez,

TABLE 3 (cont.)

Species	Recorded sites
Gadwall [cont.]	La Macta, (EHP): Boucif, Boumia, Tazougart II, Timerganine, (WHP): Dayet El Ferd, (S): Merja Hamraïa I, Merja Hamraïa II, oued Khrouf, Sidi Amrane.
Common teal	(EN): Boussedra, Lac des Oiseaux, Mekhada, Salines, Sidi Kaci, Tonga, (WN): Chekaka, Fetzara, Garaet Mhamed, Hadj Tahar, (G): Aïn Makhlouf's reservoir, (JC): Kennar, (AR): Lac de Reghaïa, (OC): Dayet El Bagrat, (EHP): Bazer Sakra, Boucif, Boumia, Foum El Gueiss, Tazougart II, Timerganine, (CHP): Boughzoul's reservoir, Oguila Dar Chioukh, (WHP): Chott Chergui, Dayet El Ferd, (S): Oued Khrouf, Merja Hamraïa I, Merja Hamraïa II, Merjaja, Sidi Amrane, Tindla.
Northern pintail	(EN): Boussedra, Lac des Oiseaux, Mekhada, Salines, Sidi Kaci, Tonga, (WN): Fetzara, Garaet Mhamed, Hadj Tahar, (G): Aïn Makhlouf's reservoir, (OC): La Macta, Mengoub, Oum El Ghelez, Telamine, (EHP): Bazer Sakra, Boucif, Boulehilet, Boumia, Guelif, Tarf, Tazougart II, Timerganine, Tinsilt, (CHP): Oguila Dar Chioukh, (WHP): Dayet El Ferd, (S): El Goléa, Merja Hamraïa I, Merja Hamraïa II, Oued Khrouf, Sidi Amrane.
Garganey	(EN): Boussedra, Lac des Oiseaux, Salines, Tonga, (WN): Fetzara, (OC): Mengoub, Sidi Chahmi, (EHP): Tazougart I, Chott El Hodna, (CHP): Oguila Dar Chioukh, (S): Merja Hamraïa I.
Northern shoveler	(EN): Boussedra, Lac des Oiseaux, Mekhada, Oubeïra, Oued Boukhmira, Salines, Sidi Achour, Sidi Kaci, Tonga, (WN): Chekaka, Chichaya, Fetzara, Garaet Mhamed, Guelb, Hadj Tahar, Ouajaa, Sidi Makhlouf, (G): Aïn Makhlouf's reservoir, Bekouche Lakhdar, (JC): Beni Belaïd, Oum El Ghelez, Sidi Chami, Telamine, (EHP): Bazer Sakra, Boucif, Boumia, Foum El Gueiss, Guelif, Marshel, Tazougart I, Tazougart II, Timerganine, Tinsilt,

TABLE 3 (cont.)

Species		Recorded sites
Northern shoveler [cont.]	<i>Anas clypeata</i>	(CHP): Boughzoul's reservoir, Oguila Dar Chioukh, (WHP): Dayet El ferd, (S): El Goléa, Merja Hamraïa I, Merja Hamraïa II, Oued Khrouf, Sidi Amrane.
Red-crested pochard	<i>Netta rufina</i>	(S): Merja Hamraïa I.
Common pochard	<i>aythya ferina</i>	(EN): Boussedra, Lac Bleu, Lac des Oiseaux, Oubeïra, Oued Boukhmira, Mekhada, Salines, Sidi Achour, Tonga, (WN): Bordj du Cantonnier, Fetzara, Garaet Mhamed, Guelb, Hadj Tahar, Sidi Makhlouf, (G): Aïn Makhlouf's reservoir, (JC): Beni Belaïd, Kennar, (AR): Lac de Réghaïa, (OC): Oum El Ghelez, La Macta, Sidi Chahmi, (EHP): Boulehilet, Fom El Gueiss, Tazougart I, Tazougart II, Timerganine, Tinsilt, (CHP): Boughzoul's reservoir, (WHP): Dayet El Ferd, (S): Merja Hamraïa I, Sidi Amrane.
Tufted duck	<i>Aythya fuligula</i>	(EN): Oubeïra, Salines, Lac des Oiseaux, Boussedra, Tonga, Tonga, Sidi Achour, (WN): Hadj Tahar, Guelb, (G): Aïn Makhlouf's reservoir.
Red-breasted merganser	<i>Mergus serrator</i>	(EN): Mafragh.
Red-footed falcon	<i>Falco vespertinus</i>	(WN): Fetzara.
Spotted crane	<i>Porzana porzana</i>	(OC): La Macta.
Little crane	<i>Porzana parva</i>	(EN): Boussedra, Tonga, (WN): Fetzara.
Common crane	<i>Grus grus</i>	(EN): salines, Tonga, (WN): Fetzara, (EHP): Boucif, Boumia, Chott Saboun, El Marshel, Ezzemoul, Guelif, Tarf, Timerganine, (CHP): Chott Hodna, (WHP): Chott Chergui, Dayet El Ferd.
Eurasian oystercatcher	<i>Haematopus ostralegus</i>	(EN): Mafragh, Salines, Sidi Salem.
Eurasian dotterel	<i>Charadrius morinellus</i>	(EHP): Zaher.
Ringed plover	<i>Charadrius hiaticula</i>	(EN): Lac des Oiseaux, Lac Mellah, Mafragh, (WN): Sidi Fritis.
Eurasian golden plover	<i>Pluvialis apricaria</i>	(EN): Salines, (WN): Fetzara.

TABLE 3 (cont.)

Species		Recorded sites
Grey plover	<i>Pluvialis squatarola</i>	(EN): Salines, (WN): Fetzara, (EHP): Tazougart II.
Northern lapwing	<i>Vanellus vanellus</i>	(EN): Bousseadra, Lac des Oiseaux, Lac Mellah, Mekhada, Oubeïra, Oued Boukhmira, Salines, Tonga, (WN): Chekaka, Fetzara, Garaet Mhamed, Guelb, Hadj Tahar, (G): Beljoudi, (OC): La Macta, (EHP): Bazer Sakra, Boucif, El Marshel, Tarf, Tazougart II, Timerganine, Tinsilt.
Red knot	<i>Calidris canutus</i>	(EN): Salines.
Sanderling	<i>Calidris alba</i>	(EN): Boukhmira, Mafragh, Salines, Sidi Salem, (EHP): Tazougart II.
Little stint	<i>Calidris minuta</i>	(EN): Boukhmira, Lac des Oiseaux, mafragh, Mekhada, Oubeïra, Salines, Tonga, (OC): La Macta, (EHP): Bazer Sakra, Ezzemoul, Guelif, Jemott, Tazougart II, tinsilt, (S): Oued Khrouf, Merja Hamraïa II.
Curlew sandpiper	<i>Calidris ferruginea</i>	(EN): Salines, (JC): Beni Belaïd, (EHP): Guelif, Tarf, Timerganine, Tinsilt.
Dunlin	<i>Calidris alpina</i>	(EN): Boukhmira, Lac des Oiseaux, Salines, (WN): Fetzara, (JC): Beni Belaïd, (EHP): Bazer Sakra, Ezzemoul, Guelif, Tazougart II, Tinsilt.
Ruff	<i>Philomachus pugnax</i>	(EN): Salines, Sidi Kaci, (EHP): Bazer Sakra, Timerganine, Chott Hodna, (S): El Goléa, Oued Khrouf.
Jack snipe	<i>Lymnocyptes minimus</i>	(EN): Lac des Oiseaux, Lac Mellah, Mekhada.
Common snipe	<i>Gallinago gallinago</i>	(EN): Bouhamra, Bousseadra, Estah, Lac des Oiseaux, Lac Mellah, Mekhada, Oubeïra, Oued Boukhmira, Salines, Sidi Achour, Sidi Kaci, Tonga, (WN): Chekaka, Chichaya, Fetzara, Garaet Mhamed, Guelb, Hadj Tahar, Sidi Makhlouf, (JC): Kennar, (OC): Dayet Morcelly, (WHP): Chott Chergui, Dayet El Ferd, (S): Oued Khrouf, Merja Hamraïa I, Merja Hamraïa II, Sidi Amrane.

TABLE 3 (cont.)

Species		Recorded sites
Black-tailed godwit	<i>Limosa limosa</i>	(EN): Lac des Oiseaux, Mekhada, Salines, (WN): Chekaka, Fetzara, Garaet Mhamed, (EHP): Guelif, Tinsilt, (WHP): Dayet El Ferd.
Bar-tailed godwit	<i>Limosa lapponica</i>	(EN): Salines, Mekhada.
Whimbrel	<i>Numenius phaeopus</i>	(EN): Salines, (EHP): Ezzemoul.
Eurasian curlew	<i>Numenius arquata</i>	(EN): Mekhada, Salines, (OC): Dayet El Bagrat, Dayet Morcelly, (EHP): Bazer Sakra, Ezzemoul, Guelif, Tarf, Timerganine, Tinsilt.
Spotted redshank	<i>Tringa erythropus</i>	(EN): Lac des Oiseaux, Lac Mellah, Mekhada, Oubeïra, Salines, Tonga, (WN): Fetzara, (EHP): Guelif, Tarf, Tazougart II, Timerganine, (CHP): Chott Hodna, (S): Oued Khrouf.
Common redshank	<i>Tringa totanus</i>	(EN): Mekhada, Oued Boukhmira, Salines, Sidi Kaci, Tonga, (WN): Fetzara, Garaet Mhamed, Hadj Tahar, (EHP): Bazer Sakra, Tazougart II, Tinsilt, (CHP): Oguila Dar Chioukh, (S): Merja Hamraïa II, Ouargla (Aïn El Beïda), Oued Khrouf.
Marsh sandpiper	<i>Tringa stagnatilis</i>	(EN): Lac des Oiseaux, Salines, (WN): Hadj Tahar, (EHP): Timerganine, (S): Oued Khrouf.
Common greenshank	<i>Tringa nebularia</i>	(EN): Lac des Oiseaux, Lac Mellah, Mekhada, Oubeïra, Salines, Tonga, (WN): Chekaka, Fetzara, Loughat, (OC): Oum El Ghelez, (EHP): Bazer Sakra, Bouleहित, Guelif, Jemott, Tazougart II, Timerganine, Tinsilt, (S): Oued Khrouf, Sidi Amrane, Temacine.
Green sandpiper	<i>Tringa ochropus</i>	(EN): Boukhmira, Lac des Oiseaux, Mare Sangliers, Salines, (WN): Fetzara, Hadj Tahar, Mare Beni Guech, (S): Oued Khrouf, Temacine.
Wood sandpiper	<i>Tringa glareola</i>	(EN): Sidi Kaci.
Common sandpiper	<i>Actitis hypoleucos</i>	(EN): Boussedra, Mekhada, Oubeïra, Oued Boukhmira, Sidi Achour, Salines, Sidi Kaci, Sidi Salem, Tonga, Vieille Calle, (WN): Fetzara, hadj Tahar, (G): Bekouche Lakhdar, Oued Seybouse II,

TABLE 3 (cont.)

Species		Recorded sites
Common sandpiper [cont.]	<i>Actitis hypoleucos</i>	(OC): Dayet Morcelly, Oued El Kihel, (EHP): Bazer Sakra, Boucif, Guelif, Tarf, Tazougart II, Timerganine, Tinsilt, (CHP): Oguila dar Chioukh, (WHP): Dayet El Ferd, (S): Merja Hamraïa I, Merja Hamraïa II, Merjaja, Oued Khrouf, Sidi Amrane.
Ruddy turnstone	<i>Arenaria interpres</i>	(EN): Salines.
Mediterranean gull	<i>Larus melanocephalus</i>	(EN): Mafragh, Salines, Sidi Salem.
Little gull	<i>Larus minutus</i>	(EN): Salines, Mekhada.
Black-headed gull	<i>Larus ridibundus</i>	(EN): Boukhadra, Boussedra, Lac des Oiseaux, Lac Mellah, Mafragh, Mekhada, Oubeïra, Oued Boukhmira, Oued Seybouse I, Salines, Sidi Achour, Sidi Salem, Tonga, (WN): Fetzara, Garaet Mhamed, Hadj Tahar, Tacha, (G): Bekouche Lakhdar, (AR): Lac de Réghaïa, (OC): Dayet Morcelly, Great Sebkh of Oran, Oum El Ghelez, (EHP): Boulhilet, Jemot, Timerganine, (CHP): Boughzoul's reservoir, (S): Oued Khrouf.
Lesser black-backed gull	<i>Larus fuscus</i>	(EN): Boussedra, Mafragh, Mekhada, Oued Boukhmira, Oued Seybouse I, Salines, Sidi Achour, Sidi Salem, (WN): Fetzara, Garaet Haouas, Garaet Mhamed, (AR): Lac de Réghaïa.
Caspian tern	<i>Sterna caspia</i>	(EN): Lac des Oiseaux, Mafragh.
Lesser crested tern	<i>Sterna bengalensis</i>	(EN): Oued Boukhmira, Salines, Sidi Salem.
Sandwich tern	<i>Sterna sandvicensis</i>	(EN): Lac Mellah, Mafragh, Mekhada, Oued Boukhmira, Salines, Sidi Salem, (WN): Garaet Mhamed.
Common tern	<i>Sterna hirundo</i>	(EN): Salines, islet off El Kala.
Black tern	<i>Chlidonias niger</i>	(EN): Salines, Tonga, (WN): Fetzara, (EHP): Jemot, Timerganine.
White-winged black tern	<i>Chlidonias leucopterus</i>	(WN): Fetzara.

TABLE 4

List of breeding species with their status and likely causes of decline.

[Lista de aves reproductoras con su situación poblacional y las posibles causas de su declive.]

		Increasing	Stable	Declining or threatened	Data deficient
1	<i>Tachybaptus ruficollis</i>		Yes		
2	<i>Podiceps cristatus</i>		Yes		
3	<i>Podiceps nigricollis</i>		Yes		
4	<i>Calonectris diomedea</i>			Introduced mammals	
5	<i>Phalacrocorax aristotelis</i>			Fish depletion?	
6	<i>Botaurus stellaris</i>			Unknown causes	
7	<i>Ixobrychus minutus</i>	Yes			
8	<i>Nycticorax nycticorax</i>	Yes			
9	<i>Ardeola ralloides</i>	Yes			
10	<i>Bubulcus ibis</i>	Yes			
11	<i>Egretta garzetta</i>	Yes			
12	<i>Ardea cinerea</i>	Yes			
13	<i>Ardea purpurea</i>	Yes			
14	<i>Ciconia ciconia</i>	Yes			
15	<i>Plegadis falcinellus</i>	Yes			
16	<i>Phoenicopterus roseus</i>	Yes			
17	<i>Tadorna ferruginea</i>	Yes			
18	<i>Tadorna tadorna</i>	Yes			
19	<i>Anas platyrhynchos</i>		Yes		
20	<i>Marmaronetta angustirostris</i>				Yes
21	<i>Aythya nyroca</i>			Poaching	
22	<i>Oxyura leucocephala</i>			Poaching, other causes?	
23	<i>Circus aeruginosus</i>		Yes		
24	<i>Pandion haliaetus</i>			Persecution	

TABLE 4 (cont.)

	Increasing	Stable	Declining or threatened	Data deficient
25	<i>Falco eleonora</i>		Introduced mammals? Persecution?	
26	<i>Rallus aquaticus</i>			Yes
27	<i>Gallinus chloropus</i>	Yes		
28	<i>Porphyrio porphyrio</i>	Yes		
29	<i>Fulica atra</i>	Yes		
30	<i>Fulica cristata</i>	Yes		
31	<i>Himantopus himantopus</i>	Yes		
32	<i>Recurvirostra avosetta</i>		Yes	
33	<i>Glareola pratincola</i>		Yes	
34	<i>Charadrius dubius</i>			Yes
35	<i>Charadrius alexandrinus</i>		Yes	
36	<i>Larus genei</i>	Yes		
37	<i>Larus audouinii</i>		Competition with <i>L. michahellis</i> ?	
38	<i>Larus michahellis</i>	Yes		
39	<i>Sterna nilotica</i>	Yes		
40	<i>Sterna hirundo</i>		Outlier, only one small colony	
41	<i>Sterna albifrons</i>		Habitat destruction, predation	
42	<i>Chlidonias hybridus</i>		vulnerable, only one colony	

TABLE 5

Temporal changes in the number of breeding wetland species in Algeria with guild renewal rates (RR). [Cambios temporales en la reproducción de aves que crían en humedales de Argelia con las tasas de renovación (RR).]

	Gain	Loss	Unchanged	Net change	RR
> 50 years	6	11	38	-5	18.30%
Last 30 years	4	1	50	3	4.80%

The second, shorter and more recent period, spanning 30 years since Ledant *et al.* (1981), has a lower guild renewal rate of 4.8%, with a net gain of 3 species, including the greater flamingo and the slender-billed gull as new additions to the breeding list (table 5). The Levantine shearwater *Puffinus yelkouan* is the only loss.

This recent trend is supported by substantial changes in the populations of herons and shelducks (table 6): which have greatly increased in numbers, by the establishment of new greater flamingo breeding colonies (Samraoui *et al.*, 2010) and by recolonisation by previously locally extinct species, including the glossy ibis and the red-knobbed coot *Fulica cristata*. In contrast, populations of marine or maritime species such as Cory's shearwater or Eleonora's falcon are dwindling because of predation by introduced

cats and rats and they may require active management (Bayle and Fernández, 1992; Thibault *et al.*, 1997; Martin *et al.*, 2000). The decline of the great bittern *Botaurus stellaris*, now probably on the verge of extinction in Algeria, may stem from a wider regional phenomenon as it is also rare in Tunisia (Isenmann *et al.*, 2005) and possibly no longer breeds in Morocco (Thévenot *et al.*, 2003).

Another subtle change in phenology has occurred over the last two decades, with an increasing number of white storks *Ciconia ciconia* reported wintering on both sides of the Mediterranean (Hernández, 1995; Sánchez *et al.*, 1995; Samraoui, 1998; Samraoui and Houhamdi, 2002). Likewise, an increasing number of great egrets *Ardea alba* and Eurasian spoonbills *Platalea leucorodia* are remaining during the breeding season: although no breeding activity has been observed so

TABLE 6

Changes in the numbers of some Algerian waterbirds. Data for herons and glossy ibis is based on counts in Numidia whereas that of greater flamingo and shelduck comes from the eastern Hauts Plateaux.

[Cambios cuantitativos de algunas aves de áreas húmedas de Argelia. Los datos para garzas y morito común están basados en censos en Numidia, mientras que los del flamenco común y el tarro blanco provienen del este de Hauts Plateaux.]

	2002-2010	Previous counts (1990s)
<i>Nycticorax nycticorax</i>	800-900 (Samraoui Chenafi, 2009)	60-100 (Hafner, 2000)
<i>Ardeola ralloides</i>	1,000-1,200 (Samraoui Chenafi, 2009)	32 (Hafner, 2000)
<i>Bubulcus ibis</i>	> 6,000 (Samraoui Chenafi, 2009)	978 (Hafner, 2000)
<i>Egretta garzetta</i>	500-600 (Samraoui Chenafi, 2009)	80 (Hafner, 2000)
<i>Ardea purpurea</i>	> 1,000 (Nedjah <i>et al.</i> , 2010)	120 (Isenmann and Moali, 2000)
<i>Plegadis falcinellus</i>	300 (This study)	Locally extinct (Bouchecker <i>et al.</i> , 2009)
<i>Phoenicopterus roseus</i>	> 30,000 (Béchet and Samraoui, 2010)	5,000 (Isenmann and Moali, 2000)
<i>Tadorna tadorna</i>	> 28,000 (Boulkhssaïm <i>et al.</i> , 2006)	3,160 (Rose, 1995)

far, the expansion of both species in southern Europe makes it likely that some breeding attempts will occur in future.

Preliminary data from ringing greater flamingos, glossy ibises and yellow-legged gulls indicate clearly that extensive interchanges of these birds occur between Algeria, south-western Europe (Portugal, Spain, France and Italy) and Turkey. Data suggest that numerous immature yellow-legged gulls originating from Algerian colonies winter or linger in Spain during their early years. Greater Flamingos from all the major European colonies breed in Algeria (Hauts Plateaux and Sahara) and Algerian flamingos move extensively between southern Europe and North Africa, lending strong support to the idea that the northern colonies most probably originated from North Africa, whose vast salt lakes are likely to have been the natural home of this halophilic species. Glossy ibises from Spain and Italy have been recorded in Algeria and ibis chicks ringed in Algeria have, in turn, been recorded in Morocco and Portugal, revealing the extent of interchange throughout the western Mediterranean region.

DISCUSSION

Relatively few studies (Ledant *et al.*, 1981; Isenmann and Moali, 2000) have presented comprehensive data on the breeding and wintering wetland birds of Algeria since the seminal work of Heim de Balsac and Mayaud (1962), despite the fact that North Africa harbours important winter quarters and stopover sites for Palearctic-trans-Saharan migrants. The crucial influence of wintering and stopover conditions on waterbird population dynamics is not in question (Ankney *et al.*, 1991; Den Held, 1981; Cavé, 1983; Tamisier and Dehorter, 1999; Gordo and Sanz, 2008). For trans-Saharan migrants such as the barn swallow *Hirundo rustica*, variation in rainfall in North Africa can in-

fluence food availability, migratory performance and survival (Szép and Møller, 2005; Møller, 2008; Turner, 2009). Substantial changes in the status of waterbirds of Algeria have occurred over the last 180 years for which documentation is available. The changes have mirrored every major modification of the Algerian landscape that has affected bird habitats. This has been reflected by the mainly negative guild renewal rate. Important wetlands such as Lake Halloula or Lake Fetzara in the Algerian coastal strip were immediately targeted for land drainage by the newly-settled French colons in the 19th century. Other wetlands, such as Lake Tonga or the Zana marsh, followed as the coastal plains and other wetlands in the Hauts Plateaux were brought into more intensive use. The independence of Algeria did not bring much relief to wetland birds as human encroachment due to demographic pressures and the need for freshwater increased. However, over the last 30 years formal protection of many wetlands across Algeria has been accompanied by a more enlightened perception of wetlands and greater conservation efforts. The international conservation effort has borne fruit and this is reflected by the mainly positive guild renewal rate over the last 30 years.

On the whole, wetland birds are doing well across their entire ranges: in a study carried out in Burgundy, France, Frochot *et al.* (2008) found out, that over a period of a century, local waterbirds were on the increase with a guild renewal rate of 23.1%. This result matches others elsewhere in France (Barbraud *et al.*, 2004) and in England (Fuller and Ausden, 2008) indicating that, in contrast to farmland birds which have been declining over recent decades (Newton, 2004), waterbirds have indeed made a remarkable recovery and have greatly benefited from less persecution and the multiplicity of man-made waterbodies. It is however expected that some breeding and migrant species will be lost as a result of climate change: long-

distance migrants have already been shown to display changes in their range sizes and location bringing substantial modification to regional pools (Barbet-Massin *et al.*, 2009).

Species on the increase include herons and egrets that may have benefited from less persecution and the widespread spread of exotic fish such as the mosquito fish *Gambusia holbrockii* and the common carp *Cyprinus carpio*. A second group exhibiting population increase includes commensal species (white stork, cattle egret and yellow-legged gull) that have easy access to food on open-air refuse dumps. A possible marker of climate change is suggested by a third group made up of species that do well in the arid regions of North Africa (greater flamingo, common shelduck, ruddy shelduck, black-winged stilt, pied avocet, slender-billed gull and gull-billed tern) and which have increased considerably over the last decade. In support of this hypothesis, past and present influxes of ruddy shelducks into northwest Europe have been linked to drought in southern Europe and North Africa (Holloway, 1999). This poleward movement driven by climate changes correlates with patterns exhibited by insects, with desert species recently landing on Europe's shores (Chelmick and Pickess, 2008; Boudot *et al.*, 2009).

Results from both our own ringing schemes and those of others in the region confirm that extensive interchange is taking place between many waterbird populations across the Mediterranean (Balkiz *et al.*, 2007; Samraoui *et al.*, 2010). Conservation efforts need to take into account the spatial scale of movements of highly dispersive waterbirds and should base their strategies on a sound understanding of the role and interconnectivity of regional wetlands.

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