



Species Composition and Distribution Pattern of Waterbirds in Algerian Central Hauts Plateaux Wetlands

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ABSTRACT

*With the aim to assess waterbirds' diversity, status and distribution in the Central Hauts Plateaux wetlands of Algeria, a survey was conducted along four successive study years in the main sites. This monitoring allowed assessing 52 species, representing 16 families. Anatidae are the most abundant, and represented by 11 species. Boughzoul's reservoir is the highly rich wetland, followed by Chott El Hodna and K'sob reservoir. However, Dayet El Kerfa is the preferred wetland for breeding species. Winter migrants, residents, and migrant species are the dominated status with 43 %, 28 % and 17 %, respectively. While these statuses varied between sites. Overall, the analyzed phenological status of assessed species displays the key role played by these wetlands as wintering grounds, a stopover during migration journeys, and breeding sites for several waterbirds' species. The presence of vulnerable species (*Marmaronetta angustirostris*), and three near threatened other species (*Aythya nyroca*, *Limosa limosa*, *Numenius arquata*) following the IUCN Red List confirms the importance of the Central Hauts Plateaux wetlands for waterbirds conservation.*

Keywords: Wetland, Waterbirds, Ecological Status, Central Hauts Plateaux (CHP).

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Received: 26 November 2017

Accepted: 26 March 2018

1. INTRODUCTION

Wetlands have been usually known as primary resources for human activities, as well as irreplaceable habitats for a rich diversity of flora and fauna, particularly waterbird communities (Weller 1999). Algeria contains a wide variety of wetlands which are important as staging posts and wintering grounds for migrating Palearctic birds (Steavenson et al. 1988; Coulthard 2001).

The Central Hauts Plateaux wetlands of Algeria is known by its habitat diversity (Chott, Reservoir, Daya, Dam...). Many of them are classified as wetland of international importance under the Ramsar Convention and as Important Bird Area (IBA) (Coulthard 2001). By its strategic location in the center of the country, this complex plays a key role in the maintenance of the ecosystem (Samraoui et al. 2008; Ledant et al. 1981). The avifauna of Algeria is moderately well known, according to the former collected data during the past century by many ornithologists (Heim de Balsac et al., 1962; Ledant et al. 1981; Isenmann & Moali 2000). These early works are based on dispatched observations recorded intermittently in a few wetlands. Baseline information on the distribution and abundance of waterbirds is the elementary task of further deeper research and the development of management and conservation strategies (Lancelotti Julio et al. 2009). In North Africa and particularly in Algeria, there are major gaps in knowledge of the birds' status, distribution, seasonal

movements and habitat use, particularly for wetland species (Samraoui et al. 2008). These wetlands are used by a large number of wintering and breeding waterbirds (Jacob et al., 1980; Bensaci et al. 2014). Waterbirds' diversity and distribution of Central Hauts Plateaux wetlands area remain poorly known, where there are few studies carried out in some sites in this region such as Boughzoul reservoir (Jacob et al., 1980), Chott El Hodna (Guergueb et al 2014), Dayet El Kerfa (Bensaci et al 2014).

This contribution aimed to assess the diversity, phenology, and distribution of waterbirds species throughout wetlands of central Hauts plateaus, and determine the opportunities offered by these habitats for the conservation of this biodiversity.

2. MATERIELS AND METHODS

Study area

The Central Hauts Plateaux located in northern Algeria, in an area consisting of mountains, valleys, and plateaus between the Mediterranean Sea and the Sahara Desert, where the landscape is dominated by steppe vegetation.

This huge complex has a semi-arid climate, with an annual mean temperature of 25°C and average annual rainfall less than 400 mm (Figure. 1).

The Central Hauts Plateaux contains more than ten wetlands covering more than 500 000 ha varied between natural and artificial sites, which were developed when the waters converge from the Saharan Atlas Mountains in the South and the Tell Atlas Mountains in the North. Most of these are vast,

shallow salt lakes that have been little studied, and are poorly known.

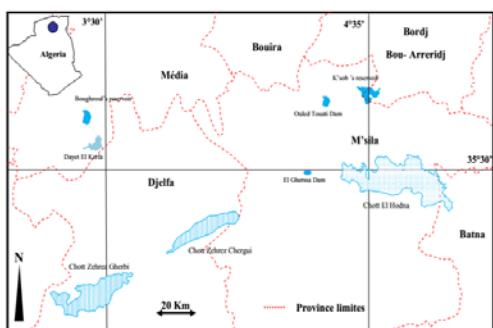


Figure 1: Geographic situation of Central Hauts Plateaux wetlands of Algeria

Table 1. Main characteristics of Central Hauts Plateaux wetlands of Algeria.

Site	Latitude (N)	Longitude (E)	Area (ha)	Water quality	Current Protection status	Main Threats
Chott El Hodna	35°21'.076'	04°32'.513'	362000	salt lake	Ramsar site / IBA	Drought
Chott Zehrez Chergui	34°52'.413'	03°27'.124'	50.985	salt lake	Ramsar site	Drought
Chott Zehrez Gherbi	34°57'.382'	02°48'.838'	52.200	salt lake	Ramsar site	Drought
Boughzoul's reservoir	35°44'.910'	02°46'.622'	1000	Fresh water	Not protected / IBA	Drought pollution
K'sob's reservoir	35°58'5"	04° 42'33"	121	Fresh water	Not protected	Drought
El Gherssa Dam	11°35'4"	31°39'35"	20	Fresh water	Not protected	overgrazing
Dayet El Kerfa	35°37'.191'	02°52'.604'	600	brackish	Not protected	Drought
Ouled Touati Dam	35°51'24"	4°10'.22"	22	Fresh water	Not protected	water pumping

Data acquisition and statistical analysis

The waterbirds surveys were undertaken across eight wetlands, two of them were dry for a long period (Chott Zehrez Chergui and Zehrez Gherbi) during four study years from 2012 to 2016, through many companies of bird counts during different seasons of the years. The census of the waterbirds was done by direct observation using an Optolyth 20x80 telescope by a team of 3 to 2 observers from near the wetland in different observation points, where most of the surface area and the edge were visible, with the aim to identify and count all the present birds (Bibby et al. 1992).

The determination of phenological status based on the period of species occurrence in the site: resident breeder (RB) species present all the year and its nesting is confirmed during the study period; winter migrant (WM) species observed exclusively during the winter season; migrant breeder (MB) migratory species came in summer for breeding; probable breeder (PB) species supposed to be breeding; and visitor passage (VP) species observed occasionally in the site mainly during migration periods.

Faunal type (FT), was determined according to Voous (1960) classification of the biogeographical origin. Trophic status (TC), was distinguished according to their diet categories (Müller, 1997): granivorous (G), carrion-feeder (Cr), carnivorous (Cv), invertebrate feeder (Inv) and polyphagous (Pp).

Protection status (PRS) was determined nationally according to species citations in Algeria legislation (OJAR, 1995), while, international status, followed their citations in various international conventions and treaties: the IUCN Red list (Bailie et al., 2004), the African-Eurasian Waterbird Agreement "AEWA" (AEWA, 2008), the Washington Convention "CITES" (CITES, 1994), and the conventions of Bonn.

3. RESULTS

Specific composition of waterbirds population

A total of 52 waterbird species representing 34 genera and 16 bird families, were recorded in the study wetlands of central Hauts Plateaux (figure 2). The species richness was varied from site to site, where the high value was observed at Boughzoul reservoir with 51 species representing 16 families. However, the low richness was observed at Ouled Touati dam, with only 6 species representing 4 families.

Anatidae family was the best represented with 11 species, followed by Scolopacidae with 9 species, then by Ardeidae with 8 species. Charadriidae, Laridae and Sternidae were represented by 4, 3 and 3 species, respectively. However other families were represented to be low (Table 1)

Boughzoul reservoir is the highly rich wetland in the complex both in species (52) and families (16), followed by Chott El Hodna and K'sob reservoir. However, Ouled Touati dam is the poorest site with only 06 species and 04 families.

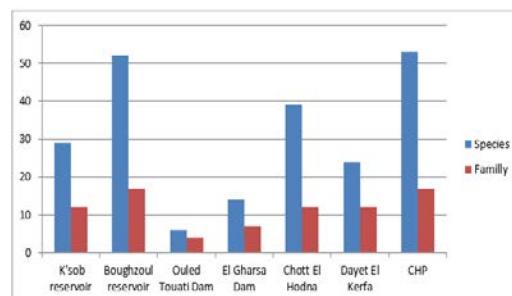


Figure 2: Distribution of families and species in different wetlands

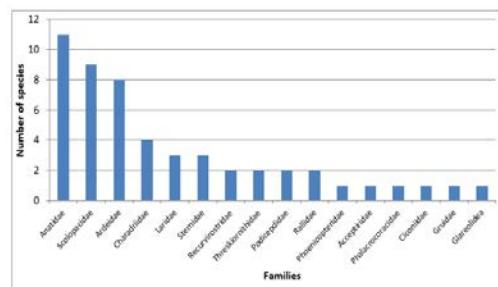


Figure 3: Species richness of different families in the central Hauts Plateaux wetlands of Algeria

Table 2. Systematic list of bird species recorded in the central Hauts Plateaux of Algeria with their ecological and protection status

Species (Scientific name)	Ph	FT	TC	PRS
Anas platyrhynchos	RB	H	Pp	LC,N2,E3,A
Anas clypeata	WM	H	Pp	LC,T3,N2,E3,A
Anas acuta	WM	P	Pp	LC,T3,N2,E3,A
Anas crecca	WM	H	G	LC,T3,N2,E3,A
Anas penelope	WM	P	Pp	LC,T3,N2,L2,E2,A
Anas strepera	WM	H	Pp	LC,N2,E3,A
Marmaronetta augurostris	RB	S	Pp	VU,N1,D,E2,A
Aythya nyroca	WM	TM	Pp	NT,T3,N1,E3,A
Aythia ferina	MP	P	Pp	LC,N2,E3,A
Tadorna ferruginea	RB	PX	Pp	LC,N2,D,E2,A
Tadorna tadorna	RB	S	Pp	LC,N2,D,E2,A
Adrea cenerea	WM	P	P	LC,W,A,R3
Bubulus ibis	RB	IA	Inv	LC,T3,E2,A
Egretta garzetta	WM	OW	Inv	LC,T3,E2,A
Ardea alba	WM	COS	P	LC, D, R2, A
Nycticorax nycticorax	WM	P	Pp	LC,W,A,R2
Ardeola ralloides	WM	P	Pp	LC,W,A,R2
Ardea purpurea	MP	P	Pp	LC,W,A,R2
Tringa nebularia	WM	SB	Inv	LC,N2,E3,A
Tringa erythropus	WM	SB	Inv	LC,N2,R3,W
Calidris minuta	WM	ARC	Inv	LC,N2,E2,A
Gallinago gallinago	WM	H	Inv	LC,N2,E3,A
Calidris alpina	SM	ARC	Inv	LC,N2,E2,A
Tringa totanus	WM	P	Pp	LC,N2,E3,A
Tringa stagnatilis	MP	P	Inv	LC, N2, R3, W
Actitis hypoleucos	MP	P	Pp	LC, N2, R2, W
Limosa limosa	WM	ETH	Inv	NT, N2, R3, W
Numenius arquata	MP	P	Pp	NT,N2,W,R3
Charadrius dubius	WM	P	Inv	LC,N2,E2,A
Charadrius alexandrinus	RB	C	Inv	LC,N2,E2,A
Charadrius hiaticula	MP	ARC	Inv	LC,N2,E2,A
Vanellus vanellus	MP	P	Inv	LC,N2,E3,A
Gallinula chloropus	RB	P	Pp	LC,W,R3
Fulica atra	RB	P	Pp	LC,E3,A
Plegadis falcinellus	WM	AM	Inv	LC,N2,W,A,R2
Platalea leucorodia	WM	OW	Inv	D, LC,C2,N2,W,A,R2
Podiceps cristatus	RB	OW	Inv	LC,W,A,R3
Tachybaptus ruficollis	RB	AM	P	LC, R3, W
Himantopus himantopus	RB	C	Inv	LC,N2,D,E2,A
Recurvirostra avesetta	RB	TM	Inv	LC,N2,D,E2,A
Cincinia ciconia	SMB	P	Inv	LC,N2,D,E2,A
Phalacrocorax carbo	WM	OW	Pp	D, LC,W,A,R3
Phoenicopterus roseus	R	M	Pp	LC,T2,N2,L2,D,E2,A
Larus ridibundus	RB	P	Pp	LC,E3,A
Larus genei	RB	S	Pp	LC,N2,E2,A
Larus cachinnans	WM	(-)	Pp	LC,E3,A
Sterna nilotica	RB	C	Pp	LC,E3
Chlidonias hybrida	MP	AM	Inv	LC, D, R2, W
Chlidonias niger	MP	H	Inv	LC,W,R2
Circus aeruginosus	R	P	C	LC, N2, D, R3
Grus grus	WM	P	Pp	LC,T2,N2,D,E2,A
Glareola pratincola	SMB	IA	Inv	LC,N2,E2,A

Ecological status of assessed waterbirds

Winter migrant birds are the most assessed species (43 %), followed by resident breeder and migrant species with 28 % and 17 %, respectively. Whereas, other statuses (summer migrant, summer migrant breeder and resident species) were represented to be lower (Table 02, Figure 04). The phonological status of inventoried species was varied between

sites, the resident breeder was presented very much in Dayet El Kerfa and Oulad Touati dam. However, Chott El Hodna, Boughzoul reservoir and K'sob reservoir avifauna was dominated by migrant passage species (Figure 05).

A total of 36 (28 %) birds were protected in Algeria, and the most identified species (92.30%: 48 species) were of "Least Concern" according to the IUCN Red List, while three species (*Aythya nyroca*, *Limosa limosa*, *Numenius arquata*) had the "Near Threatened status, and only one species (*Marmaronetta augurostris*) had the "Vulnerable" status (Table 2).

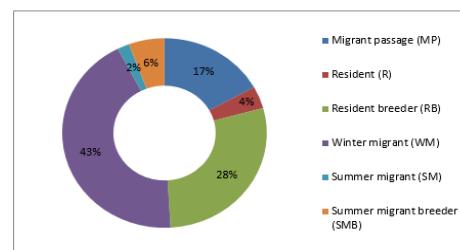


Figure 4: Distribution of waterbirds species following their phonological status in the in the central Hauts Plateaux wetlands of Algeria

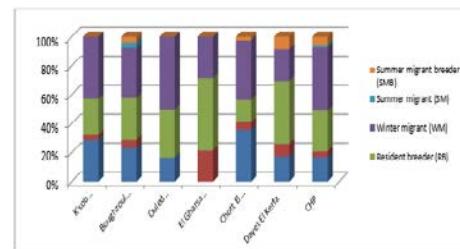


Figure 5: Distribution of waterbirds species following their phenological status in different study sites of CHP

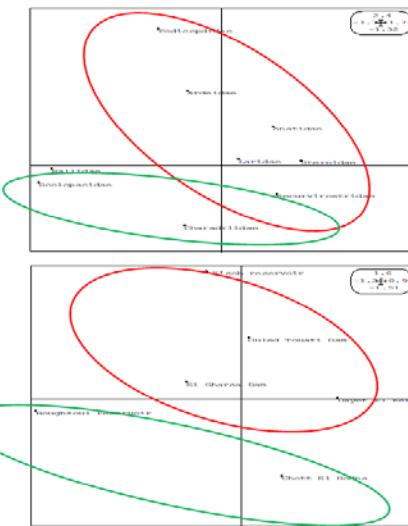


Figure 6: Graphical presentation of factorial correspondence analysis (FCA) showing the distribution of waterbirds families throughout different wetlands of the CHP

Factorial plan 1x2 indicates around 77 % of the total variation (Axe 1: 50.25%; Axe 2: 27.18 %)

4. DISCUSSION AND CONCLUSION

Central Hauts Plateaux wetlands of Algeria by this exceptional biodiversity have been remained unexplored until now. During the study period through four years, around 52 waterbirds species representing 16 families were recorded in the whole complex. Inventoried species in this wetland complex represent a considerable number of waterbirds, 52 from 99 waterbird species were identified in Algeria (Samraoui et al. 2011), and represented 12.8 % of all Algerian birds (406 species cited by Isenmann and Moali, 2000). These species represent different phenologic status: 22 winter migrant species (43%), 15 resident breeder species (28%), 9 migrant passage species (17%), and three (6%) summer migrant breeder species. However, some species had two different statuses, may be due to the existence of two distinct populations that use the site. The family of Anatidae was the most represented in terms of richness and numbers by ten species. Other families are poorly represented, except those of Scolopacidae, and Charadriidae with 09, 08 and 04 species, respectively. For some breeding species, the breeding was confirmed as Ruddy Shelduck *Tadorna ferruginea* in most parts of wetlands. This species was previously observed in winter by Jacob & Jacob (1980) at neighbor site (Lake of Boughzoul) with a small number. Among all recorded species, 36 species are protected under Algerian law pursuant to Decree No. 83-509 of August 20, 1983, and the Order of January 15, 1995 completing the list of non-domestic protected animal species. Marbled Teal *Marmaronetta angustirostris* species of the greatest conservation were listed as Endangered Species in the category (VU) of Red List by the International Union for Conservation of Nature (BirdLife International 2004). The latter species which was present with a relatively high number in three breeding sites (Chott El Hodna, Dayet El Kerfa and Boughzoul reservoir), could explain the favorable conditions for breeding, particularly the security. This species has been cited only in Chott El Hodna (Guergueb et al 2014) as breeder in Boughzoul reservoir, and summer migrant non-breeder in Dayet El Kerfa. The distribution pattern of waterbird species via families has differed between sites, these variations explained by the combination of the variability of offered habitats in this wetland complex and ecological requirements of assessed species. While, Anatidae, Podicipedidae, Ardeidae, and Laridae were represented many in depth and freshwater wetlands. Whereas, Rallidae, Recurvirostridae, Charadriidae, and Scolopacidae are the most abundant in the salt marsh and large wetlands.

5. CONCLUSION

At the end of this study, the Central Hauts Plateaux wetlands seem to play a great role in the wintering and breeding of waterfowl and also serve as a stopover site

for migrant species during their trans-Saharan migration journeys.

Widely recognized and due to the presence of the near threatened species, the site regularly holds a species of global conservation concern: The Marbled Teal *Marmaronetta angustirostris*.

The waterbirds assessment in these wetlands indicates the regional importance of this part of the country, and also supports their classification as Ramsar sites and Important Bird Area "IBA" because of the importance, richness, and abundance of avian species it shelters and hosts (BirdLife International, 2004)

Throughout our surveys, some waterbirds of these wetlands are vulnerable to many threats (human disturbance, pollution, habitats' fragmentation), especially those near cities and had a socio-economic role such as K'sob and Boughzoul reservoirs. However, this internationally important wetland presents a priority for conservation action which needs urgent intervention by local authorities to settle a management plan. These initiatives, if instituted, should provide effective protection to the waterbirds of Central Hauts Plateaux wetlands.

6. ACKNOWLEDGEMENTS

We thank the members of Association Nationale Algérien d'Ornithologie (A.N.A.O), and the PhD students of University of Oum El Bouaghi for their assistance.

REFERENCES

- AEWA (2008) Report on the conservation status of migratory waterbirds in the agreement area, 4th edn. 15–19 September 2008, Antananarivo, Madagascar.
- Baillie JEM, Hilton-Taylor C, Stuart SN (2004) 2004 IUCN Red List of Threatened Species. A Global Species Assessment. IUCN, Gland, Switzerland and Cambridge, UK.
- Bensaci E, Boutera N, Cherief A, Saheb M, Moali A, Houhamdi M (2014) Breeding ecology studies of Collared Pratincoles (*Glareola pratincola*) the Central Hauts Plateaux of Algeria. Wader St Gr Bull 121(1): 43-48.
- Bibby CJ, Burgess N D, Hill DA (1992) Bird census techniques. Academic Press, London.
- BirdLife International (2004) Threatened Birds of the World 2004. CD-ROM. Cambridge, UK.
- CITES (1994) CITES identification guide – birds: guide to the identification of bird species controlled under the Convention on International Trade in Endangered Species of Wild Fauna and Flora. A project of the Canadian Wildlife Service of Environment Canada and Baie-Comeau College.
- Coulthard ND (2001) Algeria. In Fishpool, L. D. C. & Evans, M. I. (eds.) Important Bird Areas in Africa and Associated Islands: Priority Sites for Conservation.

- Newbury: Pisces Publications & Cambridge, UK: BirdLife International.
- 8. Guergueb EY, Bensaci E, Nouidjem Y, Zoubiri A, Kerfouf A, Houhamdi M (2014) Overview of the waterbird diversity of Chott El-Hodna (Algeria). *Bull. Soc. zool. Fr.*, 2014, 139 (1-4): 233-244.
 - 9. Heim de Balsac H, Mayaud N (1962) The birds of Northwest Africa: geographical distribution, ecology, migration, reproduction. The Knight, Paris.
 - 10. Isenmann P, Moali A (2000) Birds of Algeria / Birds of Algeria. Paris: Ornithological Studies Society of France.
 - 11. Jacob JP, Jacob A (1980) New data on the birdlife of Lake Boughzoul (Algeria). *Aves*, 16: 59-82.
 - 12. Lancelotti JL, Pozzi L M, Márquez F, Yorio P, Pascual MA (2009). Waterbird occurrence and abundance in the Strobel Plateau, Patagonia, Argentina. *Hornero*, 24, 13-20.
 - 13. Ledant JP, Jacob JP, Jacob P, Malher F, Ochando B, Roche J (1981). Update of the Algerian avifauna. *The Gerfaut* 71; 295 - 398.
 - 14. Müller, Y. (1997) Birds of the Biosphere Reserve of the Northern Vosges. *Ciconia*, 21, 1-347.
 - 15. OJAR (1995) bylaw of January 17th 1995 complementary of decree N° 83-509 related to non-domestic animal species protected in Algeria. Official Journal of Algerian Republic, January 17, 1995.
 - 16. Samraoui B, Samraoui F (2008) An ornithological survey of Algerian wetlands: Important Bird Areas, Ramsar sites and threatened species. *Waterfowl*, 58, 71-98.
 - 17. Samraoui F, Alfarhan AH, Al-Rasheid KAS, Samraoui B (2011) An appraisal of the status and distribution of waterbirds of Algeria: indicators of global changes? *Ardeola*, 58, 137-163.
 - 18. Steavenson AC, Skinner J, Hollis GF, Smart M (1988) El Kala national park and environs, Algeria. An ecological evaluation. *Environmental conservation* 15: 335-348.
 - 19. Voous KH (1960) Atlas of European birds. Nelson, London.
 - 20. Weller MW (1999) Wetland birds, habitat resources and conservation implications. Cambridge University Press, London.