

COMPOSITION AND STRUCTURE OF WATER BIRDS IN SOME AREAS OF NORTHWESTERN ALGERIA

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Abstract

Wetlands have an inestimable importance in different regions of the world. Algeria is rich in wetlands which are among the most precious resources in terms of biological diversity.

Water birds are particularly attractive and important because of their long-distance migrations and their potential as indicators of the status and value of wetlands. This is how; works on the avifauna are still more and rarer, in Algeria and particularly in the area of Tiaret.

It's, with this in mind, that our study, which relates to the assessment of the biodiversity of birds in the wetlands of Tiaret area and Tissemsilt area, over a period of two years, from 2016 to 2018, and this in order to inventory and determine the distribution of all species of birds, photographed or captured and recognize species of ecological, trophic and phenological interest, located in these regions which remains still virgin.

Keywords: wetlands, biodiversity, avifauna, Tiaret, Tissemsilt.

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I. INTRODUCTION

Wetlands are a reservoir of biodiversity and a source of food for various organisms. These biological functions give wetlands an extraordinary capacity to produce living matter, they are characterized by a significantly higher biological productivity than other environments [1].

Algeria is rich in wetlands, which are among the most precious resources in terms of biological diversity. Today, we know that they play an important role in vital processes, maintaining hydrological cycles and welcoming flora, fish and migratory birds [2].

Waterbirds are particularly attractive and important, because of their long-distance migrations and their potential as indicators of the status and value of wetlands [3].

Algeria, because of its geographical position as a country of the western Palearctic, occupying a privileged place for a large number of species which use these wetlands as wintering areas or as stop-over areas for those wintering further south [4].

For several years, numerous studies have aimed to characterize aquatic environments according to the birds that use them for reproduction, feeding, or during migrations [5]. According to Isenman and Mouali (2000), the first data on the Algerian avifauna were collected from 1839; However the most important work for North Africa in general and Algeria in particular is the work published by Heim de Balsac and Mayaud in 1962 which constitutes a synthesis of the data recorded since the beginning of the inventories of Algerian avifauna, followed quickly by the work of Hetchecopar and Hüe, (1964). In 1981 Ledant, Jacobs, Malher, Ochando and Roche published the first update of the Algerian avifauna which contains 336 species. Isenmane and Moali (2000), will present an exhaustive synthesis of the Algerian avifauna; some ad hoc studies carried out on avifauna; Ghezoule and *al.* (2002), Souttou and *al.* (2004), Ababsa (2005), Farhi et *al.* (2006), without forgetting the ornithological note on the Algerian West of Thiolay and Mustefai published in 2004.

Few studies have been carried out and published in the Tiaret region, with the exception of a few engineering and Master two studies, which have not yet been published, such as: Ferhat and Sahraoui (2012), Ratiat (2014), Belaid (2014), Haddou and Deguedag (2016), Belaid and Dahmani (2016) and Benouadah (2017); concerning the census of the avifauna of wetlands and different environments (forests and steppes), in the area of Tiaret.

It is with this in mind that our study, which relates to the assessment of the biodiversity of birds in the wetlands of the region of Tiaret and Tissemsilt, is part. Our research conducted over a period of two years (2016 to 2018), and this in order to inventory and determine the distribution of all bird species, photographed or captured and recognizing species of ecological, trophic and phenological interest located in these regions.

Thus, the objective of this pioneering study, on the inventory of water birds, from two regions (Tiaret and Tissemsilt), is to:

- Carry out an exhaustive inventory of the avifauna of the two selected dams (Dahmouni dam and Bougara dam);
- Bring out the intra and inter-specific relationships of the listed species;
- Comparison of the specific diversity of the two sites sampled;

2. MATERIAL AND METHODS

2.1. Description of the study sites

Two stations are selected for carrying out the work. The first is located in the wilaya of Tiaret, the dam type (Dahmouni dam). The second is the Bougara's dam in the wilaya of Tissemsilt, the two stations located in the western region of the high plains, are located in the semi-arid bioclimat.

2.2. Dahmouni Dam

The Dahmouni dam is an artificial wetland, it was built in 1987, it is located on Wadis named Nahr Ouassel, a tributary of Oued Cheliff about 8 km north east of the city of Dahmouni and 20 km east de Tiaret, at the following UTM coordinates (Souaikeur, 2016):

X = 369,740,626 m.

Y = 3920467.723 m.

Z = 945,271 m

The area of the Dahmouni dam catchment area is 425Km², 55% of this area has a moderate slope, the rest of the area varies between zero and extreme slope.

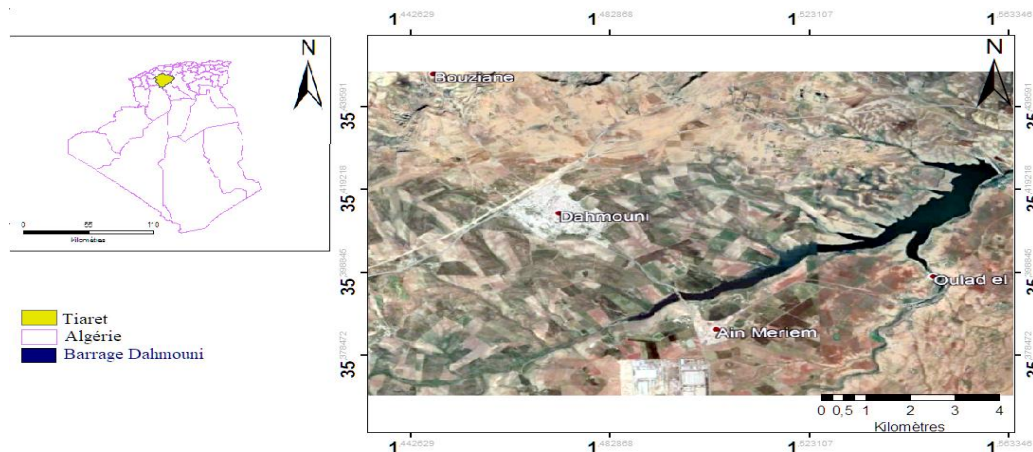


Fig.1. Geographical location of the Dahmouni dam (Google Earth 2018)

2.3. Bougara Dam

Bougara dam is an artificial wetland, it was built in 1989, with a catchment area of 454 km². It is located in the area of the high plains of South Oran 40 km down stream from the Dahmouni dam on the same water course, and about 10 km south of the town of Tissemsilt, but the waters hed of this wetland extends widely in the Wilaya of Tiaret, at the following UTM coordinates: (Souaïkeur, 2016):

X = 403 781.86 m

Y = 3936192.251m

Z = 818,226 m

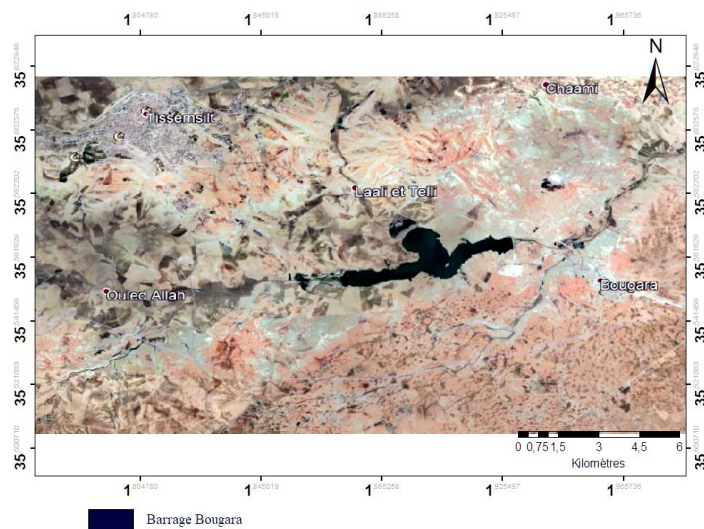


Fig.2. Geographic location of the Bougara dam (Google Earth 2018)

2.4. Methodology

All data were obtained between November 2016 and November 2018 at the rate of two releases per month. In all, we carried out 96 surveys on the two dams (Dahmouni and Bougara), 48 surveys on each. Due to the large area of the dams, we have chosen four study sites for each dam which allow an adequate vision of the birds on the one hand and on the other hand to have a fairly global view on all the dam.

Inventory methods are numerous and varied, depending on the site conditions and the population of birds [5]. These are observed directly in their natural environments using a KONUSPOT 20-60x80 telescope and a pair of binoculars and camera (Nikon coolpix p900). Observations were generally made at the beginning of the morning; it is related to sunrise times to make good observations. We used two methods for counting: the first is the absolute method, we carried out an individual count when the group of birds was close (within 200 m) and less than 200 individuals, in this case the count is said to be exhaustive since we consider that the population is estimated directly in its absolute value.

The second is the relative method: This method is used if the group was very far away or with more than 200 individuals, we carried out quantitative visual estimates of the group. This method has an estimated margin of error of 5 to 10% [6-9].

3. RESULTS AND DISCUSSION

3.1. Study period

The Dahmouni dam and Bougara dam were described from 96 observations, over a period of 02 years, from 2016 to 2018. The inventoried species are, most of them, sedentary and wintering migratory. Some species are visitors, where they make a migratory stop, to finish their passages towards the countries of the Sahel in descending (during the autumn and winter period) or towards Europe in ascending (during the spring and summer period).

The results obtained indicate to us that the two dams sampled are rich and diverse, in terms of the number of species inventoried in these wetlands, presenting favorable conditions, with regard to the permanent presence of water, food availability and the presence of a vegetation composed of *Tamarix gallica* (reproduction and protection zone against anthropogenic threats

and natural predators of this avian fauna).

The study of the diversity of the avifauna of the two wetlands, revealed the existence of 62 species, divided into sedentary species, migratory wintering migrating nests and partial migratory species (rare), the number of species has been described for each of the wetlands studied below.

3.2. Inventory of Dahmouni dam birds

The avian composition of the Dahmouni dam is illustrated in Table 1. A total of 18 families and 57 species have been inventoried in this wetland. The majority of the species are sedentary and the rest are migratory species (we have 15 sedentary species, 22 wintering migrators, 18 nesting and 2 partial migrators).

Table 1: list of birds inventoried at the Dahmouni dam

	Class	Family	Species	Vernacular name
1	Aves	Accipitridés	<i>Circus aeruginosus</i>	Busard des roseaux
2	Aves	Acrocephalidés	<i>Acrocephalus schoenobaenus</i>	Phragmite des joncs
3	Aves		<i>Acrocephalus scirpaceus</i>	Rousserolle effarvate
4	Aves		<i>Acrocephalus arundinaceus</i>	Rousserolle turdoide
5	Aves	Anatidés	<i>Anas strepera</i>	Canard chipeau
6	Aves		<i>Anas platyrhynchos</i>	Canard colvert
7	Aves		<i>Anas Penelope</i>	Canard siffleur
8	Aves		<i>Anas clypeata</i>	Canard souchet
9	Aves		<i>Aythya ferina</i>	Fuligule milouin
10	Aves		<i>Aythya nyroca</i>	Fuligule nyroca

11	Aves		<i>Anas crecca</i>	Sarcelle d'hiver
12	Aves		<i>Marmaronetta angustirostris</i>	Sarcelle marbrée
13	Aves		<i>Tadorna ferruginea</i>	Tadorne casarca
14	Aves		<i>Tadorna tadorna</i>	Tadorne de Belon
15	Aves		<i>Aythya fuligula</i>	Fuligule morillon
16	Aves	Ardéidés	<i>Egretta garzetta</i>	Aigrette garzette
17	Aves		<i>Nycticorax nycticorax</i>	Bihoreau gris
18	Aves		<i>Ardea alba</i>	Grande Aigrette
19	Aves		<i>Ardea cinerea</i>	Héron cendré
20	Aves		<i>Bubulcus ibis</i>	Héron garde-bœuf
21	Aves		<i>Ardea purpurea</i>	Héron pourpré
22	Aves	Charadriidés	<i>Charadrius hiaticula</i>	Grand Gravelot
23	Aves		<i>Charadrius alexandrines</i>	Grevlot à collier intérompu
24	Aves		<i>Charadrius dubius</i>	Petit Gravelot
25	Aves		<i>Vanellus vanellus</i>	Vanneau huppé
26	Aves		<i>Pluvialis apricaria</i>	Pluvier doré
27	Aves	Ciconiidés	<i>Ciconia ciconia</i>	Cigogne blanche
28	Aves	Cisticolidés	<i>Cisticola juncidis</i>	Cisticole des joncs

29	Aves	Glaréolidés	<i>Glareolapratincola</i>	Glariole à collier
30	Aves	Gruidés	<i>Grus grus</i>	Grue cendrée
31	Aves	Laridés	<i>Larus michahellis</i>	Goéland leucophée
32	Aves		<i>Chroicocephalus ridibundus</i>	Mouette rieuse
33	Aves		<i>Gelochelidon nilotica</i>	Sterne hansel
34	Aves	Motacillidés	<i>Motacilla alba</i>	Bergeronnette grise
35	Aves		<i>Motacilla flava</i>	Bergeronnette printanière
36	Aves	Muscicapidés	<i>Luscinia svecica</i>	Gorge bleu à miroir
37	Aves	Phalacrocoracidés	<i>Phalacrocorax carbo</i>	Grand Cormoran
38	Aves	Phoenicoptéridés	<i>Phoenicopterus roseus</i>	Flamant rose
39	Aves	Podicipédidés	<i>Podiceps nigricollis</i>	Grèbe à cou noir
40	Aves		<i>Tachybaptus ruficollis</i>	Grèbe castagneux
41	Aves		<i>Podiceps cristatus</i>	Grèbe huppé
42	Aves	Rallidés	<i>Fulica atra</i>	Foulque macroule
43	Aves		<i>Gallinula chloropus</i>	Gallinule poule-d'eau
44	Aves		<i>Rallus aquaticus</i>	Rale d'eau
45	Aves	Récurvirostridés	<i>Himantopus himantopus</i>	Echasse blanche
46	Aves	Scolopacidés	<i>Calidris ferruginea</i>	Bécasseau cocorli

47	Aves		<i>Calidris minuta</i>	Becasseau minute
48	Aves		<i>Calidris alpina</i>	Bécasseau variable
49	Aves		<i>Gallinago gallinago</i>	Bécassine des marais
50	Aves		<i>Tringa nebularia</i>	Chevalier aboyeur
51	Aves		<i>Tringa erythropus</i>	Chevalier arlequin
52	Aves		<i>Tringa ochropus</i>	Chevalier culblanc
53	Aves		<i>Actitis hypoleucos</i>	Chevalier guignette
54	Aves		<i>Tringa glareola</i>	Chevalier sylvain
55	Aves		<i>Philomachus pugnax</i>	Combattant varié
56	Aves		<i>Tringa tetanus</i>	Chevalier gambette
57	Aves		<i>Tringa stagnatilis</i>	Chevalier stagnatile

According to the table above, the bird composition of Dahmouni dam, summarizes more than 57 species distributed over 18 families.

The most abundant families, with the highest number of species are the Scolopacidae with 12 species, followed by the Anatidae family with 11 species; then comes the moderately represented families, the Ardéidae (6 species), the Charadriidae (5 species), the Rallidae (3 species), the Laridae (3 species), the Podicipedidae (3 species), the Acrocephalidae (3 species) and the Motacillidae (2 species); lastly the families Accipitridae, Ciconiidae, Cisticolidated, Glaréolidated, Gruidae, Muscicapidae, Phalacrocoracidae, Phoenicoptéridae and Recurvirostridae, with one species each one.

3.2.1. Sedentary species

The sedentary species, which are found throughout the year, and generally they nest in the

place where they live, are 15 in number in the Dahmouni dam wetland, illustrated in the table below.

Table 2: Sedentary species at the Dahmouni dam

	Species	Vernacular name
1	<i>Circus aeruginosus</i>	Busard des roseaux
2	<i>Acrocephalus schoenobaenus</i>	Phragmite des joncs
3	<i>Anas platyrhynchos</i>	Canard colvert
4	<i>Anas clypeata</i>	Canard souchet
5	<i>Ardea cinerea</i>	Héron cendré
6	<i>Bubulcus ibis</i>	Héron garde-bœuf
7	<i>Cisticola juncidis</i>	Cisticole des joncs
8	<i>Larus michahellis</i>	Goéland leucophée
9	<i>Podiceps nigricollis</i>	Grèbe à cou noir
10	<i>Tachybaptus ruficollis</i>	Grèbe castagneux
11	<i>Podiceps cristatus</i>	Grèbe huppé
12	<i>Fulica atra</i>	Foulque macroule
13	<i>Gallinula chloropus</i>	Gallinule poule-d'eau
14	<i>Rallus aquaticus</i>	Rale d'eau
15	<i>Actitis hypoleucos</i>	Chevalier guignette

3.2.2. Wintering migratory species

These are the species that spend the bad season (winter), in Africa (from North Africa to the Sahel countries), with the winter is very difficult in Europe and Asia. There are 22 of them mentioned in Table 3.

Table 3: wintering migratory species at the Dahmouni dam

	Species	Vernacular name
1	<i>Anas strepera</i>	Canard chipeau
2	<i>Anas penelope</i>	Canard siffleur
3	<i>Aythya ferina</i>	Fuligule milouin

4	<i>Aythya nyroca</i>	Fuligule nyroca
5	<i>Anas crecca</i>	Sarcelle d'hiver
6	<i>Marmaronetta angustirostris</i>	Sarcelle marbrée
7	<i>Aythya fuligula</i>	Fuligule morillon
8	<i>Ardea purpurea</i>	Héron pourpré
9	<i>Vanellus vanellus</i>	Vanneau huppé
10	<i>Pluvialis apricaria</i>	Pluvier doré
11	<i>Glareola pratincola</i>	Glariolle à collier
12	<i>Chroicocephalus ridibundus</i>	Mouette rieuse
13	<i>Gelochelidon nilotica</i>	Sterne hansel
14	<i>Motacilla alba</i>	Bergeronnette grise
15	<i>Luscinia svecica</i>	Gorge bleu à miroire
16	<i>Phalacrocorax carbo</i>	Grand Cormoran
17	<i>Phoenicopterus roseus</i>	Flamant rose
18	<i>Gallinago gallinago</i>	Bécassine des marais
19	<i>Tringa nebularia</i>	Chevalier aboyeur
20	<i>Tringa erythropus</i>	Chevalier arlequin
21	<i>Tringa glareola</i>	Chevalier sylvain
22	<i>Tringa totanus</i>	Chevalier gambette

3.2.3. Migratory breeding species

The migratory species nesting in this wetland, following the observation of courtship displays, nests and juveniles during our field trips, are 18 species. They generally come up from the Sahel and Sahara countries, to nest there in the tributary wadis of the Dahmouni dam, in riparian vegetation, bordering the permanent wadis or in the agricultural lands surrounding the dam (see table 4).

Table 4: Migratory species nesting at the Dahmouni dam

	Species	Vernacular name
1	<i>Acrocephalus scirpaceus</i>	Rousserolle effarvate

2	<i>Acrocephalus arundinaceus</i>	Rousserolle turdoide
3	<i>Tadorna ferruginea</i>	Tadorne casarca
4	<i>Tadorna tadorna</i>	Tadorne de Belon
5	<i>Egretta garzetta</i>	Aigrette garzette
6	<i>Nycticorax nycticorax</i>	Bihoreau gris
7	<i>Ardea alba</i>	Grande Aigrette
8	<i>Charadrius hiaticula</i>	Grand Gravelot
9	<i>Charadrius alexandrinus</i>	Grevlot à collier interrompu
10	<i>Charadrius dubius</i>	Petit Gravelot
11	<i>Ciconia ciconia</i>	Cigogne blanche
12	<i>Motacilla flava</i>	Bergeronnette printanière
13	<i>Himantopus himantopus</i>	Echasse blanche
14	<i>Calidris ferruginea</i>	Bécasseau cocorli
15	<i>Calidris minuta</i>	Becasseau minute
16	<i>Calidris alpina</i>	Bécasseau variable
17	<i>Tringa ochropus</i>	Chevalier culblanc
18	<i>Philomachus pugnax</i>	Combattant varié

3.2.4. Species with partial migration

Two the birds inventoried (see Table 5), are the occasional species in this area, we sometimes meet them during migratory halts, which they spend only a few days in order to obtain energy and food to complete their migration.

Table 5: migratory (partial) species at the Dahmouni dam

	Species	Vernacular name
1	<i>Grus grus</i>	Grue cendrée
2	<i>Tringa stagnatilis</i>	Chevalier stagnatile

3.3. Bougara dam bird inventory

The list of species inventoried in Bougara dam is mentioned in Table 6. We were able to count 17 families and 50 species in this wetland.

Table 6: list of birds inventoried at the Bougara dam

	Class	Family	Species	Vernacular name	
1	Aves	Accipitridés	<i>Circus aeruginosus</i>	busard des roseaux	
2	Aves	Acrocephalidés	<i>Acrocephalus scirpaceus</i>	Rousserolle effarvate	
3	Aves	Anatidés	<i>Oxyura leucocephala</i>	Erismature à tête blanche	
4	Aves		<i>Anas strepera</i>	Canard chapeau	
5	Aves		<i>Anas platyrhynchos</i>	Canard colvert	
6	Aves		<i>Anas penelope</i>	Canard siffleur	
7	Aves		<i>Anas clypeata</i>	Canard souchet	
8	Aves		<i>Aythya ferina</i>	Fuligule milouin	
9	Aves		<i>Aythya nyroca</i>	Fuligule nyroca	
10	Aves		<i>Anas crecca</i>	Sarcelle d'hiver	
11	Aves		<i>Tadorna ferruginea</i>	Tadorne casarca	
12	Aves		<i>Tadorna tadorna</i>	Tadorne de Belon	
13	Aves		<i>Anas querquedula</i>	sarcelle d'été	
14	Aves		<i>Marmaronetta angustirostris</i>	sarcelle marbrée	
15	Aves		Ardéidés	<i>Egretta garzetta</i>	Aigrette garzette
16	Aves			<i>Ardea cinerea</i>	Héron cendré
17	Aves	<i>Bubulcus ibis</i>		héron garde bœuf	
18	Aves	<i>Ardea alba</i>		grande aigrette	
19	Aves	<i>Nycticorax nycticorax</i>		Bihoreau gris	
20	Aves	Charadriidés		<i>Charadrius hiaticula</i>	Grand Gravelot
21	Aves			<i>Charadrius alexandrinus</i>	Gravelot à collier interrompu
22	Aves		<i>Charadrius dubius</i>	Petit Gravelot	
23	Aves		<i>Vanellus vanellus</i>	Vanneau huppé	
24	Aves		<i>Charadrius morinellus</i>	Pluvier guignard	
25	Aves		Ciconiidés	<i>Ciconia ciconia</i>	Cigogne blanche
26	Aves	Glaréolidés	<i>Glareola pratincola</i>	Glariolle à collier	

27	Aves	Laridés	<i>Larus michahellis</i>	Goéland leucopée
28	Aves		<i>Chroicocephalus ridibundus</i>	Mouette rieuse
29	Aves		<i>Gelochelidon nilotica</i>	Sterne Hansel
30	Aves	Motacillidés	<i>Motacilla alba</i>	Bergeronnette grise
31	Aves		<i>Motacilla flava</i>	Bergeronnette printanière
32	Aves	Muscicapidés	<i>Luscinia svecica</i>	gorge bleu à miroir
33	Aves	Phalacrocoracidés	<i>Phalacrocorax arbo</i>	Grand Cormoran
34	Aves	Phoenicoptéridés	<i>Phoenicopterus roseus</i>	Flamant rose
35	Aves	Podicipédidés	<i>Podiceps nigricollis</i>	Grèbe à cou noir
36	Aves		<i>Tachybaptus ruficollis</i>	Grèbe castagneux
37	Aves		<i>Podiceps cristatus</i>	Grèbe huppé
38	Aves	Rallidés	<i>Fulica atra</i>	Foulque macroule
39	Aves		<i>Gallinula chloropus</i>	Gallinule poule-d'eau
40	Aves		<i>Rallus aquaticus</i>	Rale d'eau
41	Aves	Récurvirostridés	<i>Himantopus himantopus</i>	Échasse blanche
42	Aves	Scolopacidés	<i>Calidris minuta</i>	Bécasseau minute
43	Aves		<i>Tringa nebularia</i>	Chevalier aboyeur
44	Aves		<i>Tringa ochropus</i>	Chevalier culblanc
45	Aves		<i>Actitis hypoleucos</i>	Chevalier guignette
46	Aves		<i>Tringa glareola</i>	Chevalier sylvain
47	Aves		<i>Gallinago gallinago</i>	bécassine des marais
48	Aves		<i>Calidris alpina</i>	bécasseau variable
49	Aves		Threskiornithidés	<i>Plegadis falcinellus</i>
50	Aves	<i>Platalea leucorodia</i>		Spatule blanche

The most represented family in this dam is that of the Anatidae with 12 species in total, followed by the moderately represented families the Scolopacidae, the Ardeidae and the Charadriidae with respectively 7, 5, 5 species; Laridae, Podicipedidae and Rallidae with 3 species each one; Motacillidae and Threskiornithidae are only represented by 2 species; the

least represented families are those of Accipitridae, Acrocephalidae, Ciconiidae, Glaréolidés, Muscicapidae, Phalacrocoracidae, Phoenicoptéridae and Recurvirostridae with one specie each one of them.

3.3.1. Sedentary species

There are approximately 14 sedentary species in the Bougara dam wetland, illustrated in the table below. These species, we meet them throughout the year, similarly they are nesting, with the exception of the Spoonbill (*Platalea leucorodia*), which we have not been able, for the moment, to prove its nesting in this region.

Table 7: sedentary species at the Bougara dam

	<i>Species</i>	Vernacular name
1	<i>Circus aeruginosus</i>	busard des roseaux
2	<i>Anas platyrhynchos</i>	Canard colvert
3	<i>Anas clypeata</i>	Canard souchet
4	<i>Ardea cinerea</i>	Héron cendré
5	<i>Bubulcus ibis</i>	héron garde bœuf
6	<i>Larus michahellis</i>	Goéland leucophée
7	<i>Podiceps nigricollis</i>	Grèbe à cou noir
8	<i>Tachybaptus ruficollis</i>	Grèbe castagneux
9	<i>Podiceps cristatus</i>	Grèbe huppé
10	<i>Fulica atra</i>	Foulque macroule
11	<i>Gallinula chloropus</i>	Gallinule poule-d'eau
12	<i>Rallus aquaticus</i>	Rale d'eau
13	<i>Tringa ochropus</i>	Chevalier culblanc
14	<i>Platalea leucorodia</i>	Spatule blanche

3.3.2. Wintering migratory species

There are 20 species in Table 3. These species spend the bad season (winter, very severe in Europe and Asia), in this wetland, where they are encountered throughout the fall and winter.

Table 8: wintering migratory species at the Bougara dam.

	<i>Species</i>	Vernacular name
1	<i>Oxyura leucocephala</i>	Erismature à tête blanche
2	<i>Anas strepera</i>	Canard chipeau
3	<i>Anas penelope</i>	Canard siffleur
4	<i>Aythya ferina</i>	Fuligule milouin
5	<i>Aythya nyroca</i>	Fuligule nyroca
6	<i>Anas crecca</i>	Sarcelle d'hiver
7	<i>Anas querquedula</i>	sarcelle d'été
8	<i>Marmaronetta angustirostris</i>	sarcelle marbrée
9	<i>Vanellus vanellus</i>	Vanneau huppé
10	<i>Charadrius morinellus</i>	Pluvier guignard
11	<i>Chroicocephalus ridibundus</i>	Mouette rieuse
12	<i>Gelochelidon nilotica</i>	Sterne hansel
13	<i>Motacilla alba</i>	Bergeronnette grise
14	<i>Luscinia svecica</i>	gorge bleu à miroir
15	<i>Phalacrocorax carbo</i>	Grand Cormoran
16	<i>Phoenicopterus roseus</i>	Flamant rose
17	<i>Tringa nebularia</i>	Chevalier aboyeur
18	<i>Tringa glareola</i>	Chevalier sylvain
19	<i>Gallinago gallinago</i>	bécassine des marais
20	<i>Plegadis falcinellus</i>	Ibis falcinelle

3.3.3. Migratory breeding species

There are 15 migrating nesting species in this wetland (Table 9), which nest in this region, offering favorable conditions (food availability, the semi-aquatic vegetation and the cereal land bordering this dam, present better conditions for the construction of nests). We were able to observe court ship displays, nests and juveniles during our field trip.

Table 9: migratory species nesting at the Bougara dam.

	<i>Species</i>	Vernacular name
1	<i>Acrocephalus scirpaceus</i>	Rousserolle effarvate
2	<i>Tadorna ferruginea</i>	Tadorne casarca
3	<i>Tadorna tadorna</i>	Tadorne de Belon
4	<i>Egretta garzetta</i>	Aigrette garzette
5	<i>Ardea alba</i>	Grande Aigrette
6	<i>Nycticorax nycticorax</i>	Bihoreau gris
7	<i>Charadrius hiaticula</i>	Grand Gravelot
8	<i>Charadrius alexandrinus</i>	Gravelot à collier interrompu
9	<i>Charadrius dubius</i>	Petit Gravelot
10	<i>Ciconia ciconia</i>	Cigogne blanche
11	<i>Motacilla flava</i>	Bergeronnette printanière
12	<i>Himantopus himantopus</i>	Échasse blanche
13	<i>Calidris minuta</i>	Bécasseau minute
14	<i>Actitis hypoleucos</i>	Chevalier guignette
15	<i>Calidris alpina</i>	bécasseau variable

3.3.4. Species with partial migration

Only one species, the Collared Glariola (*Glareola pratincola*), presents a partial migration, of a few days, during the summer period, it's the rarely encountered species in this area.

4. DISCUSSION

Through this study, carried out over a period of two years, in two dams, located in the northwest of Algeria, namely, Dahmouni dam and Bougara dam; of which several trips were made throughout the year, 2 trips per week for each site; we were able to establish a list of migratory avian species that frequent these wetlands, essential for their survival but also as stop over areas, for those who use it, during the winter and summer periods. [10, 11, 12]

A total of 62 species have been identified, distributed as follows: 57 in Dahmouni dam and 51 in Bougara dam; with several species that repeat in both areas.

In terms of specific diversity, the two wetlands can be classified in the Ramsar wetlands list,

given the number of rare species that benefit from national and international protection; who frequent them but also certain species of them nest in these favorable environments, including the vegetation (composed of *Tamarix gallica* and the reeds which border these dams) [13], thus they offer a shelter and a refuge against the threats linked to the destruction of this remarkable fauna (anthropogenic actions and natural predators); but also in terms of the food availability offered by these two wetlands, following the gray water piping systems which flow over the two dams, offering a multitude of vertebrate species and vegetation composed of algae, which these species use them for their food. [14]

Dahmouni dam, covering a large area of permanent water, supplied by Touil Wadis and also the household waste water weir in the town of Tiaret and neighboring municipalities, offering food availability, especially for freshwater fish of dams. Dahmouni dam is characterized by significant bird diversity; as well as its geographical situation, in the high lands, at the limit of the steppe region, this area offers favorable conditions for migratory stops to many species. . [15]

There are approximately 57 species that frequent this dam, with approximately 15 sedentary, 22 wintering migratory species and 18 nesting migratory species and 02 species which exhibit partial migration.

Sedentary species, composed by *Circus aeruginosus*, *Acrocephalus schoenobaenus*, *Anas platyrhynchos*, *Anas clypeata*, *Ardea cinerea*, *Bubulcus ibis*, *Cisticola juncidis*, *Larus michahellis*, *Podiceps nigricollis*, *Tachybaptus ruficollis* and *Podiceps usus*. All the species reported at the Dahmouni dam were cited in the bibliography, according to Heim de Balsac (1962), Etcheopart and Hue (1964) and Isenmann and Moali (2000). While most of these species are common species (which do not need protection by the law), there are two species present in the IUCN red list but also they benefit from legal protection in Algeria, according to the official journal of the Algerian republic, relating to protected non-domestic animal species (corresponding to June 10, 2012); these are *Rallus aquaticus* and *Circus aeruginosus*.

For the wintering migratory species of Dahmouni dam, there are about 22 species, including *Anas strepera*, *Anas penelope*, *Aythya ferina*, *Aythya nyroca*, *Anas crecca*, *Marmaronetta angustirostris*, *Aythya fuligula*, *Ardea purpurea*, *Vanellus vanellus*, *Pluvialis apricaria*, *Glare*

ridibundus, *Gelochelidon nilotica*, *Motacilla alba*, *Luscinia svecica*, *Phalacrocorax carbo*, *Phoenicopterus roseus*, *Gallinago gallinago*, *Tringa erythropus*, *Tringa glareola*, *Tringa totanus* and *Tringa nebularia*. Of which 07 species benefit from national and international legal protection, we talk about *Aythya ferina*, *Aythya nyroca*, *Marmaronetta angustirostris*, *Aythya fuligula*, *Ardea purpurea*, *Phoenicopterus roseus* and *Phalacrocorax carbo*. [16]

All migratory wintering species at the Dahmouni dam have also been cited in the bibliography, for which no new mention has been added, for the region of Tiaret and Dahmouni dam.

For migratory species nesting in these wetlands, with 18 species, all cited in the bibliography also, we find species protected by national and international law, with 08 species in total (*Tadorna ferruginea*, *Tadorna tadorna*, *Egretta garzetta*, *Ardea alba*, *Charadrius hiaticula*, *Ciconia ciconia*, *Himantopus himantopus* and *Tringa ochropus*). While the rest of the species, with 10 species are not protected, either nationally or internationally, these are *Acrocephalus scirpaceus*, *Acrocephalus arundinaceus*, *Nycticorax nycticorax*, *Charadrius alexandrinus*, *Charadrius dubius*, *Motacilla flava*, *Calidris ferruginea*, *Calidris minuta*, *Calidris alpina* and *Philomachus pugnax*.

Lastly, for this wetland, the species which exhibit partial migration, with only two species, *Grus grus* and *Tringa stagnatilis*. Including that *Grus grus*, benefits from legal protection with the Algerian law [17].

With all this avian diversity, and given the number of rare and protected species, we see that Dahmouni Dam, is a favorable place for the development and proliferation of remarkable fauna, although already cited in bibliography, but still remains news for this area, being virgin, regarding the work related to this category of animals [18].

Bougara dam With its geographical position, being closer to the Dahmouni dam (about less than 20 kilometers as the crow flies), covering a large area of permanent water and the domestic waste water spillway of the town of Tissemsilt and neighboring municipalities, offering a satisfactory food availability; Bougara dam also has large vegetation based on *Tamarix gallica* and reeds, offering refuge to the animal species that frequent it; with these characteristics, this wetland requires exceptional bird diversity. Bougara dam have approximately 51 avian species, divided into 17 families [19].

All the species reported in this wetland, already cited in the bibliography, with the exception of *Platalea leucorodia* and *Oxyura leucocephala*, which are new for the Tissemsilt and Tiaret region and especially the Bougara dam. The two aforementioned species may have encountered it all year round, with the possibility of nesting in this wetland. But the evidence of this nesting remains to be confirmed.

For the sedentary birds of Bougara dam, there are about 14 species. There are 04 species which benefit from legal protection, according to Algerian law, we speak about *Circus aeruginosus*, *Rallus aquaticus*, *Tringa ochropus* and *Platalea leucorodia*. The rest of the species, consisting of *Anas platyrhynchos*, *Anas clypeata*, *Ardea cinerea*, *Bubulcus ibis*, *Larus michahellis*, *Podiceps nigricollis*, *Tachybaptus ruficollis*, *Podiceps cristatus*, *Fulica atra* and *Gallinula chloropus*, are not protected. For migratory birds wintering in this dam, 20 species have been reported; with *Oxyura leucocephala*, *Aythya aferina*, *Aythya nyroca*, *Anas querquedula*, *Marmaronetta angustirostris*, *Gelochelidon nilotica*, *Phalacrocorax carbo*, *Phoenicopterus roseus* and *Plegadis falcinellus*, as rare species and listed in the red list of species threatened by Algerian law. While *Anas strepera*, *Anas penelope*, *Anas crecca*, *Vanellus vanellus*, *Charadrius morinellus*, *Chroicocephalus sridibundus*, *Motacilla alba*, *Luscinia svecica*, *Tringa nebularia*, *Tringa glareola* and *Gallinago gallinago*, are not classified as endangered species, and do not benefit protection according to Algerian law [20].

The migrating nesters, in this humid area of Western Algeria, are represented by only 15 species, with 08 species protected by law (*Tadorna ferruginea*, *Tadorna tadorna*, *Egretta garzetta*, *Ardea alba*, *Nycticorax nycticorax*, *Charadrius hiaticula*, *Ciconia ciconia* and *Himantopus himantopus*). The rest, made up of 07 species, do not benefit from protection according to Algerian regulations, linked to the protection of non-domestic animal species, represented by *Acrocephalus scirpaceus*, *Charadrius alexandrinus*, *Charadrius dubius*, *Motacilla flava*, *Calidris minuta*, *Actitis hypoleucos* and *Calidris alpina* [21].

Only one species (*Glareola pratincola*), presents a partial migration, of a few days, during the summer period, it is encountered rarely in this area. It is recalled that all of the Bougara dam avian fauna, already cited in the bibliography, apart from two species, which are considered new for the region (*Platalea leucorodia* and *Oxyura leucocephala*).

Comparison between the two wetlands show the Following our field trips and after the enumeration and identification of water birds, we were able to notice that some species are present only in one of the two wetlands.

In the case of the Dahmouni dam, the species encountered only at this site are 12 in number, *Acrocephalus schoenobaenus*, *Acrocephalus arundinaceus*, *Aythya fuligula*, *Ardea purpurea*, *Pluvialis apricaria*, *Cisticola juncidis*, *Grus grus*, *Calidris ferruginea*, *Tringa erythropus*, *Philomachus pugnax*, *Tringa totanus* and *Tringa stagnatilis*; because of the presence of a wadi with vegetation suitable for nesting or a refuge for some species (Reeds and *Nerium oleander*) but also the agricultural land that borders this wetlands[22,23].

While for the Bougara dam, the species encountered and which are absent from the Dahmouni dam are 05, *Oxyura leucocephala*, *Anas querquedula*, *Charadrius morinellus*, *Plegadis falcinellus* and *Platalea leucorodia*, due to the presence of *Tamarix gallica* and reeds, which border almost all the banks of this site; that most of the species take refuge indoors[18,19-24].

4. CONCLUSION

The inventory of aquatic avifauna carried out at the level of the two study stations (Dahmouni dam and Bougara dam) shows the presence of a significant diversity of fauna.

We were able to produce a list of approximately 62 species, namely, migratory species (wintering and summering), sedentary and partial migratory. Some species are visitors, where they make a migratory stop to finish their passages towards the countries of the Sahel in descending or towards Europe in ascending. This diversity reflects the characteristics of the environment favorable to these species, which depends in particular on the existence of the diversity of aquatic habitats (*Tamarix gallica* and reeds) and food resources.

The two study sites play an important role for many avian populations. During the study period, they welcomed around 57 bird species, divided into 18 families for the Dahmouni dam, among the inventoried species; migrant wintering with 22 species followed by migrating nesting with 18 species then sedentary (15 species), lastly species with partial migration, only two species. However, the aquatic avifauna in the second study area (Bougara dam) has 50

species distributed over 17 families, including 20 wintering migratory species, nesting and sedentary species with 15.14 species respectively, one species for partial migrants.

Several species protected by national legislation have been identified, there are 21 protected species, while internationally 04 species in critical position in the IUCN red list (03 vulnerable species and 01 near threatened),

In order to effectively conserve nature, it is necessary to identify the most important places for biodiversity, those most deserving of action for conservation. Most of our knowledge of the current state of the world's bird species - and more generally, of biodiversity - comes from the International Union for Conservation of Nature (IUCN) and Red List of Threatened Species. (BirdLife International).

Other more in-depth surveys will be launched, especially in the Tissemilt and Tiaret areas, in order to obtain valuable information on the distribution of avifauna and the ornithological importance (nationally and internationally) of the wetlands of western Algeria.

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