International Journal of Sciences: Basic and Applied Research (IJSBAR)

ISSN 2307-4531
(Print & Online)

http://gssrr.org/index.php?journal=JournalOfBasicAndApplied

Physico-Chemical Characteristics of water and Ornithological Assessment of Lake Telamine (Algeria)

Belguermi Ahmed[a]*, Belhaouari Benkhedda[b], Boudaoud Karim[c], Boutiba Zitouni[d]

[a,b,c,d] *Department of Biology, Faculty of Sciences, Oran university , BP 1524 El M'naouer, 31000, oran Algeria.*

[a,b] *Department of Biology, Faculty of Sciences,Chlef university , Hay Salem,* National Highway No. 19,*02000 Chlef, Algéria*

[a]*Email: ahmed.belguermi@gmail.com*

[b]*Email: belhaouaribio@gmail.com*

[c]*Email: boudaoudkarim653@yahoo.fr*

[d]*Email: zitouniboutiba@yahoo.fr*

Abstract

Our study aims is to highlight the importance of lake Telamine using two parameters : the ornithological assessment for estimate avian biodiversity and the evaluation of the water quality. First, we made censuses from December 2013 to May 2014. The census data revealed the presence of 30 bird species including one near-threatened species; ferruginous duck (Aythya nyroca) and threatened species; marbled duck (Marmaronetta angustirostris). In the second time we made study of the physical and chemical quality of the water, the organic pollution index (OPI) was used to evaluate the water quality and reveal that lake Telamine is characterized by a medium level of organic pollution but the level of BOD5 and the Orthophosphate still higher, This may be due to the presence of human activities around the lake and landfill in the middle of the lake.

Keywords: Wetland, index OPI**,** water quality**,** Lake Télamine, ornithological biodiversity.

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* Corresponding author.
E-mail address: ahmed.belguermi@gmail.com.

1. Introduction

The wetland ecosystems are characterized by exceptional biodiversity. They represent unique habitats for a number of species of bird and fish [4] .Wetlands covers a wide variety of aquatic systems and provides exceptional physico-chemical and biological characteristics, providing critical ecosystem services. They represent a source of biological diversity at all levels.

Algeria is a Mediterranean country with several wetlands; this richness is due partly to its geographic location. Algeria is one of many countries signatories of the Ramsar Convention (03/04/1984). The Algerian wetlands are important muster and wintering area for migratory birds [5], these birds migrate from north to south across the Palaearctic ecozone; Wetlands are an important breeding sites for several rare species, endangered or biome-restricted species. In the perspective of knowing the ecological status of wetlands of Oran, we were interested to Lake Telamine, listed lake Ramsar site, and exposed to a very disturbing urban pollution. The aim of our study is to highlight the importance of the lake Telamine and establish their health status using two parameters: The ornithological biodiversity and water quality.

2. Study Area

Lake Telamine in East of Oran (Algeria) covers an area of approx. 2.399 ha (Figure l). Lake Télamine (35 ° 42 '30 " N, 0 ° 22' 30" E) is the second largest basin in Oran after that of the sebkha Arzew, with a length of 6 km and 1 km of mean width and has a mean elevation of (84.5 m) above sea level [3]. Water samples were collected for physico-chemical analysis from 3 sampling sites. Lake Telamine is connected with some wastewater which not the only possible source of pollution, there is a landfill that is in the middle of Lake and contains a large quantity of all types of waste (Figure 1).

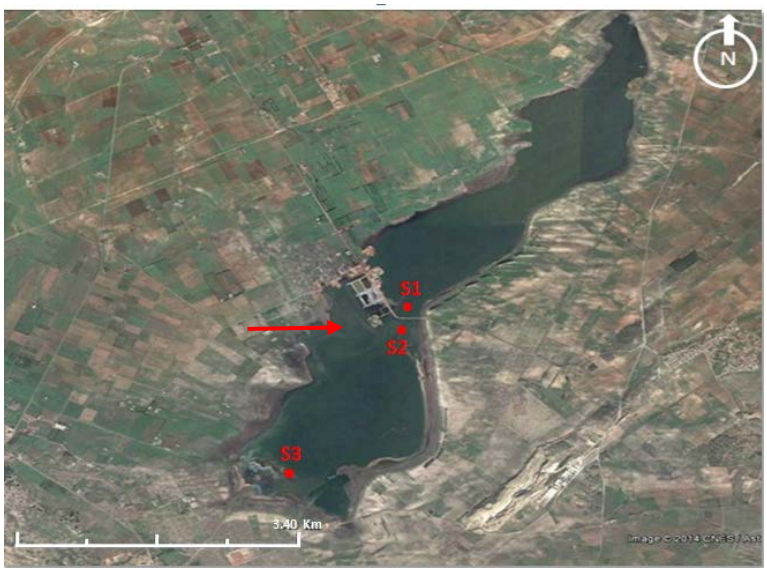

Fig1. Representative map of the study area; sampling stations (S1, S2, S3), the arrow indicate a landfill. (Google Earth, 2014)

3. Materials and methods

3.1. Birds assessment

The ornithological Study of Lake Telamine was conducted from December, 2013 to May, 2014. Olympus binocular of 10x40 and a Canon camera 650 D 18 MP with Sigma lens (70-300 mm) were used for observations, a book guide [11] was used to identify bird species.

The bird count was conducted using the method of direct counting which consists to a single count when the number of birds does not exceed 200 individuals and birds was at a distance not exceeding 200 m [2-13]. We also took panoramic pictures of the entire population presents on the surface of the water; careful analysis of these images was performed in laboratory for more accurate count.

The ornithological study allowed us to choose three sampling points (S1), (S2) and (S3), according to the habitats of main bird species and also the rapprochement and the distance to these sites to the landfill Fig 1.

3.2. Water analyses

Water samples were collected once in February and in April. Water samples were collected during morning hours between 8:00 A.M. to 11:00 A.M. water temperature, pH, dissolved oxygen were performed *"in situ"* using a multi-parameter model WTW 340i while orthophosphates, ammonium, nitrite, chlorophyll a and BOD_5 were analyzed in the laboratory of National Water Resources Agency (ANRH) by standard methods [1-12]. We determined the concentration of chlorophyll a using a method of [10].

3.2.1. The organic pollution index

The organic pollution index [8] is based on measurements of BOD5, ammonium, nitrites and orthophosphates (table1), divided into five classes which have biological significance corresponding to typical changes in diatom (table 2).

Table 1: Organic pollution index OPI classes limit

	DBO_5	NH_4^+	NO_2^-	PO_4^-
	mgO_2 /l	mg N /l	µg N/l	µg P/l
Class 5	<2	<0,1	≤5	≤15
Class 4	2-5	0,1-0,9	6-10	16-75
Class 3	5,1-10	1,0-2,4	11-50	76-250
Class 2	10,1-15	2,5-6,0	51-150	251-900
Class 1	>15	>6	>150	>900

Table 2: Average grade interpretation

Average class	Level of organic pollution
5,0 – 4,6	Zero
4,5 – 4,0	Low
3,9 – 3,0	Moderate
2,9 – 2,0	High
1,9 – 1,0	Veryhigh

4. Results and Discussion

4.1. Composition of bird community in Lake Telamine

A total of 30 birds species were recorded from December 2013 to April 2014 which belongs to 10 orders and 12 families (Table 3). The most dominating family was Anatidae with 16 species. Charadriidae formed the second dominant family with 10 species. Bird community water was dominated by three species flamingo (*Phoenico pterusroseus*), black-winged stilt (*Himantopus himantopus*) and Eurasian coot (*Fulica atra*). The orders that had the most species are those of passerines (8 species), Anseriformes (6 species), Charadriiformes (6 species), Pelecaniformes (4 species), we also identified seven species of non-aquatic birds.

The bird population number in Lake Telamine was not constant throughout the study, the flamingo was the most numerous species with a maximum during December, with 3000 individuals, and in March they were more than 1000 individuals and April with 2000 individuals. The number of Eurasian coot in March was 380 individuals which makes it the second most numerous species in Lake Telamine. The variation in the number of aquatic birds can be explained by the presence of 7 other wetlands in Oran, bird can move into these areas to find more abundant foraging patches

Table 3: List of birds counted in the Lake Telamine and their protection status.

Species	IUCN	Months	Maximum abondance	Conservation status
Greater flamingo				
Phoenico pterusroseus	LC	11-12-2-3- 4-5	2755	D, N2, W, A, R2, L2, C2
black-winged stilt				
Himantopus himantopus	LC	12-3-4	126	D, N2, W, R3
Yellow-legged gull *larus michahellis*	LC	12- 2-3-4-5	30	W, R3
Mallard *Anas platyrhynchos*	LC	12-2	2	N2, W, R3

Northern shoveler *Anas clypeata*	LC	12-1-2	27	C3, N2, W, R3
Common shelduck *Tadorna tadorna*	LC	4	9	D, N2, W, R2
Ferruginous duck *Aythya nyroca*	NT	4	4	D, C3, N1, W, R3
Marbled duck				
Marmaronetta angustirostris	VU	12,1	3	D, N1, W, R2
Eurasian coot *Fulica atra*	LC	12,2-3	256	N2, W, R3
Temminck's stint				
Calidri stemminckii	LC	3-4	2	N2, W, R3
Southern grey shrike *Lanius meridionalis*	LC	3	1	R2
Common raven *Corvus corax*	LC	2-3	2	R3
Cattle egret *Bubulcus ibis*	LC	12,1-2,3-4	11	W, R3
Grey heron *Ardea cinerea*	LC	12-3	7	D, W, R3
Common chiffchaff *Phylloscopus collybita*	LC	2	1	R2
Common buzzard *Buteo buteo*	LC	4	4	D, C2, N2, B, R2
White stork *Ciconia ciconia*	LC	3	17	D, N2, W, A, R2
European stonechat *Saxicola rubicola*	LC	1	3	R2
Common blackbird *Turdus merula*	LC	12-3	2	R3
Glossy ibis *Plegadis falcinellus*	LC	2-3	4	D, W, A, R3
Crested lark *Galerida cristata*	LC	3-4	3	R2
Little egret *Egretta garzetta*	LC	1-2-3	5	D, W, A, R3
Black-headed gull *Chroicoce phalusridibundus*	LC	1-2- 3-4	35	W, R3
White wagtail *Motacilla alba*	LC	3	3	R2
Common pochard *Aythya ferina*	LC	2	5	C3, N2, W, R3
Western yellow wagtail *Motacilla flava*	LC	3-4	2	R2
Common red shank *Tringa totanus*	LC	2-3	1	R2
Common kestrel *Falco tinnunculs*	LC	5	7	R2
Barn owl *Tyto alba*	LC	5	1	R2
Eurasian stone-curlew *Burhinus oedicnemus*	LC	5	9	R2

D = Algerian Lois; IUCN Red List: [LC = Least Concern; NT = Near Threatened; VU = Vulnerable; EN = Endangered]; C = CITES Convention; N = Bonn Convention; W = AEWA Agreement; L = Barcelona Convention; Algiers Convention: [A = A list; B = B list]; R = Berne Convention; R1, R2, R3.

4.3. Water quality

Table 4: Results of the physico-chemical analysis of water sampled at Lake Télamine

Sampling site	S1	S1	S2	S2	S3	S3
Sampling period	February	April	February	April	February	April
pH	8.33	8.33	8.58	8.86	8.69	8.90
Temperature °C	21	24	20	24	20	25
Chlorophyll a µ g/l	44.62	12.69	22.21	34.03	13.64	22.78
DBO5 mg/l	403.9	376.6	219.2	329.3	282.1	312.0
NH^{+4} mg/l	2	1	2	1	2	1
NO_2^- mg/l	0.26	0.12	0.30	0.02	0.36	0.02
PO_4^- mg/l	3.10	2.30	4.00	5.20	4.20	4.90
DO mg/l	/	5.6	/	5.8	/	7.8

pH of Lake Telamine varies between 8.33 and 8.90, and is considered acceptable values for the three sites in either the first or the second sampling.

Our results show that February temperature is between 20 and 21 ° C, 24 and 25 ° C for April. These temperature variations do not reflect a thermal pollution because these values are the normal seasonal temperature.

Chlorophyll (a) recorded is considered good in the three sample sites (S1, S2, S3) with a maximum in the (S1) and a minimum in area (S3) in February, and a maximum (S2) and a minimum in (S1) on April.

We found highest values of BOD_5 in three sites, this is due to large amounts of waste water rich on organic matter from urban and agriculture facilities rejected around the Lake,

Orthophosphates recorded in the three sampling areas (S1, S2, and S3) was very higher. An increase in sites (S2) and (S3) and a decrease in the zone (S1) have been registered in the second sample.

We noted a difference in the level of BOD_5 and the level of orthophosphates between the three sampling site, that can be explained by the presence of different source of pollution around the like (urban water, agriculture and landfill) this sites do not receive a same quantities and qualities of pollution. The level recorded for ammonium, nitrite and dissolve oxygen are considered as good.

4.4 Organic pollution index

Table 5: spatiotemporal evolution of the organic pollution index.

Period	February			April		
Sites	S1	S2	S3	S1	S2	S3
OPI	3,5	3,5	3,5	3,5	3,5	3,5

Our results of organic pollution index show that Lake Telamine have a moderate level of organic pollution and there is no difference between three sampling sites (S1, S2, S3) in February and in April.

5. Conclusion

Our study showed that this wetland is a micro habitat with high ecological value because of his great ornithological biodiversity. Lake Telamine is a rich wetland, which gives it the status of Ramsar site [9-7]. The presence of 30 species of birds in this Lake shows a great ornithological biodiversity. The large presence of migratory and wintering birds during the study shows that this wetland is a wintering or stop-over sites for certain species of migratory birds to the countries of the southern Mediterranean site. A total of 16 species listed by AEWA agreement were recorded in Lake Telamine.

The Lake Telamine is one of the most important bird areas in Oran; it was a rich wetland and is one of the most valuable resources of biodiversity and natural productivity. Lake Telamine receives more than 1% of the regional populations Mediterranean of Common shelduck (*Tadorna tadorna*) of flamingo (*Phoenicopterus ruber*) and northern shoveler (*Anas clypeata*) [3].

However, Lake Telamine is surrounded by several villages and agricultural farms, the absence of sewage treatment station and the wild grazing on the shores of the Lake exposed Lake Telamine to a real degradation. This pollution is accentuated by the presence of the landfill located in the center of the Lake which can cause the formation of leachate.

Acknowledgments: We thank ANRH for the water analyzes and the student Tayeb Mohamed Amine for his help during the sampling period.

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