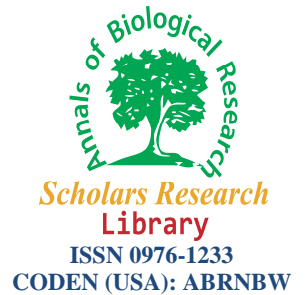




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Reproductive ecology of mallard duck (*Anas platyrhynchos*) at TONGA lake (North-East of Algeria)

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ABSTRACT

In Algeria, nesting mallard were observed by Boumezbeur (1990). The present work is a preliminary contribution to the knowledge of the reproduction of Mallard (*Anas platyrhynchos*) at Lake Tonga (North- eastern Algeria), why regular trips were made during the breeding season 2011. From March until the end of April, several nests were identified in the study area where the first spawning was noticed on March 27th and the last on June 17th. Most nests are built on the banks of the lake to the inner holes of tree trunks of alder Tonga, above the water surface about 48.807 ± 18.754 cm, surrounded by dense vegetation. The morphological parameters of nests studied showed: mean outside diameter is 29.385 ± 4.519 cm, average internal diameter is 19.000 ± 1.985 cm, the height of the average nest is 10.923 ± 5.346 cm; Thus statistical analysis shows a positive and significant correlation between internal diameters and outer diameters nests. The measure Duks Mallard eggs is average length is 56.203 ± 2.446 mm, an average width is 38.976 ± 2.031 mm and an average weight is 52.648 ± 4.539 which positive and significant correlations were noted between the different measurements of eggs (length, width and weight). The study of reproductive parameters showed a mean clutch size of $8,923 \pm 3,451$ eggs for female, an incubation period ranging from 26 to 28 days and a high hatching rate of 92.307 ± 27.735 %.

Keys words: Mallard duck-*Anas platyrhynchos*, Reproduction, Tonga Lake, PNEK, Algeria

INTRODUCTION

Geographical and strategic position of Algeria, its physical configuration and diversity of its climate, there are over 254 wetlands [1]. These wetlands are a preferred host territory for many water bird species. The most important area for wintering is the North - East of the country which includes the wetland complex area Annaba and El -Kala. Habitat quality of Lake Tonga (El Kala National park.) has earned its ranking as the most important nesting site in North Africa for a variety of species [2].

The Anatidae family is very diverse; the most common one at Lake Tonga is the Mallard duck population (*Anas platyrhynchos*). The distribution of couples generally proves quite homogeneous and it is rare to find two pairs nesting contiguously. After hatching, the broods are often maintained in vegetation and are therefore difficult to detect.

The goals we have pursued in this work are: Counting and distribution of the *Anas platyrhynchos* during the breeding season; the spatial distribution and biometric measure of nests on the Tonga Lake. Measurement and biometric parameters of eggs.

MATERIALS AND METHODS

Study area

Our study was conducted at ElKala National Park (PNEK) (Wilaya of Eltarf) which houses the complex of wetlands the largest in the country that are exceptional by their size and diversity and where several scientific studies have been conducted [3]. These Lake has wide variety of floristic and faunal From [4], the most important is the Tonga Lake, which are the subject of our study (Figure 01).

Lake Tonga (36 ° 53 N, 08 ° 31 E) extending over an area of 2500 ha [5]. It is located in the extreme north-eastern Algeria .The watershed of the lake is in the sub humid bioclimatic with Mediterranean vegetation in northern temperate [4].

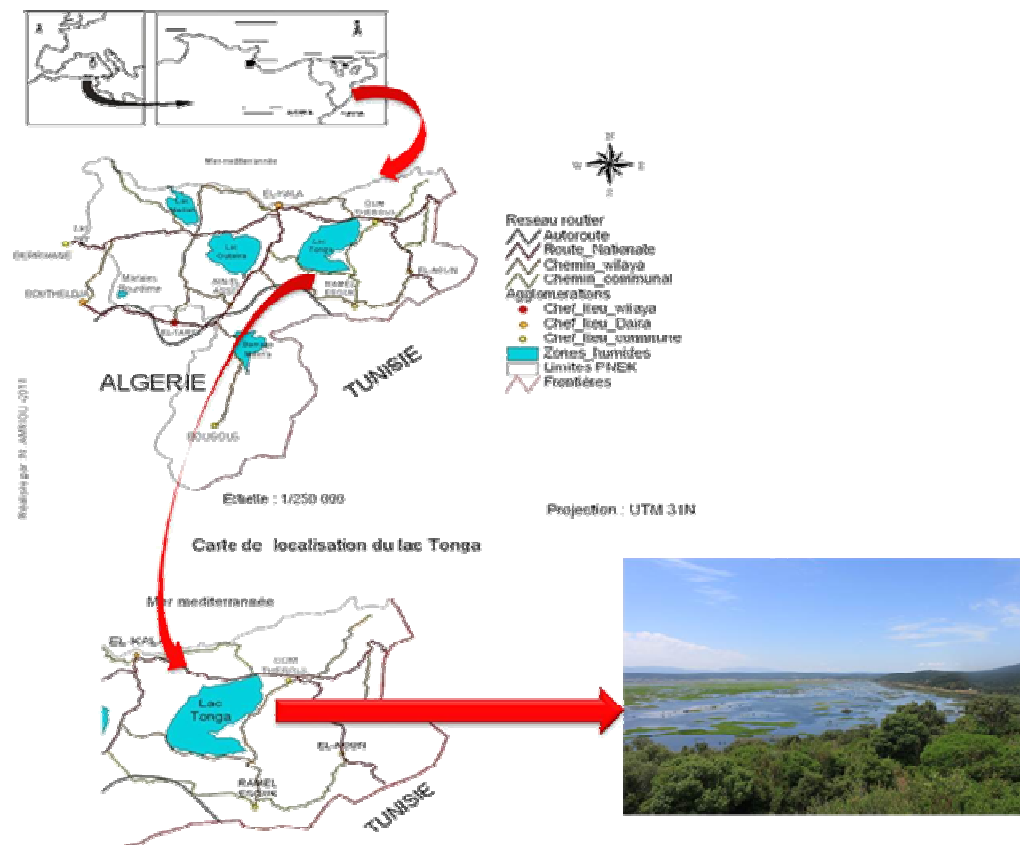


Figure 1. Location Tonga lake (Amriou, 2011).

Biological Model

The Mallard duck (*Anas platyrhynchos*) is an abundant species the workforce between Europe and Africa is around 09 million. It is a large species (50 to 65 cm and wingspan 80-95 cm), with a weight of 700 to 1300 g for females and 800 to 1400 g for the mal.

It has metallic green neck collar with a thin white at the base and one or less wine red brown chest and the belly is grayish white with ash-gray back. The wings are gray with a purplish blue mirror; the anal area is black with a white tail. The legs are orange and the bill is olive green. The female has feathers nutty brown color and identified, the mirror is purplish blue, beak and legs are orange with brown spots [6].

General Methodology

We have worked during the year 2011, including the study period spanned 83 days from March 27 to June 17 on which made regular trips to a rhythm (01) each output three (03) days.

Our work is about the systematic search for nests on borders of the Lake using inner thigh and boat without motor. The counts were made during the three months of reproduction: March- April - May. The observations have been made from different viewpoints (positions main observations) : Tonga Mirador , Mirador of Maizila , Mirador of

Oued El - Hout and tracks (points auxiliary observations) : track Maizila , Chemin Wilaya Oued El Hout , using optical equipment (binoculars, telescope) with two separate teams, each performing a circuit at the same time [7].

Characteristics of nests

When the nest is located, it takes its characteristics, the parameters measured by means of a tape are: Outer diameter (cm), Internal Diameter (cm), The water depth (cm) and the Height of nest (cm)

A map with the location of nests was conducted to study the distribution of breeding individuals in the lake.

Reproductive parameters

Four demographic parameters were put into consideration:

- Date of spawning : which means the date of the first egg
- Size of spawning corresponding to the number of eggs laid
- Incubation period
- The hatching rate: corresponding to the percentage of eggs hatched.

Meanwhile the eggs were measured (length, width) using a caliper and weighed with a weighing.

Statistical Analyses

Microsoft Excel 2010 for our license to do basic statistics (mean, maximum and minimum values), as well as different graphs (histograms, areas, lines). All data were processed by the Statistica software (version 8, 2008) to determine the correlations between those in existing settings.

RESULTS AND DISCUSSION

Counting

During our study period we noticed the complete absence of species in our area TONGA(DAM TONGA) and presence of 13 individuals in the area and a concentration MAIZILA specify in area OUED-ELHOUT 36 individuals. While the averages are: 00 for individual TONGA, 2.6 MAIZILA for individuals and 7.2 OUED-ELHOUT (Figure 02).

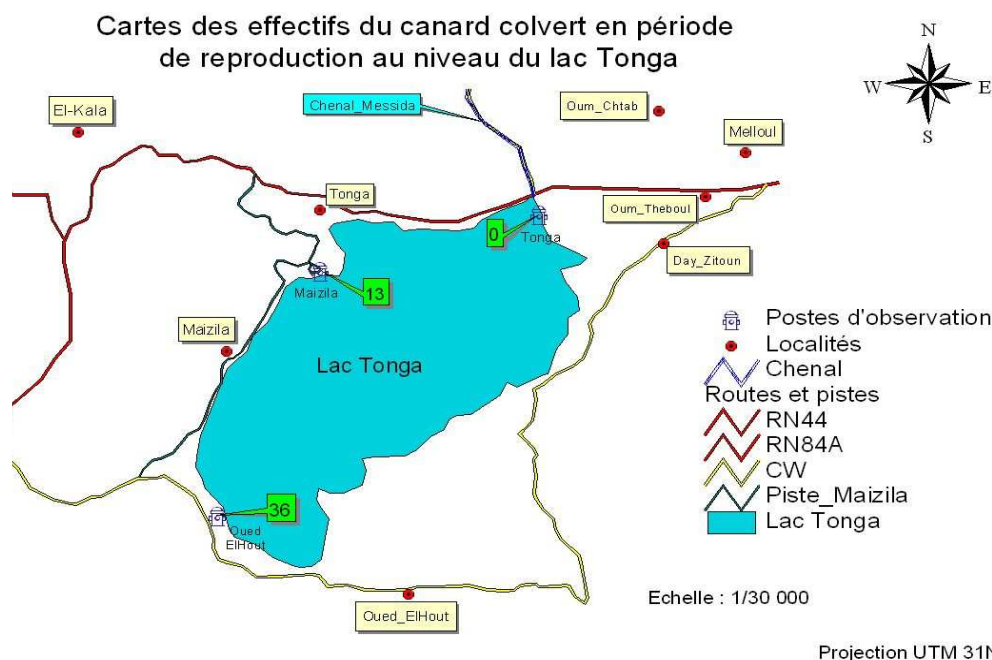


Figure 2. Abundance distribution of Mallard duck at Tonga Lake (breeding season) (Amriou, 2011)

This low abundance can be explained by the increased practice of poaching and hunting at the Wilaya of El-Tarf. Indeed, between 1984 and 1991, 1,596 individuals of Mallard duck were hunted [8]. In addition, Lake Tonga during these last years sustained of an intense eutrophication (comparing satellite images of different years past with "Google Earth" shows a remarkable development of the vegetation of the lake) at the time of reproduction. Thus almost all of the lake's surface is covered by a highly invasive hydrophyte of open water areas *Nymphaea alba* [9].

In which our species can hidden observers, which delimit the performance of observations on the lake surface and enumeration of Anatidae in general become more difficult and can be wrong.

Nests Characteristics

Construction materials and location

Almost all are located on the banks of the lake and some nests are much deeper inward (Figure 03). Although all nests studied are built above the water surface in the middle of dense vegetation composed mainly by trees of "Aulnaie Tonga", making them very difficult to identify, or 'were generally established at the inner trunks of trees in holes Aulnaie more deep and at least once between the branch of the latter. Female mallard use your own feathers in making nests along the stems and leaves of alder (photo 01).



Photo 1. Nest of Mallard duck (Ridha, 2011).

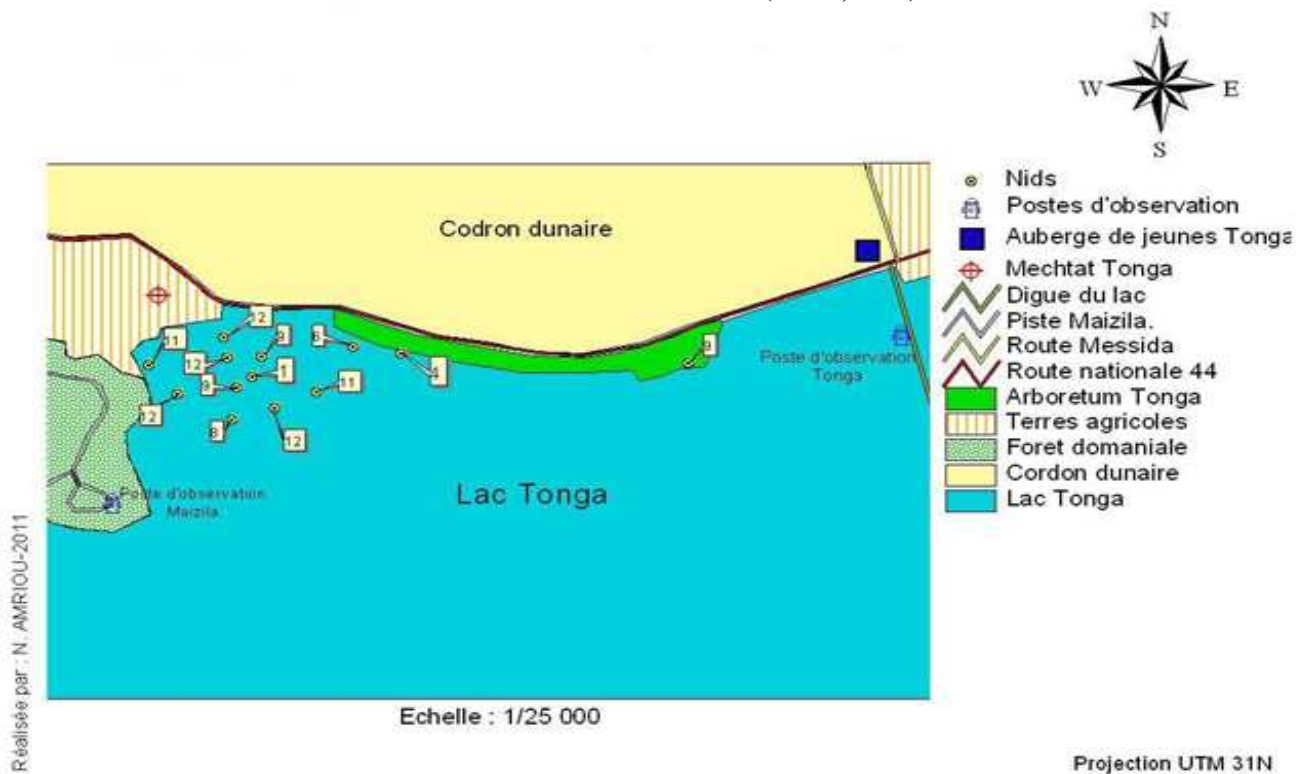


Figure 3. Abundance distribution of Mallard duck at Tonga Lake (Eggs number) (Amriou, 2011).

According to Boumezbeur (1990), our model is not nest at Lake Tonga despite extensive research due to several reasons more particularly the fact that it can nest in a great many different backgrounds and far enough of the water body, located in the center of the lake or 'extremely pure water and wetland vegetation and well developed without much mixing with other species.

This can be explained according to a report prepared by "British Trust for Ornithology (BTO)" in 2008 by a displacement phenomenon of breeding water birds under the influence of climate change becomes intensive Since1990,includingthebreedingas well as wintering species of water birds move towards the poles or to higher areas geographically [10].

Nets mesures

Table 1: Nets mesures (n=13)

| Description | Minimum | Maximum | Average |
|------------------------|----------------|---------|---------|
| Outer diameter (cm) | 29,385±4,519 | 19,000 | 36,000 |
| Internal diameter (cm) | 19,000±1,985 | 17,000 | 23,000 |
| Nest Height (cm) | 10,923±5,346 | 4,000 | 25,000 |
| Water depth (cm) | 93,762±27,472 | 63,000 | 150,000 |
| Elevation of nest (cm) | 48,807± 18,754 | 21,000 | 77,000 |

Statistical analysis showed a positive and significant only between the outer diameter and the inner diameter correlation($r = 0.59335$, significant at $p < 0.05$), no other correlation was detected for the other parameters.

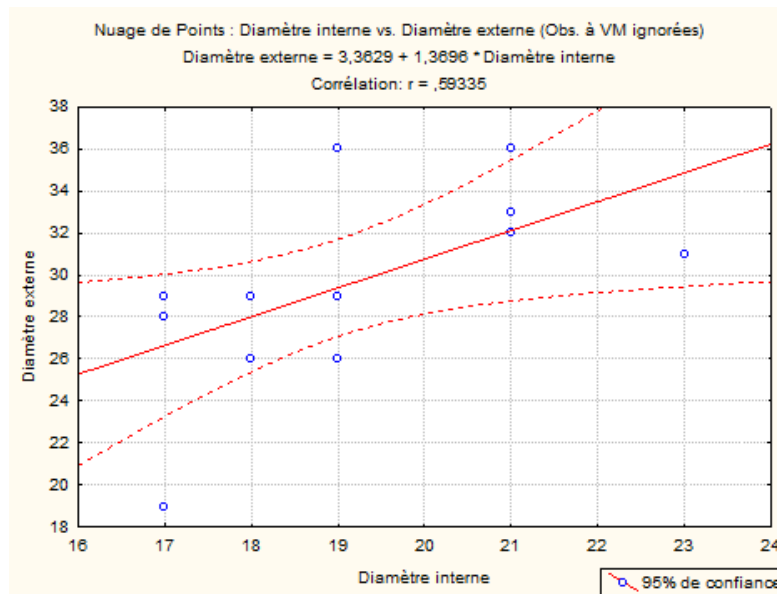


Figure 4. Significant Correlation of different nest measures (N=13).

Egg mesures

Table 2: Egg mesures (n=116)

| Œufs | length (mm) | width (mm) | weigh (g) |
|---------|--------------|--------------|--------------|
| Moyenne | 56,203±2,446 | 39,134±2,380 | 52,648±4,539 |

The statistical analysis showed significant positive correlations between the different measurements of eggs:
 - Between the length and the width ($r = 57\ 488$ and $p < 0.05$).
 - Between the length and the weight ($r = 30889$ and $p < 0.05$).
 - Between the width and the weight ($r = 37408$ and $p < 0.05$).

These mesures were found to be lower than those recorded in North America [11].

The difference of measurement can be influenced not only by the food system but also by the temperature and the quality of the female during spawning.

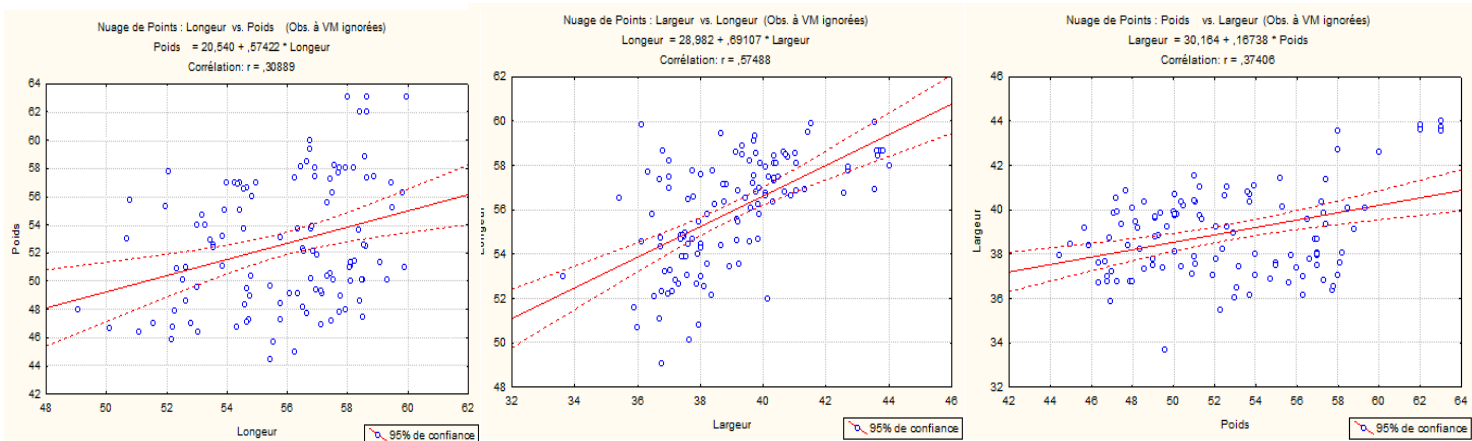


Figure 5. Significant Correlation of different Egg measures(Length, width and weigh) (N=116)

Reproduction parameter

The average of egg-laying date is around May 7. First spawning took place on March 27 and the last on June 17. According to the observations that are made about it on the same body of water by Chalabi in 1990 the first brood has been recorded on April 12 and the last on June 28. Moreover, monitoring was not regular over several years [12]. Indeed dates punctis are genetically determined [13], but influenced to some extent by environmental factors. Other factors are involved, such as the development of food resources and temperature of the medium (Lack 1954; 1968). It acts directly on the physiology of the bird and indirectly on the development of food resources [14].

The magnitude of spawning for the Mallard, the mean clutch size is $8,923 \pm 3,451$ eggs per female. The smallest clutch contains 04 eggs and the largest is 12 eggs.

We have noticed in a single nest with a second clutch but reduced number of eggs produced, which in the first 08 eggs hatched and is calculated in the second only 04 are found in eggs in the same nest.

The incubation period varies from mallard 26-28 days. It is important to note that the female begins to incubate laying since the first egg.

Hatchability of mallard is very high in Lake Tonga, and estimate average of 92.307 ± 27.735 %, between 100 % and 00 %. The rates are very high in comparison with those of America, can be explained by plant physiognomy Lake Tonga characterized by its very high density which has a favorable and preferred nesting mallard medium according to our results, which is used to protect our species against all faults particularly predation.

CONCLUSION

In Algeria, as elsewhere, it becomes imperative to manage the breeding and wintering birds and the environments in which it operates. This is actually an issue in the wake of the policy of protection and preservation of natural resources in general and wetlands in particular, is conducted in the broader context of environmental protection by the highest authorities international, that is part of the planning and management of natural heritage began in Algeria in recent years program.

Reproduction of Anatidae and especially that of Mallard Duck was confirmed on Tonga Lake and Fetzara Lake respectively in 1984 and 1987. Unlike wintering Anatidae which is well supported (especially in terms of wetlands in the North), the results of observations on nesting Anatidae in Algeria is actually quite thin. It reveals in particular the apparent lack of studies on the reproductive biology of breeding species [12].

Our study aimed to identify different morphological parameters nests and reproductive parameters of the Mallard Duck (*Anas platyrhynchos*). In this present study confirmed that the Mallard Duck is a duck nesting in Tonga Lake but at the same time a very low number of this species in relation to the global workforce which is very high it says.

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