Breeding ecology of the Marbled duck *Marmaronetta angustirostris* at Boussedra marsh (Annaba, Northeast of Algeria)

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**ABSTRACT**

Marbled duck *Marmaronetta angustirostris* (Anatidae) nested for three consecutive years (2011, 2012 and 2013) in the marai de Boussedra (North-East of Algeria): a much polluted site. Nests are built on *Scolymus hispanicus* and *Innula graveloens* (Asteraceae). In water, the nests are built in clusters of *Typha angustifolia* (Typhaceae). Nesting occurs between mid-May and mid-June of each year. The eggs have a mean weight of 32.61g and a volume of 26.51 cm$^3$. The hatching rate recorded is 40.40% and the causes of failure are many and the most important are the White Stork *Ciconia ciconia*, the rodents and the dogs.

**Keywords:** Marbled duck, *Marmaronetta angustirostris*, breeding, wetlands, Algeria.

**INTRODUCTION**

Cited as Threatened species, the Marbled duck *Marmaronetta angustirostris* is classified as "vulnerable" on the IUCN Red List [1]. This status is proved in Algeria and throughout the Western Palearctic. The number of individuals of this species suffered a rapid decline over the years, it is estimated at 55,000 individuals in 2010 [1]. Although data on clutch size, brood and chick mortality of a threatened population is essential if we are to solve conservation problems [2], the reproductive biology of the Marbled duck is not well studied in the south of the Mediterranean.

This study was carried out in order to first, improve our knowledge about the breeding of the Marbled duck *Marmaronetta angustirostris* in the northeast of Algeria and secondly to identify the effect of the habitat loss in the modification of the breeding parameters of this water-bird.

**Study area:**
Boussedra marsh (36 ° 50'45" N, 7 ° 43'47" E) is a freshwater marsh of 55 ha which situated in Annaba (Northeast of Algeria). This wetland was used as fill for 2003 having lost 30% of its total area to 2013. This ecosystem is a typical fragment [3-4] of a former large complex of wetland around the city of Annaba (Figure 1).
The vegetation is dominated by *Scirpus maritimus*, *Phragmites australis*, *Typha angustifolia*, *Juncus maritimus* and a dense stand of trees of *Tamarix gallica* is located on the southern edge of the marsh. This wetland is home to many vulnerable species listed in the IUCN Red List and is recognized as an important wintering and breeding site for many species of water-birds as the White-headed Duck *Oxyura leucocephala*, the Ferruginous Duck *Aythya nyroca* and the Purple swamphen *Porphyrio Porphyrio* [5].

**MATERIALS AND METHODS**

This current study is focused on the evolution of nesting Marbled duck in Boussedra marsh (Northeast of Algeria) during three consecutive seasons (2011, 2012 and 2013) from April to August.

The site is explored twice a week to measure certain parameters characterizing the nest. The parameters taken into consideration are those defined by the scientific literature [6-7-8-9-10], and are as follows: Installation nests, composition, cover (vegetation density 3 * 3m around the nest), measurements of nests (internal diameter, external diameter, nest depth, elevation of nests, visibility, measures of inter-nest distances), eggs measurements (length, width and weight), depth of water, clutch size and hatching monitor and failures (predation and abandonment). The eggs volume was calculated using the formula where \[ (0.476 \times L^2 \times l/1000, \text{ Harris, 1964}). \]

**RESULTS**
Number of nests:
During our three seasons of monitoring was able to identify ten nests of Marbled duck that was present on site throughout the year, two nests in 2011, four in 2012 and four in 2013, which corresponds with the number of individuals (male and female) during three years separately.

Nests phenology:
The installation of the nests started from mid-April. The firsts laying recorded each year were performed respectively on May 26, 2011, April 22, 2012 and 01May 2013. Until mid-July for three seasons followed by a period of reproduction spanning more than 100 days.

Nests characteristics:
At Boussedra marsh (exception of one nest found in 2013), all nests were installed on the dry Typha angustifolia, 2m height where the water depth is 60cm, all nests (n = 10) have been installed on an area of 6 to 15 m² in size and very diverse vegetation, ranging from: Scolymus hispanicus, Carex divisa, Innula graveolens and Tripholium repens (80% of nests were built in Innula graveolens). Table 1 summarizes the characteristics of nests measured from 2011 to 2013.

| Table 1: Nests characteristics of the Marbled duck in Boussedra marsh |
|-----------------------------|-----------------------------|-----------------------------|
|                             | 2011                        | 2012                        | 2013                        |
|                             | mean | Min | Max | mean | Min | Max | mean | Min | Max |
| Water depth (cm)            |       |     |     |       |     |     |       |     |     |
| Nests height (cm)           | 3     | 3   | 4   | 3     | 2   | 4   | 6     | 3   | 15  |
| Nests elevation (cm)        | 0     | 0   | 0   | 0     | 0   | 0   | 4     | 0   | 16  |
| Nests depth (cm)            | 6.5   | 4   | 11  | 5     | 4   | 7   | 6.5   | 4   | 11  |
| Internal diameter (cm)      | 12    | 11  | 13  | 14.5  | 10  | 15  | 12    | 12  | 12.8 |
| External diameter (cm)      | 25    | 19  | 30  | 21.5  | 18  | 25  | 23    | 19  | 30  |

Clutch size:
During the three years, the highest clutch size is 12 eggs/nest and the smallest is 5 eggs/nest, recorded during the year 2013. The results recorded in Table 01 show that the mean clutch size of the site is 9-10 eggs/nest.

Eggs characteristics:
The totality of 99 eggs measured show that the mean length of eggs was 45.8 mm, the mean width was 34.65mm, and the mean volume was 26.51 cm³ and mean egg weight was 32.61 g (n = 38).

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Eggs hatching:
The first eggs hatching were observed from the last week of May and early June. Of all nests followed: 40.40% of the eggs hatched and 59.60% failed (Fig. 04).

DISCUSSION

Before this study, no previous data on the breeding ecology of the Marbled duck in North East Algeria (subhumid bioclimatic floor) was known, except few nesting were reported in Lake Fezzara [11-12].

Contrary to what has been reported in the literature on the behavior and preferences of the Marbled duck: Species very shy, she attended the temporary wetlands [6], it seems able to adapt to a very distinct habitat type and managed to breed three successive years and probably more in Boussedra marsh despite the disturbance in this ecosystems (crossed by a railway active, health and food industry), water pollution (domestic and industrial discharge). In addition, the regular presence of individuals of water bird to suggest a large competition for the nest site-selection.
The nest of the Marbled duck is a shallow depression with grass and down (Fig. 03). The spawning period began on April 22, absolutely similar to the date (April 22-23) reported by Green (1998). The start date is known as nesting early in the Saharan ecosystems in the Oued Righ valley in southern Algeria [13]. The hatching date is recorded from 18 May and lasted about 53 days.

The hatching rate is 40.40%, about the (59.60%) hatching failure rate, 47.47% is due to predation by rodents, snakes, dogs and white storks Ciconia ciconia (personal observation) and 12.13% is due to the abandonment of nests due to anthropogenic disturbance (children and residents) or predation of the adult Marbled duck. The inter-annual variations in rates of failure and success hatching are summarized in Figure 2.

Clutch size (9-10) is less than that recorded in Del Guadalquivir in southern Spain (11.8) [2].

Previous data on the breeding of this species in southern Algeria (The arid climate) in the wetland complex of Oued Righ valley (Southern Algeria) [13] reported results and showing different possible adjustments to the behavior of the species from one region to another.

As typical in ducks of the sub-family Anatinae, the Marbled duck breed in their first year [6]. The individuals of the second season are the chicks that survive in the previous breeding season and the same for the third year. We can deduce that we are dealing with a sedentary population. In addition, Anatidae are characterized by duvet covering chicks [14] made it very difficult their monitoring.

![Figure 2: Rate of the eggs hatching/failure of the Marbled duck in Boussetra marsh.](image1)

![Figure 3: Chicks of the Marbled duck after hatching. (Aberkane, 2013)](image2)
CONCLUSION

In Algeria, the species nested in the lake Fezzara (15 000ha) west of Annaba [11-12] and in the swamps of the Macta [15]. A nest was suspected at the lake Reghaia [16] in Boughezoul [17] and Lac des Oiseaux [18-19]. In 1973, a maximum number of 500 individuals were recorded in the highlands of eastern Algeria [22] when the species is regularly observed [20-21].

REFERENCES