



Breeding ecology of the common coot (*Fulica atra*) at El-Golea Lake (Algerian Sahara)

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ABSTRACT

The breeding ecology of common coot *Fulica atra* was investigated at El-Golea Lake, in the northern part of Algerian Sahara, where the breeding season was comparatively short, during three months. The distinct habitats within the lake used by common coots for nesting are associated with *Typha angustifolia* (96%) and *Scirpus lacustris* (04%), the vegetation covers the density that varies between 30% to 80%. The mean clutch size was 5.6 ± 3.2 eggs ($N = 45$ clutches) and the laying occurred mainly in April, but continued until the end of May. The breeding success rate was (75.55%) with the predation rate of (72.72%), and clutch desertion of (27.27%). The effects of disturbance on the breeding success of this water bird and the necessity to protect this species and also this wetland were discussed in the present study.

Keywords: Breeding success, *Fulica atra*, El-Golea Lake, Sahara

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Haouam et al., 2006; Zitouni et al., 2013), the Hauts Plateaux (Samraoui & Samraoui, 2007; Baaziz & Samraoui, 2008), and Algiers region (Metna, 2014 et al.; Metna et al., 2015). The present study focused on the breeding ecology of this species in the northern Algerian Sahara at El-Golea Lake.

INTRODUCTION

The common coot *Fulica atra* is one of the most abundant water birds in Europe (Jortay, 2002), in North Africa (Isenman & Moali, 2000), and in Algeria (Baaziz & Samraoui, 2008; Metna et al., 2013) which range includes all of Northern Algeria including the Hauts Plateaux (Ledant et al., 1981; Isenmann & Moali, 2000; Metna et al., 2013; Guergueb et al., 2014) that presents nesting areas in southern Algeria at some oasis (Etchecopar & Hue, 1964).

This water bird is the common species of the Algerian wetlands (Rizi et al., 1999). It has a Breeding sedentary status in all the Mediterranean basin (Allouche & Tamisier, 1984; Samraoui & Samraoui, 2007). In Algeria, the reproductive biology of the common coot *Fulica atra* was studied in some areas of the country, particularly in Numidia region (Rizi et al., 1999;

MATERIAL AND METHODS

Study area

The lake El-Golea (30° 31 'N, 02° 56.'E), a salt marsh has a surface of 270 km² for a maximum depth of 02.5 m located in the northern Sahara (D.G.F, 2005). This region has an arid Mediterranean climate, characterized by hot and dry summer, the average annual rainfall is 20 mm. Between the Grand Erg Oriental in the East and Grand Erg Occidental in the west, this lake composed of two interconnected water bodies, an upper basin which is a permanent brackish water lake, very rich in biodiversity, fed mainly by wastewater from the city of Menea and Hassi El-Gara, and a lower basin very broad, composed of saline deposits (Khalifa et al., 2009). (Fig 01).

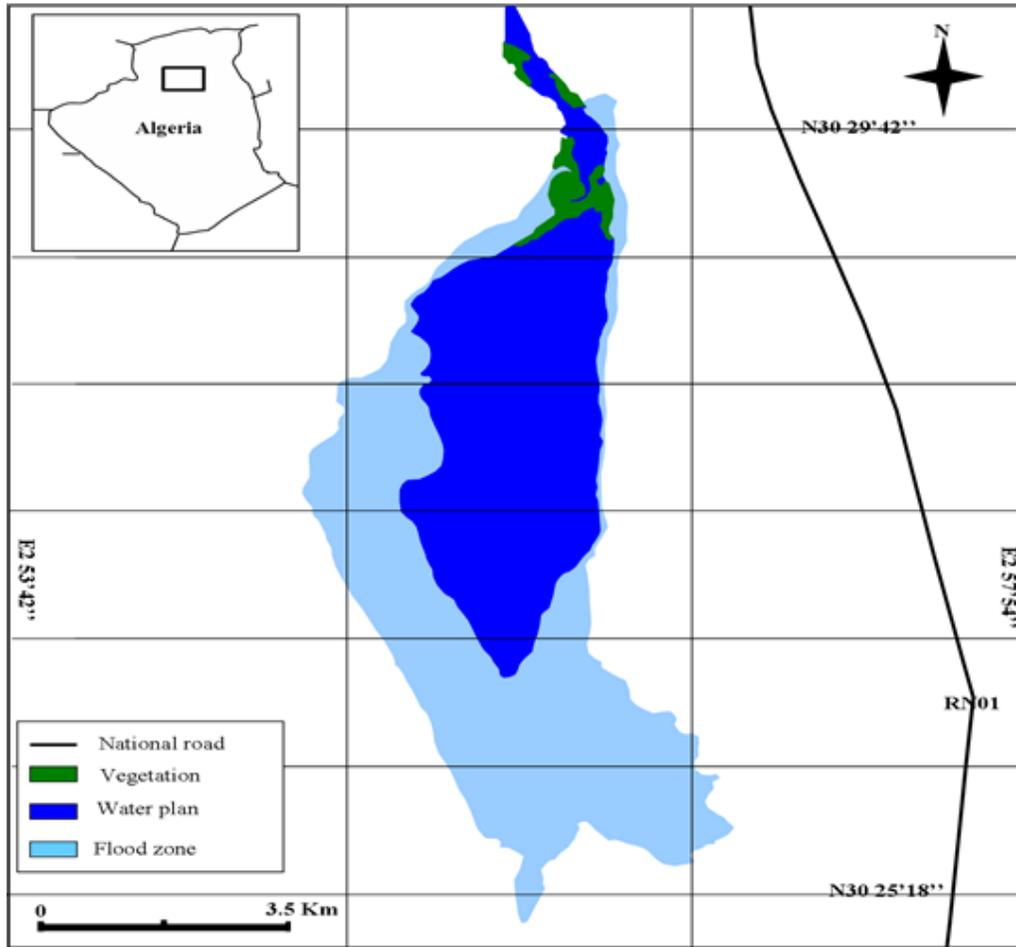


Figure 01. Map of the study area.

Data collection and statistical analysis

This work consists of studying and characterizing reproduction of the common coot *Fulica atra*. It has been considered between January 2014 to June 2014 at El-Golea Lake. For this, a nest monitoring was carried out during the entire breeding season twice a week. The date of nest establishment, the start of egg laying, egg size, egg biometrics (large and small diameter) and nest characteristics (Composition, internal and external diameter, depth of nests and their height relative to water) were the parameters which were taken into consideration. Nests and eggs have been marked to better track lying from the start, and the measurements were made with an electronic caliper at 1 / 10th of a mm. The vegetation was grouped into four classes: *Scirpus lacustris*, mixed *S. lacustris*, mixed *Typha angustifolia* and other vegetation.

RESULTS AND DISCUSSION

Breeding habitats' characteristics

During the research, 45 nests were identified in the upper basin of the body of water during the whole study period, which spanned a breeding season from February to June in 2015 (03 nests during the month of February, 08 nests during the month of March, 21 nests in the month of April, 11 nests in the month of May, and 02 nests in the month of June). Most of the nests were associated with *Typha angustifolia* (96%), and *Scirpus lacustris* (04%), with a vegetation cover density that varies between 30% to 80%, and mean water

depth of $68,8 \pm 17,55$ (Table 01). These nests have an average outside diameter of $30,15 \pm 2,98$ cm with a maximum of 35 cm, an average internal diameter of $17,23 \pm 1,83$ cm with a maximum of 20 cm, and an average depth of $3,81 \pm 1,65$ cm. The nests were positioned at an average height of $13,38 \pm 1,92$ cm in relation to the water. The breeding strategy of this water bird is related to the density of the vegetation strata (*Phragmites australis*) (Huhta *et al*, 1998).

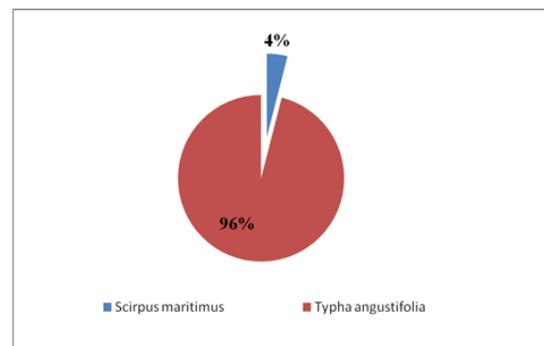


Figure 02. Percentage of vegetation use by nesting coots at El-Golea Lake

Table 01. Nest characteristics and egg measurements of common coot at El-Golea Lake

| | Mean ± SEM | Max. | Min. | N |
|-----------------------------|--------------|-------|-------|-----|
| Nest characteristics | | | | |
| Distance to shore (m) | 48,82±36,98 | 100 | 4 | 45 |
| External diameter (cm) | 30,15±2,98 | 35 | 20 | 45 |
| Internal diameter (cm) | 17,29±1,83 | 22 | 14 | 45 |
| Nest depth (cm) | 3,91±1,65 | 7 | 2 | 45 |
| Nest height (cm) | 13,38±1,92 | 17 | 10 | 45 |
| Water depth (cm) | 68,8±17,55 | 99 | 40 | 45 |
| Vegetation height (cm) | 118,66±39,11 | 190 | 25 | 45 |
| Vegetation density (%) | 48,89±15,88 | 80 | 20 | 45 |
| Egg measurements | | | | |
| Egg length (mm) | 54,13±1,67 | 58,36 | 49,52 | 257 |
| Egg breadth (mm) | 36,71±0,84 | 38,81 | 34,37 | 257 |

Clutch size

During the study, it was observed that female common coots lay between 1 and 11 eggs per clutch with an average of 5.6 ± 3.20 eggs per nest. 24.44% of broods (11 broods) with 6 eggs, 28.89% of broods (13 broods) with 7 eggs, 15.55% of broods (7 broods) with 5 eggs, 8.89% broods (4 broods) with 4 eggs, and 6.67% broods (3 broods) with 3 eggs, were found. Only 4.44% broods (2 broods) with 1 and 8 eggs, and 2.22% broods (1 brood) with 2, 9 and 11 eggs, were found.

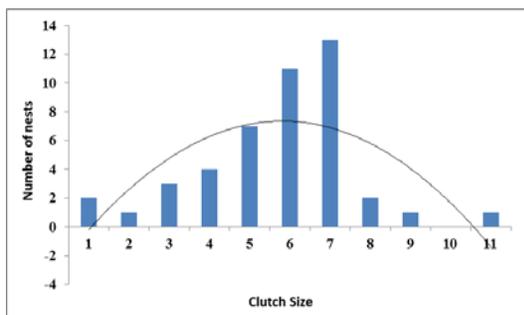


Figure 03. Frequency distribution of clutch size of coots.

Table 02. Egg measurements data in different studies of the breeding ecology of common coots in Algeria

| | Clutch size Average (Min - Max) | Dates (Start - Finish) |
|---|---------------------------------|-------------------------|
| Tonga Lake in 1997 by (Rizi et al., 1999) | 4,15 (1 - 8) | / |
| Timerganine Lake in 2005 by (Samraoui & Samraoui, 2007) | 7,2 (1 - 16) | (18 March - 02 July) |
| Réghaia Lake in 2010 by (Metna et al., 2013) | 4,8 (1 - 10) | (10 April - 10 May) |
| This study | 5,6 (1 - 11) | (20 February - 12 June) |

Egg-Laying period and laying size

Egg-laying by common coots started on February 20th and ended on June 12th, the mean egg-laying date was on April 17th. The laying size was between 1 and 11 eggs with an average of 5.6 ± 3.2 eggs. The results of this study are more important than those found in the coastal areas (Tonga Lake by Rizi et al., 1999 and Lake Reghaia by Metna et al., (2013), but are inferior to those cited by Samraoui and Samraoui (2007) in the Timerganine site, that may be due to the phenomenon of parasitism or the age of females (Table 02) according to Samraoui and Samraoui (2007). This phenomenon is well known in the region of Numidia.

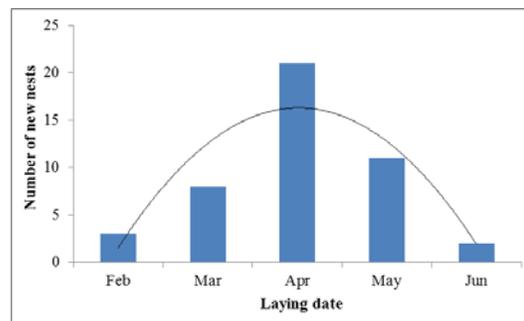


Figure 04. Distribution of laying period of coots at Lake El-Golea

Egg measurement

The 45 surveyed nests contained a total of 257 eggs. Figure 04 summarizes all the information on the characteristics of the eggs including the dimensions, the volumes and their shape indices. The large diameter of the 257 eggs measured was on an average of 54.14 ± 1.67mm with the maximum of 58.36mm, and the minimum of 49.52mm; the small diameter of the eggs was between 36.71 ± 0.84mm with the maximum of 38.81mm, and the minimum of 34.37mm. The lowest form factor of the 257 eggs studied was 17.87mm, and the strongest was 22.19mm, which gave us an average of 19.87 ± 0.84. The calculated volumes of the eggs were on an average of 34.75 ± 2.10 mm³.

The large diameter of the eggs measured in El-Golea Lake varied from 49.52 to 58.36 mm, giving us an average of 54.13 ± 1.67 mm. The small diameter varied from 34.37 to 38.81 mm with an average of 36.71 ± 0.84 mm. These results were similar to those found by Samraoui and Samraoui (2007) in the Timerganine wetland, and those found by Metna et al. (2013) in the Reghaia wetland and by Rizi et al. (1999) in the Tonga Wetland (Table 03).

The results were also similar to those found by several authors in Europe, which meant that this study site offers all the necessary conditions, especially the food necessary for the good development of the eggs of coots.

Table 03. Nests' size data in different studies of the breeding ecology of common coots in Algeria

| | Small diameter (mm) Moy ± Standard deviation (Min - Max) | Grand diamètre (mm) Moy ± Standard deviation (Min - Max) |
|---|--|--|
| Tonga Lake in 1997 by (Rizi et al., 1999) | 35 ± 0,7 (33,2 - 36,9) | 52,4 ± 1,9 (48,4 - 58,2) |
| Timerganine Lake in 2005 by (Samraoui & | 36,4 ± 1 (33 - 40,4) | 53,1 ± 0,1 (42,5 - 59,8) |

| | | |
|--|--------------------------|--------------------------|
| Samraoui, 2007) | | |
| Réghaia Lake in 2010 by (Metna et al., 2013) | 37,3 ± 1,3 (31,8 - 40) | 53,5 ± 2,3 (44,6 - 59,5) |
| This study | 36,8 ± 0,9 (34,1 - 38,8) | 54,2±1,7 (49,5 - 58,4) |

DISTURBANCE

This study highlighted the strong anthropogenic pressure on coots or other species at El-Golea Lake. Human disturbance was recognized as a threatening process that can affect habitat use or lower the breeding success of water birds (Flemming et al. 1988; Anderson and Keith 1980). The disturbance had an impact during those periods of the annual cycle when the species was most vulnerable to high energy demands like incubation.

CONCLUSION

This study presented new data on the reproductive ecology of the common coot *Fulica atra* at El-Golea Lake (Algerian Sahara); it is the first study in this region which indicated that the species is a regular breeder in the area, and also confirmed the reproduction of this species in wetlands of Algerian Sahara and their important role in its generation. The breeding strategy of this water bird is related to the density of the vegetation strata (*Phragmites australis*). Nouri et al (2013) suggested that the coots evaluate the level of the nest depredation before start to breed. In addition, the good nesting adaptive strategy of this common bird is influenced by the anthropic disturbance.

The cycle of reproduction of the common coot *Fulica atra* is faced by many troubles that can affect the breeding success (the habitat destruction and the excessive disturbance). This result can give us an image on the stability of the reproduction of this species despite the severe conditions. For this reason, some actions which are necessary to protect this species and also these wetlands should be carried out.

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