



## First Breeding of Common Coot (*Fulica atra*) at Mékhada Marsh (El-Tarf, Northeast Algeria)

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### Author's contribution

The sole author designed, analyzed, interpreted and prepared the manuscript.

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### ABSTRACT

The reproductive biology of the common Coots (*Fulica atra*). Variation in dimension of nests (external diameter, internal diameter and height), water depth and vegetation height on nest size, clutch sizes, egg sizes and hatching success were investigated. The study was carried in 2015 on a shallow freshwater marsh, Mékhada, part of the Numidian wetland complex situated in Northeast Algeria. The total number of built nests was (n=111). Coot nests are mainly made of The Common club-rush (*Scirpus lacustris*, 45%). Coot nests are characterized by an average internal diameter of  $14.58 \pm 2.48$  cm, an average external diameter of  $31.61 \pm 2.29$  cm and an average height of  $21.32 \pm 2.45$  cm. The average water depth in zones of Coot nesting is  $86.55 \pm 8.35$  cm. There was no correlation between water depth and nest height; however, there was a strong correlation between water depth and nest diameter. The first coot egg was laid on 12 March, the last one on the 29 June 2015. A total 180 eggs from 111 clutches were measured during nesting seasons. Mean clutch size was  $4.26 \pm 3.12$ . However, the average values of the egg dimensions are as follows: Egg length  $50.80 \pm 0.83$  mm, egg breadth  $32.40 \pm 0.53$  mm and egg volume  $41.58 \pm 1.03$  mm<sup>3</sup>. The correlation between length and breadth was highly significant. Hatching success for complete clutches was high (80%), coots (*Fulica atra*) bred at Mékhada Marsh at a high nest density and reproductive performances were influenced by adverse weather and more markedly by both predation and anthropogenic activities.

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## 1. INTRODUCTION

The Common Coot (*Fulica atra*) is an abundant aquatic bird that is highly territorial during the breeding season, especially in non-migrating populations [1-4]. Coots breed in a habitat which contains abundant nesting material (Fig. 1), and they use this material freely in constructing floating structures associated with breeding. These structures are bulky, and since materials seldom present a procurement problem, they are not built for permanence but must be added to repeatedly while in use. Coots are common and widely distributed in Algeria but relatively little is known of their reproductive biology in North Africa [3]. Our study was aimed at filling this gap and is a prelude to more systematic research focused on proximal factors influencing breeding density and nesting habitat of common coots (*Fulica atra*).

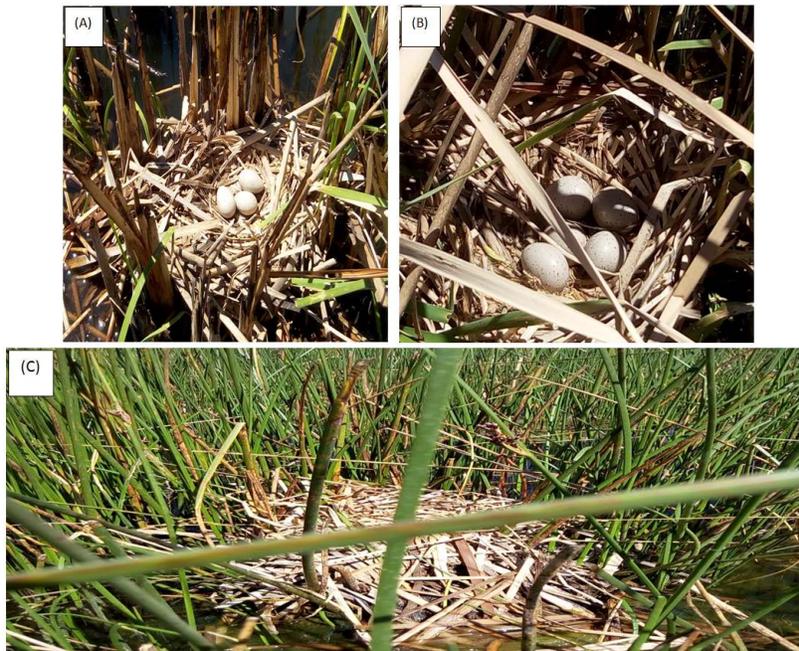
## 2. MATERIALS AND METHODS

The study was carried at Mékhada Marsh; in North-east of Algeria (36° 48' N, 08° 00' E). The vegetation of Mékhada Marsh was classified into four distinct strata supported on the dominant

plant in each formation. These four strata were made up respectively of: The Common club-rush (*Scirpus lacustris*) (Figs. 2A, B, C), reed (*Phragmites australis*), Sea Club rush (*Scirpus maritimus*) and lesser bulrush (*Typha angustifolia*). The *Scirpus lacustris* patch size was, however, estimated to be distinctly larger than the other three strata which were of similar size. Nests were found in all four strata but laying began relatively late among lesser bulrush where depredation of nests was heavy.



**Fig. 1. Common coot *Fulica atra*, adult in Mékhada Marsh, Algeria, 15<sup>th</sup> of May 2015, 18 h 30 (Boukrouma. N)**



**Fig. 2. Coot breeding structures. (A). Nest of a coot (*Fulica atra*) with three eggs showing how it is woven into the common club-rush. (B) and (C). Egg nest covered for brooding into the common club-rush in Mékhada Marsh, Algeria, 09<sup>th</sup> of March 2015, 10 h 30. (Boukrouma. N)**

The study was conducted from March-June 2015. Between March and April, surveys were led each day to record complete clutches, while in May, and June - once a week up to the expected time of hatching. In total, the lake was visited 552 times during this period and approximately 385 hours were spent on observation.

Nests were checked from a boat, when sedge vegetation was short and sparse at the beginning of the breeding season. Later, surveys were conducted in the water, wearing boots enveloped the waist. Each nest and all the eggs were given a number, with a permanent ink. Nest site characteristics such as internal and external diameters, nest height, were measured using the meter reel, we have measured water depth and height vegetation using respectively depth meter and double meter. In order to estimate the effect of vegetation height and water depth on nest dimensions of the common coot. Eggs were weighed to the nearest 0.1 g, using a Pesola spring balance. Lengths (L) and width (B) of eggs to the nearest 0.1 mm were measured using vernier callipers. We calculated egg volume (V) using Hoyt's [5] formula: ( $V = 0.000509 * L * B^2$ ). Laying date (date of first egg) and clutch size were determined [6]. Laying date was calculated, assuming a laying frequency of one egg day. The clutch was considered complete when on two consecutive days no additional egg was laid. Statistical tests (Pearson correlation, one-way ANOVA) were performed using Minitab 16.0 with a significance level of  $P \leq 0.05$ . All means are shown  $\pm$  standard error, unless stated otherwise.

### 3. RESULTS

Nests ( $n = 111$ ) were located 5–23 m from the bank, depending on the presence of emergent vegetation and water depth. The nests were well hidden. The water depth for nesting sites varied from 45 to 185 cm (Table 1). An attempt was made to find a correlation between the measurements of the nests ( $n = 111$ ) and the depth of the water at the places where they were located. There was no correlation between water depth and nest height ( $r = -0.020$ ). However, there was a strong correlation between water depth and nest diameter. (External diameter ( $r = 0.690$ ), internal diameter ( $r = 0.221$ ).

Nest-building was conducted by both sexes of a marked pair. One bird carried material to the nest site while the mate constructed the nest. The

construction and collection activities were often interchanged between the sexes. Although coots used structures built by other species for loafing, copulation, and brooding, all 111 nests in my study were built exclusively by coots.

The Common coots built their nests, using the following plants species: The Common club-rush (*Scirpus lacustris*, 45%), reed (*Phragmites australis*, 30%), Sea Club rush (*Scirpus maritimus*, 20%) and lesser bulrush (*Typha angustifolia*, 5%). Furthermore, Coots preferentially initiated laying in *Scirpus lacustris* stands where emerging vegetation was growing fastest and then shortly after (early April) used *Phragmites australis* stands. In early May, coots started nesting in the *Scirpus maritimus* stands while *Typha angustifolia* stands were not used until late June.

Descriptive characteristics of nest sizes of Coots breeding on Mékhada Marsh are presented in Table 1. No significant differences between the mean external diameter and height of nests found in the vegetation strata ( $F = 1.43$ ,  $P > 0.05$ ). As different nest dimensions were evidently interdependent; we treated them as components of a multivariate variable. This interdependence is shown by coefficients of Pearson correlation between nest height and internal ( $r = +0.290$ ;  $P > 0.05$ ). (Fig. 3), and external ( $r = -0.125$ ;  $P > 0.05$ ). Diameters (Fig. 4) and between internal and external diameters ( $r = +0.316$ ;  $P > 0.05$ ) (Fig. 5). When comparing the mean external diameter and height of nests found in *Scirpus lacustris* and *Phragmites australis*, the differences were statistically significant (external diameter,  $F = 2.56$ ,  $P < 0.05$ ). Nests located in The Common club-rush had a mean external diameter (MED) of 31.1 cm and a height above water (HAW) of 47.2 cm whereas those found in reed had a MED of 29.7 cm and HAW of 62.4 cm.

In Mékhada Marsh, the first coot egg was laid on 12 March, the last one on the 29 June 2015. (Fig. 6). The mean laying date and the median were respectively 19 May and 14 April 2015. Incubation lasted from 22-27 days. The clutch size varied from 2 to 18 (Fig. 7). We could find no significant difference in clutch sizes between nests in *Scirpus lacustris* and *Phragmites* ( $P > 0.05$ ).

The mean clutch size was  $4.26 \pm 3.12$  ( $n=111$  clutches). Mean values of the egg dimensions were as follows: egg length  $50.80 \pm 0.83$  mm ( $n$

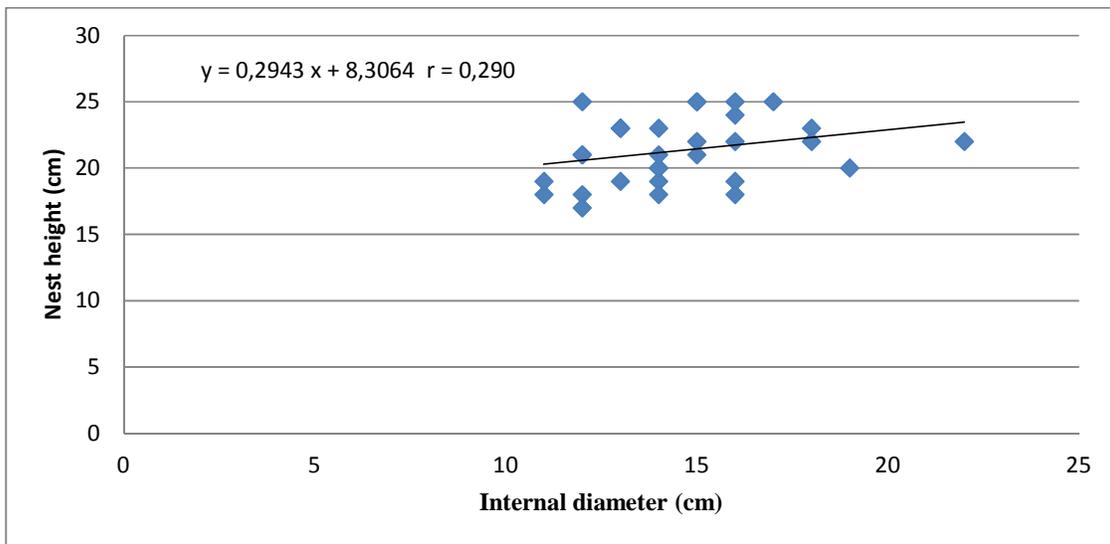
= 111), egg breadth  $32.40 \pm 0.53$  mm (n = 111) and egg volume  $41.58 \pm 1.03$  mm<sup>3</sup>. The correlation between length and breadth was highly significant ( $r = 0.52$ ,  $p < 0.05$ ). Results of

one-way ANOVA tests revealed that egg dimensions not differed significantly in clutch size ( $F = 0.13$  for length (L),  $F = 0.21$  for breadth (B) and  $F = 0.20$  for volume;  $P > 0.05$  in all cases).

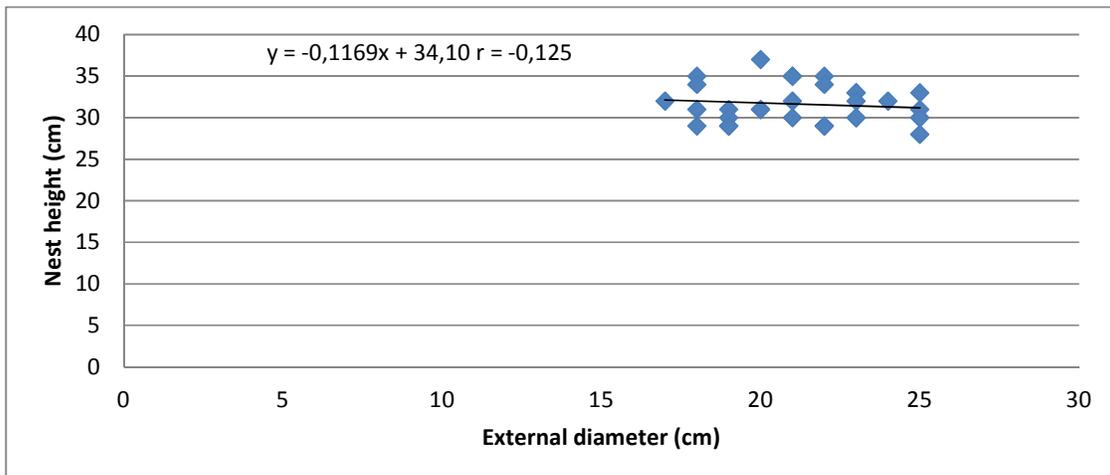
**Table 1. Nest measurements of coots breeding at Mékhada**

	Mean $\pm$ SEM	Min.	Max.
External diameter (cm)	31.61 $\pm$ 2.29	28.0	37.0
Internal diameter (cm)	14.58 $\pm$ 2.48	11.0	22.0
Nest height (cm)	21.32 $\pm$ 2.45	17.0	25.0
Water depth (cm)	86.55 $\pm$ 8.35	45.0	185.0
Vegetation height (cm)	112.81 $\pm$ 10.87	97.0	130.0

SEM: Standard Error of the Mean; Min: minimum; Max: maximum



**Fig. 3. Correlation between the nest height and internal nest diameter (r = coefficient of correlation)**



**Fig. 4. Correlation between the nest height and external nest diameter (r = coefficient of correlation)**

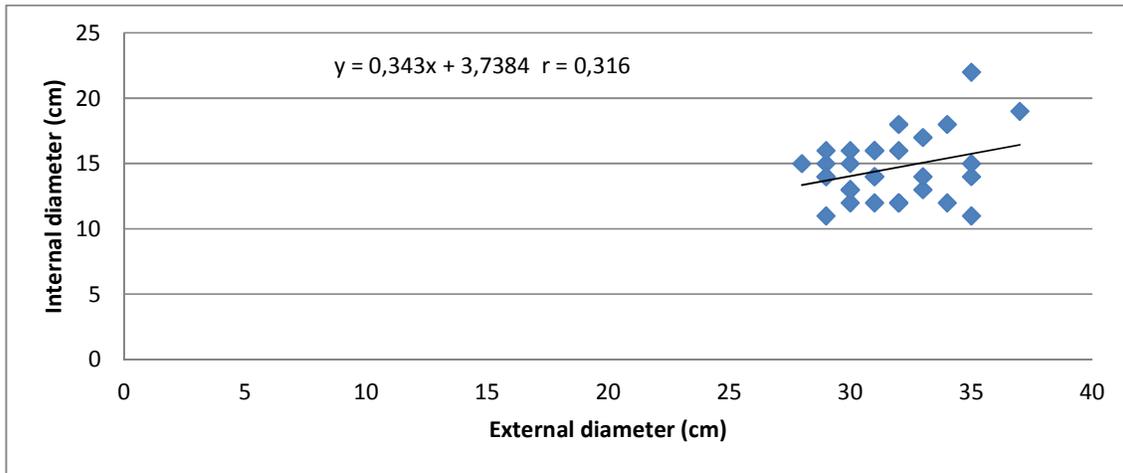


Fig. 5. Correlation between external and internal nest diameter ( $r$  = coefficient of correlation)

Table 2. Egg measurements of coots breeding at Mékhada Marsh

	Mean $\pm$ SEM	Min.	Max.
Egg weight (g)	36.80 $\pm$ 1.92	14.0	46.5
Egg length (mm)	50.80 $\pm$ 0.83	50.0	52.8
Egg breadth (mm)	32.40 $\pm$ 0.53	22.0	40.4
Volume (mm <sup>3</sup> )	41.58 $\pm$ 1.03	40.72	43.2

SEM: Standard Error of the Mean; Min: minimum; Max: maximum

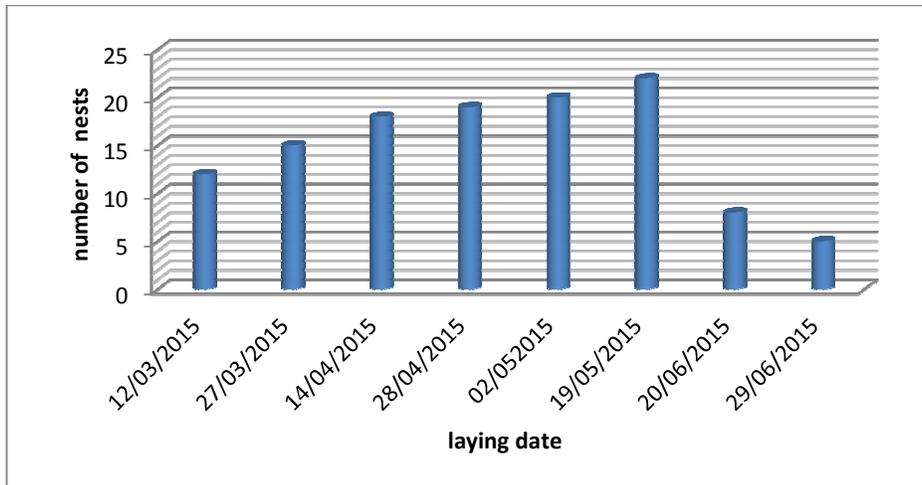


Fig. 6. Chronology of initiation of laying by the common coot (*Fulica atra*) at Mékhada Marsh

All nests were checked around the expected day of hatching. The percent hatch during the study period (not including emptied nests) was 80%. Five nests failed to hatch at least one egg (15%). The reasons why these nests were deserted remained unanswered. We could not test for differences between central and peripheral nests because the latter suffered most from the act of vandalism that occurred prior to hatching. Two nests were discovered to be depredated.

Predation seems to have been collected in the early stages of the breeding period, in March and June where at least 3% of the nests were depredated. The collection of eggs by humans was recorded at 2% of nests, during the same period. By 16 to 20 days the young coots feed themselves to a large extent and by 30 days are independent, though still often feeding in company with their parents (Fig. 8).

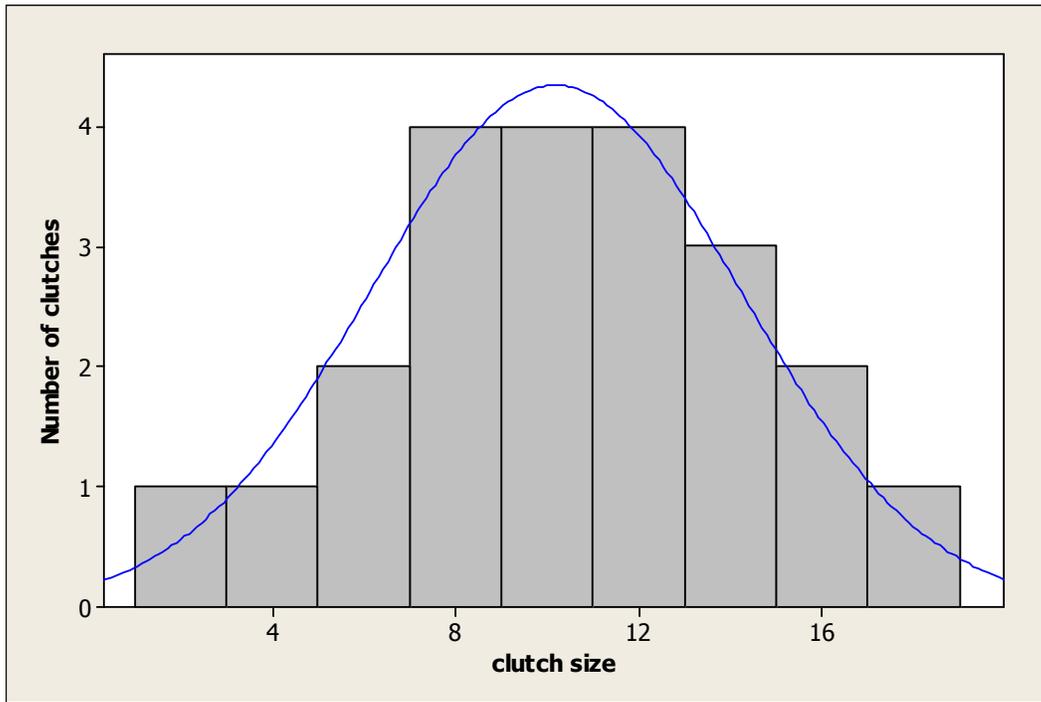


Fig. 7. Frequency of clutch size in the population breeding of coot (n=111)



Fig. 8. Common coot *Fulica atra*, adult feeding 2 chicks in Mékhada Marsh, Algeria, 25th of June 2015, 20 h 30 (Boukrouma. N)

#### 4. DISCUSSION

The Common coots build a new nest every year [6]. Thus, nest construction seems to be associated with defense of territory. We suggest that nest building is a consequence of territoriality. Our results about the nest sites selection correspond to the data obtained by Zitouni et al. [7]. From this study, the location of the nests depends on the dominated plant species. Most of the nests are placed amongst Common club-rush, which is the dominating plant

species in the Mékhada Marsh. This corresponds to the results obtained in Oubeira [3] where coot nests were situated among *Scirpus lacustris*, *Glyceria fluitans*, and *Sparganium minimum*. In Timerganine Lake, the dominating plant species is reed and most of the nests of coots were built amongst it. This reveals that the coot locates its nests amongst the available type of vegetation in wetlands.

In *Scirpus lacustris* stands, nests were well sheltered and the small proportion (5%) found in the *Typha angustifolia* stands, probably reflects a higher predation risk, especially from the air. Our result indicates that nest dimensions were related to vegetation strata (and depth of water). Nests constructed among the Common club-rush (*Scirpus lacustris*) were bulkier but had a lower height above water than nests located in reed (*Phragmites australis*). Cramp and Simmons [8] have already linked nest size with water level. Rizi et al. [3] suggested another non-exclusive explanation that nests built from a rigid material like Common club-rush have a larger external diameter. This report is in agreement with our findings.

The start of egg laying in late April and May is typical of North African Coots [9], but it is later than in most of the Western Palearctic [10]. The

mean laying date at Mékhada Marsh is similar as found by Samraoui and Samraoui [6]: 4 May and Nouri et al. [11] 2 May in Lake Timerganine. Our result showed that the timing of breeding in Algerian conditions may differ from year to year as well as in space, most probably depending on some proximal environmental clues, especially on the highly variable rainfall.

Rizi et al. [3] have reported that the mean egg length and breadth of North African coots are slightly smaller than that of coots breeding in northern parts of the taxon's geographical range. Our result does not support the suggested pattern of a latitudinal gradient of egg size as Algerian coot eggs were no smaller than their European counterparts.

The clutch size recorded in the present study (2-18 eggs) falls in the range reported by other authors [12,8,13,3,6]. It has been hypothesized that clutch size in this species increases with latitude [3]. However, Samraoui and Samraoui [6] suggested that the pattern is more complex than just latitudinal, and probably related to relative food abundance between regions and/or habitats, or to the relative variation in food abundance among years within each site. These authors also indicated that conspecific brood parasitism (and supernormal clutches) may be confounding factors in analyses geographic variation in clutch size.

Generally, between clutch differences in egg size are related to differences between female age, since in birds old animal lays heavier eggs than young ones [14]. Average egg size values (length, breadth, volume) found in this study was similar to those reported in other studies [8,13,3,6]. The studied eggs of coots from the Mékhada Marsh were slightly smaller than those noted in the colony on Vlieland (West Frisian Island of Vlieland) [15]. Egg sizes were very similar to those on fishponds in eastern Poland [16].

Previous studies have shown considerable variation in hatching rates, ranging from 40% [7] to 97.1% [17]. The present study shows a hatching success similar to that found in Lake Timerganine [6]. Our high value for the hatching rate is influenced by both egg loss (depredated nests not included) and failure of eggs to hatch as we found that natural brood reduction [18] through nonhatching of eggs was low at Mékhada Marsh.

## 5. CONCLUSION

The coot *Fulica atra* is the common species of the Algerian wetlands [3]. The breeding biology of this water-bird in Mékhada Marsh North-east of Algeria seems to fall within the general pattern observed for this species elsewhere. The present investigation together with other studies carried out in diverse conditions provides better insight into the range of reproductive strategies of this species.

## COMPETING INTERESTS

Author has declared that no competing interests exist.

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