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## Study of the Ruddy Shelduck (*Tadorna ferruginea*) diurnal behavior in Chott El-Hodna (Central Hauts Plateaux of Algeria)

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**Abstract**

The ecological study of the Ruddy Shelduck (*Tadorna ferruginea*) was done during two consecutive years (2014/15 and 2015/16) in the main wetlands of the center Hauts Plateaux of Algeria: Chott El-Hodna (362.000 ha) and Chott Zahrez Chergui (50.985 ha). The maximum of effectives (1235 individuals) was recorded during January. These hidden water birds occupied the border and the small islands of these two Chott, assembled in little groups and rarely associated to other water birds. The diurnal time budget of this species in Chott El Hodna was dominated by the feeding (50.5%), followed by sleeping (20.5%), swimming (8%), preening (7%), courtship (4.1%), resting (4%), agonistic activity (3%), flight (1.5%) and locomotion (1%).

**Keywords:** wetlands, Ruddy Shelduck, Chott, Diurnal time budget, Hauts plateaux, Algeria.

**1. Introduction**

Ruddy Shelduck *Tadorna ferruginea* is a highly ranked species that is cited as threatened species by IUCN and is very abundant in North Africa, Asia and Europe [9]. Its size is estimated at 2,500 birds [12]. Present in North Africa with a local population, but far from negligible [4, 5]. Its range then widened from the eastern part of the country to the southwest through the Middle Atlas, the High Atlas, the Anti-Atlas, through the valleys of Ziz and Low Drâa [2], in Aguelmam Sidi Ali and Aguelmam Tifounassine [9]. In Tunisia, this species is also regularly observed throughout the year in South part: Gafsa-Gabès [1] but with reduced numbers and in Algeria this shelf is usually observed On the chotts and sebkhas of the semi-arid regions between the Tell Atlas and the Saharan Atlas and on the vast Saharan wetlands [17, 15]. Reported often as an occasional breeder [7, 10] and is in fact sedentary. The most frequented sites are Chott Tinsilt, Garaet Djendli, Garaet Boulhilat, Garaets of Ouled Amara and Ouled M'barek (Hauts Plateaux of Constantinois) [18, 19], all wetlands in the Oued Righ Valley [17], Boughzoul Lake [3] and Chott El-Hodna. At the latter site and all the wetlands of the Central Hauts plateaux of Algeria, the Ruddy Shelduck although it is very abundant has not benefited from previous ecological studies. We propose in this work to follow its phenology and the evolution of the numbers of this species of Anatidae and monitoring its diurnal behavior in the largest wetlands in the center Hauts plateaux region: Chott El -Hodna.

**2. Materials and methods****2.1 Study area**

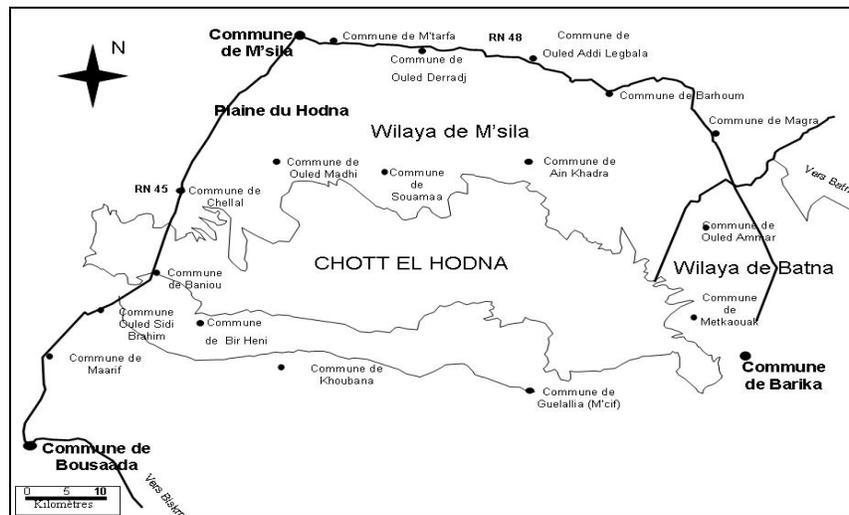
Chott El Hodna (35 ° 18'-35 ° 32N; 4 ° 15'-5 ° 06 'E) is a 392 m high wetland that is part of a series of chotts in the central Hauts plateaux (Table1). It is a saltwater lake extending over an area of 362 000ha, which makes it the most water surface still in water of Algeria. It is located in 150 km south of the city of Algiers and it is bounded to the north by the Biban chain and the Hodna mountains [6]. To the south part by the eastern-end of the Saharan Atlas and The Zab Mountains, to the east part by Djebel Metlili and to the south-east part by Barika and Djebel Tsenia [8], to the south-west part by the mounts of Boussaâda [11] and to the west part by the occidental high plains [6]. This site bellow to two wilaya: M'sila (95% of the area) and the Batna (Fig.1).

The water in this wetlands become from many Oueds of the region, the most important of which are Oued Lougnane, Oued El-Hem, Oued Kssob, Oued Barhoum, Oued M'sif and Oued Soubella. It is also an ideal hideaway for many avian species previous study reported that 39 species belonging to 12 families was observed, the main ones was the Common Cranes *Grus grus* [15], the Great Flamingo *Phoenicopterus roseus* and the Common Shelduck [15]. Around the banks of

the site grow a very abundant flora adapted to the pedological nature of the ground. It is composed mainly by *Atriplex halimus*, *Salosola fruticosa* (Chenopodiaceae) and *Matthiola arvensis*, *Mauricandia arvensis* and *Diplotaxis ericoides* (Cruciferae). It should be noted that in recent years many apricot trees have been planted on all the eastern and south-eastern parts of the lake in order to supply the agronomy industries in the region.

**Table 1:** Mainly wetlands of the central Hauts plateaux of Algeria

Wetland	GPS	Area	conservation status
Chott El-Hodna	35°18' et 35°32'N4°15' et 5°06'E	362.000 ha	Ramsar
Chott Zahrez Chergui	35°08'35°19'N, 3°24'3°43'E	50 985 ha	Ramsar
Chott Zahrez Gharbi	34°51'34°58'N, 2°36'2°58'E	52.200 ha	Ramsar
Lac Boughezoul	35°44'18" N, 02°48'56" E	1000 ha	/
Dayet El-Karfa	35°41.384 N, 02°50.264 E	600 ha.	/



**Fig 1:** Situation of Chott El Hodna (M'sila) [15].

### 3. Data collection

The Ruddy Shelduck *T. ferruginea* populations were monthly counted for two consecutive years from September 2014 to September 2016 at the Chott of El-Hodna and other wetlands in the region in order to comparing this number in the five sites of region. The counts were carried out from different observation points in order to identify the groups of waterbirds. Visual estimation method was used in this study to count shelves if the population of birds exceed 200 individual [20]. In other case, we used individual enumeration if the number of shelves did not exceed 200 individuals. In the second part of the study, a monitoring of the diurnal time activities was established during the two inter-nuptial periods of the study period (2014-2015 and 2015-2016), from October to April. It was carried out every hour from 8:00 am to 4:00 pm using Scan method [13]. Nine activities were recorded including: feeding, sleeping, swimming, preening, thefting, courtship, locomotion, resting and antagonistic activity.

### 4. Results

#### 4.1 Number of birds

In Algeria, Ruddy Shelduck *T. ferruginea* is a key species of the Hauts plateaux and Sahara wetlands. This bird regularly frequents large and shallow sites [17]. In Chott El-Hodna this bird is classed as nested and sedentary species. During this study, it was observed with low numbers during September

and October, then effective rise immediately afterwards, reaching their peak during January and February (more than 1200 individuals) (Figure 2). Maximum numbers are often noted during January and February, confirming the results obtained in previous studies in Saharan wetland [15, 16, 17]. The most important sites in this region are: Chott El-Hodna and Chott Zahrez Chergui, which alone account for more than half of the shelves population. Other wetlands in this region such as: Chott Zahrez Gharbi, Lac de Boughezoul and Dayet El-Karfa have low numbers during the study period. Globally, the evolution of shelves number in all wetlands exhibit a U-shaped Gaussian pattern, where abundance is low at the beginning of the study, which increases and then rise during the months of June, July and August (Fig. 2). This evolution of number is observed in all wintering and breeding Anatidae of Mediterranean wetlands [13, 20, 21]. These birds have a wild behavior generally observed on the banks and small islands of these sites. They are often grouped into small population of males and females. They are rarely associated with other bird species such as the *Tadorna tadorna* and the Anatidae. Thus, compared to other wetlands in the arid and semi-arid regions of Algeria, the Ruddy Shelduck, which is a sensitive species to the water depth variation, don't change their number according to water depth variation in this region. These large and little studies wetlands seems to be an ideal refuge for these birds and for many other Western Palearctic birds. Thus, they also constitute important ecosystems in the region.

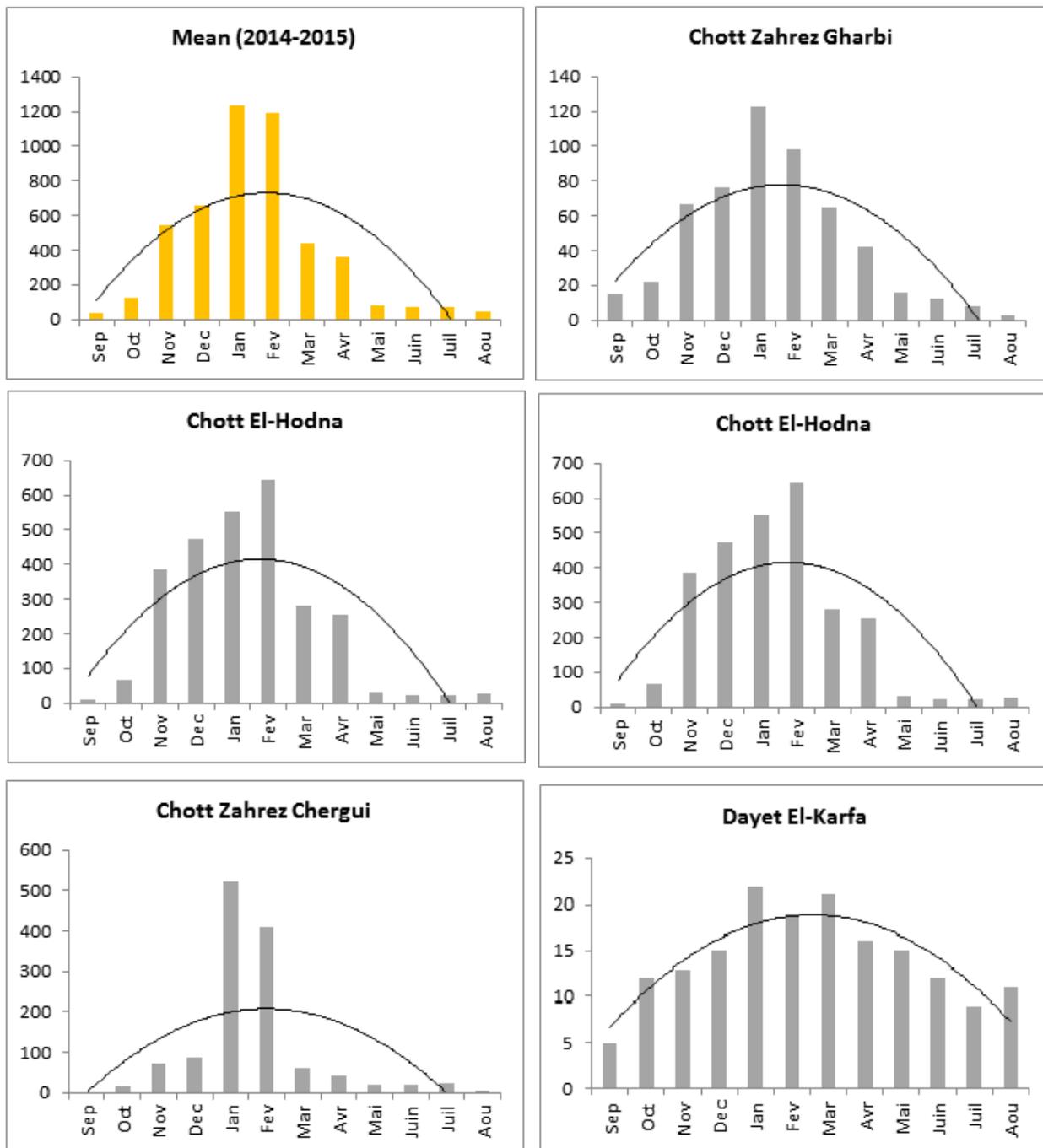


Fig 2: Abundance of the Ruddy Shelduck in the wetlands of the central Hauts plateaus of Algeria.

#### 4.2 Diurnal budget time

The rate of diurnal activity of the Ruddy Shelduck at Chott El-Hodna is dominated by feeding activity with 50.5% (Figure 3). Followed by sleeping (20.5%), then swimming (8%), preening with 7%, courtship (4.1%), resting (4%), Agonistic activities (3%), thefting (1.5%) and locomotion (1%). The feeding is an essential activity for all Anatidae species [13, 20, 21]. This activity was done in the banks of sites and sometimes in water. On the banks, feeding is done in muddy places with three ways: by tilting the body, by immersing the head in water or squarely at the surface using only their beaks. Sleeping activity is also a main diurnal activity for Anatidae [13, 20, 21]. In the Hauts plateaux, we have observed grouped individuals at the centers of the wetlands. The highest rates are mainly recorded at the start of the day. Swimming noted with rates not exceeding 10% is an activity

of comfort for Anatidae. It is often associated with feeding because in this taxa the feeding in water is synonymous to movement in water. These maximum rates were often recorded during the mid-day. The preening is often cited in the literature as a comfort activity for birds [13, 20, 21]. It was often observed at the start of the days on the banks with a small groups or in the isolated birds. Courtship activities although accounted in a small part of diurnal time budget of the Ruddy Shelduck at Chott El-Hodna, it was observed mainly from January, just before the beginning of the breeding season that allows the birds selected their congeners in order to begin a nesting in the following months. It is mostly recorded at the beginning and at the end of the day. We also noted that this activity is also done with small groups. Resting activity is an important activity for these birds. It is noted exclusively on the banks of the wetlands,

where the Ruddy Shelduck exhibit collective resting. This activity is started at the mid-day while temperatures reach their maximum. We also noted that the shelves resting in pairs. The agonistic activities are also observed. This activity characterized the start of the breeding season (from February to March) where birds are looking for a partner before starting the breeding period. Flying activity also takes a small part in the diurnal time budget of the shelves. This behavior allows individuals to fear a disturbance caused by diurnal predators such as: mammals and diurnal raptors. This activity was recorded at the beginning and at the end of the days. Locomotion in the banks of the Chott is noted with very low rate and with a small group of shelves. This activity allows these Anatidae to join other groups in order to enlarge it.

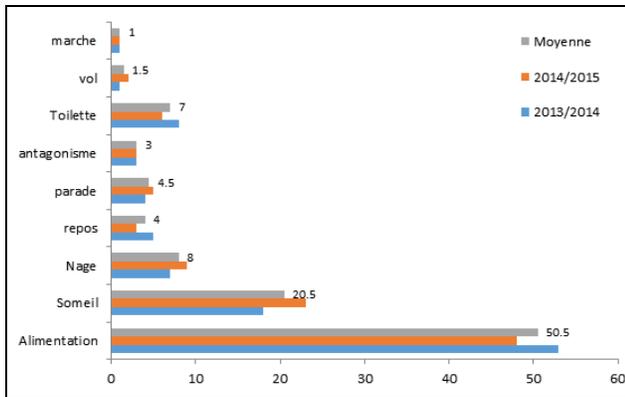


Fig 3: Diurnal time budget of Ruddy Shelduck

## 5. Conclusion

The Ruddy Shelduck *T. ferruginea* is a very abundant species in the wetlands of the Central Hauts plateaux of Algeria. The most frequented wetlands are those with large areas such as: Chott El-Hodna and Chott Zahrez Chergui, which seem to be the preferred ecosystems for wintering and breeding of these waterbirds. It is also the most diversify wetlands in the Central Hauts plateau of Algeria. These birds are often observed in groups mainly on the banks of wetlands with sex ratio of 50%. Also, the diurnal time budget is mainly dominated by feeding activity which exhibit a high rates that exceed 50% of the total daily diurnal budget time. It should be noted that hunting and poaching of these birds and all other species (especially the Great Flamingo *Phoenicopterus roseus*, the Common Crane *Grus grus*, the Common Shelduck *Tadorna tadorna*) are intense in this region despite the Ramsar protection status of Chott El-Hodna.

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