



Original Article

Ecology and behavioral response of Ruddy Shelduck (*Tadorna ferruginea*) in the wetland complex of Oued Righ valley (Algerian Sahara).

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ARTICLE INFOR

Article history:

Received 25 January 2021

Revised 22 March 2021

Accepted 25 April 2021

Keywords:

Oued Righ;

Population;

Behavior;

Ruddy shelduck;

Wetlands.

ABSTRACT

The wetland complex of Oued Righ valley accommodates a population of Ruddy Shelduck (*Tadorna ferruginea*) between 2012 and 2014, the total reached 80 individuals in the Lake Hamraia where the species wintering. The analysis of the diurnal time budget of wintering populations revealed the role of feeding area delivery for this species and they devoted their day time to feeding (51.2%), sleeping (18.8%), followed by swimming activity (6.3 %), and courtship activities with flying (2.03%) which often occurs after disturbances caused by human or by Marsh harrier (*Circus aeruginosus*). It is interesting to study the behavior of these ducks in Saharan bioclimatic area and follow the phenology and characteristics in order to preserve the biodiversity in this region.

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1. Introduction

The Ruddy Shelduck (*Tadorna ferruginea*) is considered a vulnerable species undergoing a large decline in Europe, the North West African population is relatively stable [Error! Reference source not found.]. It has been little studied in the world [2]. But now we can find several studies that are interested in this species in Asia [3,4], in Europe [5,6] and In North Africa [7,8,9,10,11,12,13,14]. Other ecological aspects such as activity budgets of ducks provide valuable information on habitat use and assist in managing populations [15].

As one of the few species that breed erratically over large expanses of arid parts of North Africa, the Ruddy Shelduck has proved to be a difficult species to study and, apart from a few isolated reports, the species has overwhelmingly been neglected. Although it is known that North Africa is an important breeding and wintering ground for

waterbirds [16,17,18].

Wetland resources comprise of the water, land, soils, plants, and animals, which may be exploited for subsistence, income, and employment [19]. Large surface area, differences in water quality and its availability are important characteristics of this area located in the heart of the Sahara, many habitat types with different morphological characteristics were distinguished in the wetland complex of Oued Righ [12].

The aim of the present study was to analyze the dynamics of diurnal behavior and wintering strategy of this species at the lake Hamraia in the wetland complex of Oued Righ valley.

2. Materials and Methods

2.1. Study area

The Oued Righ valley is located in the eastern part of

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Peer review under responsibility of University of El Oued.

DOI : <http://doi.org/10.57056/ajb.v2i1.33>

the Algerian Sahara. This region is an elongated depression with an altitude change to more than 41 m below sea level (Chott Merouane) [12]. The area has a hot and arid climate.

The study was carried out in Lake Hamraia (34°5.483'N, 06°13.292') located in The Oued Righ Valley, Southeastern Algeria (between the three department Biskra El-Oued and Ouergla) (Figure1).

This water body of 30 hectares constitutes the outlet for the wastewater of the municipality of Hamraia, evacuated by nozzles to the site. It is in water all year round and is completely surrounded by Phragmites. It is also a favorable wintering place for many Anatidae such as the Ferruginous Duck *Aythya nyroca*, the Marbled Teal (*Marmaronetta angustirostris*) and the Northern Shoveler (*Spatula clypeata*).

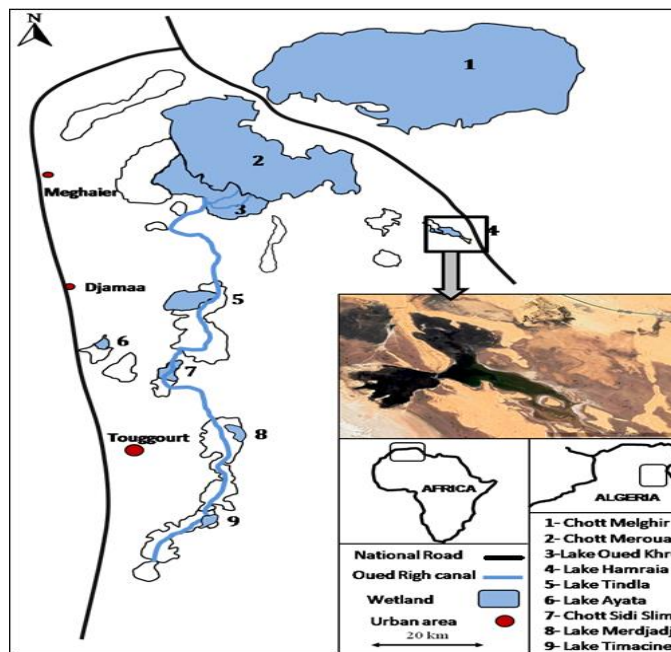


Figure 1. Location of Study area.

2.2. Bird survey

The populations of Ruddy Shelduck (*Tadorna ferruginea*) were monitored by bimonthly counts carried out from August 2012 to May 2014 in the lake Hamraia by using an ornithological telescope (KOWA 20 × 60). When the population size of the Ruddy shelduck did not exceed 200 individuals and the birds were close enough to the observation point, we counted all the birds; and if the population size of Gadwalls exceeded 200 individuals, a visual estimation was done by splitting the visual field to several strips, counting the number of birds in one strip, and then estimating the total number of birds [20,21].

Also, a diurnal behavior was studied to determine the ecological role of this site. Regular observations of diurnal behavior were made using the scan method [22], numerous scans were done. from 08:00 to 16:00 [23,24, 25] with a total of 128 h during the two wintering

seasons of 2012/2013 and 2013/2014.

Nine activities were measured: feeding, sleeping, swimming, preening, resting, flying, courtship, walking and antagonistic activity.

2.3. Data analysis

One-way ANOVA was carried out using the PAST program (Pale ontological Statistics) Version 3.14 (1999-2016) with a significance level of $p \leq 0.05$ to determine. The existence of significant differences between years.

3. Results and Discussion

3.1. Phenology

Lake Hamraia is the main site where the species is observed almost throughout the year, pairs or small groups of Ruddy Shelduck (*Tadorna ferruginea*) are mostly observed at the edge from the lake and near areas saturated with water (Figure 2).



Figure 2. Ruddy Shelduck (*Tadorna ferruginea*) in Lake Hamraia

During two years of observations and study, the early colonization of the site by Ruddy shelduck was noted. The first winterers are recorded towards the end of August with low numbers (10 to 15 individuals) during the two seasons, then increases gradually following the arrival of small groups during the months of December and January along the two seasons. This variation observed in this lake shown a difference significant (Anova test) $F_{(39;1)}=2265.03$, $P<0.05$. The peak of this species was noted in 80 individuals is reached in January 2014. Successive collapses, reflecting prenuptial migrations, are immediately observed, bringing the total abundance to 11 individuals during the month of May 2013 (Figure 3).

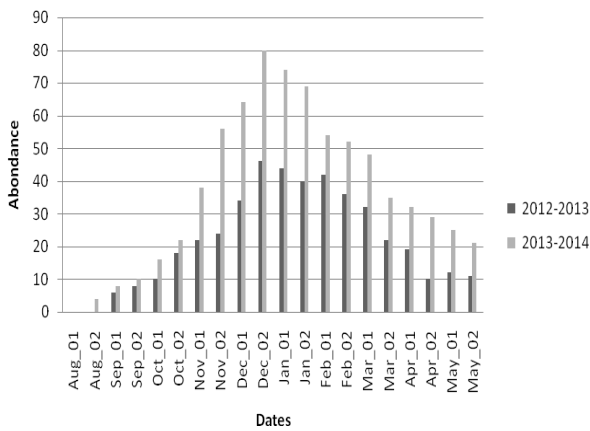


Figure 3. Seasonal changes in Ruddy Shelduck numbers on the lake Hamraia in 2012/2013 and 2013/2014.

3.2. Diurnal Behavior Study

Exploration of the results of diurnal rhythms of the Ruddy Shelduck (*Tadorna ferruginea*) in the site after 108 hours of monitoring, shows that the diet is the main and dominant activity exceeding 50%, followed by the activity of the sleep with nearby rates 20%, then other activities: swimming 9.3%, preening 6.3%, antagonism 4.38%, courtship 3.5%, resting 3, flying 2.33% and in last position the walking with 0,6% (Figure 4).

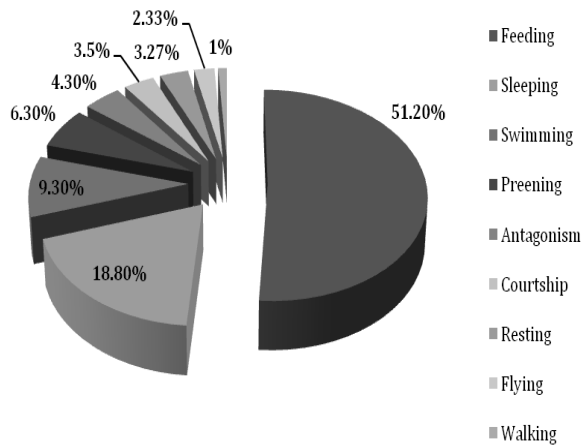


Figure 4. Proportions of the various diurnal activities of the Ruddy shelduck at the lake Hamraia in 2013/2014.

3.2.1. Feeding

Feeding is often nocturnal in Anatidae [26]. This activity is dominant in the total balance sheet 51.2%. In general, the highest values 58% of this activity were recorded during the month of December and the lowest values are however noted during the month of September. The Ruddy Shelduck (*Tadorna ferruginea*) prefers to feed on the edges of lakes in muddy places. Of which 87% with the spout on the surface of the water, and 13% only by tilting (Figure 5).

3.2.2. Sleeping

Sleeping is an activity of comfort in Anatidae [27], often interrupted by the presence of humans and predators. Or the highest rate 18.8% is recorded at the beginning of the day in the water balancing zones and in the center of the lake (Figure 5).

3.2.3. Swimming

The swimming activity, which ranks third in this report with a rate of 9.3%, is most often observed in pairs of The Ruddy shelduck (*Tadorna ferruginea*) at several times of the day (Figure 5).

3.2.4. Preening

Preening is cited in the scientific literature as an activity of comfort in birds [26,27]. This activity is noted massively with a rate of 6.3% among the first occupants of Lake Hamraia. It was noted especially at midday on the banks (Figure 5).

Generally the activities of antagonism, parry, flying, rest and walking are seldom observed and hold only a small part in the activity report (Figure 5).

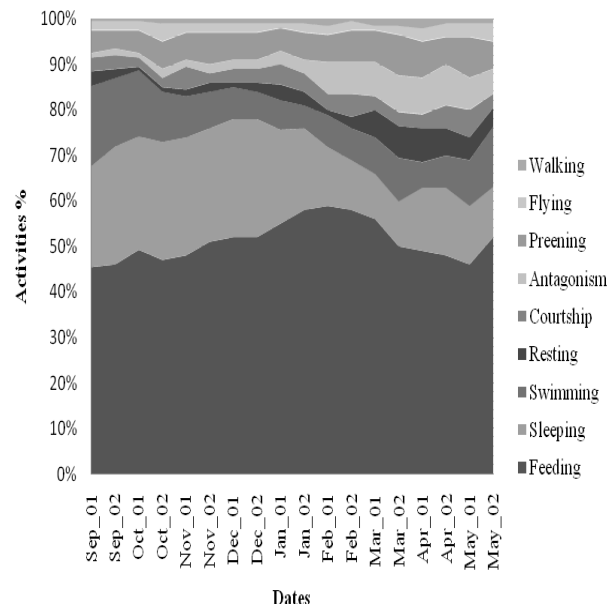


Figure 5. Dynamics of activities of The Ruddy shelduck at the lake Hamraia in 2013/2014.

4. Conclusion

The lake Hamraia in Oued Righ valley plays an important role for the Ruddy Shelduck (*Tadorna ferruginea*). It has occupied it for a period of ten months, from August 2012 until the end of May 2013 and from this fact presents the status of wintering. The maximum numbers are recorded during the months of December and January during the two seasons. Feeding is the main diurnal activity in this report. Finally, the results of our research highlight the ecological significance of the wetland complex of Oued Righ valley as one of the most important wintering areas in Algeria for the Ruddy shelduck and others waterbird species.

Acknowledgements

We thank the members of Association Nationale Algérien d'Ornithologie (A.N.A.O) for their assistance.

Conflict of Interest

The authors declare that they have no conflict of interest.

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Recommended Citation

NOUIDJEM Y., ZOUBIRI A., MEROUANI S. & MIMECHE F. Ecology and behavioral response of Ruddy Shelduck (*Tadorna ferruginea*) in the wetland complex of Oued Righ valley (Algerian Sahara). *Alger. j. biosciences*. 2021, 02(01):001-005.



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