



On the breeding ecology of the Ruddy Shelduck (*Tadorna ferruginea*) (Anseriformes: Anatidae) in Oued righ valley (South-East of Algeria)

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Abstract

We present the first data about the reproductive biology of the Ruddy Shelduck (*Tadorna ferruginea*) at Oued Righ valley in the South-east of Algeria. During the period 2009-2011; successful nesting was recorded at most sites of the wetland complex for the first time in this region. Information on its reproduction concern observations and censuses pairs with chicks. We also investigated nest site selection and measured breeding parameters. This study is to contribute to knowledge the reproduction of this bird.

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Introduction

The Ruddy Shelduck (*T. ferruginea*) was mentioned in North Africa by Vielliard (1970) as a breeder species, but with reduced numbers. Cramp and Simmons (1977) reported that the Ruddy Shelduck inhabits lakes, salt lagoons and marshes, hills, high plateaus and mountainous regions up to an altitude of nearly 5000 m. This species has the peculiarity to breed in open steppe country near a high diversity of water bodies of freshwater or brackish nature (Del Hoyo *et al.*, 1992). This bird preferred nesting in open spaces where there is water (Johnsgard, 1978).

The Ruddy Shelduck has been little studied in the world (Del Hoyo *et al.*, 1992). But now we can find several studies that are interested in this species in Asia Quan *et al.*, (2001), Vyas, 2005, Yang *et al.*, 1995, Europe Palacios (2002) and Garcia del ray (2008) and North Africa Azafzaf *et al.*, (2002), Khaffou *et al.*, (2012), Boulekhssaim *et al.*, (2013), Nouidjem *et al.*, (2015).

The western population of this species nested in Andalusia (Spain) Vielliard (1970), in the Canary Islands (Fuerteventura) (Palacios, 2002), in Morocco at Aguelmam Sidi Ali. (Khaffou *et al.*, 2012) and in south-ouest of Tunisia (Azafzaf *et al.*, 2002). The breeding status of the Ruddy Shelduck in Algeria was grossly underestimated in the past (Vielliard, 1970; Monval *et al.*, 1987), it was confirmed in the south-west of Algeria: in El Golea and Kerzaz in April 1966 and in Beni Abbes in 1974 (Daly and Daly, 1975), in Boughezoul in 1978 (Jacob and Jacob, 1980), in Ain Ben Khellil and in El Kala in 1992 (Boumezbeur, 1993; Isenmann and Moali, 2000). This duck is usually observed on Chotts, sebkhas and semi-arid land locked between the Tell Atlas and the Saharan Atlas and the vast Saharan lakes. Often reported as occasional breeding (Jacob and Jacob, 1980, Ledant, *et al.*, 1980).

The staff of Ruddy Shelduck is reduced in northwest Africa and the Nile Valley, East Asia and Western Europe in the last decade (Madge and Burn, 1988).

Reports have shown a decrease in these numbers due to human activities especially the destruction and alteration of their habitat and poaching. The population of Asia is important unlike that of Europe and North Africa where its status is in danger. (Vyas, 2005).

Therefore, this study aims to update the breeding status and give more information about the reproductive ecology of this species in the most important wetlands complex of Oued Righ Valley in the Sahara of Algeria, and is necessary to identify threats that affect reproduction in the sites to propose measures for protection and conservation.

Material and methods

Study site

The Oued Righ valley (Algerian Sahara) is an elongated depression with an altitude change to more than 41 m below sea level (Bensaci *et al.*, 2013). This wetland complex is actually a large oasis that stretches from the Saharan Atlas Mountains in the north to Touggourt City in the south (Nouidjem *et al.*, 2015). It house a series of aquatic ecosystems classified as wetlands of international importance according to the Ramsar convention such as; (Chott Melghir, Chott Sidi Slimane, Oued Khrouf lake and Chott Merouane) and shallow salt lakes like: lake Ayata, Lake Hamraïa, lake Tindla lake Merdjadja and lake Timacine). This area has hot and arid climate. (Fig. 1).

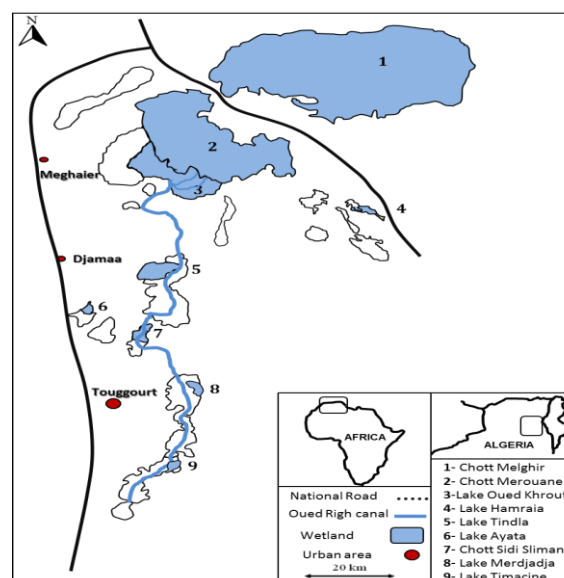


Fig. 1. Map of the wetland complex of Oued Righ Valley in the Algerian Sahara.

Bird survey

We used the “look-see” method, commonly used to count wildfowl elsewhere (Bibby *et al.*, 2000, Suthe-rland *et al.*, 2004). Twice-monthly counts were carried out for two consecutive years (from August 2009 to August 2011) with a telescope KOWA 20x80 in all wetlands of the Oued Righ valley. In many station Counts of water birds were done at noon using two methods depending on the population size: (1) counting the number of duck individuals separately when it did not exceed 200 individuals and (2) estimating their numbers visually when they exceeded 200 individuals (Lamotte and Bourlière, 1969; Blondel, 1975). Individual counts were conducted in small wetlands, whereas the total numbers were estimated by dividing the flock into small equal blocks and counting the number of blocks about high effective and in larger areas: Chott Melghir, Chott Merouane and Lake Oued Khrouf.

Satistical analysis

Two way ANOVA was carried out using the PAST program (Pale ontological Statistics) Version 3.05 (1999-2015) with a significance level of $p \leq 0.05$ to determine. The existence of significant differences between stations and years. A modest linear regression was used to determine the relationship between pairs and chicks.

Result and discussion

Population pairs size

The salmping of this study present an important abundance of the Ruddy Shelduck (*T.ferruginea.*). The highest concentration of pairs (64-30 pairs) which corresponds to 26.12-12.24% of the total population, was found at Chott Melgir, Chott merouane, canal Oued Righ and lake Oued Khrouf. The next importance sites with 16-5 pairs, which corresponds to 6.53- 2.04% of the total population, was detected at Chott Tindla and Lake Hamraia (Fig. 2). This variation observed in the stations shown a difference significatif (Anova test) $F_{(13;6)} = 41.73$, $P < 0,05$, and the no significatif difference in the years $F_{(13;1)} = 7,097$, $P = 0,08$, perhaps there is no change in life conditions: feeding, water level and temperature due to the stability of abiotic factors.

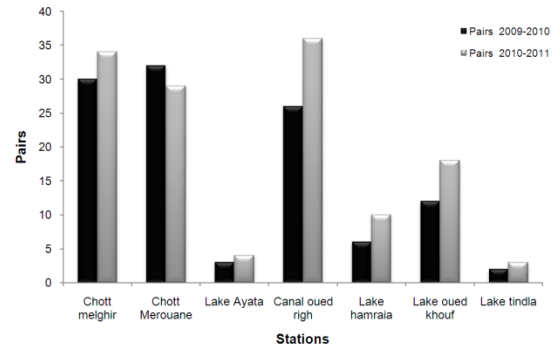


Fig. 2. Pairs number of Ruddy Shelduck *T.ferruginea* at the main sites of the wetland complex of Oued Righ (2009-2011).

Population chicks size

The maximum number of chicks observed in Lake Oued Khouf with 29 chicks and the minimum in Chott Merouane with 01 chik (Fig. 3). We shown variation in the years (Anova test) $F_{(13;1)} = 7.097$, $P < 0.05$, and any difference significatif in the stations $F_{(13;6)} = 2.299$, $P = 0,1672$. We indicate a dryness period in 2009, which can change the feeding area and the breeding season.

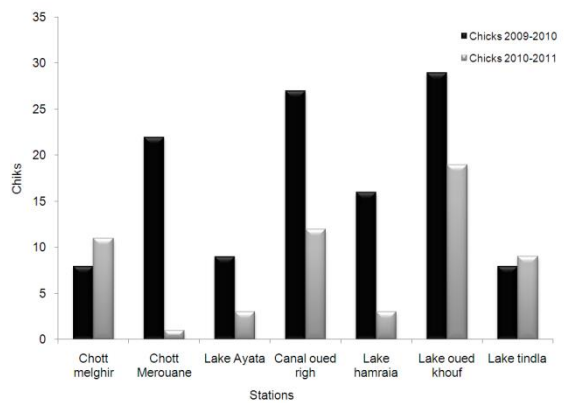


Fig. 3. Chicks number of Ruddy Shelduck *T. ferruginea* at the main sites of the wetland complex of Oued Righ (2009-2011).

In this study we observed an important size popul-ation of *T. ferruginea* in the region of Oued Righ Valley more than observed by Boulkhsaïm *et al.* (2013) in the Hauts Plateaux, north-east Algeria, Khaffou *et al.* (2012) in lake Aguelmam Sidi Ali (Mean Atlas) Morrocco and Garcia-del-Rey and Rodriguez-Lorenzo (2010) in Canary Islands (Oceanic Island).

This Valley has held a concentration of 157 individual between 50 pairs and 57 chicks. The breeding season starts with a well relationship between number of pair and his chick, the analyse of generalized linear model (Fig.4) between them revealed that high breeding success ($\phi = 39.04$, $P < 0.05$).

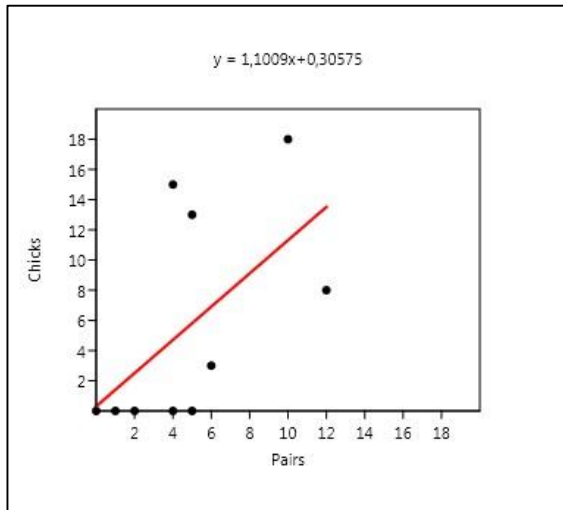


Fig. 4. The Generalized linear model between pairs and chicks.

Conclusion

This study presents new data on the reproductive ecology of Ruddy Shelduck (*T. ferruginea*) in the Oued Righ Valley wetlands; it is the first study in this region and the second in Algeria, has also just confirmed again the reproduction of this species in wetlands of Algerian Sahara and their important role for the generation of the species. Our work indicates that the species is a regular breeder in the area.

This result can give us an image on the stability of the reproduction of this species despite the severe conditions. This shows that the wetlands of the Valley of Oued Righ act the very important role in the ecology of this species.

The cycle of reproduction of Ruddy Shelduck faced with a many troubles can may be affect the breeding success (the habitat destruction and the excessive disturbance) for this reason, we suggest providing actions that necessary to protect this species and also this wetlands.

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