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Natural hatching of the world's largest bird "Struthio camelus" at the hunting reserve of Tlemcen – Algeria

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Abstract
The ostrich, Struthio camelus, is an animal that lived in the wild in Algeria, but does not anymore. The hunting Reserve of Tlemcen (RCT) adopted some specimens of this bird in 2007. Since the introduction of this bird in the reserve until the year 2011, no spawning has been reported. The present work focuses on a couple of ostriches; the male is five years old and the female is four years old. All the conditions favorable for their reproduction were fully satisfied. In addition, an adequate arrangement and a diet adapted to the specifics of their digestive system were prepared for them. Consequently, several egg layings occurred starting from April 12, 2012. All the eggs were collected daily and then directed towards artificial brooding. Unfortunately, this operation did not give any positive results. Following this brooding failure, it was decided to opt for natural brooding which proved to be the right one since the female had laid eight eggs, which she incubated and gave birth, to five ostriches after hatching. The newborns exhibited good acclimatization to their new environment; these birds became breeders in 2016. This experience indicated that this type of breeding can succeed in Algeria and can have a major economic impact, on the one hand, and on the other hand, a possibility of reintroducing this species that has disappeared from our wild fauna.
Keywords: ostrich; reproduction; RCT; Algeria.

Introduction

The ostrich was; but is no longer representative of the North African landscape. This bird belongs to the subclass of Ratites, order of Struthioniformes, family of Struthionidae, genus Struthio. The four most famous subspecies are the East African ostrich (Struthio camelus masaicus; Neumann, 1898), the West African ostrich (Struthio camelus camelus; Linne, 1758), the South African ostrich (Struthio camelus australis; Gurney, 1868) and the Somali ostrich (Struthio camelus molybdophanes; Reichenow, 1883). Unfortunately, all these subspecies have disappeared entirely from the wild or are critically endangered. This is the case, for example, of the Struthio camelus camelus (Cornette, 1998). The ostrich is today the largest bird on earth; it can reach up to 2.50 m in height and weigh 150 kg. It is worth mentioning that everything that allows birds to fly has undergone significant modifications in this animal. Apart from its size, the most typical characteristic that distinguishes the ostrich from all other birds is that it has only two toes on each foot, both facing forward (Cornette, 1998).

The ostrich is an animal that has long lived in Algeria, in the wild, in several regions. This animal existed in large numbers in the regions of the regions of the Hauts Plateaux and Ergs (Forest, 1895).

In the South of Ouargla, in the Erg of Hassi-El-Rhatmaïa, ostrich eggs that seem to have served as vases to put on fire (one of these eggs is in the Museum of Saint-Germain), and even fragments of ostrich eggs, have been encountered in several Saharan flint workshops. Moreover, the ostrich is the only Saharan animal whose fossils have been found in the Algerian Sahara so far. Unfortunately, this animal, i.e.

Struthio camelus camelus (Linne, 1758), the subspecies that existed in Algeria, has been victim of a human carelessness and cupidity which had fatal consequences for this bird and consequently induced its progressive destruction and total disappearance (Forest, 1895).

On the other hand, ostrich farming is not very well known and not very popular among Algerian farmers. Indeed, there are only a few farms, scattered in certain Provinces in the north of the country that do that kind of farming; unfortunately, these farms are neither well organized nor sufficiently developed. Over the last few years, there has been a growing interest in ostrich breeding which can be explained by the following reasons:

- The existence in Algeria of a suitable climate and adequate environmental conditions for the breeding and development of this animal,

- The diversity, quantity and quality of products derived from that animal. Indeed, in addition to the increasingly growing world demand for ostrich feathers, the ostrich produces meat appreciated for its high protein and low fat contents, for its offal and large eggs, and above all, for its very high quality leather which is highly appreciated for making good quality fashion products which are generally intended for export that would allow foreign currency to flow into the country (Ben Romdhane et al, 2000).

- This animal can be an interesting new tourist attraction (Ben Romdhane et al, 2000).

Considering all these advantages, and in order to better understand and control ostrich farming, the Hunting Reserve of Tlemcen has decided to adopt this bird. The main purpose of the present study is to promote this type of farming and highlight its economic advantages.

Material and methods

Presentation of the study area

The Hunting Reserve of Tlemcen (Figure. 1) is located in the northern part of Algeria, 26 km southwest of the wilaya of Tlemcen, and about 10 km east of the Daïra of Sabra. This reserve, which is part of the Domestic Forest of Hafir, occupies the highest and most wooded area of the Mountains of Tlemcen. It is located between latitude 34°43’45,27¨N à 34°47’28,22¨N and longitude -1°26’32,55¨E à -1°30’21,62¨N. The Hunting Reserve of Tlemcen covers an area of 2,156 ha; it is fenced with a metal grid on a perimeter of 25.04 km. It is limited:

- To the north by the agricultural land of the valley of Sidi Ouriache,

- To the south by ridges and the southern slopes of Djebel Ras Moutas, up to the arable lands of El Menakher,

- To the west by Djorf-El-Abiod and by the slopes of Djebel Boumedrer down to the base of the western slope of Djorf-El Guelâa,

- To the east by the summit of Ain-Djadj mountain.

The Hunting Reserve of Tlemcen is one of the four most important reserves created across the national territory, in the regions of Zeralda, Djelfa, Mascara and Tlemcen, and all currently operational (RCT, 2018).

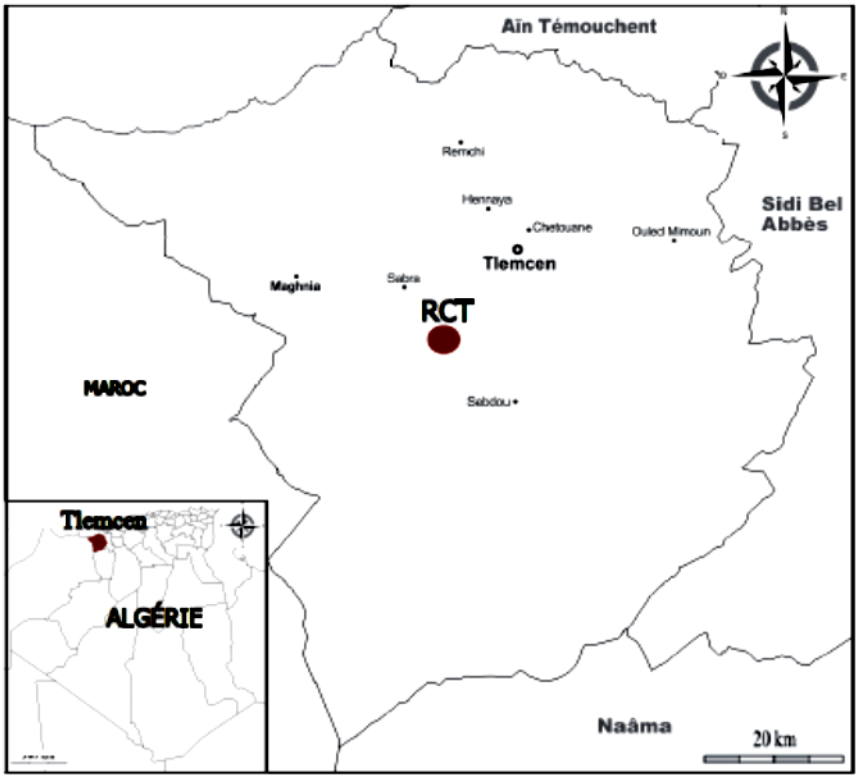

Figure. 1. Location map of Tlemcen hunting reserve (RCT).

The couple selected for reproduction

In 2007, the Hunting Reserve of Tlemcen acquired, from the company SIFAAC (Industrial Company of Food Manufacturing & Hatchery, Sarl) of Dar El Beida in Algiers, five ostriches; i.e. two males (which were one month old and one year old), and two females (which were both one month old) (RCT, 2012).

As no eggs had been laid since their adoption until the year 2011 (RCT, 2012), we have decided, in 2012, to select two healthy subjects, a six-year old male and a five-year old female (Figure. 2), to conduct a breeding experiment. Placed in a three-hectare enclosure in the plain of Hunting Reserve, at an altitude of 1100 m, the two birds were separated by a two-meter high Zimmerman fence.

Figure. 2. The couple of ostriches chosen for reproduction.

The sexual dimorphism can clearly be observed in the ostrich, as is shown in Figure 2. Indeed, one may distinctly notice that the male, which is first, has black coverts and pinnae, flight feathers and white rectrices. However, the female is smaller and entirely gray-brown (Svensson et al, 2015).

Conditions favoring egg laying and incubation

The couple was separated at first by a fence to stimulate them and properly trigger the period of sexual activity. During this period of separation, which lasted from the beginning of January until the 15th of March of the same year, food was adequately rationed in order to avoid fat deposits that are harmful to the proper functioning of the reproductive system. Moreover, appropriate bedding, of approximately 100 m^2, was fitted out to allow a sand bath for deworming. In addition, the two birds were supplied with a new diet, while taking into account the needs and specificities of the digestive tract of ostriches in general.

Previous research has clearly indicated that the ostrich is a typically herbivorous bird, with a gastrointestinal cavity allowing, through microbial fermentations, to better use a fiber-based ration; this is a peculiarity that distinguishes the ostrich from the other classic birds (Swart, 1988). Therefore, the new diet chosen consisted of concentrated foods, distributed daily at a rate of 02 kg / bird. Each ration contained roughly 600g of wheat bran, 400g of wheat, 300g of corn, 300g of barley, 200g of spelt and 200g of oats. The whole enriched with the Polycalcium® production J+ composition consisting of analytical constituents (phosphorus, calcium, magnesium, sodium, lysine, methionine), trace elements (zinc-manganese oxide, iron sulfate, copper and cobalt, potassium iodide and sodium selenite), protected minerals and vitamins (A, D3, E, B1, B2, B3, B6, B12 C K3 PP and choline). Gravel was added to this concentrated diet twice a week. Furthermore, these birds had voluntarily access to fresh food which consisted of a course of green forage previously sown inside the enclosure, with free access to fresh water.

Results and discussion

Since their introduction into the Hunting Reserve of Tlemcen in 2007 until 2011, the adopted ostrich

couples had not given any sign of laying eggs, which led our team to choose a single pair in order to start a breeding experiment on this species. After having met all the adequate conditions relating to diet and well-being, the first egg-laying took place on April 12, 2012. Then others followed at the frequency of one egg every three days. These eggs were collected daily to be sent to the cynegetic center of Tlemcen and Zeralda for artificial brooding. However, it was noted that not all of the artificially brooded eggs hatched; they were either white or showing embryonic mortality as a result of using an incubator not suitable for ostrich eggs. In addition, the initial nest was on bare ground; then the female preferred to move into the nest previously prepared by the male in the brush. This prompted us to change our strategy by using natural brooding while preserving the previous conditions and guaranteeing a more or less stress-free environment. We decided not to move the eggs.

The female had laid eight eggs and incubation started right after. Furthermore, what caught our attention is the ostrich's behavior which remains almost unique in comparison with that of other birds. Indeed, the eggs are incubated intermittently by the female and the male supervises them carefully for a long time even after they hatch, which confirms the remarks reported by Smit in 1963 (Smit, 1963).

On August 11, 2012, after the hatching of the incubated eggs, five healthy ostriches were born (Figure. 3), which is a first for the Hunting Reserve of Tlemcen. All of them had light plumage. Subsequently, around the 3rd month, the sex of all five ostriches was identified by examining the phallus because it is solely during this period that sexing of young ostriches can be carried out reliably (Kreibich and Sommer, 1995). This gender identification operation revealed that there were three males and two females.

In December 2012 and following, a cold and snow wave in the region of Tlemcen, one male and one female died (RCT, 2013). As for the other specimens, they adapted quite well to the environment. In April 2016, the remaining female from natural brooding became pubescent and reproductive (RCT, 2016).

This experience showed us that ostrich farming can be practiced in Algeria, particularly in regions with a climate similar to that of the Hunting Reserve of Tlemcen. It is worth noting that even the reintroduction of the wild species (the red-necked ostrich) remains possible. It is useful to recall the Moroccan experience of the year 1996 in the National Park of Souss-Massa which was successful in naturally developing the largest herd of ostriches living in captivity, in the Sahelo-Saharan region. In addition, other experiments with this type of breeding were also successful in some other countries. Indeed, specimens of ostriches were exported to Tunisia in 2008 in order to develop them *in situ*. Also, an *ex-situ* program was carried out by transporting eggs to Germany in 2011 and to the United States later on (Blerot et Mhirit, 1999).



Figure. 3. Brooded and hatched eggs.

Conclusion

Struthio camelus camelus was once a wild animal that was widely spread in Algeria. Afterwards, this species disappeared not only from the wild but also from the mentality of Algerian breeders. Over the last few years, the breeding of this animal has gradually spread to all continents; it became a subject that attracted a lot of attention among researchers throughout the entire world, but unfortunately very slowly in Algeria. It is widely admitted that ostrich farming can greatly alleviate the problems of red meat supply. It is interesting to know that the average weight of this bird can easily exceed 100 Kg. This study allowed confirming that the ostrich can adapt quite well to the cold snowy climate and to high altitudes. Consequently, ostrich farming can be carried out all over the country, and not only in the Saharan and steppe regions. Note that the birth of five ostriches at the level of the Hunting Reserve of Tlemcen remains a special and important event which started the ostrich farming in this structure. It is highly recommended that this experience should be repeated. Ostrich farming must be taken into serious consideration given its economic importance for the country. On the other hand, the results obtained in this work are encouraging and suggest that it is quite possible to reintroduce this species in the Algerian landscape. The use of artificial brooding, using the most appropriate means, remains an essential parameter which must be taken into account for better development of this bird. However, it should not be overlooked that our

experience focused only on one couple and should be extended to other couples before reaching better conclusions and prospects for ostrich development.

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