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Full Length Research Paper

Phenology and Diurnal Behavior of the Tufted Duck Aythya Fuligula in Garaet Hadj Tahar (Occidental Numidia, Northeast Algeria)

Sadek Atoussi, Mouslim Bara, Moussa Houhamdi *

Biology, Water & Environment Laboratory, SNV-STU Faculty, University 8 Mai 1945 Guelma (Algeria)

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ABSTRACT:

In order to evaluate the number of Tufted Duck *Aythya fuligula* and its diurnal behavior in Garaet Hadj Tahar (Guerbes-Sanhadja wetlands, Northeast Algeria), this study was carried out during the wintering period (from November to April) in the years 2006, 2007, 2008 and 2009. The peak of the number observed during whole study period was recorded in December 2008 with a value of 100 individuals. The sleeping is the dominant diurnal behavior of the Tufted Duck (32%) followed by the swimming (31%) and feeding (25%). These comfort activities are done during the cold period in order to preserve the energetic stock.

Keywords: Garaet Hadj Tahar, Tufted Duck, Aythya fuligula, diurnal behavior

1. INTRODUCTION

The wetland had a large biological productivity and makes up the ecosystems with a high value for the human being wit regard to social/economic, cultural, and scientific aspects. However, the industrial development and the farming expansion in these wetlands causes theirs draining (Pearce and Crivelli, 1994 *in* Hamdi *et al.,* 2005).

In the Northeast of Algeria, the Seybouse River separated the oriental Numidia (Annaba and El Kala wetlands) and the occidental Numidia (Guerbes-Sanhadja wetlands) (Samraoui and De Belair, 1997). Recently many scientific studies were established in this region of Algeria (Chalabi, 1998; Houhamdi, 1998; Rizi *et al.,* 1999; Samraoui and Houhamdi, 2001; Samraoui *et al.,* 2006; Samraoui and Samraoui, 2007).

Garaet Hadj Tahar is one of the most important ecosystems of the Guerbes-Sanhadja wetlands which had a primordial interest as a foraging/roosting area for the wintering of water birds. Among these water birds, the Tufted Duck *Aythya fuligula* is a species which confirmed as a wintering water bird in the Guerbes-Sanhadja wetlands (Metallaoui and Houhamdi, 2008; Metallaoui and Houhamdi, 2010; Samraoui and De Belair, 1997; Isenman and Moali, 2000).

*Corresponding author: houhamdimoussa@yahoo.fr

The majority of scientific studies about the Tufted Duck *Aythya fuligula* were about the ecology and the biology (Butler and Stephenson, 1988; Hill, 1984) of this species, contrariwise short studies about the phenology and the behavior were done (Boyd, 1997; Carbone e*t al.,* 1996; Stephenson *et al.,* 1986), being the imperative to collect data on the wintering strategy of these water birds as well.

During this study, we investigated the phenology and the diurnal behavior of the Tufted Duck *Aythya fuligula* L, 1758 between 2006 and 2010 in Garaet Hadj Tahar (Guerbes-Sanhadja wetlands, Northeast of Algeria) in order to know the eco-ethology of this anatidea and to conserve the habitat.

2. METHODS AND MATERIALS

2.1. Study area

Situated in the northeast of Algeria, Garaet Hadj Tahar (36°52 N, 7°15 E) is a natural ecosystem of the Guerbes-Sanhadja wetlands (Figure 1) which classified as Ramsar site since 2001 (Figure 1), characterized by an important biological richness (Metallaoui and Houhamdi, 2010; Samraoui and De Belair, 1997) and a high breeding success of the water birds (Perrins, 1974). This Garaet (Figure 2) is located at some distantance from the Mediterranean Sea, with an area of about 100h and a mean water depth of 0,8 to 1,20m (Boumezbeur, 2001).

For the flora, Garaet Hadj Tahar is dominated by the Typhaceae (*Typha angustifolia*), the Poaceae (*Phragmites australis*), the Nymphaceae (*Nymphea alba*), the Cyperaceae (*Scirpus lacustris*) and at the border, *Juncus acutus, Olea europea, Asphodelus aestivus, Rubus ulmifolius, Cynodan dactylon,* and *Paspalum distichum* can be found.

2.2. Methodology

In the present study we evaluated the number of the Tufted Duck *Aythya fuligula* which wintered in Garaet Hadj Tahar (Guerbes-Sanhadja wetlands, Northeast of Algeria). The counting was done with a telescope ***Konus*** 40 × 60, during four (04) wintering season, between November and April of every season.

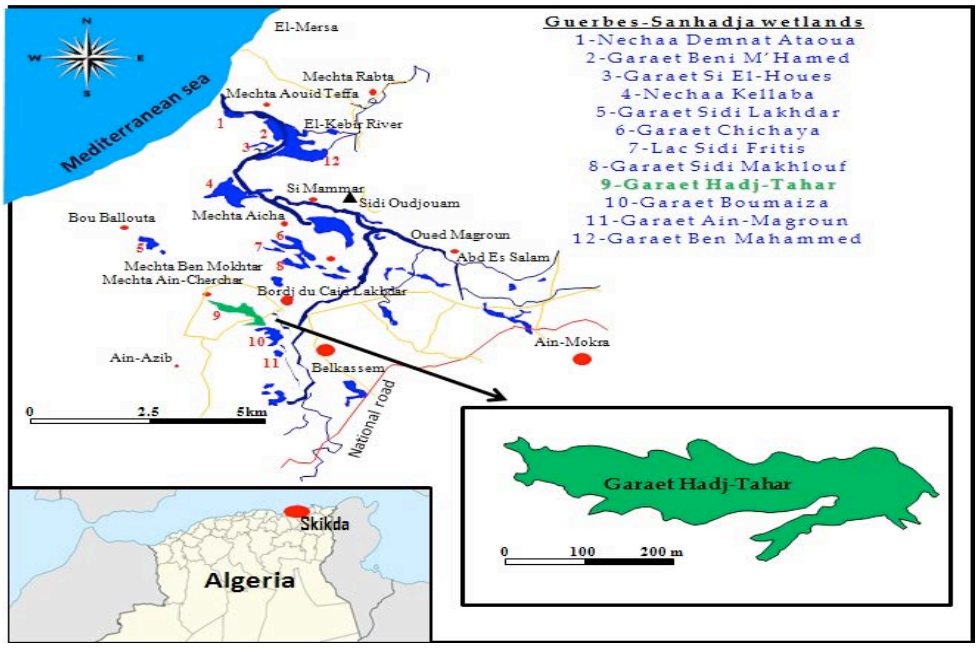

Figure 1: Geographical localization of the study area.

An individual counting was done whenever the Tufted Ducks grouped nearby (under 200 m) and their number was inferior to about 200 individuals. When the group was superior of about 200 individuals and/or the ducks were distant we estimated the number (Blondel, 1975; Lamotte and Bourrelière, 1969).

The diurnal behavior of the Tufted Duck *Aythya fuligula* was studied during the wintering season by applying the SCAN method (Instantaneous scan sampling) (Altman, 1974; Baldassare *et al.,* 1988; Losito *et al.,* 1989; Tamisier, 1972; Tamisier, 1974; Tamisier, 1976; Tamisier and Dehorter, 1999). Six diurnal activities were measured: feeding (with beak or with diving), sleeping, swimming, washing and flying. The correspondence analysis is was provided by the XLSTAT software (2009).

3. RESULTS

3.1. Phenology of the Tufted Duck

The Tufted Duck were seen during all the study period in the northeast side of the Garaet Hadj Tahar. This anatidea was observed only during the wintering season. The first's tufted duck were present at Garaet Hadj Tahar in November. The maximum number recorded during the study period varies between December and January with a peak of 63 individuals during 2006/2007, 75 individuals during 2007/2008, 100 individuals during 2008/2009 and 72 individuals during 2009/2010. After that, the number of this water bird was maintained stable until the first week of April, then the last groups of the Tufted Duck leave the Garaet to their breeding site (Figure 3).

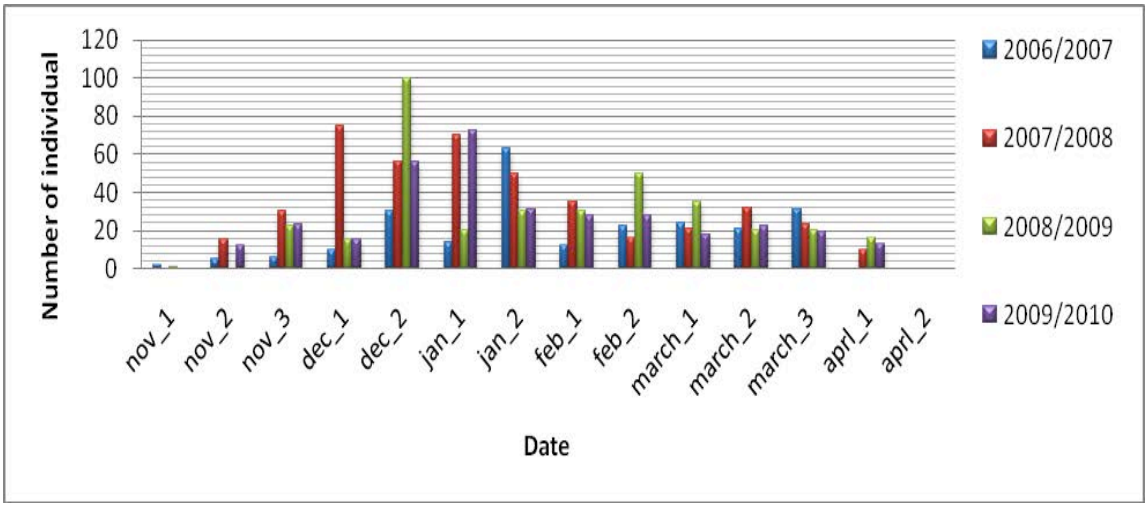

Figure 2: Temporal evolution of the Tufted Duck number's in Garaet Hadj Tahar.

3.2. Diurnal behavior

The study of the diurnal time activity of the Tufted Duck in Garaet Hadj Tahar shows that the dominant activity was sleeping (32%) followed by swimming (31%), feeding (24%), washing (12%) and finally flying (0,18%) (Figure 4). Sleeping is the dominant activity observed among this duck. With a rate of 32%, the curve of this activity shows that the Tufted Duck spends its time sleeping during all the diurnal period. The high value of sleeping was recorded during the first week of April, however the low value was recorded during the second week of March with a ratio of 1,51% (Figure 5).

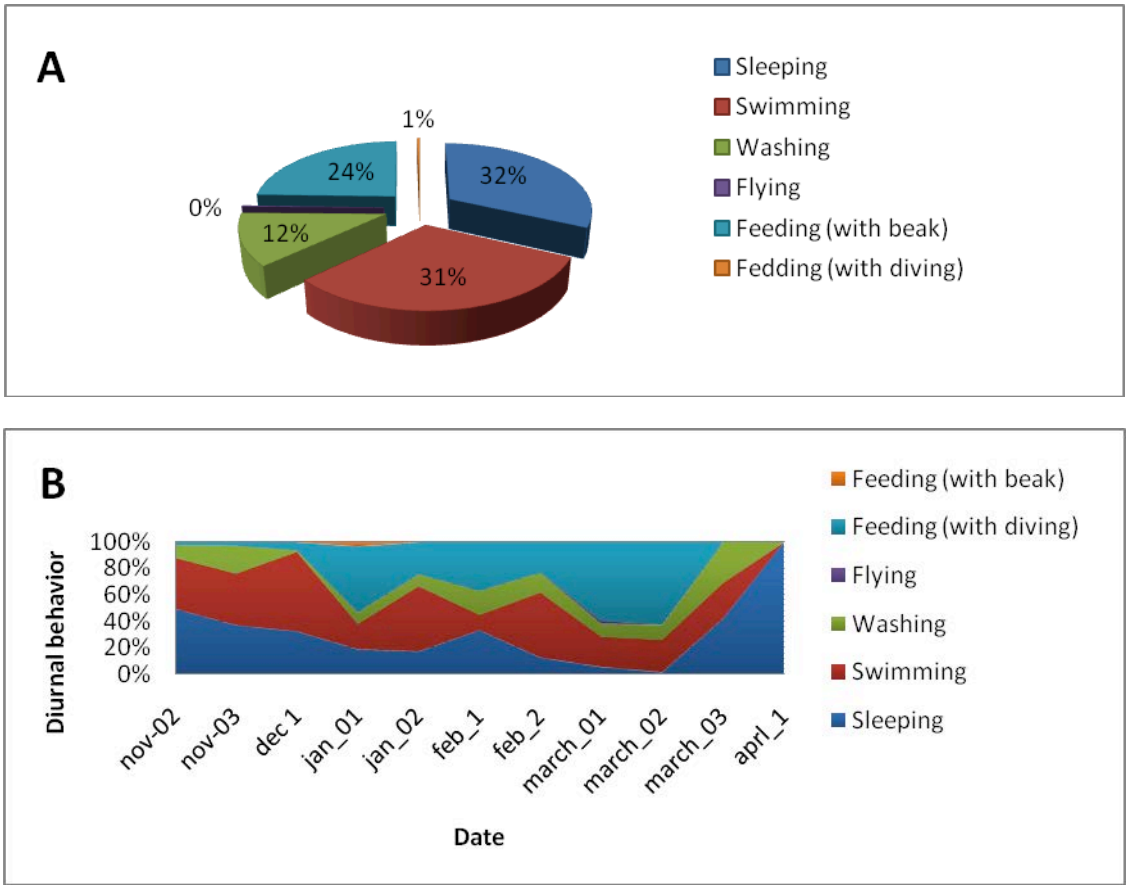

Figure 3: Diurnal behavior of the Tufted Duck in Garaet Hadj Tahar. A: Results of the time activity, B: Temporal evolution of the activities.

Swimming represents the second major activity of this bird (31%) which reached its peak during early December with a value of 60% (Figure 5). This activity is generally associated with feeding. The lowest proportion of this activity was recorded during the first week of February (11,7%).

Feeding is a primordial activity for this duck in order to raise its energetic stocks (used during the migration). This activity is observed during all wintering period and the peak recording (62%) coincides with the end of the wintering season. We noted that there are two sorts of feeding activity. The dominant type is associated with diving while feeding by beak was absent during the study period, except in January when we recorded a value of 3,3% (Figure 5) . The peak of the washing activity was recorded during the end of March with a value of 30% and the lowest rate of this activity was recorded during December (1%). Else, we recorded a value of 21% during the end of November which corresponds to the plumage maintenance following the post-nuptial migration to the wintering quarters.

A small proportion of the Tufted Duck's diurnal behavior is attributed to flying, with only 0,18% recorded during the first week of March (2,08%). This values show that the Tufted Duck flies in order to escape predators (Western Marsh Harrier *Circus aeruginosus*).

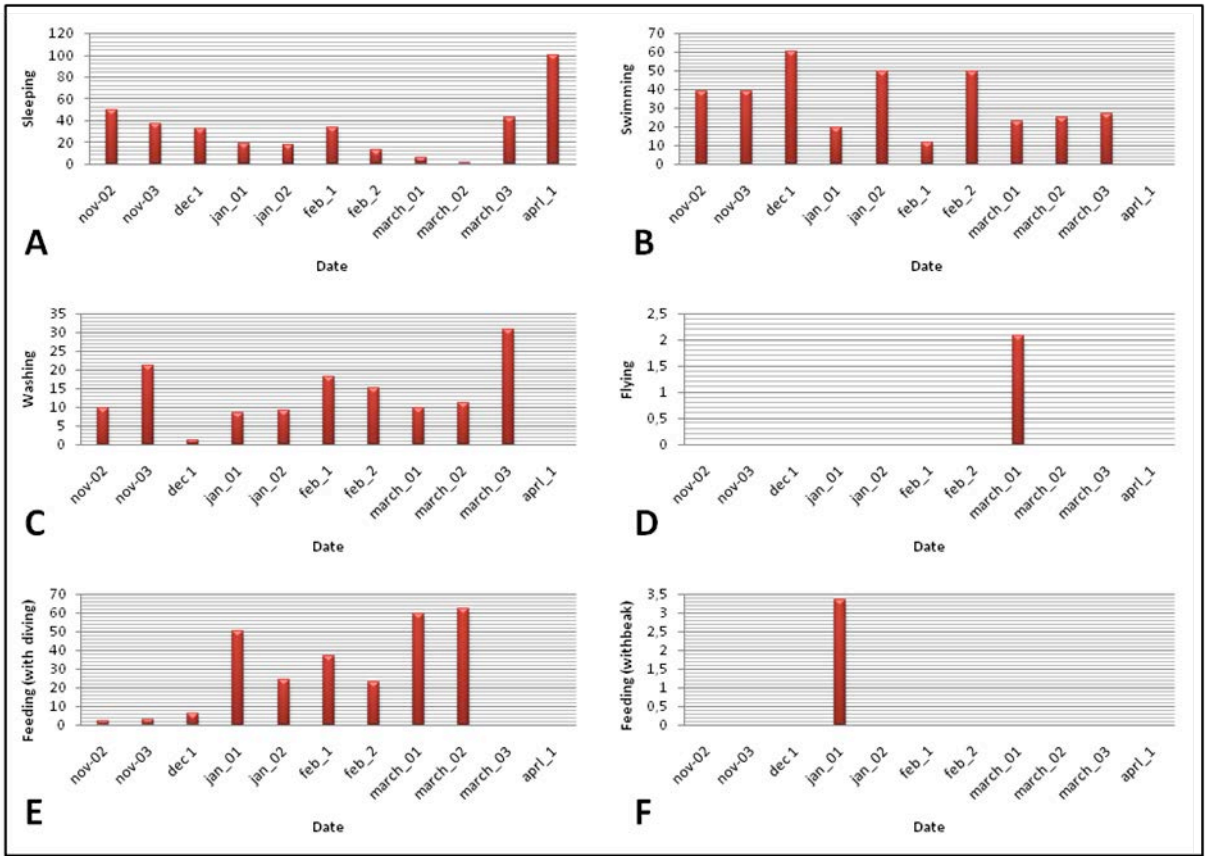

Figure 4: Proportion of the diurnal time activity of the Tufted Duck in Garaet Hadj Tahar. A: sleeping, B: swimming, C: washing, D: flying, E: feeding (diving), F: feeding (beak).

3.3. Data analysis

The correspondence analysis of the diurnal behavior of the Tufted Duck in Garaet Hadj Tahar make up 87,47% of the study. The F1 axe separates the sleeping activity (called comfort activity) from the rest of activities (feeding, flying, washing, and swimming). The F2 axe separates the sleeping activity which is associated to feeding and flying from the washing activity associated to the swimming activity (Figure 6).

Furthermore, the CA (correspondence analysis) graph shows that the feeding activity was associated to the end of the wintering period (January, February, and March) which characterizes the accumulation of the energetic stock (lipid) used during the migration to the breeding quarters. The sleeping activity was associated firstly with the cold months (November and December) in order to preserve the corporal temperature and secondly during the end of wintering season (March and April) in order to conserve the energy for an eventual migration (Figure 6).

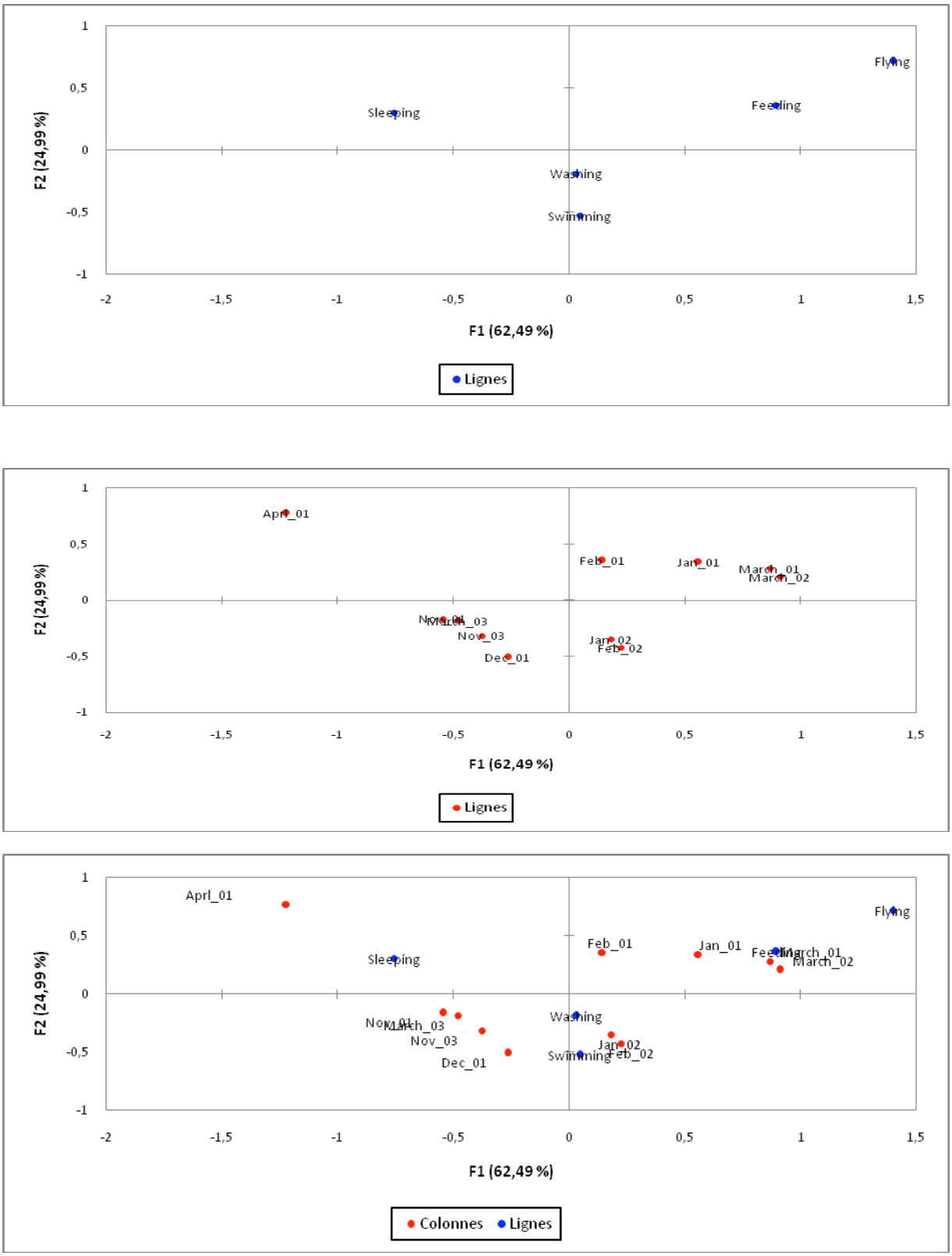

Figure 5: Factorial layout of the Correspondence analysis of the diurnal time activity of the Tufted Duck *Aythya fuligula* in Garaet Hadj Tahar.

Figure 6: View of the Garaet Hadj Tahar. (ATOUSSI, 2010)

4. CONCLUSION

This study was conducted during four seasons in Garaet Hadj Tahar in order to study the structure, the phenology, and the budget time of the Tufted Duck *Aythya fuligula* listed as least concern in the IUCN Red List (Birdlife International, 2013). This Anatidae has not been investigated in North Africa and no phenology and diurnal time activity study was done in Guerbes-Sanhadja wetlands (Garaet Hadj Tahar).

The study of the phenology of this diving duck shows that this wintering duck is the last species which arrives in the Garaet Hadj Tahar (during November) and also the last species leaving this Garaet. It is also noted that during the whole wintering period, the Tufted Duck frequents the north side of Garaet Hadj Tahar. This area is characterized by a high water depth without tufted vegetation.

The counting of the Tufted Duck in Garaet Hadj Tahar revealed that this species occupies the wintering quarters from the second week of November to early April, with a peak recorded between December and January.

Moreover, the study of the Tufted Duck behavior shows that the dominant diurnal activity of this species was sleeping. Indeed, this activity allows to reduce the energetic expenditure (mainly the lipid stock) (Green, 1998; Costa and Bondi, 2002; Tucakov, 2005; Boumezbeur *et al.,* 2005) and the loss of the corporal heat, imperative to resist in the cold temperature of the biotope (Tamisier, 1972) (Figure 4).

The proportion of the feeding activity (24%) recorded during our study period supposes that a large disturbance was exercised upon the Tufted Duck in the nocturnal time in the foraging area, especially as the anatidae uses the foraging area during the nocturnal time (Aissaoui, 2009).

Garaet Hadj Tahar is an important roosting area for the Tufted Duck *Aythya fuligula*. This ecosystem is a wintering site for many anatidea. This data represents the first results about the wintering strategy (phenology and behavior) of the Tufted Duck *Aythya*

fuligula in the north of Algeria and could be used to establish an action plan for conservation of this natural area.

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