Ecology, Distribution and Diversity of Chiropteran Fauna in the East of Algeria

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ABSTRACT

The study of troglophilic Chiroptera was done in the far east of Algeria (the region of Tamlouka) between January 2014 and December 2015. Two inventory methods were used: capture and direct observation in habitat. Data collected to date appear to confirm the scarcity of certain species, in the case of small and large horseshoe bat. This is the first data reported of Chiropteran Fauna in Tamlouka region. Five species captured belonging to three families: Rhinolophidae, Miniopteridae and Vespertilionidae, these species are: Rhinolophus hipposideros, Rhinolophus ferrumequinum, Myotis punicus, Miniopterus schreibersi, and Pipistrellus Kuhli. The surveys were carried out in 10 caves in this region.

Keywords: Chiroptera, Distribution, Inventory, Mountain, Algeria.

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1. INTRODUCTION

Chiroptera commonly called “Bats” are poorly known in Algeria, where little information is available on them in view of the difficulty of their study (difficult access, caving work, and night work). Yet they represent a major order in the class of mammals (Ahmime, 2017). Some detailed studies have been undertaken on Chiroptera in parts of North Africa such as in Morocco by many authors (Laurent, 1937; Panouse, 1951; Strinati, 1951; Strinati, 1953; Brosset, 1955; Hill, 1964); in Tunisia (Deleuil & Labbe, 1955; Allen & Strinati, 1969; Allen & Strinati, 1970; Baker, 1976) and also in Libya (Hufnagl & Craig-Bennett, 1972; Benda and al., 2004). With regard to Algeria, it is not the same and no comprehensive study has been undertaken to date. Laurent (1944) proceeded to the first bat banding in Algeria in 1942 in a cave near Algiers. Anciaux de favaux (1976) is the one who established the first study on Algerian Chiroptera. Kowalski and Rzebik-Kowalska (1991) reported the existence of 26 species of bats. Recently, some works are published about ecology, status, distribution and conservation of bats in Algeria by Ahmime and Moali (2013), Ahmime (2014) and about diet of four species of horseshoe bat (Chiroptera: Rhinolophidae) by Ahmime (2017). The aim of this study is to present the first data of an inventory and abundance of the Algerian bats during two years in the most caves of Tamlouka mountain in east of Algeria.

2. MATERIALS AND METHODS

Study area

The prospective site is located in eastern Algeria between the provinces of Oum El-Bouaghi and Guemla. The designated area is situated in the region of Ain Arko (Municipality of Tamlouka) (Figure 1). It is far of 35 km north Oum El-Bouaghi city. Its geographic coordinates are 36° 5' 28" N and 7° 6' 52" E. This area belongs to the Mediterranean semi-arid climate which is typically continental, located in the region of high plains with a medium altitude that exceeds 800 m. Over the year, 501.0 mm is the rate rainfall and the average temperature is 14.1 °C.

Figure 1. Map of study area

Data acquisition and statistical analysis

Weekly collections were made in cavities of the Ain Arko region between January 2014 and December 2015, using a visual survey and capture method detailed by Conn (1981). The habitats visited, mostly underground cavities (Table 1), were excavated by French companies for mining research. Ten underground cavities were visited at least once. Capturing by net was done at the entrance of the cavity. All visits were
conducted in calm weather, little or no wind and no rain in the morning for four hours maximum. The captured bats were categorized by hand using identification tags (Von Helversen, 2004; Dietz, 2005; Dieuleveut et al., 2010). The sampling methods used are captured using a hand net inside the cave during the morning and evening. Dieuleveut (2010), for individuals who are not in the range were photographed with a digital camera (to enable us to identify them on a PC screen) (Vicent, 2006).

The estimation of the number is based on bat counts in the habitat. The numbers were approximate, especially in the case of bats that were active or those that formed large groups. The data were logarithmically transformed to allow statistical comparisons. The total number of individuals captured was counted and expressed as number. The indexes, used to examine bat community composition and structure, are species richness (S), relative abundance (RA) and occurrence frequency (O). The significance level of the Kruskal-Wallis test was \( p \leq 0.05 \). The statistical analyses were performed with the free program PAST (Paleontological STatistics) Version 3.14 (1999-2016).

### Table 1. Caves’ characteristics

<table>
<thead>
<tr>
<th>Cave name</th>
<th>Cave Code</th>
<th>Geographic coordinates</th>
<th>Latitude</th>
<th>Longitude</th>
</tr>
</thead>
<tbody>
<tr>
<td>El Dharbane</td>
<td>DB</td>
<td>N:36°04’36.8’’ E:007°07’35.4’’</td>
<td></td>
<td></td>
</tr>
<tr>
<td>El Rmel</td>
<td>R</td>
<td>N:36°04’32.4’’ E:007°07’31.5’’</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dhib</td>
<td>D</td>
<td>N:36°05’33.1’’ E:007°06’47.7’’</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bouchadjra</td>
<td>A</td>
<td>N:36°05’33.7’’ E:007°06’47’’</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bouchkara</td>
<td>B</td>
<td>N:36°05’33.2’’ E:007°06’47’’</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Thour</td>
<td>T</td>
<td>N:36°05’33.7’’ E:007°06’47.1’’</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Zone n°:4</td>
<td>C</td>
<td>N:36°05’33.8’’ E:007°06’48.6’’</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gaz Carbonique</td>
<td>GC</td>
<td>N:36°05’33.9’’ E:007°06’46.8’’</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Zone n°:8</td>
<td>E</td>
<td>N:36°05’34.1’’ E:007°06’48.3’’</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bouhadra</td>
<td>BH</td>
<td>N:36°05’33.1’’ E:007°06’48.3’’</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

3. RESULTS

A total of 2232 bat individuals were counted representing 5 species from 4 genera and three families (Rhinolophidae, Miniopteridae and Vespertilionidae) (Figure 2, Table 2). Taxa of one family dominated the bat fauna. Vespertilionidae were the most collected and included two species representing two genera accounting for 99.73 % of the total number counted. The other was the Rhinolophidae, with two species in two genera representing 0.13 % of the total and the Miniopteridae represented by a single taxon comprising 0.13 % of the total Bats.

During the study period, with complete dominance of Myotis punicus (99.64%) and occurred 60%, the abundance of other species is very low (< 1%), but occurred in 10% (same occurrence for the other species) of the sampling (Table 2).

![Figure 2. Species-richness pattern of families at Tamlouka region.](image)

### Table 2. Relative abundance (RA %), occurrence frequency (O %) and frequency classes of species in the study area

<table>
<thead>
<tr>
<th>Species</th>
<th>Relative abundance (RA %)</th>
<th>Occurrence frequency (O %)</th>
<th>Frequency class</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rhinolophus hipposideros (Bechstein, 1800)</td>
<td>0.044</td>
<td>10</td>
<td>Accidental species</td>
</tr>
<tr>
<td>Rhinolophus ferrumequinum (Schreber, 1774)</td>
<td>0.089</td>
<td>10</td>
<td>Accidental species</td>
</tr>
<tr>
<td>Myotis punicus (Felten, Spitzenberger and Storch, 1977)</td>
<td>99.64</td>
<td>60</td>
<td>Species regular &amp; frequent</td>
</tr>
<tr>
<td>Pipistrellus kuhlii (Kuhl, 1819)</td>
<td>0.089</td>
<td>10</td>
<td>Accidental species</td>
</tr>
<tr>
<td>Miniopterus schreibersii (Kuhl, 1817)</td>
<td>0.13</td>
<td>10</td>
<td>Accidental species</td>
</tr>
</tbody>
</table>

We note that we have 2 frequency classes in our study area (Table 2). The first frequency class is regular and frequent species with one species Myotis punicus and the second is the accidental species represented by 4 species: Rhinolophus hipposideros, Rhinolophus ferrumequinum, Pipistrellus kuhlii, and Miniopterus schreibersii.

The captured estimates for all species showed large variation in the different caves, only one species of Rhinolophus hipposideros is captured in Bouhadra cave (not shown in figure 3). However, significant catch per cave was found (Kruskal-Wallis test, H = 10.56, P < 0.001) (Figure 3).
This study is the first evaluation of the bats occurring in Tamlouka region (eastern of Algeria). The five bats species were divided primarily into Vespertilionidae and Rhinolophidae (two species respectively). Miniopheridae each were represented by one species. The most abundant species was Myotis punicus. It was found in 70% of caves. Two individuals of Rhinolophus ferrumequinum are observed in Thour cave, Pipistrellus Kuhlii shown only in Dhib cave and three individuals of Miniopterus schreibersi are captured in Gaz carbonique cave. Single individual of Rhinolophus hipposideros was captured in Bouchadjra cave.

Each cave attributes a single species of bat, except in the case of Dhib cave where two species co-inhabited together: Myotis punicus and Pipistrellus Kuhlii. We note that these two species belong to the same family of Vespertilionidae.

The area of distribution of the Maghréb’s Murin (Myotis punicus) is rather wide: from the littoral coasts to the south of the Saharan Atlas (Ahmime, 2017). It is the most frequently observed throughout the study period. Concerning the last family of Miniopheridae, it is performed by Schreber’s Minioptere (M. Schrebersi). His area of distribution goes from the littoral coasts to the Saharan Atlas (Ahmime, 2017). Kowalski et al. (1986) and Kowalski (1979) observed this species in Tlemcen, Oran and Constantine. Ahmime (2014) reported it in Aokas and Souk El Thenine.

It is the most remarkable species throughout the study period with maximum numbers in winter during the hibernation period because this cellar offers ideal locations (very high humidity, low temperature, no disturbance). According to Kowalski and Rzebik-Kowalska (1991), this species was captured in the morning.

The pipistrelle of Kuhl (Pipistrellus Kuhlii) was considered as being two distinct species P. deserti and P. Kuhlii but the recent work of Ahmime (2014) showed that it was ultimately only the pipistrelle of Kuhl. This species is encountered from the littoral coasts to the central and western part of the Sahara. It is a known species in the South (Ahmime, 2017). The Pipistrellus Kuhlii was captured in the evening.

However, the Family Rhinolophidae is represented by the great Rhinolophe horseshoe (R. ferrumequinum) and the small Rhinolophe horseshoe (R. hipposideros). The first species is a common species in northern Algeria from the littoral coasts to the Saharan Atlas (Loche 1858; Loche 1867). It was recently encountered by Ahmime (2014) in Chaabet El Akhra (Kherrata) and Tichy (Bejaia) with a relative abundance of 36.44%. The second species (R. hipposideros) has a fairly wide range; it is very well replied in the northern part of Algeria (Anciaux de Faveaux, 1976). We had shown one individual during the hibernation period (Figure 7). It was reported by Ahmime (2014) in Iri, Kherrata and Tichy (Bejaia) with a relative abundance of 18.08%. The Rhinolophidae group was the least observed throughout the study period. Concerning the last family of Miniopheridae, it is performed by Schreber’s Miniopher (M. Schrebersi). His area of distribution goes from the littoral coasts to the Saharan Atlas (Ahmime, 2017). Kowalski et al. (1986) and Kowalski (1979) observed this species in Tlemcen, Oran and Constantine. Ahmime (2014) reported it in Aokas and Souk El Thenine.

**CONCLUSION**

This is the first data reported on the ecology of Chiropteran Fauna in Tamlouka region (Eastern of Algeria). Rhinolophus hipposideros, Rhinolophus ferrumequinum, Myotis punicus, Miniopherus schreibersi and Pipistrellus kuhlii. Are the species identified, they belong to three families: Rhinolophidae, Miniopheridae and Vespertilionidae.

The distribution of these bats encountered during our study has shown that, Myotis Punicus proved relatively widespread and is one of the most frequently found species. Among these, they were mentioned more than once and their range was so refined. This is the case for Pipistrellus kuhlii.

Indeed, the presence of bats is an important indicator to assess the state of biodiversity in the region. This result can give us an image on the importance of the environment conservation in which these small mammals are still living.

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