

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

Yassmina Mokrani<sup>1</sup>, Fateh Mimeche<sup>2</sup>, Yassine Nouidjem<sup>3\*</sup> and Menouar Saheb<sup>1</sup>

<sup>1</sup>Department of Natural and Life Sciences, University of Oum El-Bouaghi, Algeria.

<sup>2</sup>Department of Agricultural Sciences, University of M'sila, Algeria.

<sup>3</sup>Department of Natural and Life Sciences, University of M'Sila, Algeria.

### ABSTRACT

The study of troglomorphic 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 Kuhl*. The surveys were carried out in 10 caves in this region.

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

**Corresponding author:** Nouidjem Yassine

**e-mail** [yacinenouidjem@gmail.com](mailto:yacinenouidjem@gmail.com)

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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 Guelma. 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.

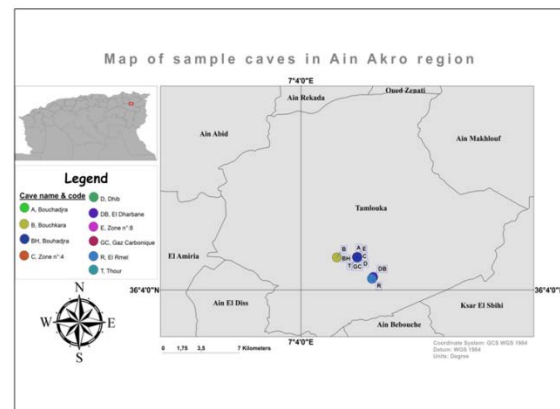


Figure 1. Map of study area

### 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

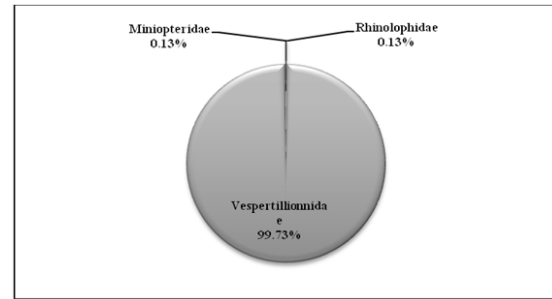
Cave name	Cave Code	Geographic coordinates	
		Latitude	Longitude
El Dharbane	DB	N:36°04'36.8"	E:007°07'35.4"
El Rmel	R	N:36°04'32.4"	E:007°07'31.5"
Dhib	D	N:36°05'33.1"	E:007°06'47.7"
Bouchadjra	A	N:36°05'33.7"	E:007°06'47"
Bouchkara	B	N:36°05'33.2"	E:007°05'47"
Thour	T	N:36°05'33.7"	E:007°06'47.1"
Zone n°:4	C	N:36°05'33.8"	E:007°06'48.6"
Gaz Carbonique	GC	N:36°05'33.9"	E:007°06'46.8"
Zone n°:8	E	N:36°05'34.1"	E:007°06'48.3"
Bouhadjra	BH	N:36°05'33.1"	E:007°06'48.3"

**3. RESULTS**

A total of 2232 bat individuals were counted representing 5 species from 4 genera and three families (Rhinolophidae, Minopteridae 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 Minopteridae 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.

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

Species	Relative abundance (RA %)	Occurrence frequency (O %)	Frequency class
Rhinolophus hipposideros (Bechstein, 1800)	0.044	10	Accidental species
Rhinolophus ferrumequinum (Schreber, 1774)	0.089	10	Accidental species
Myotis punicus (Felten, Spitzenberger and Storch, 1977)	99.64	60	Species regular & frequent
Pipistrellus kuhlii (Kuhl, 1819)	0.089	10	Accidental species
Minopterus schreibersi (Kuhl, 1817)	0.13	10	Accidental species

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 *Minopterus schreibersi*.

The captured estimates for all species showed large variation in the different caves, only one species of *Rhinolophus hipposideros* is captured in Bouchadjra cave (not shown in figure 3). However, significant catch per cave was found (Kruskal-Wallis test,  $H = 10.56$ ,  $P < 0.001$ ) (Figure 3).

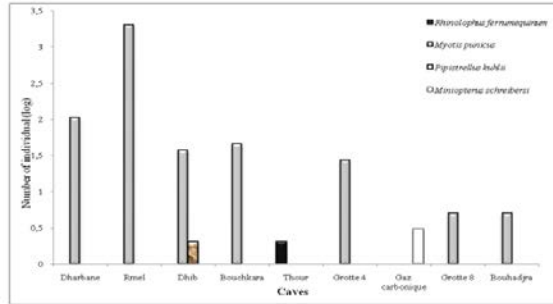


Figure 3. Total captures of Chiroptera in Tamlouka region

#### 4. DISCUSSION

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). Miniopteridae 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 schreibersii* are captured in Gaz carbonique cave. Single individual of *Rhinolophus hipposideros* was captured in Bouchadja 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 Maghreb'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 species observed in Algeria according to Aulagnier and Thévenot (1986). This species was reported by Ahmime (2014) at Aokas and Souk El Thenine (littoral coasts) with a relative abundance of 24.35%.

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 Kuhl*) was considered as being two distinct species *P. deserti* and *P. Kuhl* 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 Kuhl* 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 Ifri, 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 Miniopteridae, it is performed by Schreber's Minioptere (*M. schreibersii*). 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.

#### 5. 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*, *Miniopterus schreibersii* and *Pipistrellus kuhlii*. Are the species identified, they belong to three families: Rhinolophidae, Miniopteridae 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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