

New data on the distribution of bats (Mammalia: Chiroptera) in Algeria

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Abstract. As the bat fauna of Algeria is poorly documented, new distributional data are provided for the following 19 species of bats in this country: *Rhinopoma cystops* Thomas, 1903, *Rhinolophus ferrumequinum* (Schreber, 1774), *R. hipposideros* (Borkhausen, 1797), *R. euryale* Blasius, 1853, *R. mehelyi* Matschie, 1901, *R. blasii* Peters, 1867, *Asellia tridens* (Geoffroy, 1813), *Myotis punicus* Felten, 1977, *M. nattereri* (Kuhl, 1817), *M. emarginatus* (Geoffroy, 1806), *M. cappacini* (Bonaparte, 1837), *Eptesicus isabellinus* (Temminck, 1840), *Hypsugo savii* (Bonaparte, 1837), *Pipistrellus pipistrellus* (Schreber, 1774), *P. kuhlii* (Kuhl, 1817), *Nyctalus leisleri* (Kuhl, 1817), *Plecotus gaisleri* Benda, Kiefer, Hanák et Veith, 2004, *Miniopterus schreibersii* (Kuhl, 1817), and *Tadarida teniotis* (Rafinesque, 1814). All these data were collected between 2006 and 2015 and represent first bat records since the 1980s. Some of it relate to species previously only rarely recorded in Algeria and new data are presented on their status and distribution.

Key words. Chiroptera, faunistics, echolocation, distribution, Algeria.

INTRODUCTION

Although bats have been studied in some countries in North Africa, Algeria is an exception and no comprehensive study has been undertaken since that of Kowalski & Rzebik-Kowalska (1991). Laurent (1944) first banded bats in North Africa in 1942 in a cave in the vicinity of Algiers and Anciaux de Faveaux (1976) was the first to study Algerian bats. He recorded 23 species belonging to five families, some of which are rare and the taxonomic classification of two remains to be resolved. His list was supplemented by Gaisler (1983) who worked mainly in the northern part of the country and first recorded the presence of *Myotis nattereri* in Algeria, and the reappearance after an absence of nearly a century of *Pipistrellus pipistrellus* and *Myotis capaccinii*. In their *Mammals of Algeria*, Kowalski & Rzebik-Kowalska (1991) reported 26 species of bats, thus confirming the record of Kowalski (1979), Gaisler (1983), and Kowalski et al. (1986). In view of the paucity of data on the current status of bats of Algeria, we attempt in this paper to highlight the need for a thorough study of the order Chiroptera and provide information on Algerian species. As stated by Anciaux de Faveaux (1976) bats are a group of little known mammals, that have not been studied extensively in Algeria by scientists and so the main objective of this work is to identify the need for a more intensive zoological exploration of Algeria in order to better clarify the geographic distributions of the bats occurring there.

In the present contribution we mainly report some new records of bats in Algeria based on fieldwork, published data and the authors' acoustic data collected between 2006 and 2015.

MATERIAL AND METHODS

Geography

Algeria, the largest country in Africa in terms of area (2,381,741 km²) of which 85% is in the Sahara, is located in the north-west of the African continent and in the west of North Africa, bordering on to the Mediterranean Sea in the north (1200 km coastline), Morocco (1559 km) in the west, Tunisia (965 km) in the north-east, Libya (982 km) in the south-east, Niger (956 km) and Mali (1376 km) in the south and the Western Sahara and Mauritania (463 km) in the south-west. A country with contrasting relief and a large area, Algeria offers a wide variety of climates that vary with distance from the sea, becoming increasingly hot and dry inland. Rainfall increases from west to east and occurs principally between September and May.

Algeria is divided into five distinct areas along a north-south axis, which are characterized by their climate:

- (1) the coastal area: from 80 km to 190 km wide, includes the plains and the richest areas in the country. The climate is Mediterranean. Sometimes the sirocco brings heat and sand of the Sahara to coastal cities. The eastern part is in the mountains of Kabylia and Constantine is the wettest region of the country.
- (2) the chains of Tell Atlas are located between the sea and the high plains; their highest point is Mount Lala Khadija at 2,308 m a. s. l.; there are slopes covered with olive groves and oak forests and is densely populated.
- (3) the field of High Plains and plateaus; these huge steppe plateaus extend from east to west, from 600 to 1,000 m a. s. l. The climate is semi-arid, although a grain crop is produced without irrigation in depressions (called Chott). These semi-desert areas have long been places of human passage to Saharan Africa.
- (4) the Saharan Atlas: South of this is a succession of mountains, which marks the edge of the arid climate and northern limit of the Sahara. Mount Chelia in the Aures rises to 2,328 m a. s. l.
- (5) the Sahara and its massifs (Hoggar and Tassili): Covers much of southern Algeria, with the Algerian Sahara, covering two million square kilometers, a quarter of the entire desert. It is desolate dry and arid with varied landscapes: ergs, dry valleys, arid plains and sand dunes. It includes the volcanic Hoggar Mountains massif with the highest mountain peak in Algeria, Tahats at 2918 m, and the Tassili massif. The temperatures range from an average of 36 °C during the day to 5 °C at night. The subsoil is rich containing not only reserves of oil and natural gas, but also precious metals found during recent prospecting in the Hoggar Mountains. This territory produces 97% of the exports of Algeria.

Data acquisition

The data were obtained between 2006 and 2015 using three methods: field work including daytime visits to potential bat roosts, mist netting, and ultrasonic detection supplemented by the inclusion of recently published data.

The roosts visited were mainly underground cavities, which were mostly discovered by local people. Twelve roosts in Bejaia were visited. Others were visited in two areas in Skikda, on the peninsula of Collo, and at Guerbes, a great wetland complex. The individuals captured were identified using determination keys (Dietz & von Helversen 2004, Dietz 2005) and then released. We identified the medium-sized rhinolophids based on measurements and the structure of their nose.

The ultrasound recordings were made using D240X Pettersson detectors (AB Pettersson Elektronik) and DVRs (ZOOMH2N) and analyzed using the software Batsound 4.03 (Pettersson Elektronik AB). For specific identification we relied on the literature (Barataud 2001, Dietz 2005, Benda et al. 2008, Disca et al. 2014) and a reference sound bank (Bat Conservation Trust, Barataud 2015).

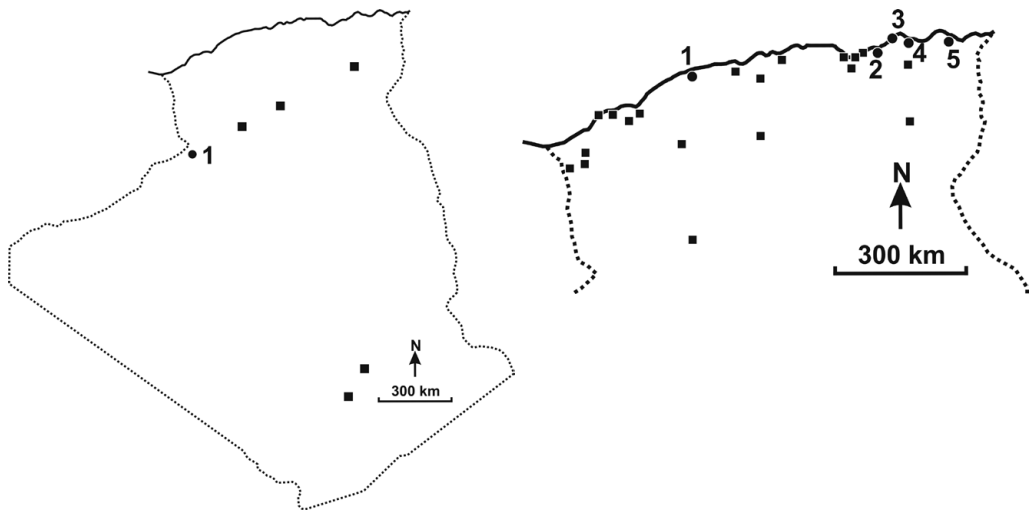
All the observations were compiled in a geographic information system MapInfo 4.1 with maps modified from D-maps.com. The taxonomic nomenclature used follows that used by Benda et al. (2004), Hulva et al. (2007) and Mayer et al. (2007).

RESULTS AND DISCUSSIONS

Rhinopoma cystops Thomas, 1903

RECORDS. Observed and photographed by Redouane Tahri on 20 February 2014 and 9 January 2015 in a cave at Mourel, 55 km north-west of Bechar (31° 38' N, 02° 28' W, 1000 m a. s. l.), there were 60 individuals in the colony (Fig. 1).

HISTORIC DISTRIBUTION. This species is known only from five regions in Algeria: On the northern border of the Sahara where it was reported at Brezina by Kowalski & Rzebik-Kowalska (1991) and Laghouat by Loche (1867). To the south of the Aures Mountains at Ghouffi specimens were collected on 18 July 1979 by Kowalski & Rzebik-Kowalska (1991). In Oued Irhargar, the Hoggar



Figs. 1, 2. Records of particular bat species in Algeria; squares – published records, circles – new records. 1 (left) – *Rhinopoma cystops* Thomas, 1903 [1 – Mourel]. 2 (right) – *Rhinolophus ferrumequinum* (Schreber, 1774) [1 – Cap Tenes, 2 – Sidi Abdelazziz, 3 – Boumoussa and Afenssou, 4 – Filfila, 5 – Kefh Laagareb].

Mts., specimens were collected by Geyr von Schweppenburg (1917) and at Oued Irhargar by Anciaux de Faveaux in a cellar in Oued Tit in 1977 (Vesmanis 1985).

***Rhinolophus ferrumequinum* (Schreber, 1774)**

RECORDS. Photographed at Sidi Abdelaziz (Jijel Dist., 36° 85' N, 06° 05' E, 95 m a. s. l.). Bendjedou et al. (2013) reported this species occurring in the extreme eastern coastal part of Algeria from Kefh Laagareb, near Annaba (36° 93' N, 07° 75' E, 30 m a. s. l.). Found in a cave at Cap Tenes (36° 33' N, 01° 21' E, 59 m a. s. l.) in February 2014. Observed and monitored from 2006 to 2012 in the Bejaia District where in total 10,989 individuals were recorded; Boukhiamia (36° 74' N, 05° 01' E, 156 m a. s. l.; 55 inds.), Taassast (36° 64' N, 05° 23' E, 135 m a. s. l.; 161 inds.), Fort Lemercier (36° 76' N, 05° 06' E, 140 m a. s. l.; 63 inds.), in the Aokas cave (36° 64' N, 05° 23' E, 6 m a. s. l.; 8,341 inds.), Chateau de la Contesse (36° 64' N, 05° 20' E, 12 m a. s. l.; 1,609 inds.), Grotte aux elephants at Melbou (36° 63' N, 05° 34' E, 3 m a. s. l.; 755 inds.), Ifri Oughilas (36° 73' N, 04° 85' E, 930 m a. s. l.; 1 ind.), Bouhatem (36° 26' N, 04° 34' E, 768 m a. s. l.; 1 ind.), Bouamrane (36° 35' N, 05° 01' E, 680 m a. s. l.; 1 ind.), Chaabet Lakhra (36° 32' N, 05° 16' E, 193 m a. s. l.; 1 ind.), Tunnel Lehal (36° 45' N, 04° 58' E, 352 m a. s. l.; 1 ind.) and in Boublatene (Jijel Dist., 36° 65' N, 05° 39' E, 15 m a. s. l.; 1 ind.). Observed also in the Boumoussa cave on the Collo peninsula (Skikda Dist., 37° 02' N, 06° 50' E, 200 m a. s. l.; 15 inds.) on 23 March 2015 and in the Filfila Mine (Skikda Dist., 36° 88' N, 07° 10' E, 450 m a. s. l.; 2 inds.) in 2012 (Fig. 2).

HISTORIC DISTRIBUTION. In Africa, *Rhinolophus ferrumequinum* occurs only in the Maghreb (Hayman & Hill 1971). In Algeria *R. ferrumequinum* is common in northern part of the country along the coast to the Saharan Atlas. Loche (1887) reported it to occur near Algiers and Aokas (Bejaia)

and Lataste (1885) at Beni Slimane. Pomel (1856) recorded it at Ghar Roubane (at Messaad). Anciaux de Faveaux (1976) saw it at Hamma Bouziane (Constantine). More recently, Gaisler (1983), recorded it at Chaâbet El Achra (Kherrata) and Tichy (Bejaia) and Kowalski et al. (1986) recorded it at Chaâbet El Achra (Kherrata), Souk El-Thenine and Tichy (Bejaia). This species is also reported by Kowalski & Rzebik-Kowalska (1991) at Aïn Fezza (Tlemcen), Aïn-Nouissi (Mostaganem), Bouyagoub (Oran), Brezina, Jebel Chelia (Batna), Frenda, Madagh, Messerghine (Oran), Sebdu and Sig.

***Rhinolophus hipposideros* (Borkhausen, 1797)**

RECORDS. Bendjeddou et al. (2013) reported this species for the first time in the extreme north-east of Algeria from a cave near Annaba (36° 92' N, 07° 75' E, 30 m a. s. l.). A colony was recorded by Idriss Belbali in the Kef El Melh salt cave at Laghouat (33° 50' N, 02° 10' E, 767 m a. s. l.; 60 inds.) on 13 March 2015. It was observed in the Filfila Mine (Skikda Dist., 36° 88' N, 07° 10' E, 450 m a. s. l.; 80 inds.) in 2012 and at Afenssou (37° 01' N, 06° 26' E, 400 m a. s. l.) in 2013 and 2014. Reported and monitored from 2006 to 2015 in the Bejaia District, where a total of 5,493 individuals were recorded; Boukhiamia (36° 74' N, 05° 01' E, 156 m a. s. l.; 11 inds.), Taassast (36° 64' N, 05° 23' E, 135 m a. s. l.; 179 inds.), Fort Lemerrier (36° 76' N, 05° 06' E, 140 m a. s. l.; 66 inds.), Aokas cave (36° 64' N, 05° 23' E, 6 m a. s. l.; 3,507 inds.), Chateau de la Contesse (36° 64' N, 05° 20' E, 12 m a. s. l.; 219 inds.), Melbou (36° 63' N, 05° 34' E, 3 m a. s. l.; 1,503 inds.), Ifri Oughilas (36° 73' N, 04° 85' E, 930 m a. s. l.; 1 ind.), Boublatene (Jijel Dist., 36° 65' N, 05° 39' E, 15 m a. s. l.; 7 inds.) and in Boumoussa (Skikda Dist., 37° 02' N, 06° 50' E, 200 m a. s. l.) on 23 March 2015. Djennane & Maamir (2011) reported the presence of an individual at Hamla in Belezma National Park (Batna, 35° 33' N, 06° 04' E, 1113 m a. s. l.) (Fig. 3).

HISTORIC DISTRIBUTION. This bat was reported from the northern part of Algeria by Lataste (1887) at Annaba, and by Falcoz (1923) at Ifri. Anciaux de Faveaux (1976) observed an individual at Chettaba (Constantine) and Gaisler (1983) recorded it at Kherrata. Kowalski et al. (1986) reported it to occur at Brezina, Messerghine (Oran), Sebdu, Sig and Tichy (Bejaia).

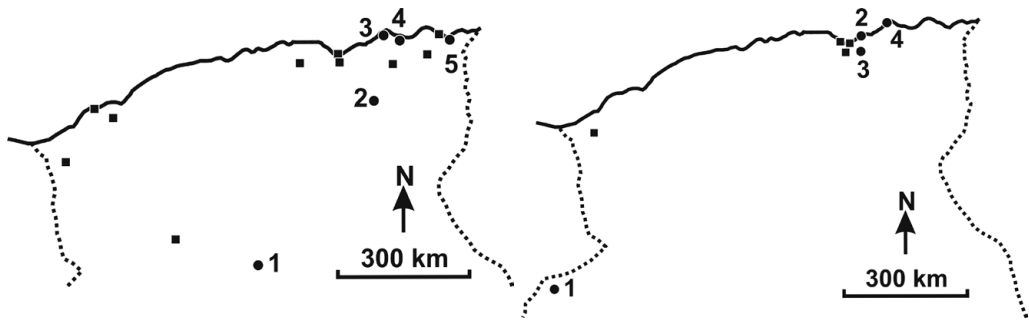
***Rhinolophus euryale* Blasius, 1853**

RECORDS. Photographed by Redouane Tahri in a cave at Mourel 55 km north-west of Bechar (31° 37' N, 02° 28' W, 1000 m a. s. l.) in February 2014. This was the first record of this species in the south of Algeria. In April 2014 recorded at Tiaret (35° 36' N, 01° 32' W, 1143 m a. s. l.). Studied from 2006 to 2015 in the Bejaia District, where 151 individuals were recorded in total; Boukhiamia (36° 74' N, 05° 01' E, 156 m a. s. l.; 3 inds.), Chateau de la Contesse (36° 64' N, 05° 20' E, 12 m a. s. l.; 130 inds.) and in the Aokas cave (36° 64' N, 05° 23' E, 6 m a. s. l.; 18 inds.). Also recorded at Boumoussa on 23 March 2015 (Skikda Dist., 37° 02' N, 06° 50' E, 200 m a. s. l.) (Fig. 4).

HISTORIC DISTRIBUTION. It was recorded by Gaisler (1983) and Kowalski et al. (1986) at Aïn Fezza near Tlemcen, Chaâbet El Achra (Kherrata), Souk El-Thenine and Aokas (Bejaia). Although this species was reported by other authors, these records were not confirmed (see Kowalski & Rzebik-Kowalska 1991).

***Rhinolophus mehelyi* Matschie, 1901**

RECORDS. Observed and monitored in the Bejaia District in 2006–2015 where 19 individuals were counted, it was present at Aokas (36° 64' N, 05° 23' E, 6 m a. s. l.; 16 inds.), Tunnel Lehal



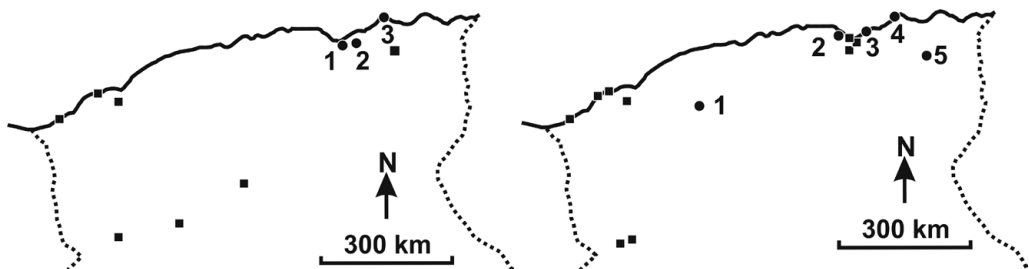
Figs. 3, 4. Records of particular bat species in Algeria; squares – published records, circles – new records. 3 (left) – *Rhinolophus hipposideros* (Borkhausen, 1797) [1 – Laghouat, 2 – Hamla, 3 – Afenssou, 4 – Filfila, 5 – Annaba]. 4 (right) – *R. euryale* Blasius, 1853 [1 – Mourel, 2 – Bejaia, 3 – Boukhiamia, 4 – Boumoussa].

(36° 45' N , 04° 58' E, 352 m a. s. l.; 1 ind.) and Chaabet Lakhra (36° 32' N, 05° 16' E, 193 m a. s. l.; 2 inds.). This species was not recorded in the humid eastern part of the coastal zone of Algeria until 23 March 2015, when it was recorded in the Boumoussa cave at Skikda (37° 02' N, 06° 50' E, 200 m a. s. l.) (Fig. 5).

HISTORIC DISTRIBUTION. This species has the widest distribution in northern Africa of all horseshoe bats (Hayman & Hill 1971). In Algeria, it is distributed in the northern areas, where it was reported by Falcoz (1923) at Bouyagoub, Messerghine (Oran) and Laghouat, where he studied its parasites. Kowalski (1979) found it at Sig and Kowalski et al. (1986) recorded it at Aïn Ouarka (Aïn Sefra), Brezina, Honaine, Messerghine and Sig. The specimen collected by Seddiki at Teffedest (north of Hoggar) in 1990 is preserved in formalin in the INA (National Institute of Agronomy).

Rhinolophus blasii Peters, 1867

RECORDS. Caught at Hemadia near Tiaret (35° 27' N, 01° 52' E, 870 m a. s. l.) in 2013 by Hichem Manseur. Bendjeddou et al. (2013) observed it at Edough near Annaba (36° 88' N, 07° 61' E,



Figs. 5, 6. Records of particular bat species in Algeria; squares – published records, circles – new records. 5 (left) – *Rhinolophus mehelyi* Matschie, 1901 [1 – Aokas, 2 – Chaabet Lakhra, 3 – Boumoussa]. 6 (right) – *R. blasii* Peters, 1867 [1 – Tiaret, 2 – Bejaia and vicinities, 3 – Melbou, 4 – Boumoussa, 5 – Bir Osmane].

1008 m a. s. l.) in November 2013. Bendjeddou et al. (2014), found it at the subterranean lake Bir Osmane at Guelma (36° 27' N, 07° 15' E, 287 m a. s. l.). This species was observed and followed during 2006–2015 at the Bejaia District, where only 6 individuals were observed during this period: in the Aokas cave (36° 64' N, 05° 23' E, 6 m a. s. l.; 2 inds.), Grotte aux elephants at Melbou (36° 63' N, 05° 34' E, 3 m a. s. l.; 3 inds.) and Bouamrane (36° 35' N, 05° 00' E, 680 m a. s. l.; 1 ind.). Observed and captured in a cave at Boumoussa on the Collo peninsula (Skikda Dist., 37° 02' N, 06° 50' E, 200 m a. s. l.; 2 inds.) on 23 March 2015 (Fig. 6).

HISTORIC DISTRIBUTION. In the western part of the Mediterranean, this species occurs exclusively in the Maghreb. Kowalski (1979) found this species at Sig and Gaisler (1983) at Aokas (Bejaia). Gaisler & Kowalski (1986) recorded it at Ain El-Hadjadj (Ain Sefra), Ain Ouarka, Honaine (Ain-Témouchent), Madagh and Messerghine (Oran). Kowalski et al. (1986) recorded it at Chaâbet El Achra (Kherrata) and Souk El-Thenin (Bejaia).

***Asellia tridens* (Geoffroy, 1813)**

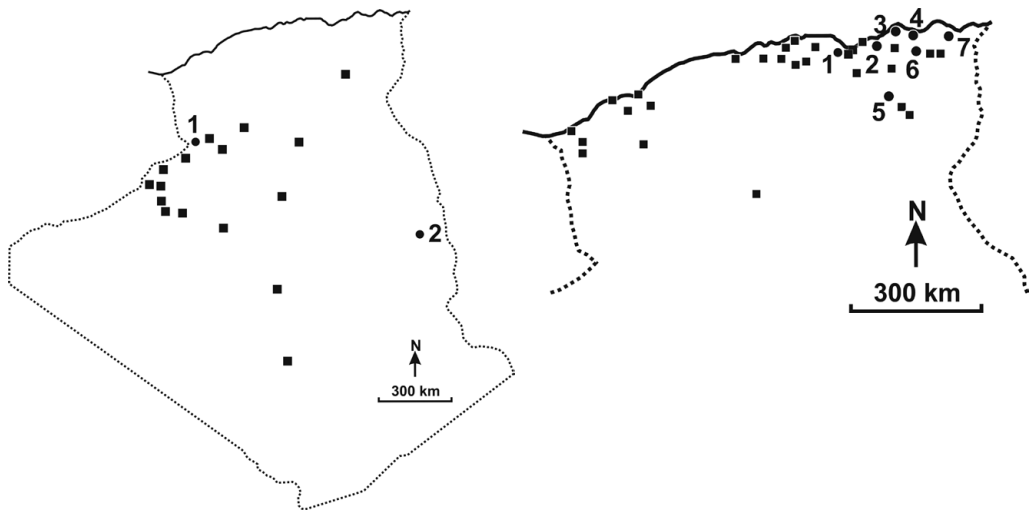
RECORDS. A colony of 250–300 individuals was observed and photographed by Redouane Tahri in a cave at Mourel 55 km north-west from Bechar (31° 37' N, 02° 28' W, 1000 m a. s. l.) on 11 January 2014. De Smet (pers. comm.) reported it from the tourist camp Illizi at Oued Djerrat (26° 48' N, 08° 46' E, 598 m a. s. l.) in 2014 (Fig. 7).

HISTORIC DISTRIBUTION. This species probably inhabits the Sahara up to the Saharan Atlas. It was reported by Thomas (1913) from El Golea, by Andersen (1918) from Biskra, by Foley (1922) from Beni Ounif, by Niethammer (1971) from Salah, and by Monod (1931) from Oued-N-Tourha. The most recent observations are those by Gaisler & Kowalski (1986) who report it at Abadla, Ain Ouarak (Laghout) and Brezina.

***Myotis punicus* Felten, 1977**

RECORDS. Bendjeddou et al. (2013) reported this species from Kehf Laagareb, a cave near Annaba (36° 92' N, 07° 75' E, 30 m a. s. l.). Bendjeddou et al. (2014) found this bat at 38 localities between 0 and 1177 m a. s. l. in the extreme north-east of Algeria. One of the most interesting localities is the subterranean lake Bir Osman at Guelma (36° 27' N, 07° 15' E, 287 m a. s. l.), where more than 4,500 individuals used this roost for both reproduction and hibernation along with large numbers of other species. Records are available from 2006 to 2015 from the Bejaia District, where 7,408 individuals were counted; Aokas (36° 64' N, 05° 23' E, 6 m a. s. l.; 6,933 inds.), Chateau de la Contesse (36° 64' N, 05° 20' E, 12 m a. s. l.; 80 inds.), Melbou (36° 63' N, 05° 34' E, 3 m a. s. l.; 394 inds.), and Boublatene in Jijel (36° 65' N, 05° 39' E, 15 m a. s. l.; 1 ind.). Other records are from the wetlands in Guerbes at Ghar Lehmane (Skikda Dist., 36° 55' N, 07° 09' E, 10 m a. s. l.; 3 inds.) in 2011 and in the Boumoussa cave on the Collo peninsula (Skikda Dist., 37° 02' N, 06° 50' E, 200 m a. s. l.; 25 inds.) in 2014. Echolocation calls were recorded in different localities at Bejaia. Djennane & Maamir (2011) reported an individual at Fesdis (35° 36' N, 06° 13' E, 961 m a. s. l.) in the Belezma National Park (Batna) (Fig. 8).

HISTORIC DISTRIBUTION. The range of this species in Algeria is rather wide, from the Mediterranean coast to the south of the Saharan Atlas. The oldest records are those by Loche (1867) from Algiers and by Dobson (1880) and Lataste (1880), who found it at Aokas (Bejaia), Lakhdaria, Setif, Jebel Tata and Dellys. Weber (1912) reported it from Larbaâ (Blida) and Rotrou (1939) from Tafna (Sebdou). Other records are for Messerghine (Oran) by Larat (1964), for Guelma, Hammam and



Figs. 7, 8. Records of particular bat species in Algeria; squares – published records, circles – new records. 7 (left) – *Asellia tridens* (Geoffroy, 1813) [1 – Mourel, 2 – Oued Djerrat]. 8 (right) – *Myotis punicus* Felten, 1977 [1 – Bejaia, 2 – Jijel, 3 – Boumoussa, 4 – Ghar lehmane, 5 – Fisdis, 6 – Bir Osmane, 7 – Kehf Laagareb].

Meskhoutine by Anciaux de Faveaux (1976), for Messerghine and Oran by Felten et al. (1977), and for Sig by Kowalski (1979). Gaisler (1983) found this species at Aokas, Souk El-Thenine and Timgad (Batna). Gaisler (1984) recorded it at Sebdu (Tlemcen), Tikjda and Yakouren (Tizi-ouzou). The most recent data on this species are by Vesmanis (1985), who reported it at Laghouat, and Gaisler & Kowalski (1986) at Ain Nouissi (Mostaganem), Bouira, Bouyagoub (Oran), Messerghine (Oran), Sebdu, Sig, Tiddis (Constantine) and Yakouren. Kowalski & RzebiK-Kowalska (1991) found remains of this species in raptor pellets collected at Honaine, Aokas, Saida and Tikjda.

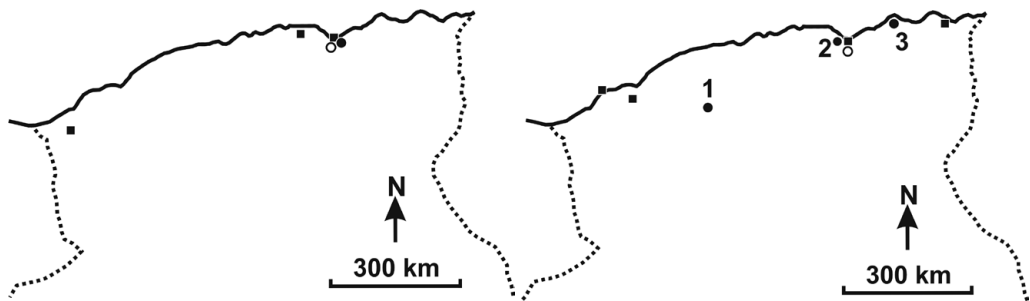
Myotis nattereri (Kuhl, 1817)

RECORDS. Only a single individual was recorded between 2006 and 2015 in Aokas (Bejaia Dist., 36° 64' N, 05° 23' E, 6 m a. s. l.). Echolocation calls of this species were recorded at different places in the same region (Fig. 9).

HISTORIC DISTRIBUTION. This species is known only from three locations in Algeria: Aokas and Yakouren, in north-eastern Algeria (Gaisler 1983, 1984) and a nursery colony was reported from Ain Fezza, western Algeria (Kowalski et al. 1986)

Myotis emarginatus (Geoffroy, 1806)

RECORDS. Recorded at Tiaret (35° 36' N, 01° 32' E, 1014 m a. s. l.) in April 2014. Only a single individual was seen between 2006 and 2015 in Aokas (Bejaia Dist., 36° 64' N, 05° 23' E, 6 m a. s. l.) and a breeding colony was reported from Boumoussa on the Collo peninsula (37° 02' N, 06° 50' E, 200 m a. s. l.; 200 inds.) on 23 March 2015. This species was observed and its echolocation calls were recorded at Bejaia and Skikda (Fig. 10).



Figs. 9, 10. Records of particular bat species in Algeria; squares – published records, circles – new records, white circles – calls. 9 (left) – *Myotis nattereri* (Kuhl, 1817) [Bejaia]. 10 (left) – *M. emarginatus* (Geoffroy, 1806) [1 – Tiaret, 2 – Bejaia, 3 – Boumoussa].

HISTORIC DISTRIBUTION. Its presence in Algeria was noted by Lataste (1885), who received a specimen from Annaba. Kowalski (1979), Gaisler (1983) and Gaisler & Kowalski (1986) recorded this species from Aokas, Madagh and Sig.

***Myotis capaccinii* (Bonaparte, 1837)**

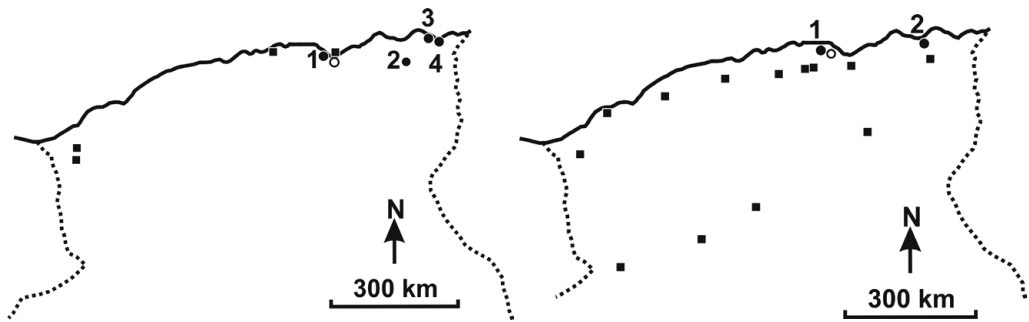
RECORDS. Bendjeddou et al. (2013) reported this species from Benmhidi (36° 45' N, 07° 59' E, 64 m a. s. l.) and El-Chatt near Annaba (36° 81' N, 07° 86' E, 3 m a. s. l.). Bendjeddou et al. (2014) recorded it at the subterranean lake Bir Osman (Guelma) (36° 27' N, 07° 15' E, 287 m a. s. l.). This species was observed and tracked from 2006 to 2015 in the Bejaia District, where six individuals were counted in Aokas (36° 64' N, 05° 23' E, 6 m a. s. l.). Its echolocation calls were recorded several times at different localities at Bejaia (Fig. 11).

HISTORIC DISTRIBUTION. This species occurs from the coastal area to the Tell Atlas. It was first reported by Dobson (1880) at Aokas and by Lataste (1885) at Dellys. Laurent (1944) observed an individual near Algiers, then Gaisler (1983, 1984) and Kowalski et al. (1986) mentioned it from Aokas, Sebdu and Tebbar (Tlemcen).

***Eptesicus isabellinus* (Temminck, 1840)**

RECORDS. A specimen was collected at Tizirt (Tizi-ouzou) (36° 53' N, 04° 07' E, 28 m a. s. l.) in 2008. Bendjeddou et al. (2013) reported this species from Sidi Kassi near Annaba (36° 45' N, 07° 59' E, 64 m a. s. l.). Echolocation calls were recorded in different regions of Bejaia (Fig. 12).

HISTORIC DISTRIBUTION. In Algeria, this bat is distributed from the Mediterranean coast to the Saharan Atlas. First reported by Loche (1867) from the plain of Chlef, by Lataste (1885) from Chaâbet El Akhra (Kherrata) and Jebel Tata (near Constantine) and by Jeannel & Racovitza (1914) from Ifri at Bejaia. Beaucournu & Clerc (1968) recorded it at Miliana and Kowalski (1979) found one specimen at Oran. Gaisler & Kowalski (1986) reported this species at Bouira, Messerghine, Amantan (M'Sila) and Tebbar (Tlemcen), where they saw a colony of over 40 individuals, and also at Ain El-Hadjadj (AïnSefra) and Arbaouats near Sidi Cheikh Labiod.

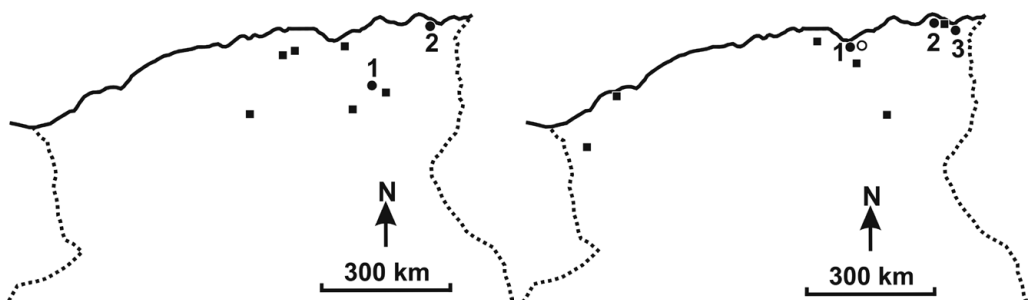


Figs. 11, 12. Records of particular bat species in Algeria; squares – published records, circles – new records, white circles – calls. 11 (left) – *Myotis capaccinii* (Bonaparte, 1837) [1 – Aokas, 2 – Bir Osmane, 3 – Ben Mhidi, 4 – Echatt]. 12 (right) – *Eptesicus isabellinus* (Temminck, 1840) [1 – Tigzirt, 2 – Sidi Kassi].

Hypsugo savii (Bonaparte, 1837)

RECORDS. Bendjeddou et al. (2013) reported this species from Kehf Nasser near Annaba ($36^{\circ} 91' N$, $07^{\circ} 69' E$, 75 m a. s. l.) and Djennane & Maamir (2011) from the Belezma National Park (Batna) ($35^{\circ} 52' N$, $05^{\circ} 94' E$, 1500 m a. s. l.). Acoustic records have been recorded at different localities at Bejaia (Fig. 13).

HISTORIC DISTRIBUTION. This bat is reported to be widespread in the Maghreb region, including the Canary Islands (Hayman & Hill 1971). It was recorded as occurring at least at six sites in the Mediterranean parts of Algeria. In Hill (1964) reported its records from Guelt Stell based on two specimens from the Natural History Museum London. Gaisler (1983) recorded it in the Babors Mountains (Setif), at Tikjda and Timgad. Then Gaisler & Kowalski (1986) recorded it at Amantan (Biskra), Bouira and Tikjda, where they observed respectively three, one, and three individuals.



Figs. 13, 14. Records of particular bat species in Algeria; squares – published records, circles – new records, white circles – calls. 13 (left) – *Hypsugo savii* (Bonaparte, 1837) [1 – Belezma, 2 – Kahf Nasser]. 14 (right) – *Pipistrellus pipistrellus* (Schreber, 1774) [1 – Bejaia, 2 – El Hadjar, 3 – Kahf Nasser].

Pipistrellus pipistrellus (Schreber, 1774)

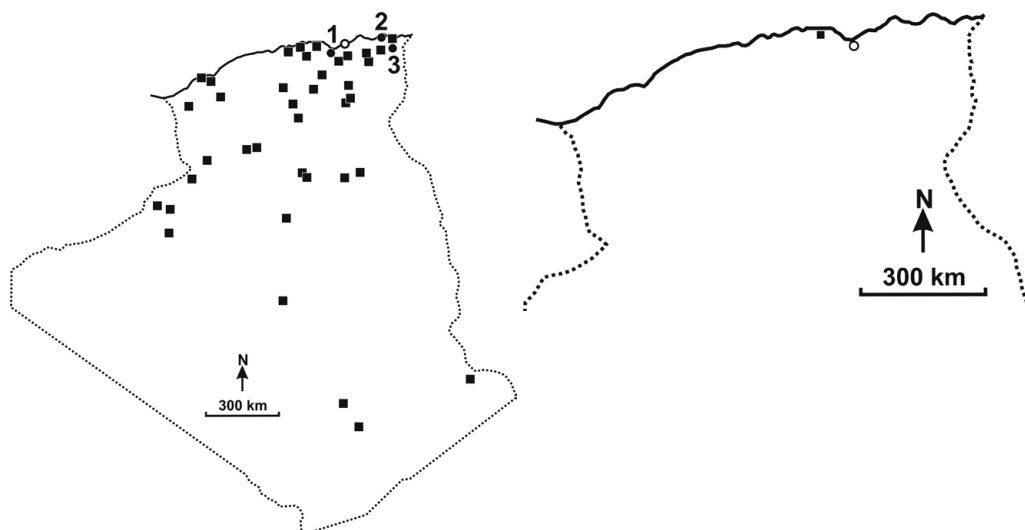
RECORDS. A dead specimen was found in the campus of the Bejaia University (36° 75' N, 05° 04' E, 29 m a. s. l.) on 29 September 2013 and another on 3 October 2013. Bendjeddou et al. (2013) reported the presence of this species at El Hadjar (36° 76' N, 07° 68' E, 17 m a. s. l.) and Kahf Nasser near Annaba (36° 91' N, 07° 69' E, 75 m a. s. l.). Calls of this species were recorded at Bejaia and in its vicinity (Fig. 14).

HISTORIC DISTRIBUTION. In Africa bats of the *Pipistrellus pipistrellus* group occur only in the Maghreb and Mediterranean part of Cyrenaica. In Algeria it occurs only in the coastal area and Tell Atlas. Dobson (1880) reported a specimen from Annaba. Gaisler (1983, 1984) and Gaisler & Kowalski (1986) and report this species from several localities, Messerghine, Sebdoou, Setif and Yakouren, where they observed and captured respectively two, six, three and four individuals.

Pipistrellus kuhlii (Kuhl, 1817)

RECORDS. Beba & Baziz (2011) caught four individuals in the Oued Righ valley near Tougourt (33° 02' N, 06° 10' E, 69 m a. s. l.). Bendjeddou et al. (2013) reported this species from El Hadjar (36° 76' N, 07° 68' E, 17 m a. s. l.) and Kahf Nasser near Annaba (36° 91' N, 07° 69' E, 75 m a. s. l.). Recorded near Mezaia Lake in Bejaia (36° 74' N, 05° 05' E, 21 m a. s. l.) from 2010 to 2015, and its echolocation calls were recorded in different parts of this region (Fig. 15).

HISTORIC DISTRIBUTION. This species occurs in both Mediterranean and desert habitats of North Africa. It was reported by Wagner (1841) from Algiers and Oran, and by Loche (1867) from



Figs. 15, 16. Records of particular bat species in Algeria; squares – published records, circles – new records, white circles – calls. 15 (left) – *Pipistrellus kuhlii* (Kuhl, 1817) [1 – Mezaia lake, 2 – El Hadja, 3 – Kahf Nasser]. 16 (right) – *Nyctalus leisleri* (Kuhl, 1817) [Bejaia].

Algiers. Lataste (1880) recorded it in Algiers, Annaba, Biskra, Tolga and Boussaâda and Lataste (1885) at Larbaâ, M'Sila and Touggourt. Thomas (1913) reported it from Aïn Sefra, El Golea, El Kantara, south of Ghardaia and Sebseb. Foley (1922) recorded it at Beni Ounif. Heim de Balsac (1936) reported it from Djanet and Tamanrasset. Qumsiyeh (1985) recorded it at Aïn Sefra, Constantine, Beni Abbes, Salah, Hoggar, Tamanrasset and In Amguel and Vesmanis (1985) in Djelfa. Gaisler (1983) found it at Djemila (Setif) and Sebseb. Gaisler & Kowalski (1986) observed specimens at Taghit (Bechar) and Djanet. Finally, Gaisler & Kowalski (1986) recorded it at Abadla, Arbaouats, Beni Abbes, Brezina, Messerghine, M'Sila Forest (Oran), Oran, Sebdou, Sebseb, Taghit and Yakouren.

Nyctalus leisleri (Kuhl, 1817)

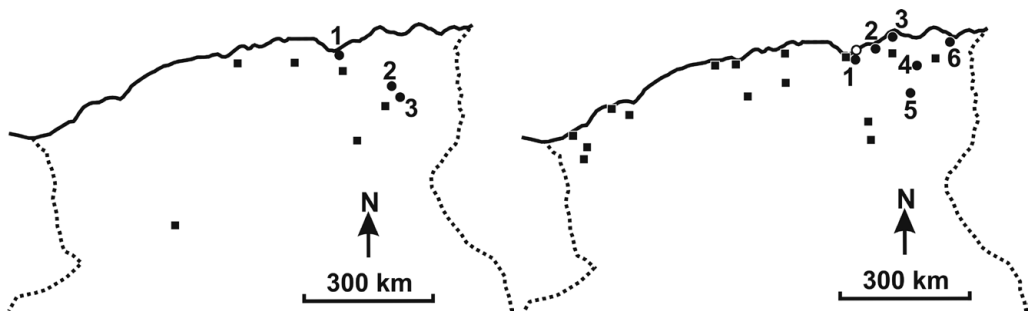
RECORDS. This species was not recorded during the current study but its echolocation calls were recorded at different locations at Bejaia (Fig. 16)

HISTORIC DISTRIBUTION. This species is reported at Yakouren by Hanak & Gaisler (1983) who record the biometrics of four individuals collected at the same locality by Kowalski & Gaisler (1986).

Plecotus gaisleri Benda, Kiefer, Hanák et Veith, 2004

RECORDS. Reported by Djennane & Maamir (2011) from the Belezma National Park at Batna and Oued el Ma (35° 65' N, 06° 01' E, 1027 m a. s. l.; 5 inds.) and Fesdis (35° 36' N, 06° 13' E, 961 m a. s. l.; 7 inds.). A specimen was captured in the Gueldamane Mine at Bejaia (36° 44' N, 07° 58' E, 575 m a. s. l.) on 20 September 2016, which is 65 km from the sea (Fig. 17).

HISTORIC DISTRIBUTION. This species is distributed along the northern edge of the Sahara and in the highlands as well as in the Mediterranean zone. Loche (1867) reported it from Blida and Thomas (1913) from Oumach (near Tolga). More recently, Gaisler (1983,1984) recorded this species at Setif, Timgad, and Tikjda. Gaisler & Kowalski (1986) recorded it at Brezina, Setif and Tikjda, where they recorded, respectively, twelve, one and one individual.



Figs. 17, 18. Records of particular bat species in Algeria; squares – published records, circles – new records, white circles – calls. 17 (left) – *Plecotus gaisleri* Benda, Kiefer, Hanak et Veith, 2004 [1 – Gueldamane, 2 – Oued el Ma, 3 – Fesdis]. 18 (right) – *Miniopterus schreibersii* (Kuhl, 1817) [1 – Bejaia, 2 – Jijel, 3 – Boumoussa, 4 – Bir Osmane, 5 – Fesdis, 6 – Annaba].

***Miniopterus schreibersii* (Kuhl, 1817)**

RECORDS. Bendjeddou et al. (2013) reported this species from a cave near Annaba (36° 91' N, 07° 69' E, 75 m a. s. l.). Bendjeddou et al. (2014) recorded it in the subterranean lake Bir Osman at Guelma (36° 27' N, 07° 15' E, 287 m a. s. l.). Tracked and observed from 2006 to 2015 in the Bejaia District, where 6,215 individuals were counted; Fort Lemercier (36° 76' N, 05° 06' E, 140 m a. s. l.; 2 inds.), Aokas cave (36° 64' N, 05° 23' E, 6 m a. s. l.; 3,770 inds.), Melbou (36° 63' N, 05° 34' E, 3 m a. s. l.; 2,436 inds.) and Boublatene (36° 65' N, 05° 39' E, 15 m a. s. l.; 5 inds.) in Jijel. Seen in Boumoussa cave on the Collo peninsula (Skikda Dist., 37° 02' N, 06° 50' E, 200 m a. s. l.; 34 inds.) on 23 March 2015. Djennane & Maamir (2011) reported seeing an individual at Fesdis in the Belezma National Park (35° 36' N, 06° 13' E, 961 m a. s. l.) at Batna (Fig. 18).

HISTORIC DISTRIBUTION. Range of this bat extends from the Mediterranean coast to the Saharan Atlas. Wagner (1841) and Laurent (1944) recorded this species in Algiers, Lataste (1867) in Bejaia and Tixeraine (Algiers) and Dobson (1880) in Aokas and Dellys. Taczanowski (1869) reported it from El Kantara. Weber (1912) collected an individual at Birkhadem in Algiers. Rotrou (1939) observed it in a cellar in Tafna (Sebdou). More recently, many authors have observed and studied it in different places, Anciaux de Faveaux (1976) in Chettabah at Constantine, Gaisler (1983, 1984), Gaisler & Kowalski (1986) and Kowalski et al. (1986) in Aïn Fezza (Tlemcen), Aokas (Bejaia), Honaine, Messerghine (Oran), Sebdou, Sig, Souk El-Thenine (Bejaia) and Tiddis (Constantine).

***Tadarida teniotis* (Rafinesque, 1814)**

RECORDS. Calls were recorded in different parts of Bejaia. Bendjeddou et al. (2013) found a male in a crack in a house 4 km north-east of Tamanrasset (22° 47' N, 05° 31' E, 1372 m a. s. l.) (Fig. 19)

HISTORIC DISTRIBUTION. It was recorded at Aures and Lakhdaria (Bouira). Kock & Nader (1984) reported it from Lakhdaria and Tighanimine in Roufi (Batna). Gaisler & Kowalski (1986) recorded four individuals near Meniaâ Amantan (around Barika).

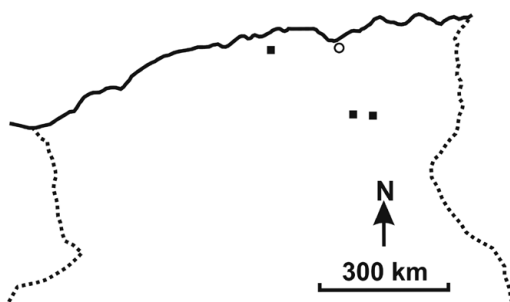


Fig. 19. Records of *Tadarida teniotis* (Rafinesque, 1814): black squares – published records, white circle – call records.

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