Short Note

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A new mammal species for Algeria, *Rhinopoma microphyllum* (Chiroptera: Rhinopomatidae): morphological and acoustic identification

DOI 10.1515/mammalia-2016-0153
Received October 17, 2016; accepted January 17, 2017; previously published online February 23, 2017

Abstract: The greater mouse-tailed bat (*Rhinopoma microphyllum* Brunnich 1782) is reported for the first time in Algeria from two caves of the Boukaïs region (Bechar). Noseleaf shape, forearm and tail lengths clearly identified this species. The frequency of maximal energy of echolocation calls varied from 28.2 to 31.2 kHz for hand released individuals.

Keywords: biometrics; cave; echolocation calls; Northwest Africa; *Rhinopoma microphyllum*.

The monotypic family Rhinopomatidae is widely distributed from Morocco to Sumatra island across Africa (north of the Equator), the Arabic peninsula and India, (Simmons 2005, Aulagnier 2013a). Among the five species two have been reported from North Africa: *Rhinopoma cystops* (Thomas, 1903) and *Rhinopoma microphyllum* (Brünnich 1782) (Hulva et al. 2007). *Rhinopona cystops* is a common species throughout North Africa, inhabiting arid and semi-desert vegetation zones where it roosts in warm caves, underground tunnels, rock crevices, wells and mosques (Aulagnier 2013b). This species has already been reported from several Algerian localities (Kowalski and Rzebik-Kowalska 1991). *Rhinopoma microphyllum* has been recorded only in Morocco (Aulagnier and Thévenot 1986), Mauritania (Poulet 1970) and Egypt (Qumsiyeh 1985), inhabiting regions with very sparse vegetation, roosting in crevices, small caves, mines, underground tunnels, wells and old buildings (Aulagnier 2013c). In this note we report the first record of *R. microphyllum* in Algeria and the first echolocation calls reported from north-western Africa.

Bat surveys in Boukaïs region (Bechar), in the south-West of Algeria, targeted investigations in two caves: an underground natural cavity at a place called El Hadj Ali (X; – 2.4680, Y; 31.9268), sheltering a mixed maternity of 500 *Rhinopoma* and *Asellia tridens*, and an old abandoned copper mine (X; – 2.4566, Y; 31.9351), occupied by a hundred of *Rhinopoma* of presumably two sizes. In this arid region (72.4 mm of rain) the natural habitat is characterized by jujube trees (*Zizyphus lotus*), sagebrush (*Artemisia herba-alba*) and scattered *Noaea mucronata*, palm groves (*Phoenix dactylifera*) and oases. However, the two sites are close to water bodies: the first one is 150 m from a water tower providing irrigation through gutters and a dry wadi (See Figure 1), the second one is 800 m from an important water reservoir, and both are 950 m far from the closest palm grove.

Three large *Rhinopoma* females, easily identifiable by their rudimentary noseleaf, were captured, photographed (Figure 2), measured using a caliper and released during visits to the cavities by HL, BA and OP on May 19, 2016. At the first site, the measurements of two specimens were 64.3 mm and 68.8 mm for forearm length, 60.8 mm and 67.5 mm for tail length, 72 mm and 79 mm for the third finger, and 60 mm and 65 mm for the fifth finger. At the second site the specimen had a forearm length of 67.4 mm, a tail length of 57.5 mm, a third finger of 79 mm and a fifth finger of 66 mm. Forearm lengths clearly fell within the range of *Rhinopoma microphyllum*, and were all longer than tail lengths (Hill 1977, Van Cakenberghe and de Vree 1994, Schlitter and Qumsiyeh 1996, Dietz 2005, Aulagnier 2013c).

Ultrasound echolocation signals were recorded from hand released individuals, using a Pettersson D240x bat

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Figure 1: Area where *Rhinopoma microphyllum* was recorded. Photo HL.

Figure 2: Rhinopoma microphyllum from Boukais (Bechar). Photo BA.

detector connected to an Edirol R05 recorder. The sounds were analyzed with Batsound 4.2 software (Pettersson Elektronik, Uppsala, Sweden). The 15 calls from the three individuals were typically multiple-harmonic frequency modulated (Figure 3). The peak frequency of the strongest component, the second harmonic, varied from 28.2 to 31.2 kHz with call duration from 2.4 to 6.1 ms, while start and end frequency averaged 35.6 and 24.4 kHz, respectively (Table 1).

Rhinopoma microphyllum is reported in Algeria for the first time despite the former investigations of Kowalski and Rzebik-Kowalska (1991). Formerly recorded in southern Anti-Atlas and Jebel Bani regions in south-western Morocco (Aulagnier and Thévenot 1986), this species was recently recorded in the Saharan Atlas of eastern Morocco (Dieuleveut et al. 2010), about 60–80 km apart from our Algerian locality. Our specimens probably belong to the same trans-boundary population, however, we can expect a wider area of occurrence in the Saharan Atlas of Algeria as *R. microphyllum* appears to be distributed through the margins of the Sahara in the south (Kock 1969, Van Cakenberghe and De Vree 1994, Aulagnier 2013c).

Echolocation calls differed from those of *Rhinopoma cystops* recorded in the same area, the frequency of maximum energy (FME) and the end frequency being

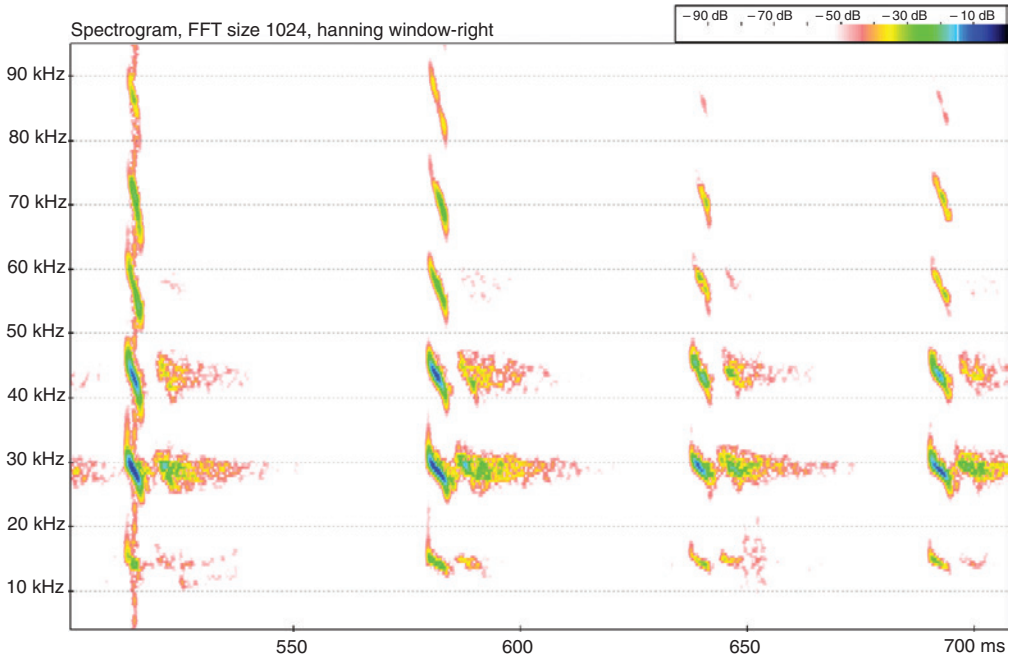

Figure 3: Sequence of frequency modulated calls of hand-released *Rhinopoma microphyllum* recorded at Boukais (Bechar, Algeria).

Table 1: Parameters of echolocation calls of *Rhinopoma microphyllum* and *Rhinopoma cystops* recorded after hand release at Boukais-Bechar, Algeria.

	Type	n	Start F	F_{max}	End F	Pulse duration	
Rhinopoma microphyllum	FM	15	15.8–20.3	28.7–30.7	11.3–13	3.1–6.3	1st Harmonic
			31.9–37.9	**28.2–31.2**	**23.1–25.2**	**3.2–6.1**	2nd Harmonic
			48.6–64.8	28.7–30.7	36.5–53	3.2–6.1	3rd Harmonic
			60.8–77.8	28.7–30.2	49.6–63.5	3.2–4.7	4th Harmonic
Rhinopoma cystops	FM	25	36.4–41.8	33.7–36.2	27.0–32.1	3.2–9.0	2nd Harmonic

Frequencies in kHz; duration in ms; n, number of analyzed calls; in bold, the harmonic of maximum energy.

lower (Table 1). Such short frequency modulated calls at 27–31 kHz (FME) have been recorded by Schmidt and Joermann (1983) in experimental conditions with specimens from Egypt, where Simmons et al. (1984) reported a range of 36–40 kHz for *R. cystops* in similar conditions. In open space, Dietz (2005) and Hackett et al. (2013) recorded quasi-constant frequency longer signals in a slightly lower frequency range in Egypt and Israel, respectively. Benda et al. (2010) also reported lower range frequency and longer calls from Jordan, without information on the recording conditions. *Rhinopoma* should be investigated further to identify the influence of activity and environment on their echolocation calls.

The distribution of *Rhinopoma microphyllum* in north-western Africa also requires further investigations to confirm the disruption with Egypt and Levant populations which could explain the slight differentiation of Moroccan specimens using the mitochondrial control region (Levin et al. 2008, Akmali et al. 2011), even if Hulva et al. (2007) failed to find any genetic (cytochrome *b* gene) support to the previous sub-species identified in India in comparison with Levant forms. Further field campaigns in Algeria should focus on the Saharan margins to provide better information on bat occurrences, distribution and ecology in this area, and to improve their protection and more widely fauna conservation management.

Acknowledgments: We are grateful to Moussa Oulad Ali for hosting us during field trips, and Rachid Djoumi, Si Mohamed Baglab, Kamel Torki and Mohamed Ali Malki for their help during this time. We would also like to acknowledge Houria Bouziane for her help during the preparation of the manuscript.

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