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**The Arachnological Bulletin
of the Middle East and North Africa**

**Volume 20
November, 2024**

**Part 3
Cairo, Egypt**

ISSN: 1110-502X

On current distribution of *Androctonus aeneas* Koch, 1839 in Algeria (Scorpiones: Buthidae)

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Abstract

This work concerns a new consideration on the geographical distribution of *Androctonus aeneas* C.L. Koch, 1839 (Scorpiones) in Algeria. Historically, this species occupied the central band of Algeria, from Tébessa and Khenchela in the east, through Batna in the Belezma mountains, to Naâma in the west. Recent surveys by young researchers have noted an expansion of the range of this scorpion not only in the geographic distribution area predicted for this species by Lourenço *et al.* (2015) but also towards western Algeria (Aïn Témouchent, Sabdou, El Bayadh and Saïda) and towards the southwest of Algeria in Naâma and Béchar. These new data may enrich the understanding of this potentially dangerous species, but also to the known area of scorpion envenomation risk.

Keywords: *Androctonus aeneas*, Algeria, geographic distribution, habitat.

Introduction

Genus *Androctonus* Ehrenberg, 1828, is represented in Algeria by six species: *A. aeneas* C.L. Koch, 1839, *A. amoreuxi* (Audouin, 1825), *A. australis* (Linnaeus, 1758), *A. eburneus* (Pallary, 1928), *A. hoggarensis* (Pallary, 1929), and *A. Liouvillei* (Pallary, 1929) (Dupré *et al.*, 2023). These species have particular bioecological affinities and a wide distribution in this vast country. *Androctonus aeneas* was first described in Algeria by C.L. Koch in 1839 based on specimens from Aïn El-Turk region (Oran). This species has a limited distribution in the Algerian highlands and in Tunisia (Sadine *et al.*, 2011; Sadine, 2012; Lourenço *et al.*, 2015; Ouici *et al.*, 2020). In Algeria, Vachon (1952) reported its distribution in the central horizontal band extending from Tébessa and Khenchela in the east to Naâma in the west.

Contemporary authors confirmed several localities such as Belezma mountains-Batna (Sadine *et al.*, 2012), in Tébessa region (Mekahlia *et al.*, 2021; Abidi, 2022), in El-Oued region (Sadine *et al.*, 2011; Sadine, 2012) and in the Ghardaïa region (Sadine *et al.*, 2014; Sadine *et al.*, 2023). It is also found in the steppe area of Khenchela (Meddour *et al.*, 2017), as well as in the Tiaret region (Ait Hammou *et al.*, 2023) and in Sidi Bel Abbès (Ouici *et al.*, 2020).

This species has a morphological variability that complicates its classification (Vachon, 1952) and it is frequently confused with *A. bicolor* Ehrenberg, 1828. Pallary (1924) proposed two subspecies: *A. aeneas aeneas* and *A. aeneas liouvillei*, while Levy & Amitai (1980) suggested *A. bicolor aeneas*. In his famous revision of *Androctonus*, Lourenço (2005) proposed that *A. aeneas* might be a synonym of *A. bicolor* due to a gradient of variations in some populations. Consequently, Sadine *et al.* (2011, 2014) reported it as *A. bicolor* for Algeria in Batna and Ghardaïa.

In Tunisia, Teruel & Kovařík (2014) identified *A. turieli* and consider *A. aeneas* as *nomen dubium* due to the loss of type specimens. However, Lourenço *et al.* (2015) revalidated *A. aeneas* based on a neotype of *A. aeneas* from the type locality of Aïn El-Turk (Oran) and they synonymized these two species.

Therefore, the present work aims to update the spatial distribution of *Androctonus aeneas* in Algeria. Given that this species is classified as potentially dangerous (Sadine *et al.*, 2020), the updated distribution map will highlight high-risk areas in terms of scorpion envenomation.

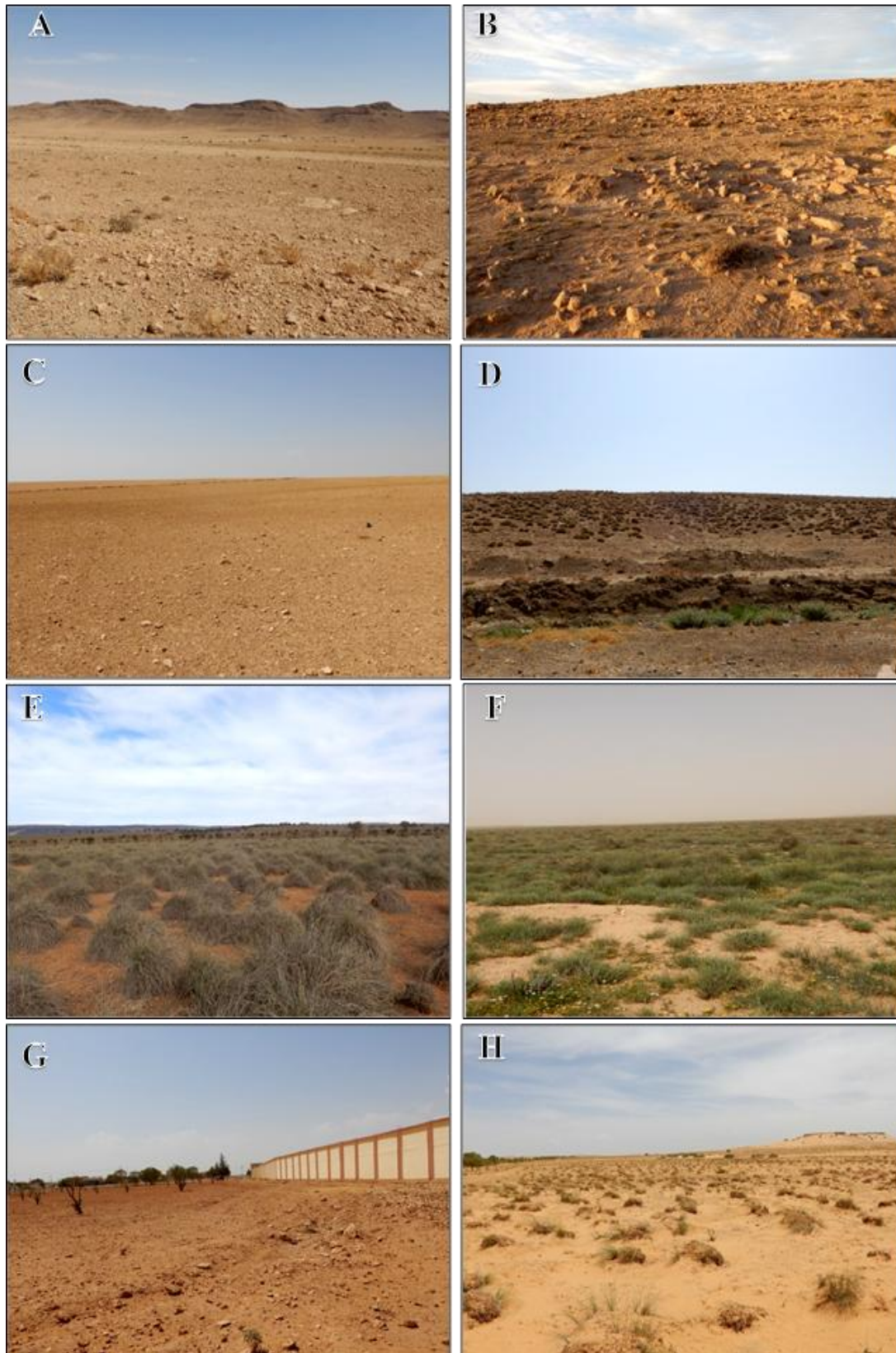


Fig. 1. Different biotopes of *Androctonus aeneas* in Algeria. A. uncultivated plains. B. stony plain. C. abandoned steppe. D. herbaceous layer of *Lygeum spartum*. E. herbaceous layer of Alfa. F. herbaceous layer of *Artemisia*. G. abandoned Almond farm. H. overgrazed Alfa steppe.

Material and Methods

Scorpion sampling

Data on the distribution of *Androctonus aeneas* in Algeria are collected from various sources, including old publications by C.L. Koch (1839), Ehrenberg (1828) and Vachon (1952), as well as recent publications.

The collecting of new scorpion material was carried out by a team of young researchers (authors of this note). During the period from January 2021 to September 2024, several stations (different biotopes) were explored (Fig. 1), including the southern steppes and large uncultivated plains of grassy expanses with sandy formations, herbaceous layer of Alfa and *Artemisia*, *Atriplex* plantations, and some Matorral and Garrigues.

Additionally, we carried out field surveys among local residents and health services to obtain additional data which allowed us to identify new locations for this species.

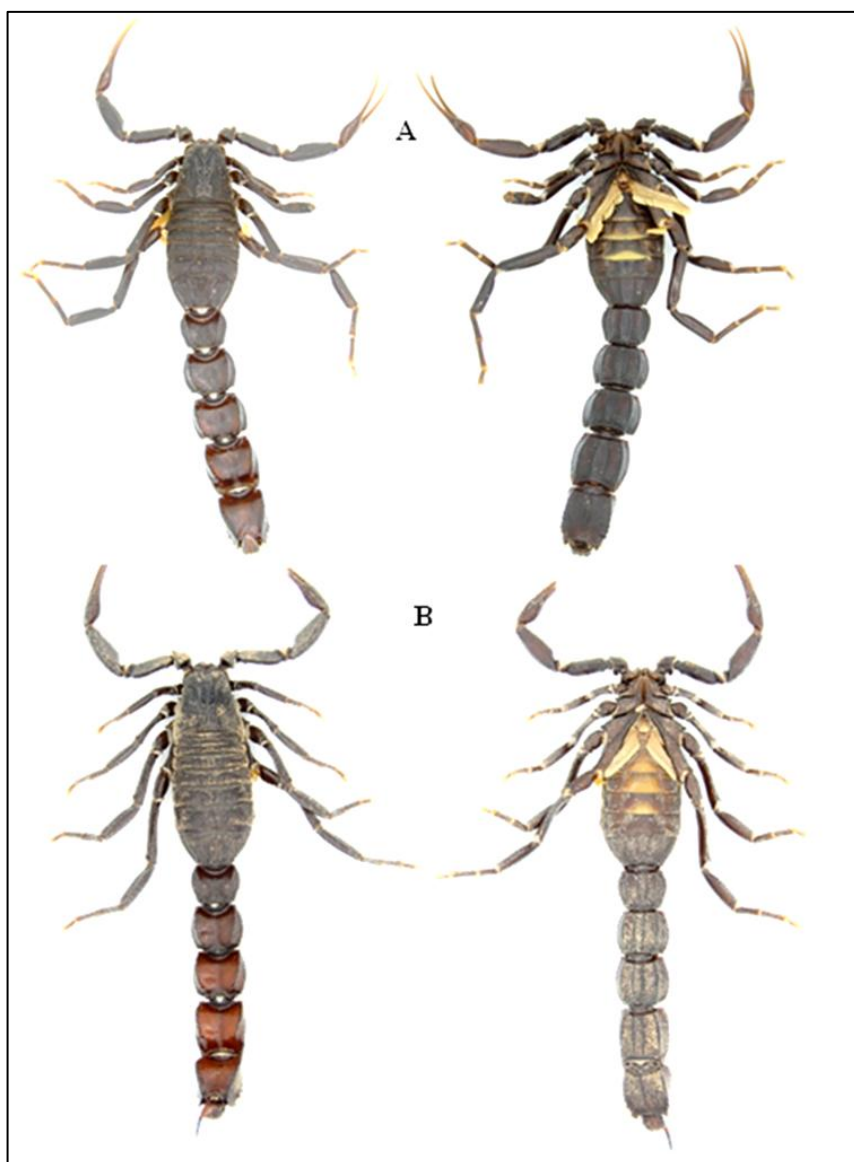


Fig. 2. *Androctonus aeneas* adult, dorsal and ventral views. A. ♂. B. ♀.

Scorpion identification

The specimens were killed and kept in 96% alcohol (ethanol). Identification was obtained using a stereo-microscope to highlight the distinctive and specific characteristics of the species (Fig. 2) according to the criteria established by Vachon (1952, 1974).

Results and Discussion

Systematic position

Family **Buthidae** C.L. Koch, 1837
Genus **Androctonus** Ehrenberg, 1828
Androctonus aeneas C.L. Koch, 1839 (fig. 3)
Syn. **Androctonus turieli** Teruel & Kovařík, 2014



Fig. 3. *Androctonus aeneas* C.L. Koch, 1839 in its biotope. A. adult. B. juvenile.

Material of *Androctonus aeneas* from Algeria cited by Vachon (1952)

Chellala and Tiaret, January 1930 (coll. IPA, Dr. ALQUIER), 2♂♂ ad., 3♀♀ ad.; **Messad**, coll. IPA, 2♂♂, 8♀♀; **Taguine**, coll. IPA, 8♀♀, 3♂♂; **Zenina** (currently El-Idrissia located at. Djelfa), coll. IPA, 2♂♂, 6♀♀; **Ouled Djellal**, coll. IPA, 4♂♂; **Ghardaïa**, coll. LS, n° 109, Oct. 1924 (Dr. DESANGLES), 1♀ det. *Aeneas* by H. FOLEY; **Laghouat**, coll. MNP, 1899 (P. SECQUES), 1♀ im. det. *Aeneas* by E. SIMON = *bicolor* par KRAEPELIN with mention: passing to *crassicauda*; **Bou Sâada**, coll. MNP, 5♂♂, 5♀♀, det. *Aeneas* by E. SIMON; **Ouargla**, coll. MNP, 1885 (M. LECHATELIER), 1♂ ad. det. *Aeneas* by E. SIMON and *crassicauda* by KRAEPELIN. **Oran**, coll. MNP, 1887 (COQUEROL leg.), 1♀ im. det. *Aeneas* by E. SIMON et *crassicauda* by KRAEPELIN.

Recent material

The material cited in recent publications, also the new observation points, is summarized in Table (1).

Table 1. New observation points of *Androctonus aeneas* in Algeria.

Province	Region	Latitude	Longitude	Altitude (m)	Biotopes	References/ collectors
Recent literature						
Batna	Hidoussa	35°32'N.	05°55'E.	1633	Open Forest	Sadine <i>et al.</i> , 2015
Batna	Fesdis	35°37'N.	06°10'E.	1230	Matorrals	Sadine <i>et al.</i> , 2015

Khenchela	Khenchela	35°17'N.	07°07'E.	1134	Uncultivated plain	Meddour <i>et al.</i> , 2017
Tébessa	Safsaf El Ouesra	34°57'N.	08°12'E.	928	Agricultural plain	Abidi, 2022
Tébessa	Bir el-Ater	08°02'E.	34°44'N.	897	Natural	Abidi, 2022
Biskra	El Ghrous	34°43'N.	05°15'E.	176	Palm grove	Sadine <i>et al.</i> , 2015
El Oued	Ben Guecha	34°12'N.	07°36'E.	25	Palm grove	Sadine <i>et al.</i> , 2015
Sidi Bel Abbès	Marhoum	34°24'N.	00°18'O.	1134	Stony plain	Ouici <i>et al.</i> , 2020
Sidi Bel Abbès	Marhoum	34°14'N.	00°15'O.	1061	Stony plain	Ouici <i>et al.</i> , 2020
Tiaret	Sidi Abderrahmane	34°37'N.	00°55'E.	1002	Plowed steppe	Ait Hammou <i>et al.</i> , 2023
Tiaret	Sidi Abderrahmane	34°45'N.	01°04'E.	1091	Plowed steppe	Ait Hammou <i>et al.</i> , 2023
Tiaret	Madna	34°42'N.	00°59'E.	1028	Agricultural plain	Ait Hammou <i>et al.</i> , 2023
Tiaret	Medrissa	34°52'N.	01°14'E.	1100	Natural	Ait Hammou <i>et al.</i> , 2023
Tiaret	Ksar Chellala	35°13'N.	02°16'E.	826	Uncultivated plain	Ait Hammou <i>et al.</i> , 2023
Tiaret	Zmalet Emir AEK	34°57'N.	02°22'E.	802	Natural	Ait Hammou <i>et al.</i> , 2023
Tiaret	Faidja	35°06'N.	01°42'E.	1233	Agricultural plain	Ait Hammou <i>et al.</i> , 2023
Tiaret	Naima	34°34'N.	01°45'E.	1026	Stony plain	Ait Hammou <i>et al.</i> , 2023
Tiaret	Naima	34°59'N.	01°30'E.	1224	Stony plain	Ait Hammou <i>et al.</i> , 2023
Tiaret	Ain D'heb	34°55'N.	01°31'E.	1156	Herbaceous layer of Alfa	Ait Hammou <i>et al.</i> , 2023
Tiaret	Ain Dehab	34°55'N.	01°31'E.	1141	Uncultivated plain	Ait Hammou <i>et al.</i> , 2023
Tiaret	Si Abdelghani	35°16'N.	01°36'E.	990	Uncultivated plain	Ait Hammou <i>et al.</i> , 2023
Tiaret	Naima	34°34'N.	01°45'E.	1026	Stony plain	Ait Hammou <i>et al.</i> , 2023
Tiaret	Rechaiga	35°22'N.	02°08'E.	876	Agricultural plain	Ait Hammou <i>et al.</i> , 2023
Tiaret	Chehaima	34°26'N.	01°13'E.	1028	Uncultivated plain	Ait Hammou <i>et al.</i> , 2023
Tiaret	Chehaima	34°23'N.	01°13'E.	1036	Uncultivated plain	Ait Hammou <i>et al.</i> , 2023
New observation points						
Sétif	Guidjel	36°01'N.	05°25'E.	960	Open Forest	Rebbas, 2024
M'sila	Maarif	35°23'N.	04°15'O.	422	Steppe	Rebbas, 2023
M'sila	Baniou	35°24'N.	04°19'E.	401	Uncultivated plain	Rebbas, 2023
M'sila	Mergueb (Slim)	35°00'N.	03°48'E.	1010	Uncultivated plain.	Rebbas, 2023
M'sila	M'Cif	35°20'N.	04°52'E.	437	Stony plain	Rebbas, 2023
Sidi Bel Abbès	Marhoum	34°22'N.	00°50'O.	1200	Stony plain	El Bouhissi, 2020
Sidi Bel Abbès	Merine	34°48'N.	00°22'O.	1011	Aleppo Pine Forest	El Bouhissi, 2020
Sidi Bel Abbès	Ain Adden	35°17'N.	00°13'O.	714	Clear maquis	El Bouhissi, 2024
Sidi Bel Abbès	Rdjem Demouch	34°22'N.	00°50'O.	1197	Stony plain	El Bouhissi, 2024
Sidi Bel Abbès	Marhoum	34°16'N.	00°02'O.	1037	Uncultivated plain	El Bouhissi, 2024
Ain Temouchent	Sassel	35°03'N.	01°11'O.	366	Degraded maquis	Megharbi, 2024
Djelfa	Hassi fdoul	35°26'N.	02°15'E.	794	Stony ground	Ait Hammou, 2024
Tlemcen	El Aricha	34°19'N.	01°13'O.	1068	Steppe	Ziani, 2024
Djelfa	Hassi fdoul	35°29'N.	02°10'E.	903	Stony ground	Ait Hammou, 2024
Tiaret	Sougueur	35°09'N.	01°27'E.	1196	Agricultural plain	Ait Hammou, 2024
Tiaret	Mahdia	35°25'N.	01°43'E.	921	Agricultural plain	Chelghoum, 2024
Tiaret	Hamadia	35°33'N.	01°49'E.	816	Agricultural plain	Ait Hammou, 2024
Tissemsilt	Layoune	35°39'N.	02°00'E.	864	Stony plain	Cheddad, 2024
Tissemsilt	Layoune	35°38'N.	02°01'E.	827	Plowed steppe	Cheddad, 2024
Tissemsilt	Douar Essaid	35°34'N.	01°44'E.	910	Uncultivated plain	Feghoul, 2024
Tissemsilt	Boumengouch	35°35'N.	01°53'E.	878	Agricultural plain	Feghoul, 2024
Tissemsilt	Selmana	35°35'N.	02°05'E.	831.2	Uncultivated plain	Dahmani, 2024
Tissemsilt	Selmana	35°34'N.	02°08'E.	872	Almond Orchard	Ait Hammou, 2024
El Bayadh	Sidi Taifour	33°40'N.	01°40'E.	1139.3	Uncultivated plain	Bakel, 2024
El Bayadh	Boualem	33°44'N.	01°36'E.	1311	Stony plain	Bakel, 2024
Saïda	Aïn El Hadjar	34°49'N.	00°09'O.	833	Stony plain.	Ait Hammou, 2023
Aflou	Aflou	34°03'N.	02°02'E.	1432	Uncultivated plain	Ait Hammou, 2023
Aflou	Aflou	34°11'N.	02°02'E.	1298	Stony plain	Ait Hammou, 2023
Aflou	Sebgag	33°59'N.	01°55'E.	1406	Uncultivated plain	Ait Hammou, 2024
Djelfa	Hassi Fdhoul	35°26'N.	02°17'E.	774	Stony plain	Ait Hammou, 2024
Naâma	Naâma	33°15'N.	00°18'O.	1173	Aleppo pine Forest	Ait Hammou, 2024
Bechar	Beni Ounif	32°08'N	01°00'W	1023	Uncultivated plain.	El Bouhissi, 2022
Ghardaïa	Berriane	32°51'N.	03°43'E.	600	Palm grove	Sadine, 2014

Several authors reported that the taxonomic status of several species in the genus *Androctonus* remains very uncertain (Fet *et al.*, 2000; Lourenço, 2005). Vachon (1952) noticed that *A. aeneas* is a morphologically "plastic" species with many varieties that are difficult to classify. However, according to Lourenço *et al.* (2015), *A. aeneas* remains a well-defined and valid species, described as the largest black species of the genus *Androctonus* in Algeria (Sadine *et al.*, 2020). Its distribution in Algeria is over a wide area from Tunisia to the Algerian high plateaus (Lourenço *et al.*, 2015; Meddour *et al.*, 2017; Sadine, 2018; Mekahlia *et al.*, 2021).

This species has a significant ecological plasticity, because it has been found in various biotopes such as: the steppes (Vachon, 1952; Chichi, 2015; Ouici *et al.*, 2020), in forest and herbaceous habitats and rocky areas (Sadine *et al.*, 2012; Meddour *et al.*, 2017; Ouici *et al.*, 2020; Mekahlia *et al.*, 2021), as well as in the Sahara Regs and palm groves (Sadine *et al.*, 2011, 2012, 2014; Sadine & Bissati, 2014). According to our recent observations, this species is primarily concentrated in steppe biotopes, particularly in flat lands with sandy limestone soils where shelters are abundant. It is also found in uncultivated plains, stony plains offering numerous shelters, as well as in plowed and abandoned steppe soils, areas with *Lygeum spartum*, herbaceous layer of Alfa and *Artemisia*, abandoned farms and overgrazed Alfa steppe (Fig. 2). Its presence has been noted near farms and urban areas, probably due to the abundance of various preys (Feghoul & Benali, 2022).

Based on results of Table (1), we deduce that *A. aeneas* can be adapted to an altitude ranging from 25 m to 1633 m. Although, Ouici *et al.* (2020) found this species in steppes and forests at an altitude exceeding 700 m in north western Algeria. Sadine *et al.* (2012) reported that in the Belzma-Batna region (eastern Algeria), the abundance of *A. aeneas* is negatively correlated with a dense forest vegetation and altitude, which influence the climatic conditions. Lourenço *et al.* (2015) and Sadine (2018) stated that the abundance of *A. aeneas* decreased with the density of forest vegetation and altitude as well as in the Algerian Sahara.

The new observations are mostly located in the predicted geographical distribution zone for this species by Lourenço *et al.* (2015) and Sadine (2018), with the exception of the new records from Aïn Témouchent, Sabdou, El Bayadh, and Saïda, which are situated in the west and southwest towards Naâma and Béchar. It is also important to highlight its presence in the Tiaret region (Ait Hammou *et al.*, 2023), which is qualified at steppe with semi-arid climate, as well as in Sidi Bel Abbès (North western Algeria).

Additionally, the species has also been observed in the southern part of Tissemsilt, in a steppe area bordering Djelfa and Media, where the presence of *A. aeneas* had already been reported by Vachon (1952) and confirmed in the present work. Recently, one more observation in the region of Sétif, which confirms the north-western limit of its distribution range in Algeria.

Therefore, the distribution map of *A. aeneas* drawn up by Lourenço *et al.* (2015) and Sadine (2018) must be updated in a way that this species occupies the central horizontal band, extending from Tébessa in the East, passing through Batna in the Belezma Mountains, at an altitude varying between 800 and 1000 m, to Naâma in the West. Thus, the current distribution of this species in Algeria can be summarized in Fig. (4).

The information presented in this work, can allow us to better understanding of the habits, ecology, and geographical distribution limits of this species in Algeria noting also that the updating of the distribution indicates that this species frequents several

biotopes, previously unknown, allow us to understand and define the risk areas in terms of scorpion envenomation by this potentially dangerous species.

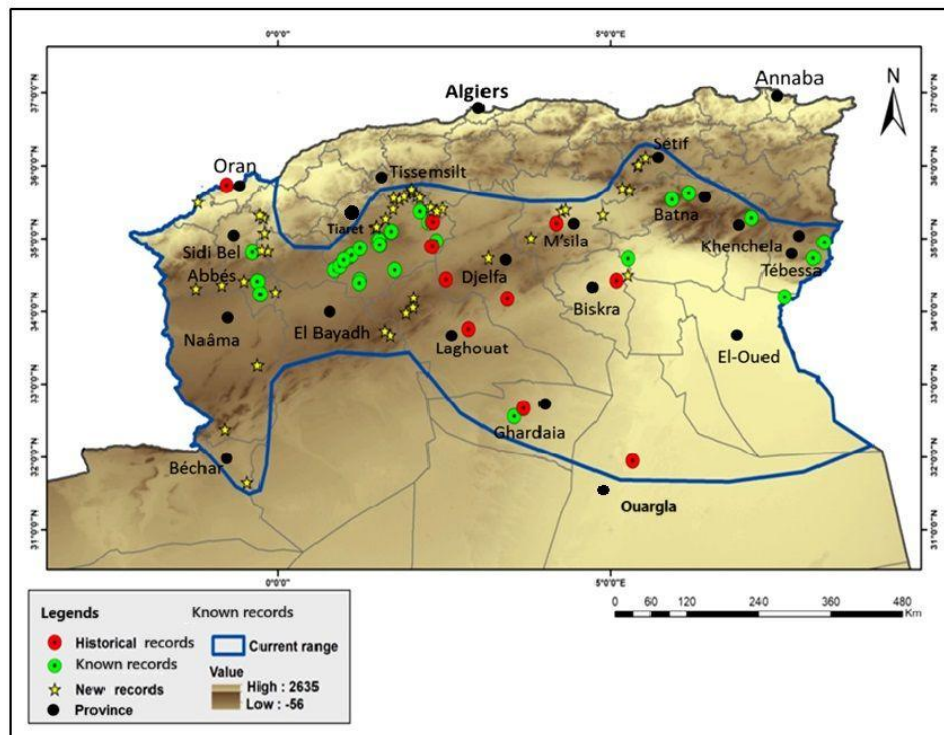


Fig. 4. Map of current geographical distribution range of *Androctonus aeneas* in Algeria.

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