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Species composition and geographical distribution of Saharan scorpion fauna, Morocco

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ABSTRACT

Objective: To describe the species composition of scorpions and to study its geographical distribution in Laayoune-Sakia El Hamra and Dakhla-Oued Ed Dahab regions in July 2014.**Methods:** To locate scorpions, the ground was examined through searching the places under the stones, rocks and in burrows. The nocturnal missions were also conducted using portable ultraviolet lamps. The scorpions were subsequently identified in the laboratory.**Results:** The results of the investigations in these regions showed the presence of five scorpion species, two of which *Androctonus gonneti* and *Buthus bonito* were endemic in Morocco.**Conclusions:** This work is allowed to complete the inventory of the studied scorpion fauna and provides some considerations on the distribution patterns in the study area.

1. Introduction

The Vachon monography[1] is the only synthetic work remained so far on the systematics and distribution of scorpions in North Africa. Through this work, the majority of Moroccan scorpion fauna is known and processed. However, despite its importance, this work has rarely addressed the Saharan and pre-Saharan regions of Morocco where scorpion fauna remained unknown. Since the beginning of the last decade, many scientific works have contributed significantly to the knowledge of the ecology and biogeography of Saharan and pre-Saharan scorpions[2-9]. Some of these works led to the discovery of six new species for science, such as *Butheoloides occidentalis* near Tan Tan[3], *Buthus bonito* (*B. bonito*) along the Atlantic coast between Tan Tan and Tarfaya[5], *Microbuthus maroccanus* (*M. maroccanus*) at 20 km from North Tan Tan[2], *Sahabobuthus elegans* (*S. elegans*) in the extreme south of Morocco near Tichla[8], *Orthochirus maroccanus* at 45 km from Assa towards

Aouinet Torkoz[9] and *Butheoloides littoralis* in north of Sidi Ifni in the southern coast and Sidi Moussa, west of Tiznit[6].

As part of an overall program of ecological and biogeographical study of Moroccan scorpion fauna with the aim to contribute in the development of the knowledge about scorpion distribution in under-explored Saharan regions, an exploration and a collection mission in Saharan region have been conducted in July 2014. The current work presents the results of this study.

2. Materials and methods

2.1. Study areas

The study was conducted in two southern administrative regions of Morocco, Laayoune-Sakia El Hamra and Dakhla-Oued Ed Dahab, which occupy an area of around 282 883 km²[10,11]. Seven sites were surveyed (Figure 1) (Table 1).

The study area was a vast territory with homogeneous landscape. This was a large desert area with vast plateau and rocky slabs, usually limestones or sandstones. This area had no large variation relief, except dry wadis (riverbeds). Sand dunes were located in certain places and cliffs near the Atlantic coast.

The study area was affected both by the low amount of rainfall received and the intensity of the dry Saharan. This was a more temperate and humid coastal desert near the coast, but the climate was very dry eastward inside land.

As a vast stretch of the desert, the study area was dotted with a

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thin herbaceous vegetation or underwood. Sparse tufts of succulent species adapted to drought pronounced dominated by various species of Chenopodiaceae. Steppes of *Euphorbia officinarum* subsp. *echinus* (Euphorbiaceae) or *Acacia raddiana* (Fabaceae) were present locally.

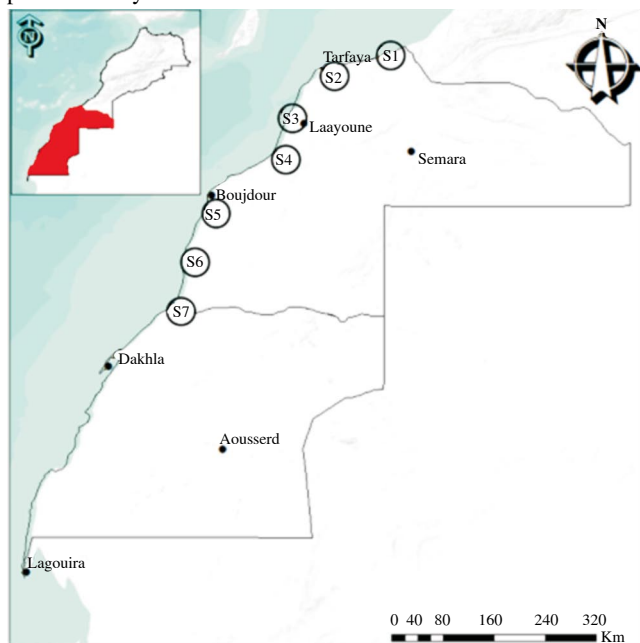


Figure 1. The study area with seven localities surveyed.

Table 1

Coordinates of the surveyed sites in the study area.

Stations	Altitude (m)	Location	Scorpion species inventory in the present study
S1 (Akhfennir)	40	28°6'14.940" N 12°2'17.448" W	<i>B. bonito</i>
S2 (Tarfaya)	5	27°55'54.516" N 12°52'59.087" W	<i>B. bonito</i>
S3 (Laayoune)	15	27°11'29.148" N 13°19'50.808" W	<i>Androctonus amoreuxi</i> (<i>A. amoreuxi</i>), <i>B. bonito</i>
S4 (59 km south of Laayoune)	81	26°40'58.000" N 13°32'51.997" W	<i>B. bonito</i>
S5 (30 km south of Boujdour)	94	26°0'13.882" N 14°29'27.758" W	<i>Microbuthus fagei</i> (<i>M. fagei</i>), <i>B. bonito</i>
S6 (106 km south of Boujdour)	96	25°14'13.500" N 14°49'11.599" W	<i>Androctonus gonneti</i> (<i>A. gonneti</i>), <i>B. bonito</i> ,
S7 (30 km north of Dakhla)	94	24°38'2.760" N 14°57'6.804" W	<i>Buthacus occidentalis</i> (<i>B. occidentalis</i>), <i>B. bonito</i> ,

2.2. Collection and identification of specimens

To locate scorpions, the ground was examined by lifting stones and tree barks. The burrows considered to be occupied by scorpions were destroyed with a shovel to try to dislodge the scorpions. The nocturnal missions in the field were carried out with ultraviolet lamps. The collected specimens were then identified using taxonomic descriptions according to previous works[1,2,4,12-15].

3. Results

3.1. Scorpion fauna composition

Currently, there were 55 species and subspecies of scorpions in Morocco of which 41 were endemic. They belonged to two families,

Buthidae and Scorpionidae. This ecological survey involved in five species of scorpions belonging to four genera in Buthidae family: *A. amoreuxi*, *A. gonneti*, *B. occidentalis*, *B. bonito* and *M. fagei* (Figure 2).

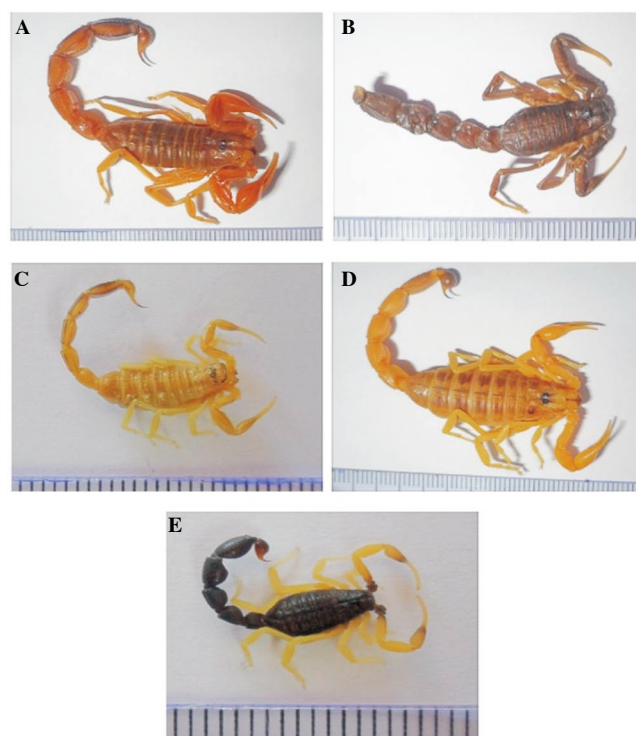


Figure 2. Scorpion species found in the study area. A: *A. amoreuxi*; B: *A. gonneti*; C: *B. occidentalis*; D: *B. bonito*; E: *M. fagei*.

3.2. Ecological and biogeographical characteristics of inventory scorpion fauna

3.2.1. *A. amoreuxi*

A. amoreuxi was a large yellow straw color scorpion that could reach 8 cm in size (Figure 2). It had a very wide distribution ranging from North Africa to Sudan, Senegal and Tchad. In the present study, this species was collected in Dchira, southeast of Laayoune (S3) (Figure 3).

3.2.2. *A. gonneti*

This species was *Androctonus crassicauda gonneti* before its elevation to the species rank after the revision of the genus in 2005. It was dark and described in Morocco from Akka region[1], which varied from black-brown to black but with the ends of the ambulatory legs clearer (Figure 2).

It differed mainly from *Androctonus mauritanicus* by the absence of setae on the pedipalp patella and by the absence of chitin granules on the dorsum of the first ring of the tail *Androctonus liouvillei*.

In this mission, a specimen of 5.7 cm size in the station S6 on sandy substrates was discovered (Figure 3).

3.2.3. *B. occidentalis*

In the present study, a female specimen of *B. occidentalis* with a size of 2.61 cm (Figure 2) in the S7 station in syntopy with *B. bonito* (Figure 3) was found .

During the previous mission, we collected this species in the Sebkhla Imlily, about 150 km south of the present station and Oued Jenna, northwest of Aousserd[7](Figure 3).

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