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# Biometry and inventory of scorpions in the Algerian Northwest

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**Abstract** :

The present study consists in making an inventory of the scorpionic fauna at the level of the Algerian north-west (Tlemcen, Naama and Bechar). Following a 10-month survey, we were able to collect a total of 117 living scorpions, they are grouped into 8 species belonging to two large families (Buthidae and Scorpionidae). Indeed, it is at the Teiher station in the wilaya of Tlemcen where the large number of scorpions was collected about 90 individuals. According to the results of the outings and among the scorpions sampled, it appears that the animals belong to the Buthidae family of which 6 species have been identified namely: Androctonus amoreuxi, Androctonus australis, Buthus tuneatanus, Buthus oudjanii, Hottentotta franzwerneri and Orthochirus innesi. Concerning the Scorpionidae family, two species of which have been identified, namely: *Scorpio maurus* and *Scorpio punicus*. The largest species in size is *Hottentota franzwerneri* with a total length of 101 mm (cephalothorax 12 mm, abdomen 29 mm and tail 60 mm). Equitability is close to one for the Zebche station, we noticed at this station that the species tend to be in numerical equilibrium, however in the Teiher station, the fairness is zero which is a result of dominance of only one species.

**Keywords:** Scorpion, inventory, biometrics, North-West Algeria.

## Introduction:

Scorpions are present and ecologically important in arid and semi-arid ecosystems (Araujo et al., 2010). There are around 1,500 species of scorpions in the world, of which 50 species are known to be dangerous to humans (Devarbhavi et al., 2014). According to Al-Asmari et al. (2007) the current literature on scorpion taxonomy recognizes the presence of 16 families (some including extinct genera or species): *Bothriuridae, Buthidae, Chactidae, Chaerilidae, Diplocentridae, Euscorpiidae, Hemiscorpiidae, Heteroscorpionidae, Luridae, Liochelidae, Luridae, Liochelidae, Microcharmidae, Pseudochactidae, Scorpionidae, Superstitioniidae, Troglotayosicidae and Urodacidae.* The systematics of the scorpion is currently based almost entirely on the characters of the external morphology, despite an abundant literature on theinternal anatomy (in particular the mesosome) of scorpions (Volschenk, 2007). Scorpions are generally found in arid and semi-arid environments, although some species are also found in forest and humid savannas, all species are nocturnal, hide during the day under stones, bark of wood or trees. The risk of scorpion stings is higher in rural areas, but some species are in close contact with humans and live around or inside human habitation (Bawaskar and Bawaskar, 2012).

Scorpion envenomation is an occupational hazard for farmers, farm workers, and hunters. With the exception of *Hemiscorpius lepturus*, all poisonous scorpions belong to the large family of Buthidae. The most notorious are found in the genera *Buthus* (eastern Mediterranean Spain), *Parabuthus* (Western and Southern Africa), *Hottentotta* (Southern Africa to Southeast Asia), Tityus (Central America, South America and the Caribbean), *Leiurus* (North Africa) and *Androctonus* (North Africa to Southeast Asia), *Centruroides* (Southern United States, Mexico, Central America and the Caribbean) and *Mesobuthus* (across Asia) (Bawaskar and Bawaskar, 2012).

There are 30,000 to 50,000 cases of scorpion stings resulting in 100 to 150 deaths, scorpion envenomation is a real public health problem in Algeria (Benguedda et al., 2002), but the species responsible for this morbidity remain unknown. According to Sadine (2018), in Algeria there are 38 species of scorpions, of which 21 species are described.

The objective of this work is the inventory and identification of the existing scorpionic diversity at the level of Northwest Algeria.

## Material and methods

### *Description of study stations*

In this study, our sampling is carried out in three regions in Algeria which are: Naama, Tlemcen and Bechar.


**Figure 01**– Geographical position of the regions surveyed (Tlemcen, Naama and Bechar).

The Gaussen and Bagnouls ombrothermal diagram, plotted with data on rainfall and average temperatures collected between 1981 and 2010 shows that the region undergoes a dry period which lasts from April until the middle of October, i.e. six and a half months with variations in climate from one year to another (Bacciu et al., 2018).

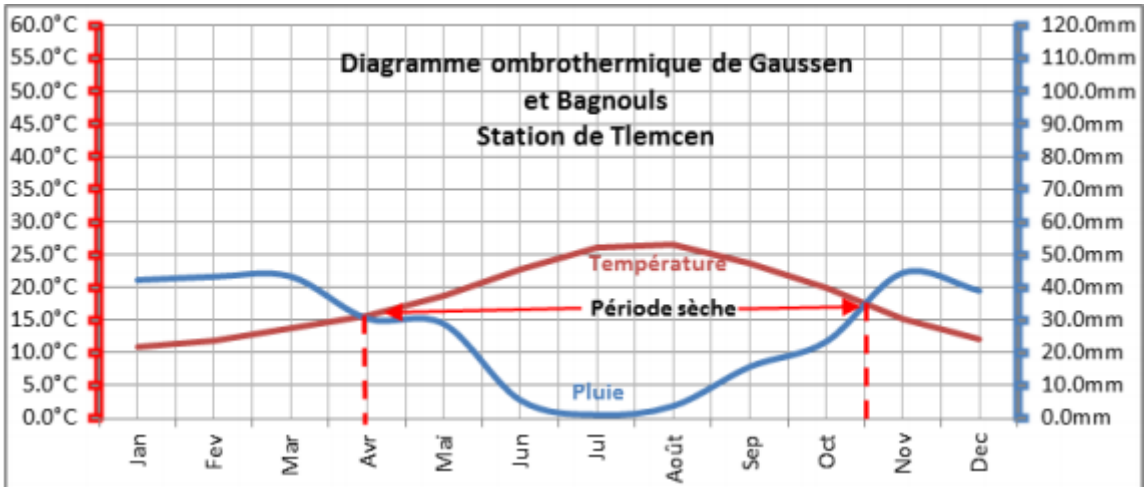


**Figure 02 -** Ombrothermal diagram of Gaussen and Bagnouls from Tlemcen (Bacciu et al., 2018).

The appearance of the diagram in Figure 3 shows that the dry period in the wilaya of Naama is spread out throughout the year (Mansour, 2011). The same observation (figure 4) is made for the Bechar region (Bekhedda, 2016).

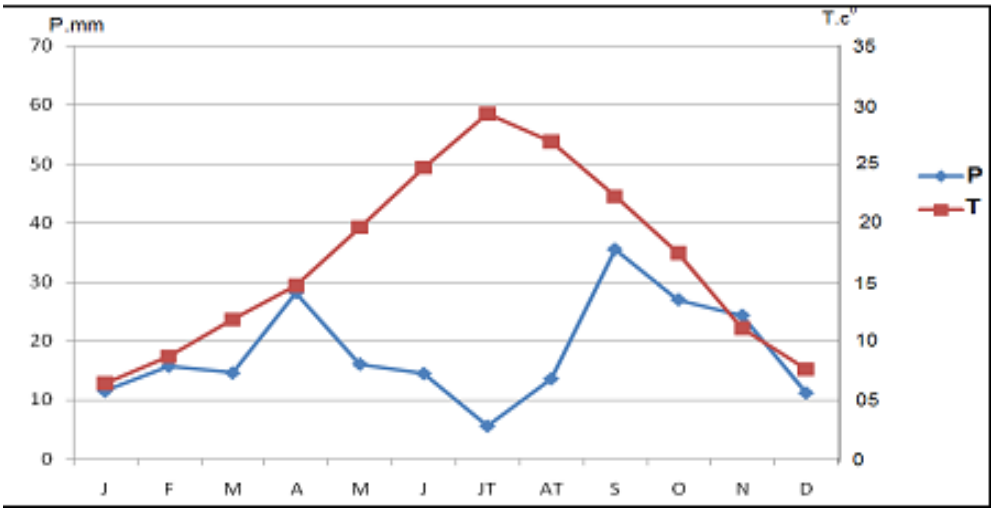


**Figure 03** - Ombrothermal diagram of Bagnouls and Gaussen (Mansour, 2011).

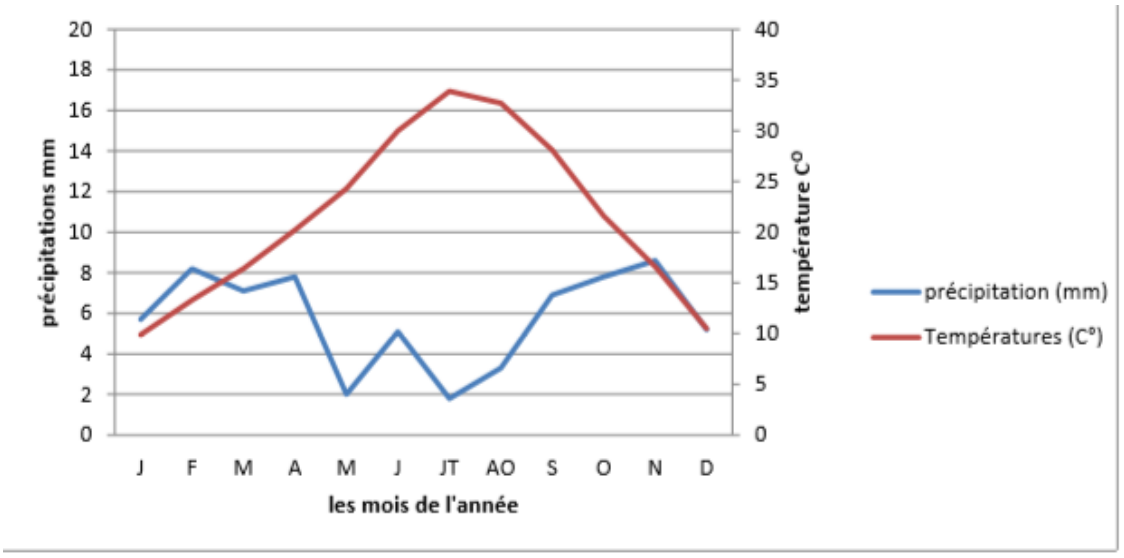


**Figure 04** - Ombrothermal diagram of Bagnouls and Gaussen de Bechar (Bekhedda Rahma Racha, 2016).

Teiher station in Sebdou (Tlemcen): This station is located at an altitude of 985 m, the geographic coordinates are 34 ° 37 ’25.1’ N; 01 ° 18 ’35.1’ ’W. The floristic diversity in this station is characterized by the presence of *Scirpus*, *Stipa tenacissima*, *Pinus* and *Lavandula stoechas*.

**Figure 05** - Teiher station in Sebdou (Original)

Lala Setti Station (Tlemcen): This station is located at an altitude of 1,069 m, the geographic coordinates are 34 ° 51'61.7 ’N; 01 ° 19'19.9"W. The floristic diversity in this station is mainly characterized by the presence of Scirpus and *Pinus halepensis.*

**Figure 06**- Lala Setti Station (Original)

*Nedroma station (Tlemcen):* This station is located northwest of Tlemcen at about 60 km, it is located at an altitude of 650m.

*Zebche station in Sebdou (Tlemcen):* It is located in the Naama region, it is at an altitude of 1.106 m, the approximate geographic coordinates are 01 ° 18.9 ’08’ ’W.; 34 ° 34.17 ’1’ ’N.

**Figure 07** - Zebche Station (Original)

The floristic diversity in this station is characterized by the presence of *Stipa tenacissima* and *Peganum*.

Naama center station (Naama): It is located in the center of the Naama region at an altitude of 1,188 m, the geographical coordinates are 33 ° 16 ’59.0’ ’N; 00 ° 18 ’31.0’ ’W.

Swiga Station (Naama) : It is located in the Naama region, at an altitude of 1,177 m, the approximate geographic coordinates are 33 ° 10 "8.14" N; 00 ° 22 ’14.5’’W.


**Figure 08** - Swiga Station (Original)

Tiout station (Naama): It is located at an average altitude of 1000 m, the approximate geographic coordinates are 0 ° 25 ′ 13 ″ W.; 32 ° 46 ′ 16 ″ N., the floristic diversity is characterized by the presence of *Hammada scoparia*, *Stipa tenacissima*, *Retama retam*, *Ziziphus lotus* and *Thymelaea microphylla*. Boukaïs station (Bechar)

It is located north-west of the wilaya of Bechar, it is located at an average altitude of 839 m, the approximate geographical coordinates are 31 ° 55 ′ 24 ″ N.; 2 ° 27 ′ 51 ″ W.

Kenadsa Station (Bechar) : Kenadsa is a Saharan commune in Algeria, located 22 km west of Bechar, it is located at an average altitude of 741 m. The approximate geographic coordinates are 31 ° 33 ′ 32 ″ N.; 2 ° 25 ′ 24 ″ W.

***Sampling***

The sampling, by free capture of scorpions was carried out from October 2018 to July 2019. After having defined the stations to prospect for sampling, several trips were made.

The capture follows a strategy, which consists of systematically searching places of the refuge, which were either chosen at random or suspected of harboring the scorpions. Scorpions were collected from different microhabitats such as fallen trees and under stones. Each captured scorpion was kept in an individually plastic box on appendix. The dead animals were stored directly in alcohol at 70°. To capture the scorpions, we used a metal clip (Figure 09) with a length of 30 cm and collection boxes (Figure 09) (usually sturdy plastic boxes).


**Figure 09** - Collection box and metal clamp for capturing scorpions (Original)

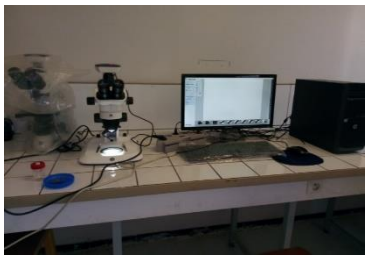

**Figure 10** - Binocular magnifier (Original)

The scorpions were killed (with 100% formalin) to handle them safely, the storage was done in plastic boxes containing 70% alcohol or 10% formalin.

Collecting the data required GPS Essentials, a camera, a binocular magnifier with CCD camera and a ruler. The magnifying glass is used for the morphological identification of scorpion species. The magnifying glass is equipped with an integrated CCD camera and a microcomputer (Figure 10). For precise measurements of scorpion individuals, we used the Euromex software, this software is also used for taking photos and videos. The identification of the species was carried out with reference to the family identification keys described by Vachon (1952).

***Statistical analysis***

Both qualitative and quantitative data were analyzed using R. 3.0.1 (2012). Software a multivariate analysis was performed to discriminate accessions with Hierarchical Ascending Classification (HAC) and principal component analysis. ShannonWeaver diversity index (H; Shannon and Weaver 1949) to calculate phenotypical variation of each population.

$$H = -\sum_{i=1}^{n} Pi\ Ln\ Pi$$

H was standardized by converting it to a relative phenotypic diversity index (H') after dividing it by Hmax

$$H' = -\sum_{i=1}^{n} Pi\ Ln\ Pi\ /\ Ln(n)$$

## Results and discussion

***Scorpion inventory***

During 10 months of work, we collected a total of 117 live scorpions (Table 1).

**Table 01.** The number of individuals collected at the different stations.

| | | Number of individuals | |
|---|---|---|---|
| **Regions** | **Stations** | **Per station** | **Per region** |
| Tlemcen | Nedroma | 1 | 104 |
| | Lala Setti | 7 | |
| | Teiher | 90 | |
| | Zebche | 6 | |
| **Naama** | Naama | 3 | 10 |
| | Swiga | 1 | |
| | Tiout | 6 | |
| **Bechar** | Boukais | 2 | 3 |
| | Knadsa | 1 | |
| Total | | 117 | |

***Species identification***

The captured scorpions belong to two families: *Buthidae* and *Scorpionidae*.

The *Buthidae* family contains four genera *Androctonus*, *Buthus*, *Hottentotta* and *Orthochirus.* While the Scorpionidae family is represented by a single genus: *Scorpio*.

The species to identify are: *Androctonus australis* (Linnaeus, 1758), large species that can reach more than 10 cm in adults, brown or straw-yellow in color with parts of the body (pincers and last rings of the tail) more or less darkened (Vachon, 1952).

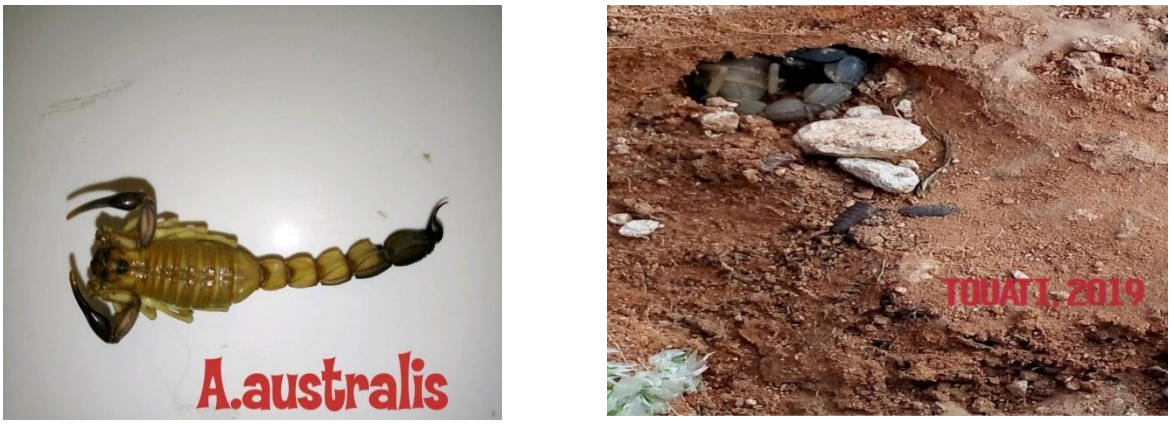


**Figure 11** -Androctonus australis (Original)

*A. australis* lives in North Africa in the region of the Algerian and Tunisian highlands, it has never been reported in Morocco, but its range extends to the east to Libya, Cyrenaica, Egypt and as far as India and Belochistan (Vachon, 1952).

**Figure 12**- Biotope (Swiga) of A. australis (Original)

***Androctonus amoreuxi*** (Audouin and Savigny, 1812 and 1826)

Large scorpion, up to 12 cm in length. The tail is much thinner from the 3rd ring on (SADINE et al., 2014).


**Figure 13** -*Androctonus amoreuxi* (Original)

*A. amoreuxi* has a very wide geographic distribution, ranging from Egypt, Sudan, Senegal and Libya in the east, to Chad in the south. In Algeria, *A. amoreuxi* has a wide geographical distribution. In Ouargla, it is generally found in sandy places and sometimes in some stony ground (SADINE et al., 2014).

**Table 02:** Measurements of *Androctonus australis* (average determined from 09 individuals) and *Androctonus amoreuxi.*

| Species | *A. australis* | | | *A. amoreuxi* |
|---|---|---|---|---|
| Sex | | ♀ | ♂ | ♀ |
| | Average | Standard deviation | | |
| Total length | 75 | 14,92 | 81 | 93 |
| Cephalothorax | 10,5 | 1,94 | 11 | 11 |
| Abdomen | 19 | 3,48 | 24 | 29 |
| Tail | 45,5 | 9,50 | 46 | 53 |
| 1st ring | | | | |
| Length | 6 | 1,50 | 7 | 6 |
| Width | 4 | 0,87 | 4 | 5 |
| Height | 3 | 1,20 | 3 | 4 |
| 2nd ring | | | | |
| Length | 7 | 1,81 | 7 | 8 |
| Width | 5 | 1,20 | 5 | 4 |
| Height | 4,5 | 1,01 | 5 | 3 |
| 3rd ring | | | | |
| Length | 7 | 1,41 | 8 | 8 |
| Width | 5 | 1,33 | 5 | 5 |
| Height | 4 | 1,20 | 6 | 4 |
| 4th ring | | | | |
| Length | 8 | 1,58 | 8 | 9 |
| Width | 5 | 1,33 | 5 | 5 |
| Height | 5 | 1,20 | 5 | 4 |
| 5th ring | | | | |
| Length | 9 | 1,24 | 9 | 10 |
| Width | 5 | 1,75 | 5 | 5 |
| Height | 4 | 1,17 | 4 | 3 |
| Telson | 9 | 2,03 | 7,5 | 9 |
| Pedipalp | | | | |
| Arms | | | | |
| Length | 8 | 1,32 | 7 | 10 |
| Width | 2 | 0,83 | 3 | 3 |
| Forearm | | | | |
| Length | 7 | 1,72 | 7 | 8 |
| Width | 1 | 0,53 | 1 | 2 |
| Hand | | | | |
| Length | 7 | 1,86 | 7 | 9 |
| Width | 4 | 1,94 | 4 | 5 |
| Movable finger | 9 | 1,69 | 9 | 10 |
| Number of comb teeth | 27 | 2,73 | 34 | 20 |

The total length, the length of the tail and the number of the comb of *A. australis* are more important in the male than the female, the length of the fifth ring is the same for the male and the female. We failed

to capture a male from *A. amoreuxi* during our work. We have captured only one adult female individual. For the A. *australis* species, we have captured one male and nine females.

*Buthus tunetanus* (Herbst, 1800) : It is a scorpion varying in size from 5.5 to 7.5 cm, usually straw yellow in hue, with a darker abdomen and sometimes even darker stripes. The ventral surface and the appendages are clear and all the rings of the tail are of the same shade (Vachon, 1952).


**Figure 14**- *Buthus tunetanus* (Original)

This species has a wide geographic distribution (VACHON, 1952).

**Figure 15**- Biotope (Teiher) of *Buthus tunetanus* (Original)

The total length of *B. tunetanus* in the male is the same as in the female, the tail length in the male is longer than that of the female, the fifth ring in the male is larger than that of the female and the number of combs in the male is greater than that of the female.

*Buthus oudjanii* (Leurenço, 2017) : We were able to capture three juveniles of *B. oudjanii*, which show a general color of the body, which is yellowish with black keels, darker tergites, and the hand is yellowish with darker keels.

**Table 03:** Measurements of *Buthus tunetanus* (average determined from 32 individuals)

| Species | *B. tunetanus* | | | |
|---|---|---|---|---|
| Sex | ♀ | | ♂ | |
| | Average | Standard deviation | Average | Standard deviation |
| Total length | 61 | 8,57 | 61 | 4,77 |
| Cephalothorax | 8 | 1,34 | 7 | 0,87 |
| Abdomen | 18 | 4,07 | 16 | 1,12 |
| Tail | 35 | 5,01 | 38 | 2,78 |
| 1st ring | | | | |
| Length | 4,5 | 0,66 | 5 | 0,50 |
| Width | 3 | 0,59 | 4 | 0,50 |
| Height | 2,5 | 0,67 | 2 | 0,50 |
| 2nd ring | | | | |
| Length | 5 | 0,79 | 5 | 0,67 |
| Width | 3 | 0,60 | 3 | 0,53 |
| Height | 2 | 0,59 | 2 | 0,50 |
| 3rd ring | | | | |
| Length | 5 | 0,89 | 6 | 0,60 |
| Width | 3 | 0,71 | 3 | 0,53 |
| Height | 2,5 | 0,79 | 2 | 0,53 |
| 4th ring | | | | |
| Length | 5 | 1,00 | 7 | 0,78 |
| Width | 3 | 0,70 | 3 | 0,53 |
| Height | 2 | 0,72 | 2 | 0,53 |
| 5th ring | | | | |
| Length | 7 | 1,10 | 8 | 0,53 |
| Width | 3 | 0,69 | 3 | 0 |
| Height | 1 | 0,63 | 1,5 | 0,53 |
| Telson | 7 | 1,11 | 6 | 0,44 |
| Pedipalp | | | | |
| Arms | | | | |
| Length | 6 | 1,02 | 6 | 0,71 |
| Width | 2 | 0,60 | 1 | 0,50 |
| Forearm | | | | |
| Length | 5 | 1,05 | 5 | 0,53 |
| Width | 1 | 0,51 | 1 | 0,33 |
| Hand | | | | |
| Length | 5 | 1,16 | 4,5 | 0,53 |
| Width | 2 | 0,95 | 2 | 0,60 |
| Movable finger | 6 | 0,96 | 6 | 1,22 |
| Number of comb teeth | 25 | 4,70 | 32 | 3,5 |


**Figure 16** - *Buthus oudjanii* (Original)

*Hottentotta franzwerneri* (Birula, 1914): This scorpion is large in size, reaching up to 10 cm in adulthood, dark in color (body and tail), but sometimes having light-colored ambulatory legs (VACHON, 1952).


**Figure 17**- *Hottentota franzwerneri* (Original)

We found *H. franzwerneri* in the posts bordering the Jebel Bani, Saharan posts whose climate is one of the hottest in North Africa and also in intermediate areas such as Ouarzazate, Tinerhir, Talouine and even near the sea at 30 km of Mogador and in the most rugged part of the territories of southern Algeria (VACHON, 1952).

**Table 04:** Measurements of *Hottentota franzwerneri* (mean determined from 1 adult female individual)

| Species | *H. franzwerneri* |
|---|---|
| Sex Mensurations (mm) | ♀ |
| Total length | 101 |
| Cephalothorax | 12 |
| Abdomen | 29 |
| Tail | 60 |
| 1st ring | |
| Length | 7 |
| Width | 5 |
| Height | 3 |
| 2nd ring | |
| Length | 9 |
| Width | 4 |
| Height | 2 |
| 3rd ring | |
| Length | 9 |
| Width | 5 |
| Height | 4 |
| 4th ring | |
| Length | 10 |
| Width | 5 |
| Height | 4 |
| 5th ring | |
| Length | 12 |
| Width | 4 |
| Height | 4 |
| Telson | 11 |
| Pedipalp | |
| Arms | |
| Length | 11 |
| Width | 2 |
| Forearm | |
| Length | 9 |
| Width | 2 |
| Hand | |
| Length | 10 |
| Width | 4 |

| | |
|---|---|
| Movable finger | 19 |
| Number of comb teeth | 19 |

***Orthochirus innesi*** (Simon, 1910):

The General Color of this animal is olive-black, with the reddish vesicle, two-colored jaw-legs, black arm, brownish forearm, pale yellow hand and feet, two-colored ambulatory legs: hip, trochanter and femur are blackish, the rest of the leg is yellowish (VACHON, 1952).


**Figure 18** - *Orthochirus innesi* (Original)

This scorpion is only found in palm groves or relatively humid places, *Orthochirus innesi* is native to Lower Egypt and cited from the oases of Libya and Tripolitania its presence in southern Algeria, first in Ghadames, then in Ouargla , in Beni Abbès and its capture in large numbers in the palm grove of Ain Salah extends the domain of this species, rarely mentioned in all of southern Algeria (VACHON, 1952).

In the present research, we have captured only one juvenile individual.

*Scorpio maurus* (Linnaeus, 1758): It is a scorpion varying in color from reddish brown to dark brown with slightly paler legs, tail the same shade as the body with a slightly lighter vesicle, concolorous hand but sometimes darkened fingers. In adults, the height fluctuates from 5 to 6.5 cm (VACHON, 1952).



**Figure 19** - *Scorpio maurus* (Original)

*S. maurus* is able to live in altitudes especially in North Africa; it has an altitudinal distribution wavering between 900 and 1100 m (SADINE et al., 2012).

**Figure 20** - Biotope (Zebche) of *S. maurus* (Original)


**Figure 21**- *Scorpio punicus* **(**Original**)**

**Figure 22** - Biotope (Zebche) de *S. punicus* **(**Original**)**

*Scorpio punicus* (Fet, 2000) = *Scorpio tunetanus* (Birula, 1910): This animal is light in color, light brown to reddish brown, the fingers of the pincers are slightly darkened yellowish or orange ambulatory legs, vesicle sometimes lighter than the rest of the tail The size of the adult can reach 7 cm (VACHON, 1952).

**Table 05:** Measurements of *Scorpio maurus* (mean determined from 7 adult individuals) and *Scorpio punicus* (mean determined from 2 adult individuals).

| **Mensurations (mm)** | **Species** | | | |
|---|---|---|---|---|
| | ***S. maurus* (♀)** | | ***S. punicus* (♀)** | |
| | **Mean** | **Standard deviation** | **Mean** | **Standard deviation** |
| **Total length** | 59 | 4,83 | 60,25 | 9,55 |
| **Cephalothorax** | 10,71 | 1,70 | 12 | 2,83 |
| **Abdomen** | 17 | 1,41 | 19 | 0 |
| **Tail** | 31,17 | 1,72 | 29,25 | 6,72 |
| **1st ring** | | | | |
| **Length** | 3,83 | 0,41 | 4 | 1,41 |
| **Width** | 4 | 1,00 | 3,5 | 0,71 |
| **Height** | 2,29 | 0,49 | 1,5 | 0,71 |
| **2nd ring** | | | | |
| **Length** | 4 | 0 | 4 | 1,41 |
| **Width** | 3,14 | 0,38 | 3 | 0 |
| **Height** | 2,5 | 0,55 | 2,5 | 0,71 |
| **3rd ring** | | | | |
| **Length** | 4,5 | 0,55 | 4 | 0 |
| **Width** | 3,14 | 0,38 | 3 | 0 |
| **Height** | 2,71 | 0,49 | 2 | 0 |
| **4th ring** | | | | |
| **Length** | 5 | 0,58 | 5 | 1,41 |
| **Width** | 2,86 | 0,38 | 2,75 | 0,35 |
| **Height** | 2,57 | 0,53 | 2 | 0 |
| **5th ring** | | | | |
| **Length** | 7,17 | 0,41 | 7 | 1,41 |
| **Width** | 2,8 | 0,45 | 2,5 | 0,71 |
| **Height** | 2,29 | 0,49 | 2 | 0 |
| **Telson** | 6,57 | 0,79 | 5,25 | 1,06 |
| **Pedipalp** | | | | |
| **Arms** | | | | |
| **Length** | 6,71 | 1,11 | 7 | 1,41 |
| **Width** | 3,14 | 0,38 | 3 | 0 |
| **Forearm** | | | | |
| **Length** | 4,86 | 0,38 | 5 | 1,41 |
| **Width** | 2,43 | 0,53 | 2 | 0 |
| **Hand** | | | | |
| **Length** | 8,86 | 1,07 | 8 | 1,41 |
| **Width** | 10,14 | 1,35 | 8,5 | 2,12 |
| **Movable finger** | 4,71 | 1,11 | 4,5 | 0,71 |
| **Number of comb teeth** | 10 | 1 | 8 | 0 |

***Ecological structure indices***

The ecological structure indices are the Shannon-Weaver diversity index (H'), maximum diversity (H'max) and fairness (E).

**Table 06:** Ecological structure indices of scorpions from three stations

| Indices | Stations | | |
|---|---|---|---|
| | **Zebche** | **Lala Setti** | **Teiher** |
| **H'** | 0,64 | 0,41 | 0,18 |
| **H'max** | 0,69 | 0,69 | 1,10 |
| **E** | 0,92 | 0,59 | 0,17 |

Ecological structure indices are calculated for stations with more than one species (Table 12). The most important Shannon-Weaver diversity index (H ') is observed at the Zebche station (0.64), on the other hand it is the Teiher station which includes the Shannon-Weaver diversity index (H ') the lowest (0.18).

In terms of maximum diversity, both stations Zebche and Lala Setti have the same maximum diversity; station Teiher has the highest value for this index. Equitability is close to 1 for the Zebche station, therefore the species tend to be in equilibrium between them, on the other hand in the Teiher station, the equitability is close to 0, therefore there is the dominance of only one species.

***Multifactorial analysis***

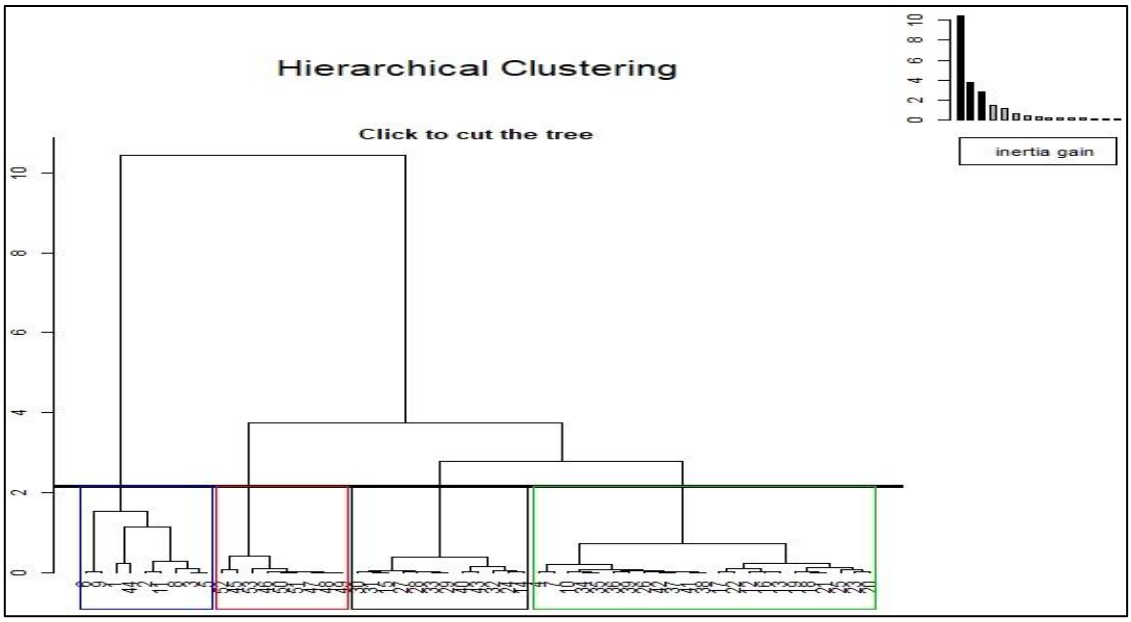


**Figure 23 -** Hierarchical tree using the mean distance (between classes) in scorpions (4 species).

The CAH analysis (Figure 23) subdivided our animals (species whose number sampled was less than 05 were eliminated from this statistical analysis) into 4 distinct classes. The first class contains animals of the species *H. franzwerneri*, the second class contains animals of the species *A. australis*, the third class consists of animals of the species *A. amoreuxi*, and finally the fourth class contains animals of the species *B. tunetanus*.

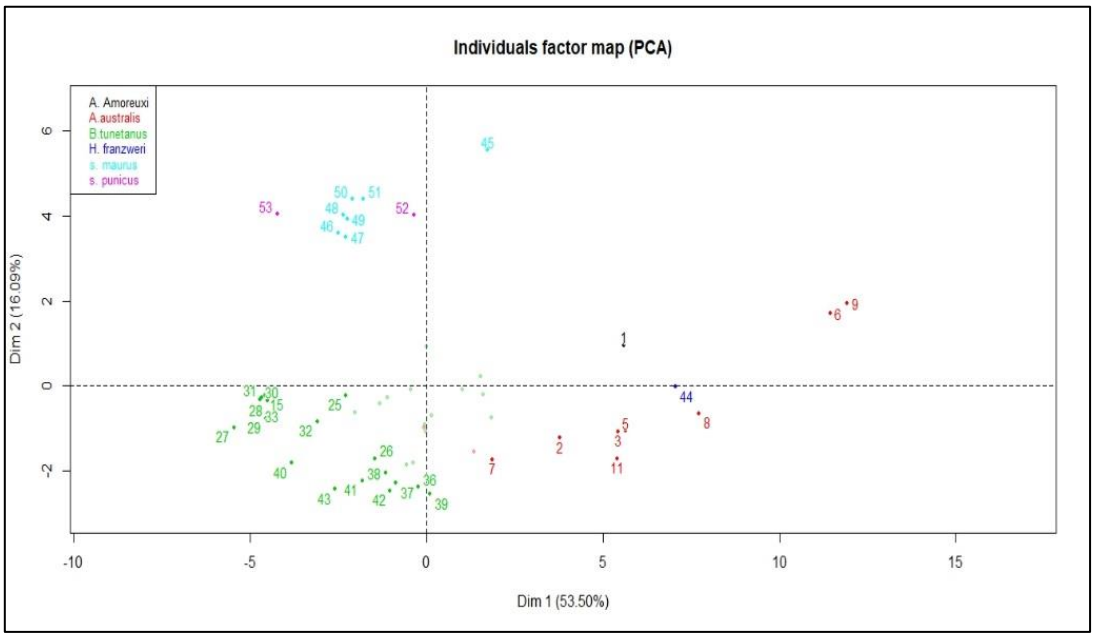


**Figure 24** - Variation of individuals of (06) species of scorpions (analysis by PCA)

We notice the presence of 3 large clouds (Figure 24), the 1st is composed of 2 species *S. punicus* and *S. maurus*, the 2nd cloud is mainly composed of *B. tunetanus*. The last cloud is a mixture of the 3 other species (*H. franzwerneri*, *A. amoreuxi* and *A. australis*). Animals of the two species *B. Odjanii* and *O. innesi* are not included in this analysis because the sampled animals were not measured, as they were juvenile animals.

**Discussions**

In the present research, we collected 117 individuals belonging to 8 species, the Buthidae family is composed of 6 species: *Androctonus amoreuxi*, *Androctonus australis*, *Buthus tuneatanus*, *Buthus oudjanii*, *Hottentotta franzwerneri* and *Orthochirus innesi*. The Scorpionidae family is represented by only 2 species: *Scorpio maurus* and *Scorpio punicus*. According to SADINE (2014), the Buthidae family is represented by 4 species in Ghardaïa: *Androctonus amoreuxi*, *Androctonus australis*, *Androctonus bicolor* and *Buthacus arenicola*.

*Lissothus chaambi* is a new species described for the desert of the central region of Algeria. The new species shows affinities with the other two species of the genus, and in particular with *L. bernardi*.

A new species of Buthus was described in 2015 in the Algerian Sahara Desert, bringing the number of *Buthus* species confirmed for our country to five. Insofar as most species of *Buthus* from North Africa, and in particular those from Algeria, inhabit milder environments than those encountered in the central compartment of the Sahara, the new species appears to be the first element of the genus truly desert found in our country (LOURENÇO et al., 2015). In 2016, a new species of *Buthus* was described in the Algerian mountains, bringing the number of confirmed *Buthus* to six (LOURENÇO and SADINE, 2016).

Another new species of *Buthacus* is described in the Algerian Saharan desert, raising the number of *Buthacus* confirmed in Algeria to nine. This new discovery brings new evidence of the complexity of this genre and also testifies to the considerable diversity existing in the Algerian desert (LOURENÇO and SADINE, 2017).

SADINE (2018) in his study which covered 1272 individuals of scorpions, he grouped together 12 species belonging to two families of the animals to study. The Buthidae family includes 11 species: *Androctonus amoreuxi*, *Androctonus australis*, *Androctonus aeneas*, *Buthacus arenicola*, *Buthacus samiae*, *Buthacus spinatus*, *Buthiscus bicalcaratus*, *Buthus saharicus*, *Buthus tunetanus*, *Lissothus*

*chaambi* and *Orthochiruse* family of Scorpidae is represented by a Scorpidae family, and single species *Scorpio punicus*.

**Conclusion**

The present study is an inventory of the scorpion fauna in northwestern Algeria (Tlemcen, Naama and Bechar). During ten months of work, we were able to collect a total of 117 individuals of scorpions. We have inventoried in total 8 species of scorpions belonging to two families (Buthidae and Scorpionidae). Six of the inventoried species belong to the family of Buthidae, which are *Androctonus amoreuxi, Androctonus australis, Buthus tuneatanus, Buthus oudjanii, Hottentotta franzwerneri* and *Orthochirus innesi* and two species Scorpio maurus and Scorpio punicus belong to the family of *Scorpionidae*.

It emerges from this study that the mountainous zone is the biotope richest in scorpion. The Shannon-Weaver index indicates that the greatest diversity is observed at the Zebche station (0.64) and the lowest diversity is observed at Teiher (0.18).

Equitability shows that in the Zebche station, the species tend to be in equilibrium with each other, on the other hand at Teiher, the same index shows that there is a dominance of one species over the others (fairness is close to 0).

It is very important that in the near future we need to carry out larger field surveys with more sample to list all the diversity that may exist at the level of this taxonomic set in Algeria. It is important that the health authority is an idea about this diversity in order to be able to fight effectively against biting accidents by these animals. A biochemical study of the venoms of these different listed species would be of great benefit to health authorities. Finally, the genetic analysis of these samples would provide important information for a better zoological classification.

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