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Contribution to the study of insects in north east of Sahara of Algeria (El Oued region)

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Abstract

We propose to establish a study on the diurnal and nocturnal insect activity according to their specific distribution in both daily variations in three palm groves (Sahne Elmartome, Bouhmid and Zemla) in the region of Oued Souf during 6 months. To this end, we considered that such a study requires first, a work in different stations. The methods that are used during the sampling periods (Barber pots, Fauchoire net and light traps), allow capturing the maximum of existing insects. Thereby 2245 class individuals' insect distributed among 92 species are trapped in the day, where the order Coleoptera 43.03%, Diptera 25.9% and Hymenoptera 23.53% with more abundant but the other orders are the weakest. We noted a maximum diversity 6.66 bits, with a diversity index H' 4.79 equal to bits and equitability 0.71. Thanks to the night Trap 381 individuals and 35 species are caught, where Lepidoptera 47.77%, Diptera 32.01%. Coleoptera 13.89%, Neuroptera 3.41%, Hymenoptera 1.57% and Homoptera 0.78%. The same maximum diversity in the day 6.66 bits, with a diversity index H' 3.81 equal to bits and equitability 0.57.

Keywords: Insect, palm grove, Oued Souf, diversity, nocturnal insect

Introduction

The zone of Souf gathers a group of oases contained in a depression as a valley, Chotts, Sebkhass and Oueds, surrounded in every direction by Big Erg and gorgeous dunes, which meets from the north The East ^[1]. The date-palm tree is the very old fruit tree cultivated in the hot arid and semiarid zones which has important life element in oases, and it allows the sustainability of oasis system. The date-palm culture represents the richness of the Saharan regions; this one accommodates the formation of desert and semi-desert soil which constitute cultivable lands of these regions ^[2]. In an oasis, the groundwater reserves provide the essential support, every life: human, animal and vegetable. To palliate, in no precipitation, the oasis irrigate the groves by groundwater ^[3]. Globally, this work comes in the direction of completing the work of different authors such as those made by Mavoungou *et al.* ^[4] in Gamba region (Gabon), Soldati ^[5] about beetle of the open environment in Pyrenees- Orientals, Hautier *et al.* ^[6] in the north of Benin and Roth ^[7] in France and Selmane ^[8] in Oued Souf by a numeration of arthropods using Barber pots method. In Algeria, the inventory of arthropod has been the subject of a lot of study including the work of Bekkari and Benzaoui ^[9] at Ouargla and Djamaa, of Boussad and Doumandji ^[10] at the pilot farm of El Alia in Algeria, of Moussa ^[11] at Staoueli, of Remini ^[12] at Biskra, of Remini ^[13] at Ben Aknoun, of Mosbahi and Naam ^[14] and Beggas ^[15] at the region of Souf. The insects like all living beings involved in ecosystem balance. There are about 2 million species currently described, which represents 90% of all animal species as ^[16]. These animals have variable sizes and forms, occupy all ecological niches. The beetle is the largest number of species followed by the Hymenoptera and Diptera ^[17]. In the pastured ecosystems, the insects perform crucial tasks, from the pollination of plant species to recycling of waste produced by herbivores ^[17]. Considering the importance of the palm groves in the Saharan regions and its role as a shelter for various pests, and in order to minimize the damage of the latter, and the knowledge of the wildlife that frequent palm groves, we propose to establish a contribution on insects of the day and night according to their specific distribution in the Oued Souf region. For this purpose, we considered that such a study requires in the first place, a work in various stations. The methods that are used during the sampling periods (Barber pots, net and light traps) allow capturing the maximum of the existing insects.

Materials and methods

Geographic location of the study region

The region of Souf is situated at south east of Algeria. It is in the northern reaches of the eastern Erg (33° to 34° N and 6° to 8° E). It is a mass of sand surrounded by water on three sides;

it is bordered to the east by the great Tunisian Chott El-Jerid, at the North by chotts of Merouane, Melghir and Harsa, to the west by the series of chotts of OuedRigh and to the South Ouargla (Figure 1)^[18].

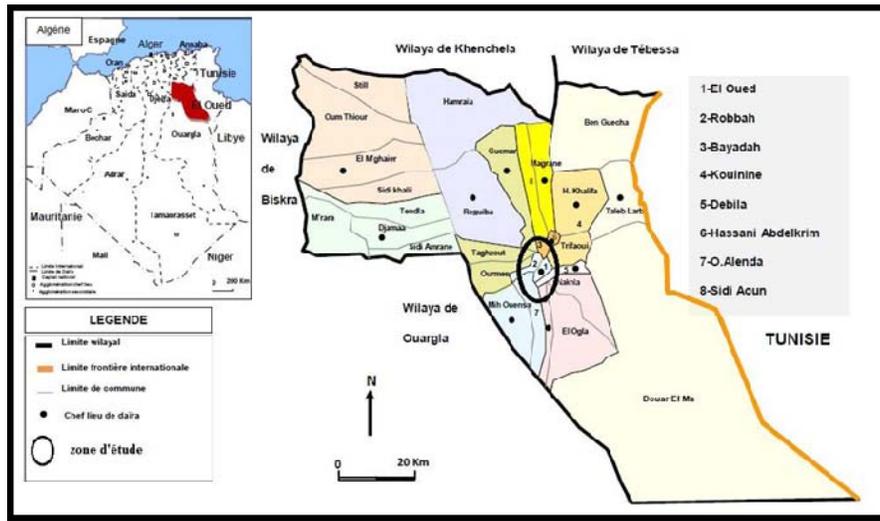


Fig 1: Location of the study area (source D.U.C)^[19]

Selection and description of study sites

Station of Sahne Elmartom

This palm grove is located in the north of El Oued, bounded in the north by Hassani Abdelkarim town, and from the south by El Oued, from the east is bounded by Tersest and from the west Tarifawi. The total area is 4 ha, and the farmed area is 1 ha and 500m². There are several cultures along with the culture of the date palm e.g. apple, pear, vineyards and olive trees.

Station of Bouhmed

This palm grove is located to the east of El Oued, bounded from the east by Trifawi town, from the south by Bayada, El Oued from the west, and from the north by Hassan Abdelkarim. It has never been the subject of particular attention in the domain of education, however, in the absence of data listed, we took as reference the visual observations we have made during our field surveys. The total area is 6 ha, and the farmed area is 5 ha. The dominant culture is the date palm (*Phoenix dactylifera*), mainly the varieties Deglet Nour and Ghars.

Station of Zemla

This palm grove is located to the east of Oued El Alenda town, bounded to the east by Dawia palm grove, Oued El Alenda from the west, to the north by the borders of the town of Ourmes and south through the dunes of El Ghadachi. The total area is 4 ha; the farmed area is 2 ha. The dominant culture like that of Bouhmid is the date palm (*Phoenix dactylifera*).

Equipments and sampling methods

Description of the method Barber pots

To sample mobile epidemic arthropods, the most common method is the pitfall trap, or Barber trap^[20]: a pot dipped in the ground intercepts mobile animals. Its popularity comes from its practical advantages, cheap, easy to use, and pretty quick fitting and rising, it provides significant staffing epidemic Arthropods. The pitfall trap captures Circulatory

fauna consists of invertebrates epidemic Coleoptera, Carabidae, Silphidae, Staphylinidae, Spiders, Opiliones, Diplopods, Chilopoda, Isopods, Formicidae, etc. For a large number of sites and species, the pitfall trap is preferable to the alternatives posed by Berlèse, the harvesting to view or suction systems D-Vac^[21-22].

Description of Fauchoire net method

The Fauchoire net captured the low mobility insects, billeted in the grass or bushes^[23]. Mowing is mainly used for sampling of arthropods in terrestrial environments. It consists of a pocket made of a very tight mesh Canvas at a depth of 45 cm mounted on a metal hoop whose diameter is 30cm. The handle of the net has a length of 120 cm.^[24].

Light traps applied in stations of study

The most used method, along with practically as many variations as there are entomologists^[25]. The trap consists of placing a light system in an open area. The device, quite complex, usually consists of three bulbs produce a high UV spectrum. The most powerful one or appellate lamp is placed between 3 and 6 meters high on a mast, the other two placed at 1.60 meters from the ground, that serve to bind off insects to a white sheet of 1.80 meters by 2 meters, stretched vertically. Another white cloth is lying on the ground, to easily identify insects that land on the ground. The bulbs are powered by a generator. Insect Harvesting is done on both sides of the cloth, by land and surroundings of the trap, certain insects landing at a certain distance from the light^[22].

Results

The determination of the insects showed the presence of 115 species which belonged to 13 orders and 57 families in the palm region of Oued Souf. We noted that the order Coleoptera which clearly dominant with 38 species distributed over 13 families, followed by Diptera with 25 species distributed in 13 families, Hymenoptera with 18 species is spread over 7 families. Lepidoptera and Orthoptera are represented by 11 species distributed over 7 families.

Finally, the orders Hemiptera, Neuroptera and Dermaptera represent 2 species of two families each and Plecoptera and Zygentoma represent by single species and Homoptera by 2 species (Table 1).

Table 1: Global list of insects trapped in the region of Oued Souf (2014-2015).

| Order | Family | Species | Day / Night | |
|----------------------|-----------|------------|-------------|-----------|
| Coleoptera | 13 | 38 | 32 | 8 |
| Diptera | 13 | 25 | 21 | 12 |
| Hymenoptera | 7 | 18 | 15 | 3 |
| Lepidoptera | 7 | 11 | 5 | 8 |
| Orthoptera | 6 | 11 | 11 | 0 |
| Neuroptera | 2 | 2 | 1 | 2 |
| Hemiptera | 2 | 2 | 2 | 0 |
| Dermaptera | 2 | 2 | 1 | 0 |
| Homoptera | 1 | 2 | 0 | 2 |
| Insect. undetermined | 1 | 1 | 1 | 0 |
| Odonata | 1 | 1 | 1 | 0 |
| Plecoptera | 1 | 1 | 1 | 0 |
| Zygentoma | 1 | 1 | 1 | 0 |
| Total | 57 | 115 | 92 | 35 |

Species diversity

The values of Shannon-Weaver diversity index fluctuate between 4.79 bits for diurnal insects and 3.81bits for the nocturnal insects, followed by calculating the maximum diversity of equal environment 6.66. Equitability of diurnal insects is very high compared to the equitability single nocturnal insects, because diversity in the day is more than the night (Table 2).

Table 2: Index values of the Shannon-Weaver diversity (H'), of the maximum diversity (H_{max}) and equitability applied of insects trapped in the region of Central Oued Souf

| Parameter | Day | Night |
|------------------|------|-------|
| H' (Bits) | 4.79 | 3.81 |
| H_{max} (Bits) | 6.66 | |
| E | 0.71 | 0.57 |

Data analysis

From the observed results we carried out a Factorial Analysis of Correspondences (F.A.C). The contributions of the different mediums for the formation of the two axis are the following ones. The graphical representation of axis F1 and F2 (Figure 2) shows that the different types of species lists found in different daytime of each medium. The analysis of the distribution of the captured species shows the existence of two groups (night and day) specific to each time and a group in the middle, between day and night composed the commune species of the various palm groves. We noted that the dominant groups during the diurnal activity are Coleoptera, Hymenoptera, Orthoptera and Diptera. On the other hand we noted the presence of three dominant groups in the period of night; they are Coleoptera, Diptera and Lepidoptera, either Diptera noticeable with some species in the day and night. On the other hand, we found a large number of butterflies at night compared to daytime. For the rest of other species, the numbers were few. The factors that control the appearance of each species studied are desert climate which is characterized by Oued Souf region and also the ability of some groups to adapt in all environmental conditions, such as variations in nutrient requirements and also cohesion among them, like ants community who works in groups, unlike the rest of the other species (Figure 2).

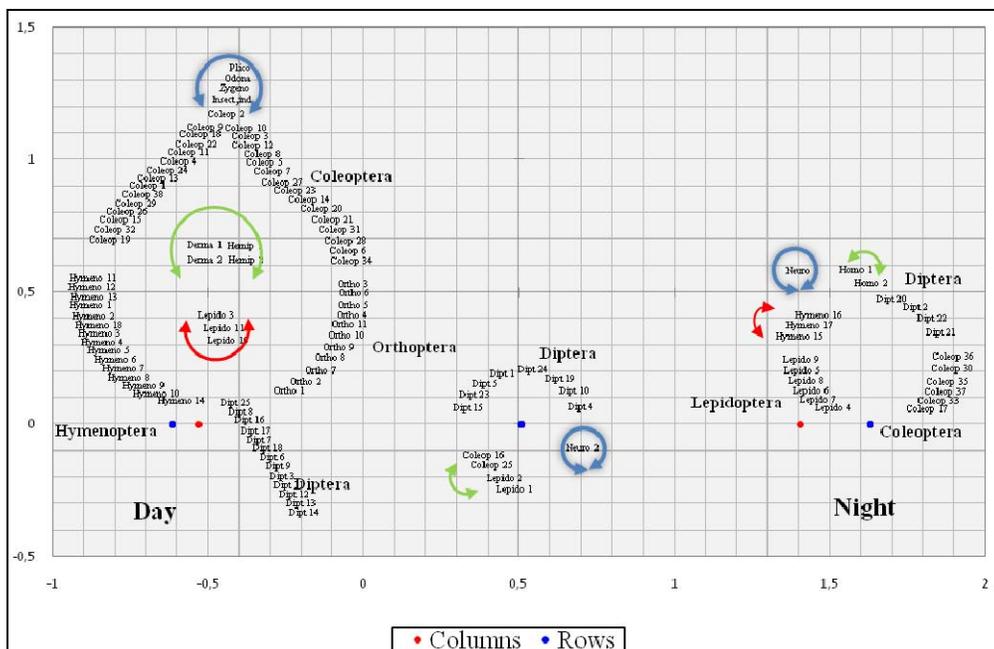


Fig 2: Factorial Analysis of Correspondence applied to species of insect.

Discussion

Diurnal insects

At the end of this work, that focuses on the study of insect distribution at three stations palm groves (Sahne Elmartome, Bouhmed and Zemla) in the Souf region, subject to sampling of insects by three methods, pots of Barber, Fauchoire net and

Night Trap. Sampling is used to list 115 species distributed in class of insects, 13 orders and 57 families between day and night. Where, the use of daytime traps allowed inventorying 2245 invidious distributed among 92 species. The highest number of species (32) belonged to order Coleoptera. Followed by the order Hymenoptera 14 species, 22 species to

the order Diptera and the other orders have low abundance. There is new order Plecoptera. On the other hand Alia ^[26] in the region of Oued Souf (case of two stations Debila and Ghamra), we notice the Coleoptera 50 species, Hymenoptera 20 species and Diptera 9 species. Also, the author Aggab ^[27] in the region of Debila and Hassi Khalifa, he reported order Coleoptera with 17 species, Hymenoptera with 16 species, and Diptera with 5 species. According to Selmane ^[8] in the region of Oued Souf, he captured 12 Coleoptera species, 5 Hymenoptera species and 2 Diptera species.

Nocturnal insects

The use of night traps allowed an inventory of 381 individuals distributed among 35 species. Samplings with Night Trap method in the region of Oued Souf allowed us to capture order Lepidoptera 47.77%, Diptera 32.01%, Coleoptera 13.89%, Neuroptera 3.41%, Hymenoptera 1.57% and Homoptera 0.78%. We noted between day and night to the following values of maximum diversity (6.66 bits), H' (4.79 - 3.81) and the equitability E (0.71-0.57). In the nocturnal insect distribution and diurnal ago deference in the activity; insect has large distribution against their distribution in the night. The orders found in the day and night is Lepidoptera, Coleoptera, Diptera, Hymenoptera and Neuroptera. There are also species distribution in the day and night.

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