

Orthopteroids on three Species of Cistaceae in the Region of Tlemcen (Algeria)

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ABSTRACT: The region of Tlemcen is located in the northwestern part of Algeria. It is characterized by the Mediterranean climate. It moves away from the coast about 60 km. *Cistus salvifolius* or Cistus with sage leaves is a thermophilic shrub characterizing the Mediterranean region. It is a moderately fragrant plant that can reach 100 cm in height. *Cistus ladaniferus* or Cistus gum is a woody pyrophyte shrub with glutinous leaves, used in medicine up to 1.5 m in height. These two cists are found in the mountains of Tlemcen. On the other hand, *Cistus monspeliensis* is a shrub with very vigorous vegetation known for its medicinal virtues and is present in the Nedroma zone. We propose to study the Orthopteroid fauna associated with these three Cistaceae. It includes 3 orders namely Orthoptera, Mantoptera and Dermaptera. The order of Orthoptera is divided into 02 sub-orders: that of Caelifera includes 03 families: those of Pamphagidae, Pyrgomorphidae and Acrididae. The second suborder, which of the Ensifers, comprises 2 families: those of the Gryllidae and the Tettigoniidae. The order Mantoptera includes the family Mantidae. The order Dermaptera has only one family, that of Forficulidae.

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Of the 3 Cistaceae, 25 species of Orthopteroids have been inventoried. *Cistus ladaniferus* has 16 species; *C. salvifolius* and *C. monspeliensis* have 15 species respectively. Orthoptera are the most numerous. We count 13 species on the sage-leaved cistus. Two species of Mantidae are found on the rockrose. *Mantis religiosa* is found in the different stations of Cistaceae. *Sphodromantis linicola* is found on *Cistus ladaniferus*. *Forficula auricularia* (Dermaptera) is present on all three Cists. Six species of Orthopteroids seem common to the 3 plants considered.

KEYWORDS: Orthopteroids - *Cistus salvifolius* - *C. ladaniferus* - *C. monspeliensis* - Species richness - Common species - Tlemcen region (Algeria).

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INTRODUCTION

The Orthopteroids constitute an entomological Super-Order which has been well studied lately in Algeria, in particular the Orthoptera and this on different points (inventory-bio-ecology-distribution) CHOPARD (1943); DOUMANDJI and DOUMANDJI-MITICHE (1994) and DAMERDJI (1996).

Studies on the orthopterofauna have been made on various xerophilic plants such as Doum (DAMERDJI, 2002); the Diss (DAMERDJI, 2003;2007a and 2007b); Calycotome (DAMERDJI and DJEDID, 2004) and aromatic plants such as Rosemary (DAMERDJI 2001) and Thyme (DAMERDJI, 2005; 2008 and 2012).

DAMERDJI and *al.* (2011) carried out work relating to Orthopteroids on two Cistaceae, namely the Sage-leaved cistus and the Gum cistus.

Orthopteroids have been studied in different areas such as: the Maghnia plain by DAMERDJI and KEBBAS (2006), in the far west of the Algerian coast by DAMERDJI and CHEIKH-MILOUD (2007) and in the southern area of the Tlemcen region by DAMERDJI and BECHELAGHEM (2010).

DAMERDJI (2006) carried out work on the orthopterofauna concerning these different plants in the region of Tlemcen. In this work, we propose to make a comparative study between the Orthopteroids found on the three Cistaceae. An inventory was carried out on these three plants by separating the different orders. Given the importance of that of the Orthoptera, we are trying to see its distribution over these three Cistaceae. From there, we highlight the common species on the one hand and the specific species.

DAMERDJI Amina, Orthopteroids on three Species of Cistaceae in the Region of Tlemcen (Algeria)

1.1. - Presentation of the Tlemcen region

The Tlemcen region is located in northwestern Algeria. The climate tends to become arid, which leads to degradation of the forest in open formation, where xerophilous plants such as Doum (*Chamaerops humilis*), Diss (*Ampelodesma mauritanicum*), Broom (*Calycotome spinosa*) are found. Two other species of Cistaceae are considered: the sage-leaved rockrose (*Cistus salvifolius*) and the ladaniferous rockrose (*Cistus ladaniferus*). The poor distribution of precipitation on the one hand, the summer temperatures on the other hand characterize the region of Tlemcen, located in the semi-arid bioclimatic stage with temperate winter. *Cistus monspeliensis* is rather located in the Nédroma area, approximately 60 km from Tlemcen.

1.2. - Study of the different host plants

The three plants studied are part of the Spermaphyte phylum, the Angiosperm sub-division, the Eudicots class, the Eurosidae subclass, the Malvales order and the Cistaceae family.

Host plant: *Cistus ladaniferus*

Cistus ladanière or *Cistus gum* is a woody pyrophyte shrub with young shoots and glutinous leaves. It can reach 1 to 2 m in height. This shrub appreciates the heat, the sun and the well-drained light soils. It is quite hardy and supports minimum temperatures of -5°C. *Cistus ladaniferus* has strongly aromatic leaves (ladanum), sessile, very elongated. In the pharmacopoeia, it was reputed to be stimulating and expectorant. It is also used in the parapharmaceutical or cosmetological industry.

The classification is as follows:

Genus *Cistus*

Genus-species *Cistus ladaniferus* subsp africanus

Common name Ciste ladanière, Lédon,

Gum cistus

Arabic name Kastousse

Host plant: *Cistus salvifolius*

The sage-leaved cistus is a highly branched, compact, erect, sometimes prostrate shrub. This plant can reach 20 to 60 cm in height, sometimes 100 cm. The root does not usually have root hairs. The leaves are simple, persistent, opposite and provided with a short petiole which can reach several cm. They look like sage leaves, slimy like young twigs.

Genus-species *Cistus salvifolius* L.

Common name Sage-leaved cistus, white rockrose

It is a moderately fragrant plant. *Cistus salvifolius* is a thermophilic shrub that prefers sunny places and siliceous soils. It is a species that prefers sunny sites with calcareous soils or soils poor in nutrients. This plant is considered an important food source for cattle and is grown as an ornamental plant. *Cistus salvifolius* is used as a traditional remedy. It is visited by bees especially for pollen.

Host plant: *Cistus monspeliensis* L. (Montpellier Cistus)

This cistus is known as a shrub with very vigorous vegetation, forming a beautiful, very compact pyramid, which can reach a height of 0.5 to 1.2m and a width of 1.5m. The leaf is lanceolate, linear, without petiole, sticky due to the presence of resin, dark green on top and light on the reverse. They last only one day but they are numerous and are renewed for nearly 6 weeks. The white flowers are very fragrant and polliferous attract insects and mainly butterflies. The fruits of *C. monspeliensis* are dehiscent oval capsules with 5 valves. *C. monspeliensis* tolerates very well the seaside and dry and poor soils, prefers very sunny places and does not like very strong winds. Montpellier cistus is very common and grows in forests, scrub and non-calcareous soils. *Cistus* is also used for its medicinal virtues.

Genus-species. *Cistus monspeliensis*

French name. *Cistus* of Montpellier or flower for a day

2. METHODOLOGY

2.1.- Description of stations

The description of the *Cistus salvifolius*, *C. ladaniferus* and *C. monspeliensis* stations is given respectively in the following tables.

Table 1- Edaphic and botanical data of the 3 stations surveyed for *Cistus salvifolius*

Prospected stations	Type of soil	Slope	Altitude	Humidity	Recovery Rate
Station 1 (Sour El-Hammam)	limestone	8-10%	1078 m	60%	50-65%
Station 2 (Zarifelt 2)	limestone	8-10%	1060 m	60%	60-70%
Station 3 Hafir (Oued Fernane)	sandstone	□12%	1200 m	70%	30-50%

DAMERDJI Amina, Orthopteroids on three Species of Cistaceae in the Region of Tlemcen (Algeria)

Table 2- Edaphic and botanical data of the 3 stations surveyed for *Cistus ladaniferus*

Prospected stations	Slope	Altitude	Humidity	Recovery Rate
Station 1 (Koudiat Hafir)	12%	1321 m	60%	45-50%
Station 2 (Sour El-Hammam)	8-10%	1078 m	60%	50-60%
Station 3 (Zarifelt)	8-10%	1060 m	70%	60-70%

Table 3- Edaphic and botanical data of the 3 stations surveyed for *Cistus monspeliensis*

Prospected stations	Slope	Altitude	Exposure	Recovery Rate
Station 1 (Zaouia de Sidi Amar)	30-35%	525m	South-west	60-70%
Station 2 (Mkhalfa 1)	30-35%	514m	East	50%
Station 3 (Mkhalfa 2)	35-40%	587m	East	70-75%

2.2. - In the field

To carry out this work, we prospected 3 stations including the three plant species with a fairly high recovery rate.

The experimental protocol carried out is the same for the three plant species. Sampling is carried out for about 5 months with generally 2 samples per month. To harvest the Orthopteroids, we use plastic bags where we put the individuals. Some easily recognized species are determined and released right away. Captures are also made either using the butterfly net, or by direct sampling when it comes to large insects poorly adapted to flight.

2.3. - In the laboratory

The individuals of Orthopteroids once brought back to the laboratory are determined. We try to keep them. The largest such as *Ocneridia*, *Acinipe* are emptied. The smaller ones are pinned to the frames so as not to damage them during the determination.

The species of Orthoptera harvested are identified by morphological characters such as:

- The shape of the pronotum
- The color of the membranous wings - The shape of the hind legs.

3. RESULTS

3.1. - Inventory of Orthopteroid species on each of the plants

Based on the classification of LOUVEAUX and BENHALIMA (1987), a systematic list of Orthopteroid species found on the three Cistaceae has been established. The results obtained are given in the following table.

DAMERDJI Amina, Orthopteroids on three Species of Cistaceae in the Region of Tlemcen (Algeria)

Table 4: Orthopteroid species listed on the three Cistaceae

Super ordre	Order	sub Order	Famil ies	sub Famil ies	Genres- species	<i>Cistus sabiifolius</i> (15 sp ecies)	<i>Cistus (Adaniferus ecies)</i> sp	<i>Cistus hygospeliensis ecies)</i> sp	
O R T H O P T E R O P T I D E A	O	C A E L I F E R A	Pamphagidae		<i>Ocneridia volxemi</i>	-	+	+	
			<i>Pyrgomorphidae</i>	<i>Pyrgomor phinae</i>	<i>Pyrgomorpha conica</i>	+	-	-	
					<i>Pyrgomorpha Aff.miniata</i>	+	-	-	
			<i>Acrididae</i>	<i>Oedipodinae</i>	<i>Calliptaminae</i>	<i>Calliptamus barbarus</i>	+	-	+
					<i>Oedipoda miniata</i>	-	+	+	
					<i>Oedipoda coerulescens sulfurescens</i>	+	-	+	
					<i>Oedipoda fuscocincta</i>	+	+	+	
					<i>Thalpomena algeriana</i>	+	+	-	
					<i>Sphingonotus lucasii</i>	+	+	+	
					<i>Acrotylus insubricus</i>	-	+	+	
					<i>Acrotylus patruelis</i>	+	+	+	
					<i>Catantopinae</i>	<i>Pezotettix giornai</i>	+	+	+
					<i>Gomphocerinae</i>	<i>Omocestus raymondi</i>	+	-	-
						<i>Omocestus ventralis</i>	-	+	-
					<i>Cyrtacanthacridinae</i>	<i>Anacridium aegyptium</i>	+	+	-
						<i>Locusta migratoria</i>	-	-	+
				<i>Platycleis laticauda</i>	+	-	-		
			<i>Gryllidae</i>	<i>Decticus sp.</i>	-	-	+		
				<i>Nemobius sylvestris</i>	-	+	+		
				<i>Gryllus campestris</i>	+	-	-		
				<i>Gryllus sp.</i>	-	+	+		
				<i>Gryllus bimaculatus</i>	-	+	-		
			<i>Mantoptera</i>	<i>Mantidae</i>	<i>Sphodromantis linicola</i>	-	+	-	
<i>Mantis religiosa</i>	+	+			+				
<i>Dermoptera</i>		<i>Forficulidae</i>		<i>Forficula auricularia</i>	+	+	+		

DAMERDJI Amina, Orthopteroids on three Species of Cistaceae in the Region of Tlemcen (Algeria)

In total, 25 species of Orthopteroids are inventoried on the 3 Cistaceae. The order of Orthoptera, the richest specifically has 22 species.

In ascending order, *Cistus salvifolius* and *C. monspeliensis* have 15 species respectively. *Cistus ladaniferus* has 16 species. The Mantoptera have 2 species. The order Dermaptera includes a single species: *Forficula auricularia* (Table 4).

3.2. - Distribution of the different groups of Orthopteroids on the three plants

The results concerning the distribution of the different groups of Orthopteroids are given in the following figure.

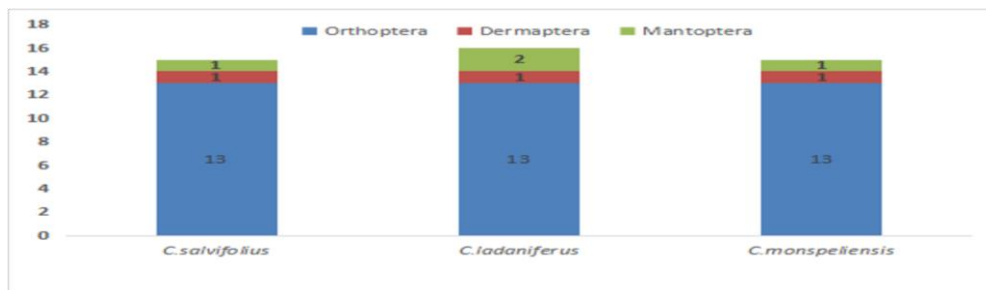


Fig.1- Different groups of Orthopteroids on the three Cistaceae

3.3. - Distribution of the 2 suborders (Caelifera -Ensifera) on the three plants

Given the importance of the Orthoptera group, we try to separate it into two subgroups: Orders: that of the Caelifera and the Ensifera. The results are given in the following figure.

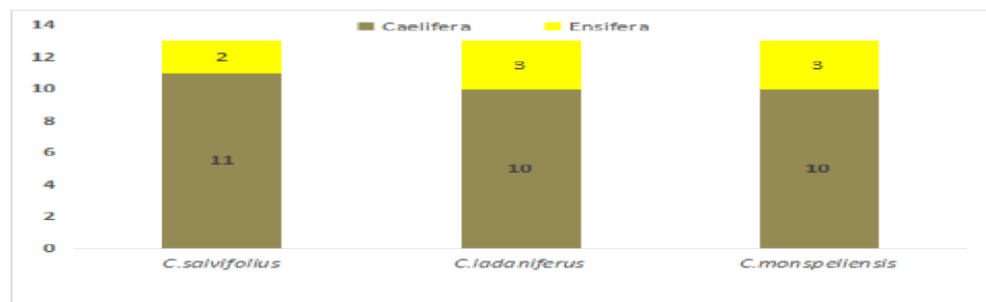


Fig.2- Distribution of the 2 sub-Orders (Caelifera-Ensifera) on the three Cistaceae

We notice that the Caelifera suborder remains the most important. We there are 11 species on the sage-leaved cistus. That of ensifers is represented by 03 species respectively on the *C. ladaniferus* and the *Cistus* of Montpellier.

3.4. - Distribution of Orthopteroid families on the three Cistaceae

The results are given in the following figure.

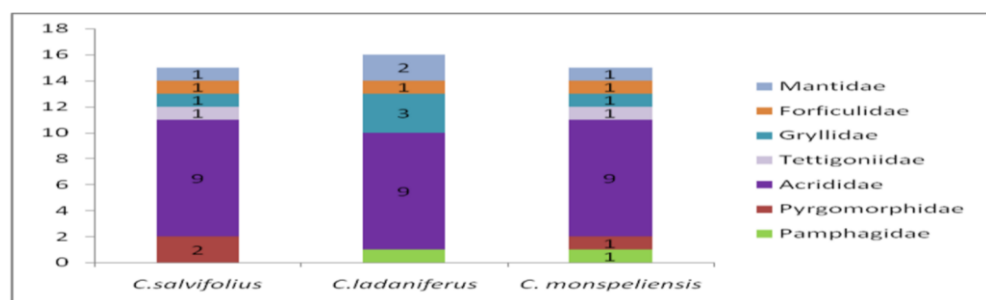


Fig. 3- Distribution of the different families of Orthopteroids on the three Cistaceae

The Acrididae family remains the most important of the three cistus. That of the Pyrgomorphidae is represented by two species on *Cistus salvifolius*. On the other hand, that of the Pamphagidae is absent on this one. The Mantidae are represented by two species on *C. ladaniferus*. The same species of Forficulidae is found on the 3 *cistus*. This is *Forficula auricularia*.

3.5. - Common species and specific species

Secondly and very briefly, we tried to note the species common to the three Cistaceae and the specific species.

- Common species

* Species common to the three Cistaceae

DAMERDJI Amina, Orthopteroids on three Species of Cistaceae in the Region of Tlemcen (Algeria)

We count 6 species including 4 species of Acrididae: *Oedipoda fuscocincta*, *Sphingonotus lucasii*, *Acrotylus patruelis* and *Pezotettix giornai* (Orthoptera) a species of Forficulidae: *Forficula auricularia* and lastly, a species of Mantidae: *Mantis religiosa*.

* Species common to two Cistaceae

- Species common to *Cistus salvifolius* and *C. ladaniferus*

Thalpomena algeriana, *Anacridium aegyptium* (Acrididae, Orthoptera);

- Species common to *C. salvifolius* and *C. monspeliensis*

Calliptamus barbarus, *Oedipoda coerulea* (Acrididae, Orthoptera)

- Species common to *C. monspeliensis* and *C. ladaniferus*

Ocneridia volxemi (Pamphagidae), *Oedipoda miniata*, *Acrotylus insubricus* (Acrididae) and *Gryllus* sp. and *Nemobius sylvestris* (Gryllidae).

- Species specific to each Cistaceae

Pyrgomorpha conica, *Pyrgomorpha* Aff. *miniata* (Pyrgomorphidae), *Omocestus raymondi*, *Platycleis laticauda*, *Gryllus campestris* are the 5 species of Orthoptera specific to *Cistus salvifolius*.

We find *Omocestus ventralis*, *Gryllus bimaculatus* and *Sphodromantis linicola* (Mantidae) only on the *C. ladaniferus*.

On the other hand, on the Montpellier cistus, *Locusta migratoria* (Acrididae) and *Decticus* sp. are the two species encountered.

DISCUSSION

Rosemary and Doum are the most populated in Orthopteroids with 21 species followed by Diss with 20 species. The richness in Orthopteroids is estimated at 13 on the Calycotome and lastly 10 on the Thyme (DAMERDJI, 2007a and 2007 b). This richness in species would certainly be due to the size of the plant species and the morphology and structure (the rough aspect of the leaf of *Ampelodesma mauritanicum* allows these insects to cling and cling better) and to the presence of certain compounds in Rosemary. Whatever the plant considered, the Caelifera suborder is always the most important.

The Acrididae family, the most diversified remains the richest specifically. We count respectively 12 species on the Doum, 11 species on the Diss, 09 species on Rosemary and Broom and lastly 05 species on Thyme (DAMERDJI, 2006).

Ramburiella hispanica seems specific to Diss (DAMERDJI, 2006) and *Thalpomena algeriana* is also found on broom and on cistus ladaniferous and sage-leaved cistus.

Chamaerops humilis, *Ampelodesma mauritanicum* and *Calycotome spinosa* only includes species belonging to the Gryllidae family; where a large number of species is found on the Diss (05 species), followed by the Doum (02 species) and the Broom (01 species). The Pamphagidae family is represented on Rosemary by *Acinipe* sp. and on Broom by *Ocneridia volxemi* (DAMERDJI and DJEDID, 2004). The Pyrgomorphidae family is represented respectively by 02 species on the Doum and the Diss and a single species on the Thyme: it is *Pyrgomorpha cognata*. We note the absence of Phasmidoptera on Diss, Rosemary and Thyme. We note the absence of Mantoptera on Diss, Thyme and Broom (DAMERDJI, 2007a). Dermaptera are present on the three Cistaceae.

CONCLUSION

A total of 25 species of Orthopteroids are recorded on three Cistaceae. The order of Orthoptera, the richest specifically has 22 species. In ascending order *Cistus salvifolius* and *C. monspeliensis* has 15 species and *C. ladaniferus* 16 species. The Mantoptera are represented by two species on the Cistus gum. Dermaptera are present on the three Cists. Phasmidoptera are totally absent on the three species studied. *Omocestus ventralis*, *Gryllus bimaculatus* and *Sphodromantis linicola* (Mantidae) are present only on *Cistus ladaniferus*.

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