

# Composition and structure of Gastropoda in the *Lavandula dentata* L. (Labiatae) stations in the Ghazaouet region (Tlemcen, North-West Algeria)

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## ABSTRACT

An approach to the diversity of malacofauna associated with toothed lavender was carried out in three stations belonging to the coastal region of Ghazaouet (Wilaya de Tlemcen) from January to July 2013. The specific richness of gastropods is 14 species. Four species are accessories and ten others are accidental. The relative importance of snails varies by station and by month and season. Gastropods preferring certain humidity are easily collected in winter and spring. In April, the species richness is relatively important (6 species) in the 1st and 2nd stations respectively. *Milax gagates* has a frequency of 78.57% in the first station (Sidi-Aissa) and 57.14% in the 2nd station (Sidi- Amar). *Helicella pyramidata* has a frequency of 35.71% in station 3 (Bab Khroufa). Similarly, this Helicellinae has a density equal to 0.50 in the same station.

**Keywords:** *Lavandula dentata*, terrestrial gastropods, diversity, bioecology, vertical distribution, Ghazaouet region (Tlemcen).

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## INTRODUCTION

With regard to faunistics work in the Tlemcen region, several of them have been undertaken on different species of host plants. In fact, in the steppe region south of Tlemcen, a bioecological study on the fauna linked to *Stipa tenacissima* L. (Poaceae) including gastropods (Khelil, 1984) preceded a publication on arthropods in the same region (Khelil, 1989). Bioecological studies on fauna are undertaken later on the " diss " *Ampelodesma mauritanicum* (Poiret) Durd and Shinz, 1895 (Poaceae) in the Tlemcen region by Adjlani (1998) and Damerdji and Adjlani (1999), on the doum *Chamaerops humilis* Linné always around Tlemcen by Bouhellou (1998) and Damerdji and Bouhellou (2002a, 2002b). On Thyme, *Thymus ciliatus* Desf. (Labiatae) a study is made then on the malacofauna proper by Damerdji (2010). On the Genet (Fabaceae), a faunistic inventory is made by Damerdji in 2008.

Authors have worked on the taxonomy and biogeography of gastropods in the Iberian Peninsula and

the Balearic Islands (Gomez, 1988; Altonaga et al., 1994; Puente, 1997).

Other authors have carried out studies on terrestrial molluscs in very particular areas such as the Najerilla Valley (Ortiz de Zarate, 1991), the municipality of Valence (Ondina, 1988; Martinez-Orti, 1999). Gomez (1988) has compiled a catalog of species from the Iberian region.

Bigot and Aguesse (1984) deal with the structural variations of 7 highly characteristic Mediterranean ecosystems of the Rhône delta (Camargue).

On malacofauna proper in 1996, Damerdji performs a bioecological study in the steppe zone of the Tlemcen region, work that the author completes at the Tlemcen Mountains (Damerdji, 1997a) and taking into consideration the impact of edapho-climatic factors on the conchyliological characters of the terrestrial malacological stand in the same region (Damerdji, 1997b). Again, no work has been done on the gastropods

living on *Lavandula dentata*. This gap justifies the present work.

## MATERIALS AND METHOD

Three parts are presented, the first concerns the choice of plant material, the second the presentation of the study stations and the third the adopted methodology which includes first the field work and then the techniques used to exploit the results obtained.

### Choice of plant material

#### *Lavandula dentata* (toothed lavender)

Lavender is a chamaephyte that forms dense tufts. Their leaves are toothed, crenate on the margins, greyish below, green above. It is an annual grass with a height of 40 to 80 cm, opposite evergreen, which may be whole or dentate. The bracts are located at the base of each cyme. The fruit is tetrackene. The foliage is very finely cut allowing more airy vegetation. Abundant blue-violet bloom is observed in the spring season. The monopetalous corolla is overthrown, with a longer tube than a calyx and a limb divided into five unequal, rounded lobes, imperfectly divided into two lips. *L. dentata* occurs in scrublands, dry places, and siliceous soils. It is silico and calcifuge. Lavender used in herbal medicine, aromatherapy is considered a medicinal plant for the action of its oil used in perfumery.

*Genus. species. L. dentata* L. French name Lavande dentée

Local name Khouzama

Common name Timazouriat

### Choice of study stations

The region of Ghazaouet cannot be entirely studied. We have therefore been led to make a subjective choice of three stations.

This choice is essential because research on biocenoses can only be done on small surfaces. Thus the analysis of the samples will only be valid if the choice of the surface of the studied station is accurate. For this and to know precisely the stand linked to *L. dentata*. We deemed it necessary to extend the study area as much as possible, taking into account our accessibility.

To carry out this work, we chose three stations, representative of the study area, of Ghazaouet. To study the bio-ecology of the fauna, these stations are differentiated by their morphology, their vegetation and their geographical position (altitude, exposure, etc).

#### Station 1: Sidi Aissa

This station is located to the west of Ghazaouet on the national road N° 77 going to Ghazaouet city and 2.5 km away; from 35°05'17.79 N and 1°48'56.17 W. The altitude is 243 m a.s.l. with a slope of about 30%. The substrate is rocky. The recovery rate is between 60 and 70%.

The plant species that dominate station 1 are: *Lavandula dentata* L. (Lamiaceae); *Witania frutescens* L. (Solanaceae); *Asparagus acutifolius* L. (Liliaceae); *Daucus carota* L. (Apiaceae); *Retama raetam* Forssk. (Fabaceae).

#### Station 2: Sidi Amar

This station is located to the east of Ghazaouet connected by the national road N° 98 of 9.3 km (towards Nedroma) with an exposure 35° 06'15.93 N and 1° 50'11.67W. It represents a slope of approximately 10 to 15%, an approximate elevation of 92 m a.s.

and a recovery rate of 75 to 80%.

*L. dentata* L. (Lamiaceae); *Pistacia lentiscus* L. (Anacardiaceae); *Daucus carota* L. (Apiaceae); *Eucalyptus* (Myrtaceae); *Lavandula multifida* L. (Lamiaceae); *Witania frutescens* L. (Solanaceae) are the plant species found in station 2.

#### Station 3: Bab Khroufa

Located in the South-East at about 900 meters from Station N° 2. The slope is between 30 and 45%. Also the substrate is completely different, highly sandy and the recovery rate is as important as that of the first station, it amounts to more than 80%.

The plant species that dominate station 3 are *Lavandula dentata* L. (Lamiaceae); *Cistus monspeliensis* (L.) (Cistaceae); *Ranunculus* sp. (Ranunculaceae); *Daphne gnidium* L. (Thymelacaceae); *Scolymus* sp. (Asteraceae).

From the bioclimatic point of view, the studied stations are part of the upper semi-arid stage in warm winter.

Table 1 shows the characteristics of the three stations surveyed.

## METHODOLOGY

In field campaigns from January to July 2013, 14 samples were recovered, taken back to the laboratory where individuals and empty shells live are separated and stored in plastic bags. Small sized species are kept in tubes usually made of glass. The morphological and anatomical characters do not have the same importance from the systematic point of view. However, the shape, size, coloring and ornamentation of the shell are taken into account as well as many morphological differences that can help in the species determination. In addition, the anatomical characteristics, in particular of the genitals, remain determining criteria for the identification of the species. In this respect, the morphological description is based on the biosystematic study of the Molluscs Gastropods Pulmonate terrestrial of the region of Tlemcen drawn up by Damerджи (1990).

Among the ecological indices of composition used to describe the results we used the abundance percentage that is the ratio expressed as a percentage of the number of samples where this species is recorded to the total number of samples taken:

$$F = \frac{P_a}{P} \times 100$$

F is the frequency of occurrence of the species.  $P_a$  is the total number of samples containing the species taken into consideration. P is the total number of samples taken. In terms of consistency DAJOZ (1985) distinguishes three groups. Species in the first group are considered constant when they are found in 50% or more of the surveys in the same community. Those in the second group are accessory because they are only present in 25 to 49% of the samples. Finally, accidental species have a frequency of occurrence of less than 25%.

The relative abundance of a species corresponds to the ratio of the number of individuals of this same species to the total number of individuals all species combined:

$$A_{rel} = \frac{N_a}{N_a + N_b + N_c + N_{...}} \times 100$$

$A_{rel}$  is the relative abundance of the species considered.  $N_a$ ,  $N_b$ ,  $N_c$ , are the numbers of individuals of species a, b, c.

**Table 1.** Abiotic and biotic data from the three stations surveyed.

Stations surveyed	Altitude (m)	Slope (%)	Exposure	Recovery Rates (%)
Station no 1 (Sidi Aïssa)	243	30	West	60-70
Station no 2 (Sidi Amar)	92	10-15	Southeast	75-80
Station no 3 (Bab Khroufa)	107	40-45	Southeast	75-85

The relative abundance provides information on the importance of each species in relation to all species present.

The density of a stand is the number of living individuals of all species per unit area:

$$D = \frac{N}{P}$$

D = Density of the species. N = Total number of individuals of a species harvested "a" in the stand considered. P = Total number of samples taken in the stand under consideration.

Of the ecological structure indices only the Shannon-Weaver Diversity Indices and Fairness are used. The calculation of this index makes it possible to evaluate the faunistic diversity of a given environment and to compare the faunas of different environments, even when the numbers of individuals harvested are very different (DAJOZ, 1985).

The Shannon-Weaver and equirepartition indices are expressed by the following formulas:

$$H' = - \sum q_i \log_2 q_i$$

$$H'_{\max} = \log_2 S \quad (S = \text{number of species})$$

H' = diversity index expressed in bits

H'max = Maximum diversity expressed in bits

Equitability (E) is defined as the ratio of calculated diversity to maximum diversity.

$$E = \frac{H'}{H'_{\max}}$$

## RESULTS

The results from the inventory of gastropods harvested on toothed lavender allowed describing their seasonal and monthly relative importance, the calculation of ecological indices and the vertical distribution of these species.

### Diversity of malacological species harvested from *Lavandula dentata*

Based on the classification of Germain (1969a and b) a systematic list of species found on toothed lavender is established.

The results concerning the inventory of malacological species are recorded as below.

List of species of pulmonary gastropods recorded on toothed lavender in 3 stations in the area of Ghazaouet:

#### Milacidae

*Milax gagates* Draparnaud, 1801

#### Helicidae

##### Helicinae

*Macularia hieroglyphicula* Michaud, 1833

*Archelix polita punctatiana* Gassies, 1856

*Helix aspersa* Müller, 1774

*Eobania vermiculata* Müller, 1774

*Euparypha pisana* Müller, 1774

##### Helicellinae

*Helicella (Cernuella) virgata* Da Costa, 1778

*Helicella pyramidata* Draparnaud, 1805

*Helicella acompsia* Bourguignat, 1864

*Helicella breveti* Debeaux

*Helicella reboudiana* Bourguignat, 1864

*Helicella terveri* Michaud, 1831

*Cochlicella acuta* Müller, 1774

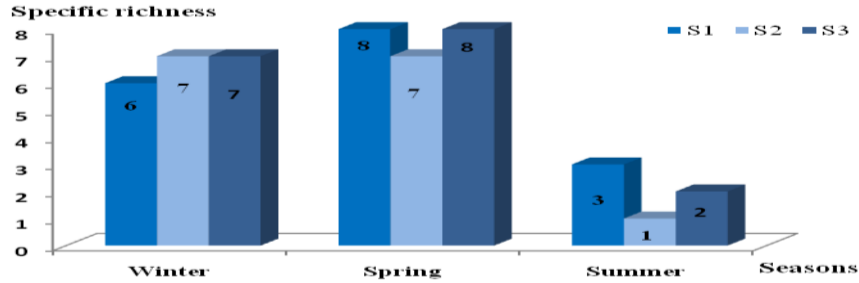
##### Subulinidae

*Rumina decollata* Linné, 1758

Along our field campaigns from January to July 2013 in the 3 stations prospected, we recovered representatives of 109 taxa which are grouped in six (6) classes which are: Gastropods, Annelids, Arachnids, Crustaceans, Myriapods and Insects (Danoun, 2013). The specific richness of gastropods is 14. They are distributed among 3 families: Milacidae, Helicidae and Subulinidae. The 1st and 2nd families comprised a single species. For the 1st family, it is *Milax gagates* which is also present in the first two stations. For the third family, that of Subulinidae represented by *Rumina decollata*. The family Helicidae comprises two subfamilies: Helicinae with 10 species distributed in the following taxa: *Helix*, *Macularia*, *Archelix*, *Eobania*, *Euparypha* and that of Helicellinae with 2 genera: *Helicella* and *Cochlicella*. *Cochlicella acuta* is present only in the third station.

### Seasonal variations of the gastropods found on *Lavandula dentata*

During winter, stations 2 and 3 contain 7 malacological species (Figure 1). The first station (Sidi-Aïssa) has 6 species. In the spring, gastropods are important in the 1st and 3rd stations with richness equal to 8 species whereas the second station has only 7 species. In summer, gastropods have richness equal to 3 species in the 1st station (Sidi-Aïssa) and only one in the 2nd station (Sidi-Amar). Station 3 (Bab-Khroufa) has 2



**Figure 1.** Seasonal importance of gastropods according to species diversity in the three stations.

malacological species.

**Monthly variations of gastropod wealth**

The results concerning the monthly importance of gastropods are given in Figure 2.

At first glance, the gastropods seem to be present during the different months of prospection except in July in stations 2 and 3. Only one species is found in July. The second station comprises respectively 6 species in January and April, 4 species in February and March, 5 species in May and a single species in June. The malacological wealth is zero in July in the second and the third station. We collected in the 3rd station (Bab-Khroufa) respectively 5 species in January, March and May 4 species in February and 3 species in April.

**Monthly variations in the number of snails recorded on *Lavandula dentata* at the three stations**

The results obtained are shown in Figure 3. They show the importance of snails month by month, in the 3 stations.

They have presence that varies during the different months of prospecting. The total of individuals (empty shells + shells with live individuals) is equal to 231.

Fluctuations occur between 47 individuals in April and 1 individual in July in the first station (Sidi-Aïssa). It should be noted that gastropods are absent in the second and third stations in July. In March, the number does not exceed 16 in the third station (Bab-Khroufa).

**Exploitation of results by ecological indices**

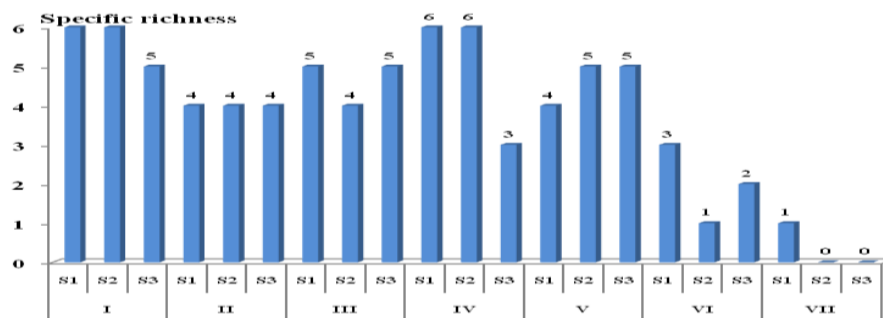
All inventoried malacological species are taken into consideration for the calculation of ecological indices. The results for ecological indices are shown in Table 2.

**Application of frequency of occurrence to snail species**

Four species of gastropod are classified as accessories. These species are *Milax gagates*, *Archelix polita punctatiana*, *Helicella pyramidata* and *H. acompsia* (Helicidae) and *Rumina decollata* (Subulinidae).

Among the species considered as accidental, we find 10 species that are: *Macularia hieroglyphicula*, *Helix aspersa*, *Eobania vermiculata*, *Euparypha pisana*, *Helicella virgata*, *H. reboudiana*, *H.terveri* and *Rumina decollata*.

The very accidental species are two in number, namely: *Helicella breveti* and *Cochlicella acuta*.



**Figure 2.** Monthly importance of gastropods according to species diversity in the three stations.

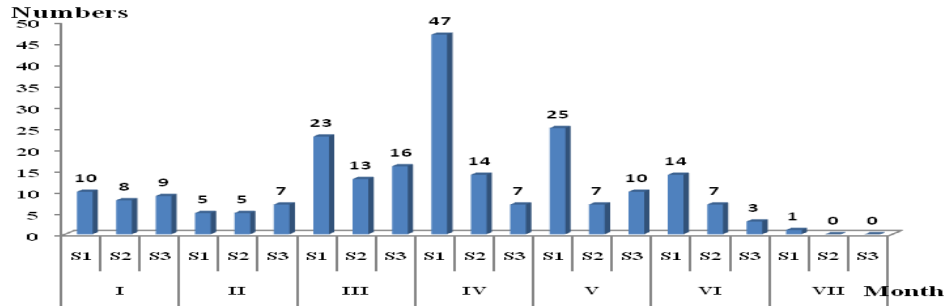


Figure 3. Monthly importance of gastropods according to number in the three stations.

Table 2. Frequency of occurrence, relative abundance and density of malacological species observed in the 3 stations.

Stations Malacological species	Station 1			Station 2			Station 3			Moy. FO(%)	Classes of constance
	F%	A%	D	F %	A%	D	F %	A%	D		
<i>Milax gagates</i>	78.57	0.69	1.35	57.14	0.43	0.92	0	0	0	45.23	Accessory
<i>Macularia hieroglyphicula</i>	0	0	0	21.42	0.23	0.5	14.28	0.02	0.42	11.9	Accidental
<i>Archelix polita punctatiana</i>	64.28	1.35	2.64	7.14	0.06	0.14	5	0.6	1	25.47	Accessory
<i>Helix aspersa</i>	21.42	0.36	0.71	14.28	0.13	0.28	14.28	0.08	0.14	16.66	Accidental
<i>Eobania vermiculata</i>	28.57	0.29	0.57	14.28	0.16	0.35	21.42	0.17	0.28	21.42	Accidental
<i>Euparypha pisana</i>	21.42	0.22	0.42	21.42	0.19	0.42	0	0	0	14.28	Accidental
<i>Helicella virgata</i>	28.57	0.18	0.35	7.14	0.06	0.14	0	0	0	11.9	Accidental
<i>Helicella pyramidata</i>	28.57	0.25	0.5	14.28	0.23	0.5	35.71	0.3	0.5	26.18	Accessory
<i>Helicella acompisia</i>	71.42	0.66	1.28	7.14	0.09	0.21	21.42	0.17	0.28	33.32	Accessory
<i>Helicella breveti</i>	14.28	0.14	0.28	0	0	0	0	0	0	4.78	Very accidental
<i>Helicella reboudiana</i>	7.14	0.14	0.28	7.14	0.06	0.14	14.28	0.17	0.28	9.52	Accidental
<i>Helicella terveri</i>	7.14	0.07	0.14	7.14	0.06	0.14	28.57	0.17	0.28	14.28	Accidental
<i>Cochlicella acuta</i>	0	0	0	0	0	0	21.42	0.17	0.28	7.14	Very accidental
<i>Rumina decollata</i>	14.28	0.18	0.35	7.14	0.03	0.07	14.28	0.13	0.21	11.9	Accidental

**Relative abundance and density of snails**

This criterion sheds light on the biology of malacofauna harvested on toothed lavender. In the first station (Sidi Aissa), *Eobania vermiculata* abundance equals 0.96% and a density of 0.75. In the second station (Sidi Amar), *Milax gagates* abundance equals 0.43% and a relatively high density equal to 0.92. In the third station, *Milax gagates*, *Euparypha pisana*, *Helicella virgata* are absent. On the other hand, *Eobania vermiculata*, *Helicella acompisia*, *H. reboudiana*, *H. terveri* and *Cochlicella acuta* have the sea abundance (0.17%) in the third station (Bab khroufa). The density is 0.28.

**Diversity index or Shannon - Weaver**

The data in Table 3, allow us to calculate the Shannon-Weaver index in the 3 stations.

The Shannon-Weaver index reflects the level of species diversity. So it is the highest in the 2nd station. It decreases (2.98 bits) in the 3rd station where we meet 10

species.

**Equidistribution index applied to snail species**

For equidistribution, it is at the three stations where this value is greater than 0.50 and tends to 1. Consequently, the numbers of different species tend to be in equilibrium with each other.

**Vertical distribution of gastropods on toothed lavender**

Table 4 shows the vertical distribution of gastropod species on lavender.

**At the root level**

Only one species is found on the root, it is: *Milax gagates*. This layer is preferred by this species seeking

**Table 3.** Numbers, indices ( $H'$ ,  $H'$  max, E) of the different malacological species encountered in the three stations.

Stations	Station 1 (Sidi Aissa)	Station 2 (Sidi Amar)	Station 3 (Bab Khroufa)
Total	125	54	52
Present species	12	12	10
$H'$ (en bits)	3.06	3.09	2.98
$H'$ max (en bits)	3.58	3.58	3.32
E	0.85	0.86	0.90

**Table 4.** Distribution of the malacological species collected on the different strata of the *Lavandula dentata* foot.

Genus species	Root	Area of soil	Stem
<i>Milax gagates</i>	+	+	
<i>Macularia hieroglyphicula</i>		+	
<i>Archelix polita punctatiana</i>		+	
<i>Helix aspersa</i>		+	
<i>Eobania vermiculata</i>		+	
<i>Euparypha pisana</i>		+	
<i>Helicella virgata</i>			+
<i>Helicella pyramidata</i>		+	
<i>Helicella acompsia</i>		+	+
<i>Helicella breveti</i>		+	
<i>Helicella reboudiana</i>		+	
<i>Helicella terveri</i>		+	+
<i>Cochlicella acuta</i>		+	
<i>Rumina decollata</i>		+	

+: Presence of the species.

moisture.

#### **At the level of the soil surface**

Here, we find *Milax gagates*, *Macularia hieroglyphicula*, *Archelix polita punctatiana*, *Helix aspersa*, *Eobania vermiculata* and *Euparypha pisana* (Helicinae, Helicidae) and *Helicella terveri* (Helicellinae) and *Rumina decollata* (Subulinidae). Several or all species have been captured on the soil surface.

#### **On the stems**

We find 3 species of gastropods: *Helicella virgata*, *H. acompsia* and *H. terveri*. The gastropods make their epiphragms to survive in extreme conditions.

#### **On leaves level**

There are practically no species of gastropod except in very rare cases.

## **DISCUSSION**

On *Ampelodesma mauritanicum* Damerdji in 2002b recognized 13 malacological species whereas Damerdji (2002a) and Damerdji and Bouhellou (2002a) observed 19 on *Chamaerops humilis* and Damerdji (2010) also 19 on *Thymus ciliatus*. On *Rosmarinus officinalis* (Rosemary) are counted 18 species of gastropods (Damerdji et al., 2005).

In the Tlemcen Mountains, Damerdji (1997a) harvested 27 species of snails. Similarly, in the steppe zone south of Tlemcen, Damerdji (1996) has 15 species that are part of the malacofauna, while Khelil (1984) has only noted one with *Leucochroa candidissima*. This species, currently known as *Sphincterochila candidissima*, is particularly fond of calcareous rocks (Damerdji, 1990). The latter shows a strong morphological adaptation for its thick and white test which must protect it from the high temperatures that can prevail in these lawns; it is closed in summer by a horny epiphragm, from which it enters diapause. The bioecology of malacofauna found in 2 stations (Hafir and Zarifelt) of the Tlemcen Mountains indicates the presence of 34 species in Hafir and 19

species in Zarifelt during the years 1999 and 2000. Some particular conchyliological characters whose size and color distinguish species are likely to rise in altitude (Damerdji, 2004a). During this same period, a study on the distribution of malacological species from the coast (Ghazaouet), through Tlemcen (urban center), the mountains (Hafir and Zarifelt), Maghnia (plain) to the southernmost zone and steppe (El-Aricha) has identified 5 common species in these different ecosystems: *Sphincterochila candidissima* (Sphincterochilidae); *Archelix lactea*, *A. punctata* and *A. zapharina* (Helicidae); and *Rumina decollata* (Subulinidae). It should be noted that 20 species are considered specific including 14 Helicidae (Damerdji, 2004b). As an example, the 5th ecosystem considered (the steppe zone); we find 2 species of Helicidae (*Archelix bailloni* and *Helicella lemoinei*).

In his essay on the quantitative ecology of the Invertebrates of the Camargue Sansouire, Bigot (1965) indicates in number of species the molluscs collected in the main milieus of the Camargue. In Sansouire, the species richness is estimated at 8. The abiotic and biotic factors remain important in the variation of the size of the shells of *Sphincterochila candidissima* (Damerdji, 2001). This species has a strong abundance in xerophilic medium as in El-Aricha. This is however linked to the degradation of the environment (Damerdji, 1997b). *L. candidissima* is much localized in the Camargue where it is known from the area of the tower of Valat and its surroundings (Aguesse and Bigot, 1962). The population of *L. candidissima* from the Camargue tends to show a clear detachment of the whorls of its shell (Altes, 1956). Engel (1957) reports its presence mainly in the low and salty salwalt with *Arthrocnemum glaucum*.

On the other hand, *E. pisana* is common throughout the Camargue where its tests gather under the *Salicornia fruticosa* and harbor many invertebrates (Aguesse and Bigot, 1962). On the other hand, the impact of edapho-climatic factors on the conchyliological characteristics of the terrestrial gastropod population in the Tlemcen region has been demonstrated (Damerdji, 1997b). According to Bigot (1957), a large fauna representing most of the orders of Invertebrates and almost all orders of insects known in the Camargue, took refuge in empty shells. These tests play a big role as shelters. The fauna finds an ideal refuge against the low temperatures of the winter and against the heat wave. These tests are also used as a source of food, or even a place of spawning and metamorphosis. In 1971, Sacchi studied the comparative ecology of the pulmonate gastropods of the Mediterranean and Atlantic dunes (Sacchi, 1971).

At the same time, it should be noted that Damerdji (2002a) found that in winter, the species richness of snails is high on *Chamaerops humilis* with 12 species. Moreover, *Macularia hieroglyphicula* was also found in winter on the diss (Damerdji, 2002b).

On rosemary, fluctuations occur between 125 individuals in April and 31 in December (Damerdji et al.,

2005). In the study conducted on *Chamaerops humilis*, Bouhellou (1998) showed that gastropods occupy the second position in terms of numbers with 112 individuals. The same observation is made by Adjlani (1998) on *Ampelodesma mauritanicum* with 98 individuals.

The phenomenon of "clusters" is an adaptive mark pushed towards the environment for species that are isolated are not very resistant. It occurs every year in the Rhone delta for at least 2 or 3 weeks and sometimes for several months (Bigot and Aguesse, 1984).

On rosemary, Damerdji et al. (2005) found the index of diversity in the 3rd station which decreases in the 1st station. The largest population is *Euparypha pisana* with 137 individuals in the 1st station and 212 individuals in the 3rd station.

Damerdji et al. (2005) found the highest equidistribution in the 3rd rosemary plant. On the other hand, Damerdji and Mebarek (2014) noted a balance between the two gastropod species in *Cistus monspeliensis* stations.

At the level of the soil surface, the majority of inventoried gastropods are found there. *Macularia*, *Archelix* (Helicidae) and *Milax gagates* are counted among the soil fauna (Damerdji and Adjlani, 1999).

At the level of the Diss stem, 4 species of gastropods are noted. These species use this part of the plant to make their epiphragm and settle there (Damerdji, 2002b). The e species *Euparypha pisana*, difficult to recognize due to its polymorphism, is found on the stipe of the doum (Damerdji, 2002a).

On diss, we found 2 species of Helicidae considered phytophagous. According to Khelil (1989), individuals of *Leucochroa candidissima* are consumers of Alfa foliage. On the doum, when the leaf surface is rough, gastropods manufacture epiphragms to be able to subsist under extreme conditions.

## CONCLUSION

The bioecological study of the malacological fauna of toothed lavender in the 3 stations of the region of Ghazaouet (Tlemcen), allowed us to inventory 14 species during the samples taken from January to July 2013. In the spring, stations 1 and 3 have a specific richness equal to 7 respectively. Gasteropods are found even during the warmest months (May and June). In effective, it is the 2nd station and in May where we meet the maximum of samples. Of the 14 malacological species analyzed, 4 are accessories and 10 others are accidental.

The calculation of the Shannon-Weaver index varies between 2.98 and 3.09 bits. It is the highest in the 2nd station. Equidistribution indicates a balance between the numbers of the different species present. Regarding the distribution of gastropods on toothed lavender, all inventoried species are found on the ground. Finally, while a number of results have emerged during this study, many points remain to be clarified, particularly the

relationship between the trophic level and the malacofauna identified therein.

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