

An inventory of the myrmecofauna at five semi-arid sites in East of Algeria

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ABSTRACT

In a contribution to the study of the bioecology of ant populations in eastern Algeria, an inventory of the Myrmecofauna was carried out in five sites belonging to three wilayas: Oum El Bouaghi, Constantine and Souk Ahras. These sites are considered as different ecological environments (forest, agricultural and aquatic environment). This inventory has been defined by the presence of 09 species of ants, each of which is attached to a biotope, the different biotic and abiotic factors that favour their adaptation are studied. The 9 species of Formicidae belong to the 5 genera: *Tapinoma*, *Cataglyphis*, *Camponotus*, *Messor* and *Monomorium* of 3 subfamilies: Dolichoderinae, Formicinae and Myrmicinae. The calculation of the ecological indices, a statistical analysis was carried out to evaluate the abundance, richness and the distribution of these species.

Key words : *Inventory, Ants, Bioecology, Abundance, Wealth, East Algerian.*

Introduction

Ants. They belong to the order of Hymenoptera, constituting the family Formicidae. According to Lebas *et al.*, (2016) there are more than 13,000 species of ants described in the world, which occupy nearly all types of terrestrial environments: forests, cultivated and anthropogenic environments and at the edge of aquatic environments. Despite the large biomass of these insects they are unable to live alone, they shelter very large, occupied, organized and hierarchical nests known as anthills (Bernard, 1983). Concerning ecological interactions, ants play the role of predators of arthropods and herbivores;

mutualists receiving honeydew rejected by aphids, seed transporters, excavators from the ground... (Beattie, 1985; Beattie and Hughes, 2002). Several authors around the world have focused on the study of ants but most of the work is interested in their bio-ecology. In Europe, the work of de Jolivet *et al.*, 1986), Holldobler *et al.*, 1996 is cited. The systematics of the Algerian myrmecofauna seems to be unknown to date only through the work of de Bernard (1951-1983) and those of Cagniant (1969-1970) also the works of Barech *et al.*, 2011, Barech, 2014 and Barech *et al.*, 2015.

The present work consists of carrying out an inventory of the myrmecofauna in a few terrestrial environments at Eastern Algeria.

Materials and Methods

Study sites

The study was held in three wilayas of Eastern Algeria: Oum El Bouaghi, Constantine and Souk Ahras. The sampling sites were chosen according to the types of terrestrial environments selected, each of which was sealed in different zones defined by the presence of several anthills. Geographic coordinates of each site have been defined by a GPS Garmin 72. The first site is that of the mountain of Sidi R'ghiss (35° 53' 18.74 "N, 07° 07' 25.89 "E) where we have selected three zones at different altitudes: at the foot of the mountain, 500 and 600 m higher. The second and third sites are agricultural areas, their coordinates are 36° 13' 08.22" N and 06° 41' 50.43 "E for El khroub, Constantine and 35° 51' 03.48" N, 07° 08' 25.09" E for Oum El Bouaghi. These are divided into two areas: the edges and the centre of the fields. The fourth one, we chose a part of the Oued Charef which is located west of the city of Souk Ahras, it is between 36° 06' 14.49" N and 07° 22' 44.36" E, where two enclosures have been selected: the edges, and a middle farm about 80 metres from the wadi. The fifth site prospected is part of Lake El Zemoul, which is located on the bor-

der between the wilaya of Oum El Bouaghi and Batna (35° 52' 11.1" N and 06° 29' 51.24 "E), the latter is divided into three zones: the first is on the lakeshore, the second at 80 m and the third at 200 m.

Sampling methods

Sampling

Sampling was carried out using the square method of counting ant-hills. Present in 10 randomly selected squares of 100 m² each (Cagniant, 1966).

Trapping

Sight hunting is the most accessible search method for everyone and one of the most effective. Its effectiveness increases with experience. The hunting method does not require the use of special equipment and can be practised in the following ways without any special preparation, as appropriate (Lebas *et al.*, 2016) Samples from individuals placed in vials containing ethanol at the 70% concentration, each of which is named, dated and particularized for a single species. Captured individuals were then counted and identified using a binocular magnifying glass with micrometric ocular, for morphometric measurements, and various guides: Guide Delachaux of Lebas *et al.*, 2016, the lists of Algerian

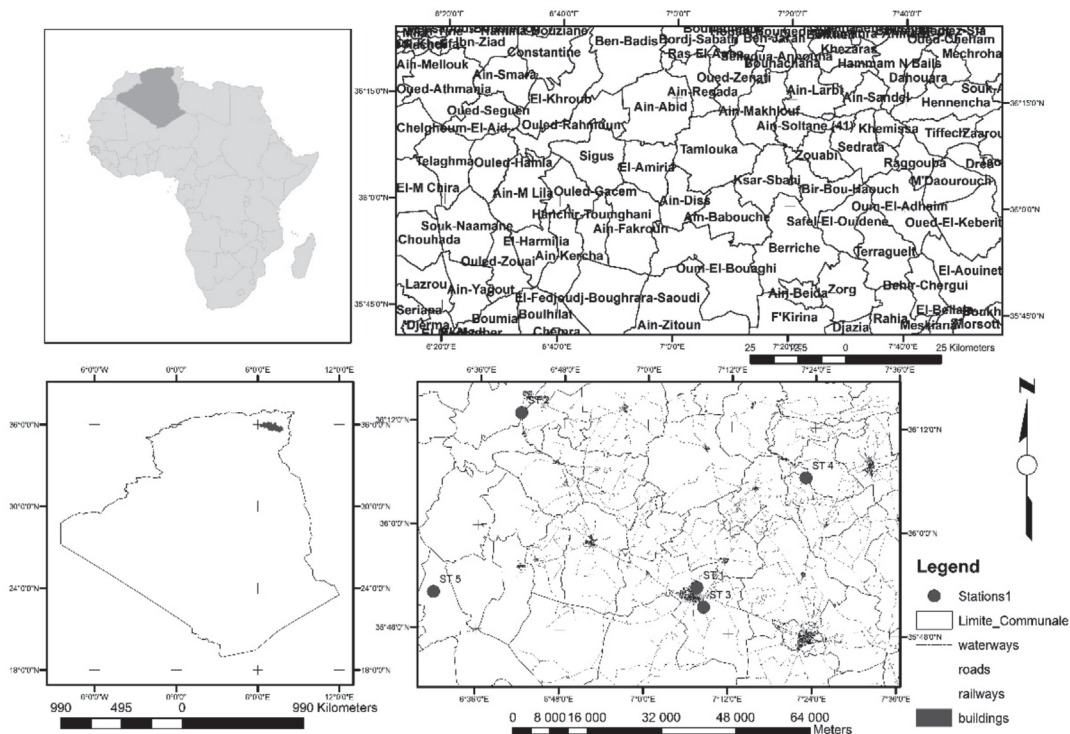


Fig. 1. Map of the geographical location of the study area.

nant with a percentage of 93.47% (Table 2). The interpretation of the number of individuals of ants recaptured in the different study sites during 08 months of work from March to October shows that abundance is high during the spring and summer seasons (Fig. 3).

Statistical analysis

The use of Principal Component Analysis (PCA) shows that the genus *Messor* is associated with agricultural environments; however, *Tapinoma nigerrimum* is affected by the aquatic environment of

either the lake or the dam. Thus, the genera *Camponotus* and *Monomorium* are related to the forest environment and that of *Cataglyphis* exists in the various selected environments (Fig. 4).

The soil analysis

Based on soil analyses of various study sites carried out in the regional laboratory - East - Oum El Bouaghi of the National Institute of Irrigation and Drainage Soils, it was obtained that each site has particular criteria characterizing an ecological factor that affects the distribution of different species of Formicidae.

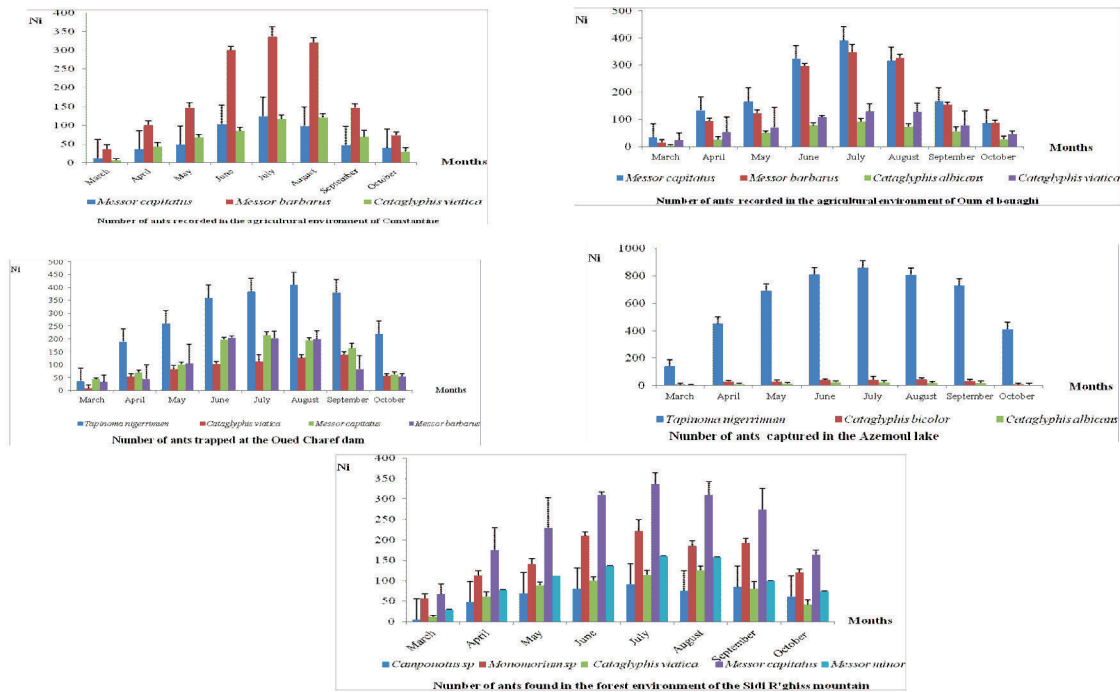


Fig. 3. The number of ants counted at the different study sites.

Table 2. The relative abundance of ant individuals recorded in the five study sites.

Species	Relative abundance (RA%)				
	Forest environment OEB	Agricultural Environment OEB	Agricultural Environment Constantine	Oued charef DamSouk Ahras	El Zemoul Lake O E B
<i>Camponotus sp</i>	8.3	*	*	*	*
<i>Cataglyphis bicolor</i>	*	*	*	*	4.35
<i>Cataglyphis viatica</i>	28.23	15.61	21.47	13.9	*
<i>Cataglyphis albicans</i>	*	9.88	*	*	2.16
<i>Messor minor</i>	13.57	*	*	*	*
<i>Messor capitatus</i>	29.95	39.36	20.31	21.35	*
<i>Messor barbarus</i>	*	35.13	58.2	18.87	*
<i>Monomorium sp</i>	19.92	*	*	*	*
<i>Tapinoma nigerrimum</i>	*	*	*	45.85	93.47

The soil of the Oued Charef dam is alkaline (pH=8.27), low in organic matter (0.212%), unsalted (EC= 0.101 ds/cm) with a sandy texture and a total limestone content equal to 0.123%. That of the El Zemoul Lake is neutral to alkaline (pH = 7.31-8.21), entirely salty for *Cataglyphis bicolor* and very salty for *Tapinoma nigerrimum* and salty for *Cataglyphis albicans*. It has a silty texture for genus *Cataglyphis* and fine silt for the genus *Tapinoma*; the rate of organic matter and total limestone is low successively at 0.52% and 0.6%.

The soil of Djebel Sidi R'ghiss is slightly alkaline (7.36-7.83), unsalted (EC = 0.25-0.37 ds/cm), with a weak rate of limestone (0.12-0.98%), it is low in organic matter for *Cataglyphis* and *Messor* and very poor for the genus *Camponotus* and *Monomorium*. Its texture is sandy-sand loamy for *Cataglyphis*, sandy-clay loamy for *Camponotus* and *Monomorium* and clayey for the different species of *Messor*. The agricultural site of Constantine has a slightly salty soil (EC=1.17 ds/cm) and a total limestone content equal to 1.55%. Its texture is sandy-clay loamy with an average rate of organic matter (2.75%) and a neutral pH. By against that of Oum El Bouaghi is an unsalty soil (EC=0.3 ds/cm), neutral to alkaline with a rate of limestone low and medium for organic matter. It has a texture varying from clayey to silty clayey.

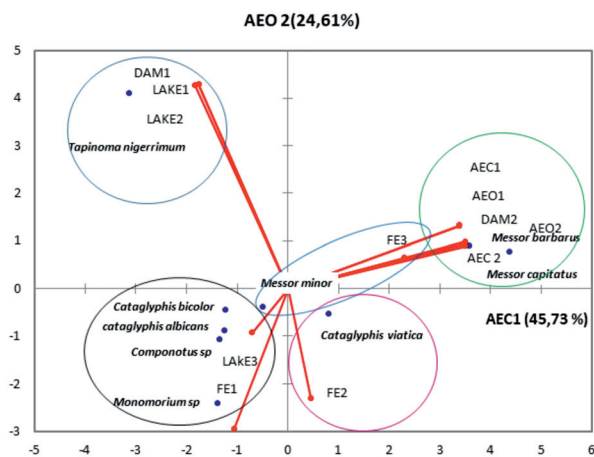


Fig. 4. Principal Component Analysis (PCA).

AEC: The agricultural environment of Constantine, 1: path, 2: middle; **Lake:** Lake of El Zemoul, 1: the edge, 2: at 80m, 3: at 200 m; **DAM:** The dam of Oued Charef, 1: The edge, 2: Agricultural environment; **AEO:** The agricultural environment of Oum El Bouaghi, 1: path, 2: middle; **FE:** Forest environment, 1: the foot of the mountain, 2: at 500 m higher, 3: 600 m higher.

Discussion

Cagniant (1966), in his study on ants stands of the Atlas of Blida, found 39 species. However, in his preliminary list of forest ants of Algeria (1963–1966) which wrote in 1968, he mentioned the presence of 90 species in 30 stations of study. An inventory realized by Djioua *et al.*, (2015) in 5 different ecosystems from Tizi Ouzou was defined by the presence of 15 species belong to 3 subfamilies. These results were more important than ours. So that, during our bio-ecological study of Formicidae in the five sites in the east of Algeria, a total richness of 9 species was observed that are less important and similar to those of Bouzekri *et al.*, (2015) who worked on the Djelfa ant stand, however, Barech *et al.*, (2016) reported the existence of 24 species in the Lake of Chott El Hodna.

The inventory of ants was realized frequently on Maroc. Bernard, 1945 in his work about Mamora Forest reported the existence of 55 species in which 43 were not described. Also, Taheri *et al.*, (2014) were noted the presence of 40 species of ants at least classified on three subfamilies and 13 genera in the national park of Talssemteane. Cagniant in his actualized list of Maroc ants has noted the existence of 214 species grouped on 38 genera, in which 60% of Maroc ants were founded in Algeria-Tunisia and 30% in the Iberian Peninsula.

A survey of the ant fauna found in the vicinity of the K'sob dam (M'sila, Algeria) done by Barech *et al.*, 2018 led to the identification of 4483 ant specimens belonging to 16 species and 3 subfamilies (Formicinae, Myrmicinae and Dolichoderinae). Fifty-one species were recenced on French Polynesia by Thibault, 2014. The interpretation of the number of individuals surveyed by the relative abundance index, which is considered as a tool to quantify the diversity and dominance of different Formicidae communities and to interpret it in value shows that some sites have been dominated by the presence of particular species, this is the case of two aquatic environments the dam of oued charef and the lake of El Zemoul, of which *Tapinoma nigerrimum* is the dominant species. The latter is in cohabitation with the genus *Cataglyphis* in the lake environment.

According to Cagniant, 1970 *Tapinoma nigerrimum* was distributed throughout Algeria, including the Saharan Atlas, in the humid pasture, very common in large Kabyl.

The low number of *Cataglyphis albicans* caught in

the lake and the agricultural environment can be explained by the solitary behaviour of female workers in the search for nutritional resources Lebas *et al.*, 2016. Cagniant, (1968) cited that it was a species of steep slopes and unstable soils: screwed, sandy. It showed its resistance to drought and high temperature (Cagniant, 1970).

It appears that *Cataglyphis bicolor* prefers heavy, clay and humid soils and near lakes, these results have been confirmed by the work of wehner *et al.*, (1994) and that of Cagniant, (2009) working on a salt lake of Oum Dba (northern Laâyoune) in Morocco and Heatwole, (1996) in Chott El Djerid in Tunisia.

According to Cagniant, (1970), this species has a varied hue; in the tellien Atlas, we found only the dark one.

The obtained result concerning the presence of *Cataglyphis viatica* in the sandy-sand loamy soils of the mountain of Sidi R'ghiss and silty clayey of the field was approved by the result of Wehner, 1983 who reported that this species prefers dry and hard soil in the steppe regions, and those of Cagniant, 1968 that she was found on the edge of the forest.

Cagniant, 1968 reported that species of the genus *Cataglyphis* are found in North Africa from the seaside to 2800 m at Hoggar and appeared to nest in open areas.

Regarding the genus *Messor*, it was noted that has existed in the agricultural environments of Oum El Bouaghi and Constantine this was explained by how workers supply food, they are exclusively granivores. Detrain *et al.*, (1999) pointed out that for this major predator of Gramineae in the annual meadows of the Mediterranean area, the maximum density and its distribution are under natural seed conditions

The agricultural area of Djebel Sidi R'ghiss includes this kind of *Messor* but the absence of species *Messor barbarus* and the presence of *Messor minor* were noted. These data were defined according to the information of Lebas *et al.*, (2016) who reported that *Messor barbarus* was not ascended to the high altitude while *Messor minor* can reach an altitude of 700 m. Cagniant, (1968) cited that *Messor Barbarus* is absent in forest while it abounds in the plains and plateau mainly of the constantinois and east Algerian, however, in 1969 he added that *Messor capitatus* is present in the forested and mountainous vicariates, in the paths and forest in 1500 m of altitude. The species *Monomorium sp* was only found in the first and second areas of the mountain of Sidi

R'Ghiss where the soil is silty clayey at an altitude of less than or equal to 500 m. This was pointed out by Fisher *et al.*, 2016 who's proved that the latter occurs in almost all locations from harsh desert to rain forest and from the soil to the canopy of trees. Its nests are constructed in the ground, among the roots of plants, in leaf litter and fallen twigs, in rotten wood and standing timber, which explains the presence of nests in soils and under the leaves of the trees of *cyprae* and pine that are the most vegetable of the mountain of Sidi R'Ghiss The first area of Djebel Sidi R'Ghiss is home to the *Camponotus sp* species which is explained by the nature of the rocky soil where it installs its nest under the stones. During the sampling period, the number of individuals increased during the spring season for almost all species with favourable climatic conditions for breeding, egg foundation, foraging, and establishment of inter- and intra-specific relationships. For this reason, Bernard, (1945) and Cagniant, (1973) have shown that spring season is the best for ant sampling and harvesting. This study allowed us to learn about the stands of ants associated with different biotopes: forest, agricultural and aquatic environment of eastern Algeria. To properly discover the biodiversity of ants in eastern Algeria, it is necessary to continue and expand research to other territories of the other adjacent wilaya.

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