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DIVERSITY AND ANT COMMUNITY COMPOSITION IN SOME ALGERIAN ISLANDS

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Abstract

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The present paper seeks to study the diversity and ant community composition of some Algerian islands. This study is considered as the first exhaustive survey of ant species of Algerian islands since 1957. The survey was carried out in the spring and summer seasons between April and July of two years 2014 and 2015. Vegetation richness, island area, mainland distance, and elevation variables were measured for each island. Relative abundance (RA), frequency of occurrence (FO), as well as species richness (S), Shannon's diversity index (H), and equitability (E) for each island were used to compare the diversity pattern among islands. Patterns of species composition and community structure were compared among the sampling islands through ordination analysis (nonmetric multidimensional scaling [NMDS]). SIMPER analysis using a Bray–Curtis similarity index matrix was performed to determine the contribution of each ant species to the dissimilarities among islands. Canonical correspondence analysis (CCA) was performed to highlight the impact of environmental variables on the ant community. All analyses were computed by using PAST software. Two sampling methods (pitfall trap and hand collecting) were used, which led to the identification of 1039 individuals belonging to 16 species. Diversity indexes were different among islands. Ant community was significantly different between islands of the two regions Bejaia and Jijel. Three species contributed to 50.74% of the differences between islands of the two regions. Part of the ant community composition was influenced directly or indirectly by three environmental variables: vegetation richness, island area, and mainland distance. It is important to point out the absence of two invasive ants, *Linepithema humile* and *Paratrechina longicornis,* in our islands.

Key words: diversity, richness, ants, environmental variables, Algerian islands.

Introduction

The islands have always played a prominent role in zoogeography; they are isolated because of their degree of isolation from the mainland, age, altitude, and environmental variables (Gressitt, 1974). They are important refuges for animals and plant communities that are not very diversified but often original or even unique, and therefore present strong patrimonial values (Chapuis et al., 1995).

Ants are among the most studied animals from island ecosystems and have frequently been model organisms in developing current ecological theory (Mac Arthur, Wilson, 1967). Before human intervention, ants were relatively poor dispersers across oceanic islands, but they have evidently been introduced by human travel from native ranges scattered throughout the old and new worlds (Suarez et al., 1998). Because of their great success and ecological dominance, ants are also among the worst invasive species, being particularly harmful in the island ecosystems. Mediterranean islands harbor ants of many species that have been apparently introduced by humans (Wittman, 2014). Species richness of ants is generally low in insular ecosystem than in continental one (Ohyama et al., 2020) because of many constraints like isolation (distance to the continent), size of islands, and competition for habitats and resources.

The ant fauna of north Mediterranean islands has been subjected to a long history of intense study and is perhaps the most studied of any region in the world. However, in south Mediterranean islands, particularly in Algeria, only the ants of Habibas islands were surveyed by Bernard (1957). The present study constitutes since Bernard (1957) the firs exhaustive inventory interested in the ant fauna of some Algerian islands.

The aim of this study is to evaluate diversity and composition of ant community in different islands from two regions (Bejaia and Jijel) in the northeast of Algeria.

Also, this study is intended as a reference state of ant communities that can be used to monitor the invasion of two invasive ant species, *Linepithema humile* and *Paratrechina longicornis,* that are recently observed in the near continent.

Material and methods

Study area and sample sites

Our study area consists of two adjacent areas (Bejaia and Jijel) where our study islands are located (Fig. 1). Bejaia is located at the northern latitude of 36°45'24" and the eastern longitude of 05°05'24"; its coastline extends over 100 km. On its west coast, it shelters four small islands including Sahel islet, Pisans island, Ail islet, and El Euch island (Fig. 1A).

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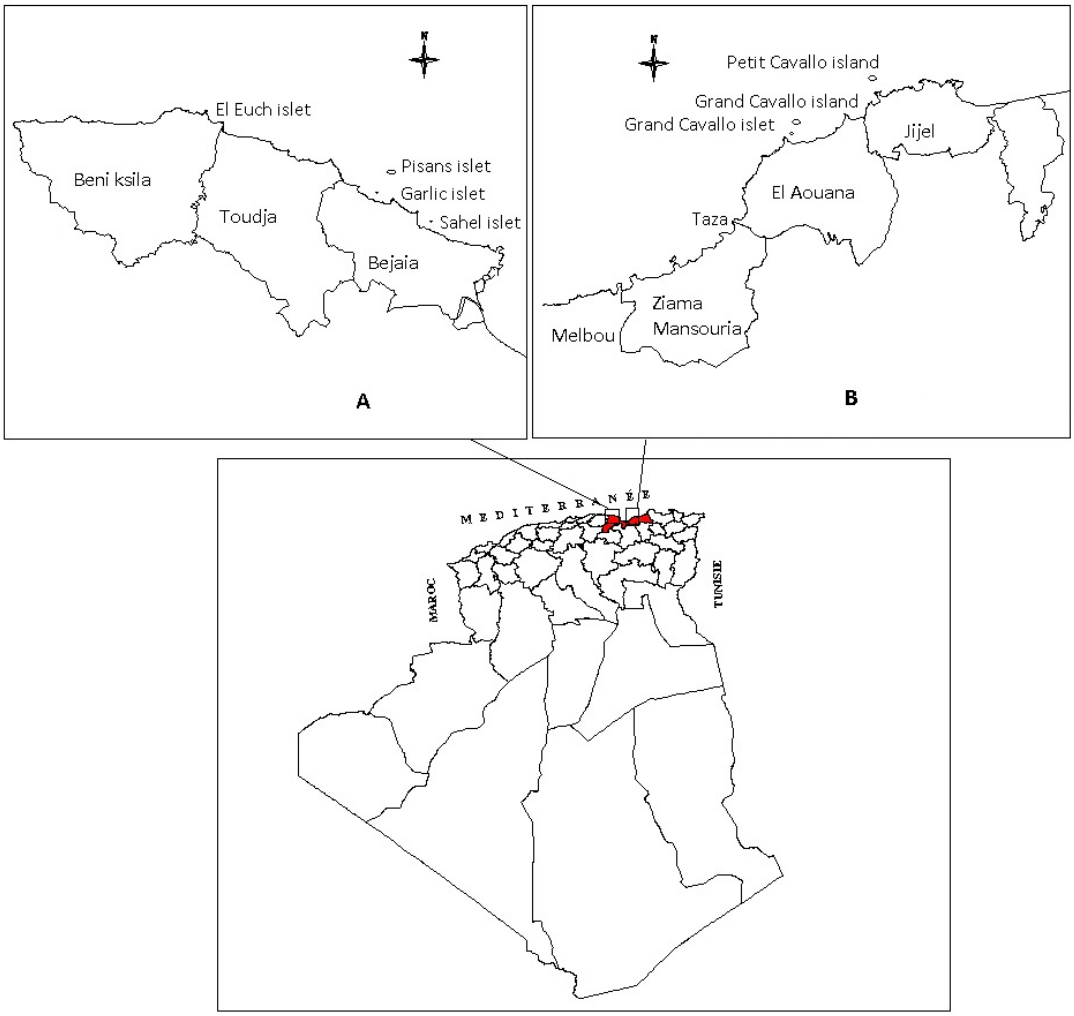


Fig. 1. Islands location in the two regions of Bejaia (A) and Jijel (B).

Jijel is located at the eastern longitude of 5°47' and the northern latitude of 36°49'. Its coastline stretches for 120 km, and it shelters, to the west, three small island systems, including Grand Cavallo island, Petit Cavallo island, and Grand Cavallo islet (Fig. 1B). These islands are of continental origin, small, and very close to the shore.

Jijel and Bejaia islands have differences in their vegetation structure. Regarding the islands of Bejaia, Sahel islet is dominated by *Pistacia lentiscus, Phillyrea media,* and *Chamaerops humilis.* On the whole, Pisans island is covered with a mattoral composed mainly of *Malva arborea, Opuntia ficus-indica,* and *Phillyrea media.* Also, it houses important flora represented essentially b*y Suaeda fruticosa* and *Calendula arvensis.* Garlic islet (Ail islet) is dominated by *Allium commutatum* with a summer flowering. El Euch island is covered with a mattoral composed of *Chamaerops humilis, Quercus coccifera,* and *Pistacia lentiscus.* As for Jijel islands, Grand Cavallo island is covered with a high mattoral; it can reach 4 m in height. It is formed mainly of *P. lentiscus* and *Phillyrea media* and partly of nitrophilous flora such as *Lavatera cretica, Urtica membranacea*, and *Chenopodium murale.* Grand Cavallo islet has a rocky and bare structure for the most part. The plant cover is in the form of clumps located at the top of the islet. It is composed of *Pistacia lentiscus*, *Phillyrea media,* and *Chamaerops humilis.* Overall, Petit Cavallo island is covered by a more or less high mattoral composed of *Dactylis glomerata*, *Daucus carota maritimus,* and *Malva cretica.*

The islands surveyed in this study ranged from 7 to 50 m in elevation and from 0.2 to 6 ha in size. Island area, mainland distance, and elevation were calculated from a Google map. Area (ha) was estimated as the planar surface of islands. Isolation of islands (m) was measured as the shortest distance between the islands and the shoreline. Information on plant richness of seven islands was obtained from Benhamiche and Moulaï's (2012) study (Table 1).

Ants sampling

Two methods of capture were used, targeting terricolous ants, surface ants, ants living under the stones and in the ground,

Table 1. Surveyed islands in the northeast of Algeria ranked by increasing isolation from 'mainland'. Island coordinates, island size, elevation, the total number of recorded plant species per island is also indicated. Jijel region: Gisl: Grand Cavallo island, Pisl: Petit Cavallo island, Gist: Grand Cavallo islet. Bejaia region: Pisl: Pisans island, Eisl: El Euch island, Sahel islet: Sist, Garlic islet (Ail isle): Aist.

Islands	Coordinates	Plant richness	Elevation (m)	Size (h)	Isolation (m)
Gisl	36°47´05.60″N 5°36´28.01″E	82	50	6	950
Pisl	36°48´05.23″N 5°39´06.20″E	101	10	4	750
Pisl	36°49´31.01″N 4°59´50.88″E	52	30	1.2	1250
Eisl	36°53´34.08″N 4°47´20.30″E	60	20	0.8	120
Aist	36°48´55.61″N 4°58´41.85″E	21	15	0.4	100
Sist	36°47´38.69″N 5°01´23.33″E	23	15	0.2	7
Gist	36°46´42.74″N 5°36´03.90″E	23	30	0.15	50

Table 2. Ant species collected at seven Algerian islets: Jijel region: Gisl: Grand Cavallo island, Pisl: Petit Cavallo island, Gist: Grand Cavallo islet. Bejaia region: Pisl: Pisans island, Eisl: El Euch island, Sahel islet: Sist, Garlic islet (Ail islet): Aist.

Sub-families	Ants	Pisl	Eisl	Sist	Aist	Pisl	Gisl	Gist
Dolichoderinae	*Tapinoma simrothi* (Krausse, 1911)	0	0	30	18	2	1	0
	Tapinoma magnum (Mayr, 1861)	0	0	10	0	0	0	0
Formicinae	*Camponotus atlantis* (Forel, 1890)	0	0	1	0	0	0	0
	Camponotus ruber (Forel, 1894)	0	8	23	0	0	0	0
	Camponotus vagus (Scopoli, 1763)	0	0	0	0	3	4	2
	Camponotus sp	0	0	0	0	0	0	1
	Cataglyphis bicolor (Fabricius, 1793)	3	10	15	10	240	110	80
	Plagiolepis schmitzii (Forel, 1889)	0	0	0	20	0	0	0
	Lasius flavus (Fabricius, 1782)	0	0	15	0	0	0	0
	Lasuis grandis (Fabricius, 1782)	0	0	4	0	0	0	0
Myrmicinae	*Aphaenogaster testaceopilsa* (Lucas, 1849)	0	0	0	0	6	3	0
	Messor barbarus (Linnaeus, 1767)	0	0	0	0	60	30	20
	Crematogaster scutellaris (Olivier, 1792)	20	0	20	0	20	12	5
	Crematogaster auberti (Emery, 1869)	3	0	0	0	18	10	0
	Pheidole pallidula (Nylander,1849)	86	0	50	31	1	3	0
	Tetramorium biskrensis (Forel, 1904)	0	8	0	0	4	4	0
	Abundance	112	26	168	79	354	177	108
	Richness	4	3	9	4	9	9	5

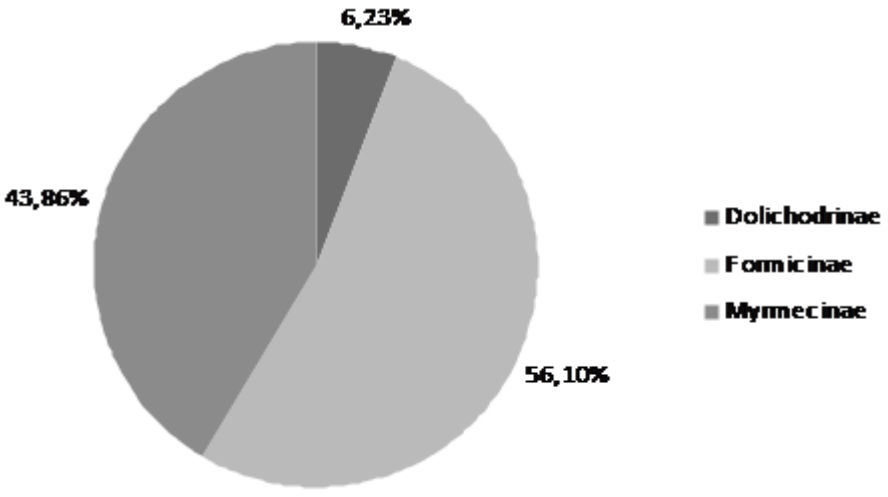


Fig. 2. Ant species subfamilies of overall islands.

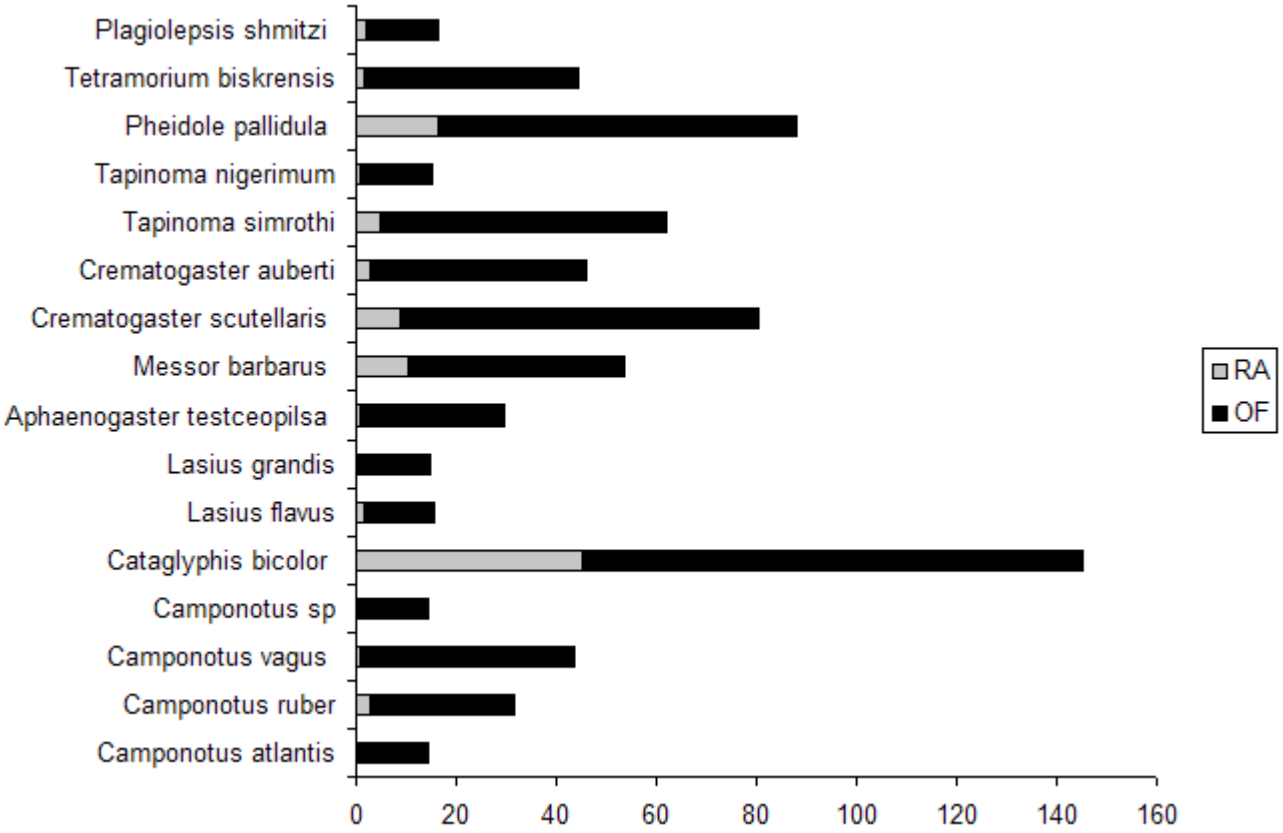


Fig. 3. Relative abundance and occurrence frequencies of islands ant species.

and those living in trees and crevices in rocks. The first method consisted of hand collection in different types of habitats, during which the prospected surface was traversed at random in a known time interval. The second method consisted of capturing mobile ants by using pitfall traps. Twenty pitfall traps were established along a 100-m linear transect, consisting of 102-ml plastic cups (10 cm diam. × 12 cm height) driven into the soil, with the top of the cups flushed with the ground surface, with a distance of 10 m between the traps. The cups were filled to three fourths with an unattractive mixture of propylene glycol, which acted as a preservative by avoiding decomposition of the harvested ants, and some drops of dishwashing liquid, which allowed the ants to sink to the bottom. Traps remained in the islands for 7 days. The two methods, hand collection and pitfall traps, were carried out for 21 full days in 3 months of the year (May, June, and July) over two successive years (2014–2015).

Ants were identified using the keys of Cagniant (1996, 1997, and 2009), Cagniant and Espadaler (1997), and the Internet site of B. Taylor ("Ants of Africa"). Specimens of ants were deposited in Applied Zoology Laboratory at the University of Bejaia.

Data analysis

We computed the relative abundance (RA), frequency of occurrence (FO), as well as species richness (S), Shannon's diversity index (H), Simpson diversity index, and equitability (E) for each island. The index of first-order Jackknife was used to evaluate true species richness. All indexes were calculated using SPADE software (Chao et al., 2015). Sample-based rarefaction curves were calculated using PAST 3.25 for computing species richness (Hammer et al., 2001)

To compare the ant species' richness and abundance between the sampled islands, Kruskal–Wallis nonparametric test was used. We also used Spearman correlation test to assess the relationship between RA and the FO of island ants.

Patterns of species composition and community structure were compared between the sampled islands through ordination analysis (nonmetric multidimensional scaling [NMDS]). Bray–Curtis similarity index was used as the distance measure (PAST; Hammer et al., 2001). Then, a PERMANOVA was performed using the same software. Due to the significant difference that resulted from this test, we performed a SIMPER analysis using a Bray–Curtis similarity index matrix to determine the contribution of each ant species to the dissimilarities between islands.

Canonical correspondence analysis (CCA) was performed using the PAST software (Hammer et al., 2001). Using CCA, the total ant communities were exploited based on the abundance of each species and the island. Species present in only one island and with no more than 10 individuals were excluded. Before CCA was performed, species data was transformed using log (x + 1) to consider zero values and prevent high values from influenc-

Table 3. Diversity index parameters.

	Pisl	Eisl	Sist	Aist	Pisl	Gisl	Gist
Taxa_S	4	3	9	4	9	9	5
Individuals	112	26	168	79	354	177	108
Simpson-1-D	0.46	0.66	0.82	0.71	0.50	0.57	0.41
Shannon_H	0.79	1.09	1.91	1.31	1.08	1.28	0.79
Equitability	0.55	0.99	0.75	0.92	0.32	0.39	0.44

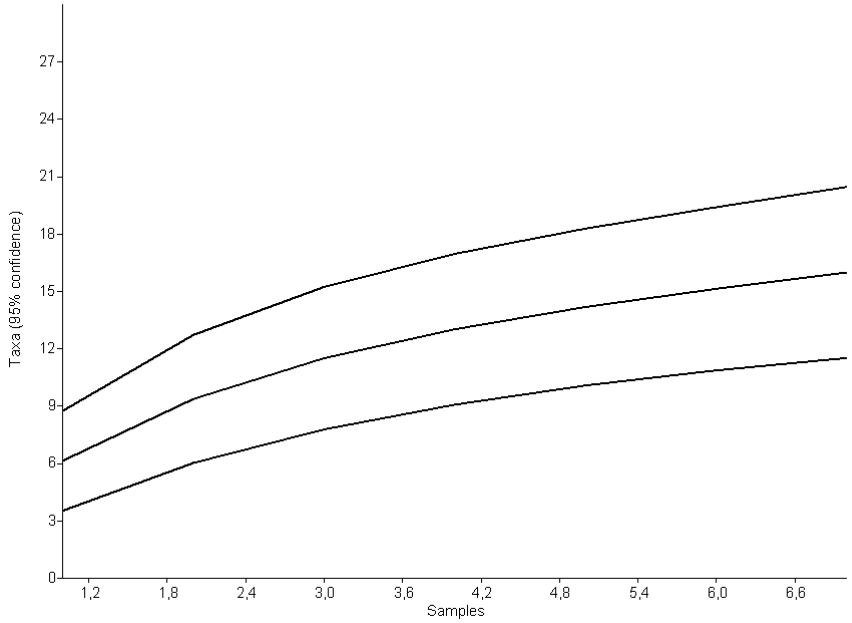


Fig. 4. Sampling effort rarefaction of ants richness of Jijel and Bejaia islands.

ing the ordination. Ordination by CCA was calculated to analyze the impact of environmental variables on the ant communities.

Results

Ant fauna of two regions Jijel and Bejaia islands

Sixteen species of ants belonging to three subfamilies (Formicinae, Myrmicinae, and Dolichoderinae) were inventoried. The Formicinae and Myrmicinae were represented by the highest number of genera (five genera each) and species (eight vs. six) compared to the Dolichoderinae (only one genus and two species).

The ants collected from all the studied islands belonged to 16 species (Table 2). Three islands were the richest with nine species, which were the Petit Cavallo island, Grand Cavallo island, and Sahel islet. In the rest of the islands, their ant richness varied between three and five species. A significant difference was observed between the ant species richness of all islands (Kruskal–Wallis, H = 21, degrees of freedom [df] = 6, $P = 0.01$).

In terms of abundance, Petit Cavallo island had the most abundant ants, with 352 individuals, followed by Grand Cavallo island with 176 individuals. The Grand Cavallo islet, Pisans and Sahel islands included 108, 127, and 128 individuals, respectively. The difference in ant species abundance among all islands was significant (Kruskal–Wallis, $H = 27.41$, df = 6, $P = 0.001$).

In all studied islands, *Cataglyphis bicolor* species was the most abundant with 466 individuals, that is, 47.85% of all the ants collected. It was followed by two species, *Pheidole pallidula* and *Messor barbarous,* with 171 individuals (17.48%) and 110 individuals (11.25%), respectively (Fig. 2). In terms of FO, *Ca. bicolor* was present in all surveyed islands (100%), followed by *Crematogaster scutellaris* and *Pheidole pallidula* that were found in five islands (71.43% for both species) (Fig. 3). Six species were the rarest in all surveyed islands, namely, *Tapinoma magnum*, *Camponotus atlantis*, *Camponotus* sp., *Plagiolepis schmitzii, Lasius flavus*, *L. grandis* (Fig. 3).

Spearman's nonparametric test showed that the correlation between the RA and the occurrence frequencies of islands ants was highly significant ($R = 0.79$, $P = 0.0001$). The most abundant

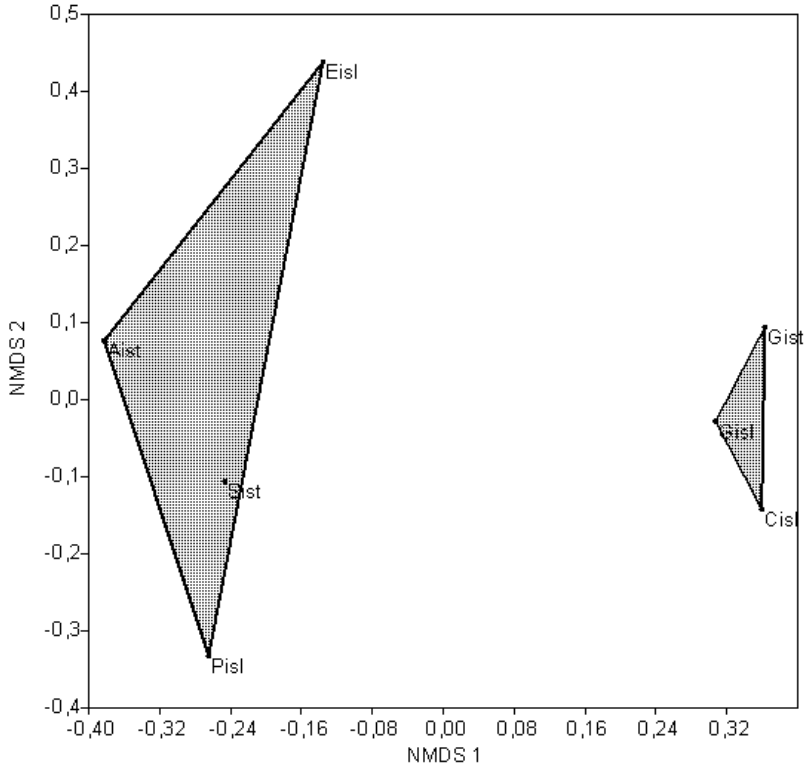


Fig. 5. Non-metric multidimensional scaling of ant communities in Bejaia and Jijel islands. Stress = 0.03.

Table 4. SIMPER analysis of ant contributions to dissimilarities between islands of two region (Bejaia and Jijel) communities.

Ant species	Av. dissim	Contrib. %	Cumulative %
Cataglyphis bicolor	28,06	36,87	36,87
Pheidole pallidula	15,17	19,93	56,8
Messor barbarus	7,518	9,875	66,67
Crematogaster scutellaris	6,127	8,048	74,72
Tapinoma simrothi	4,939	6,487	81,21
Camponotus ruber	3,291	4,323	85,53
Plagiolepsis shmitzii	2,856	3,752	89,28
Crematogaster auberti	2,101	2,76	92,04
Tetramorium biskrensis	1,657	2,176	94,22
Lasius flavus	1,502	1,973	96,19
Tapinoma magnum	1,001	1,316	97,51
Camponotus vagus	0,6635	0,8716	98,38
Aphaenogaster testceopilsa	0,6088	0,7997	99,18
Lasius grandis	0,4006	0,5262	99,7
Camponotus sp.	0,1255	0,1649	99,87
Camponotus atlantis	0,1001	0,1316	100

ant species were the most frequent in different islands, like *Cataglyphis bicolor, Pheidole pallidula,* and *Messor barbarus.*

Diversity indexes

The Simpson index illustrated medium values. For the Shannon's index, the values were generally small with a high value (H' = 1.91 bits) obtained in Sahel islet and a lower value in Pisans islet (H' = 0.79 bits), which reflected a moderate diversity of ants at these seven islands. The evenness values of the seven islands were slightly different; three islands registered the highest values (El Euch island, Sahel islet, and Ail islet with 0.99, 0.75, and 0.92, respectively), whereas Cavallo islet and Grand Cavallo islet registered the lowest values (0.32 and 0.39, respectively) (Table

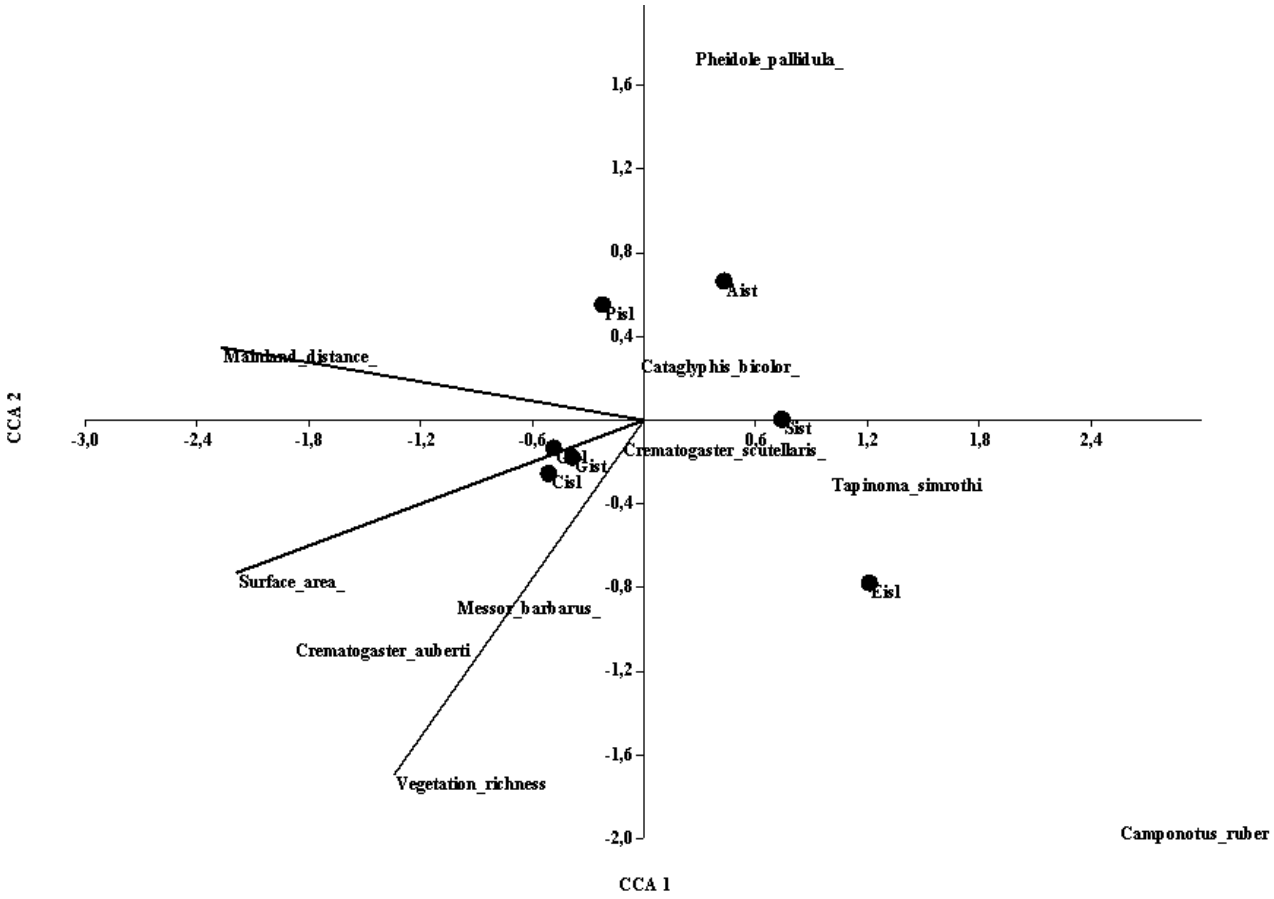


Fig. 6. Canonical correspondence analysis (CCA) based on the most abundant ant species, showing axes 1 and 2. Environmental variables are displayed as Vectors and islands as filled circles.

3). By using the Jackknife first order, it was estimated that 18 species being sampled represented 88.88% (Fig. 4) of the total island ants.

The NMDS showed two separate groups that represented islands of each region (Fig. 5). According to PERMANOVA, differences in the ant community composition of the islands of two regions (Bejaia and Jijel) were highly significant ($F = 4.67$, $P = 0.01$). The average dissimilarity (as per SIMPER) was 76.13%. Table 4 illustrates the contribution of each ant to the dissimilarity between the islands of two regions (Bejaia and Jijel). Three species contributed to 60% of the differences between islands of the two regions.

Ant community was tested in relation to environmental variables by using CCA (Fig. 6). Only three variables, vegetation richness ($P < 0.01$), island area ($P < 0.01$), and mainland distance ($P < 0.01$), were significant. The three variables were strongly associated with four islands (Grand Cavallo island, Petit Cavallo island, Grand Cavallo islet, and Pisans island) with their characteristic ant species (*Cataglyphis bicolor, Messor barbarus, Crematogaster scutellaris, C. auberti,* and *Pheidole pallidula*) and were negatively associated with Sahel islet, Ail islet, and El Euch island.

Discussion

The seven islands of the two regions Bejaia and Jijel seem to host a fairly rich ant fauna despite their small surface area. Currently, with 16 ant species, the islands studied comprise more than 7.51% of the Algerian myrmecofauna (Cagniant, 2009). This observation is surprising regarding the islands' dimensions, where rather drastic ecological conditions prevail with violent winds loaded with salt spray and one would expect a much lower ant richness and abundance here. These 16 ant species belong to 10 genera and three subfamilies (Dolichoderinae, Formicinae, and Myrmicinae) of the six subfamilies found in Algeria. Five are particularly well represented among the collected ants; they are the genus *Camponotus* (four species), *Messor* (six species), *Tapinoma* (two species), *Lasius* (two species), and *Crematogaster* (two species). At a national scale, Algeria has 23 species of the genus *Camponotus*, 16 species of the genus *Aphaenogaster*, 21 species of the genus *Messor*, nine species of the genus *Crematogaster*, and eight species of the genus *Lasius* (Borowiec, 2014). We would like to point out the absence of two invasive ants, *Linepithema humile* and *Paratrechina longicornis,* in our studied islands, whereas they are well present in the near continent (Maouche, 2019).

The absence of a species can be very instructive, but the myrmecofauna of an island has never been collected. But in our case, according to Jackknife first order, there will be less chance of finding new species of ants in all studied islands. Among 21 species of the genus *Cataglyphis* inhabiting Algeria (Cagniant, 1997), *Cataglyphis bicolor* is the one that was able to settle in our studied islands, mainly in Jijel islands, abundantly (430 individuals). It is a xerophilous ant which certainly survives well in the insular humidity, provided that the grounds of the islands are dry in summer. The species *Pheidole pallidula* is another ant with a wide distribution and is very common in the Sahara, in crops, and near lakes. It was well present in our islands; it was found in five islands with a total of 171 individuals. Its ecological success can be explained, on the one hand, by its adaptation to the heat and the insular humidity, which accentuates the preferences of this ant and, on the other hand, by the strong slopes of certain islands creating excellent habitats perfectly exposed to the sunshine. Similarly, the species *Messor barbarus*, which has a typically granivorous diet and hence obtaining its name the "harvester," was quite abundant, inhabiting only Jijel islands. It absence from Bejaia islands is very striking, which can probably be linked to the lack of dry and open suitable habitats for nesting (Azcarate, Peco, 2003). Moreover, no further on the mainland *M. barbarus* ant was found inhabiting Sigli, Sahel, and Boulimat lands (Maouche, 2019). Even though the distribution of *Crematogaster scutellaris* is being linked to the cork oak forest areas of the country, its presence in a few islands is related to the development of tree stratum of *Olea europea*. This ant embeds itself in the bark of the tree and is rarely seen on the ground (Bernard, 1957). In our islands, it was not uncommon under stones, especially at the foot of *O. europea* tree trunk. Its presence in such habitats to which it is not accustomed can be explained by the absence of its terricolous congener *Crematogaster auberti,* which generally does not tolerate wooded areas. *Aphaenogaster testaceopilosa* was only found in two islands (Petit Cavallo and Grand Cavallo) in a small number. The presence of *Cataglyphis bicolor* is probably the reason for this; it is considered as a potential competitor that shares the same diet (small arthropods).

It is very interesting to note that six species of ants had their distribution limited to islets closer to the mainland. Four of them (*Tapinoma magnum*, *Camponotus atlantis*, *Plagiolepis schmitzii*, and *Lasius flavus* and *L. grandis*) were confined to Sahel islet separated from the mainland with a distance of 7 m. *Plagiolepis schmitzii* and a specimen of genera *Camponotus* that was not yet identified were collected from Ail islet (50 m distance) and Grand Cavallo islet (100 m distance), respectively. The distance separating the mainland and these islets explains the colonization success of these ants. Moreover, the strong correlation between ants' species abundance and their occurrences in the whole of the studied islands shows the role of ants with great number of individuals in the colonization of the islands of the two regions, Bejaia and Jijel. Indeed, the ants, *Cataglyphis bicolor, Pheidole pallidula, Messor barbarus, Crematogaster scutellaris*, were the most common and abundant in the studied islands. It may be that ants living in colonies with a highly developed social behavior will allow them to be very competitive and efficient in expanding their ecological niches, and therefore keep their respective populations viable in the face of hostile island environments.

This study shows differences in species richness, abundance, and diversity index parameters of the ant communities of two regions, Bejaia and Jijel islands.

The values of the Shannon's and Simpson diversity indexes were higher in Sahel islet and lower in Grand Cavallo islet. Shannon's index gives more importance to rare species, but Simpson's index gives more weightage to abundant species (Faurie et al., 2006; Magurran, 1988). The highest evenness values were recorded in two islands, El Euch and Ail, with 0.92 and 0.91, respectively, while the lowest values were recorded in three islands, Petit Cavallo island, Grand Cavallo island, and Grand Cavallo islet, with 0.32, 0.39, and 0.44, respectively. The high abundance of few ant species contributes to the decrease in diversity and evenness values, for example, the dominance of *Cataglyphis bicolor* in Jijel islands and *Pheidole pallidula* in Bejaia islands.

The NMDS ordination analysis showed that there was a significant difference in the ant species composition of the islands in Bejaia and Jijel regions, which were statistically different in PERMANOVA, suggesting that our island systems, especially in the two regions, offer different ecological conditions for the ant community. Three ant species (*Cataglyphis bicolor*, *Pheidole pallidula*, *Messor barbarus*) were responsible for 60% of dissimilarity among the islands, which can be explained, on one hand, by the lower abundance of *Cataglyphis bicolor* and the absence of *Messor barbarus* in Bejaia islands and, on the other hand, by the lower abundance of *Pheidole pallidula* in Jijel islands.

According to CCA results, three variables (island area, vegetation richness, and mainland distance) were partly responsible for explaining variation in ant community. These variables could have direct or indirect influence on ant community. It is important to note that Grand Cavallo and Petit Cavallo islands are the largest in terms of surface area and the richest in terms of plant species. The majority of ants with height abundance are subservient to these two islands, such as *Cataglyphis bicolor, Messor barbarus* and *Crematogaster scutellaris.* For example, *Cataglyphis bicolor,* characterized by an insectivorous diet, takes advantage of the great diversity of insects in the two islands, which themselves are linked with vegetation richness and a large surface area (Aissat, Moulai, 2016). *Messor barbarus* is a granivore preferentially feeding on seeds and harvests mainly grass and plant seeds. The absence of this ant in Bejaia islands is probably associated with the relative humidity rate of these islands. According to Azcarate et al. (2007), the intensity of the activity of *M. barbarus* is related to microclimatic conditions (temperature and humidity), and high soil moisture could be a limiting factor for ground-foraging ants (Cylarke et al., 2008). *Crematogaster scutellaris* is related to tree stratum and is likely to settle in any degraded or dead tree whose trunks hollow or whose wood is perforated by galleries of xylophagous or wood-eating insects (Casevitz-Weuleress, 1972). Pisans island is associated with the variable, mainland distance; this island is the furthest from the mainland and is the one that houses the *Pheidole pallidula* species with large number of individuals. Despite its remoteness from the mainland, it remains the first destination of fishermen and tourists at least at the region of Bejaia. It is important to note that *P. pallidula* has an anthropogenic species status (Abdi-Hamecha et al., 2021), highlighting the intensity of human impact, which partly explains its abundance in this island, adding to that its tolerance to island humidity is more accentuated in Bejaia islands than in Jijel islands. Moreover, these three variables do not explain all the variations observed in ant community. Other environment variables that are not measured in this study in relation to climatic condition (temperature and humidity) and physicochemical soil param-

eters can provide interesting information about the variations observed in the ecological indexes and ant community composition of different islands.

Conclusion

The absence of the two invasive ants in our island environments should not lead to a decrease in vigilance. Indeed, these species are not very far from our islands, and consequently, their colonization by these two ants is very likely in the next few years. In the continental environment, fighting against the phenomenon of invasion of animal or plant species is very complicated nowadays. Also, if these species manage to colonize our islands, which is not impossible because of human activity (fishing activity and uncontrolled tourism) and the absence of a legal framework to preserve these islands, the situation may become irreversible. To avoid an ecological disaster, it would be wise to raise awareness among the local population, tourists, and even researchers working on these islands of the need to protect the fauna and flora of these islands.

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