International Journal of Entomology Research
ISSN: 2455-4758; Impact Factor: RJIF 5.24
Received: 06-01-2019; Accepted: 09-02-2019
www.entomologyjournals.com
Volume 4; Issue 2; March 2019; Page No. 09-12

Inventory of coleoptera of two ecosystems of the Gharb plain: The forest of Mamora and the Merja of fouarat

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Abstract
A faunistic study on beetles was conducted in two areas of the Gharb Plain (Mamora forest and Merja of fouarat) to improve knowledge of their local diversity, assess species and provide the first list of heritage species, using the various techniques used in the field of entomology among which (hunting by sight, Barber Pots, sweeping on vegetation). The beetles were caught from mid-August to the end of October 2016. A total of 17 species have been identified. The inventory conducted consists of 17 species belonging mainly to the families of: Scarabaeidae, Cerambycidae, Buprestidae, Carabidae, Dynastidae, Coccinellidae, Tenebrionidae, Platypodidae. At the Mamora forest, we have identified 17 species belonging to 8 families, the majority of which are represented by Scarabaeidae with 47.05%, followed by Cerambycidae, Buprestidae, with 11.76%, Carabidae, Dynastidae, Coccinellidae, Tenebrionidae, Platypodidae are represented by 5.88% for each. At the Merja of fouarat, we have inventoried 13 species of Coleoptera distributed over 6 families. The Scarabaeidae family is the richest with a rate of 47.05% of all inventoried species, the other families, Cerambycidae, Carabidae, Dynastidae, Coccinellidae, Tenebrionidae, are represented by an equal rate or 5.88%.

Keywords: Mamora forest, Merja of fouarat, diversity, beetles.

1. Introduction
The Gharb Plain is defined by its taxonomic, eco-systemic, landscape and cultural diversity and its semi-arid bioclimatic stage, and has many diverse ecosystems. Among these formations, the Mamora forest and the fouarat Merja. Arthropods occupy a very important place in these two ecosystems.
Indeed, arthropods, in addition to being good biological indicators, are largely a food source for many animal species [1].
In Morocco, several studies have been carried out on the inventory of arthropods in general and the entomo fauna in particular, among others we mention the works of: Alluaude [2] Raymond [3], Pierre [4], and Bigot [5].
Thus, with the exception of a few fragmentary entomological studies Idrissi [6], Slim *et al*., [7], Zouaki *et al*., [8], no entomological study is done to date in these two areas of the Gharb plain. Our work aims to study the Coleoptera fauna of two ecosystems in the Gharb Plain, namely the Mamora forest and the fouarat Merja. It is a study that comes within the framework of biodiversity, with a view of enriching the local inventory and participate to complete our national heritage.

2. Materials and methods
2.1 Presentation of the study area
The study took place from mid-August to the end of October 2016 in two areas of the Gharb plain namely the Mamora forest which is located in the north-west of Morocco, bordering the Atlantic Ocean, between meridians 6 ° 00 'and 6 ° 45' west longitude, and parallels 34 ° 00 and 34 ° 20 'north latitude [9] (Figure 1), and the Merja of fouarat of altitude 34 ° 15 'N; 06 ° 32 W, which is located in the Mamora plateau. (Figure 2).

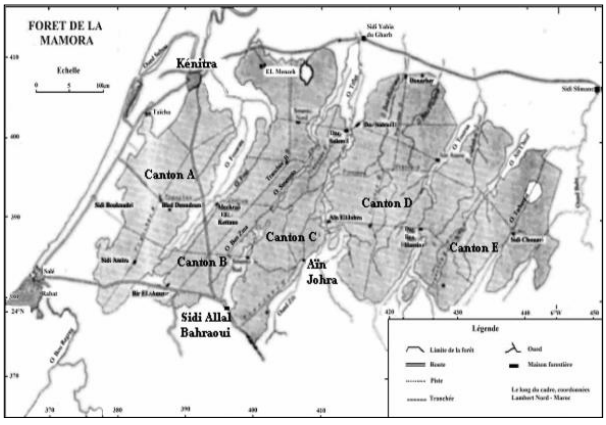

Fig 1: Location of Mamora forest

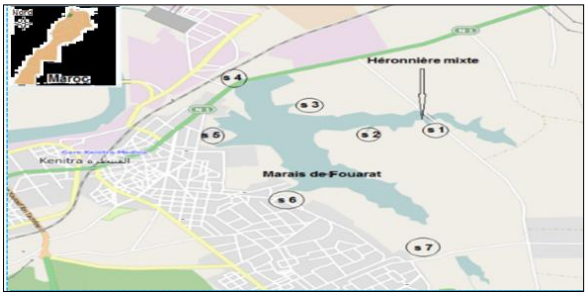

Fig 2: Location of fouarat Merja

The study was limited to the period of adult activities, the methods of collection were as follows: hunting by sight, Barber pots, sweeping on vegetation. The identification of the species harvested was carried out at the Nutrition, Health and Environment laboratory of the Faculty of Sciences, Kenitra (Morocco).

3. Results

The inventory conducted consists of 1145 individuals and 17 species (Table 1) belonging mainly to the families of: Scarabaeidae, Cerambycidae, Buprestidae, Carabidae, Dynastidae, Coccinellidae, Tenebrionidae, Platypodidae.

Table 1: List of Beetles collected in both study areas.

Family	Taxa	Mamora forest	Merja of fouarat
Scarabaeidae	*Oryctes nasicornis*	29	38
	Scarabaeus nitidicollis	77	32
	Aethiessa floralis	96	33
	Scarabaeus cicatricosus	36	27
	Polyphylla maroccana	12	43
	Phylloganathus excavatus	28	28
	Thorectes distinctus	43	29
	Copris hispanus	36	17
Carabidae	*Carabus sp*	85	43
Dynastidae	*Dipelicus optatus*	32	44
Coccinellidae	*Harmonia sp*	43	42
Tenebrionidae	*Akis tingitana*	98	25
Cerambycidae	*Cerambyx cedro*	15	0
	Stenochorus sp	34	18
Buprestidae	*Coroebus florentinus*	15	0
	coroebus undatus	21	0
Platypodidae	*Platypus cylindrus*	26	0
8	17	726	419

At the Mamora forest, we have recorded 17 species belonging to 8 families, the majority of which are represented by Scarabaeidae (47.05%), followed by Cerambycidae, Buprestidae, (11.76%), Carabidae, Dynastidae, Coccinellidae, Tenebrionidae and Platypodidae are represented by 5.88% for each (Figure 3).

At the Merja of fouarat, we have surveyed 13 species of Coleoptera distributed over 6 families. The Scarabaeidae family is the richest with a rate of 47.05% of all the surveyed species, the other families, Cerambycidae, Carabidae, Dynastidae, Coccinellidae, Tenebrionidae, are represented by an equal rate or 5.88% (Figure 4).

The beetle population harvested at the Mamora forest is characterized by a dominance of species belonging to the Scarabaeoidea Superfamily: The Scarabaeidae family has the largest number of species and is mainly represented by: *Oryctes nasicornis, Scarabaeus Nitidicollis, Aethiessa floralis, Scarabaeus cicatricosus, Polyphylla maroccana, Phylloganathus excavatus, Thorectes distinctus, Copris hispanus*. The Cerambycidae family is represented by two species *Cerambyx cedro* and *Stenochorus sp*.

The Buprestidae has two species: *Coroebus florentinus, coroebus undatus*. The families Carabidae, Dynastidae, Coccinellidae, Tenebrionidae, Platypodidae are represented by one species for each.

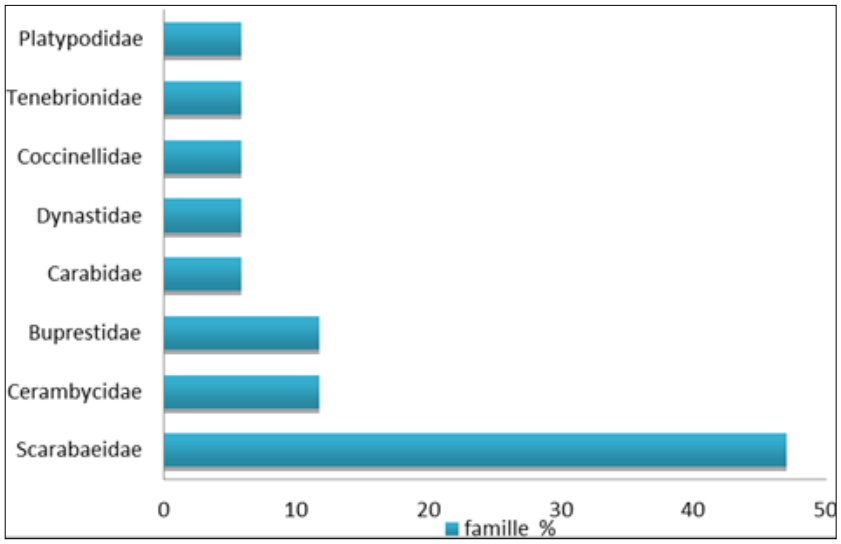

Fig 3: Relative importance of various beetle families at the Mamora forest

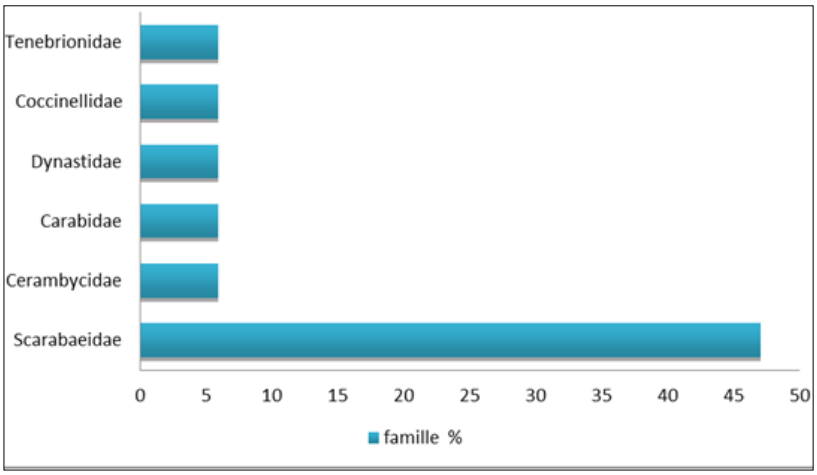

Fig 4: Relative importance of various beetle families at the fouarat Merja

Regarding the species harvested at the Merja of fouarat, the Scarabaeidae is represented by 8 species namely: *Oryctes nasicornis, Scarabaeus nitidicollis, Aethiessa floralis, Scarabaeus cicatricosus, Polyphylla maroccana, Phylloganathus excavatus, Thorectes distinctus, Copris hispanus*.

We also identified one species for each family: Carabidae, Dynastidae, Coccinellidae, Tenebrionidae, Cerambycidae.

Regarding the common species, we identified 13 species belonging to 6 different families (Table 2).

Table 2: List of common beetles in both study areas.

Family	Taxa
Scarabaeidae	*Oryctes nasicornis*
	Scarabaeus nitidicollis
	Aethiessa floralis
	Scarabaeus cicatricosus
	Polyphylla maroccana
	Phylloganathus excavatus
	Thorectes distinctus
	Copris hispanus
Carabidae	*Carabus sp*
Dynastidae	*Dipelicus optatus*
Coccinellidae	*Harmonia sp*
Tenebrionidae	*Akis tingitana*
Cerambycidae	*Stenochorus sp*

Ecological Indices

We collected 726 individuals at the Mamora forest and 419 individuals at the Merja of fouarat. The total diversity of the harvested stand is 2,645 at the Mamora forest and 2,525 at the fouarat Merja, these important values of diversity reflect the richness and the complexity of the stands studied in the two study areas. The equitability E is unequal in the two stands; it is 0.93 at the Mamora forest and 0.984 at the Merja of fouarat.

This value being close to 1 indicates a balance in the abundance distribution of the identified species. The fisher alpha index indicates a large qualitative difference in the composition of the two stands; it is 3.116 at the Mamora forest and 2.544 at the fouarat Merja (Table 3).

Table 3: Structural Parameters of Coleoptera Stands in the Two Study Areas

	Mamora Forest	Merja of fouarat
Taxa	17	13
Numbre of individus	726	419
Shannon weaver H'	2,645	2,525
Equitability	0,933	0,984
Fisher alpha	3,116	2,544

Figure 5 shows the variations of the beetle's diversity between the two study areas. It is notable that the Mamora Forest is more diversified in beetles than the Merja of fouarat.

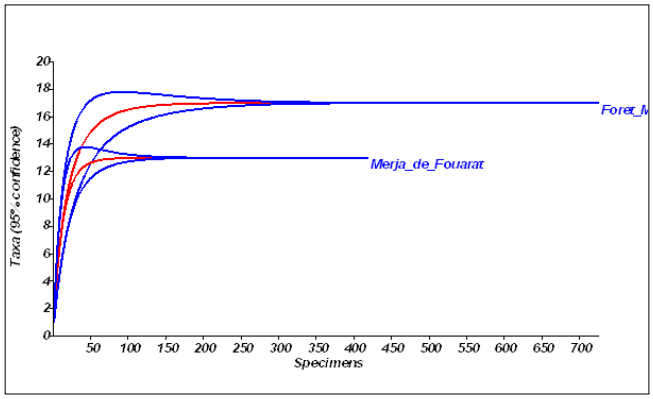

Fig 5: beetles variation between the two study areas.

4. Discussion

The beetle fauna of the Mamora forest as well as that of the Merja of fouarat constitute an essential link in the functioning and dynamics of the two ecosystems. The differences came from the health status of the two study areas. Indeed, the Mamora forest has a better health status

and better management than the Merja of fouarat. The Coleoptera population in both areas is rich and diverse, with a balance in species distribution. However, the species richness is higher at the Mamora forest, and the two stands show significant differences in composition.

The inventory conducted at the Mamora forest includes 726 individuals belonging to 17 species, divided into 8 families, the majority of which belong to the Scarabaeidae family. At the fouarat Merja, we have identified 13 species belonging to 6 families with the dominance of Scarabaeidae. The diversity is important in both stands, and the Shannon Weaver index is high for the Mamora forest stand, indicating that it is more diverse than the Merja of fouarat. The distribution of the species is balanced in the two stands; it seems that their composition is different because of the difference of the health status of the two studied ecosystems, the fouarat Merja being polluted.

Furthermore, several ecological, biological, climatic and edaphic factors may be behind the variation of the species richness of beetles in these two zones, notably the geographical dispersal capacity of the studied species. In fact, half of the beetles are pterygota and they are endowed with great migratory power, especially when conditions are unfavorable. Ecological conditions Slim *et al.* [10], which are factors determining the absence, presence and abundance, as a result of the geographical distribution of each species harvested. In addition, the richness and abundance of beetles are known to be lower in disturbed environments [11, 12, 13]. In fact, the significant reduction in the Coleoptera population recorded in the area of the fouarat Merja illustrates the threat of coleoptera species in their biotope. In addition to these factors, mention is made of the quality and methods of sampling Slim *et al*, [10].

The most notable is that carabidae is less important in this inventory, which explains why the Mamora forest is in danger, because carabidae is considered bio-indicator of the quality of the environment and forest ecosystems [14, 15].

5. Conclusion

The analysis of the global faunal composition of the two study areas led to the determination of a collection of 1145 individuals belonging to 17 species during the study period from mid-August to the end of October. These species are unequally distributed among 8 families. In this community, Scarabaeidae dominate both in numbers of individuals and in species richness.

It is hoped that this work can provide strong support for rapid action to protect the wetland fouarat Merja classified Ramsar site.

6. References

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