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Beetles in the dunes fixed by *Ammophila arenaria* Link. in the station of Saïdia (Oriental Morocco)

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Abstract

The present study aims at a better knowledge of the spatial faunistic organization of the faunal population and in particular the beetles of the coastal sandy formations (dunes) fixed by perennial grasses of the tourist site of Saïdia (North) in Eastern Morocco (Mediterranean coast), the fixing vegetation of these dunes is: the Oyat (*Ammophila arenaria* Link.). The population of fauna is very clearly distinguished from groups of Mediterranean species. In our inventory we have identified 67 taxa represented by 2058 individuals and divided into 17 different families. The faunistic analysis brings out three main dominant entomological populations: The *Carabidae* family dominates in number of species (18 species and 104 individuals) with a large representation of the Scaritinae tribe (46 individuals), while the family of Tenebrionidae dominates in number of individuals (937 individuals and 14 species) and well represented by *Tentyrinae*, *Erodinae*, *Pimilinae* and *Pachychilae* and whose diet is mainly phytophagous and well adapted to this type of environment which has climatic conditions very special and formed by species typical of the Mediterranean area. The super family of *Scarabaeoidea* comes third in number of species (12) and in second position in number of individuals (496) well represented by *Scarabinae* and *Psammodinae* and whose species are mostly coprophages attracted by feces. The other families come later with more or less represented values such as *Coccinilidae*, *Curculionidae*, *Chrysomilidae* ..., and whose presence is linked to the Mediterranean climate.

Keywords: Beetles, Mobile dunes, Northern fringe, Eastern Region, Morocco, Sahara.

Introduction

Knowledge of Moroccan wildlife has made extraordinary progress over the past 100 years. Its wealth of beetles is remarkable due to the diversity of geographic and geological regions.

At the beginning, they were devoted to establishing the systematics and the geographical distribution of the different cataloged species: Antoine (1955 to 1963); Alluaude (1924); Bruneau de Mire (1958); Peyerimhoff (1943 to 1947); Pierre (1958 to 1954); Kocher (1956 to 1969) and Raymond (1948), after beginning properly ecological studies in the form of memory reports, theses or scientific publications at the level of sandy formations and we can cite: Bouraada (1996), Labrique and Chavanon (2001), Maachi and Radouani (1993), Bouraada (2003), Bouraada and *al*. (2020).

On the northwest coast of Africa, there are different types of buildings and the coastal sands are composed by:

a- A pre-dune, between the tidal swing area and the dune,
b- The dune proper,
c- The inter-dune, semi-fixed by sparse vegetation,
d- The rear dune, fixed by fairly dense vegetation.

The strictly coastal fringe is mainly dominated by sandy formations (beaches and dunes) (BOURAADA, 1996), these include two main beaches, one extending from the borders to Ras el Ma and the other of Kariat Arkmane in Nador, the latter being mainly formed by the coastal cordon of the Bou-Areg lagoon. Behind these formations are humid and salty silty areas constituting samphire with salicornia, the most important of which are located at the mouth of the Moulouya and the Bou-Arg lagoon, especially towards Kariet Arkmane.

On the other hand, the formation of continental sandy dunes is a consequence of the desertification of the environment due to an irreversible reduction of the plant cover leading to the denudation of the soil. Bare soil becomes the object of wind erosion. This desertification ultimately manifests itself in a new distribution of the soil. The loose part is carried away by deflation and accumulated elsewhere in the form of dunes for the sandy fractions, and in the form of loess for the silty and clayy fractions. On the ground thus stripped, comes then accumulates sandy deposits of exogenous origin which, gradually, constitute mobile dunes. The best fixers seem to be local grasses: the Oyat (*Ammophila arenaria* Link.) As well as various shrubs or bushes.

The period of activity of adult beetles in the North-Western Sahara generally extends from mid-December to mid-February (Pierre, 1958). During this period he distinguished 4 phases:

a) Pre-vernal phase: short, starting in mid-February, it hardly extends beyond March. It is mainly characterized by the sudden appearance on the surface of several diurnal or morning sabulicoles. Nocturnals are almost completely absent.

b) Vernal phase: extending from March to the end of May, it coincides with the blooming of the vegetation and thereby brings together the richest and most dense fauna of the year (Phytophages, flowering plants, etc.). It also corresponds to the start of the nocturnal activity.

c) Summer phase: from the end of May to the end of June; the number and density of nocturnals increases considerably, while the activity of the few diurnals ceases in the middle of the day. The morning and evening hours are shortened and are closer to dark.

d) Post-summer phase: it begins in July and stretches until around December 15. It is characterized by the appearance of a tropical affinity fauna comprising both clearly diurnal species (Buprestides) and frankly nocturnal species (Bostrychides).

Our study deals with the ecological and systematic aspects of the settlement of these coastal sandy formations (dunes) fixed by various perennial grasses (the Oyat: *Ammophila arenaria* Link.)

I- Presentation of the study station

The station of Saïdia is located on the Mediterranean coast 8 km east of the city of Saïdia, this station is under strong softening marine influence with Lambert coordinates of 35 ° 05 'Latitude N. and 2 ° 13' Longitude W . (Figure 1). The dunes are 1 to 3 m high and their northern slope, exposed to sea breezes, consists of very mobile sand. Some are alive, others are partially fixed by the Oyat (*Ammophila arenaria* Link.) Quezel and Santa (1962, 1963).

Behind the dune cord is a silty or sandy-silty area covered with a salicora. The southern part is occupied by the old dune on which a reforestation of *Acacia* and *Euclyptus* has been made and where some fragments of the primitive stand of junipers and *Pheniciaremain*. The road from Saïdia to the mouth crosses this reforested area.

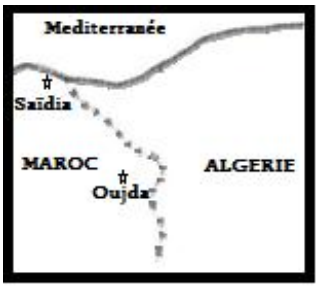

Figure 1, Location of the study area
(scale: 1/1500000)

II. Materials and Methods

After making a general reconnaissance of the terrain. The samples were collected in the station qualitatively. The harvested species are brought back to the laboratory and then determined with the faunistic keys of Antoine (1955 to 1963), Barraud (1985) and Kocher (1956 to 1969). For certain fauna species, we compared the collection to the Scientific Institute of Rabat in collaboration with the entomologists of this same institute and for, we sent them to France (Mr. L. Soldati, Mr. Richoux and Mr. H . Labrique) and in Spain (Mr. Vela).

In the region, the distribution of rains in the year is spread from the end of September to June. The fairly short dry period covers the months of July and August. The average annual precipitation is around 350 mm and corresponds to an annual rainfall of between 50 and 95 days (Bouraada, 1996). Rainfall is irregular from year to year, with a succession of dry years followed by wet years. The potential evapotranspiration, there is a low aridity in the station Saïdia (Mediterranean coast) which is also marked by a wet and cold north wind and characterized by a low speed.

We have adopted three techniques: sight hunting by direct capture of individuals on the sand, inside burrows, on plant species when they exist, under stones (in the rare cases where there were some stones in the station) and under the faeces of various animals (dromedaries, donkeys, goats, cows, etc.). Screening for the harvest of burrowing beetles and trapping, which consists in placing interception traps formed of plastic pots baited by a solution consisting of a mixture of beer and salt (Chavanon and Bouraada, 1995; Chavanon and Bouraada, 1996 ; Bouraada, 1996; Bouraada and *al*., 1999; Bouraada and *al*. 2014)

III. Results and Discussion

In first position, we find the *Carabidae* family which dominates in number of species (18 species and 104 individuals) with a representativeness of the *Scaritinae* tribe (46 individuals) while in number of individuals, the station is dominated by the family of *Tenebrionidae* (937 individuals and 14 species) and well represented by the *Tentyrinae*, the *Erodinae*, the *Pimilinae* and the *Pachychilae* (respectively 384, 262, 223 and 208) (Table I). The super family of *Scarabaeoidea* comes third in number of species (12) and in second position in number of individuals (496) well represented by *Scarabinae* (364) and *Psammodinae* (155) and whose species are mostly coprophages attracted to faeces. The *Tenebrionidae* is the most represented and well adapted to this type of environment which has very special climatic conditions and formed by species typical of the Mediterranean area. A faunistic group more or less abundant in number of species and individuals comes thereafter with more or less represented values it is the case of *Coccinilidae*, *Curculionidae*, *Chrysomilidae*… etc., And whose presence is linked to the Mediterranean climate.

In our inventory we have identified 67 taxa represented by 2058 individuals and divided into 17 different families (Figure 2).

In general, in terms of taxonomic richness, the stand is dominated by the Carabidae family in number of species (104 species and 104 individuals) while the Tenebrionidae dominate with a very large number of taxa (1199 individuals and 14 species) and which contains a significant number of psammophile species followed by the family Scarabaeoidea in third position in number of species (12) but in second position in number of individuals (416) the Carabidae on the other hand is placed in third position in number of individuals (Figure 3). This family is very diverse in North Africa (Bouraada, 2003; Bouraada, 1999; Pierre, 1958). In addition, the super family of Scarabaeoidea gathers a large contingent of taxa and more or less dominates the settlement with the Tenebrionidae. This good diversification is generally independent of the environment and closely linked to the presence of animal faeces for coprophagous species, and to plant cover for phytophages (Bouraada, 1999).

The harvested stand is formed by the species characteristic of the Mediterranean area, this fauna of the beetles harvested under the direct influence of the environment in which they live. Figure 2 shows that Mediterranean species are very well represented. It seems normal, for the Mediterranean communities, constituted by species generally adapted to a humid climate.

Indeed, in our inventory that the majority of specimens are of Mediterranean origin which is logical from the geographical point of view of the location of our study station and are part of the Mediterranean bio-climatic stage, the European species are present for a very small proportion.

The vast majority of the *Tenebrionidae* species encountered are phytophagous while and the other Carabidae are carnivores, scavengers or omnivores, *Scarabeaoidae* on the other hand are mostly coprophages, hence the problem of trophic relationships which arises within the biocenosis taken in the sense large.

Table I: Catalog of inventoried beetle species.

The systematic classification adopted was established taking into account the work of Antoine (1955 to 1963), Barraud (1985) and Kocher (1956 to 1969).

Family	Species	Abundance
CARABIDAE	*Lephyra flexuosa* F.	13
	Carabus morbillosus marginaus Lalt.	2
	Scarites buparius Fors.	46
	Paralielomorphus laevigatus F.	12
	Trechus rufulus Dej.	3
	Harpalus tenebrosus Dej.	1
	Platyderus gregarius Rche.	1
	Sphodrus leucophtamus L.	1
	Calathus mollis encaustus Frm.	1
	Amara simplex Dej.	2
	A. refescens shsmatica Ant.	2
	Saprinus (Saprinus) beduinus Mars. (s. lat.)	1
	Licinus punctatulus FAL.	1
	Masoreus wetterhalli testaceus Luc.	2
	Cymindis setifensis var. l*eucophtalma* Luc.	10
	Microlestes abeilli brisouti Hol.	4
	Catops sp.	3
	Xantholinus linearis OL.	1
	Lutea nigritula Er.	9
	Saprinus ormatus Er. (s.lat.)	25
	S. semipunctatus F	2
	S. niger Motseis.	2
	Hypocaccus rosihs Fochi.	6

SCARABAEOIDEA	*Aphodius hydrochaeris* Fab.	19
	Cognatus Schm.	2
	Psammodius porcicollis III	155
	Scarabeus sacer Ln.	20
	S. semipunctatus Fab.	184
	Onthophagus maki III.	21
	Phyllognathus excavatus Scop.	7
	Tropinota squalida pilosa Brullé.	3
	Aethiessia floratis Fabr.	2
	Erytus cognatus Fair.	3
DRILIDAE	*Drilus mauritanicus* Luc.	2
DASYTIDAE	*Psilithrix yaneus* Ol.	38
ELATERIDAE	*Drasterius bimaculatus* Rossi (s.lat.)	2
	Cardiophora sp.	7
BUPRESTIDAE	*Acmacodera adspersula* III	1
	Sphenoptera barbarica Gmel. (s.str.)	1
DERMESTIDAE	*Dermasters vulpinus* Kug.	1
	D. frischi Kug.	3
NITIDULIDAE	*Melgetes elongatus* Rosh.	85
	Nitudulidae sp.	1
COCCINELLIDAE	*Coccinella septempunctata* L.	108
PTINIDAE	*Ptinus lusitanus* III.	3
OEDEMERIDAE	*Oedemera* sp.	1
ANTHICIDAE	*Anticus opaculus* Woll.	1
ALLECULIDAE	*Heliotaurus plenifrons* Fairm.	47
TENRBRIONIDAE	*Erodius audouini* Solier.	262
	Pachychila germari Sol.	208
	Tentyria maroccana Solier	384
	Scaurus uncinus Forst.	12
	Pimelia servillei populosa Sol.	222
	P. interstilialis Sol.	1
	Gonocephalum perplexum Luc	1
	Nesocaedius pardoi Esp.	109
	Zophosis (Hologenosis) nigroaenea Dey.	1
	Scaurus vicinus Solier.	2
	Akis reflexa tatae Théry.	14
	Blaps gigas Linn.(s. lat.)	1
	Timarcha punctella Mar.(s. lat.)	5
	Galeruca (Galeruca) barbara Eri., 1841	1
CERAMBYCIDAE	*Stenopterus ater* L.(s.lat.)	2
CHRYSOMELLIDAE	*Psylliodes inflatus* Rche.	7
CURCULIONIDAE	*Apion hydrolapathi* Kirby.	2
	Sitona intermedius Kust.	2
	Curculionidae sp.	1
Beetle ind. sp.		1

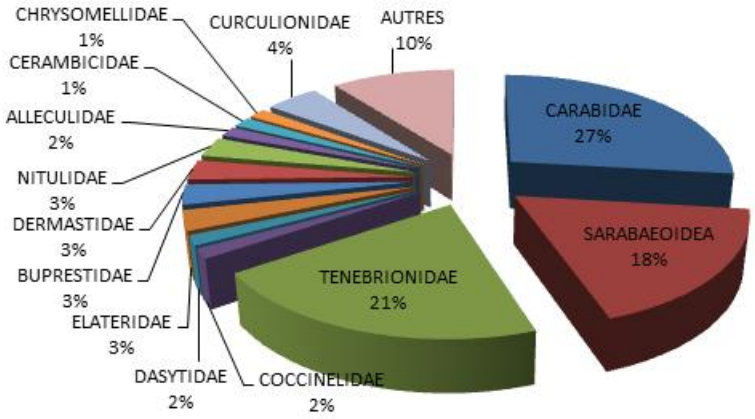

Figure 2: Specific richness of the different families inventoried beetle species

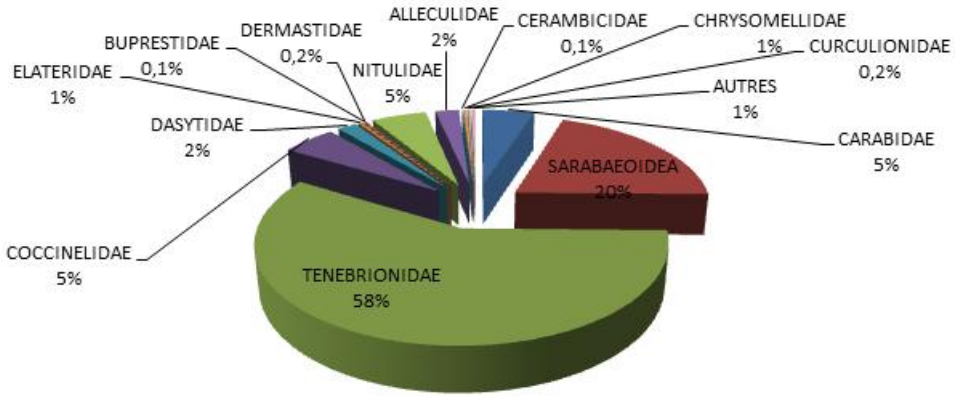

Figure 3: Overall specific abundance of dune beetles

The inventory thus carried out also made it possible to verify the sustainability of certain species in the region and to improve knowledge of the bio-geography of others while supplementing the regional inventory. The coastline is home to a much more stable population. This stability of the environment can be explained by the confinement of the coastal biotope and therefore has all the characteristics of such an environment with, in particular, a strong attenuation of variations in the various parameters that compose it (temperature, humidity, lighting, etc.) (Bouraada, 1996). Edaphic and climatic factors determined the distribution patterns of the littoral beetle and especially the degree of humidity of the substrate, which explains the distribution of species between the different habitats. The dynamics and distribution of these also depend on the variables relating to soil moisture, which is a key factor (limiting factor) in the distribution of these beetles on the Mediterranean coast. The intervention of the regional climate, the physico-chemical characteristics of the soil are at the origin of particular microclimates which determine their local distribution (Bouraada, 1996).

Conclusion

In our inventory we have identified 67 taxa represented by 2058 individuals and divided into 17 different families. The *Carabidae* dominates in number of species (18 species and 104 individuals), the family in second position is the *Tenebrionidae* (937 individuals and 14 species) is the most represented and well adapted to this type of environment which has climatic conditions very special, the super family *Scarabaeoidea* comes third in number of species (12) and second in number of individuals (496) and dominated by coprophagous species.

The Saidia plant population is dominated by *Poaceae* (Grasses), especially the Oyat (*Ammophila arenaria* Link.). The fixing vegetation of the dunes can have a triple protective role: protection against water erosion by braking runoff water, protection against wind erosion by reducing the wind speed at ground level, therefore reducing the stripping of the layers surface of the soil and the drying out of herbaceous vegetation and protection against grazing by sheltering from

livestock certain herbaceous plants, perennial or annual, which take refuge at their feet.

The group of beetles has a distinctly Mediterranean character, but this group remains fairly close with a not inconsiderable contingent of common species. The dunes of Saïdia form recreational spaces and undergo great disturbances leading to a strong degradation: destabilization by destruction of their vegetation, trampling, extraction of sand, even pure and simple disappearance by leveling for the creation of housing estates very close to the shores which can accelerate the specific depletion of this station. These dunes are essential in the sedimentary and ecological balance of our coastal environments.

Bibliographical references

ALLUAUD C. (1924).-Report of a zoological mission in South-Eastern Morocco. Bull.Soc.Sc.Nat.du from Morocco. t. IV, (1-6): 12-19.

ALLUAUDE C. (1925).-Zoological excursion to the beach of Saïdia (Eastern Morocco). Bull.Soc.Sc.Nat. from Morocco. t.V, (3): 47-49.

ANTOINE M. (1961).-Carabic beetles of Morocco: 4th part. Mem.Soc.Sc.Nat.Phy. Morocco, Zool. (8): 1-170.

ANTOINE M. (1955).-Moroccan carabid beetles: 1st part. Mem.Soc.Sc.Nat.Phy. Morocco, Zool. (1): 1-177.

ANTOINE M. (1957).-Carabic beetles of Morocco: 2nd part. Mem.Soc.Sc.Nat.Phy. Morocco, Zool. (2): 1-157.

ANTOINE M. (1959).-Moroccan carabid beetles: 3rd part. Mem.Soc.Sc.Nat.Phy. Morocco, Zool. (6): 1-150.

ANTOINE M. (1961).-Carabic beetles of Morocco: 4th part. Mem.Soc.Sc.Nat.Phy. Morocco, Zool. (8): 1-170.

ANTOINE M. (1962).-Moroccan carabid beetles: 5th part. Mem.Soc.Sc.Nat.Phy. Morocco, Zoo. (9): 1-153.

ANTOINE M. (1943).-On some Moroccans Carabiques. Bull.Soc.Sc.Nat.du from Morocco. (23): 43-55.

AGRAY F. and BIGOT L. 1984.-Fluctuation of a community riplicoole according to the level and the state of the body of water in the center-west Morocco. Water Science, 6 (3): 311-318.

BOURAADA K. (1996).-The settlement of plants and beetles of dunes fixed by perennial grasses in eastern Morocco. 3rd year thesis, Uni. Mohamed V, Fac. Sc. Oujda. P. 1-137.

BOURAADA K. (2003).-The settlement of Beetles and plants of the mobile dunes in the eastern region and eastern Morocco. Thesis Ph.D. Mohamed V Fac. Sc. Oujda, pp. 1-107.

BOURAADA K., ESSAFI M., CHAVANON G. and JANATI IDRISSI A. (2020).-Ecological types of riparian's insects Carabidae beetles of Lake Dayat Aoua (Atlas Morocco). International Journal of Advanced Research in Biological Sciences (Int. J. Adv. Res. Biol. Sci.) 7(2): 75-85.

BOURAADA K., ESSAFI M., CHAVANON G. and JANATI IDRISSI A. (2020).-Abiotic and edaphic factors influencing the settlement of the sands of the mobile dunes by the beetle fauna at the Northern fringe and the Eastern region of Morocco. International Journal of Advanced Research in Biological Sciences (Int. J. Adv. Res. Biol. Sci.) 7(2): 121-130.

BOURAADA K., ESSAFI M., CHAVANON G. and ElGHADRAOUI L. (2020).-Climatic factors of mobile dune stations populated by beetle fauna of the Northern fringe and the Eastern region of Morocco. International Journal of Advanced Research in Biological Sciences (Int. J. Adv. Res. Biol. Sci.) 7(2): 111-120.

BOURAADA K., JANATI IDRISSI A., CHAVANON G., OUABDELHADI H. and ESSAFI M. (2018).-Spatial biotypology of riparian carabic beetles at Lake Dayat Aoua (Moroccan Atlas), Rev. Mar. Sci. Agron. Vet. Rabat (Morocco).

BOURAADA K., CHAVANON G., ESSAFI M. and EL GHADRAOUI L. (2017).-Biology and typology of carabids beetles ripicole on the ZA river Morocco (Dam: El Ghoress), International Journal of Scientific & Engineering Research, (IJSER) - Volume 8, Issue 4, April 2017, 1315-1324.

BOURAADA K., CHAVANON G., ESSAFI M., EL GHADRAOUI L. and BENJELLOUN M. (2016).-Ecological diversity of the beetle population of mobile dune ecosystems of the northern fringe and the eastern region of Morocco. ecologia mediterranea - Vol. 42 (1) - 2016, p. 39-50. ISSN: 1775-4100 University of Avignon and the Pays de Vaucluse.

BOURAADA K., CHAVANON G. and ESSAFI M. (2015).-a- Commented catalog of beetles in the mobile dunes of the northern fringe and the eastern region of Morocco. Rev. Mar. Sci. Agron. Vet. Rabat (Morocco), 2 (3): p 27-33.

BOURAADA K., CHAVANON G., JANATI IDRISSI A. and ESSAFI M. (2015).-b- Affinity and ecological organization of the

stand of mobile dune ecosystems in the northern fringe and the eastern region of Morocco Rev. Mar. Sci.Agron.Vet. Rabat (Morocco), 2 (3): p 42-47.

BIGOT L., PICARD J. and ROMAN M. L. (1984).- Meaning of invertebrate stands in the dunes of the Rhone delta; determination of the marine and terrestrial domains. C.R.Acad. Sc. Paris, t. 296, Series III, No. 1, p. 5-7.

CORRE J.-J. (1987).- Plant stands and the management of the low coast of the Lion Golf. Bull. Ecol., T. 18, 2. P. 201-208.

GREUTER W., BURDET M. and LONG G. (1984-1989).-Med Checklist (Mediterranean Circumstances Inventory, Volumes I, II and IV, Geneva.

CHAVANON G. and BOURAADA K. (1995).-2nd Note on Scarabaeoidea of Eastern Morocco, addendum and corrigenda, Entomologist 51 (6): 257-262.

CHAVANON G. and BOURAADA K. (1996).-New or interesting beetles from the region of Figuig (South-East of Morocco): supplements and new data, Nouv. Ent review. Paris, T. 13 (4): 287-293.

KOCHER L. (1956).-Commented catalog of Moroccan beetles, Tenebrionides. Trav. Inst. Sc. Cherifien. Morocco. Fasc. VI. Ser. Zool. (12): 1-185.

KOCHER L. (1957).-Contribution to the study of Moroccan Glaphyrus (Col. Scarab.). Bull. Soc. Sc. Cherifien. Morocco. Fasc. To aim. Zool. (30): 1-83.

KOCHER L. (1961).-Commented catalog of Moroccan beetles, Addenda and corrigenda. Trav. Inst. Sc. Cherifien. Morocco. Fasc. X. Ser. Zool. (30): 1-164

KOCHER L. (1969).-Commented catalog of Moroccan beetles. New addenda and corrigenda. Trav. Inst. Sc. Cherifien. Morocco. Fasc. X bis., Ser. Zool. (34): 1-132.

PEYERIMHOFF P. (1943).-Coleoptera of Western Sahara. Bull,Soc.Nat.Phys. Morocco, (9): 90-164.

PEYERIMHOFF P. (1947).-Study and description of Moroccan Beetles II. Bull, Soc. Nat. Phys. Morocco (9): 90-164.

PIERRE F. (1958).-Ecology and entomological settlement of the living sands of the North-West. National Center for Scientific Research. Biological Series (1): 332.

RAYMOND A. (1948).-Insects of various orders harvested in the Central Sahara during a mission of the National Center for Scientific Research in 1947-1948. Bull. Soc. Nat. Morocco. (32): 77-89

JAHADIEZ E. and MAYOR R. (1931-1934).-Catalog of plants of Morocco (Spermaphytes and Pteridophytes). Volume I and III.

MAYOR R., (1958-1977).-Flora of North Africa, V Encyc. Edit. Lechevallier, Paris. Volume I to X.

QUEZEL P. and SANTA S. (1962-1963).-New flora of Algeria and Southern desert regions. Edition of the National Center for Scientific Research. Paris. Volume I and II.

GREUTER W., BURDET M. et LONG G. (1984-1989).-Med Checklist (Inventaire Circum Méditerranéen, tome I, II et IV . Genève.

IDRISSI L. (1984).- Contribution à l'étude écologique des Coléoptères sabulicoles du littoral Atlantique Marocain. Thèse de 3ième cycle, Univ. Med V, Fac. Sc. Rabat. P. 1-95.

MAIRE R., (1958-1977), Flore de l'Afrique du Nord, V Encyc. Edit. Lechevallier, Paris. Tome I à X.

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