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CONTRIBUTION TO THE STUDY OF SOME WILD CARNIVOROUS MAMMALS IN WESTERN ALGERIA

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Abstract

This four-year study (from April 2013 to May 2017) focuses on the inventory and updating of the geographical distribution of some endangered wild mammals in various biotopes in western Algeria. Our work has been started over the years (2013-2017) ie four years of investigation based on direct and indirect observation as well as information collected from a questionnaire and surveys conducted with indigenous populations, hunters and foresters. Our investigations carried out on this mammalian fauna, allowed us to count 14 species of carnivorous mammals, the order of Carnivores contains: the Canids where a wide distribution has been reported on the whole territory to study. The latter are represented by Canis aureus or North African wolf Canis lupus, Vulpes rupellii and Vulpes vulpes. Felids; are poorly represented in the study area. Indeed, the 03 identified species in this group are all taxa listed by subsequent studies as threatened in the region. These species are Felis libyca, Felis margarita and Felis caracal. The Hyaenidae; very low and almost nonexistent in the desert areas. This group is represented by Hyaena hyaena. Mustelids; the 05 species Mustelanivalis, Ictonyx libyca, Mellivora capensis, Lutra lutra and Mustela putorius furo showed a very small geographical distribution. The viverrids represented by Genetta genetta are present throughout the area but in small numbers. Finally, the Herpestidae; represented by Herpestes ichneumon are present with numbers that place the species in danger and risk of extinction.

Keywords: Mammals, Wild carnivores, inventory, geographical distribution, Western Algeria.

Introduction

Biodiversity is leading to a severe crisis in recent decades, resulting mainly from habitat destruction and species extinction. Indeed, according to Mayers et al., (2000), Margules and Pressey, (2000), the identification of "hot spot" media, or ecological systems with high species richness, are also subject to a major risk of extinction. However, a characterization of pragmatic roles in the systematic conservation of these environments has a certain role in safeguarding this biodiversity. The collection of biological data is unavoidable in order to identify the causes responsible for the different extinctions of various taxa, especially those with large population sizes (Torres et al., 2009).

On the other hand, several species remain unknown given their numbers, frequency of occurrence, their privileged habitats and territory of occupation. In this study, our focus is on a contribution to the inventory, and knowledge of the diversity and spatial distribution of wild carnivores inhabiting some biotope of western Algeria. To do this, we based ourselves on the one hand on the analysis of wild

carnivores richness established in its biotopes and on the other hand on the distribution of these carnivores in its territories as well as the biotopes frequented.

Materials and methods

Our study is based on a bibliographic aspect, relating the bibliographical data on carnivores. The numerous results are mainly oriented towards an exhaustive inventory of these taxa, their diversities and their spatial distributions in order to establish their cartography at the level of these regions and this from April 2013 until May 2017. The current state scientific knowledge of mammal communities is growing more and more. Following the ancient works of (Arambourg, 1927), (Letourneaux, 1860), (Lavauden, 1926), (Lataste, 1881) and more recently by (Khidas, 1986), (Leberre, 1990) and (Ahmim, 1999) (and many others). This work represents a very rich and diversified background of knowledge that must be used in this study to answer many questions related to the theme that we propose to address. It is important to emphasize the need to use the various information, audiovisual and Internet systems that will allow us to access a considerable amount of valuable information. It should be noted, finally, that, whatever the value and the precision of the information reported by the bibliographical synthesis, the data of the field constitute a precious complement allowing to validate and to update the already existing results.

To do this our investigations are also focused on observation methods, in this context we have opted for three methods, namely, direct observation of subjects (direct contacts, or cadavers), indirect observations based on the indices of presence of these mammals such as feces, footprints and hair. The presence of the species will be determined by survey of the places of study (testimonials and reliable indications), by direct search of the animals (visual or auditory contact with the animals), and by indirect search by finding reliable indices that can testify to the existence of the animal in the sites prospected. Similarly, surveys were conducted in the form of questionnaires with local indigenous people in rural areas, hunters, rangers, nomads and shepherds in various biotopes (**Figure 1).**

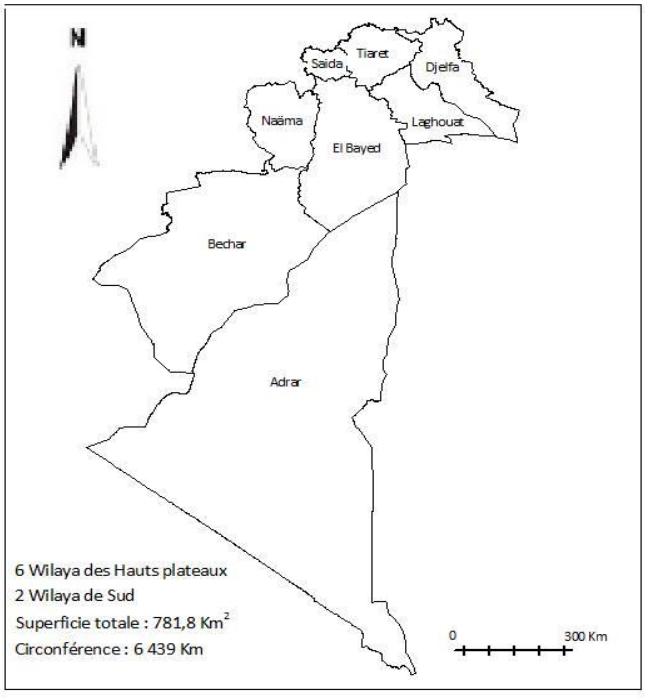

Figure 1. Map showing the study area

The study used a questionnaire, survey, digital camera, binoculars and GPS. The choice of techniques to implement takes into account the biology and ecology of animals. The mammals of our study are

very discreet in the eyes of visitors but they are actually very active from dusk, and also at dawn, and some species are visible during the day. To study mammals, standardized methods are needed, but according to Lamotte and Bourliere (1969), there is no standard method for accurately estimating the number or density of mammal populations. According to Ramade (1984) it is not possible to make absolute counts of animal populations, according to the same author, it is not possible to make absolute counts of animal populations, with the exception of the species. Human populations (censuses) and domestic animals, we therefore make estimates of numbers that we want as faithful as possible; these involve the adoption of sampling strategies and a sampling technique that make the least possible mistakes. We proceeded during our study for the inventory as follows:

We used the systematic survey method as a main method, as well as 2 other complementary methods that are:

- The Progressive Frequency Sampling (EFP) method, (Blondel, 1975).
- Species trapping technique.

The field exploration data provide information on the location and validation of the range of animals that live in the study areas.

Results and discussions

The preliminary results we have obtained show the existence of 14 species of carnivores identified and divided into six large families, the Canidae; represented by Canis aureus, Vulpes rupellii and Vulpes vulpes, Felidae; represented by Felis libyca, Felis margarita and Caracal caracal, the Hyaenidae; represented by Hyaena hyaena, the Mustelids represented by Mustela nivalis, Ictonyxlibyca, Mellivora capensis, Lutra lutra and Mustela putorius furo, Viverridae represented by Genetta genetta and finally Herpestidae; represented by Herpestes ichneumon. Our data are almost similar to the work already done on the mammals of Algeria in the past (Seurat, 1930 and Heim De Balzac (1928, 1930) and recently updated by Desmet (1989) and Kowalski and Rebzik-Kowalska (1991), on the carnivorous fauna of Algeria. Our investigations allowed us to identify them (We also designed spatial distribution maps for the different species to identify within the different prospected regions):

Canidae Family

For the Canidae family three species with a very wide distribution could be identified, these are Canis aureus, Vulpes vulpes and Vulpes rupellii. The Golden Jackal, Canis aureus or North African wolves is sometimes considered to be a widespread pest in northern Algeria and the South (Desmet, 1989, Kowalski and Rebzik-Kowalska, 1991). Our results are in agreement with those previously mentioned by these two authors 27 years ago. Micro-mammals are interesting in many ways not only for their high energy intakes as carnivores' preferred prey species but also because they tell us about occupied habitats (richness of prey) by them. Indeed, the role of rodents in the food spectrum of Carnivores is widely discussed in the bibliography (Pearson 1964, McShane and Grettenberger 1984, and Mukherjee et al. This abundance of rodents only proliferates these species in these biotopes.

The diversity and outbreaks of rodents in our region have been the subject of many investigations, this abundance is reflected by the presence of rodents Gerbillidae and Meriones (Adamou, 2010), this is in agreement with our observations. This abundance of rodents gives them a certain food availability, especially for all small wild carnivores, our results corroborate with those already obtained by Sultana and Iaeger 1989; Prakash et al., 1995 on rodent outbreaks and their shares in the carnivore diet. Micro-mammals are interesting in many ways not only because of their high carnivore energy supply, but also because they provide information on occupied habitats (richness in prey) by carnivores (Amroun et al., 2006). According to Amroun (2005), trophic ecology analysis of jackals shows that the relative importance of active predation and foraging varies with the time, location and local food availability of predators.

The Jackal will behave either as a predator or a scavenger, this is related to the available food resources. Our results are consistent with literature data (Kruuk, 1972, Kleiman and Eisenberg, 1973, Alexander, 1974, Bradbury and Vehrencamp, 1976, MacDonald, 1983 in ME Sunquist and FC Sunquist, 1989), which suggest that distribution of food categories, prey distribution and abundance, is one of the major ecological factors affecting the organization of mammalian communities, primarily for carnivores.

In addition, it should be noted that several authors, such as (Brown et al., 1978, Lemen and Rosenzweig, 1978), confirm that rodents in cultivated fields frequently change habitats, especially when the media become dry and bare during the breeding season. summer. Other authors, such as Kotler (1984) and Kotler et al (1988), show that the increase in predation in open spaces triggers the flight of rodents to more reassuring places with taller grasses such as maquis. riparian forests or wooded areas. These habitats are often frequented by the jackal (photos 1, 2 and 3), following the prey species that it captures. We can find it in forests, scrub, lawn or arable land and grain fields, or in bare areas of vegetation. Thus this Carnivore is found in a variety of different habitats that we can link to the prey species available in the regions studied (Figure 2).

Photos 1: footprint of jackal in the study area.

Photos 2: Night observation of a jackal.

Photos 3: Observation of a jackal at the level of a rocky massif.

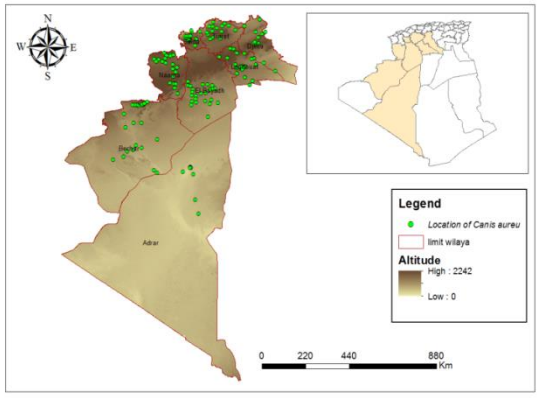

Figure 2: Geographic location of Canis aureus (jackal).

The common point in all these environments is the predominance of maquis, which remains the habitat most sought after by many carnivores, especially for the strong presence of micromammals and cover vegetation. That said, this species avoids certain places such as anthropised environments, such as sites with strong agricultural activities (clearing, urbanization, ...).

As for the second canid Vulpes vulpes (photos 4 and 5) commonly called the red fox, abundant in the northern part of Algeria (Figure 3), it was already reported by Kowalski in 1979, in the region of Tiaret, at the Theniet El Had National Park (Bounaceur et al., 2012); Kowalski and Rebzik-Kowalska (1991),

report it everywhere in Algeria, from the coastlines, the Tell to the Highlands, and at the level of part of the Saharan Atlas, but never in the Sahara, with the exception of the Saoura Valley, to Béni Abbes. This species can be found up to the altitudinal limits of southern Aurès (Gouat, 1988) and Biskra (Desmet, 2007). It is an animal very close phenotypically Golden Jackal, they can live in the same biotopes with however specific home ranges for each species, the possibilities of cohabitation in sympathy seem to be obvious. We often met him alone not far from farms and henhouses, a priori, he attacks the small farms, it was also observed not far from public dumps and slaughterhouses with relatively high numbers, the same observations were made by Bounaceur et al., (2012), at the Theniet El Had National Park.

Photos 4: Observation of a red fox animal.

Photos 5: Corpse of an animal red fox.

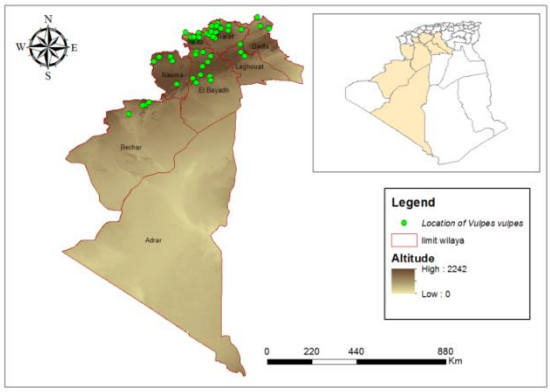

Figure 3: Geographical location of Vulpes vulpes (Renard Roux).

Fatal collisions have been reported many times, he is often reported as a victim of road accidents, at dusk, he approaches the roads in search of rest of food left by road users, especially at relays roads and rest areas and close to parks such as Theniet El Had and the Tiaret attraction area (Bounaceur et al., 2012).

The starved fox, Vulpes rueppelli, has been observed in the localities of the South and has been visualized in El Bayadh, Laghouat, Naâma, Bechar and Adrar (Figure 4).

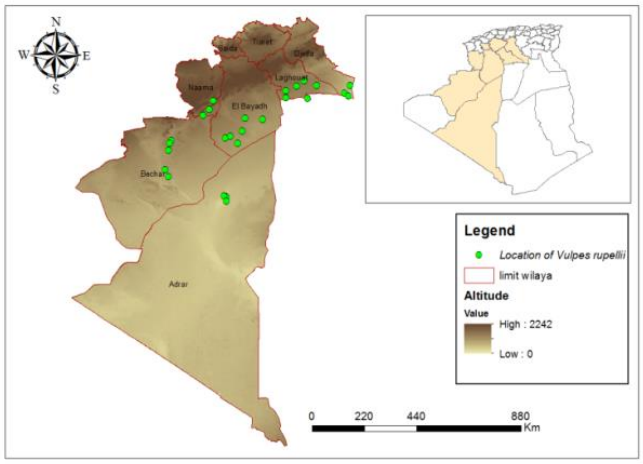

Figure 4. Geographical location of Vulpes rueppellii (Famous Fox).

Our observations are in agreement with those already obtained, more than a century ago by Lataste (1881) in Laghouat. That said, there was confusion about the identity of this species, because for him the fox is a subspecies of Vulpes vulpes. However, for the majority of scientific explorations carried out in the old colonial period, it is certain that its distribution mainly concerns the central Sahara, Hoggar and Tassili (Thomas and Hinton, 1921 and Regnier 1960). His presence in Adrar is also in accord with the observations of Monod (1931), Lavauden (1926). Specimens are in collection at the National Museum of Natural History in Paris. The latter come from Bechar, Beni Abbes, Beni Ounif and Taghit (Regnier, 1960). Its distribution is also reported in El Bayadh is in agreement with the observations of Desmet (1989), who reports it to Abiodh Sidi Cheich. Indeed the species seems to proliferate along these biotopes in the Sahara and along the Saharan Atlas.

Hyaenidae Family

We were able to make direct observations (photos 6 and 7) on the striped hyena Hyaena hyaena (whose status is vulnerable), footprints and droppings were also observed. Its presence has been strongly reported in the Sougeur region, particularly at the Nador Mountains. It is present all around this territory. During the month of May 2017 we had the opportunity to see a female accompanied by two juveniles.

Photos 6: Observation of an animal Hyaena hyaena.

Photos 7: Corpse of an animal red fox

This species has also been reported for several years (3-4 individuals) in the region of Frenda locality El Gaâda, Machraâ Sfa, Brida, Djelfa locality Djble Gaada, Adrar, Oued Lili, Mechria and Bougtob. The investigations conducted confirmed our direct and indirect observations. Our observations are in agreement with the observations made by many mammalogists, who mention the presence of the northern striped hyena north of the Sahara (Seurat 1930, Kowalski and Rebzik-Kowalska 1991) (Figure 5). These authors mention that its presence became rare during the 90s. The striped hyena was widespread in the 19th century, it was observed even near the coast (Wagner, 1841). According to testimonies, it has been very abundant in the coastal areas of Tipaza on the side of Gouraya. This animal attacked the freshly dug graves (Bounaceur et al., 2012) probably due to a lack of prey. According to Kowalski and Rebzik-Kowalska (1991), this species is present in its natural range. Bounaceur et al., (2012) observed it at the level of the Theniet El Had National Park. One specimen has even been recovered by the veterinary service of the Chréa National Park. Two individuals have been recovered from the Hamdania sector (Bounaceur et al., 2012).

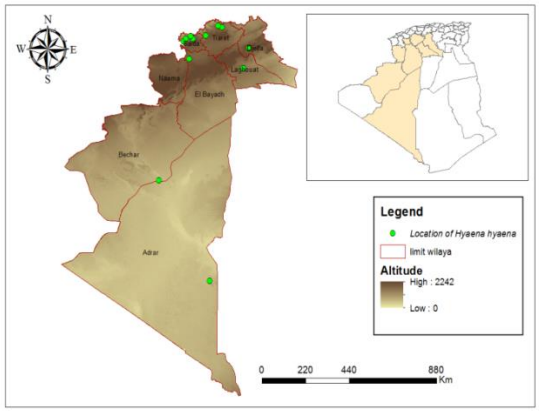

Figure 5: Location of Hyaena hyaena (Striped hyena).

In Morocco, this species is highly threatened (Cuzin, 2003), the main cause of the carnivore's killings is to recover its skull, which is widely used in the rituals of local magic (Bounaceur et al., 2012). Desmet, 2007 updates its current distribution area, is reported the presence of the species in the western part to the Moroccan borders (Tlemcen, Bechar and Tindouf to Illizi through Tamanrasset). No data seem to mention the presence of the species in the east of the country.

Felids Family:

Three species of Felidae were observed by our team, Felis silvestris, Felis marguerita and Caracal caracal.

Felis silvestris, thought to be the ancestor of the domestic cat, has long been considered a geographically distributed species from Africa to western Asia (Cuzin, 2003). The latter (photos 8 and 9) has been reported in most of the biotopes of northern Algeria north of the Saharan Atlas (Kowalski and Rebzik-Kowalska, 1991) (Figure 6), it has been reported in the Sersou not far from Mahdia in the Tiaret region by Desmet (in Kowalski and Rebezik-Kowalska, 1991), which is in agreement with our data. We also reported the species in Machraa Sfa, Laghouat, Djelfa, Bayadh, Saida.

Photos 8: Corpse of an animal Felis silvestris in advanced stage of decomposition.

Photos 9: Footprint of a wild cat.

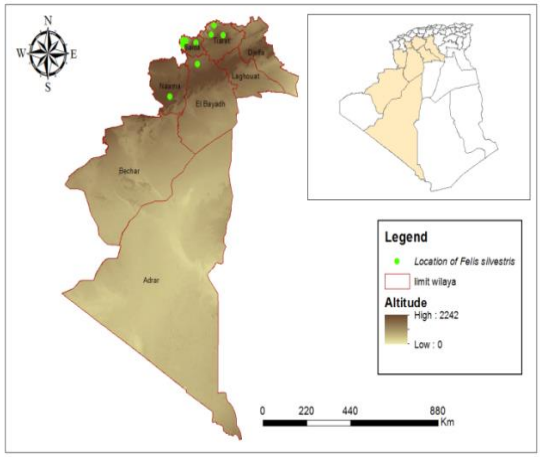

Figure 6: Location of Felis silvestris (The wild cat).

Cuzin (2003) reports it in Morocco, from the sea level up to 2600 m altitude in a forest of green oak Jbel Aberdouz (Eastern High Atlas), where he discovered his traces and excrement. According to the same author, this species shows a preference for moderate altitudes up to 1000 m. Stahl (1984) mentions that the upper altitudinal limit may be due to a sensitivity of the species to a high snow cover, as has been demonstrated in European wild cats. On the other hand, it has been found that this Feline does not live in the vicinity of the man or near the small human settlements (isolated houses, small villages). The degradation of the environment can contribute to the regression of the species, by destruction of the vegetal cover, and decrease of the biomass of the prey, however it is admitted in the literature that the competition phenomena of the wild cat in general with the other species of Carnivores are very poorly documented (Heptner and Sludskii 1972). Hubbard et al 1992, Stahl and Artois 1991, note that a crucial problem has been observed in Europe and Palestine regarding hybridization with the domestic cat. Cuzin (2003), notes that in Morocco, this problem can be exacerbated by the genetic proximity of gloved and domestic cats, since the domestic cat is derived from the gloved cat (Stahl 1984). In a context of increasing human population, and therefore of the domestic cat population, the areas of contact between gloved cat and domestic cat are increasing, especially as the domestic cat is partially nourished by humans, and is less subject to vicissitudes related to prey fluctuations in Mediterranean climates with random rainfall (Cuzin, 2003). Finally, contact with the domestic cat allows the spread of virulent diseases (Stahl and Artois 1991).

On the other hand, the presence of the sand cat or Felis marguerita (photos 10 and 11) was reported in the southern part of our study area: Naama, Bechar, Laghouat and Adrar **(Figure 7**).

Photos 10: Footprint of a sand cat

Photos 11: Corpse of an animal Felis margarita.

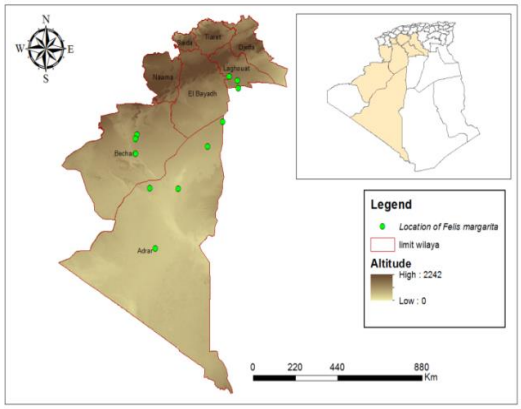

Figure 7: Location of Felis margarita (sand cat).

The caracal, Caracal caracal, has a range encompassing all of Africa (excluding dense forest) and Southwest Asia (Kowalaski and Rezbik-Kowalska, 1991). Its distribution range in Algeria extends from the North, to the limit of the Saharan Atlas, traces of its existence were also noted in the Ahaggar (Kowalaski and Rezbik-Kowalska, 1991). Desmet in (Kowalaski and Rezbik-Kowalska, 1991), reported it in the regions of Brezina and Ain Sefra. On the other hand Dupuy (1966), confirms that as soon as the last Caracal was shot in the region of Béni Abbès no observations or traces of presence of this Felidae were reported. Our results prove the opposite, according to our study a total of 5 individuals were observed, 1 living in the forest of Machrâa Sfa, 1 other shot by a resident of the Nador Mountains and the others were observed in Bayadh, Laghouat (Djbel Lazrag) and Bechar (Taghit) (Figure 8). For the first time in Algeria photos were taken on an animal alive by our team (photos 12), moreover corpses were recovered but unfortunately were not sent in time to undergo taxidermy.

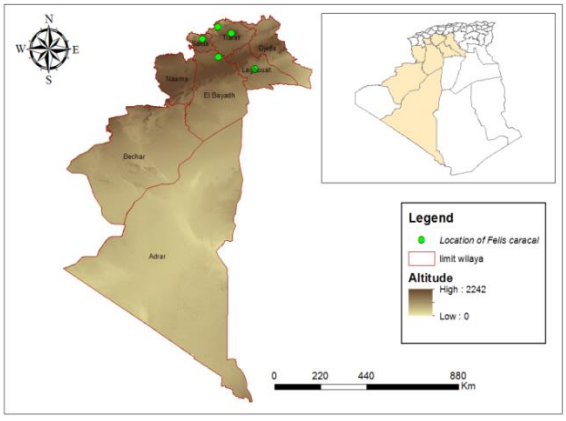

Figure 8: Location of Caracal caracal (the Caracal).

Photos 12: Observation of a living Caracal caracal.

Our results corroborate with those of Bounaceur et al. (2012), who reported his tracks at the Theniet El Had National Park. A dead specimen was recovered in the Monts de Ouarsenis in 2013 (Bounaceur et al., 2012), skin samples were sent to the genetic laboratory of the University of Limoges for analysis, but so far no information did not reach us, it was also reported in the Oued Bellaâ region not far from Cherchell and in Menaceur and the Zaccar Mountains, in 2013 and 2014 (Aulagnier et al., 2015), on the other hand it was observed in May 2017 in the region of Mechounech south of Aurès in the wilaya of

Biskra (Zahafi, 2017). All this very important information testifies to its existence still in our latitudes. Our results are similar to those previously obtained by (Cuzin, 2003), the caracal sometimes approaches the man, to visit in particular irrigated crops, poultry houses and sheepfolds. It is a very effective predator, which according to several informants, sometimes attacks small livestock and poultry, both in Morocco (several informants) and in Algeria (direct testimony of local residents). In Palestine, the caracal feeds on dead animals, particularly when food resources are scarce (Mendelsohn, 1989). The degradation of the environment can contribute to the regression of the species, by the destruction of the plant cover, and the decrease of the prey biomass. The decrease in the numbers of the golden jackal, given the phenomena of competition with this species (Mendelsohn, 1989) could have had a favorable effect on the caracal. However, it must be admitted that the population of this Felida remains unrecognized or unrecognizable in Algeria, this is in agreement with the observations made by Cuzin (2003), in the framework of his thesis, according to these studies, the number of breeding animals, is in continual decline, severely fragmented, with no sub-population with more than 50 breeding animals in Morocco. On the other hand, in Algeria, a small number of staff remains undisputed (Desmet 1989, Kowalski and Rzebik-Kowalska 1991), Cuzin (2003) suggests that a strengthening of the Moroccan population by animals of Algerian origin seems likely.

Viverridae family

Only one species of viverrid was observed during our investigations. The common genette or Genetta genetta (photos 13), has been described since the first expeditions of Tristtram (1860) and Lataste (1881) in (Kowalski and Rezbik-Kowalska, 1991), in the region of Laghouat and Djelfa. In our study we observed Genetta genetta, 5 individuals in the region of Frenda lieu-dit Gaâda, 4 individuals in the region of Sougeur at the level of the Monts de Nador, 2 individuals in Oued Lili, Saida, Tifrit, Bayadh (Bougtob) , Naama, Bechar, Laghouat and Djelfa. Only one individual was observed at Machraâ Sfa (Figure 9). Bounaceur et al, 2012, reported it at the level of the Theniet El Had National Park, this is in agreement with the results previously obtained by Bounaceur et al, 2012. Individuals found killed by accidents are very frequent on our roads. (Bounaceur et al., 2012).

Photos 13: Corpse of an animal Genetta genetta.

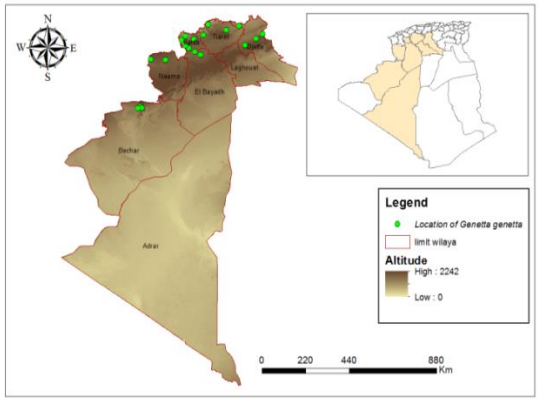

Figure 9: Location of Genetta genetta (The genet).

Genets, both in North Africa (Delibes et al 1989, Hamdine 1991) and in Europe (Livet and Roeder 1987, Palomares and Delibes 1991) do not seem to consume dead animals, and therefore seem insensitive to poisoning. Very discreet because of its exclusively nocturnal habits, this small viverrid is an active hunter of Rodents. In this context several studies on the trophic ecology of this animal have been conducted, we quote the works in France of Cugnasse and Riols (1979), Roeder and Pallaud (1980), Aymerich (1982), Maizeret et al. (1990), Clevenger (1995), and Virgos et al. (1999). In Algeria, the work of Hamdine (1991), Hamdine et al. (1993), Hannachi (1998) and Mostefai et al. (2003). Regarding its distribution and habitat preferences, it appears that the genette shows a clear preference for relatively

high altitudes, from 1000 to 2500 m altitude. The species has also been observed in the Saharan steppe in regs and hills (Cuzin, 2003). According to studies by the same author, the genette has been observed in all bioclimates in Morocco. Its habitat preference is for subhumid and semi-arid bioclimates. On the other hand, arid and Saharan bioclimates seem relatively uncrowded. The species is widespread in the warm to very cold stages. The genette can live in the vicinity of man, in crops and environments with relatively dense vegetation, provided they have shelters (fairly dense vegetation, rocks, walls with crevices). According to Cuzin (2003), in Morocco, animals living near humans attack poultry, breaking into poorly-closed poultry houses at night. Genets are captured easily (Desmet and Hamdine 1988, Livet and Roeder 1987) and are frequently trapped. An inevitable threat is exerted on this species; it seems that the fur of the genette, very elegant, is quite frequently used as a decorative object, in particular, in recent years, to decorate the rear window of motor vehicles in Morocco (Cuzin, 2003) and Algeria (Bounaceur et al.; 2012).

Herpestidae Family

Represented by the mongoose ichneumon (Herpestes ichneumon) (photos 14) whose range includes most of Africa (excluding the Sahara and dense forests), the Near East and the South of the Iberian Peninsula. Unlike the majority of carnivores, the mongoose has diurnal activity. In Algeria it has been described in the northern parts of the country particularly at the Tell, Atlas Blidéen, Djurdjura to El Kala, specimens have been observed in Seraidi, Ain el Kercha, Zéralda and Andalusians in Oran (Kowalski and Rezbik-Kowalska, 1991).

Photos 14: Corpse of an animal Herpestes ichneumon.

In the course of our study mongoose was observed in two distinct regions with only one individual, in the Machraâ Sfa region in the Aleppo Pine Forest and in the Nador Mountains near Sougeur. This is also reported in Saida, El Bayadh and Béchar (Figure 10). This is in agreement with previous work obtained by Bounaceur et al 2012.

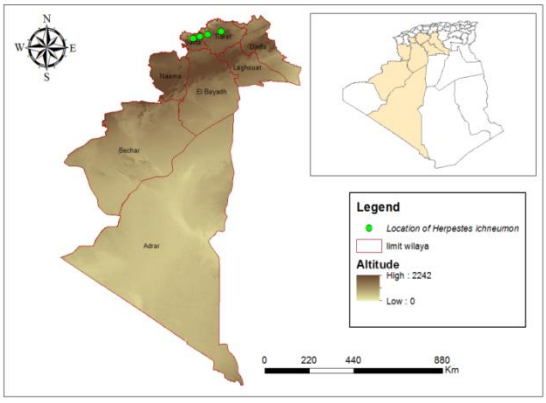

Figure 10: Location of Herpestes ichneumon (Egyptian mongoose).

In Algeria, few researchers have studied the bioecology of Mongoose ichneumon. Few studies are devoted to it worldwide, Palomares (1993) in Spain and Angelici (2000) in Niger. Cuzin (2003), notes that the ichneumon mongoose has been observed in all bioclimates of the studied region of Morocco. The only bioclimate relatively avoided by this animal is the Saharan. Although present in the Saharan floor, she seems to avoid it. In Morocco, it appears that the decline in numbers of the lynx caracal has coincided with an increase in mongoose density (Palomares et al., 1995).

Mustelids Family

Five species belonging to this family have been observed, namely the weasel or Mustela nivalis, the Libyan Zelilla Ictonyx libyca, the ferret Mustela putorius furo, the ratel Mellivora capensis and the otter Lutra lutra. Each one of them has been recorded in different biotopes, for the weasel, we observed it in a water point, on the side of the dam of Benkhada, in the region of Machraâ Sfa; while the Zorilla of Libya has been reported at the level of the steppe in the region of Sidi Abed, Ain Dzarit, Saida, Bayadh and Laghouat. On the other hand, the ferret was reported with 2 individuals not far from the city of Mahdia at the pine forests of Aleppo pine, and in mountain ranges, the Ratel was reported in the region of Bougtob (Bayadh), Béchar and for the first time in Tiaret. The otter was reported only in Jorf Torba in the Bechar region, these biotopes are home to a wild population whose size has not been easy to determine given the constraints of investigations. Their numbers seem more or less discreet and generally vary from 1 to 2 individuals.

The weasel, Mustela nivalis, is a palaarctic species: it is found throughout Europe, non-tropical Asia, and in North Africa. This small mustelid elongated body is specialized in hunting small rodents, frequently caught in their burrows. According to many local testimonies during our investigation claims to have seen the weasel attacked poultry. This carnivore, known for a very long time (Poiret 1789 in Kowalski and Rezbik-Kowalska, 1991), has been reported from the Algerian coast to the Highlands, and has been reported in the Mechria region. Desmet (in Kowalski and Rezbik-Kowalska, 1991) also collected data on its presence in the El Bayadh region. It was reported by Kowalski and Rezbik-Kowalska, (1991) in the Béni Saf region, Senia near Oran, in the northern parts of El Kala, Babors, Djurdjura, Chenoua Mountains on the side of Tipaza and Atlas Blidéen. Our observations are in agreement with those of Kowalski and Rezbik-Kowalska, (1991) in the area surveyed by our team (**Figure 11**).

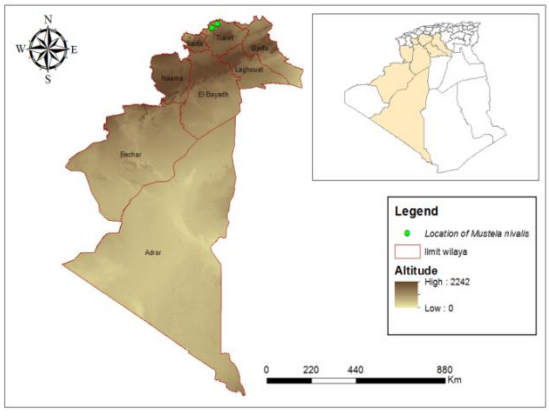

Figure 11. Location of Mustela nivalis (The weasel).

In Morocco, Cuzin (2003) reported weasel in almost all bioclimates in the study area, with the exception of the upper subhumid. According to him no geographical regression was detected, but the evolution of the numbers remains unknown, but the strong reproductive potential of the species (Delattre, 1987) makes it possible to suspect a relative stability of the populations, with important multiannual variations.

As for the Libyan Zorilla Ictonyx libyca (photos 15 and 16), a species inhabiting the steppes and pre-desert zones of Algeria, it is found only in the northern part of Africa, in the Saharan and arid regions. This little mustelid strictly nocturnal is discreet. In Algeria, it is mainly described in the western regions, from the north of the wilaya of Mostaganem to the Moroccan borders (which is in agreement with our observations, figure 12) and to the south to the Saoura valley (Lavauden 1926 and Niethammer 1987). Several authors cited in reference have reported in various areas of Algeria from Oued Souf, Biskra, Boussaada, Laghouat, Mascara, Ain Sefra, and Cape Falcon on the dunes in the Oran region. These traces have been reported in the Takouazet region of Tassili, by Von Schweppenburg in Kowalski and Rezbik-Kowalska, 1991).

Photos 15: Corpse of an animal Ictonyx Libyca.

Photos 16: Observation of a desert zorilla.

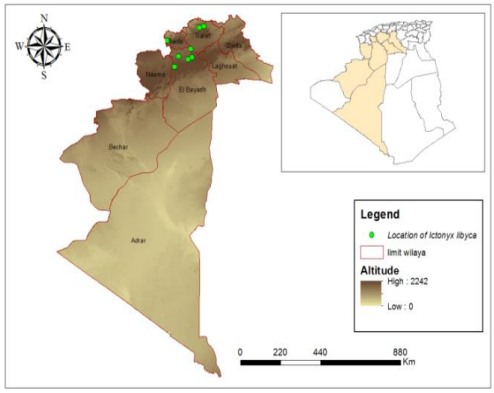

Figure 12: Location of ictonyx libyca (desert zorilla).

Slow animal, the zorilla defends itself by means of particularly nauseating projections of its anal glands, a mode of defense announced by its showy colors, black and white. Cuzin, (2003), notes that in Morocco, this animal occupies bioclimates ranging from the lower arid to the Saharan, the majority of observations of this animal being at the level of the lower Saharan bioclimatic stage. An observation was made in lower semi-arid bioclimate. The variants in which the species has been recorded range from warm to cool. No geographical regression has been observed in the whole country, however the evolution of the numbers remains unknown. In the Saharan region, the species can possibly be consumed by humans, its odorous flesh is moderately appreciated. Zorilla can attack poultry, which has already been reported in Niger and Libya (Hufnagl 1972, Dragesco-Joffé 1993).

The ferret Mustela putorius furo (photos 17) is the third species belonging to the Mustelidae family that was observed during our survey in western Algeria (for the first time). This species has been observed only in the Mahdia region where it appears to occupy forest habitats and mountainous terrain (Figure 13). Indeed the origin of the Ferret seems to be the result of an old introduction, it seems that this species was brought back by the European community during the colonization of Algeria in order to hunt the wild rabbits, Arnold, (1993).

Photos 17: Observation of two animals of the species Mustela putorius furo.

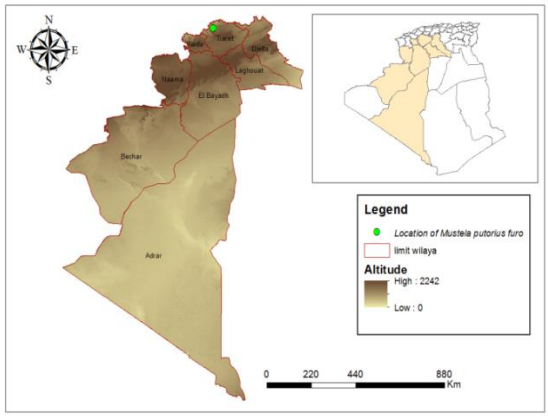

Figure 13: Location of Mustela putorius furo (The ferret).

This species is considered as a pest and has been introduced into several global ecosystems (Gippoliti, 2011). This animal was not the subject of any note, notably on the list of mammals of Algeria presented by Kowalski and Rezbik-Kowalska, (1991). Populations of a size of 30 individuals have been observed in the locality of Maamoura south of Sour El Ghozlane in the province of Bouira by (Ahmim, 2013), a priori this colony has existed for more than 60 years. It is probably the result of an accidental introduction by settlers in the area. Research involving DNA sequencing appears to be needed to determine whether these populations are native or introduced wild (Ahmim, 2013).

Another species of mustelidae was encountered during our study in the Bechar region: the otter Lutra lutra (photos 18). This species was observed at the Jerf Torba dam during the spring of 2015, it is totally absent during our various surveys conducted on western Algeria (Figure 14). Its presence in the Saouara was already reported by Heim de Belsac (1930), in the Bechar region, and was also reported in Igli (Dupuy, 1966a). To the west it existed in the Oranais not far from Mersa El Kebir (Kowalski, 1979b), it was also described in the area of Sig (Pomel, 1856) and Thiuout on the side of Naâma (Heim de Belsac, 1930). This presence in high density in the Saouara Valley shows that this environment is still healthy and unpolluted. Indeed, the Grand Crus and the permanent supply of unpolluted waters from the Moroccan Atlas Mountains have led to a diversity of ichthyofauna and trophic resources essential for the survival and proliferation of this species whose status is critical given its absence in the various western biotopes with the exception of the Saouara Valley represented here by the Jerf Torba dam.

Photos 18. Frech fingerprints of the species Lutra lutra

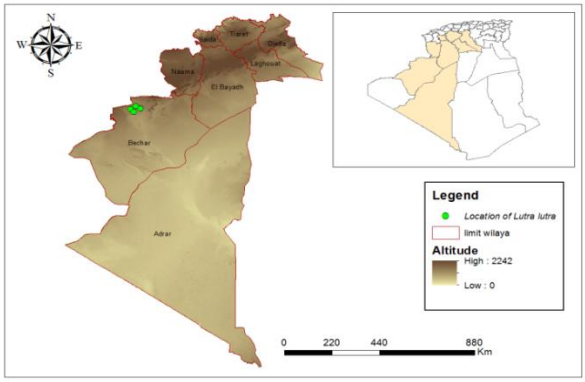

Figure 14. Location of Lutra lutra (The otter).

An animal was found killed crossing the road in the Jijel region (Aulagnier et al., 2015), and in 2014 it was observed in the Oued Seybouse valley in the Guelma region, with similar footprints. that of the otter were recorded in a wetland at Tiaret (Bounaceur et al., 2012), this remains to be verified by the presence of live specimens. Regarding the ratel or Mellivora capensis (photos 19), its observation by our team in the El Bayadh region, Béchar and Tiaret is in agreement with the data reported by Kowalski (1982) (Figure 15). The species has been identified as frequenting the northwestern parts of the Saharan Atlas to the border of the Moroccan border. Panouse (1954 and 1957) notes its presence north of Hammada. Its presence south of Oran has been reported by Desmet (1989) without giving more details on localities. The lack of work on this species means that we have no data on its status and ecology.

Photos 19: Corpse of a Ratel.

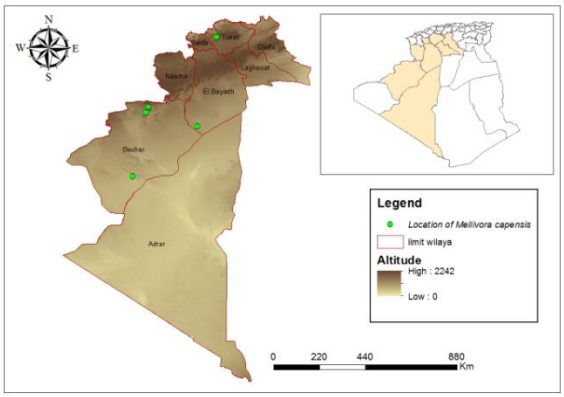

Figure 15: Location of Mellivora capensis (The ratel).

Threat

The increased anthropization of environments (urbanization, fire, grazing, clearing, ...) and the gradual disappearance of large predators strongly modify the modes and levels of competition between existing predatory species. These changes may threaten the survival of species most vulnerable to changing environments. This is very noticeable in the highly man-transformed environments (in the case of the vast cereal plains). Indeed, in this site where the anthropization of environments has accelerated, added to that the gradual disappearance of large predators (note that the striped hyena is at the top of the food pyramid, (mainly in the Tell) strongly modifies the modes and levels of competition between existing predatory species, but we can note that other sites such as the Nador Massif show greater diversity in mammals (Lagnaoui, 2014).

Conclusion

We note that the literature available on carnivores in Algeria remains very old and the few studies devoted to the study of these species have focused mainly on national parks. The species encountered seem to be well diversified and their presence reflects the carnivore richness and indicates the good ecological value of the different biotopes of our study area. Knowing that carnivores are on the highest scale of the food chain pyramid, carnivore richness indicates that natural conditions are pristine and wild habitats and has a rich potential for prey species.

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