Animal Diversity State and Trends of Wild Animal Communities in The Northern East Part of Libya.

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Abstract

Due to the lack of studies in the field of biodiversity in Libya, especially in animal ecology, this paper aims to assess the diversity and distribution of wildlife animals in three areas of the EL-Jabal EL-Akhdar region of northern-eastern Libya (Jeera, Taknes, Wadi Zaza) and the anthropogenic pressure in these areas, the areas were divided into three squares of 6 km by 12 km covering 72 km^2 each, waste remnants, animal remains including feathers and hair, and track traces were used to identify the wild animals, also questionnaire was used to assess the anthropogenic stress in the area, ecological indexes such as Shannon, Simpson, Richness, and Evenness.., among these species that suffer from high risk, *Testudo qraec*a due to mass exportation and *Hayena hyaena L, canis anthus, Vulpes vulpes,* subjected to poaching for the trading of their skin.These species are associated with the vegetation in the zone of study, especially *Juniperus phoenicia,* which is considered to be a dominant species in the study area which , in turn, suffers from environmental imbalance. The dense vegetation in the Wadi Zaza area has an impact on the fauna in the form of high rates of animal diversity, especially birds. The study concluded that several animal species are on the brink of extinction due to the intensity of anthropogenic in the different study zones, which ranged from extreme trade and mass exportation to hunting, urban and agricultural expansion, and deforestation Urgent action is needed to stop environmental deterioration, especially land use, and to establish protected areas.

Keywords: Anthropogenic, Mammals, Birds, Reptiles, Distribution, Biogeography, Threat, EL-Jabal EL-Akhdar,

INTRODUCTION

Biodiversity is the degree of variety or variation found in nature within the natural system, both in terms of quantity and frequency, it is frequently explained in terms of the vast array of different species of plants, animals, and microbes, the genes they carry, and the ecosystems they create(Rawat & Agarwal, 2015).

An area's biodiversity is defined as the variation found within and between living things, living organism assemblages, biotic communities, and biotic processes, whether these are found naturally or have been altered by people. The amount (e.g., abundance, biomass, cover, rate) and structure of each of the following can be used to quantify bio-diversity: biotic communities, assemblages of species, genetic diversity, and the number and identity of distinct species. Any spatial scale, from microsites and habitat patches to the entire biosphere, can be used for observation and measurement (Swingland, 2013).

Early 19th- and 20th-century literature on wildlife in Libya includes works by, (Whitaker, 1902), (Zavattari, 1934), (Setzer, 1957), (Rank, 1968), (Toschi, 1969), (Fitter & Parslow, 1979). More knowledge about mammals, birds, and reptiles has been available in the past few decades. Based on first approximations from (EGA.,2010), there are currently about 4,590 different animal species in Libya. In terms of total number, the insects make up the largest taxonomic group (81%). 350 different species of birds have been identified, of which 100 are now known to be nesting there (Etayeb & Isenmann, 2016). There were 76 species recognized in the most current assessment of Libyan mammals by EGA (2010). Four of the 76 species that were identified were acknowledged as endemics. In terms of reptiles, (Bauer et al., 2017) listed 66 species, comprising 39 lizards, 21 snakes, three marine turtles, and three terrestrial chelonians.

"McBurney (1967) published a book about Libyan animals. The book gathered information from various previous studies on mammals and distributed it throughout the country. McBurney's research on the biodiversity of El-Jabal El-Akhdar revealed that the area's species diversity and abundance were previously higher than they are now."

As per (Elbabour, 2007), a major concern for the natural habitats of El-Jable-Akhdar, Cyrenaica, is the surge in human activity in recent times, which can be attributed to population growth. Furthermore, the removal of native flora and its replacement with vast agricultural lands for profit modifies the composition of the landscape, affecting the quantity and range of flora and fauna. Conversely, it is now apparent that the altered climatic conditions increased the rate of drought, thereby threatening native plants and putting a variety of species in jeopardy. In particular, because they are rare in the arid area of the Jafara plain (Bsissa et al., 2019).

Although Libya's fauna is acknowledged to come from a variety of places (Hufnagl et al., 1972), little is known about its makeup because not enough thorough research has been done on the topic .

The lack of scientific studies on animal ecology and biodiversity in the region of El-Jabal AL-Akhdar necessitated the conducting of this study to shed more light on this zone with its rich Fauna.

Accordingly, this study aimed to assess the fauna's distribution in the EL-Jabal EL-Akhdar region of northern-eastern Libya (Jeera, Taknes, Wadi Zaza) and the anthropogenic pressure. The study's findings corroborate those of earlier research, both generally and specifically on this area; nonetheless, they will also be critical in guiding future efforts to preserve the area's biodiversity and species.

MATERIALS AND METHODS

The study area extends from west to southeast on the first terrace, overlooking the Mediterranean Sea from the north. The total area of the region is about 1,500 km.

The study area is located in the Cyrenaica region in the EL-Jabal EL-Akhdar in northeastern Libya, between latitudes (32°-11) and (32°-26) north and longitudes (20°-21) and (20°-57) east, Figure (1). Three areas were chosen (Jeera, Wadi Zaza, and Taknes) (Figures 2, 3, 4). Each of these areas has its topographic characteristics. Each area consists of one quadrate with a total area of 72 km, in the western part of Jabal Al Akhdar, and its height varies. Above sea level on average (120-615) meters.
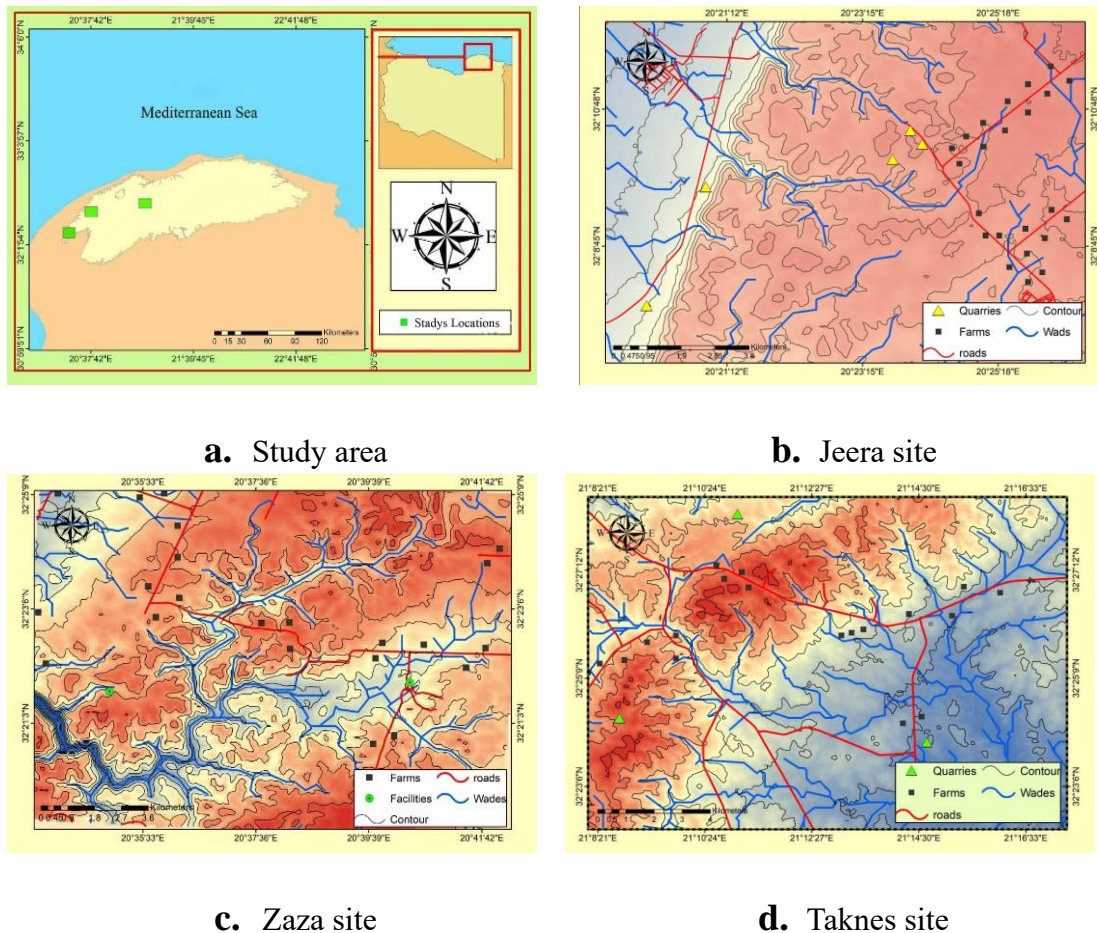

a. Study area   **b.** Jeera site

c. Zaza site   **d.** Taknes site

Fig 1. The maps represent (a) the study area, (b) the Jerra site, (c) the Zaza site (d) and Taknes site**.**

The study region has a comparable climate to Benghazi, with typical highs of 20 degrees Celsius. The northern face of the first terrace slope of Jebel Akhdar has significant humidity

and rainfall, which causes the establishment of forested areas where perennial plants grow on the upper plateau. (El-Barasi et al., 2003).

There are different animal species which constitute, including some types of mammals. Of the order of carnivores, the most important of which are ***Canis anthus, Vulpes vulpes, Poecilictis libyca, Hyaena hyaena , Lepus capeasis barceas, Hystrix cristata, Hemiechinus auritus, Allactaga teradactyl*a**, as well as many types of birds, endemic and the most important of which are ***Alectoris Barbara, Galerida cristata, Streptopelia turtur, Upupa epops, Corvus corax tingitans***, in addition to that, some types of reptiles, the most important of which is ***Testudo graeca*** (Saaed et al., 2022).

In general, the natural vegetation in the study area in the north is dominated by ***Juniperus phoenice (L), Pistacia lentiscus (L), Arbutus pavarii pamp, Rhus tripartite (Ucria) Grande, Sarcopoterium spinosum (L.) Spach, Ceratonia siliqua tree (L).***In the *south**, Thymelaea hirsute (L) Endl bushes abound, Thymus capitatus (L) Hoffm bush, Deverra tortuosa (Desf) DC.Syn.Pituranthos tortuosus (Desf) Benth***, and we find that the ***Ziziphus lotus (L.) Lam bush*** spreads in the streams at the bottom of the valleys (El-Barasi et al., 2011; Saaed et al., 2022).

To study wildlife, the study area was divided into three squares of 6 km by 12 km covering 72 km2 each, by using GPS, waste remnants, animal remains including feathers and hair, and track traces were used to identify the different species of wildlife animals in the sites. by using the most recent scientific names on the findings of the research (Secretariat, 2021), (POWO, 2021).

The plant species were identified by using the Herbarium located in the Department of Botany, Faculty of Science, University of Benghazi.

Wildlife was studied through several field trips and many wild species were monitored in the study area (Jeera, Wadi Zaza, and Taknes) in stages within a phased schedule for the years: 2021-2023.

The questionnaire is thought to be a tool for gathering information and data to determine how human activity 'anthropogenic pressure' affects natural areas in terms of the environment. There were thirty surveys provided in each of the three area (Jeera, Wadi Zaza, and Taknes), for a total of eighty-two questionnaires that were completed. The study period was from April 2021 to June 2022. Questionnaires were dispersed at random. and the obtained data were analyzed by using the SPSS statistical program, as well as the application of many indicators of biodiversity, (Shannon & Weaver, 1949).

$H=\sum (pi)\ in\ (pi)$　　　　Shannon　Equitability　$E_{H=}$ $H/_{in\ (S)}$

Simpson reciprocal index　$Ds = 1 - \frac{\sum n\,(n-1)}{N\,(N-1)}$, Simpson index　$Ds = \frac{\sum n\,(n-1)}{N\,(N-1)}$

(Simpson, 1949)

evenness (Pielou, 1975) index　$J=\frac{H}{in\ S}$, richness (Margalef, 1959) index D=$\frac{S-1}{in\ N}$

abundance, to obtain the best results of biodiversity and species richness in the study area.

RESULTS

a- Anthropogenic pressure

A questionnaire consisting of 82 respondents was used to analyze the impact of various human activities on biodiversity in Jeera, Zaza, and Taknes. The results showed that the highest percentage of human activities in Taknes was 30.5%, and in Zaza, it was 26.8%. In the Jeera region, human activities such as grazing, urban growth, woodcutting, and water shortage had percentages of 9.8%, 1.2%, 3.7%, and 4.9%, respectively. The probability value (P=0.000) was found to be less than 0.05, which indicates that the results are statistically significant and do not follow a normal distribution. Table (1).

Table (1): Analysis of some human activities on the biodiversity of animals in Jeera, Zaza, and Taknes areas in the study region was conducted through a questionnaire.

			what is the reason for the extinction of wildlife (anthropogenic)						Total
			Agricultural expansion	Hunting	Grazing	Population growth	Woodcutting	Water shortage	
Region	Jeera	Number	4	9	8	1	3	4	29
		% Of Total	4.9%	11.0%	9.8%	1.2%	3.7%	4.9%	35.4
	Zaza	Number	0	25	1	0	0	1	27
		% Of Total	0.0%	30.5%	1.2%	0.0%	0.0%	1.2%	32.9
	Taknes	Number	1	22	3	0	0	0	26
		% Of Total	1.2%	26.8%	3.7%	0.0%	0.0%	0.0%	31.7
		Number	5	56	12	1	3	5	82
		% Of Total	6.1%	68.3%	14.6%	1.2%	3.7%	6.1%	**100%**

b- The total percentages (%) of animals in different areas.

The density and distribution of animals in these areas were studied, Aves, Mammals, and reptiles represented 45.58%, 42.26%, and 12.16% of all species in the examined sites. It is worth noting that these species were found in the Zaza, Taknes, and Jeera areas, making up 45.5%, 28.6%, and 25.9% respectively. Furthermore, 40.95%, 34.38%, and 24.67% of all Mammals were found in this area, while 44.37%, 26.82%, and 28.81% of all reptiles were found there. Additionally, 50.04%, 23.70%, and 26.26% of all Aves were found in the Zaza, Taknes, and Jeera areas respectively**.** Figure (2)**.**
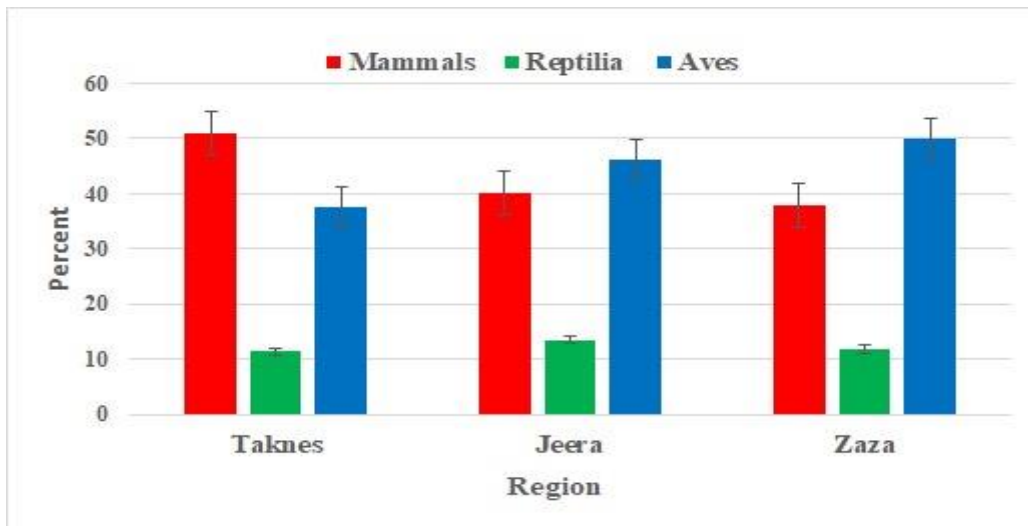
Figure (2). The Percent of (%) (Mammals, Reptilia, Aves) in a different area (Taknes, Jeera, Zaza).

The correlation matrix for the distribution and density of animals in the study area shows that there is a relationship between mammals and reptiles (r = 0.4509) and a relationship between mammals and Aves (r = 0.5575). between mammals and elevation above sea level (r = 0.3031). Figure (3).

However, when it comes to the three areas in the study area (Jeera, Zaza, and Taknes), the relationship between mammals and the area is very weak and almost non-existent (r = 0.0382). This indicates that there is no significant relationship between the density and distribution of mammals in this area. Figure (3).

The results indicated a very weak or almost non-existent inverse linear relationship between the elevation of the region at sea level and the density distribution of birds and reptiles. The correlation coefficient r is (-0.0928) and (-0.0916) respectively. It can be inferred from this that there is no significant relationship between these variables. Figure (3).
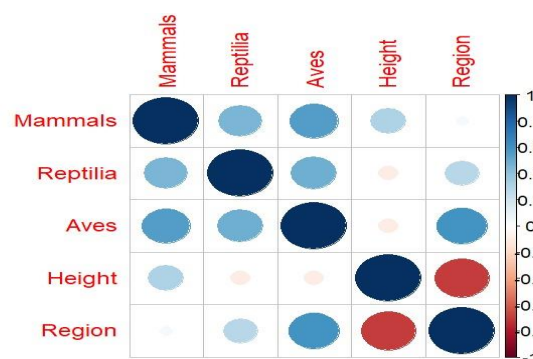

Figure (3) The correlation matrix of the distribution of mammals, reptiles, and aves with elevation and study areas.

According to the Shapiro-Wilk normality test and Density plots in the region, it was generally observed that reptiles are distributed normally with a p-value of 0.0147. However,

it was found that birds and mammals do not follow a normal distribution, with respective p-values of 0.5176 and 0.1264. Figure (4).
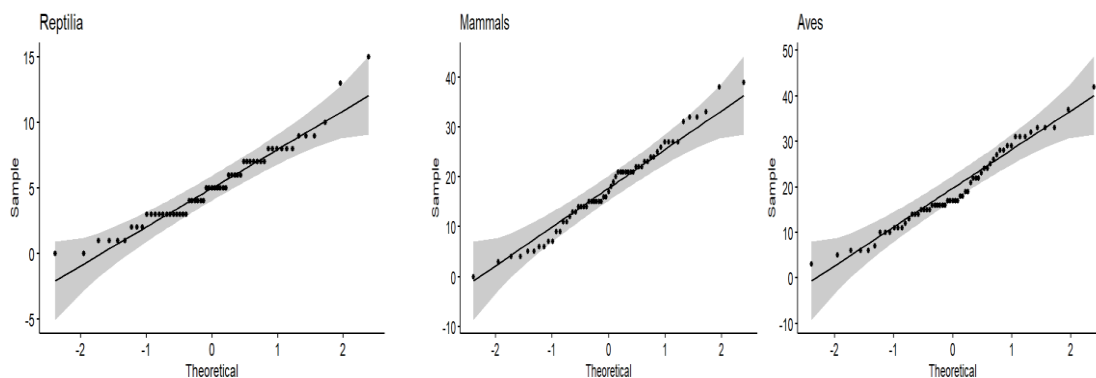

Figure (4). The correlation between the numbers and density of mammals, reptiles, and Aves in the study area.

<u>**c- Animal distribution**</u>

Table (2). Shapiro-Wilk normality test results for Mammal, Reptile, and Aves species across study areas Jeera, Zaza, and Taknes.

region Animal's	Shapiro-Wilk normality test		
	W	P-Value	Significant
Mammals Taknes	0.9697	0.8129	Yes
Reptilia Taknes	0.8082	0.0026	Not
Aves Taknes	0.9565	0.5665	Yes
Mammals Jeera	0.97448	0.8117	Yes
Reptilia Jeera	0.95315	0.3641	Yes
Aves Jeera	0.97294	0.778	Yes
Mammals Zaza	0.95577	0.4631	Yes

Reptilia Zaza	0.90033	0.04183	Not
Aves Zaza	0.96957	0.7457	Yes

The results of the Shapiro-Wilk normality test were conducted separately for three areas: Jeera, Zaza, and Taknes. The test was performed on the distribution of animals classified by type (mammals), with the resulting p-values being 0.8117, 0.4631, and 0.8129, respectively. Similarly, for Aves, the p-values were 0.7780, 0.7457, and 0.5665, respectively. It can be concluded that the distribution of animals in all three areas does not follow a normal distribution. Table (2).

However, for reptiles, the p-values for the two areas (Taknes and Zaza) were found to be 0.0026 and 0.0418, respectively, indicating that reptiles do follow a normal distribution in that area. Table (2).

c- Ecological index.

When it comes to the variety of mammal species, research has shown that the number of species in habitats is generally linked to the stability of the ecosystem. An increase in biodiversity leads to greater habitat stability. The Simpson index is a scale that ranges from 0 to 1. As the value approaches zero, diversity increases infinitely.

Ds results of the three study sites that there are significant differences in the Simpson index (Ds), which is the dominance index. It was found that the location of the Jeera region is the most diverse and abundant, and its value is (Ds = 0.14) for the diversity of habitats. This diversity is inversely proportional, the higher its value, the lower the diversity.

It is followed by the second quadrate of Wadi Zaza, which is similar in its characteristics of diversity to a large extent to the first square of Jeera, where its value was (Ds = 0.15) for the diversity of habitats.

As for the quadrate of the Taknes area, its value according to the Simpson index of dominance was the least diverse (Ds = 0.2), Hence, this indicator is biased towards the most abundant species in the habitat.

To reach an agreement in the previous values of the three areas, the Simpson index is used on them (D. Gini. S = 1-D). An increase in the value of the Simpson Index for habitat diversity is an increase in biodiversity.

$SDI = 1 -$he biodiversity habitats of Jeera quadrate and it was estimated (0.86), followed by Wadi Zaza (0.70), while the Taknes quadrate had the lowest value (0.48) in the diversity of habitats.

Table (3). Biodiversity indicators for study areas (Taknes, Jeera, and Zaza).

Species	Region	Simpsons index D	Simpson's index 1 - D	Simpson's reciprocal index 1/D	Richness index	Evenness index
Mammals	Jeera	0.14	0.36	7.14	1.8	0.9
	Takes	0.2	0.48	5	1.61	1.07
	Zaza	0.15	0.7	6.6	1.64	1.2
Reptilians	Jeera	0.4	0.6	2.5	0.95	0.67
	Takes	0.47	0.53	2.13	0.96	0.63
	Zaza	0.25	0.75	4	0.98	0.91
Aves	Jeera	0.22	0.78	4.54	1.17	0.72
	Takes	0.17	0.83	4.17	1.2	0.95
	Zaza	0.24	0.67	5.86	1.1	0.98

To overcome the problem of the ˝axiomatic ˵nature of the Simpson index, the coefficient 1/D is used, which is the Simpson reciprocal index, in which the upper limit of the index is the number of species in the area of study.

The Simpson reciprocal coefficient of mammal habitats was found to be 7.14 in Jeera, 6.6 in Wadi Zaza, and 5 in Taknes. This suggests that Jeera has the highest value of species richness and abundance, followed by Wadi Zaza and then Taknes.

Based on the results obtained for reptiles at three sites, we can conclude that there is a variation in the diversity of species in reptilians. The Wadi Zaza region is the most diverse and abundant with a habitat diversity value of (Ds=0.25). Jeera and Taknes come in second place with a value of (Ds=0.4) and (Ds=0.47) respectively. Although the percentage of diversity is lower, it is still considered significant and similar to the great diversity of reptile habitats in general.

According to the analysis using the Simpson index, we have found that the Wadi Zaza zone has the highest biodiversity value in habitats of reptiles. Its estimated value is 0.75. The second-highest value was found in Jeera, with a value of 0.6. On the other hand, the least diversified area was the quadrate of the Taknes zone, with a value of 0.53. Table (3).

The Simpson reciprocal index is to used measure the diversity of reptiles in different areas. The analysis shows that the Wadi Zaza area has the highest value of the Simpson Mutual Index (4), indicating that it is the most diverse and abundant in species. Jeera and Taknes come next with values of 2.5 and 2.13 respectively, which are close to each other. This confirms that the Wadi Zaza zone has more species diversity than the other areas.

Regarding the diversity of species in Aves, analysis using the Simpson index showed that the Taknes region had the highest diversity, with a value of Ds = 0.17. The Jeera region had a diversity value of Ds = 0.22, making it the second most diverse region. Finally, the Wadi Zaza region had the highest diversity value of Ds = 0.24.

Based on the Simpson Aves Index, Wadi Zaza, Jeera, and Taknis have almost equal and close values, respectively (0.67), (0.78), (0.83). This indicates that they have a diverse biological presence between them, with species richness and abundance in equal proportions. The values for Wadi Zaza, Jeera, and Taknis are (4.54), (4.17), and (5.86), respectively. Table (3).

DISCUSSION.
From the study of biological biodiversity (Jeera, Wadi Zaza, Taknes), it is noted that the higher percentages of biodiversity are in the Wadi Zaza region.

All the areas suffer from anthropogenic pressure, but it is less severe in Wadi Zaza than in the rest of the study zones, and therefore we can say that the percentage of biodiversity in the Wadi is attributed to the dense vegetation and topography of the deep wadies that are inaccessible in many parts, and in general they form safe heaven and shelters in the form of refugial sites for the animals, as well as transit areas of migratory path for birds during migration seasons. (Xu et al., 2022).

Hence, we find that the stand of Taknes consists of less dense vegetation than the two other stands (Jeera and Wadi Zaza), and for this reason, this led to the fluctuation of the percentage of biodiversity that preserves wildlife in particular and the topographic nature which is in the form of high elevation above sea level. Here is mentioning the lack or scarcity of vegetation as we gradually move south, towards the southern study region, which constitutes a more arid environment with more severe human activities, that led to the deterioration of the nature of biodiversity. (El-Barasi et al., 2011) (El-Barasi & Saaed, 2013)**.**

Among the factor that affects biodiversity and wildlife are the proximity of the sea coastal region and the density of vegetation and thus are considered important attracting factors, for some types of aves.

However, there is some similarity in the vegetation concerning (Jeera and Wadi Zaza) stands, but they differ in the density of human activities. It is denser in Jeera stand which in turn has an impact on the biodiversity.

In general, we conclude that there are dense human activities in the study zone, and the wildlife is affected by it in particular. Compared to the rest of the results obtained, Wadi Zaza has the highest percentage in the distribution of all animals due to its dense vegetation and inaccessibility (El-Barasi & Saaed, 2013).

It also found that there is in common population factor between (Jeera and Taknes) due to the presence of dwelled centers, which completely differs from Zaza stand, and the intensity of the activities is equal between them (Jeera and Taknes), but there is an attraction factor to Jeera with a higher percentage because it is located near other dwelled centers (Rajma, Boomariyama , and El-Abyar), and therefore these activities are represented in the form of pollution, solid waste, and rising domestic animals and other agricultural activities, and turn, they constitute attraction factors for wild animals especially some reptiles, due to the availability of nutritional requirements, so we find that the proportion of reptiles, in general, is very high, especially turtles in the two area.

(Essghaier et al., 2015) stated that vegetation plays a major role in increasing the gatherings of wild animals, especially aves, whose availability is based primarily on the density of the vegetation, compared to desert environments that have widespread and non-dense vegetation, and thus a decrease in the number of bird nests.

This coincides with the results that, dense vegetation has an impact on Fauna, especially in the Wadi Zaza area, in the form of higher rates of biodiversity, especially birds and the formation of birds' nests. We find that the percentage of Aves is high in this site, because of its vegetation and topography, which makes it difficult to access.

It is worth noting that geographical location plays an important role in the distribution of animals as well as human activities. The area of (Jeera) is located as an intermediate area between several nearby areas with a higher population density, where the diversity of occupations varies, including agriculture, raising domestic animals, hunting, agricultural fires, and others, which directly affect the region by accessing the surrounding forests (Jeera) and destroying vegetation and wildlife, which in turn affects the availability of nutrients that are helpful for the survival and reproduction. According to (Doak et al., 1998) the variation in the characteristics of the environmental community is measured over time. (McCann, 2000) Stability is a measure of flexibility and resistance, that is, the ability of the ecosystem to return to a state of balance after any imbalance and resistance to violations, so the flexible system is more stable.

Jeera and Taknes are located geographically south of the Zaza zone, where there are many keystone species, especially the ***Canis anthus*** , which constitutes one of these anchor species due to its close relationship with wildlife and other prey. In addition to its relationship with vegetation, especially the ***Juniperous phoenice (L)*** plant, which contributes to its distribution by feeding on its seeds and feeds on some other animals such as ***Lepus capensis barceus***, ***Hystrix cristata***, etc., and thus constitutes a kind of biological control of the fauna and vegetation. In the absence of ***Canis anthus***, whether by the decrease in number or migration to other sites, it may affect the distribution of some plants like ***Juniperous phoenice*** (L)., which in turn affects the natural balance of the ecosystem services, and this is consistent with what was stated by (Stiling, 2012).

If the anthropogenic pressure continues in the region in an ever-increasing manner, especially the urban expansion of the two areas (Jeera, Taknes), which are expanding areas at the expense of the natural vegetation and fauna, by increasing the activities of hunting animals, agricultural activities and deforestation, and thus it impacts on the environmental balance system in the future, unless appropriate measures are to be taken to save the environment in the form of protected areas.

So, there is concern and fear that the region may reach a point of no return in terms of natural balance, due to the increase in the frequency of human activities, and the ecosystem may not be able to repair or restore (Arms, 1990).

One of the attraction factors of this region is hunting, maybe because it is a limitless hobby in terms of frequency and type of hunting operations. It is practiced continuously throughout the year, and it results in the killing of many animals without discrimination. Sometimes there is poaching, that accurately targets certain species to benefit from their skin, as in the

case of the **Hyaena hyaena L**, **Canis anthus**, **Vulpes vulpes**, and others, which are important animals in the food chain, and thus lead to a decrease in the numbers of these species, which affects the natural environmental balance and the biological control that works to regulate the natural ecosystem (Botkin & Keller, 2007).

The presence of some animals such as birds in the Wadi Zaza area may be because these birds can migrate long distances and may enable them to leave the place and go to other areas or return to their original habitats in other places, and this in turn reduces their numbers and thus decreases their hunting rates.

As for other types of mammals that live in herds searching for food, such as the wolf, fox, hyena, and others, they move in specific areas to search for food and shelter. In an unstable environment, their natural imbalance suffers from a major imbalance. It was brought by (Botkin & Keller, 2007; El-Barasi & Saaed, 2013).

The western race T.g.graeca is listed as "Vulnerable" on the IUCN red list (Groombridge, 1982; Groombridge & Wright, 1982). The designation was applied given the well-recorded mass exportation of animals from North African countries, especially Morocco and Algeria, continuing to the end of the 1970s. Current information is required on the status of remaining wild populations in these countries as well as in Tunisia and Libya. Field studies (Lambert, 1982) reported very low densities over wide areas.

Turtles feed on annual plants, including their seeds, and these seeds accumulate inside the turtle and are activated through a physiological process that consists in its gut and ensures that the germination process in the coming spring is 100%, and the seeds remain there protected from birds and insects and rain and wind. In short, the turtles perform a protection process of seeds on behalf of humans, until the life cycle is complete. Moreover, **Testudo greaca** in these zones is exposed to mass exportation.

Turtles face the threat of extinction, as they are smuggled in large numbers, and the smugglers consider them a great source of income for them. It is well known fact, that turtles have a very limited reproduction rate, as they take a long period to reproduce.   Urban expansion and assaults on forests threaten their existence in nature.

During this research in the Wadi Zaza zone about 1,600 turtles were recovered on their way to be smuggled out of Libya. They were resettled in the Libyan forest in the Esqafa and the El Kouf reserve in the El-Jabal El-Akhdar, as their area of existence extends from the Wadi Zaza area, after Dariana, to Shahat in the El-Jabal El-Akhdar. After isolating the patient from them, and feeding them well. During the resettlement we put them in the bushes and separate them, we do not put them in small groups so that they are not found easily.

It requires awareness of the importance of turtles in preserving the environment and the annual vegetation in Libya. Through the media and the use of social networking sites, awareness can be spread to clarify the importance of turtles, as they are a mobile seed store. If they are eliminated, the vegetation will be affected.

To preserve turtles and other animals from extinction, their habitats must be preserved and restored (McCann, 2000).

Conclusion.

The study improves our understanding of the ecology of wild animals, including mammals, aves, and reptiles, in the areas of Jeera, Wadi Zaza, and Taknes in the northeastern part of the El-Jabal El-Akhdar.

There is dense anthropogenic pressure in the region of various studies in general which affects the wildlife. Wadi Zaza turns at the highest rate of distribution of all animals, and high rates of biodiversity especially birds, due to its dense vegetation.

It is worth mentioning, the very high proportion of reptiles in the study zone. ***Canis anthus*** constitutes one of the most important anchor species due to its close relationship with wildlife and prey, in addition to its relationship with vegetation, especially ***Juniperous phoenicuae***,***lepus capensis barceus***, ***Hystrix cristata***, constitutes a kind of biological control to either the fauna or the vegetation.

Increasing the activities of hunting animals, agricultural activities, and deforestation, and thus impacts the ecological balance system in the future, unless appropriate measures are to be taken to save the environment in the form of protected areas.

The evaluation shows that even after human activities intensify over the entire study area, forests still serve as important habitats for wild animals, such as birds, including those with high conservation values such as doves and wild partridges, mammals such as anchor ***Canis anthus***, ***Hyaena hyaena L***, ***Hystrix cristata***, ***Lepus capensis barceus***, ***Vulpes vulpes***, and ***reptiles***. like ***Testudo greaca***.

Our findings highlight the importance of proper management at the level of improving the biodiversity of wild animals in the study area by preserving the vegetation cover. In addition, we believe that urgent action is needed to stop further conversion to other land uses, particularly industrial and agricultural use. Including those areas that have been already encroached upon by logging, they should be integrated into the networks of protected areas in Libya.

One of the most distributed species that made it at risk of extinction is ***Testudo greaca***. It is the type, that is not considered to be associated with a specific study area. It is widely spread due to the availability of its nutritional requirement in all places, therefore, makes it vulnerable to extinction due to the human pressure that raises it to commercial level.

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