Sustainability and Biodiversity Conservation

Extreme climate conditions and loss of faunal biodiversity in the rainforest zone of Abeokuta, Ogun State, Nigeria

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Abstract

Based on Scientific Consensus (NASA, 2022), it is no longer a debate that the climate has changed, is changing, and will continue to change. One of the most conspicuous aspects of contemporary global change is the rapid decline of biodiversity in many ecosystems. This research focuses on the effect of climate change on biodiversity in the Abeokuta South Local Government Area of Ogun State. It further identified the amount of temperature, sunshine, relative humidity, and rainfall; determining the occurrence of animal species; examining existing interrelationships among the animal species and the climatic elements; and establishing a projection pattern of animal life in the study area. The required data for the study are rainfall amount, maximum and minimum temperature, relative humidity, and sunshine hours between 1988 and 2023. Both descriptive (charts, mean, and standard deviation) and inferential statistics (Time Series Analysis, Regression, and Correlation Analysis) were used for data analysis. The results show that the grasscutter (0.716) and Bush rat (0.648) have a strong positive relationship with relative humility, while there are negative relationships between grasscutter (-0.578, antelope (-0.569), bush rat (-0.588), and rabbit (-0.563) with sunshine, respectively. Changes in climate over the past 30 years have resulted in a significant decrease in the occurrence of the animal species in the study area. It was further projected that the current trend of temperature (33.6^{0}C), and with its negative relationships with animals (-0.492, -0.442, -0.453, -0.339 and -0.429), it is possible that

animal species would be in extinction as a result of further and more complex changes in climate in years to come. The study concludes that various activities such as felling of trees and urbanization, to mention but a few, result in the emission of carbon dioxide (CO_2) and other greenhouse gases into the atmosphere, which in turn increases the temperature of the Earth's surface. This increased temperature is, however, detrimental to animal survival, as well as to human health. The study, however, recommends that residents of the study area and every other related environment be educated on the importance of environmental conservation, which focuses on restoration projects, sustainability practices, and community engagement.
Keywords: Climate change impact, Biodiversity, Human Impact, Species extinction, Environmental conservation

Introduction

Biodiversity is one of the important key drivers of ecosystem functions. An increase in biodiversity loss has significant impacts on both human and environmental security. The extreme climate condition has direct impacts on the ecosystem, especially the gradual extinction of global species. Aside the habitat fragmentation, natural disasters, overexploitation by humans, and pollution, which enforce evolutionary changes in their members, climate change has now become another environmental threat to the living conditions of many fauna species in the environment today. The International Union for Conservation of Nature (IUCN, 2024) observed that over 44,000 species are threatened with extinction, which could mean that over 2,000 more than in the previous years. Extinction is a product of environmental forces that results in a diminished number of species in an environment. The recent rate at which the heat increases is alarming. The heat condition is becoming more critical in urban areas of many developing countries. No doubt, the current environmental condition has subjected most species around the world to huge pressure. According to the International Fund for Animal Welfare (IFAW, 2024), the Earth is now about 1.1°C (2°F) warmer than it was in the 1800s. Based on current projections, global temperatures will rise by 2.7°C (4.8°F) by the end of the century. In another study, Kevin et al (2000) observed that the amount of carbon dioxide in the atmosphere has increased by more than 30% since the beginning of the Industrial Revolution, due to industry and the removal of forests. In the absence of controlling factors, projections are that concentrations will double from per-industrial values within the next 60 to 100 years. Carbon dioxide is not the only greenhouse gas whose concentrations are observed to be increasing in the atmosphere from human activities. The most important other gases are methane, nitrous oxide, and the chlorofluorocarbons (CFCs) (Kevin et al, 2000). Climate change is attributed directly or indirectly to human activity, and it is usually observed over time (Gabriele et al., 2019). The anticipated adverse effects or impacts are equally attributable to natural activities, which affect the environment and human health; food security, economic activities, natural resources, physical infrastructure, culture, and agriculture, which is considered the most vulnerable (Lang et al, 2007). The loss of biodiversity is largely caused by atmospheric changes, especially those associated with air pollution and climate change. While air pollution directly damages organisms and disturbs biological processes, climate change modifies habitats and ecosystems, resulting in the displacement and extinction of species. From individual species to large ecosystems, these impacts are seen at many different levels. The atmosphere is a mixture of different gases and aerosols (suspended liquid and solid particles) collectively known as air. Air consists mostly of nitrogen (78%) and oxygen (21%). However, despite their relative scarcity, the so-called greenhouse gases, including carbon dioxide and methane, have a dramatic effect on the amount of energy that is stored within the atmosphere, and consequently, the Earth's climate. These greenhouse gases trap heat within the lower atmosphere that is trying to escape to space, and in doing so, make the surface of the Earth hotter. Thus, it becomes a necessity to examine the past trend of occurrence of biodiversity and then examine the influence of climate change on animal life and to provide preventive measures that promote mitigation of or adaptation to climate change to guarantee biodiversity's long-term survival and well-being, conservation strategies concentrate on safeguarding, maintaining, and managing it. This combines community engagement, sustainable resource management, and in situ and ex-situ conservation initiatives. According to the Millennium Ecosystem Assessment (2008), climate change now poses one of the principal threats to the biological diversity of the planet, and is projected to become an increasingly important driver of change in the coming decades. There are several reasons why plants and animals are less able to adapt to the current phase of global warming. One is the very rapid pace of change: it is anticipated that over the next century, the rise in average global temperatures will be faster than anything experienced by the planet for at least 10,000 years (Leadley et al, 2010). Many species will simply be unable to adapt quickly enough to the new conditions, or to move to regions more suited to their survival. Equally important, the massive changes humans have made to the landscape, river basins, and oceans of the world have closed off survival options previously available to species under pressure from a changing climate. IPCC (2001) estimates that 20 to 30 percent of assessed plants and animals could be at risk of extinction if average global temperatures reach the projected levels by 2100. Evolution would have to occur 10,000 times faster than it typically does for most species to adapt and avoid extinction. A 2011 study found that in response to warming temperatures, species are moving to higher elevations at an average rate of 36 feet per decade and to higher latitudes approximately 10 miles per decade, though individual species vary in their rates. The diminishing of the Earth`s biological diversity has consequences more profound than other, sometimes more widely recognized, environmental dilemmas (Marsh et al, 1996). Because the loss of biodiversity is irreversible, species that are lost are lost forever; the potential impact on the human condition, on the fabric of the Earth`s living systems, and the process of evolution is immense (Evans & Gaston 2005). Climate change is an added stress to already threatened habitats, ecosystems, and species in Africa, and is likely to trigger species migration and lead to habitat reduction. Up to 50% of Africa's total biodiversity is at risk due to reduced habitat and other human-induced pressures (Boko et al, 2007). The current loss of biodiversity has several causes (McNeely et al.,1990; Scott et al., 1993). The direct destruction, conversion, or degradation of ecosystems results in the loss of entire assemblages of species. Overexploitation, habitat disturbance, pollution, and the introduction of exotic species accelerate the loss of individual species within communities or ecosystems. More subtly, selective processes arising directly and indirectly from human activities can result in the loss of genetic variability (Scott et al., 1993). Exploitation, habitat alteration, the presence of chemical toxins, or regional climate change may eliminate some genetically distinct parts of a population, yet none cause the extinction of entire species (Reid & Miller, 1989). In the past, when human activities slowly altered limited areas of the Earth`s surface, the rate of local extinctions was barely distinguishable from the natural background rate. The rate at which we lose species stands at 1,000 to 10,000 times greater than the background rate (Wilson & Peter, 1988). As further noted by Robinson (1988), we are destroying irreplaceable species on an unprecedented scale without regard for their economic, aesthetic, or biological significance. The current estimates of the Earth`s total species diversity range from 10 million to 100 million (Robinson, 1988; Ehrlich & Wilson, 1991; Erwin, 1983). One-half of the total species diversity of the Earth may be found in the tropical forests and is, therefore, threatened by their destruction or degradation. If current trends continue, almost all the tropical forests will be severely damaged or reduced to small patches within the next few decades, resulting in the extinction of many as yet unknown plant species (Raven, 1988). In order to determine the impacts of climate on the loss of fauna biodiversity in the rainforest zone of Abeokuta South Local Government Area, Ogun State, Nigeria, this study examined the relationships between the monthly temperature, rainfall, humidity, and sunshine, and the incidence of animal extinction between 1988 and 2023.

Material and methods

Study Area

Abeokuta lies on latitude 7°9'39" N and longitude 3°20'54" E. It is the largest city and the state capital of Ogun State (Fig. 1). It is situated on the east bank of the Ogun River, near a group of rocky outcrops in a wooded savanna; 77 kilometers (48 miles) north of Lagos by railway, or 130 kilometers (81 miles) by water. The city has an area of 879 km2 (339 sq miles), a density of 510/km^2 (1,300/sq miles). The city has a tropical climate. When compared with winter, the summers have much more rainfall. This location is classified as Aw by Koppen and Geiger. The Köppen climatic classification "Aw" denotes a tropical wet and dry climate, known as a tropical savanna climate. There is a noticeable dry season in the winter and a wet season in the summer, which defines this climate type. The temperature here averages 27.1 °C. Precipitation here averages 1238mm. The state has two main types of vegetation, namely tropical rainforest and guinea savanna. Abeokuta lies within the tropical rainforest, as well as other coastal areas in the state. The state has two main rock types. These are the basement complex rocks of the Precambrian age, which are made up of the older and younger granites in the northern parts of the state and the younger and older sedimentary rocks of both tertiary and secondary ages in the southern parts. The geology of the state comprises the sedimentary and basement complex rocks. Soils in Ogun State are varied according to the geological history and soil formation processes in different localities. The soil groups for the study area are the Arenosols, Leptosols, Lixisols, and Nitisols. All soil types have unique traits that affect the biodiversity of their fauna. A wide variety of invertebrates that are suited to dry and nutrient-poor environments can be found in arenosols, or sandy soils. Because of their short depth and rocky composition, leptosols—shallow soils over rock—may have a limited fauna. A varied soil fauna that has adapted to the leaching process and nutrient availability can be found in lixisols, or soils with a high leaching potential. Due to their structure, biological activity, and nutrient availability, nitisols—deep, well-drained soils with clay accumulation—tend to have a large and varied soil fauna. The people of Abeokuta are of the Yoruba ethnic group and have a population of 449,088 (National Population Commission, 2006). The people of Abeokuta engage in tye and dye; Ankara materials. They also engage in quarrying as they are a major producer of limestone. The main way that quarrying operations contribute to climate change is by increasing greenhouse gas emissions from the energy used to extract, transport, and process quarried materials. Furthermore, quarrying-related biodiversity loss and the degradation of natural carbon sinks might worsen the effects of climate change in this area. Agriculture is the main occupation of the people.

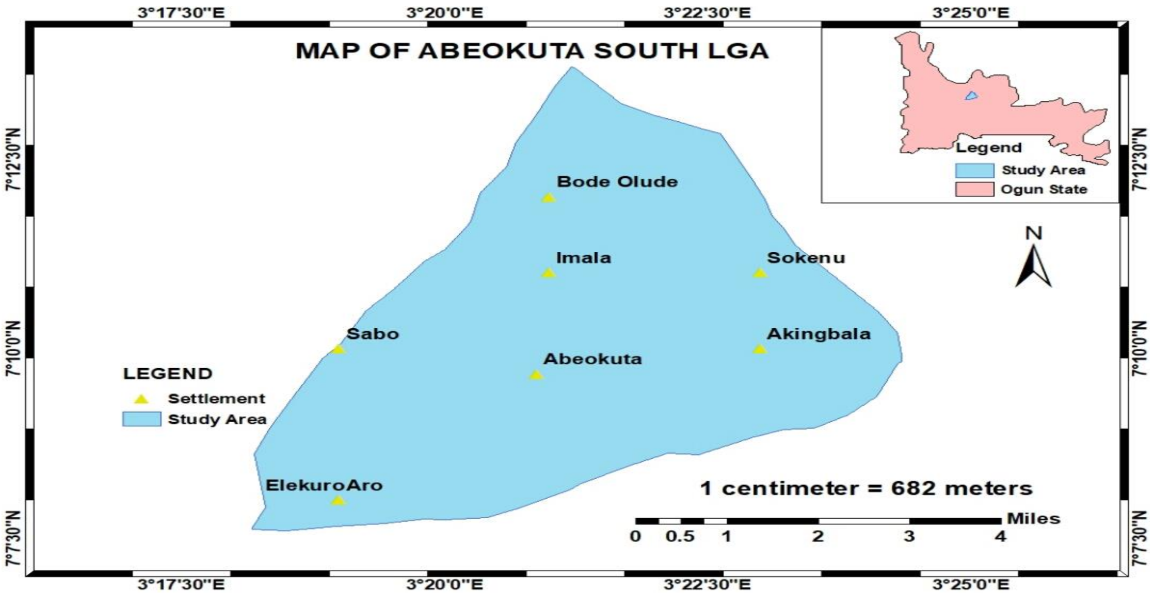

Figure 1. Map of Abeokuta South Local Government Area
Source: Ogun State Ministry of Land and Survey, 2022

The data acquired for this research are climatic data (maximum and minimum temperature, rainfall, relative humidity, and sunshine hours) and data on the trend of animal life in the study area between the years 1988 and 2023. The inventory of animals spanning the same period was based on the existing data on animal life collected from the Department of Forestry, Federal University of Agriculture, Alabata, Ogun State, Nigeria. The climatic data were sourced from the archival records of the Nigerian Meteorological Agency (NIMET), Abeokuta, Ogun State. Descriptive statistics (Mean, Standard deviation, Tables, and Charts) and Inferential Statistics that include Time Series Analysis, Regression, and Correlation Analysis were used for data analysis. By analyzing historical climate data gathered at regular periods, time series analysis is a potent tool for evaluating long-term climate patterns. This approach aids in the discovery of trends, cycles, and other patterns in climate variables like precipitation and temperature. The regression statistical tool establishes the direction and intensity of correlations between climate variables and biodiversity loss scientifically. It forecasts how variations in climate factors (such as temperature and precipitation) may affect biodiversity indicators like species richness or extinction rates using statistical models.

Results

Climatic Variables

Table 1 shows the mean and standard deviation in the change of the climatic variables (Relative humidity, minimum and maximum temperature, sunshine hours, and rainfall) between the years 1988 and 2023.

Table 1. Descriptive Statistics of the Climate Variables

Climatic Parameters	N	Minimum	Maximum	Mean	Std. Deviation
Relative humidity (%)	37	78.1	84.7	81.50	1.566
Minimum temperature	37	21.1	24.9	23.59	0.74
Maximum temperature	37	31.1	33.6	32.44	0.55
Sunshine hours	35	4.0	5.5	4.73	0.38
Rainfall (mm)	37	59.4	161.6	108.61	23.20

Source: Author's fieldwork, 2023

Table 1 is a summary of the descriptive statistics of the climatic variables in the study area. It is shown that the change in Relative humidity at 09 hours (%) has a mean of 81.50 with a standard deviation of 1.57. Also, a change in minimum temperature has a mean of 23.589 with a standard deviation of 0.73. Furthermore, a change in maximum temperature is shown to have a mean of 32.44 with a standard deviation of 0.55. Sunshine hour was shown to have a mean of 4.73 with a standard deviation of 0.38. Rainfall (mm) was also shown to have a mean of 108.605 with a standard deviation of 23.2. As observed by NOAA (2022), global average temperatures in 2022 were 0.86°C (1.55°F) higher than the 20th-century average. This shows an increase in climate change in the current times. In a related study by NOAA (2022), the warmest year on record since records began in 1880 was 2016, with 2020 ranking second. In 2020, global average land temperatures experienced a record high, while 2016 global ocean temperatures remain the highest on record. The nine warmest years on record since 1880 have all occurred within the last nine years (2014-2022), and in

2022, annual global temperatures were above average for the 46th consecutive year (NOAA, 2021).

Occurrence of Animal Species in the Study Area

Table 2 revealed the range in the occurrence of the mean of animal species found in the study area, as well as the standard deviation.

Table 2. Descriptive statistics of the animal species

Animal Species	N	Minimum	Maximum	Mean	Std. Deviation
Tryonomys swinderianus (Grasscutter)	37	182	1250	572.70	336.754
Eudorcas thomsonii(Antelope)	37	30	754	403.68	221.896
Rattus fuscipes (Bush rat)	37	420	2142	1115.49	507.980
Pyton regius (Royal python)	37	180	820	521.49	213.531
Oryctalogus cuniculus (Rabbit)	37	584	1900	1340.70	396.301

Source: Author's fieldwork, 2023

Table 2 further revealed that *Tryonomys swinderianus* (Grasscutter) has a mean of 572.70 with a standard deviation of 336.75. Also, Eudorcas thomsonii (Antelope) is displayed to have a mean of 403.68 with a standard deviation of 221.89. *Rattus fuscipes* (Bush rat) is also shown to have a mean of 1115.49 with a standard deviation of 507.98. *Pyton regiu*s (Royal python) is also displayed to have a mean of 521.49 with a standard deviation of 213.53. The *Oryctalogus cuniculus* (Rabbit) is shown to have a mean of 1340.70 with a standard deviation of 396.301. These particular species of animals were chosen for analysis based on the availability of data.

Linear trend model of animal species between 1988 and 2023

This explains the observed pattern of occurrence of the various animal species found in the study area between 1988 and 2023. This variation has been partly responsible for changes in the climatic conditions that favor the optimum growth and survival of these animal species in the study area. However, Bell (2010) observed factors that include habitat loss, pollution, invasive species, and over-exploitation are equally a cause of habitat destruction, leading to decreased populations and increased risk of extinction.

Pattern of *Tryonomys Swinderianus*

Figure 2 displays the time series analysis using ordinary least squares. The result of the trend line equation is given as y = 1136.5 – 29.67×t. There is a significant decrease in the occurrence of *Tryonomys swinderianus* (Grasscutter) from the year 1988 and 2023. *Tryonomys swinderianus* is a major source of food. It is the most preferred meat in the major parts of Abeokuta. This implies that a decline in *Tryonomys swinderianus* will result in food scarcity if not properly checked. Researchers observed that the meat is widely consumed in Nigerian rural and urban areas by people of all socioeconomic backgrounds (Onyeanusi et al., 2008; Odebode et al., 2011; Owen & Dike, 2012; Etchu et al., 2012). Through its domestication, the meat not only aims to make up for the lack of animal protein in the country, but it may also provide small-scale farmers, rural residents, investors, and businessmen with financial incentives and much-needed informal jobs (Mensah & Okeyo, 2005; AbdulAzeez, 2011).

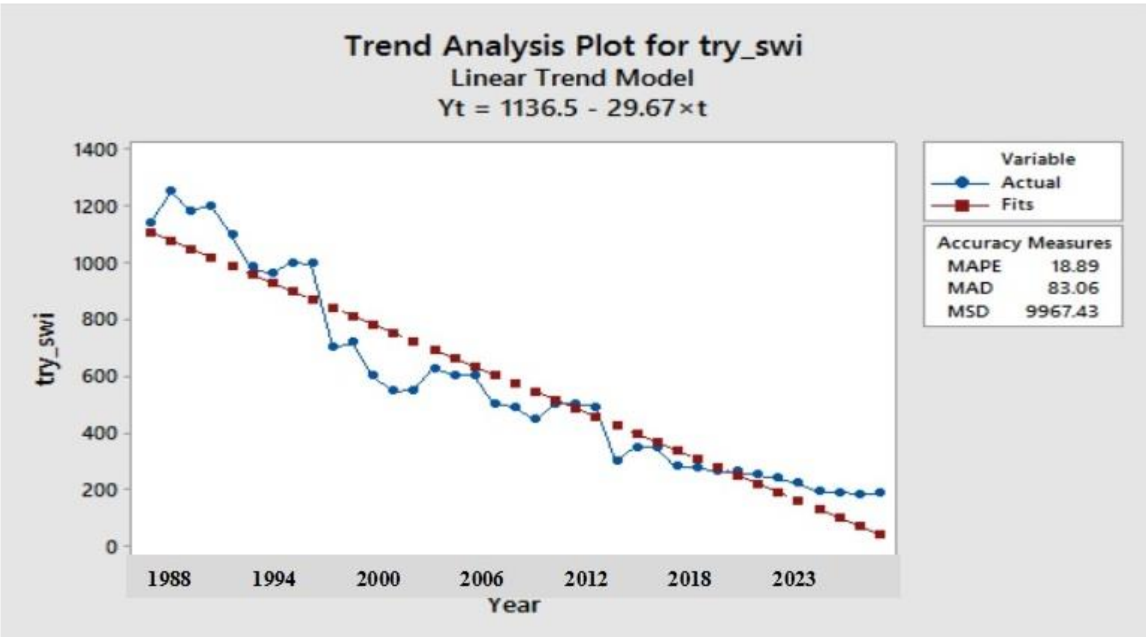

Figure 2. Pattern of *Tryonomys swinderianus*

Pattern of *Eudorcas Thomsori*

In Figure 3, the result of the trend line equation is given as y = 788.6 – 20.261×t. This shows a significant decline in the occurrence of *Eudorcas thomsori* from 1988 – 2023. *Eudorcas thomsori* is mainly hunted for food. This implies that a decline in *Eudorcas thomsori* will result in food scarcity in the study area. The sale of wildlife for meat generates millions of US dollars in government revenue in West and Central Africa (Davies, 2002). *Eudorcas Thomsori,* often known as wildlife meat, is a popular meaty delicacy in Africa (Golden, 2009; Kuukyia et al., 2014). Bushmeat is a direct, high-protein source and a flexible source of income for the majority of rural residents in West and Central Africa (Okiwelu, 2009; Tee et al., 2012). Bushmeat consumption and trading are also accepted as normal and a component of regional customs and cultural identity (Vliet et al., 2014). Bushmeat is mostly made from wild animals, especially antelopes (Fa et al., 2002; Wildaid Report, 2021).

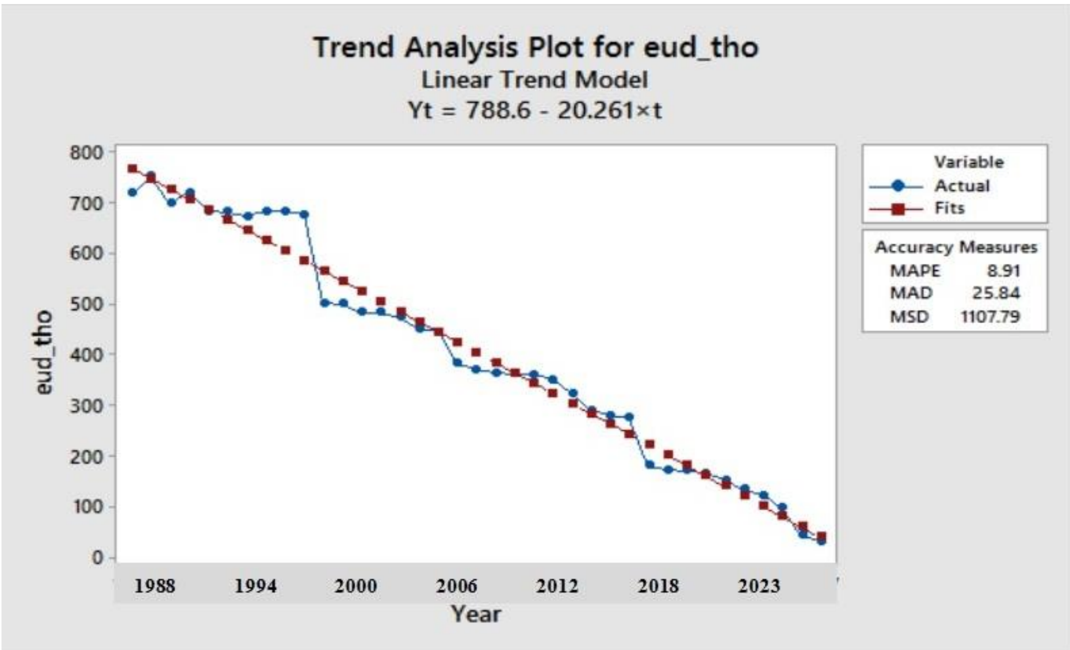

Figure 3. Pattern of Eudorcas thomsori

Pattern of *Rattus Fuscopes*

The slope is -46.28, which is interpreted as the decrease in *Rattus fuscopes* for a unit increase in year, based on the result of the trend line equation given as y = 1994.7 – 46.28×t. This result implies a significant decrease in the occurrence of *Rattus fuscopes* over the years. *Rattus fuscopes* serves as a major source of food in the study area, and its decline will affect food security in the study area. Some indigenous and rural African groups may consume more than 80% of their animal protein from bushrat meat, which they view as a staple or dietary supplement (Wilkie & Carpenter, 1999). Although a large portion of the bushrat trade is unregulated, it is vital to both local and national economies (Fig. 4).

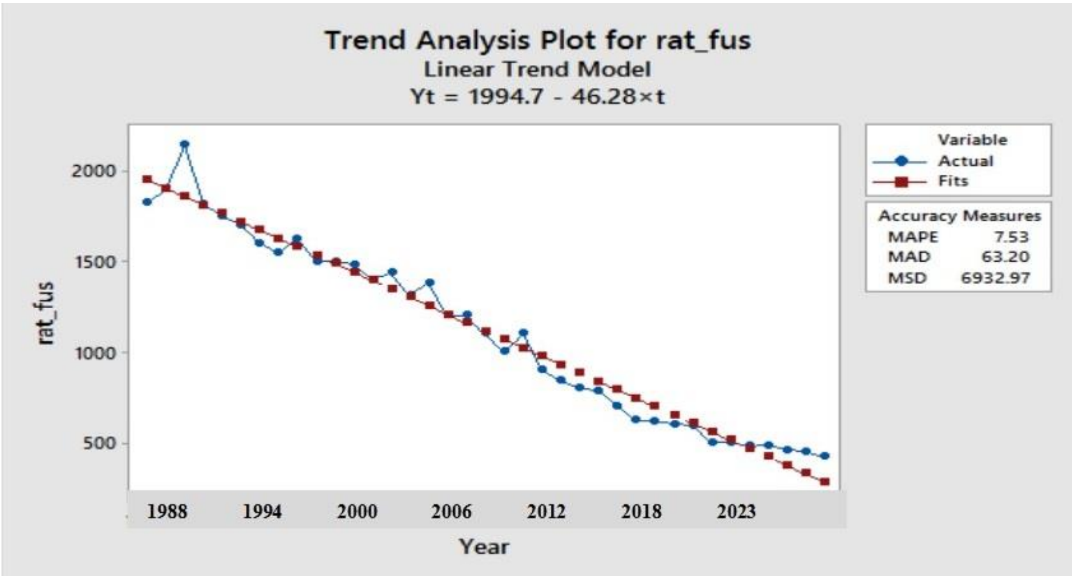

Figure 4. Pattern of *Rattus fuscopes*

Pattern of *Pyton Regius*

The result of the trend line equation is given as y = 883.5 – 19.052×t. There is a significant decrease in the occurrence of *Pyton regius* from 1988 and 2023 (Fig. 5). *Pyton regius* is another major source of food in the study area. This implies that a decline in *Pyton regius* will result in food scarcity and traditional values in the study area if not properly checked. For instance, traditional healers and indigenous cultures in West Africa use a variety of animals for medical and magical-religious purposes, including attracting people, finding love, and warding off evil (Loko et al. 2019; Assou et al. 2021). For instance, people frequently look to pythons (Python spp.) for protection from witchcraft (D'Cruze et al. 2020c). Because they are more approachable than medical professionals with university degrees, especially in rural regions, belief-based healers are reportedly frequently consulted in several African nations (Williams, 2007; Williams & Whiting, 2016). Pythons have been observed in greater numbers in sacred sites in several West African cultures; this is believed to be due to traditional taboos and regulations that have probably helped with animal conservation (Toudonou, 2015). Hunting and trading ball pythons can contribute significantly to local livelihoods and offer both rural and urban populations in West Africa economic opportunities (D'Cruze et al. 2020a). Unsustainable harvesting, however, can negatively affect wild snake populations and long-term local livelihoods, making biodiversity conservation more difficult (Janssen, 2021).

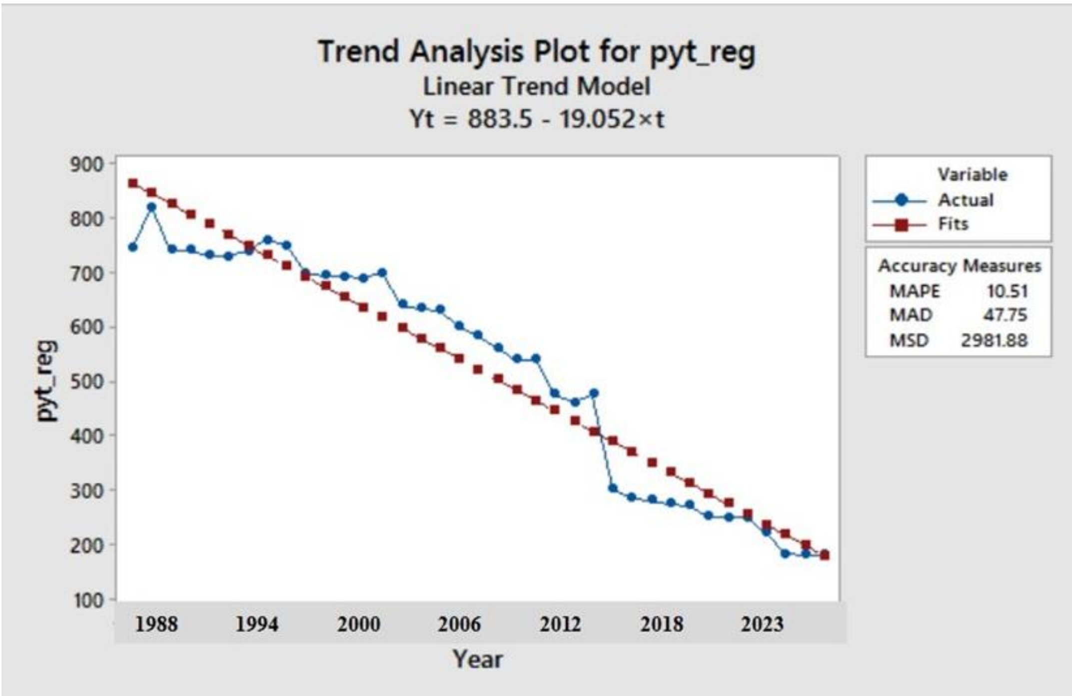

Figure 5. Pattern of *Pyton regius*

Pattern of *Oryctalogus Cuniculus*

The result of the trend line equation is given as y = 2023.7 – 35.95×t (Fig. 6). There is a significant decline in the occurrence of *Oryctalogus cuniculus* from 1988 and 2023. *Oryctalogus cuniculus* is an important source of food in the study area. This implies that a decline in *Oryctalogus cuniculus* will result in food scarcity in the study area if not properly checked. With its high protein content, low fats, low cholesterol, sodium, and calories, as well as its high nutritional value—which includes phosphorus, iron, zinc, riboflavin(B2), thiamin(B1), cobalamin (B12), and niacin(B3)—rabbit meat is a great choice for people with hypertension (Okorie, 2011). The aforementioned qualities of this animal have made it one of the underutilized livestock species in developing nations, where it may be the most appropriate and sustainable way to produce high-quality meat (protein) to address the lack of animal protein in the diets of people in developing economies (Okorie, 2011).

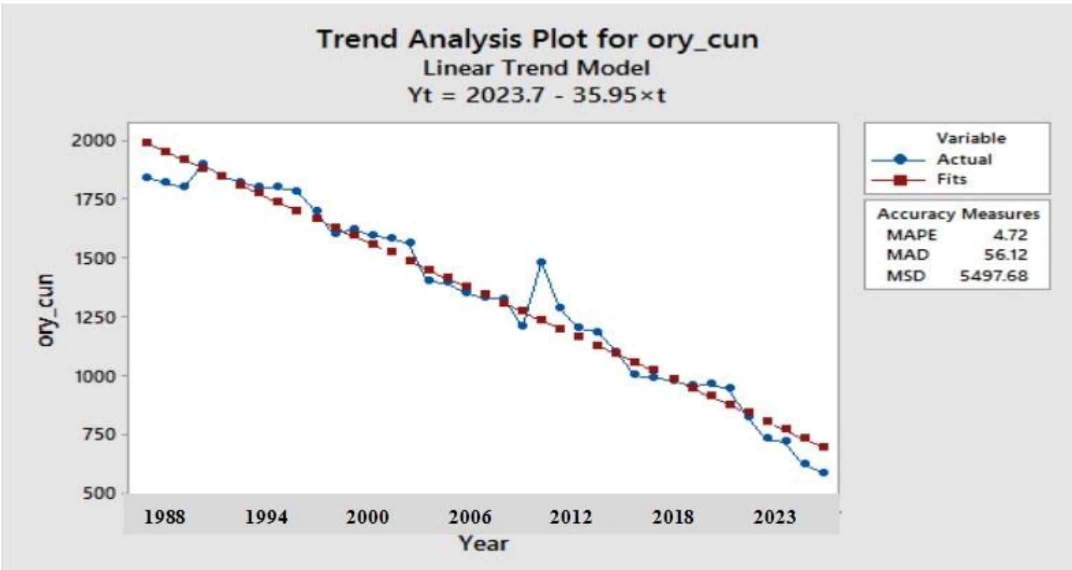

Figure 6. Pattern of *Oryctalogus cuniculus*

Interrelationship among the animal species and climatic elements

Relationship among the animal species

Table 3 shows the correlation coefficient among the animal species. From the table, it is shown that all the animal species have a strong positive correlation with each other since the correlation coefficient is greater than 0.7. Also, the correlation coefficients are shown to be significant at a 0.05 significance level since their p-values are less than the significance level. The high correlation values (e.g., $\rho = 0.956$ between *Eudorcas thomsori* and *Rattus fuscopes*) is an indication of a common ancestor that was recently shared by the allied species of rat and rabbits. Although both species are classed in the same order, the rat is a rodent, and the rabbit is a lagomorph—they are also members of the superorder Glires, which originated around 82 million years ago (mya) (Hedges et al., 2015). Equally, this study established a correlation between Bushrat and Python at p=0.957, mainly because of their nutrition and possible interactions. In their native African environments, royal pythons, also called ball pythons, naturally eat tiny rodents, such as bushrats. Royal pythons and rabbits are also correlated, particularly concerning predation. According to McCleery (2015), even though royal pythons are usually smaller snakes, they can still feed on smaller rabbits, especially those that are young or weak. Adult rabbits may also be preyed upon by larger constrictor snakes, such as boas, and pythons have been known to reduce marsh rabbit numbers.

Table 3. Relationship among the Animal Species of the study area

ITEMS		TRYONOMYS SWINDERIANUS (Grasscutter)	EUDORCAS THOMSORI (Antelope)	RATTUS FUSCOPES (Bush rat)	PYTON REGIUS (Royal python)	ORYCTALOGUS CUNICULUS (Rabbit)
TRYONOMYS SWINDERIANUS **(Grasscutter)**	P	1				
	p-val					
EUDORCAS THOMSORI **(Antelope)**	P	.956	1			
	p-val	.021				
RATTUS FUSCOPES **(Bush rat)**	P	.951	.969	1		
	p-val	.002	.003			
PYTON REGIUS **(Royal python)**	P	.883	.955	.957	1	
	p-val	.021	.045	.046		
ORYCTALOGUS CUNICULUS **(Rabbit)**	P	.920	.980	.956	.971	1
	p-val	.034	.021	.034	.052	

Source: Author’s fieldwork, 2023

Interrelationship among the animal species and the climatic elements

Table 4 shows the Pearson correlation coefficient and p-value of the relationship between climate change and animal species. The relationship between the relative humidity and the animal species shows that there is a positive correlation between them, and the correlation coefficients are shown to be significant at a 0.05 significance level since their p-values are greater than the significance level. The relationship between the minimum temperature and the animal species shows that there is a negative correlation between them, and the correlation coefficients are shown to be significant at the 0.05 significance level since their p-values is less than the significance level. The study revealed that animals are impacted by minimum temperatures in ways that impact their survival, behavior, and metabolism. Cold stress can affect growth, reproduction, and general health by lowering activity, lowering metabolic rates, and possibly damaging the immune system, especially when paired with additional environmental conditions like wind or rain. In order to survive the cold, animals have developed a number of adaptations, such as improved insulation, metabolic acclimation, and behavioral modifications. The relationship between the maximum temperature and the animal species shows that there is a positive correlation between them, and the correlation coefficients are shown to be significant at a 0.05 significance level since their p-values are greater than the significance level, which is significant at p-value less than the significance level (0.05). The relationship between the sunshine hours and the animal species shows that there is a negative correlation between them, and the correlation coefficients are shown to be significant at a p-value less than the significance level (0.05). The negative correlation could be a result of the influence of solar radiation on the ambient temperature, which directly impacts how animals regulate their body temperature, and also the way solar radiation exacerbates heat stress in animals, especially during hot seasons. The relationship between the rainfall and the animal species shows that there is a weak negative correlation between them, and the correlation coefficients are shown to be insignificant except for *Rattus fuscopes* and *Python regius,* which are significant at a p-value less than the significance level (0.05). Rattus fuscopes and Python regius are significantly affected because rats frequently seek cover indoors during rainy seasons, while snakes, particularly those used to dry climates, may become more active and roam around in search of food or potential partners. Rainfall can also have an impact on snake populations by influencing the availability of prey. In a study by the National Research Council (2009), both current and previous warming have impacts on the biological timing (phenology) and geographic range of plant and animal communities.

Table 4. Relationship between the climatic variables and the animal species

Animal Species	Significant level	**RELATIVE HUMIDITY at 09 HOURS (%)**	**TMIN**	**TMAX**	**SUNSHINE HOURS**	**RAINFALL (mm)**
***TRYONOMYS SWINDERIANUS* (Grasscutter)**	P	.062	-.492	.246	-.578	-.274
	Sig. (2-tailed)	.716	.002	.142	.002	.100
***EUDORCAS THOMSORI* (Antelope)**	P	.142	-.442	.308	-.569	-.298
	Sig. (2-tailed)	.403	.006	.063	.000	.073
RATTUS FUSCOPES (Bush rat)	P	.078	-.453	.327	-.588	-.362
	Sig. (2-tailed)	.648	.005	.048	.006	.028
PYTON REGIUS (Royal python)	P	.132	-.339	.329	-.486	-.335
	Sig. (2-tailed)	.436	.040	.047	.003	.043
ORYCTALOGUS CUNICULUS (Rabbit)	P	.119	-.429	.298	-.563	-.297
	Sig. (2-tailed)	.483	.008	.074	.003	.074

Source: Author's fieldwork, 2023

Five-year projection on the pattern of animal life in the study area

Table 5 shows the pattern of occurrence of animal life in the next five years. From the table, it is shown that there is a decline in the occurrence of animal life as the years increase. It envisaged that both *Tryonomys swinderianus* and *Eudorcas thomsori* would go into extinction as a result of more complex climate changes and increased human exploitation of the environment. These animal species serve as food to the residents of the study area.

This implies that the extinction of these animal species in the next five years, if not properly checked, will result in a scarcity of food. However, the domestication of wild animals under well-monitored climatic conditions could help in meeting human needs. In its projections, IUCN revealed that about 18% of all species on land will face a high risk of going extinct at the increased rate of global temperatures by 2°C in 2100. Also, more sensitive animals will fare even worse, with over 30% of insect pollinators and salamanders facing high risks in this projection. In a similar trend, deforestation, habitat loss, and overexploitation are some of the causes of the alarming trend of animal extinction in Abeokuta and Nigeria at large. The situation may terribly affect *Tryonomys Swinderianus and Eudorcas thomsori* to a large extent.

Table 5. Pattern of occurrence of animal species in the next five years

YEAR	*Tryonomys swinderianus*	*Eudorcas thomsori*	*Rattus fuscopes*	*Pyton regius*	*Oryctalogus cuniculus*
2019	8.928	18.7117	236.225	159.491	657.703
2020	-20.744	-1.5495	189.948	140.439	621.755
2021	-50.417	-21.8108	143.671	121.386	585.808
2022	-80.089	-42.0721	97.394	102.334	549.861
2023	-109.761	-62.3333	51.118	83.281	513.913

Source: Author’s fieldwork, 2023

Conclusion

It has been established that the current rate of climate change has a detrimental effect on the local fauna of the study area. Specifically, it envisaged that both *Tryonomys swinderianus* and *Eudorcas thomsori* would go into extinction as a result of more complex climate changes and increased human exploitation of the environment. The projection trend also reflects a decline in animal existence as long as the natural habitats are continuously disturbed by various activities of man. This loss, however, is bound to be detrimental because of the distortion in the natural ecosystems and their services to human societies. Aliyu et al. (2014) noted that constant felling of trees by man is an example of what results in the emission of strong greenhouse gases such as carbon dioxide (CO_2), methane, nitrous oxide into the atmosphere, thereby leading to increased temperature on the Earth's surface. According to Global Forest Watch (2024), in 2020, Abeokuta had 46 ha of natural forest extending over 0.66% of its land area. In 2023, it lost 1 ha of natural forest, equivalent to 3.44 kt of CO_2 emissions. The current weather conditions are unfavorable for the optimum survival of the animal species, resulting in their migration and extinction in the study area. The study therefore recommends minimizing loss in biodiversity through conservation policies that will focus on restoration projects, sustainability practice, and community engagement with a view to strengthening wildlife preservation in the study area and other related environments. These conservation programmes would reduce human disturbances to biodiversity.

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