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A comprehensive study on the population dynamics of stray dogs, wild foxes, and rodents in the western desert of Egypt

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ABSTRACT

Stray dogs, foxes and rodents contribute to serious health problems in human societies around the world. Before any necessary interventions to control them, an accurate estimate of their populations should be attained. This study investigates the population dynamics of dogs, foxes, and rodents in the western desert regions at Kalabsha, Umbaraka, Razzak, and Abu Gharadig localities from June 2022 to February 2024. Monthly observations revealed that 1447 dogs were sighted, with a trap index peaking at 22.7% in July 2022 and declining to 2.0% in August 2023. Fox sightings were less frequent, with notable peaks in Autumn 2022 and Spring 2023. Rodent captures exhibited a substantial peak in July 2022 (59.14%), followed by a decline to a low in May 2023 (5.0%). Seasonal and regional variations in sightings can be due to the influences of environmental factors and human activities. Abu Gharadig and Razzak consistently reported higher dog and rodent sightings, while Kalabsha and Umbaraka documented more fox sightings. The statistical analyses show significant differences in abundance across the investigated localities for dogs ($p<0.048$), foxes ($p<0.005$), and rodents ($p<0.001$). The diversity indices indicated moderate species richness and evenness, with Simpson's Diversity Index at 0.576 and Shannon's Diversity Index at 0.699. These findings highlight the complex interactions between the investigated species and their environments, emphasizing the need for tailored conservation and management strategies. The results highlight the need for a science-based policy to control and manage their populations in the study areas as well as in other localities of Egypt.

Keywords: Population dynamics, stray dogs, wild foxes, rodents, western desert, Egypt

INTRODUCTION

The presence of stray dogs, wild foxes, and rodents in public spaces and desert environments holds significant ecological and public health implications (Allen *et al.*, 2018). Stray dog populations may experience rapid growth due to a variety of factors, including the accessibility of sustenance, the absence of predators, the scarcity of competitors and the simplicity of locating a reproductive companion (Miklosi, 2008; Gill *et al.,* 2022). The increase in the population of stray dogs is mainly facilitated by the presence of accessible solid wastes and rubbish dumps (Dias *et al.,* 2013) and the percentage of stray dogs is higher at rubbish dumps than elsewhere (Wandeler *et al.,* 1993; Markandya *et al.,* 2008). Derived from the Canidae family, domestic dogs, including the Egyptian Baladi (Native) dog,

which exhibits a diverse mix of breeds and behaviors, coexisting with humans across various landscapes (Mahdy and Mohamed, 2022).

The widespread increase in the number of stray dogs, which is expected to be over 200 million worldwide, highlights the pressing need for efficient management approaches to reduce the spread of diseases and conflicts between humans and animals (WOAH 2023). In areas such as Egypt, where there are a high number of stray dogs and local authorities often use culling methods to manage the increase of their populations, however this may have negative effects on the environment (King *et al.,* 2004). Moreover, the increase of untamed flesh-eating animals into human living areas, caused by alterations in their natural environment and the growth of cities, emphasises the intricate relationship between wildlife and human actions via unregulated migration across borders (El-Tholoth *et al,* 2015).

Wild foxes play a vital role in the ecosystem balance, however they serve as reservoirs for diseases such as rabies and canine distemper viruses, posing risks to both human and animal populations. According to WHO (1997), rabies in red foxes poses a public health concern in the Middle East, including Egypt. Red foxes are commonly found throughout Egypt and are considered highly adaptable mammals that can thrive in various habitats (Saleh, 1993; Stuart and Stuart, 2017). The remarkable adaptability of the Red fox stems from its ability to consume a wide range of foods in different habitats (Basuony *et al.,* 2005). In general, foxes have an omnivorous diet, consuming small mammals, reptiles, birds, fish, insects, and a variety of fruits (Fedriani *et al.,* 2000; Mohallal, 2018).

In desert landscapes, the rivalry between feral canines and indigenous vulpines escalates because of few provisions, resulting in territorial disputes and competition for sustenance. Human settlements, together with their additional sources of food such as rubbish or livestock, worsen these dynamics, highlighting the need for a thorough understanding of the interactions between wildlife and human activity (Mohallal, 2018).

In addition, rodents, which are often found in agricultural environments, provide considerable difficulties owing to their destructive actions and ability to transmit diseases (Shoukry *et al.,* 1991; El Kady *et al.,* 2007; El Bahrawy *et al.,* 2008). Efficient rodent control measures are essential for reducing economic losses and minimising public health hazards linked to rodents. Rodents have a significant impact on human health and well-being (El Gindy *et al.,* 1987). They have accompanied humans to every corner of the globe, transmitting dangerous zoonotic illnesses to them, including plague, murine typhus, rickettsial infections, cutaneous leishmaniasis, trichinosis, toxoplasmosis, and others. They have been studied by several researchers (Shoukry et al., 1993; Morsy *et al.,* 1982, 2000; El Kady *et al*., 1998; Reeves *et al.,* 2007).

Therefore, obtaining a thorough comprehension of the population dynamics and interconnections between stray dogs, wild foxes, and rodents is essential for offering useful insights to conservation efforts, and to develop sustainable strategies for living in arid environments and protect biodiversity.

MATERIALS AND MTHODS

Study area:

This study was conducted at four localities: Kalabsha (30°32'26.7"N 26°05'34.1"E), Umbaraka (30°49'26.2"N 26°28'36.0"E), Razzak (30°32'13"N 28°30'05"E), and Abu Gharadig (29°47'35.3"N 28°33'12.3"E) close to the

Khalda Petroleum Co. (KPC) (Fig. 1). The company's primary operational region is situated in the Western Desert of Egypt .

Fig. 1. The study site (Google Earth 2023.)

Animals monitoring:

The methodology employed in the study for canines was direct enumeration that conducted by Katica *et al.* (2017). This includes visual inventory of the inhabitants within a designated area for a predetermined duration. Notwithstanding the challenge of quantifying every animal in each geographical area, the collected data could potentially be utilized to approximate the total population of stray canines. Seven days throughout the investigation, daily activities were commenced at the same time. Photographs have been used to prevent duplicate estimates and tables for individual identification, the daily tally of dogs was conducted. The aggregate of the daily counts of newly acquired canines over a period of seven days was utilized to determine the final tally of all animals. By employing specialized enclosures, the proficient staff apprehended the stray canines and humanely transported them to the nearest animal shelter. Seven consecutive nights of fox activity were monitored via direct enumeration during the night and early morning in the area where canines were detected.

Fifty wire box traps with new baits were employed to catch the rats, according to Desoky (2015). These traps were placed in every instance quite near to the walls, with a distribution of 10 meters between each trap (Hussien, 1991). During the study period, the traps were erected and left up for seven nights at each location every month.

Data analysis:

Population abundance of animals in different sites were determined monthly for 7 nights of each location from Jun-2022 till Feb-2024 inclusive.

Indices calculation:

Trap index was estimated according to Asran *et al.,* (1985) and El-Deeb *et al.* (1999) as follows: trap index = number of trapped or seen animals / no. of trap nights.

Estimation of stray dogs, fox and rodent populations based on the identification probability of each animal seen in each visit according to Özen *et al.* (2016).

Species Diversity

The Shannon Diversity Index (Shannon and Weaver,1949):

$H = -\Sigma pi \times ln(pi)$

where:

Σ: A Greek symbol that means "sum"

ln: Natural log

pi: The proportion of the entire community made up of species i

The Shannon Equitability Index "evenness (Pielou, 1966) :

$EH = H / ln(S)$

H: The Shannon Diversity Index

S: The total number of unique species

This value ranges from 0 to 1, where 1 indicates complete evenness.

Simpson's Diversity Index (Simpson, 1949):

$D = \Sigma ni(ni-1) / N(N-1)$

The significance level of $P < 0.05$ was used for all the statistical tests, and the results were presented as means±SE. The statistical software SPSS 19.0 (IBM Corporation) was used for all the analyses.

RESULT

Tap index:

The prevalence of dogs in the western desert has been meticulously recorded in Kalabsha, Umbaraka, Razzak, and Abu Gharadig. It was obvious from Table (1) that during the study period, an average of 1447 dogs were seen each month, with an average value of trap index of 9.84 during the investigated 21 month. The dog % indicator exhibited monthly fluctuations in sightings, ranging from 2.00% to 22.71%. Abu Gharadig and Razzak consistently reported a higher number of dog sightings compared to Umbaraka and Kalabsha. In February 2024, there were the greatest number of sightings overall. In contrast, May 2023 had the lowest number of sightings overall, except for Abu Gharadig, which had its lowest number of sightings in August 2023.

For foxes, Kalabsha and Umbaraka frequently documented the highest number in comparison to Razzak and Abu Gharadig. Razzak exhibited significant variations in observed fox populations over various seasons, with particularly elevated levels in Autumn 2022 and comparatively reduced numbers in future seasons. Abu Gharadig routinely documented fewer observed foxes in comparison to other regions, with many seasons registering no sightings. Umbaraka exhibited significant fluctuations in the observed fox population, with elevated numbers between the winter of 2022-2023 and spring of 2023 (Table 1).

Abu Gharadig consistently recorded the greatest tally of captured rats and mice over most seasons. Razzak also documented significant captures, namely between Autumn 2022 and Winter 2023-2024 .Umbaraka and Kalabsha consistently reported lower rodent capture rates compared to Razzak and Abu Gharadig, with occasional fluctuations observed between seasons.Abu Gharadig had notably elevated numbers between Autumn 2022 and Winter 2023-2024 (Table 1).

For dogs, the trap index demonstrates a nuanced pattern, with notable peaks in July 2022 (22.71) and January 2024 (9.71), potentially reflecting seasonal variations or shifts in population dynamics. Interestingly, there's a gradual decline from July 2022 onwards, reaching a low point in August 2023 (2.00), Fox sightings, while less frequent compared to dogs, reveal intermittent peaks, notably in August 2022 (1.00), October 2022 (2.14), and April 2023 (2.43). In the case of rodents, the trap index depicts a distinct trend, with a substantial peak in July 2022 (59.14), followed by a gradual decline until May 2023 (5.00), where the index hits its lowest

point. From June 2023 onwards, there's a slight uptick in rodent catches (Table 1).

Table (1). Monthly abundance of animals recorded in the four investigated localities in the western desert during the study period.

Season	Animals	Recorded Doges		Recorded Foxes		Caught Rodents	
	Month	no	index	no	Index	no	index
Summer	Jun-22	144	20.57	0	0.00	414	59.14
	Jul-22	159	22.71	1	0.14	307	43.86
	Aug-22	127	18.14	7	1.00	291	41.57
Autumn	Sep-22	120	17.14	9	1.29	304	43.43
	Oct-22	100	14.29	15	2.14	241	34.43
	Nov-22	80	11.43	15	2.14	230	32.86
Winter	Dec-22	55	7.86	11	1.57	237	33.86
	Jan-23	67	9.57	9	1.29	206	29.43
	Feb-23	58	8.29	14	2.00	154	22.00
Spring	Mar-23	66	9.43	7	1.00	117	16.71
	Apr-23	50	7.14	17	2.43	93	13.29
	May-23	28	4.00	27	3.86	35	5.00
Summer	Jun-23	23	3.29	5	0.71	47	6.71
	Jul-23	45	6.43	5	0.71	78	11.14
	Aug-23	14	2.00	5	0.71	136	19.43
Autumn	Sep-23	36	5.14	9	1.29	211	30.14
	Oct-23	38	5.43	8	1.14	177	25.29
	Nov-23	28	4.00	6	0.86	231	33.00
Winter	Dec-23	32	4.57	5	0.71	216	30.86
	Jan-24	68	9.71	10	1.43	213	30.43
	Feb-24	109	15.57	5	0.71	181	25.86
	Total	1447	206.71	190	1.29	4119	28.02

animals index = No. of animals /7 trap nights

Estimation of stray dog fox and rodent populations

The estimations of dog, fox, and rodent populations provide valuable insights into the ecological dynamics of the surveyed areas. As shown in Table (2) the mean number of dogs sighted per visit is 17.226 with a standard error of 1.350, suggesting a relatively consistent average population across visits. However, the standard deviation of 12.377 indicates considerable variability in dog populations among the regions visited. Quartile values of 7, 13, and 24 further illustrate this distribution, indicating that 25% of observations have fewer than 7 dogs, 50% fewer than 13, and 75% fewer than 24. The statistical analysis reveals a significant difference in dog abundance across areas ($p<0.048$).

For foxes, the average observed is approximately 2 per visit, with a small margin of uncertainty (0.248) and a standard

deviation of 2.271 (Table 2), suggesting relatively consistent numbers across visits but with some variation among regions. Quartile values of 0, 2, and 4 indicate that 25% of visits recorded no foxes, 50% had a maximum of 2 foxes, and 75% had a maximum of 4 foxes. A significant difference in fox abundance across areas was found ($p<0.005$).

Regarding rodents, the average number recorded per visit is around 49, with a margin of error of 6.207 and a substantial standard deviation of 56.884 (Table 2).

The descriptive statistics of the estimated number of dogs, fox, and rodent in the visited areas indicated significant variation in populations among the surveyed regions. Quartile values of 9, 27, and 73 demonstrate this distribution, with 25% of instances having fewer than 9 rodents, 50% fewer than 27, and 75% fewer than 73. The statistical analysis revealed a highly significant difference in rodent abundance across areas ($p<0.001$).

The diversity indices calculated, including Simpson's Diversity Index (0.576), Shannon Diversity Index (0.699163), and Shannon Equitability Index (0.636405), offer insights into the richness and evenness of species distribution, contributing to a comprehensive understanding of the ecosystem's health and stability.

Table 2. Descriptive statistics of the estimated number of dogs, fox, and rodent in the investigated areas.

Animals	Mean ± SE	SD	Quartiles (Q1 ; Q2 ; Q3)	Sum
Dogs	17.226 ± 1.350	12.377	7;13;24	1447
fox	2.262 ± 0.248	2.271	0;2;3	190
rodent	49.036 ± 6.207	56.884	9;27;73	4119

It was clear from Figure (2) that there was a seasonal fluctuation in number of dogs in the four investigated sites during the whole study period. In Kalabsha, the percentage of dog sightings drops from 6.4% in Summer 2022 to a low of 1.3% in Summer 2023. There is a slight increase in Winter 2023-2024, reaching 2.6%. while in Umbaraka number of observed dogs showed fluctuations with A similar trend of decline is observed, starting from 6.8% in Summer 2022 to 0.7% in Spring 2023 and Summer 2023.It also sees a recovery to 2.6% by Winter 2023-2024. Razzak also experienced fluctuations, with Dog sightings starting at 6.6% in Summer 2022 and decrease to 1.7% by Summer 2023.Sightings in Razzak stabilize somewhat in the following seasons, reaching 2.6% by Winter 2023-2024. Similarly, Abu Gharadig the highest initial percentage (9.9% in Summer 2022) compared to other locations. It drops to a low of 2.0% in Summer and Autumn 2023, but then increases sharply to 6.6% in Winter 2023-2024. Overall, there is a general decrease in dog sightings over the observation period, with fluctuations likely influenced by factors such as migration, changes in population dynamics, environmental changes, and human activities.

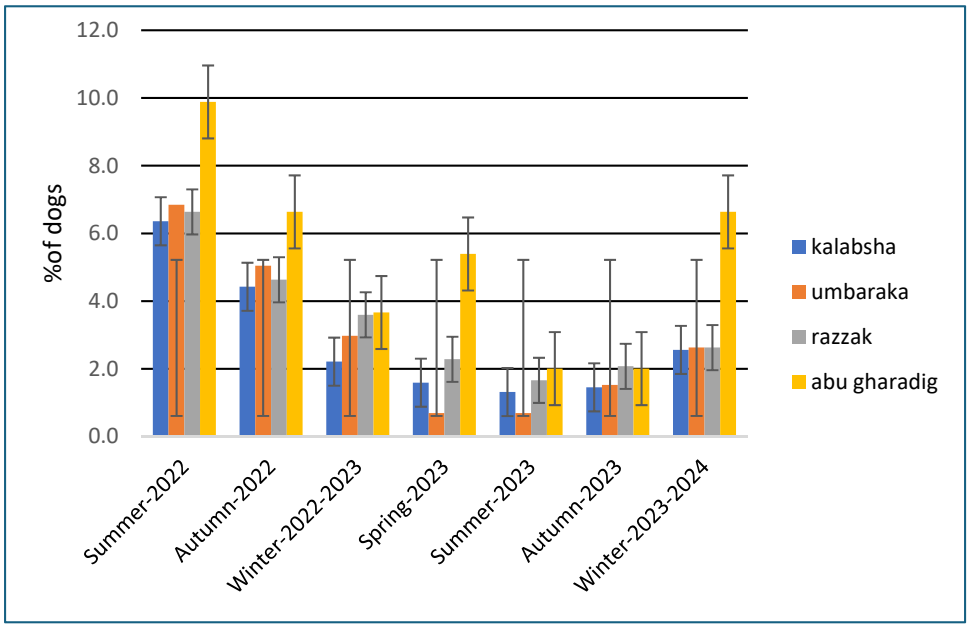

Fig. (2). Percentage of dogs' sightings in various locations over different seasons in study period from Jun-2022 till Feb-2024.

Population fluctuation of animal species at various locations over different seasons:

The percentage of fox sightings in various locations over different seasons varied according to the site and season (Fig.3). Fox sightings appear to peak in certain seasons (Spring for Kalabsha and Umbaraka) and show notable lows in other seasons, particularly in Summer and Autumn 2023. In Kalabsha, Fox sightings increase from 1.6% in Summer 2022 to a peak of 10.0% in Spring 2023. There is a decline to 4.2% in Summer 2023, and further to 3.2% in Winter 2023-2024. Similrly Umbaraka the percentage Starting from a low of 1.1% in Summer 2022, sightings rise to 9.5% in Spring 2023.They remain relatively high at 5.8% during Winter seasons and 4.2% in Autumn 2022. Razzak experienced Sightings start at 1.6% in Summer 2022, rising to a high of 9.5% in Autumn 2022.They then decrease significantly to 0.5% in Summer 2023 and further to 1.1% in Winter 2023-2024. Abu Gharadig consistently shows low percentages of fox sightings, with 0.0% in Summer 2022 and Summer 2023. The highest observed percentage is 5.3% in Spring 2023. Fox sightings display significant fluctuations, There is a clear peak in fox sightings during Spring 2023, particularly in Kalabsha and Umbaraka .the Winter sightings show a mixed trend, with stable observations in Umbaraka but decreases in Kalabsha and Razzak potentially influenced by habitat changes, prey populations, weather, vegetation, and human activities.

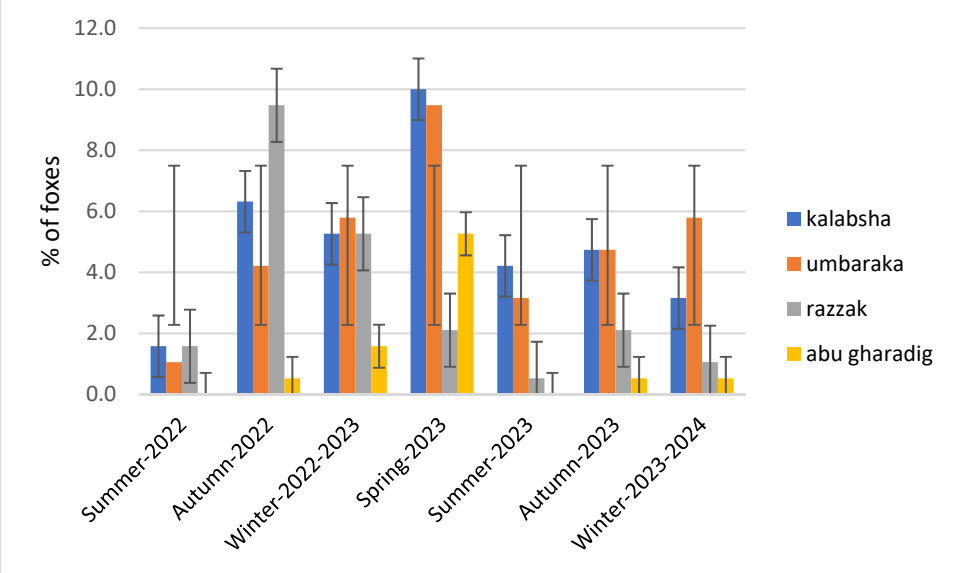

Fig. 3. Percentage of foxes' sightings in various locations over different seasons in study period from Jun-2022 till Feb-2024.

Figure (4) shows that there is a general decline in the percentages of caught rodents across most locations from Summer 2022 to Winter 2023-2024. The lowest capture rates are observed in Winter 2023-2024 across Kalabsha, Umbaraka, and Razzak, while Abu Gharadig shows high capture rates during this period, sudden increase in rodent populations, potentially due to favorable environmental conditions. In Abu Gharadig starts with the highest capture rate of 13.6% in Summer 2022. Although there is a decline, Abu Gharadig maintains relatively higher capture rates, especially noticeable peaks in Autumn 2023 (13.3%) and Winter 2023-2024 (13.8%). These fluctuations may result from factors such as weather, agricultural practices, and pest control measures. In Kalabsha Rodent capture rates start at 2.3% in Summer 2022 and show a declining trend, reaching a low of 0.2% in Winter 2023-2024. Umbaraka showing capture rates are consistently low from Spring 2023 onwards. Starting at 3.9% in Summer 2022, captures decline to 0.3% by Winter 2023-2024. Capture rates in Razzak begin at 4.7% in Summer 2022 and decrease to 0.5% in Winter 2023-2024.

The significant drop-in capture rates in Spring and Summer 2023 across most locations may indicate unfavorable conditions for rodent activity. Winter 2023-2024 shows an unusual trend with Abu Gharadig maintaining high capture rates, which contrasts with the low rates in other locations. The variations in rodent catches across seasons and regions indicate complex interactions influenced by environmental and human factors. Further analysis needed to understand the implications of these fluctuations for the ecosystem and human activities in these areas.

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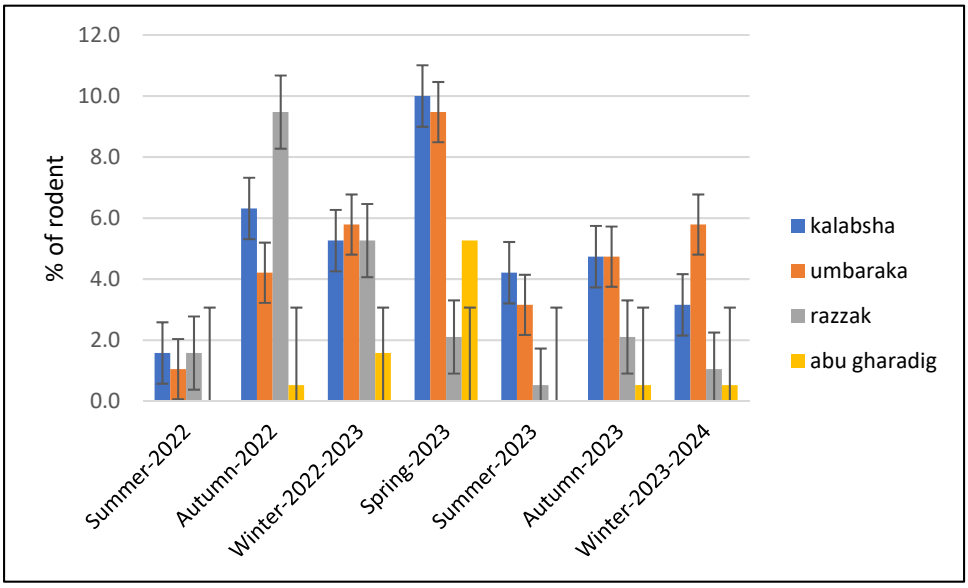

Fig. 4. The percentage of rodent caught from different in locations over different seasons in study period from Jun-2022 till Feb-2024.

DISCUSSION

Dog Populations

The data shows significant variations in the number of dog sightings in different locations of the western desert, as indicated by the trap index ranging from 2.0% to 22.71%. These differences are probably impacted by a confluence of seasonal fluctuations, habitat accessibility, and human activities (Villatoro *et al.*, 2016; Zapata-Ríos and Branch, 2016). Abu Gharadig and Razzak regularly observed a greater number of dog sightings than Umbaraka and Kalabsha, indicating the presence of causes that are distinct to each region. The slight increase in sightings during February 2024 can be attributable to favorable environmental and behavioral conditions, whereas the decrease in sightings in May 2023 may be due to seasonal changes in dog behavior or migration patterns, especially seen in Abu Gharadig during August 2023. It is crucial to comprehend the demographic characteristics of the dog population to assess and forecast the general condition of well-being. This includes identifying factors that may pose risks to health, behavior, and disease outcomes (Gompper, 2014; Anderson *et al.*, 2023).

The inclusion of domestic dogs in the list of the top five invasive species in Egypt presents substantial threats to the indigenous wildlife, which supports the conclusions made by Doherty *et al.* (2017). According to Chundawat *et al.* (2016), the presence of free-ranging dogs has a significant negative effect on wildlife, especially in smaller protected areas. The limited space in these regions worsens the risk to biodiversity. Efficient management of these populations frequently requires implementing contentious strategies such as lethal control or fertility control, with the latter proving to be less efficient in the immediate term (Totton *et al.*, 2010). Although there has been support for more

compassionate approaches such as Trap-Neuter-Release (TNR), however the researches of (Longcore *et al.,* 2009; Woollett 2014) indicated that these procedures have had minimal effectiveness in significantly decreasing the number of free-ranging dogs. Hence, it is crucial to implement complete strategies that involve actively removing and restricting the free-ranging behavior (Belsare and Gompper, 2015).

Population of Foxes

The frequency of fox sightings showed considerable variation, with Kalabsha and Umbaraka consistently reporting higher numbers than Razzak and Abu Gharadig. The fox population in Razzak had noticeable seasonal variations, reaching its highest point in Autumn 2022 and decreasing in the following seasons, possibly indicating breeding or migratory patterns. In contrast, a decrease in the number of fox sightings in Abu Gharadig indicates less suitable environmental circumstances or a higher level of human disturbance. The observed patterns are consistent with the methodology of the relative abundance index, which uses animal signals to estimate population sizes (Caughley and Sinclair, 1994). Nevertheless, according to Dempsey *et al.* (2014), conventional spotlight surveys may not consistently and accurately identify the presence of foxes, particularly during periods of dispersal. The study of fox population dynamics is crucial for developing effective control tactics (Harris and Smith, 1987).

Notably, the relationship between wild dogs and foxes may also be affected by the availability of resources. In places characterized by abundant resources, such as areas with high productivity, wild dogs may exhibit tolerance towards the presence of foxes. This tolerance is likely owing to the availability of ample prey, water, and shelter. In contrast, in locations with limited resources, such as the dry regions of Australia, the phenomenon of competitive exclusion may be more noticeable, resulting in a decline in the number of foxes (Thomson, 1992; Corbett, 1995; Mitchell and Banks, 2005). Empirical observations indicate that there is a relationship between large populations of wild dogs and reduced numbers of foxes. This correlation may be attributed to competition between the two species or the foxes' tendency to avoid areas inhabited by wild dogs. This is supported by studies that have detected foxes in the diets of wild dogs (Newsome *et al.,* 1983; Marsack and Campbell, 1990; McKay, 1994). Nevertheless, there is a scarcity of quantitative research on this inverse correlation, and it is worth noting that other environmental factors could potentially impact the distribution of foxes (Fleming *et al.* 2001).

Population of rodents

The quantity of rodent captures differed greatly among the regions, with Abu Gharadig generally having the greatest numbers. These findings indicate that Abu Gharadig offers ideal circumstances for the rapid increase of rodents, potentially because of a combination of environmental factors including suitable habitat, abundant food supply (Asran, and Abd El Galil, 2018) and reduced levels of predation or human interference. The surge in mouse captures seen during winter 2023-2024 in Abu Gharadig highlights the intricate interaction of various elements, suggesting a potentially ideal mating season affected by good weather conditions.

Conversely, areas such as Umbaraka and Kalabsha recorded diminished rates of rodent collection, potentially due to several circumstances. Habitat suitability differences, such as variations in plant cover

and the presence of nesting sites, are likely to have a substantial impact (Desoky, 2015). Furthermore, changes in pest management methods may have an impact on the number of rodents, as more efficient procedures could potentially result in a decrease in the rate of capturing rodents.

The current results indicated that rodent populations tend to be higher in spring and summer in different areas. This is believed to be due to the greater availability of food during these seasons (Desoky *et al.,* 2014; El-Bakhshawngi, 2020). More precisely, the presence of seeds and grains, which are kept indoors and in cereal granaries, offers ample food supplies that can sustain higher populations of rodents. The availability of these resources is reduced during fall and winter, which could account for the observed decrease in rodent captures during these seasons.

In addition, the diversity indices, such as the Shannon-Weaver and Simpson indices, showed that less disturbed habitats, such as drainage areas, had the highest levels of rodent variety. These ecosystems offer stable conditions with minimal human interference and abundant flora, which support varied populations of rodents. In contrast, urban residences had the lowest diversity indices, most likely because of increased human activity and less favorable living conditions for rats. This pattern aligns with the results of earlier research, which have shown that places with high trap success tend to have lesser species diversity. This is because a few numbers of species that survive in disrupted ecosystems dominate these locations (Prakash *et al.,* 1996; Vipin Chaudhary *et al.,* 2017).

The complex interaction between environmental conditions and the dynamics of rodent populations highlights the necessity for customized management measures. To effectively control rodents, it is important to consider seasonal changes and specific characteristics related to their habitat (Asran, and Abd El Galil, 2018). This will help to reduce any potential dangers to the environment and public health. Implementing intensified pest control strategies at periods of peak breeding and in areas with abundant resources could increase the management of rodent populations.

Significance for Conservation and Administration

The thorough examination emphasizes the complex interactions of dog, fox, and rodent populations in the western desert, which are affected by a blend of ecological causes and human activity. Customized conservation and management techniques that are adapted to the distinct requirements and dynamics of each location are essential for achieving effectiveness. This encompasses not just mitigating the immediate effects of invading species such as unrestrained canines, but also comprehending the seasonal and habitat-specific fluctuations in populations of indigenous species. Consistent monitoring and flexibly managing are essential for fostering biodiversity preservation and guaranteeing sustainable ecological administration in the area. Furthermore, it is important to consider the possible competitive interactions between dogs and foxes, particularly in regions where resources are not consistent, when developing management strategies to minimize negative impacts on fox populations.

Generally, this comprehensive analysis of the three investigated animal populations highlights the complex characteristics of ecological systems in the western desert. By using thorough surveillance and focused control methods, it

is feasible to improve the preservation of biodiversity and guarantee the sustainable cohabitation of animal and human populations.

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دراسة شاملة عن الديناميكية السكانية للكلاب الضالة والثعالب البرية والقوارض في الصحراء الغربية بمصر

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المستخلص

تساهم الكلاب الضالة والثعالب والقوارض في مشاكل صحية خطيرة في المجتمعات البشرية حول العالم و قبل تنفيذ أي تدخلات ضرورية للسيطرة عليها، يجب الحصول على تقدير دقيق لأعدادها. يحقق هذا البحث في ديناميكيات تجمعات الكلاب والثعالب والقوارض في مناطق الصحراء الغربية، وهي كلابشة وأمبراكه ورزاق وأبو غراديق، من يونيو 2022 حتى فبراير 2024. تكشف الملاحظات الشهرية عن أن عدد الكلاب التي تم رصدها هو 1447 كلبًا، حيث بلغ مؤشر المصيدة ذروته عند 22.71% في يوليو 2022 وانخفض إلى 2.00% في أغسطس 2023. كانت مشاهدات الثعالب أقل تكرارًا، مع ذروات ملحوظة في الخريف 2022 والربيع 2023. أظهرت مصائد القوارض ذروة كبيرة في يوليو 2022 (59.14 %)، تلتها انخفاض إلى أدنى مستوى في مايو 2023 (5.00 %). تشير التغيرات الموسمية في المشاهدات إلى تأثيرات من العوامل البيئية والأنشطة البشرية.. تظهر التحليلات الإحصائية اختلافات كبيرة في الكثافة بين المناطق للكلاب($p<0.048$) ، والثعالب ($p<0.005$)، والقوارض .($p<0.001$) تشير مؤشرات التنوع إلى ثراء وتوزيع معتدل للأنواع، حيث بلغ مؤشر التنوع لسيمبسون 0.576 ومؤشر التنوع لشانون 0.699. تبرز هذه النتائج التفاعلات المعقدة بين الأنواع وبيئاتها، مما يؤكد الحاجة إلى استراتيجيات إدارة وحفظ مخصصة. تسلط النتائج الضوء على الحاجة إلى سياسة مبنية على العلم للسيطرة على تجمعاتهم وإدارتها في مصر.