محمية دبي الصحراوية
DUBAI DESERT CONSERVATION RESERVE

Emirates

Baseline Assessment of Nocturnal Reptiles in Dubai Desert Conservation Reserve - DDCR

2025

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1.0 Abstract

The Dubai Desert Conservation Reserve (DDCR) represents one of the most important protected desert ecosystems in the United Arab Emirates, supporting a diverse assemblage of reptile species adapted to arid environments. This study presents a baseline assessment of nocturnal reptiles within the reserve, conducted across 14 survey quadrats using standardized nocturnal visual encounter surveys and supplementary vehicular observations. Surveys were undertaken to document species composition, distribution patterns, relative abundance, and habitat associations of nocturnal reptiles. A total of six gecko species, one Worm lizard species, one diurnal lizard species, and four snake species were recorded during the survey. Species richness and abundance varied across quadrats and habitat types. Reptile occurrence and distribution appeared to be influenced by vegetation cover, substrate characteristics, and the presence of anthropogenic structures. Species such as *Stenodactylus doriae* exhibited high encounter rates and broad distribution across the reserve, whereas other species demonstrated more localized occurrence patterns. The findings provide the first comprehensive baseline dataset for nocturnal reptiles in the study area and establish a foundation for future monitoring, conservation planning, and ecological research within DDCR. Continued long-term monitoring is recommended to assess population trends, habitat use, and potential responses to environmental change and management interventions.

2.0 Introduction

Nocturnal reptiles form an important but understudied component of desert ecosystems. Their activity patterns reflect adaptations to extreme temperatures and limited daytime foraging opportunities typical of arid environments. Despite their ecological roles, knowledge of nocturnal reptiles in the Arabian Peninsula remains fragmentary, and many species have not been surveyed systematically.

The DDCR, the first protected area in the UAE managed as a national park, contains a range of desert habitats capable of supporting diverse reptile communities. Although monitoring programmes exist for mammals, birds, and vegetation, comparable surveys for reptiles - particularly nocturnal species - have not been conducted. The absence of such data restricts assessments of species distributions, habitat use, and conservation needs within the reserve.

Establishing a baseline for nocturnal reptile diversity is therefore crucial. Baseline datasets provide information necessary for understanding community structure, detecting changes over time, and guiding management actions. They are especially valuable in desert environments where habitat pressures and climate variability can affect reptile populations. This study presents the first targeted survey of nocturnal reptiles in the DDCR and aims to document species richness, characterize habitat use, and provide essential information for future monitoring and conservation.

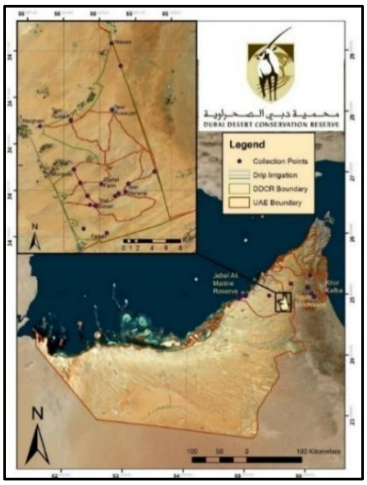


Figure 1.0

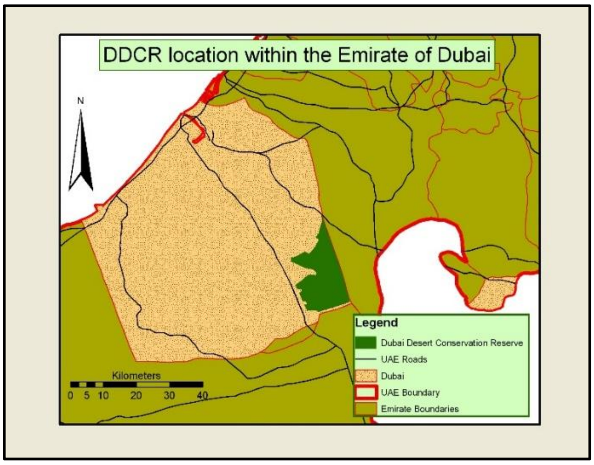


Figure 2.0

Figure 1.0 shows the location of the Dubai Desert Conservation Reserve (DDCR) within the United Arab Emirates **Figure 2.0** Illustrates the position of the DDCR within the Emirate of Dubai.

Family	Species	IUCN Status	Activity Pattern
Trogonophidae	*Diplometopon zarudni*	LC	Nocturnal
Boidae	*Eryx jayakari*	LC	Nocturnal
Typhlopidae	*Indotyphlops braminus*	LC	Nocturnal
Leptotyphlopidae	*Myriopholis macrorhyncha*	LC	Nocturnal
Psammophiidae	*Psammophis schokari*	LC	Diurnal
Colubridae	*Lytorhynchus diadema*	LC	Nocturnal
Psammophiidae	*Malpolon moilensis*	LC	Diurnal
Viperidae	*Cerastes gasperettii*	LC	Nocturnal
	Echis carinatus sochureki	LC	Nocturnal
Varanidae	*Varanus griseus*	LC	Diurnal
Agamidae	*Phrynocephalus arabicus*	LC	Diurnal
	Uromastyx aegyptia leptieni	VU(Global),VU(UAE)	Diurnal
	Trapelus flavimaculatus	LC	Nocturnal
Lacertidae	*Omanosaura cyanura*	LC	Diurnal
	Acanthodactylus gongrorhynchatus	DD	Diurnal
	Acanthodactylus schmidti	LC	Diurnal
	Mesalina adramitana	LC	Diurnal
Gekkonidae	*Hemidactylus turcicus*	LC	Nocturnal
	Hemidactylus flaviviridis	LC	Nocturnal
	Hemidactylus persicus	LC	Nocturnal
	Hemidactylus robustus	LC	Nocturnal
	Trigonodactylus arabicus	LC	Nocturnal
	Stenodactylus doriae	LC	Nocturnal
	Stenodactylus leptocosymbotes	LC	Nocturnal
	Bunopus tuberculatus	LC	Nocturnal
Sphaerodactylidae	*Teratoscincus keyserlingii*	LC(Global),CE(UAE)	Nocturnal
	Pristurus minimus	LC	Diurnal
Scincidae	*Scincus mitranus*	LC	Diurnal

Table1.0

Reptile species known from the Dubai Desert Conservation Reserve (DDCR) based on the reserve's consolidated species inventory derived from multiple data sources, including structured surveys, incidental observations, and historical records.

3.0 Materials and Methods

3.1 Study Area and Quadrat Design

The study was conducted within the DDCR, located approximately 60 km southeast of Dubai City along the E66 between Margham and Al Faqa. Covering 225 km^2, representing 4.7% of the Emirate of Dubai, the DDCR is the largest single land allocation for a conservation project in the region (Gallacher, 2015). Established in 2003 as a joint initiative between Emirates Airlines and the Government of Dubai, it is recognized as the first protected area in the UAE managed under a national park framework, with a core mandate to conserve native flora, fauna, and desert landscapes.

The reserve is enclosed by a 98 km perimeter fence, enabling effective habitat protection and wildlife management. Within the DDCR lies the Al Maha Reserve (AMR), which was originally established in 1999 as a fenced core area surrounding the Al Maha Desert Resort and Spa (Alqamy, 2004)(Figure 3.0). However, the fence was later removed, and the area was integrated into the greater reserve, allowing wildlife to freely roam across a larger, continuous landscape. This transition contributed significantly to improving natural movement, habitat connectivity, and ecological restoration across the DDCR. The AMR has remained free of domestic livestock since its creation, while camels continued to graze across the wider DDCR until their complete removal in December 2008, an important milestone that significantly improved ecological restoration efforts. Historical surveys recorded approximately 1,209 camels in 2004, decreasing to around 600 by 2007 after their gradual relocation from southern areas of the reserve (Simkins, 2004).

The DDCR encompasses five major habitat types typical of Arabian desert ecosystems: rock outcrops, shifting dunes, vegetated dunes, gravel plains, and sandy plains. These features create a heterogeneous desert landscape dominated by low to medium sand dunes interspersed with gravel flats. Elevation ranges from 260 m in the south to 180 m in the north, producing subtle microhabitat variations that support diverse wildlife communities (Maria Jose Martin, 2024). The reserve provides refuge for key desert species, including Arabian Oryx (*Oryx leucoryx*), Sand Gazelle (*Gazella marica*), and Arabian Gazelle (*Gazella arabica*), each playing important ecological roles in the region.

To evaluate nocturnal reptile diversity within the DDCR, 14 quadrats (50 m × 50 m) were established to capture the spatial and habitat variability across the reserve. Quadrat locations were generated using ArcGIS and selected to provide representative coverage of the major habitat types present within DDCR, including sand dunes and gravel plains (Figure 4.0). All quadrats were assigned to one of two broad habitat categories: sand dunes or gravel plains, although several quadrats contained a mosaic of both habitat types. The quadrats were randomly distributed throughout the reserve to ensure broad spatial coverage, using Al Maha Resort as a central reference point, with seven quadrats located north of the resort and seven located to the south. Furthermore, eight quadrats overlapped with existing annual vegetation monitoring sites, providing an opportunity to examine relationships between nocturnal reptile communities and vegetation characteristics.

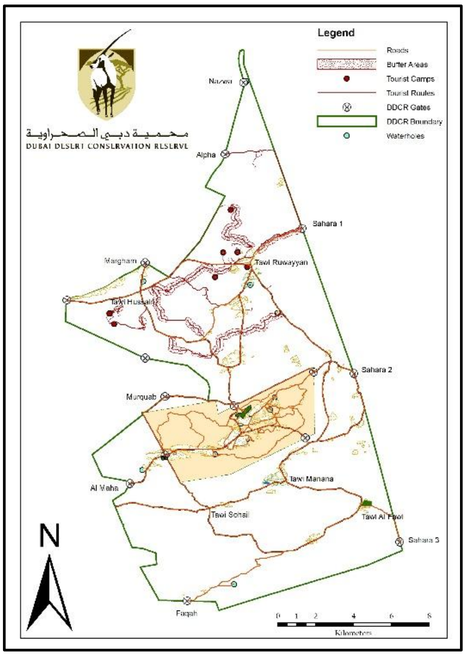


Figure 3.0

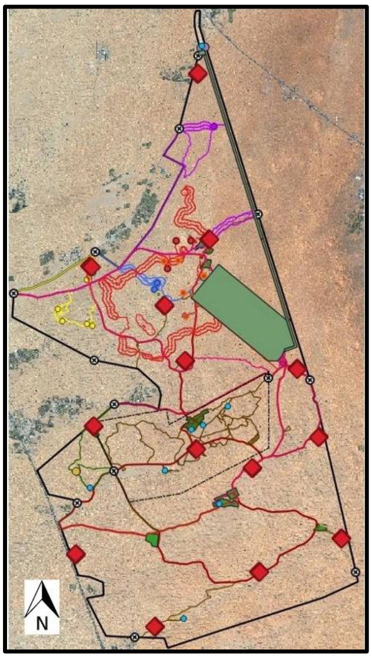


Figure 4.0

Figure 3.0 - Location of the AMR reserve (1999-2003) within the current DDCR map. **Figure 4.0** - Distribution of the 14 survey quadrats established across the DDCR study area.

3.2 Survey Design

Nocturnal reptile surveys were conducted using Visual Encounter Surveys (VES) supplemented by opportunistic observations across representative habitats within the reserve. Surveys were carried out two hours after sunset to coincide with peak activity periods of nocturnal reptiles. Each 50 × 50 m quadrat was surveyed by a single observer walking 26 parallel transects spaced approximately 2 m apart, using high-intensity headlamps and handheld spotlights to detect reptiles. Survey effort averaged approximately 1.3 km per quadrat and was conducted at a slow pace (1–1.5 km/h) to maximize detection probability. To assess seasonal variation in reptile communities, the study was divided into four quarterly sampling periods: January–March, April–June, July–September, and October–December. Each quadrat was surveyed once during each quarter, resulting in four surveys per quadrat annually. Survey dates were randomly selected within each quarter based on surveyor availability and operational requirements, with approximately 14 survey nights completed per quarter.

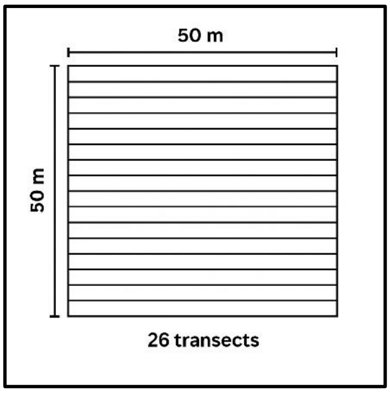


Figure 5.0

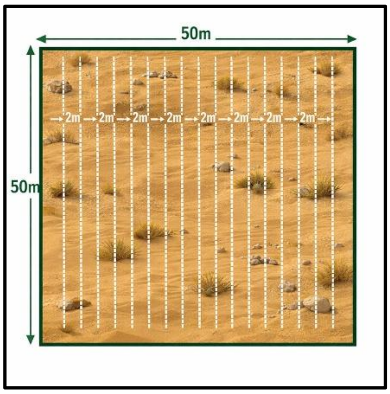


Figure 6.0

Figure 5.0 & Figure 6.0 Sample layout of Survey Quadrat and Associated Transects

3.3 Environmental Data Collection

For each individual reptile encountered during the survey, standardized field data was recorded to ensure consistency in observations. This included geographic coordinates (GPS), date and time of observation, moon phase, ambient air temperature, relative humidity, estimated age class, and observed behaviour. In addition, habitat information was systematically documented at each detection site, including the broader habitat type and associated microhabitat characteristics, such as vegetation cover, rock crevices, burrows, and dune crest features that may influence reptile presence and activity.

Opportunistic observations recorded outside the established transects were incorporated into the dataset only when species identification was unequivocal and the observation occurred within the boundaries of the DDCR. These records contributed to the overall species inventory but were excluded from analyses involving quantitative estimates of abundance or encounter rates.

3.4 Species Identification

Species identification was conducted using regional herpetological field guides and relevant taxonomic references, supplemented by photographic documentation where necessary to confirm diagnostic features. Only individuals that could be confidently and positively identified were included in the final dataset to ensure the reliability of species records.

In addition to direct visual identification, track morphology was also used as a complementary method for species identification, particularly for fossorial and nocturnal snake species that are often difficult to observe directly. For example, the tracks of the sidewinding snake *Cerastes gasperettii* can be readily distinguished from those of the sidewinding *Echis carinatus sochureki* by the presence of distinctive scale drag marks produced by the enlarged supraocular scales of the former. (Figure 7.0 & Figure 8.0)

Figure 7.0 Examples of snake tracks observed and recorded during the survey. **Figure 8.0**

Figure 9.0 Examples of snake tracks observed and recorded during the survey. **Figure 10.**

Figure 7.0: *Cerastes gasperettii*, **Figure 8.0**: *Echis carinatus sochureki,* **Figure 9.0**: *Eryx jayakari,* **Figure 10.0**: *Diplometopon zarudni*

Similarly, the tracks of the sand boa *Eryx jayakari* (Figure 9.0), thread snakes such as *Myriopholis macrorhyncha*, and worm lizards like *Diplometopon zarudnyi* (Figure 10.0) produce characteristic track patterns in loose sand that allow reliable identification. Track-based identification was not applied to geckos, as their tracks are generally less distinctive and require extensive time and field effort to interpret accurately. Given the time constraints associated with nocturnal surveys, gecko species were therefore identified primarily through direct observation and morphological characteristics rather than track evidence.

3.5 Ethical and Regulatory Considerations

No in vivo, in vitro experiments or animal handling were performed. The field study was authorized by the DDCR, with the author participating as a Conservation Ranger. This research was non-institutional and conducted in full compliance with UAE laws, regulations, and biodiversity study protocols. The surveys followed standard ethical practices to minimize disturbance to wildlife and habitats.

3.6 Safety and Risk Mitigation

Appropriate safety measures were implemented throughout all field activities to minimize risks associated with nocturnal surveys and encounters with potentially venomous reptile species. The researcher consistently wore protective safety boots during survey operations to reduce the likelihood of snakebite incidents and other injuries while traversing desert habitats. Direct handling of reptiles was avoided whenever possible, particularly in the case of snakes, and animals were observed and identified without physical contact unless handling was deemed necessary for species identification or immediate safety concerns.

When handling was required, specialized reptile-handling equipment, including snake tongs, snake bite–resistant gloves, and large tweezers, was used to maintain a safe distance between the researcher and the animal. In addition, the researcher carried essential safety and navigation equipment, including a head torch, handheld flashlights, a GPS unit, and a mobile phone. These tools facilitated safe movement during nighttime surveys, enabled accurate georeferencing of observations, and ensured reliable communication and emergency response capabilities during fieldwork conducted within the DDCR.

Figure 11.0

Figure 12.0

Figure 11.0: *Echis carinatus sochureki* well camouflaged and concealed within a shrub, demonstrating its cryptic coloration and reliance on vegetation for cover. **Figure 12.0:** *Cerastes gasperettii* partially buried in sand in an ambush position, a typical behaviour used to remain concealed while waiting for passing prey.

3.7 Data Analysis

There are many diversity indices proposed to describe and compare biological communities. These indices help to explain differences in species composition, abundance, and community structure between habitats, and are therefore important in ecological research, biodiversity monitoring, and conservation studies. However, different indices measure diversity in different ways, and no single index can fully describe all aspects of a community (Morris et al., 2014). Two commonly used diversity indices are the Shannon-Wiener Diversity Index and Simpson's Diversity Index. The Shannon-Wiener Index is considered a Type I index, as it is more sensitive to rare species within the community and reflects both species richness and evenness. In contrast, Simpson's Diversity Index is a Type II index, which is more sensitive to dominant or abundant species and provides information on species dominance and community stability. Using both indices together gives a more comprehensive understanding of biodiversity patterns within the study area.

4.0 Results

A total of 12 reptile species were recorded during the nocturnal baseline survey conducted in the DDCR. The compiled species list includes all reptiles documented throughout the survey period using multiple observation approaches (Table 2.0). These records comprise species detected within established quadrats, outside quadrat boundaries, during vehicular surveys, and through opportunistic observations made in areas outside the designated sampling sites, including built environments and farm areas within the reserve.

For instance, the gecko *Hemidactylus flaviviridis* was recorded on structures associated with the DDCR administrative buildings. Although the primary focus of the survey was nocturnal reptiles, one diurnal species was also encountered during fieldwork. Notably, *Acanthodactylus schmidti* was recorded in two quadrats during the survey period. While this species is primarily diurnal, it has been included in the overall species inventory as it was documented during the survey effort.

Species Name	1St Quarter	2nd Quarter	3rd Quarter	4th Quarter
Stenodactylus doriae	✓	✓	✓	✓
Stenodactylus leptocosymbotes	✓	✓	✓	✓
Trigonodactylus arabicus	✓	✓	✓	✓
Bunopus tuberculatus	✓	✓	✓	✓
Cerastes gasperettii	✓	✓	✓	✓
Eryx jayakari	*x*	✓	✓	✓
Echis carinatus sochureki	✓	✓	✓	✓
Myriopholis macrorhyncha	*x*	✓	*x*	✓
Diplometopon zarudni	x	✓	✓	✓
Hemidactylus robustus	x	x	✓	✓
*Hemidactylus flaviviridis**	x	x	✓	✓
*Acanthodactylus schmidti***	x	x	✓	x

Table 2.0 Seasonal and Annual Occurrence of Species in the Reserve (✓ = Present ✕ = Not recorded)

**Hemidactylus flaviviridis* was observed outside the designated quadrat sampling areas.

***Acanthodactylus schmidti* a diurnal species recorded during the survey

4.1 Encounter Rate of Nocturnal Reptiles

Species	Total Observations	Survey Efforts (hrs)	Encounter rate (obs/hrs)
Stenodactylus doriae	132	74.33	1.77
Stenodactylus leptocosymbotes	83	74.33	1.16
Trigonodactylus arabicus	135	74.33	1.81
hemidactylus robustus	1	74.33	0.01
Bunopus tuberculatus	53	74.33	0.71
Cerastes gasperettii	10	74.33	0.13
Eryx jayakari	3	74.33	0.04
Echis carinatus sochureki	32	74.33	0.43
Myriopholis macrorhyncha	3	74.33	0.04
Diplometopon zarudni	4	74.33	0.05

Table 3.0 Time-based Encounter Rate (Heyer, 1994) (Buckland, 2001)

Species	Total Observations	Survey Efforts (km)	Encounter rate (obs/km)
Stenodactylus doriae	132	72.8	1.68
Stenodactylus leptocosymbotes	83	72.8	1.14
Trigonodactylus arabicus	135	72.8	1.85
hemidactylus robustus	1	72.8	0.01
Bunopus tuberculatus	53	72.8	0.72
Cerastes gasperettii	10	72.8	0.01
Eryx jayakari	3	72.8	0.04
Echis carinatus sochureki	32	72.8	0.43
Myriopholis macrorhyncha	3	72.8	0.04
Diplometopon zarudni	4	72.8	0.05

Table 4.0 Distance-based Encounter Rate (Heyer, 1994) (Buckland, 2001)

Based on the total survey hours and distance covered across the 14 quadrats *Trigonodactylus arabicus* exhibited the highest encounter rate, indicating that it was the most frequently encountered species during the nocturnal surveys. In contrast, *Hemidactylus robustus* recorded the lowest encounter rate, reflecting its comparatively low detection frequency within the survey area.

4.2 Seasonal Patterns in Reptile Activity

Four ground-dwelling gecko species were recorded during all four seasons of the survey, demonstrating their year-round presence within the DDCR. However, their observed abundance declined during the colder months at the beginning and end of the year, when ambient temperatures frequently fell below 20 °C. This seasonal reduction likely reflects decreased surface activity during cooler periods.

Both viper species recorded during the survey were detected throughout the year, indicating a consistent seasonal presence. Their activity was noticeably higher during the second and third quarters of the year, corresponding to the hottest months in the region. This pattern suggests a strong relationship between elevated ambient temperatures and increased viper activity levels.

However, *Teratoscincus keyserlingii* was not recorded during the present survey period. Although this species appears in the DDCR reptile checklist, there have been no recent confirmed sightings. Historical information suggests that the species was previously recorded in the northernmost section of DDCR; however, no published records or documented details of these observations were found during the literature review.

Similarly, *Hemidactylus persicus*, another gecko species listed in the DDCR reptile checklist, was not recorded during the survey. This species is typically associated with rocky, mountainous, or tree-based habitats rather than open sandy desert environments. Available information indicates that it has been recorded from the Nazwah mountain area within the reserve. However, this mountainous section was not included in the current survey due to limited accessibility caused by an oil pipeline installation project. In addition, the area represents a distinct habitat type characterized by rocky outcrops.

Another nocturnal reptile species listed for the reserve, *Lytorhynchus diadema*, was also not recorded during the systematic survey period. However, the author has previously recorded this species in 2024 during a random field survey within the reserve, indicating that it does occur in the area but was not detected during the structured sampling surveys. Given the ecological differences of the rocky mountain landscape, the author intends to conduct a separate reptile baseline survey focusing specifically on these rocky mountain habitats in the future.

Species Name	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14
Cerastes gasperettii	0	0	0	0	0	0	3	2	0	*0*	4	0	1	0
Eryx jayakari	1	0	1	0	0	1	0	1	0	*1*	0	1	0	1
Echis carinatus sochureki	2	0	12	5	2	2	0	0	5	*0*	1	0	0	2
Myriopholis macrorhyncha	0	0	0	1	0	0	0	0	1	1	0	0	0	0

Table 5.0 Occurrence of snake species across fourteen quadrat sampling units

Species Name	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14
Stenodactylus doriae	3	0	33	12	0	14	11	13	1	1	16	16	3	20
Stenodactylus leptocosymbotes	0	17	0	5	35	0	0	3	6	12	0	0	1	0
Trigonodactylus arabicus	16	1	4	9	0	20	24	7	1	1	22	2	4	24
Bunopus tuberculatus	2	7	7	2	8	1	5	0	2	6	1	7	1	5
Hemidactylus robustus	0	0	1	0	0	0	0	0	0	0	0	0	0	0

Table 6.0 Occurrence of gecko species across fourteen quadrat sampling units

Species Name	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14
Diplometopon zarudni	0	0	0	0	0	0	0	2	0	*0*	0	0	0	3

Table 7.0 Occurrence of other reptile species across fourteen quadrat sampling units

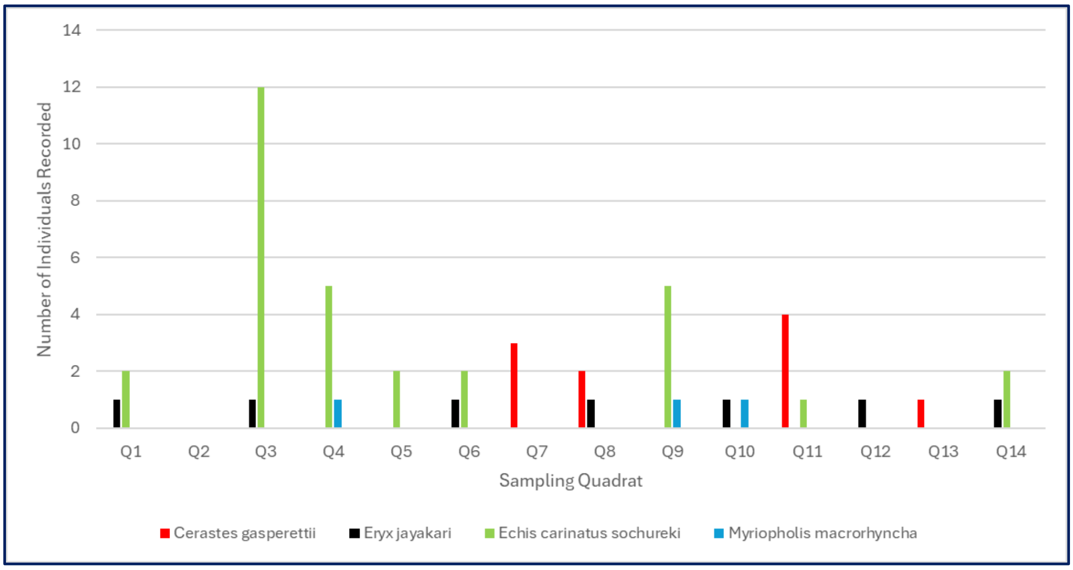


Figure 13.0 Occurrence of snake species across fourteen quadrat sampling units

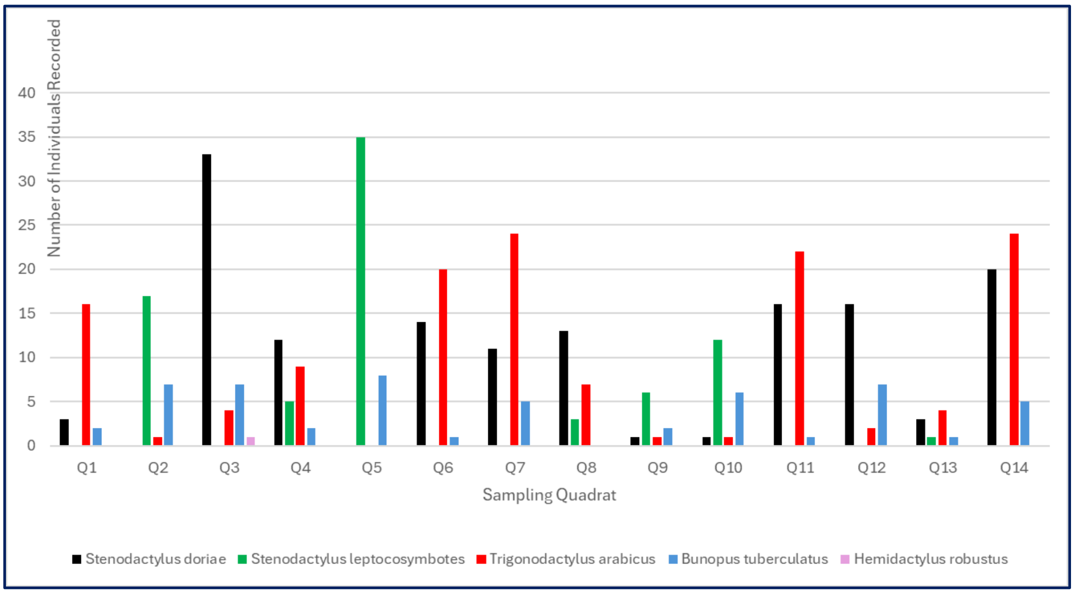


Figure 14.0 Occurrence of gecko species across fourteen quadrat sampling units

4.3 Distribution of Nocturnal Snake and Gecko Species Across Survey Quadrats

During the survey period, five species of nocturnal snakes are known to occur within DDCR. Of these, four species were recorded within at least one of the fourteen sampled quadrats during the year-long survey. Among the recorded snake species, *Echis carinatus sochureki* was the most frequently encountered (Table 5.0, Figure 13.0) occurring in 8 of the 14 surveyed quadrats, indicating the widest spatial distribution among nocturnal snakes within the study area. *Eryx jayakari* was recorded in 5 quadrats, while *Cerastes gasperettii* was detected in 4 quadrats. The lowest occurrence among the recorded snake species was observed for *Myriopholis macrorhyncha*, which was documented in 3 quadrats.

Additionally, *Diplometopon zarudnyi* was recorded in 2 quadrats (Table 7.0), representing one of the lowest occurrences among the species detected during the survey.

With respect to nocturnal geckos, *Trigonodactylus arabicus* and *Bunopus tuberculatus* were the most widely distributed species, each recorded in 13 of the 14 quadrats surveyed. *Stenodactylus doriae* was recorded in 12 quadrats, while *Stenodactylus leptocosymbotes* was observed in 7 quadrats and *Hemidactylus robustus* was recorded in one quadrat (Table 6.0, Figure 14.0).

During the nocturnal reptile survey, *Hemidactylus robustus* was recorded inside the reserve for the first time, confirming its presence within the protected area and justifying its addition to the DDCR reptile checklist. Although the species had previously been observed several times around the DDCR Visitor Centre by the author and the DDCR staff, those records were limited to the newly developed visitor centre area near the main highway and surrounding farmland, which was insufficient to confirm its occurrence within the reserve itself. During the present survey, the author observed the species on most of date palm trees (*Phoenix dactylifera*) within the reserve (Figure 15.0), as well as in an abandoned building and within one survey quadrat. These confirmed observations provide sufficient evidence to validate the presence of the species inside the reserve.

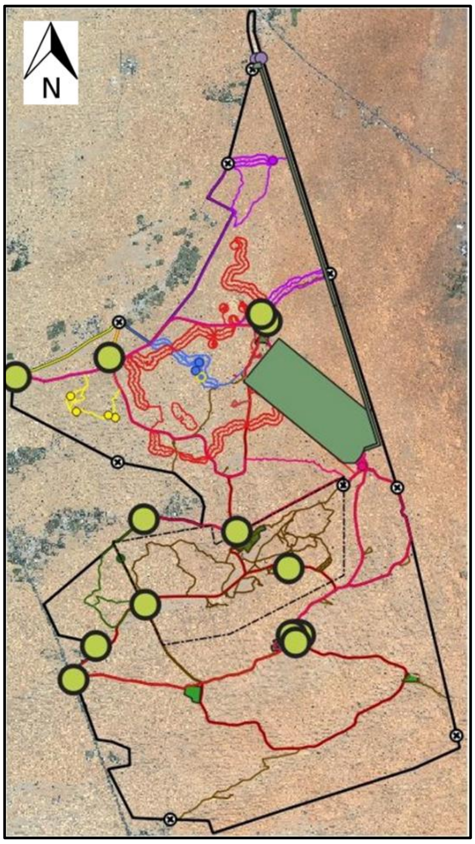


Figure 15.0

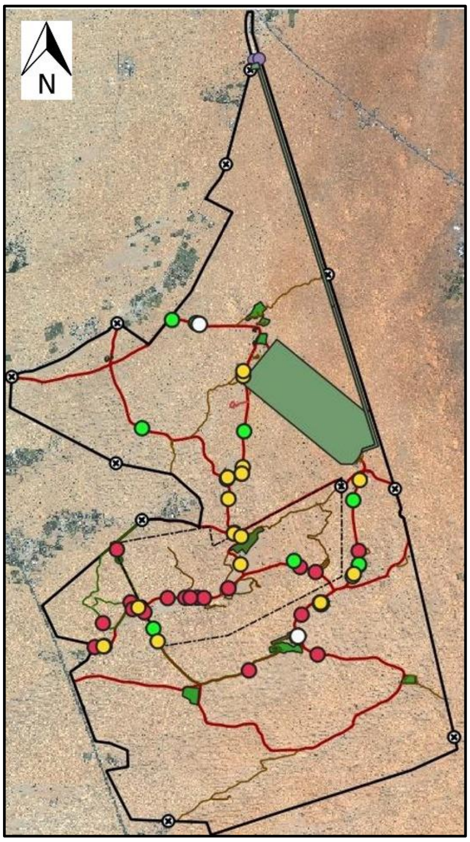


Figure 16.0

Figure 15.0 Recorded Locations of *Hemidactylus robustus* (Circled in light Green) during Nocturnal Surveys in DDCR. **Figure 16.0** Incidental Sightings of Four Nocturnal Reptile Species During Nocturnal Surveys Beyond Survey Quadrats in DDCR **Red**: *Cerastes gasperettii* **Yellow**: *Echis carinatus sochureki* **Green**: *Eryx Jayakari* **White**: *Diplometopon zarudnyi*

These findings indicate clear differences in the spatial occurrence and relative detectability of nocturnal reptile species across the sampled quadrats. While some species exhibited a broad distribution throughout the study area, others appeared to have more localized or habitat-specific occurrence patterns. Opportunistic vehicular observations conducted outside the established survey quadrats further supported these distribution patterns (Figure 16.0). Gecko species were not included in the vehicular observation records because of their widespread occurrence throughout the reserve and the additional survey time that would have been required to document the large number of individuals encountered.

4.4 Quarter-wise distribution and variation of species richness

As shown in Figures 17.0 and 18.0, both total specimen abundance and species richness increased from the first quarter to the third quarter of the survey period. The highest specimen count was recorded during the third quarter, indicating a peak in nocturnal reptile activity and detectability during this period. In contrast, specimen abundance declined sharply in the fourth quarter.

Despite the reduction in the total number of specimens recorded during the fourth quarter, species richness continued to increase and reached its highest level during this period (Figure 19.0). This indicates that although fewer individual reptiles were encountered, a greater diversity of species was detected. Overall, the results suggest differing temporal patterns between abundance and species richness, with peak abundance occurring in the third quarter and peak species richness occurring in the fourth quarter.

Species name	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
Stenodactylus doriae	40	37	42	13
Stenodactylus leptocosymbote	23	19	26	15
Trigonodactylus arabicus	22	45	45	23
Bunopus tuberculatus	11	17	15	10
Hemidactylus robustus			1	
Cerastes gasperettii		3	5	2
Eryx jayakari		1	1	1
Echis carinatus sochureki	1	4	13	14
Myriopholis macrorhyncha		1		2
Diplometopon zarudni				4
Total	97	127	148	84

Table 8.0 Quater-wise distribution and variation of species richness

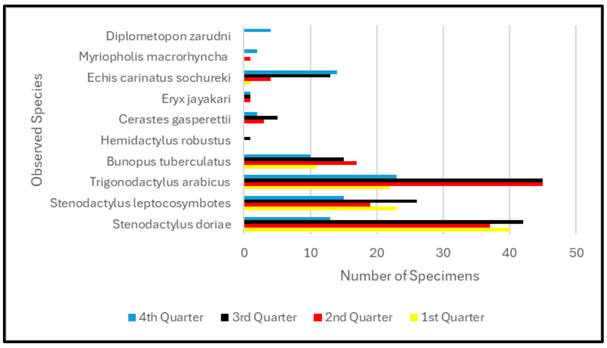


Figure 17.0 Seasonal Variation in Specimen Counts

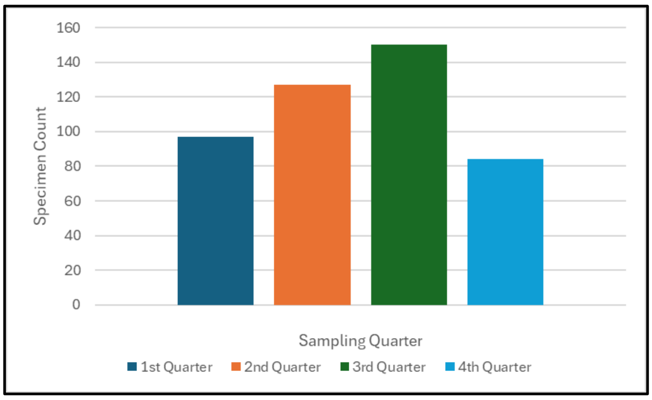


Figure 18.0

Quater-wise variation in total individual counts of species.

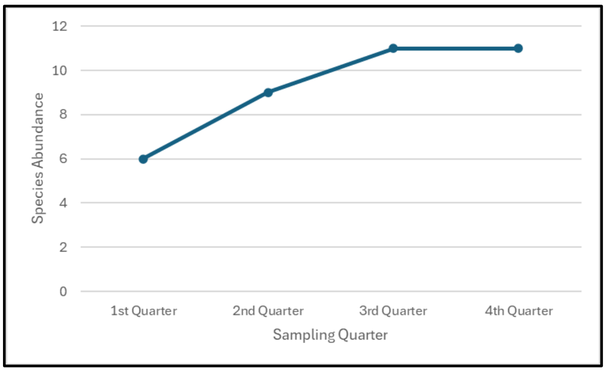


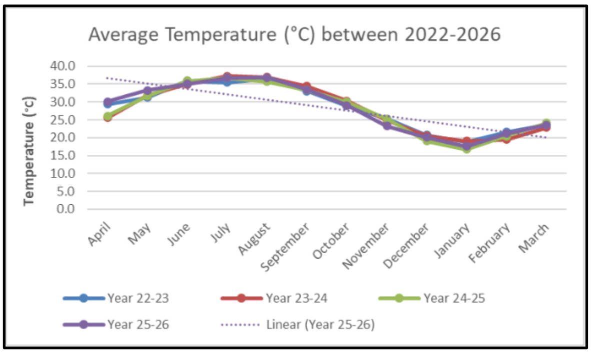
Figure 19.0

Seasonal Trends in Overall Species Abundance

Species Name	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14
Stenodactylus doriae	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Stenodactylus leptocosymbotes		✓		✓	✓			✓	✓	✓		✓	✓	
Trigonodactylus arabicus	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓
Hemidactylus robustus			✓											
Bunopus tuberculatus	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓
Cerastes gasperettii							✓	✓			✓		✓	
Eryx jayakari			✓			✓		✓						✓
Echis carinatus sochureki	✓	✓	✓	✓	✓				✓					✓
Myriopholis macrorhyncha				✓					✓	✓				
Diplometopon zarudni								✓						✓

Table 9.0 Spatial Patterns of Species Richness Across Quadrats

4.5 Influence of Temperature & Humidity on Species Diversity Across Four Quatres



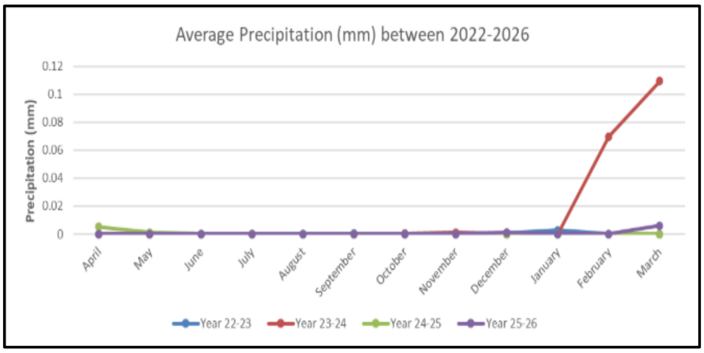
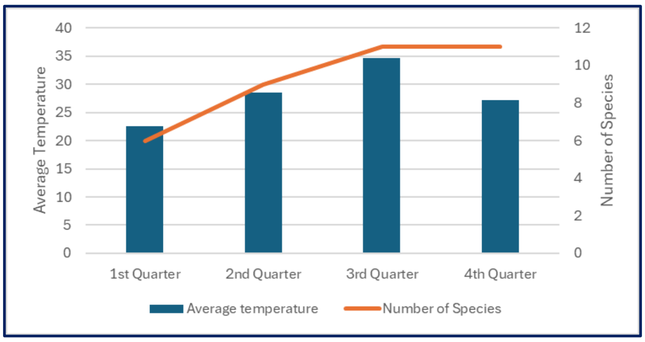


Figure 20.0 Source: DDCR Annual report 2025-26 (In Preparation) **Figure 21.0** Source: DDCR Annual report 2025-26 (In Preparation)

Figure 20.0 Temperature records over the past four years indicate relatively stable conditions within the reserve, with only moderate interannual variation. Nevertheless, the most recent survey period (2025–26) exhibited slightly elevated temperatures overall, particularly during the warmer months of the year. March temperatures, however, were comparatively lower than in most preceding years, except for 2024–25. This reduction may be associated with increased precipitation events recorded in the reserve during that period.

Figure 21.0 Precipitation data demonstrate considerable variability between years, although rainfall remained generally low across most months. Distinct peaks were observed during certain periods, most notably in 2023–24, when February and March received substantially higher rainfall compared to the corresponding months in other years (Figure 21.0 red line). In contrast, the 2025–26 period was characterized by overall lower precipitation levels, with only a minor increase recorded during March. These findings emphasize the irregular and episodic nature of rainfall patterns within the reserve rather than the presence of a predictable annual trend. Despite the limited rainfall, vegetation within the reserve appears to respond rapidly to short-term precipitation events, and the area currently supports noticeably greater vegetation cover compared to the previous year, when rainfall during the same period was minimal.



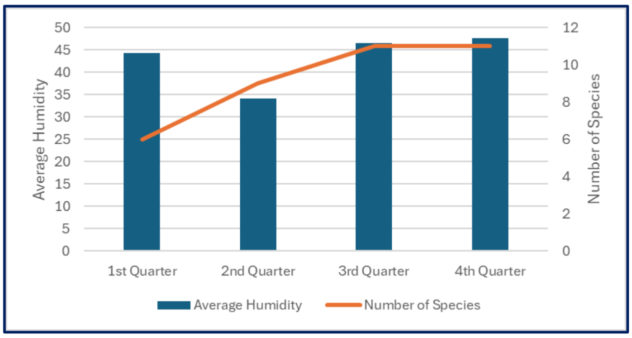


Figure 22.0 **Figure 23.0**

Influence of Temperature (**Figure 22.0**) and Humidity (**Figure 23.0**) on Species Diversity Across Four Quatres

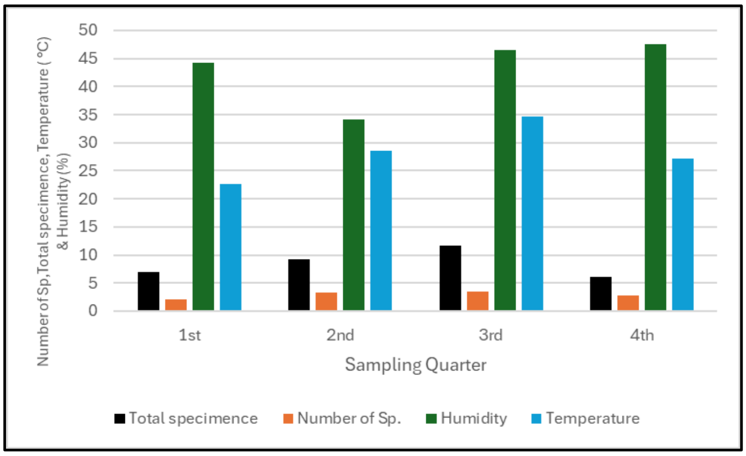


Figure 24.0 Influence of Temperature and Humidity on Species Diversity Across Four Quatres

Temperature and humidity are key environmental factors influencing species diversity, particularly in shaping behavioural patterns and activity timing of desert fauna. In the present study, the survey data indicate a clear relationship between ambient temperature and species activity (Figure 22.0), where an increase in temperature corresponds with higher levels of species detectability and activity. Desert-dwelling reptiles, in particular, are known to become more active under warmer conditions as their physiological processes are strongly dependent on external heat sources for thermoregulation. This is consistent with established ecological understanding that reptiles rely on environmental heat to regulate body temperature and support metabolic activity (Pianka & Vitt, 2003; Shine, 2005).

In arid ecosystems such as the Arabian deserts, many reptile species exhibit seasonal behavioural shifts, including reduced activity or brumation during colder months to conserve energy (Avery, 1982; Pianka, 1986). Brumation in reptiles is commonly observed when temperatures drop, leading to decreased movement and lower detection rates during surveys. Reptile activity in the DDCR increases noticeably when temperatures exceed approximately 35°C, indicating optimal thermal conditions for activity (Figure 22.0). The first and fourth quarters of the year, which correspond to the cooler months in the reserve, show comparatively lower species activity, while the second and third quarters, representing the hottest periods, show increased activity levels. This pattern highlights the strong influence of seasonal temperature variation on reptile activity and overall detectability within the study area.

Humidity is also an important environmental factor influencing desert reptile activity, particularly by affecting water balance, thermoregulation efficiency, and surface activity patterns. While reptiles in arid ecosystems are primarily driven by temperature, humidity can moderate water loss and influence the timing and duration of activity, especially in species adapted to extreme desert conditions (Du & Shine, 2015; Lillywhite, 2006). In many desert environments, relatively higher humidity levels can support increased surface activity by reducing desiccation stress, particularly for nocturnal and crepuscular reptiles.

Humidity in the study area generally remained above 40% across most quarters, except during the second quarter (Figure 23.0). The third and fourth quarters, which maintained higher humidity levels combined with favourable thermal conditions, showed comparatively higher species diversity and activity. Although the first quarter also recorded humidity above this threshold, species counts remained low, likely due to reduced temperatures limiting reptile activity. This pattern suggests that both temperature and humidity interact to influence reptile detectability, with optimal activity observed when temperatures exceed approximately 35°C alongside moderate humidity levels (30 -50 %) (Figure 24.0). These conditions are particularly important for desert-dwelling and nocturnal reptiles, which rely on suitable microclimatic conditions to minimize water loss while maintaining sufficient metabolic activity.

4.6 Association Between Vegetation Cover and Nocturnal Reptile Occurrence

The data indicate a positive relationship between vegetation cover and species richness, where an increase in vegetation is associated with higher species counts (Figure 25.0). This pattern suggests that maintaining adequate vegetation cover plays a significant role in supporting biodiversity in arid ecosystems by providing shelter, food resources, and microhabitats that reduce environmental stress (Schlesinger et al., 1990; Hunter, 1991). In desert environments, vegetation patches often act as biodiversity hotspots, enhancing habitat complexity and supporting higher faunal diversity compared to sparsely vegetated areas.

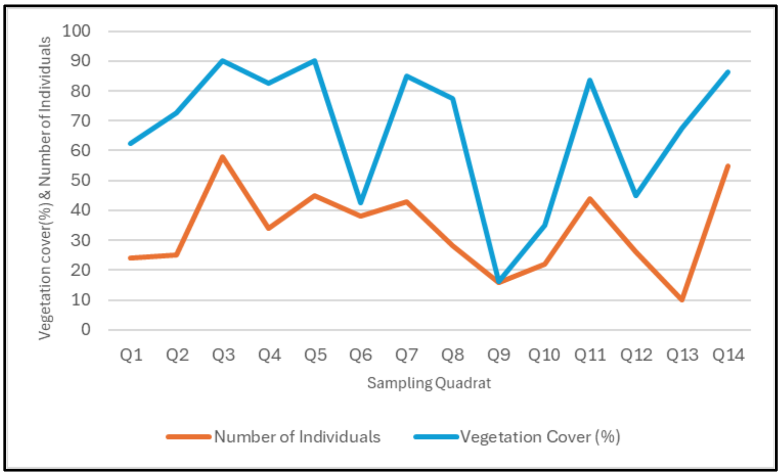


Figure 25.0 Positive Association Between Vegetation Cover and Total Specimen Abundance

Based on the surveyed quadrats, vegetation cover within the reserve was generally higher in the northern section than in the southern section. This difference may be attributed to the greater extent of active sand dune systems in the southern landscape, as reported in the DDCR Vegetation Survey (Martin et al., 2024). In the northern section, Quadrat 3 recorded the highest vegetation cover and correspondingly the highest species count (Figure 26.0) indicating a strong local-scale association between plant abundance and faunal presence. Similarly, in the southern section, Quadrat 14 showed the highest vegetation cover and also recorded the highest number of specimens (Figure 27.0), further reinforcing the positive relationship between vegetation density and species abundance across both habitats

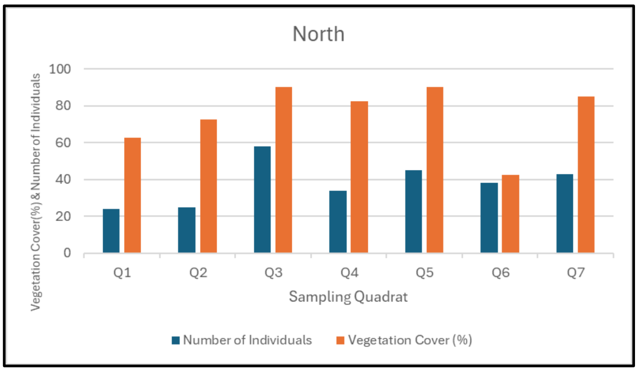


Figure 26.0

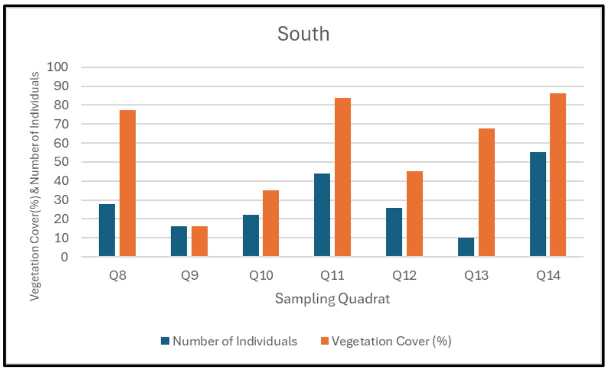


Figure 27.0

Figure 26.0 & Figure 27.0 Comparative Analysis of Vegetation Cover and Nocturnal Reptile Occurrence in Northern and Southern DDCR

4.7 Relationship Between Moon Phase and Nocturnal Reptile Observations

Moon phase has been identified as a potential environmental factor influencing the activity patterns of nocturnal reptiles through changes in nocturnal illumination, predation risk, and foraging behaviour. Increased lunar illumination during full moon periods may enhance predator visibility and reduce surface activity in some nocturnal reptile species, whereas darker conditions during new moon phases may provide safer conditions for movement and hunting (Polis, 1991). Previous studies have demonstrated species-specific responses to lunar illumination. For example, prairie rattlesnakes (*Crotalus viridis viridis*) showed higher activity levels during darker nights (Clarke et al., 1996), while other studies suggested that reptile activity may be more strongly influenced by environmental variables such as temperature and prey availability than by moon phase alone (Sperry et al., 2013). Survey-based studies have also reported that reptile detectability and capture rates may vary under different environmental conditions, including lunar phase, although these responses are not consistent across taxa or habitats (Spence-Bailey et al., 2010). Overall, the influence of moon phase on reptile activity appears to be context-dependent and variable among species and ecosystems.

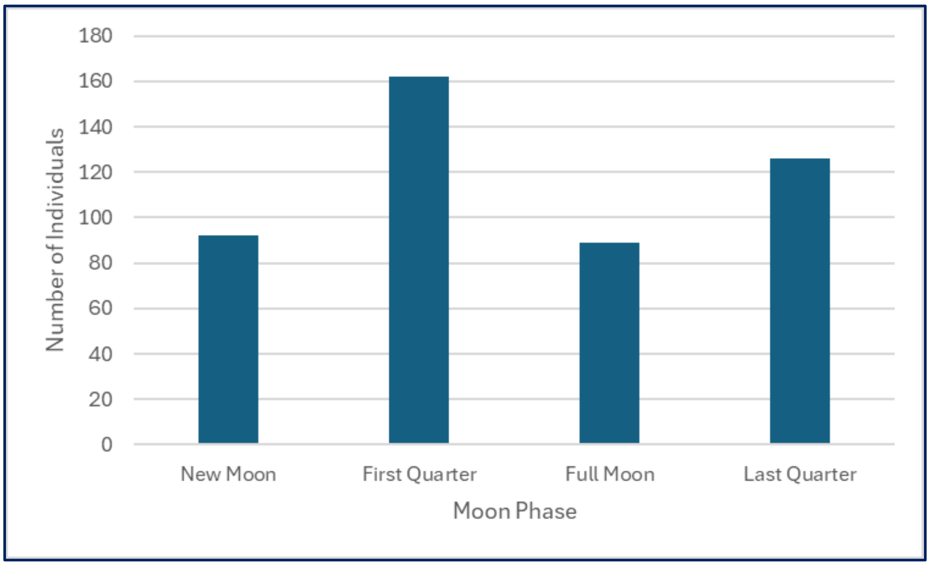


Figure 28.0 Changes in Reptile Individual Counts Under Different Moon Phases

Moon phases were categorized according to approximate lunar illumination percentages following standard astronomical classifications: New Moon (0–10% illumination), First Quarter (~50%), Full Moon (90–100%), and Last Quarter (~50%) (NASA, 2024).

Moon phase and lunar illumination were recorded during each survey using the *Moon* application available on iOS devices. To reduce potential bias associated with short-term lunar variation, surveys were distributed across different lunar conditions rather than conducted continuously over 14 consecutive nights to cover all quadrats. In addition, due to work schedule constraints and operational commitments, surveys were conducted on randomly selected days within each lunar quarter phase. This approach allowed sampling under varying moonlight conditions while maintaining consistency in survey methodology throughout the study period.

Observed reptile species richness and encounter rates varied among lunar phases, with lower observations generally recorded during full moon conditions compared to darker lunar periods (Figure 27.0). Increased lunar illumination may reduce nocturnal surface activity in some reptile taxa due to elevated predation risk and avoidance of exposed habitats (Polis, 1991; Clarke et al., 1996). These findings suggest that moon phase may influence reptile detectability during nocturnal surveys in desert ecosystems.

4.8 Habitat-based variation in community structure and species diversity

The sand dune habitat exhibited the highest overall abundance of herpetofaunal assemblages, with a total of 266 individual specimens recorded during the study period. Species composition within this habitat was strongly dominated by *Stenodactylus doriae* and *Trigonodactylus arabicus*, which accounted for 89 and 122 individuals, respectively (Figure 31.0). Quadrat 14 yielded the highest cumulative abundance across all surveyed quadrats (Table10.0), indicating a localized area of elevated habitat suitability and faunal concentration within the sand dune ecosystem.

In addition to high lizard abundance, the sand dune habitat also supported a comparatively diverse snake assemblage. A total of 12 individuals of *Echis carinatus sochureki*, 9 individuals of *Cerastes gasperettii*, and 4 individuals of *Eryx jayakari* were documented (Table 10.0). Furthermore, a single individual of *Myriopholis macrorhyncha* was recorded within this habitat type. The fossorial amphisbaenian *Diplometopon zarudnyi* was also relatively well represented, with five observations recorded during the survey.

Overall, the results suggest that sand dune habitats support both high species abundance and notable reptilian diversity (Figure 29.0), particularly for psammophilous and fossorial taxa adapted to loose sandy substrates.

The gravel plain habitat, although characterized by a comparatively lower overall abundance relative to the sand dune habitat, still supported a substantial reptile assemblage, with a total of 202 individual specimens recorded during the survey period. Species composition within this habitat was dominated by *Stenodactylus leptocosymbotus* and *Stenodactylus doriae*, with 71 and 54 individuals recorded respectively (Figure 32.0). In addition, *Bunopus tuberculatus* was notably abundant within gravel plains, with 38 records, compared to only 16 individuals documented in the sand dune habitat, suggesting a stronger ecological association with gravelly substrates.

Snake assemblages within the gravel plain habitat were also well represented. *Echis carinatus sochureki* exhibited the highest abundance among snake species, with 19 individuals recorded, exceeding the number observed within the sand dune habitat (Figure 32.0). *Eryx jayakari* was represented by 8 individuals, while *Myriopholis macrorhyncha* accounted for two records. In contrast, only a single individual of *Cerastes gasperettii* was recorded in the gravel plain habitat, further indicating a stronger habitat preference for sand dune environments in this species.

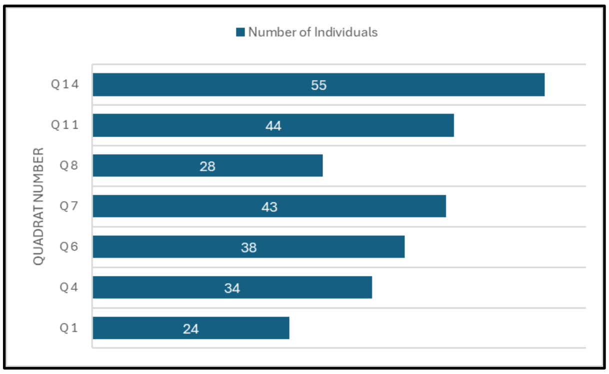
Quadrat 3 recorded the highest overall abundance within the gravel plain habitat and also contained the highest number of *Echis carinatus sochureki* observations, with a total of 12 individuals documented (Figure 30.0). This quadrat was characterized by the highest vegetation cover among all surveyed gravel plain quadrats, consistently exceeding 90%, predominantly composed of *Heliotropium kotschyi* vegetation. The dense vegetation structure within this quadrat may have contributed to increased prey availability, microhabitat complexity, and shelter opportunities, thereby supporting higher reptile abundance and particularly favourable conditions for viper populations.

Species Name	Q1	Q4	Q6	Q7	Q8	Q11	Q14
Stenodactylus doriae	3	12	14	11	13	16	20
Stenodactylus leptocosymbotes	0	5	0	0	3	0	0
Trigonodactylus arabicus	16	9	20	24	7	22	24
Hemidactylus robustus	0	0	0	0	0	0	0
Bunopus tuberculatus	2	2	1	5	0	1	5
Cerastes gasperettii	0	0	0	3	2	4	0
Eryx jayakari	1	0	1	0	1	0	1
Echis carinatus sochureki	2	5	2	0	0	1	2
Myriopholis macrorhyncha	0	1	0	0	0	0	0
Diplometopon zarudni	0	0	0	0	2	0	3

Table 10.0 Patterns of Species Diversity Across Different Habitats in DDCR - Sand dune habitat

Species Name	Q2	Q3	Q5	Q9	Q10	Q12	Q13
Stenodactylus doriae	0	33	0	1	1	16	3
Stenodactylus leptocosymbotes	17	0	35	6	12	0	1
Trigonodactylus arabicus	1	4	0	1	1	2	4
Hemidactylus robustus	0	1	0	0	*0*	0	0
Bunopus tuberculatus	7	7	8	2	6	7	1
Cerastes gasperettii	0	0	0	0	*0*	0	1
Eryx jayakari	0	1	0	0	*1*	1	0
Echis carinatus sochureki	0	12	2	5	*0*	0	0
Myriopholis macrorhyncha	0	0	0	1	1	0	0
Diplometopon zarudni	0	0	0	0	*0*	0	0

Table 11.0 Patterns of Species Diversity Across Different Habitats in DDCR -Gravel plain habitat



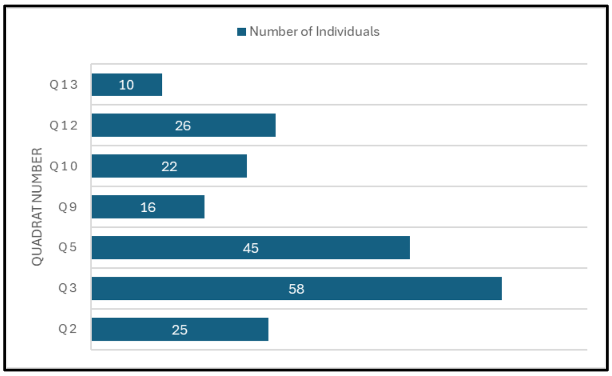
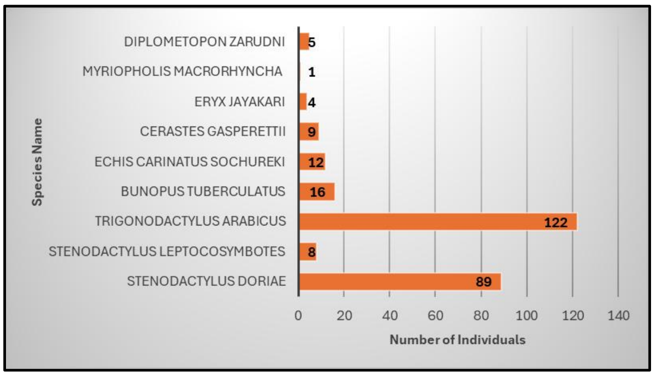


Figure 29.0 Sand Dune Relative Abundance of Individuals Across Habitat Types **Figure 30.0** Gravel Plain



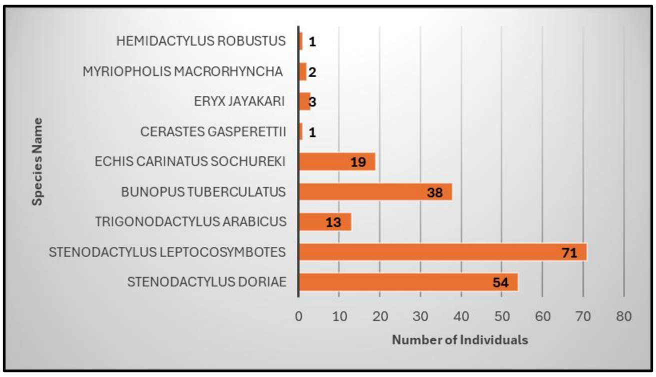


Figure 31.0 Sand Dune Relative Abundance of Individuals Across Habitat Types **Figure 32.0** Gravel Plain

4.8.1 Shannon–Wiener diversity index

Gravel Plains

The gravel plain habitat demonstrated a moderate level of reptilian diversity, with a Shannon diversity index (H') of 1.59. A total of nine species were recorded within this habitat type, comprising 202 individual specimens in total. The evenness value of 0.726 indicates a moderately balanced distribution of individuals among species, although some taxa exhibited greater dominance within the assemblage. The calculated average population size was 22.4 individuals per species, suggesting a relatively stable community composition across the surveyed gravel plain habitat. Collectively, these diversity indices indicate that the gravel plains support a moderately diverse reptile community with a comparatively equitable species distribution despite variations in species-specific abundance.

Sand Dunes

The sand dune habitat exhibited a moderate level of reptilian diversity, with a Shannon diversity index (H') of 1.41. A total of nine species were recorded within this habitat type, comprising 266 individual specimens overall. The evenness value of 0.642 indicates a relatively uneven distribution of individuals among species, reflecting the dominance of a few highly abundant taxa within the community assemblage. The average population size was calculated at 29.6 individuals per species, which was higher than that recorded in the gravel plain habitat. These findings suggest that, although the sand dune habitat supported greater overall abundance, species composition was less evenly distributed due to the strong dominance of psammophilous species adapted to sandy substrates.

4.8.2 Simpson's Diversity Index

Gravel Plains

The Simpson diversity analysis for the gravel plain habitat indicated a relatively high level of community diversity and lower species dominance compared to the sand dune habitat. Simpson's Index (D) was calculated at 0.24, suggesting a lower probability that two randomly selected individuals from the assemblage would belong to the same species. Correspondingly, Simpson's Diversity Index (1−D) was 0.76, reflecting a comparatively diverse and heterogeneous reptilian community within the gravel plains. In addition, the Simpson's Reciprocal Index (1/D) value of 4.17 indicates a more even distribution of individuals among species, with reduced dominance by a limited number of taxa. Collectively, these indices demonstrate that the gravel plain habitat supports a relatively balanced reptile assemblage with higher overall diversity and community stability.

Sand Dunes

The Simpson diversity analysis indicated a moderate level of community diversity within the surveyed habitat. Simpson's Index (D) was calculated as 0.33, indicating a moderate probability that two randomly selected individuals from the assemblage would belong to the same species. Correspondingly, Simpson's Diversity Index (1−D) was 0.67, suggesting a relatively diverse community structure with moderate species heterogeneity. Furthermore, the Simpson's Reciprocal Index (1/D) value of 3.05 reflects the presence of moderate species dominance within the assemblage, where a limited number of species contributed substantially to the overall abundance. Collectively, these indices indicate that the habitat supports a moderately diverse reptilian community with uneven species representation driven by the dominance of a few abundant taxa.

In Comparison

Comparison of the Shannon diversity indices between the two habitat types indicates that the gravel plain habitat supports a slightly more diverse and evenly distributed reptile community than the sand dune habitat. Although the sand dune habitat recorded a higher total abundance of individuals (n = 266), its lower Shannon diversity index (H' = 1.41) and evenness value (0.642) suggest that the assemblage was dominated by a few highly abundant species. In contrast, the gravel plain habitat exhibited a higher Shannon diversity index (H' = 1.59) and greater evenness (0.726), indicating a more balanced distribution of individuals among species despite the lower total abundance (n = 202).

Similarly, Simpson diversity indices further support this pattern. The gravel plain habitat showed a lower Simpson's Index value (D = 0.24) and higher diversity values (1−D = 0.76; 1/D = 4.17), indicating lower species dominance and greater community heterogeneity. In comparison, the sand dune habitat had a higher Simpson's Index value (D = 0.33) and lower diversity values (1−D = 0.67; 1/D = 3.05), reflecting stronger dominance by a limited number of psammophilous species. Overall, both Shannon and Simpson indices suggest that gravel plains support a more even and ecologically stable reptile assemblage, whereas sand dunes are characterized by higher abundance but greater dominance of fewer species.

4.9 Comparison of Reptile Diversity Between Northern and Southern Sections

Additionally, as mentioned earlier, the reserve is divided into two major zones, the northern and southern sections, using Al Maha Desert Resort & Spa as the central reference point. The observed differences between these two regions are likely related to the variation in human activities and interactions.

The northern section experiences significantly higher levels of human activity compared to the southern section. Most tourism-related facilities and activities, including tour camps, nature trails, and dune driving buffer zones, are located in the northern area. In addition, roads in the north become considerably busier during the tourist season, particularly during the cooler months, compared to the south (Madurapperuma P. L., 2024).

In contrast, the southern section remains relatively undisturbed, with minimal human activities and lower levels of disturbance. Therefore, comparing species diversity and community structure between these two regions is important for understanding the potential impacts of tourism and human activities on the reserve's ecosystems. Such information will be valuable for future management and conservation planning, especially considering that tourism is one of the main sources of income for the Dubai Desert Conservation Reserve.

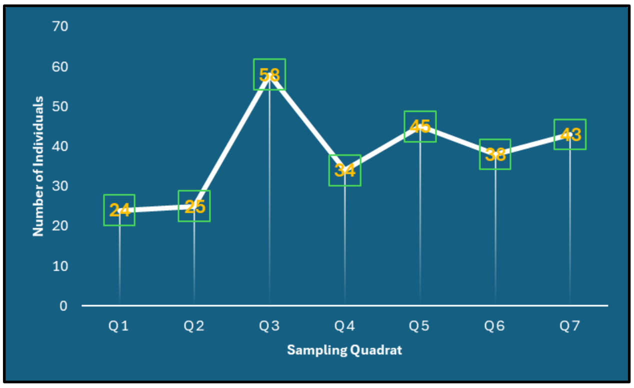


Figure 33.0 North Total Recorded Specimens and Regional Differences in DDCR **Figure 34.0** South

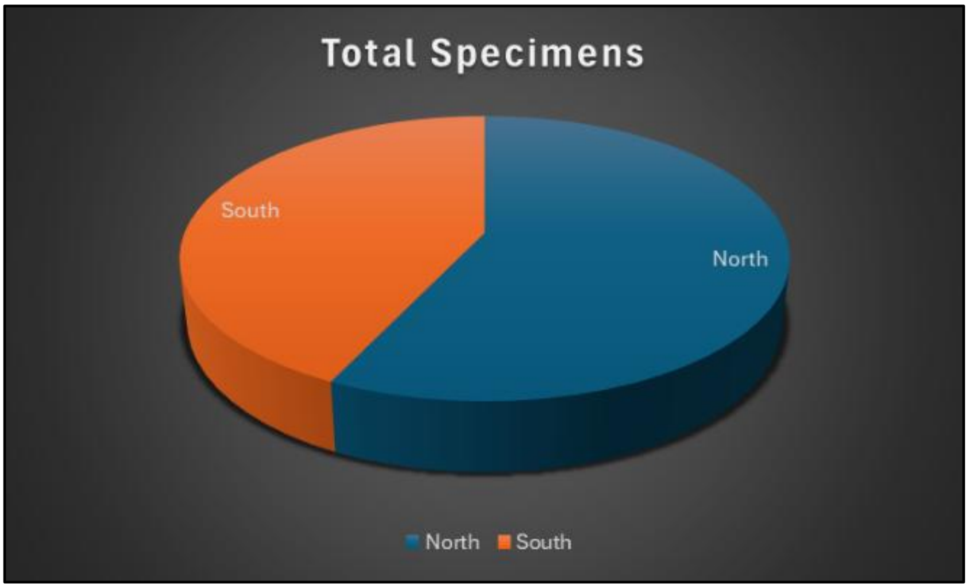


Figure 35.0 Spatial Variation in Specimen Abundance: North vs. South DDCR

4.9.1 Shannon–Wiener diversity index

Northern Section

The northern section of the DDCR recorded a Shannon Diversity Index of 1.65, indicating a moderate level of species diversity within the study area. The evenness value of 0.75 suggests that individuals were fairly evenly distributed among the recorded species, with no single species dominating the community significantly.

Species richness in the northern section was recorded as 9 species, with a total of 267 individuals observed during the survey period. The average population size per species was calculated as 29.7 individuals. Overall, these results show that the northern section supports a moderately diverse faunal community despite experiencing higher levels of tourism activities, vehicle movement, and other human disturbances compared to the southern section.

Southern Section

The southern section of the DDCR recorded a Shannon Diversity Index of 1.67, indicating a moderate to relatively high level of species diversity within the study area. The evenness value of 0.762 suggests that individuals were distributed quite evenly among the recorded species, with low dominance by any single species.

Species richness in the southern section was recorded as 9 species, with a total of 201 individuals observed during the survey period. The average population size per species was calculated as 22.3 individuals. These findings indicate that the southern section supports a stable and balanced faunal community, likely influenced by the lower levels of human disturbance and reduced tourism-related activities compared to the northern section.

4.9.2 Simpson's Index

Northern Section

The northern section of the DDCR recorded a Simpson's Index (D) value of 0.22, indicating relatively low dominance by a single species within the community. The Simpson's Diversity Index (1-D) value of 0.78 suggests a moderately high level of species diversity in the area. In addition, the Simpson's Reciprocal Index (1/D) value of 4.62 further indicates that the northern section supports a reasonably diverse and stable faunal community despite the higher level of tourism activities and human disturbance present in the region.

Southern Section

The southern section of the Dubai Desert Conservation Reserve recorded a Simpson's Index (D) value of 0.24, indicating low dominance by individual species within the community. The Simpson's Diversity Index (1-D) value of 0.76 suggests a moderate level of species diversity in the area. Furthermore, the Simpson's Reciprocal Index (1/D) value of 4.21 indicates that the southern section supports a relatively stable and diverse faunal community, likely influenced by the lower levels of human disturbance and limited tourism-related activities compared to the northern section.

The results from both the northern and southern sections of the DDCR indicate that both areas support a moderately diverse and relatively stable faunal community with similar species richness. The diversity analyses suggest that no single species strongly dominated either habitat, and species were distributed fairly evenly across both regions. Overall, the findings highlight that the reserve continues to maintain healthy biodiversity despite variations in habitat conditions and human influence between the two sections.

5.0 Discussion

The findings of the present study are broadly consistent with previous herpetological research conducted within the United Arab Emirates and across the Arabian Peninsula, where desert reptile communities are strongly influenced by substrate type, climatic conditions, and habitat structure (Arnold, 1980; Gardner, 2013; Tamar et al., 2021). Desert ecosystems within Arabia are known to support highly specialized reptile assemblages adapted to extreme temperatures, low water availability, and shifting sandy substrates (Pianka, 1986; Pianka & Vitt, 2003). Similar to previous regional studies, the present survey recorded high abundances of psammophilous gecko species such as *Trigonodactylus arabicus* and *Stenodactylus doriae* within sand dune habitats, confirming the importance of loose sandy substrates for these taxa (Arnold, 1986; Gardner, 2013). The widespread occurrence of *Echis carinatus sochureki* across multiple quadrats also reflects patterns previously documented in Arabian desert environments, where the species is regarded as one of the most adaptable and ecologically tolerant nocturnal vipers (Gasparetti, 1988; Gardner, 2013).

The absence of *Teratoscincus keyserlingii* during the survey is notable, particularly because the species has historically been listed within the DDCR reptile checklist. Recent study demonstrated that Arabian populations of this species are highly fragmented and genetically isolated, suggesting naturally restricted distributions and potentially low population densities within the UAE (Tamer, et al., 2021). Similarly, *Hemidactylus persicus* was not detected during the present study, likely due to the exclusion of rocky habitats such as the Nazwah mountain area, where previous unpublished observations indicate its occurrence. This habitat association is consistent with regional ecological studies, which describe the species as primarily associated with rocky escarpments, cliffs, and mountainous terrain rather than open desert plains (Arnold, 1980; Gardner, 2013).

Habitat preferences observed during the present study strongly support the ecological importance of substrate composition and vegetation cover in structuring reptile assemblages within the DDCR. Sand dune habitats supported the highest overall reptile abundance, particularly among species adapted to burrowing and locomotion on unstable sandy surfaces. Species such as *Cerastes gasperettii* and *Diplometopon zarudnyi* demonstrated stronger associations with sandy habitats, reflecting previously documented psammophilous and fossorial adaptations (Arnold, 1986; Gasparetti, 1988). In contrast, *Bunopus tuberculatus* was considerably more abundant within gravel plain habitats, indicating ecological specialization toward compact gravel substrates. These findings are consistent with ecological niche differentiation observed among Arabian desert reptiles, where subtle variation in substrate and vegetation can strongly influence species distribution patterns (Pianka, 1986).

Vegetation cover also demonstrated a strong positive relationship with reptile diversity and abundance. Quadrats characterized by dense *Heliotropium kotschyi* vegetation supported higher reptile abundance and greater viper occurrence (Figure 39.0). Vegetation in arid ecosystems plays an important ecological role by increasing habitat heterogeneity, stabilizing microclimatic conditions, and supporting greater invertebrate prey availability (Schlesinger et al., 1990; Hunter, 1991). Vegetated areas additionally provide refuge from thermal extremes and reduce desiccation stress, which is particularly important for nocturnal desert reptiles operating within narrow physiological limits (Lillywhite, 2006). Similar positive relationships between vegetation complexity and reptile diversity have been documented in other desert ecosystems throughout Arabia and North Africa (Pianka & Vitt, 2003).

Seasonal variation in reptile activity recorded during the present study further emphasizes the strong influence of environmental variables on nocturnal reptile ecology. Activity levels increased substantially during the hotter months when ambient temperatures exceeded approximately 35 °C, while cooler months showed reduced encounter rates. This pattern is consistent with established ecological theory describing reptiles as ectothermic organisms that rely heavily on environmental heat sources for thermoregulation and metabolic functioning (Avery, et al.,1982; Shine, 2005). In arid environments, reptiles often exhibit seasonal behavioural adjustments, including reduced activity or partial brumation during colder periods to conserve energy and minimize physiological stress (Pianka, 1986). Humidity also appeared to influence reptile detectability during the survey, likely by moderating evaporative water loss and extending nocturnal surface activity periods. Similar interactions between temperature, humidity, and reptile activity have been documented in several desert reptile studies globally (Du & Shine, 2015).

The nocturnal reptile surveys revealed that both the northern and southern sections of the DDCR supported a similar diversity of reptile species, with the same number of species recorded in each area. However, notable differences were observed in the abundance and distribution of individuals. The northern section recorded a higher total number of individuals and larger average population sizes per species, despite being exposed to greater levels of tourism activities, vehicle movement, and other human disturbances. In contrast, the southern section recorded fewer individuals but exhibited a more balanced distribution of species, suggesting a more stable community structure. The lower level of human disturbance and reduced tourism pressure in the southern section may contribute to maintaining more natural ecological conditions and a more even distribution of reptile populations. Overall, the results indicate that both sections provide important habitat for nocturnal reptiles, although differences in disturbance levels and habitat conditions appear to influence species abundance and community composition across the reserve.

The ecological significance of the present findings is considerable for biodiversity conservation and ecosystem management within DDCR. Reptiles form an important component of desert food webs, functioning both as predators regulating invertebrate and small vertebrate populations and as prey for higher trophic-level predators (Pianka & Vitt, 2003). Fossorial species additionally contribute to soil turnover and ecosystem functioning through burrowing behaviour.

The confirmation of *Hemidactylus robustus* within protected habitats of the reserve is particularly significant, as previous records of the species were restricted to anthropogenically modified areas surrounding the DDCR visitor centre. The present survey demonstrated that the species occurs widely throughout areas containing established date palm (*Phoenix dactylifera*) plantations (Figure 40.0).Although date palms are not a natural component of the sandy desert habitats that dominate the DDCR, they are traditionally associated with oasis ecosystems and areas with access to groundwater, where they form the ecological foundation of many desert oasis systems (Battesti et al., 2018; Green et al., 2019). In the hyper-arid environments of the UAE, date palms require continuous irrigation and account for a substantial proportion of agricultural groundwater use, highlighting their dependence on reliable water sources rather than natural dune habitats (Green et al., 2019; Alyamani et al., 2017). Many of the date palm plantations within DDCR pre-date the establishment of the reserve and continue to be maintained through groundwater irrigation. Despite their anthropogenic origin, the widespread occurrence of *H. robustus* within these plantations suggests that they have become an integral component of the reserve ecosystem, providing structurally complex habitats that offer shelter, foraging opportunities, and suitable microclimatic conditions. These findings demonstrate the ecological value of date palm groves within DDCR and indicate that they now support native wildlife communities. The present study therefore provides the first verified evidence confirming the occurrence of *H. robustus* within reserve habitats, supporting its inclusion in the DDCR reptile checklist.

Despite the extensive survey effort and year-round sampling design, several limitations should be acknowledged. Nocturnal reptile detectability is strongly influenced by environmental conditions such as temperature, humidity, wind speed, and moonlight intensity, all of which may affect reptile surface activity and visibility during surveys (Durso et al., 2011). Consequently, some species may have been under-detected during cooler months or under suboptimal survey conditions. Species exhibiting highly cryptic, fossorial, or patchy distributions, including *Lytorhynchus diadema* and *Myriopholis macrorhyncha*, are particularly difficult to detect through standardized visual encounter surveys. In addition, the exclusion of rocky mountain habitats due to accessibility constraints likely contributed to the absence of habitat-specialist taxa such as *Hemidactylus persicus* and possibly *Teratoscincus keyserlingii*. Therefore, the present study primarily reflects reptile assemblages associated with dune and gravel plain ecosystems and may underestimate the full reptile diversity of DDCR.

Nevertheless, the present survey provides one of the most comprehensive baseline datasets currently available for nocturnal reptiles within DDCR. Long-term ecological monitoring is essential for understanding temporal changes in reptile populations, particularly in rapidly developing arid landscapes experiencing increasing tourism pressure, habitat modification, and climate change (Gardner, 2013). The standardized quadrat-based methodology used in this study provides a valuable framework for future population monitoring, habitat occupancy assessments, and conservation planning. Repeated long-term monitoring will allow DDCR management to evaluate trends in species abundance, habitat use, and community structure while identifying potential ecological impacts associated with anthropogenic disturbance. Future research should prioritize occupancy-based monitoring approaches, targeted assessments of under-surveyed rocky habitats, and investigations into prey availability, microhabitat selection, and road mortality impacts to further improve understanding of reptile ecology and conservation within the reserve.

6.0 Conservation and Management Implications

The results of this study highlight the DDCR as an important refuge for nocturnal reptile diversity within the Arabian desert ecosystem. The reserve supports a wide range of habitat-specialist and generalist reptile species, including dune-adapted geckos, gravel plain assemblages, fossorial reptiles, and medically significant vipers. The confirmation of stable and widespread populations across multiple habitats further emphasizes the ecological value of DDCR in maintaining desert biodiversity within a landscape that is increasingly influenced by tourism and infrastructure development.

However, multiple anthropogenic pressures may be affecting reptile populations within the reserve. Habitat disturbance linked to tourism activities, off-road driving, and infrastructure expansion can lead to microhabitat degradation and fragmentation, particularly in sensitive dune systems. Road networks represent a particularly significant threat, not only through direct mortality but also through habitat fragmentation and disruption of movement corridors. In addition, artificial lighting around visitor facilities and tourist infrastructure may interfere with nocturnal behaviour, potentially altering activity patterns, foraging efficiency, and detectability of light-sensitive species (Gaston et al., 2014).

Importantly, the 2024–2025 roadkill monitoring data (Madurapperuma P. L., 2024) indicate that a substantial proportion of recorded mortalities consist of reptiles, with *Stenodactylus doriae* and viper species (including *Echis carinatus sochureki* and *Cerastes gasperettii*) being the most frequently affected taxa. This pattern suggests that road mortality is a significant and ongoing conservation concern within DDCR, particularly for both abundant ground-dwelling geckos and ecologically important venomous snakes. These findings highlight the urgent need to implement targeted mitigation measures such as vehicle speed reduction zones, improved signage in high-risk reptile crossing areas, seasonal awareness campaigns during peak reptile activity periods, and enforcement of controlled access on sensitive internal roads.

To reduce these impacts, several management interventions are recommended. Vehicle speed limits should be strictly enforced, particularly during nighttime hours when reptile activity is highest. High-risk road segments identified through roadkill data should be prioritised for mitigation measures such as rumble strips, reptile warning signage, and possible temporary seasonal closures. Additionally, restricting off-road driving in ecologically sensitive dune and gravel habitats will help minimize direct mortality and habitat disturbance. Lighting management strategies should also be implemented around visitor areas, including the use of low-intensity, shielded lighting to reduce disruption of nocturnal species behaviour.

The findings further reinforce the importance of establishing a structured long-term monitoring program for nocturnal reptiles within DDCR. The current study provides a critical baseline for future comparisons of population trends, habitat use, and community dynamics. Continued integration of systematic quadrat surveys with roadkill monitoring data will be particularly valuable for assessing human impact over time. Long-term datasets will also enable the identification of population declines or shifts in species distribution linked to environmental change, tourism pressure, or infrastructure development.

Overall, the study demonstrates that while DDCR remains a vital conservation area for nocturnal reptiles, targeted management actions are required to mitigate emerging threats. Proactive road mortality reduction, habitat protection, and sustained ecological monitoring will be essential to ensure the long-term persistence of reptile populations and the ecological integrity of the reserve.

7.0 Conclusion

This study successfully established a comprehensive baseline dataset on nocturnal reptile diversity and distribution within the DDCR. The year-long survey confirmed that the reserve supports a diverse assemblage of nocturnal reptiles across both sand dune and gravel plain habitats, including several widespread desert specialists and habitat-associated species. The study also confirmed the presence of *Hemidactylus robustus* within natural habitats of the reserve for the first time, supporting its inclusion in the DDCR reptile checklist.

The results demonstrated that habitat structure, vegetation cover, and seasonal environmental conditions strongly influence reptile distribution and activity patterns within the reserve. Sand dune habitats supported the highest reptile abundance, while gravel plains maintained comparatively more balanced community composition and diversity. Areas with greater vegetation density consistently supported higher reptile abundance and species richness, emphasizing the ecological importance of maintaining habitat heterogeneity within arid ecosystems.

Although some checklist species such as *Teratoscincus keyserlingii, Hemidactylus persicus*, and *Lytorhynchus diadema* were not detected during standardized surveys, available historical records and opportunistic observations indicate that these species likely persist within localized or under-surveyed habitats of the reserve. This highlights the importance of future targeted surveys, particularly within rocky mountain habitats that were inaccessible during the present study.

Overall, the findings indicate that DDCR continues to function as an important refuge for nocturnal desert reptiles despite increasing tourism activities and ongoing environmental pressures. The baseline information generated through this study provides an important foundation for future ecological monitoring, conservation planning, and habitat management within the reserve. Continued long-term monitoring will be essential for assessing population trends, detecting ecological changes, and supporting evidence-based conservation strategies aimed at maintaining reptile diversity and ecosystem stability within DDCR.

Figure 36.0

Figure 37.0

Figure 33.0 Ophiophagy observed in *Echis carinatus sochureki* during field survey. (Madurapperuma, 2025) **Figure 34.0** The same *Echis carinatus sochureki* specimen observed showing ophiophagy was recorded at the same location for over one year.

Figure 38.0

Figure 39.0

Figure 35.0 *Eryx jayakari* preying on *Stenodactylus doriae*. **Figure 36.0** Two *Echis carinatus sochureki* observed at a *Leptadenia pyrotechnica* bush, one preying on *Bunopus tuberculatus* while the other remained nearby.

Figure 39.0 **Figure 40.0**

Figure 39.0 Quadrat 3 with dense growth of *Heliotropium kotschyi*, representing a preferred habitat of *Echis carinatus sochureki*. **Figure 40.0** Date palm (*Phoenix dactylifera*) plantation representing a suitable habitat for *Hemidactylus robustus*.

Figure 41.0 **Figure 42.0**

Figure 41.0 Site of ophiophagy observed in *Echis carinatus sochureki* during field survey (Madurapperuma, 2025). The same *Echis carinatus sochureki* specimen exhibiting ophiophagy was recorded at this location for over one year (24.80440,55.68785). **Figure 42.0** Quadrat 14, southern section of DDCR, exhibiting the highest vegetation cover density and among the highest reptile diversity and abundance.

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9.0 Appendices

Annex I

Time-based Encounter Rate

(Encounter rate = $\frac{Total\ individual\ observed}{Total\ hours\ surveyed}$)

Distance-based Encounter Rate

(Encounter rate = $\frac{Total\ individual\ observed}{Total\ distance\ surveyed}$)

Annex II

Shannon's Index: Where p_i is the proportion of individuals in species (i) and (S) the total number of species in the sample.

$$H' = -\sum_{i=1}^{S} p_i \ln p_i$$

Simpson's Index = 1 – λ: Where n_i is the number of individuals in species (i), N is the total number of individuals in the sample.

$$\lambda = \sum_{iI=1}^{S} \frac{n_i(n_i-1)}{N(N-1)}$$

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