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Original Research Article

Species Composition and Diversity of Reptile in Hadejia Wetlands National Park Jigawa State, Nigeria

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ABSTRACT
Reptiles are among the most threatened vertebrate groups globally, however, baseline ecological information remains scarce for many African biodiversity hotspots, including Hadejia Wetlands National Park, Nigeria. This study assessed the species composition, distribution, and diversity of reptiles across forest, savannah, and aquatic habitats during dry and wet seasons using visual encounter surveys and active search techniques. A total of 141 individuals representing 21 species were recorded during the wet season, while 127 individuals representing the same number of species were documented during the dry season. Forest habitats consistently supported the highest reptile abundance, whereas water bodies recorded the lowest abundance. Agama agama was the dominant species in both seasons, contributing 23.94% and 19.12% of wet and dry season records, respectively. Other relatively abundant species included Trachylepis perrotetii, Mochlus guineensis, and Pelusios castaneus. Diversity analyses showed that forest and savannah habitats generally exhibited higher Shannon–Wiener diversity (H' = 2.455, H' = 2.354) and species richness values (3.592, 3.501) compared to water bodies (0.2899, 1.82), while evenness was highest in aquatic habitats (0.8258, 0.9172). Seasonal variation influenced reptile abundance and distribution patterns, with several arboreal and aquatic species occurring in low numbers. The study provides important baseline ecological data for reptile conservation in Hadejia Wetlands National Park and highlights the significance of reptiles as indicators of wetland ecosystem health and environmental stability.

INTRODUCTION

Reptiles constitute an integral component of global biodiversity and play critical ecological roles in terrestrials and aquatic ecosystems (Vitt and Caldwell, 2014). They serve as predators, prey, scavengers and ecological indicators as they contribute significantly to ecosystem stability and nutrient cycling (Mehra *et al.,* 2021). Their sensitivity to environmental changes, habitat degradation, pollution and climatic variations makes them valuable indicators of ecosystem health and conservation status (Cox *et al*., 2022). Living reptiles are represented by the clades Archosauria (crocodylians and birds), Testudines (turtles), and Lepidosauria (tuataras and squamates) (Kirchhof *et al.,* 2023). Reptiles and amphibians

(herpetofauna) are among the most species-rich groups of terrestrial vertebrates, with hundreds of new species still being discovered every year (Pincheira-Donoso *et al*., 2013). Reptile species are essential components of terrestrial and aquatic ecosystems, being major secondary consumers and important prey for many tertiary and quaternary consumers (Mehra *et al*., 2021 and Musah *et al*., 2019).

According to Cox *et al*. (2022), Reptiles are currently considered to be among the world's most endangered groups, with 21.1% of reptiles threatened with extinction as it was also estimated that 20% of the world's reptiles are threatened with extinction (Ahmed *et al*., 2018 and Tingley *et al*., 2016). This is perhaps attributed to the fact that they are sensitive to habitat destruction and fragmentation, various environmental changes, pollution, and climate change. Such threats are linked to both anthropogenic activities and natural causes (Kirchhof *et al*., 2023). They tend to be very important parts of many trophic chains in ecosystems, maintaining their energy balance, its flow, keeping a stable state. Simultaneously, the structural and functional state of common species' populations (age composition, sex ratio, morphological and genetic features of these animals) can be used for bioindication, since it reflects the state of the environment as a whole (Akulenko *et al.,* 2019). Reptile species, even those treated as common ones, are extremely sensitive to the state of the environment (biotopes and habitats) and, therefore, require development of special conservation measures now, based on the long-term trends and probabilistic models of environmental change (Catenazzi 2015, Greenberg and Palen 2021). Anthropogenic processes demanding such urgent needs include pollution of the environment (e.g. with pesticides, insecticides etc.), degradation, fragmentation and direct destruction of suitable habitats (e.g. as a result of military actions, shelling, using chemical weapons etc.) (Vasyliuk *et al*. 2022), emergence and expansion of alien invasive species and harmful agents (viruses, microorganisms and parasites) (García-Díaz *et al*. 2016, Demkowska-Kutrzepa *et al*. 2018) and, of course, global climate change (Lindenmayer *et al*. 2011, Vasyliuk *et al*. 2015, Tytar *et al*. 2018, Nekrasova *et al*. 2019).

Globally, the diversity and distribution of reptile species are influenced by factors such as geography, humidity, disturbance, and habitat type (Mehra *et al*. (2021)). There are 11,690 reptile species reported in which lizards (7,144 species), snakes (3956 species), turtles (360 species), amphisbaenians (202 species), crocodiles (27 species), and tuataras (1 species) across the globe (Uetz, 2021). Hadejia wetlands National Park support and provide habitats for a wide variety of wildlife resources especially water birds, and provide essential habitats for resident Palearctic, and inter- African migratory birds (Birdlife International, 2023). Generally, wetlands are store house or hot-spot for the conservation of important species that rural inhabitants mostly depend upon for a source of protein, while at the same time serving high interests of the conservationists for protection. It is not far-fetched that wetlands are good sites for numerous wildlife and home for different natural endowments.

MATERIALS AND METHODS

Study Area

Hadeijia Wetlands National Park (HWNP)

Hadejia Wetlands national Park popularly known as Baturiya Wetlands Game Reserve (BWGR) before it was recently upgraded to National Park. It is natural wetlands located within the Sudano-Sahelian biogeography region of Nigeria, in Jigawa State. It is situated between latitudes $12^0$30' and $12^0$40' N and longitudes $10^0$05' and $10^0$35' E. It is located at West to East directions of Hadejia River, sharing boundaries with Auyo, Kirikasama and Guri Local Government areas of Jigawa State (Nasir *et al.*, 2025). The wetland is internationally known as a hotspot for the conservation of flora and fauna species (Ramsar, 2009). The area of the Reserve including the buffer zone is about 320km^2 and it is characterized by the presence of ponds and flooded lands that are seasonally replenished by the annual flooding of Kafin Hausa and Katagum Rivers, which in fact supports great variety of wildlife resources, particularly water birds that are of both migratory and resident origins. The wetlands game reserve derived its name from the neighboring community of Baturiya, meaning a lady from Europe or white lady. These dates back to three – four hundred years ago visited and camped at the site (Sanusi, 2021).

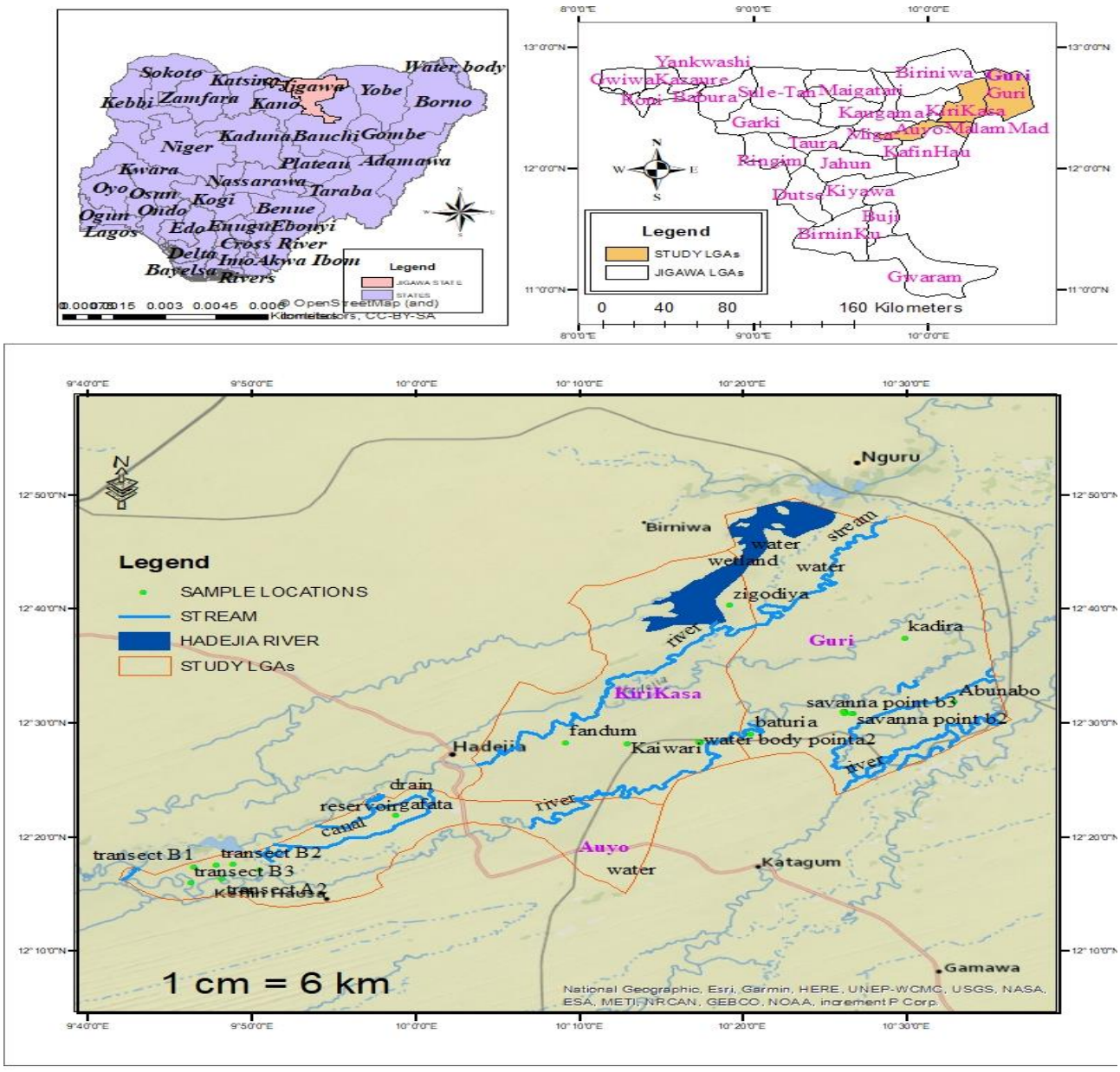

Figure 1: Map of Nigeria showing Hadeijia Wetlands National Park

Research Design

Longitudinal Research design was employed for this study. In longitudinal species diversity of reptilian diversity was obtained across the sampled locations of the different habitats.

Sampling Locations

The area sampled for this study were Hadeijia Wetlands National Park was Based on the vegetation type, the study area was stratified into three (3) categories as follows: (1) Savannah: grassland characterized by few scattered tropical, broadleaved, deciduous trees (House *et al.,* 2003; Baudena *et al*., 2015); (2) wetland/swamp: an area of lowland forest partially or intermittently covered with water (Olalekan *et al.,* 2014); (3) forest: a large area dominated mainly by tropical, broadleaved, evergreen trees with few grasses/shrubs (Baudena *et al.*, 2015).

Data Collection/Sampling Procedures

The sampling procedures and protocols followed strictly ethical approval issued by National Park Service Headquarters, Abuja, Nigeria. The herpetological survey was conducted both in rainy and dry seasons of 2025, with the aid of 3 men search team at Hadeijia wetlands National Park (HWNP). Two types of ecosystems were involved in this study; these are terrestrial and the aquatic ecosystems.

The Terrestrial Ecosystem: this includes the forest land, savannah and farm lands where five transects of 1km length had been established in each of the sampled sites and then, Diurnal (06:00–09:00) and nocturnal (18:00 – 21:00) searches were conducted by aid of visual encounter surveys and opportunistic observations following methods described by Rödel and Ernst (2004) and adopted by Nneji *et al* (2019). Each sampling station was searched daily for three hours per search by a team of three persons each positioning themselves ten 10 meters apart and conducted refuge examinations along 1km transect. The examinations was done by turning over rocks and fallen logs, peeling tree barks, digging through leaf litter, and searching through trees, rotten tree stumps, tree buttresses, termite mounds and burrows fall on the transect (Rödel and Ernst, 2004).

Caution had been taken to ensure negligible disturbance of habitats by returning objects moved to their original points after searching them.

The Aquatic Ecosystem: the aquatic ecosystem on the other hand, point counts method was adopted in collecting the data from the sampled water bodies, with the aid of sound recorder, deep fishing/scoop nets (adopted from Yahaya *et al*., 2019).

Digital photographs were taken for easy handling and later identification of the specimen. Some specimens captured were contained in perforated plastic buckets containing fresh leaves until the search was terminated. Subsequently, the specimens were released at about 50m away from the capture area to avoid recapture.

Specimen Identification

The specimens identification was done to species level using following literatures: Romer (1953); Schiøtz (1963); Walker (1967); Dunger (1967a,b, 1968); Walker (1968); Perret and Amiet (1971); Perret (1977); Hoogmoed (1974); Hughes (1983); Branch (1988); Butler and Reid (1990); Reid *et al*. (1990); Schiøtz (1999); Rödel (2000); Chippaux (2006); Trape and Mediannikov (2016) and Mediannikov *et al*. (2012). Froglife; Amphibia web (2018) and Reptile Database (Uetz *et al*., 2018).

Data Analysis

Species diversity of Reptiles of the study area

Species diversity of the Reptiles of the study area was analyzed using Shannon Diversity Index (Usher, 1991) with the following model.

$H1 = -\Sigma Pi \ln Pi$ (1)

Where:

Pi is the proportion of the ith species in the sample and H1 is the Shannon index, ln Pi is the natural log of the proportion of ith species.

The relative abundance (r), as described in the following model

$RA = n/N \times 100$ (2)

Where;

n_i = individual species *i*

N= total number of the individuals

Community or habitat dominace was determined using Simpson's dominance index (1-D) as described in the following model

$D = \sum pi^2$

Where;

$Pi = n_i/N$ (3)

And the specie richness was determined using Margalef's index (d) as expressed in the following model;

$$\mathrm{DMg} = \frac{s-1}{InN} \quad (4)$$

Where:

S = number of species

N = total individuals

RESULTS AND DISCUSSION

The Checklist of Herpetofauna in Hadeijia Wetlands National Park

Table 1 presents a comprehensive checklist of the Reptiles recorded in Hadeijia Wetlands National Park, Nigeria during this study. It comprises lizards, snakes, crocodiles, and turtles, representing a wide range of taxonomic families and ecological organizations. The presence of these taxa indicates that the park supports diverse Reptiles assemblages associated with both terrestrial and aquatic ecosystems.

The reptile fauna recorded in the park includes representatives of Agamidae, Chamaeleonidae, Gekkonidae, Scincidae, Varanidae, Elapidae, Lamprophiidae, Pythonidae, Viperidae, Crocodylidae, and Pelomedusidae. Lizards formed the largest component of the reptile assemblage, particularly species of the family Scincidae, which are known for their adaptability to open and semi-open habitats. Species such as *Agama agama* and *Agama parafricana* were recorded across forest and savannah habitats, indicating broad ecological tolerance. Arboreal species like *Chamaeleo gracilis* and *Chamaeleo africanus* were mainly associated with forested habitats. Semi-aquatic and aquatic reptiles, including *Varanus niloticus, Crocodylus niloticus*, and *Pelusios castaneus*, were restricted to wetland and water body habitats, emphasizing the ecological importance of aquatic environments within the park. Conservation Status of Recorded Species All the amphibian and reptile species listed in the checklist are currently categorized as Least Concern (LC) on the IUCN Red List. Although none of the species are presently considered threatened, their continued survival depends on the maintenance of suitable habitats.

Generally, the checklist reveals that Hadeijia Wetlands National Park supports a rich and diverse reptilian community encompassing forest, savannah, and wetland-dependent species.

Table 1: The Checklist of the Reptile in Hadeijia Wetlands National Park, Nigeria

Reptiles	Scientific name	Habitat	Common Name	IUCN Red List
Lizards				
Agamidae	*Agama agama* (Linnaeus, 1758)	S,F	Common Agama, Red-headed rock agama	LC
	Agama parafricana (Trapé *et al.,* 2012)	S,F	False Agama	LC
Chamaeleonidae	*Chamaeleo gracilis* (Hallowell, 1844)	S,F	Graceful Chameleon	LC
	Chamaeleo africanus	F	African Chameleon	LC
Gekkonidae	*Hemidactylus mabouia* (Moreau de Jonnès, 1818)	F	Tropical house gecko	LC
Scincidae	*Panaspis togoensis* (Werner, 1902)	S	Togo skink	LC
	Trachylepis affinis (Gray, 1838)	S,F	Senegal Mabuya	LC
	Trachylepis maculilabris (Gray, 1845)	F	Specle-lipped skink	LC
	Trachylepis perrotetii (Duméril and Bibron, 1839)	S	African red-sided skink	LC
	Trachylepis quinquetaeniata (Lichtenstein, 1823)	S	African five-line skink	LC
	Mochlus guineensis,	W, F	Guinean Forest Skink	LC
Varanidae	*Varanus exanthematicus* (Bosc, 1792)	S,F,W	Svannah monitor	LC
	Varanus niloticus (Linnaeus, 1766)	S,F	Nile Monitor	LC
Snake				
Elapidae	*Naja melanoleuca* (Hallowell, 1857)	S,F	Forest cobra	LC
	Naja nigricollis (Hallowell, 1857)	S,F	Black-necked spitting cobra	LC
Lamprophiidae	*Boaedon paralineatus (*Trape and Mediannikov, 2016)	F	Striped house snake	LC
	Boaedon perisilvestris (Trape and Mediannikov, 2016	F	Black house snake	LC
	Lycophidion sp.	F		
Pythonidae	*Python regius* (Shaw, 1802)	S,F	Royal phython	LC
Viperidae	*Causus maculatus* (Hallowell, 1842)	S,F	Spotted night Adder	LC
Crocodiles				
Crocodylidae	*Crocodylus niloticus* (Geoffroy, 1807)	W	West African crocodile	LC
Tortoise				
Pelomedusidae	*Pelusios castaneus* (Schweigger, 1812)	W	West African mud turtle	LC

F-Forest Land; S-Savannah; Water bodies
Source: Field Survey, 2025

Species Composition and Diversity of Reptiles in HWNP during the Wet Season

Table 2 presents the species composition and diversity of reptiles across forest land, savannah, and water body during the wet season. A total of 141 individual reptiles, representing 21 species, were recorded across the three sampled habitats. The forest land habitat recorded the highest abundance (86 individuals), followed by the savannah habitat (42 individuals), while water bodies recorded the lowest abundance (13 individuals). This pattern shows that terrestrial habitats, particularly forest land, provided more suitable conditions for reptile occurrence during the wet season than aquatic habitats.

Lizard species were the most dominant reptile group recorded in the study area.

Species such as *Agama agama*, *Trachylepis perrotetii*, and *Mochlus guineensis* were particularly abundant in forest land and savannah habitats, reflecting their adaptability to a wide range of terrestrial environments. Arboreal species such as *Chamaeleo gracilis* and *Chamaeleo africanus* were recorded only in forest land, highlighting the importance of forest vegetation structure for habitat specialization. Aquatic and semi-aquatic species, including *Crocodylus niloticus* and *Pelusios castaneus*, were restricted mainly to water bodies, indicating strong habitat dependence on aquatic habitats.

The Shannon–Wiener diversity index (H') showed that forest land had the highest reptile diversity (H' = 2.455), followed by the savannah habitat (H' = 2.205), while water bodies recorded the lowest diversity (H' = 1.418). The higher diversity observed in forest land may be attributed to greater habitat heterogeneity, availability of refuges, and complex vegetation structure that support different reptile ecological niches. Species evenness values were relatively low in forest land (0.6849) and savannah (0.648), but comparatively higher in water bodies (0.8258). This indicates that although fewer species were recorded in water bodies, individuals were more evenly distributed among those species. Conversely, forest land and savannah habitats were dominated by a few abundant species, particularly *Agama agama* and *Trachylepis* species.

The Margalef species richness index was highest in forest land (3.592), closely followed by savannah (3.478), and lowest in water bodies (1.559). This further confirms that forest land supported a higher number of reptile species relative to the number of individuals sampled during the wet season. The dominance index (D) was highest in forest land (0.8848) and savannah (0.8413), but considerably lower in water bodies (0.2899). Higher dominance values in forest land and savannah indicate that reptile communities in these habitats were largely influenced by a few dominant species, whereas the lower dominance in water bodies suggests a more balanced distribution among the fewer species present.

Table 2: Species Composition and Diversity of Reptiles Across the Sampled Habitats in HWNP during the Wet Season

S/N	Species	Forest land	Savannah	Water bodies	Total
1	*Agama agama*	21	13	0	34
2	*Agama parafricana*	8	1	0	9
3	*Chamaeleo gracilis*	2	0	0	2
4	*Chamaeleo africanus*	3	1	0	4
5	*Hemidactylus mabouia*	0	2	0	2
6	*Panaspis togoensis*	4	1	0	5
7	*Trachylepis affinis*	3	2	0	5
8	*Trachylepis maculilabris*	6	4	1	11
9	*Trachylepis perrotetii*	10	8	2	20
10	*Trachylepis quinquetaeniata*	7	3	0	10
11	*Mochlus guineensis,*	10	2	0	12
12	*Varanus exanthematicus*	1	0	2	3
13	*Varanus niloticus*	1	0	0	1
14	*Naja melanoleuca*	0	0	0	0
15	*Naja nigricollis*	2	1	0	3
16	*Boaedon paralineatus*	2	0	0	2
17	*Boaedon perisilvestris*	1	1	0	2
18	*Python regius*	2	1	0	3
19	*Causus maculatus*	0	0	0	0
20	*Crocodylus niloticus*	0	0	2	2
21	*Pelusios castaneus*	3	2	6	11
	Total	**86**	**42**	**13**	**141**
	Diversity indices				
	Shannon_H	2.455	2.205	1.418	
	Evenness_e^H/S	0.6849	0.648	0.8258	
	Margalef	3.592	3.478	1.559	
	Dominance_D	0.8848	0.8413	0.2899	

Source: Field Survey; 2025

Species Composition and Diversity of Reptiles in HWNP during the Dry Season

Table 3 presents the species composition and diversity of reptiles across the sampled habitats during the dry season. A total of 127 individual reptiles, representing 21 species, were recorded across the three sampled habitats. The forest land habitat recorded the highest abundance (77 individuals), followed by the savannah habitat (41 individuals), while water bodies recorded the lowest abundance (9 individuals). This form suggests that terrestrial habitats, particularly forest land, provided more stable and suitable environmental conditions for reptiles during the dry season compared to aquatic habitats. Lizard species constituted the majority of reptiles recorded during the dry season, indicating their adaptability to dry environmental conditions. Species such as *Agama agama*, *Trachylepis perrotetii*, and *Mochlus guineensis* were the most abundant and widely distributed, especially in forest land and savannah habitats. Their dominance reflects ecological flexibility, effective thermoregulation, and the ability to exploit diverse microhabitats and food resources. Arboreal species such as *Chamaeleo gracilis* and *Chamaeleo africanus* were recorded in low numbers (2 and 3 respectively), likely due to reduced vegetation cover and humidity during the dry season. Snake species were generally scarce, possibly due to reduced surface activity under dry conditions. Aquatic and semi-aquatic species such as *Varanus exanthematicus, Varanus niloticus*, and *Pelusios castaneus* were recorded mainly in water bodies but in low numbers (2, 4 and 6). The reduced abundance of these species highlights the negative impact of seasonal water scarcity on aquatic reptile habitats. The absence of *Crocodylus niloticus* during the dry season further emphasizes the influence of reduced water availability on large aquatic reptiles.

The Shannon–Wiener diversity index (H') showed that savannah recorded slightly higher species diversity (H' = 2.354) compared to forest land (H' = 2.337), while water bodies recorded the lowest diversity (H' = 1.523). The similarity in diversity values between forest land and savannah showed that both habitats provided comparable ecological conditions for reptiles during the dry season. Lower diversity in water bodies reflects habitat limitation and environmental stress.

Species evenness was highest in water bodies (0.9172), followed by savannah (0.7516), while forest land recorded the lowest evenness (0.6471). High evenness in water bodies indicates balanced distribution among fewer species, whereas lower evenness in forest land reflects dominance by a few abundant species such as *Agama agama* and *Mochlus guineensis*. The Margalef species richness index showed that savannah recorded the highest richness (3.501), closely followed by forest land (3.453), while water bodies recorded the lowest richness (1.82). This suggests that savannah habitats supported slightly more species relative to sampling effort during the dry season. The dominance index (D) was highest in water bodies (0.2346), followed by forest land (0.126) and savannah (0.1208), indicating greater species dominance under stressful conditions in aquatic habitats

Table 3: Species Composition and Diversity of Reptiles across the Sampled Habitats in Dry Season

S/N	Species	Forest land	Savannah	water bodies	Total
1	*Agama agama*	17	9	0	26
2	*Agama parafricana*	7	6	0	13
3	*Chamaeleo gracilis*	2	1	0	3
4	*Chamaeleo africanus*	1	1	0	2
5	*Hemidactylus mabouia*	1	2	0	3
6	*Panaspis togoensis*	3	2	0	5
7	*Trachylepis affinis*	2	2	0	4
8	*Trachylepis maculilabris*	5	3	1	9
9	*Trachylepis perrotetii*	12	7	2	21
10	*Trachylepis quinquetaeniata*	6	2	0	8
11	*Mochlus guineensis,*	13	2	0	15
12	*Varanus exanthematicus*	0	0	2	2
13	*Varanus niloticus*	3	0	1	4
14	*Naja melanoleuca*	0	0	0	0
15	*Naja nigricollis*	0	1	0	1
16	*Boaedon paralineatus*	2	0	0	2
17	*Boaedon perisilvestris*	0	1	0	1
18	*Python regius*	1	0	0	1
19	*Causus maculatus*	1	0	0	1
20	*Crocodylus niloticus*	0	0	0	0
21	*Pelusios castaneus*	1	2	3	6
	Total	**77**	**41**	**9**	**127**

Diversity Indices:			
Shannon_H	2.337	2.354	1.523
Evenness_e^H/S	0.6471	0.7516	0.9172
Margalef	3.453	3.501	1.82
Dominance_D	0.126	0.1208	0.2346

Source: Field Survey, 2025

Distribution, Composition and Relative Abundance of Reptiles of HWNP (Wet Season)

Table 4 presented a total of 142 individual reptiles, representing 21 species, were recorded across forest land, savannah, and water body habitats during the wet season. The result indicates clear differences in species abundance, habitat preference, and activity patterns. *Agama agama* was the most abundant species with 34 individuals, accounting for 23.94% of the total records, making it the dominant reptile species in the study area during the wet season. Other relatively abundant species included *Trachylepis perrotetii* (14.08%), *Mochlus guineensis* (8.45%), *Trachylepis maculilabris* (7.75%), *Pelusios castaneus* (7.75%), and *Trachylepis quinquetaeniata* (7.04%). Species such as *Chamaeleo gracilis*, *Hemidactylus mabouia*, *Varanus niloticus, Boaedon paralineatus*, *Boaedon perisilvestris*, and *Crocodylus niloticus* recorded very low relative abundance, indicating rarity or low detectability during the survey period.

The result further showed that forest land habitat supported the highest number of species and individuals, suggesting that it provides favorable environmental conditions such as shelter, food availability, and suitable microclimate. Most lizard species were predominantly recorded in this habitat. In other hand, Savannah habitat recorded fewer species and individuals, while water bodies were mainly occupied by semi-aquatic and aquatic reptiles such as *Crocodylus niloticus*, *Varanus niloticus*, and *Pelusios castaneus*, reflecting habitat specialization. In addition, the results depicts that most reptiles were encountered during daytime surveys, indicating predominantly diurnal activity patterns during the wet season. Only a few species such as *Naja nigricollis*, *Python regius,* and *Crocodylus niloticus* were recorded at night.

Some species such as Naja *melanoleuca* and *Causus maculatus* were not recorded during the study period, which may be attributed to low population density, seasonal movement, cryptic behavior, or limited sampling efficiency

Table 4: Distribution, Composition and Relative Abundance of the Reptiles Species across the Habitats (Wet Season)

S/N	Species	Forest Land		Savannah		Water body		Count	RA (%)
		Day	Night	Day	Night	Day	Night		
1	*Agama agama*	21	0	13	0	0	0	34	23.94
2	*Agama parafricana*	8	0	1	0	0	0	9	6.34
3	*Chamaeleo gracilis*	2	0	0	0	0	0	2	1.41
4	*Chamaeleo africanus*	3	0	1	0	0	0	4	2.82
5	*Hemidactylus mabouia*	0	0	2	0	0	0	2	1.41
6	*Panaspis togoensis*	4	0	1	0	0	0	5	3.52
7	*Trachylepis affinis*	3	0	2	0	0	0	5	3.52
8	*Trachylepis maculilabris*	5	1	4	0	1	0	11	7.75
9	*Trachylepis perrotetii*	8	2	8	0	2	0	20	14.08
10	*Trachylepis quinquetaeniata*	6	1	3	0	0	0	10	7.04
11	*Mochlus guineensis,*	10	0	2	0	0	0	12	8.45
12	*Varanus exanthematicus*	1	0	0	0	2	0	3	2.11
13	*Varanus niloticus*	0	0	1	0	1	0	2	1.41
14	*Naja melanoleuca*	0	0	0	0	0	0	0	0.00
15	*Naja nigricollis*	0	2	0	1	0	0	3	2.11
16	*Boaedon paralineatus*	2	0	0	0	0	0	2	1.41
17	*Boaedon perisilvestris*	2	0	0	0	0	0	2	1.41
18	*Python regius*	1	1	0	1	0	0	3	2.11
19	*Causus maculatus*	0	0	0	0	0	0	0	0.00
20	*Crocodylus niloticus*	0	0	0	0	0	2	2	1.41
21	*Pelusios castaneus*	3	0	1	1	6	0	11	7.75
	TOTAL							**142**	**100**

Source: Field Survey, 2025

Distribution, Composition and Relative Abundance of Reptiles in HWNP (Dry Season)

Result in Table 5 showed that a total of 136 individual reptiles, representing 21 species, were recorded across forest land, savannah, and water body habitats during the dry season. The results reveal variations in species abundance, habitat use, and activity patterns when compared with the wet season. Species Composition and Relative Abundance *Agama agama* was the most abundant species during the dry season with 26 individuals, accounting for 19.12% of the total records, indicating its dominance across the study area. *Trachylepis perrotetii* was the second most abundant species (15.44%), followed by *Mochlus guineensis* (11.03%), *Agama parafricana* (9.55%), and *Pelusios castaneus* (8.08%). Species such as *Chamaeleo africanus, Varanus exanthematicus, Boaedon paralineatus*, and *Boaedon perisilvestris* showed low relative abundance, suggesting limited distribution or reduced activity during the dry season.

Forest land habitat supported the highest number of individuals and species during the dry season, similar to the wet season pattern. Savannah habitat contributed moderately to reptile abundance, while water bodies were mainly occupied by semi-aquatic species such as *Pelusios castaneus* and *Varanus niloticus*. Most reptiles were recorded during daytime surveys, indicating that reptile activity during the dry season was predominantly diurnal. However, a slightly higher number of nocturnal observations were recorded for species such as *Hemidactylus mabouia, Mochlus guineensis*, *Python regius, and Pelusios castaneus*, reflecting adaptive behavioral responses to dry season conditions.

The results also indicated that *Naja melanoleuca, Causus maculatus*, and *Crocodylus niloticus* were not recorded during the dry season, this could be due to habitat contraction, seasonal migration, or cryptic behavior under dry environmental conditions.

Table 5: Distribution, Composition and Relative Abundance of the Reptiles Species across the Habitats in HWNP (Dry Season)

S/N	Species	Forest Land		Savannah		Water body		Count	RA (%)
		Day	Night	Day	Night	Day	Night		
1	*Agama agama*	17	0	8	1	0	0	26	19.12
2	*Agama parafricana*	7	0	6	0	0	0	13	9.55
3	*Chamaeleo gracilis*	2	0	1	0	0	0	3	2.21
4	*Chamaeleo africanus*	1	1	0	0	0	0	2	1.47
5	*Hemidactylus mabouia*	1	2	0	0	0	0	3	2.21
6	*Panaspis togoensis*	3	0	2	0	0	0	5	3.68
7	*Trachylepis affinis*	2	0	2	0	0	0	4	2.94
8	*Trachylepis maculilabris*	4	1	3	0	1	0	9	6.62
9	*Trachylepis perrotetii*	12	0	7	0	2	0	21	15.44
10	*Trachylepis quinquetaeniata*	6	0	2	0	0	0	8	5.88
11	*Mochlus guineensis,*	10	3	2	0	0	0	15	11.03
12	*Varanus exanthematicus*	0	0	0	0	2	0	2	1.47
13	*Varanus niloticus*	1	2	0	0	1	0	4	2.94
14	*Naja melanoleuca*	0	0	0	0	0	0	0	0.00
15	*Naja nigricollis*	2	0	1	0	0	0	3	2.21
16	*Boaedon paralineatus*	2	0	0	0	0	0	2	1.47
17	*Boaedon perisilvestris*	1	0	1	0	0	0	2	1.47
18	*Python regius*	1	1	1	0	0	0	3	2.21
19	*Causus maculatus*	0	0	0	0	0	0	0	0.00
20	*Crocodylus niloticus*	0	0	0	0	0	0	0	0.00
21	*Pelusios castaneus*	2	1	2	0	4	2	11	8.08
	TOTAL							**136**	**100**

Source: Field Survey, 2025

Discussion

Herpetofauna Species Checklist of Hadejia Wetlands National Park

The results obtained demonstrate clear patterns of habitat-specific species occurrence, indicating that habitat type significantly influences Reptiles composition in the study area. The recorded assemblage of Reptiles and reptiles across forest, savannah, floodplain, and wetland habitats confirms that Hadejia Wetlands National Park supports a diverse and ecologically structured herpetofaunal community. This finding corroborates with the studies and findings of Gibbons (2003), Mehra *et al*.

(2021), and Oni *et al.* (2024), who reported that wetlands with heterogeneous habitat structures support high species richness. With regards to Habitat Associations, The null hypothesis proposed that reptilian species diversity and distribution are not significantly influenced by habitat type within the park.

The results further showed the Reptile Species Distribution and their Habitat Heterogeneity. The hypothesis that reptile species composition does not vary significantly among habitat types was rejected, as reptiles showed clear habitat specific distributions. Arboreal species were confined to forests, while aquatic and semi aquatic species occurred only in wetland habitats. These findings corroborate with Uetz, (2021).

Similarly, the conservation status of all the species were classified as Least Concern, suggesting that localized declines may occur despite global conservation status. Habitat degradation, climate change, and anthropogenic pressures pose potential risks to herpetofaunal populations as indicated by Frost, (2021) and Villamarín *et al*. (2022).

The results clearly portrayed the rejection of all null hypotheses supports the conclusion that habitat heterogeneity is the primary driver of Reptilian diversity in Hadejia Wetlands National Park. The study provides essential baseline data for conservation planning and long-term monitoring.

Reptile Species Composition and Diversity in Hadejia Wetlands National Park

The observed patterns of the reptilian species strongly support the assumptions which emphasized habitat heterogeneity and seasonal variation as major determinants of reptile structure in tropical ecosystems. In both seasons, lizard species such as *Agama agama, Trachylepis perrotetii, Mochlus guineensis*, and *Trachylepis maculilabris* were statistically dominant. The result corroborated a study of Nneji *et al*., (2019) who reported dominance of generalist lizards in West African forest savannah mosaics. These species possess broad thermal tolerances, high reproductive potential and flexible diets, allowing them to persist under fluctuating environmental conditions and moderate anthropogenic disturbance. Forest land consistently recorded the highest reptile abundance in both wet and dry seasons. This finding is in line with Segniagbeto *et al*. (2022) and Luiselli (2022), who reported that structurally complex habitats enhance reptile abundance by providing refuge from predators, stable microclimates, and diverse prey resources.

For the Savannah habitats on the other hand, recorded slightly lower abundance, showed higher species richness, particularly during the dry season. This form is in line with Onyishi *et al.,* (2021) who opined that savannah ecosystems support diverse reptile communities due to their variety of grasses, shrubs, rocks, and open ground, which create numerous ecological niches.

Seasonal variation strongly influenced reptile distribution and diversity. The higher abundance recorded during the wet season corroborates earlier findings that reptile activity increases with rainfall due to improved hydration, prey availability, and reproductive activity (Da Silva *et al*., 2022; Segniagbeto *et al*. 2022). Conversely, reduced encounters during the dry season, especially for snakes, reflect behavioral avoidance of extreme temperatures and desiccation stress as submitted in Pereira *et al.*, (2022). Arboreal reptiles such as *Chamaeleo gracilis* and *Chamaeleo africanus* occurred in low numbers across both seasons. Similar observations were made by Nneji *et al*., 2018), who reported that chameleon abundance is closely linked to vegetation density and humidity. Reduced canopy cover during the dry season likely limits suitable microhabitats for these species.

Aquatic and semi aquatic reptiles such as *Pelusios castaneus*, *Varanus exanthematicus, Varanus niloticus*, and *Crocodylus niloticus*, were largely restricted to water bodies and recorded with very low number of sightings. Other studies (Luiselli *et al.,* 2022) have emphasized the strong dependence of these species on stable hydrological conditions. The zero record of *Crocodylus niloticus* during the dry season supports earlier reports of seasonal retreat or reduced detectability under low water conditions (Behangana *et al.,* (2020).

Diversity indices further indicated the influence of habitat type and season. Shannon diversity values recorded for forest land and savannah fall within ranges reported for reptile assemblages in West Africa (Nneji *et al.,* 2019). Lower diversity in water bodies reflects habitat restriction and environmental stress. However, high evenness values in aquatic habitats support the stress dominance proposition, which predicts balanced species distribution under constrained conditions (Onadeko & Ogunkanmi (2024).

CONCLUSION

This study provides a comprehensive assessment of the species diversity, ecological distribution of Reptilian in Hadejia Wetlands National Park, Nigeria. The findings demonstrate that Hadejia Wetlands National Park supports diverse and ecologically structured reptiles with distinct habitat associations. Species distribution patterns varied significantly across habitat types and seasons, confirming the importance of wetlands, floodplains, forest patches, and savannah varieties in sustaining Reptilian diversity.

RECOMMENDATIONS

Based on the findings of this research and given the strong influence of habitat type and seasonality on Reptiles diversity and distribution; There is a need to prioritize the

protection of key habitats, particularly permanent wetlands, floodplains, riparian forests, and breeding sites for reptiles; Restoration of degraded microhabitats should be incorporated into park management plans to sustain breeding and refuge sites.

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