DIVERSITY OF GECKO SPECIES IN EHANIRE DANJUMA LEGACY HALL OF RESIDENCE WITHIN THE UNIVERSITY OF BENIN, BENIN CITY, NIGERIA.

BY

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CERTIFICATION

This is to certify that this work was carried out by **VICTOR ETIM OYAMA** with matriculation number **LSC2103678** in the Department of Animal and Environmental Biology, University of Benin, Benin City under my supervision.

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DEDICATION

This project is indisputably dedicated to God Almighty for his love and guidance and to my parents and siblings for their unending support, which facilitated its success.

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First and foremost, I return all glory to God Almighty for His unfailing love, strength, wisdom, and grace that saw me through every stage of this research.

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Lastly, to my mom, your unconditional love and steadfast support have been the foundation upon which this success stands. I am forever grateful.

May God Almighty richly bless you all.

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ABSTRACT

This study examined the diversity and distribution of gecko species within the newly constructed Danjuma Hostel, University of Benin (UNIBEN), Ugbowo Campus, Edo State, Nigeria. The survey was conducted from August to October 2025 to determine how quickly *Hemidactylus* species establish in modern human dwellings. Visual encounter surveys were carried out during both day and night, focusing on walls, ceilings, corridors, and nearby vegetation. A total of 18 geckos were recorded, comprising *Hemidactylus mabouia* (10 individuals, 55.6%) and *Hemidactylus angulatus* (8 individuals, 44.4%). Despite the hostel's recent construction, both species displayed remarkable adaptability, indicating early colonization facilitated by artificial lighting, insect availability, and microhabitat conditions. *H. mabouia* was predominantly observed in light-exposed areas, while *H. angulatus* occupied more secluded and shaded sections, suggesting niche differentiation within a shared environment. These findings reveal that ecological succession in human structures can occur much faster than previously assumed, particularly among synanthropic reptiles. The presence of both species in near-equal proportions implies a balanced micro-ecosystem, where competition and resource partitioning allow coexistence. Beyond its local significance, this study underscores the broader ecological principle that nature wastes no opportunity to reclaim and inhabit newly available niches, even those fashioned by human hands.

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

Geckos are generally small, nocturnal reptiles characterized by their soft skin, short and stout bodies, large heads, and well-developed limbs (Borsuk-Białynicka, 1990). The tips of their limbs often bear digits equipped with adhesive pads, which facilitate climbing on various surfaces. Most species range in size from 3 to 15 cm in total length, including the tail, which typically accounts for about half of the entire body length. Geckos have successfully adapted to a wide range of habitats, from arid deserts to humid rainforests. Several species are also commonly found in human dwellings, where they feed mainly on insects. Globally, geckos are distributed across six families (Conrad and Norell, 2006): Carphodactylidae, Diplodactylidae, Eublepharidae, Gekkonidae, Phyllodactylidae, and Sphaerodactylidae**.** Among these, members of the family *Eublepharidae*, which includes the banded geckos (*Coleonyx*) of the southwestern United States and the cat geckos (*Aeluroscalabotes*) of Indonesia and the Malay Peninsula, are unique for possessing movable eyelids. Most other geckos have feet specially modified for climbing (Conrad, 2008). Their elongated toes are covered with lamellae, which in turn bear numerous microscopic hair-like projections that are forked at the tips. These tiny hooks adhere to minute surface irregularities, enabling geckos to scale smooth vertical surfaces and even run across ceilings. Some species also possess retractable claws (Bauer *et al.,* 2005). In escaping predators, certain geckos exhibit remarkable speed and agility, and have been observed running across the surface of water without sinking. Although this ability has been conclusively documented only in the flat-tailed house gecko (*Hemidactylus platyurus*), it is believed that many other species may exhibit similar behavior (Roth *et al.,* 2009). Like snakes, most geckos possess a transparent protective covering over their eyes in place of movable eyelids. The students of normal nocturnal species have observed that geckos typically possess vertical pupils, often lobed in such a way that they nearly form four distinct pinpoints. The tail of a gecko may vary in form; it can be long and tapering, short and blunt, or even globular in shape. In many species, the tail serves as a fat storage organ, providing an essential energy reserve that can be utilized during periods of food scarcity or harsh environmental conditions. The tail is also quite delicate and, when detached, can regenerate rapidly to its original form (Bet *et al.,* 2015). Unlike many other reptiles, most gecko species are vocal, producing calls that differ among species and range from faint clicks and peeps to loud chortles or barking sounds. The majority of geckos are oviparous, laying hard-shelled, white eggs usually beneath tree bark or attached to the undersides of leaves. However, a few species in New Zealand are viviparous, giving birth to live young. Geckos are abundant across tropical and subtropical regions of the world, with several species found on nearly every continent except Antarctica (Bet *et al.,* 2012). Gecko coloration is typically dull, dominated by shades of gray, brown, and off-white. However, certain genera, such as *Phelsuma*, the day geckos of Madagascar, display vivid green coloration and are diurnal in habit. The banded or western banded gecko (*Coleonyx variegatus*), one of the most widespread native species in North America, grows up to 15 cm long and is pinkish to yellowish-tan with darker bands and blotches. The Tokay gecko (*Gekko gecko*), native to Southeast Asia, is among the largest species, reaching lengths of 25 to 35 cm (Santos *et al.,* 2007). Another well-known species, *Tarentola mauritanica* (family Gekkonidae), is native to the western Mediterranean region of Europe and North Africa, but has been widely introduced to North America and parts of Asia. It is commonly found on walls and buildings in urban environments, especially in warm coastal areas, though it also extends inland in some regions such as Spain. This robust species, which can reach up to 150 mm in total length, has prominent tubercles that give it a rough, armored appearance (Puthoff *et al.,* 2010). *T. mauritanica* is now distributed across much of the Mediterranean Basin, demonstrating the adaptability of geckos to both natural and urban ecosystems. On the European mainland, its populations extend from Portugal (except for the northwestern areas) and Spain (absent in most of the north), through southern France, mainly along coastal areas of Italy, southern Slovenia, northern coastal Croatia, and the southwestern parts of Greece. In North Africa, the species ranges from northern Egypt through northern Libya, central and northern Tunisia, northern Algeria, and much of Morocco to the northwestern parts of Western Sahara. A small, introduced population also exists in southern Western Sahara (Prowse *et al.,* 2011). The species occurs on numerous Mediterranean islands, including Corsica (France); Sardinia, Sicily, Pantelleria, and Lampedusa (Italy); and the Ionian Islands and Crete (Greece). Many of these northern Mediterranean populations are believed to have been introduced in ancient times. *T. mauritanica* has also been introduced to several non-native regions, such as the Balearic Islands, Tenerife (Spain), the island of Madeira (Portugal), Montevideo (Uruguay), Buenos Aires (Argentina), and California (USA). It is found from sea level up to elevations of about 2,300 meters in Spain (Tzadi *et al.,* 2014).

Another widely distributed species, *Hemidactylus frenatus*, commonly known as the Common House Gecko, is native to Asia. Individuals grow between 3 and 6 inches in length and possess small rows of spines along each side of their slightly flattened tails. *H. frenatus* is known for its competitive success against endemic gecko species for both food and shelter. The species typically lives for about five years and reaches sexual maturity at approximately one year of age. Females generally produce two eggs per clutch, with an incubation period ranging from 45 to 70 days (Hansen and Pre-Winter, 2005). Today, *H. frenatus* has spread across much of the globe. It is now found in the southern United States, Central and South America, Australia, Africa, and numerous Pacific islands. Its distribution continues to expand into regions with climates ranging from tropical to temperate zones. Although *H. frenatus* populations were historically associated primarily with human dwellings, recent observations indicate that the species is increasingly adapting to a wider variety of habitats, reflecting its high ecological flexibility and invasive potential. *H. frenatus* is often spread to new regions through delivery. It can move high into steel trailers (Xu *et al*., 2015). This makes it more challenging to recognize *H. frenatus* or its egg stores during assessments of the freight.

1.2 Aim and Objectives

This study aims to determine the diversity index of geckos found in female halls of residence within the University of Benin.

The specific objectives of the study were to determine:

1. The number of gecko species in the Danjuma Legacy Hall of Residence at the University of Benin.
2. Their percentage relative frequency distribution and relative abundance.
3. Their diversity and distributions.

CHAPTER TWO

LITERATURE REVIEW

2.1 Geckos

Geckos are unique among reptiles for their ability to produce vocal sounds, which vary across species. Most geckos within the family *Gekkonidae* communicate socially using peeping or clicking sounds. The Tokay gecko (*Gekko gecko*) is well known for its loud mating calls, while some other species produce faint hissing sounds when frightened or threatened (Huber *et al.*, 2005). Geckos represent the most species-rich group of reptiles, comprising about 1,500 species worldwide. The name *gecko* originates from the Indonesian–Malay word *gēkoq*, which mimics the sound made by certain species. Except for those in the family *Eublepharidae*, all geckos lack eyelids. Instead, their eyes are protected by a transparent membrane that functions as a cornea. Since they cannot blink, species without eyelids often lick their corneas to remove dust and keep them clean and moist (Chen and Gao, 2010). Nocturnal geckos possess exceptional night vision, estimated to be about 350 times more sensitive to color in low light than human vision. These nocturnal species evolved from diurnal ancestors that had lost their eye bars. Over time, the gecko eye developed modified cones that enlarged and diversified into multiple types, both single and double cones, containing three photopigments sensitive to ultraviolet, blue, and green light. Their multifocal optical system allows them to produce sharp images at different depths (Bet *et al.*, 2012).

While most gecko species are nocturnal, some are diurnal, being active during the day. This adaptation has evolved independently multiple times in different lineages. Like most reptiles, geckos can autotomize their tails as a defense mechanism, distracting predators long enough to escape, a process known as *autotomy*. The tail later regenerates, though with a slightly different structure and coloration. Geckos are widely recognized for their specialized toe pads, which enable them to climb smooth, vertical, and even inverted surfaces effortlessly. This ability allows them to coexist closely with humans, particularly in warm regions where they frequently inhabit buildings. These house geckos are often welcomed because they feed on insects such as moths and mosquitoes (Loskill *et al.*, 2012). The largest known species, the *Kawekaweau*, measured up to 60 cm in length and was likely endemic to New Zealand. It is known only from a single preserved specimen discovered in the basement of a museum in Marseille, France. This species is believed to have gone extinct in the late nineteenth century, following the introduction of invasive species such as rats and stoats during European colonization (Harvest Time *et al.*, 2002). Conversely, the smallest known gecko, *Jaragua sphaero*, measures just 1.6 cm in length and was discovered in 2001 on a small island off the coast of Hispaniola. Geckos are commonly found in tropical and subtropical regions, often cohabiting with humans. House geckos, in particular, are frequent in urban and residential areas where they help control insect populations such as mosquitoes and moths, thus serving an important ecological role. The largest recorded gecko, the *Kawekaweau*, reached approximately 60 cm in length and was likely endemic to New Zealand before its extinction in the 19th century due to habitat loss and the introduction of invasive species during European colonization (Harvesttime *et al.*, 2002). On the other hand, the smallest known gecko, *Jaragua sphaero*, measures only 1.6 cm and was discovered in 2001 on a small island of

Hispaniola. In summary, geckos are an exceptionally diverse, adaptive, and ecologically vital group of reptiles. Their vocal, visual, and adhesive adaptations illustrate the complexity of evolutionary mechanisms that have enabled them to survive in diverse habitats, from dense forests and arid deserts to urban environments around the world.

2.2 Common Traits

Like most reptiles, geckos are ectothermic, meaning they depend on external heat sources to regulate their body temperature. They produce very little metabolic heat and rely on the warmth of their surroundings to maintain proper physiological function. As a result, environmental temperature plays a crucial role in their movement, feeding, digestion, and reproduction. To perform these essential life processes effectively, geckos must maintain a moderately elevated body temperature compared to their environment (Lee *et al.*, 2007). When the temperature drops too low, their metabolism slows, making them less active. Conversely, excessive heat can lead to dehydration and stress. This dependency on ambient temperature is why geckos are more abundant in tropical and subtropical regions, where consistent warmth supports their survival and activity levels.

2.3 Shedding or Molting

All geckos shed their skin at fairly regular intervals, although the frequency and method of shedding vary among species. Shedding, also known as molting or ecdysis, is a natural biological process through which geckos remove the outer layer of dead skin to allow for growth and renewal. This process also helps eliminate parasites and maintain a healthy skin condition. For instance, leopard geckos typically shed every two to four weeks, while younger geckos shed more frequently, about once a week, due to their rapid rate of growth. As geckos mature, the interval between shedding increases, and adults may shed once every one to two months (Loskill *et al.*, 2012). Environmental factors such as humidity play a significant role in successful shedding. Higher humidity helps loosen the old skin, making it easier to remove. When shedding begins, a gecko usually assists the process by rubbing its body against rough surfaces to detach loose skin. Interestingly, most geckos consume their shed skin, a behavior that helps them recycle nutrients and avoid leaving traces that could attract predators. Failure to shed completely, especially around the toes and tail, can cause circulation problems or infections, making proper environmental conditions crucial for gecko health. Overall, shedding is a vital process that supports growth, cleanliness, and survival in geckos across all habitats. In addition to temperature regulation, geckos exhibit other common reptilian traits such as scaly skin, internal fertilization, and egg-laying reproduction in most species. Their scales serve as protective armor and help minimize water loss, allowing them to thrive in both humid forests and arid environments. Some geckos also display color variations that aid in camouflage, enabling them to blend into their surroundings to evade predators or ambush prey. Overall, the physiological and behavioral traits of geckos reflect a high degree of adaptation to environmental conditions, contributing to their success as one of the most diverse and widespread reptile groups on Earth.

2.4 Adhesion ability

Approximately 60% of gecko species possess adhesive toe pads that enable them to cling to various surfaces without the use of liquids or surface tension. These adhesive pads have evolved multiple times across gecko lineages, being independently gained in about 11 different gecko families and subsequently lost in roughly 9 separate ancestries (Hsu *et al.,* 2011). The spatula-shaped setae, arranged in lamellae on the gecko's footpads, generate van der Waals forces, the weakest of molecular attractions, between the β-keratin lamellae/setae/spatulae structures and the surface. These forces involve no fluids, meaning that in theory, a boot made from synthetic setae could adhere equally well to the surface of the International Space Station as to a living room wall, although adhesion can vary with humidity (Higham *et al.,* 2011). However, recent research suggests that electrostatic interactions (caused by contact electrification) may also play a key role in gecko adhesion, rather than van der Waals or capillary forces alone. Interestingly, the setae on gecko feet are self-cleaning; they typically remove any clinging dirt particles after just a few steps. Teflon, which possesses very low surface energy, remains one of the few materials that geckos struggle to adhere to (Russell *et al.,* 2015).

Gecko adhesion tends to increase with humidity, even on hydrophobic surfaces, but it decreases under conditions of complete immersion in water. The exact role of water in this mechanism is still debated, though recent findings agree that the presence of molecular water layers, which carry a large dipole moment, on the setae and surface can increase surface energy. Consequently, the energy gained when these surfaces come into contact is enhanced, resulting in greater adhesive force (Green *et al.,* 2017). Additionally, the elastic properties of β-keratin alter with moisture absorption, influencing adhesion.

Gecko toes appear "double-jointed," but this is a misconception. The correct term is digital hyperextension, which allows geckos to peel their toes off surfaces from the tips inward, counteracting the van der Waals forces that keep them attached. Through this peeling motion, each spatula detaches sequentially, requiring minimal force per spatula (Watson *et al.,* 2015). Geckos typically use only a fraction of their full adhesive potential, as the actual grip depends on surface roughness and the number of setae in contact. To produce effective adhesion through weak van der Waals forces, extremely large surface areas are required. Each square millimeter of a gecko's footpad contains approximately 14,000 hair-like setae, each about 5 µm in diameter, far thinner than human hair, which ranges between 18 and 180 µm. A single human hair's cross-sectional area is thus equivalent to between 12 and 1300 gecko setae (Gregory *et al.,* 2010).

Each seta branches into 100–1000 spatulae, each measuring around 0.2 µm in length, just below the wavelength of visible light. The combined adhesive strength of a mature 70 g gecko's setae could theoretically support a load of 133 kg, with each spatula capable of exerting an adhesive force between 5 to 25 nN. The exact adhesive strength of each spatula varies depending on the surface energy of the substrate (Han *et al.,* 2004).

Beyond the structural design of the setae, naturally produced phospholipid substances in geckos also play an important role. These lipids lubricate the setae, allowing smooth detachment before the next step. The origin of gecko adhesion likely began with simple epidermal modifications on the undersides of their toes (Bet et *al.,* 2008). Such developments were recently identified in the South American genus *Gonatodes*, where the elaboration of epidermal spinules into setae enables *Gonatodes humeralis* to climb smooth surfaces and rest on glossy leaves. Modern biomimetic technologies are inspired by this mechanism, aiming to create reusable, self-cleaning dry adhesives with vast industrial and robotic applications. However, producing synthetic setae that mimic gecko adhesion remains a highly complex material design challenge (Bet *et al.,* 2007).

2.5 Skin

Gecko skin does not typically bear true scales but instead exhibits a papillose surface at the macroscopic level. This surface is composed of hair-like microstructures distributed across the entire body. These microscopic protrusions, which measure up to 4 microns in length and taper to a fine point, impart the skin with superhydrophobic properties and a remarkable antimicrobial function. The specialized structure of these protrusions prevents the adhesion of water and pathogens, creating a natural self-cleaning mechanism. Notably, gecko skin demonstrates antibacterial activity, effectively destroying Gram-negative bacteria upon contact (Bet *et al.,* 2011). This unique biological adaptation not only enhances the animal's survival in humid, pathogen-rich environments but also inspires biomimetic applications in material science and medicine.

An outstanding example is the Mossy Leaf-Tailed Gecko (*Uroplatus sikorae*) of Madagascar. This species exhibits skin coloration that serves as camouflage, mimicking the appearance of tree bark, complete with lichen-like markings. Its coloration ranges from grayish-brown to greenish-brown, depending on the surrounding environment. Additionally, *U. sikorae* possesses dermal folds, flaps of skin running along the sides of its body and limbs, which it presses against tree trunks during the day. These folds disperse shadows and break up the animal's outline, rendering it almost invisible in its natural habitat.

2.6 Teeth

Geckos are polyphyodonts, meaning they continuously replace their teeth throughout their lifespan. Each of the approximately 100 teeth in a gecko's mouth are replaced every 3 to 4 months. Adjacent to each mature tooth lies a developing replacement tooth, formed from odontogenic stem cells within the dental lamina (Bet *et al.,* 2012).

The formation of gecko teeth follows a pleurodont pattern, in which the teeth are ankylosed (fused) to the inner surface of the jawbone rather than being set in sockets. This pleurodont dentition is a defining feature among reptiles of the order Squamata, to which all gecko species belong. This continual tooth regeneration ensures that geckos maintain efficient feeding mechanisms throughout life, even when older teeth wear out or break.

2.7 Taxonomy and Classification

The infraorder Gekkota comprises a diverse group of lizards distributed globally, especially in tropical and subtropical regions. It is divided into seven extant families, encompassing approximately 125 genera of geckos. These families include:

1. Family Carphodactylidae
2. Family Diplodactylidae
3. Family Eublepharidae
4. Family Gekkonidae
5. Family Phyllodactylidae
6. Family Pygopodidae
7. Family Sphaerodactylidae

In addition to these, several extinct genera of geckos that cannot be confidently placed within the seven families have been identified, such as *Cretaceogekko* and *Yanatarogecko* (Vidal and Hedges, 2005).

Although legless lizards of the family Dibamidae (commonly referred to as *blind skinks*) have sometimes been classified as members of Gekkota, recent molecular phylogenetic analyses suggest that they do not belong within this infraorder.

The infraorder Gekkota comprises a diverse range of gecko species adapted to different environments across the world. *Coleonyx variegatus*, commonly known as the western banded gecko, is native to the southwestern United States and northwestern Mexico, inhabiting arid and semi-arid regions. *Cyrtopodion brachykolon*, the bent-toed gecko, occurs in northwestern Pakistan and was first described in 2007. *Eublepharis macularius*, popularly known as the leopard gecko, is one of the most common geckos kept as pets. Unlike most geckos, it lacks adhesive toe pads and therefore cannot climb smooth surfaces such as glass. *Gehyra mutilata* (formerly *Pteropus mutilatus*), commonly called the stump-toed gecko, can alter its coloration from very light to very dark, enabling effective camouflage in both natural and urban settings (Townsend *et al.,* 2004). *Gekko gecko*, widely known as the Tokay gecko, is a large Southeast Asian species recognized for its bright coloration, loud mating calls, and aggressive temperament. The genus *Hemidactylus* includes numerous species distributed across tropical and subtropical regions, many of which coexist with humans. *Hemidactylus frenatus*, the common house gecko, is widespread in human habitations throughout tropical and subtropical zones. *Hemidactylus garnotii*, the Indo-Pacific gecko, occurs in tropical houses across many regions and has become an invasive species of concern in parts of the United States, including Florida and Georgia (Gamble *et al.,* 2015). *Hemidactylus mabouia*, also known as the tropical or Afro-American house gecko, is native to sub-Saharan Africa but now widely distributed across North, Central, and South America as well as the Caribbean. *Hemidactylus turcicus*, the Mediterranean house gecko, commonly inhabits buildings and has been introduced to several U.S. states.

Lepidodactylus lugubris, the mourning gecko, originally native to East Asia and the Pacific Islands, thrives in both wild and residential environments, demonstrating remarkable adaptability. *Pachydactylus bibroni* (Bibron's gecko) is native to southern Africa and is a hardy arboreal species often considered a household pest (Borsuk-Bialynicka, 1990). *Phelsuma laticauda*, the gold dust day gecko, is a diurnal species native to northern Madagascar and the Comoros and has also been introduced to Hawaii. *Ptychozoon*, a genus of arboreal geckos from Southeast Asia, is commonly referred to as the flying or parachute geckos; they possess wing-like flaps from the neck to the upper legs that aid in camouflage and provide lift while gliding between trees (Conrad and Norell, 2000). *Rhacodactylus* is a genus native to New Caledonia, which includes *Rhacodactylus ciliatus* (now reassigned to the genus *Correlophus*), known as the crested gecko. This species was once believed to be extinct until it was rediscovered in 1994 and has since become a popular pet. Another member, *Rhacodactylus leachianus*, known as the New Caledonian giant gecko, was first described by Cuvier in 1829 and remains the largest living species of gecko (Conrad, 2008). *Sphaerodactylus ariasae*, the dwarf gecko, is native to the Caribbean Islands and holds the distinction of being the world's smallest lizard. Finally, *Tarentola mauritanica*, the Moorish gecko, is commonly found throughout the Mediterranean region, from the Iberian Peninsula and southern France to Greece and northern Africa, and is easily recognized by its pointed head, spiked skin, and crocodile-like tail (Bauer *et al.,* 2005).

2.8 Reproduction in Geckos

Geckos display diverse reproductive strategies. Most species lay small clutches of eggs, while a few are live-bearing, and some reproduce asexually through parthenogenesis (Roth *et al.,* 2009). Their sex-determination systems are equally varied, ranging from temperature-dependent sex determination to ZZ/ZW sex chromosomes, which have undergone multiple evolutionary modifications over time.

Madagascar day geckos, for example, exhibit a unique courtship behavior. Sexually mature males produce a waxy secretion from pores on the back of their legs and approach females using head-bobbing displays accompanied by rapid tongue flicking aimed at the female (Bet *et al.,* 2015). These behaviors enhance mating success and demonstrate the complex reproductive strategies employed by geckos in their natural habitats.

Geckos Family

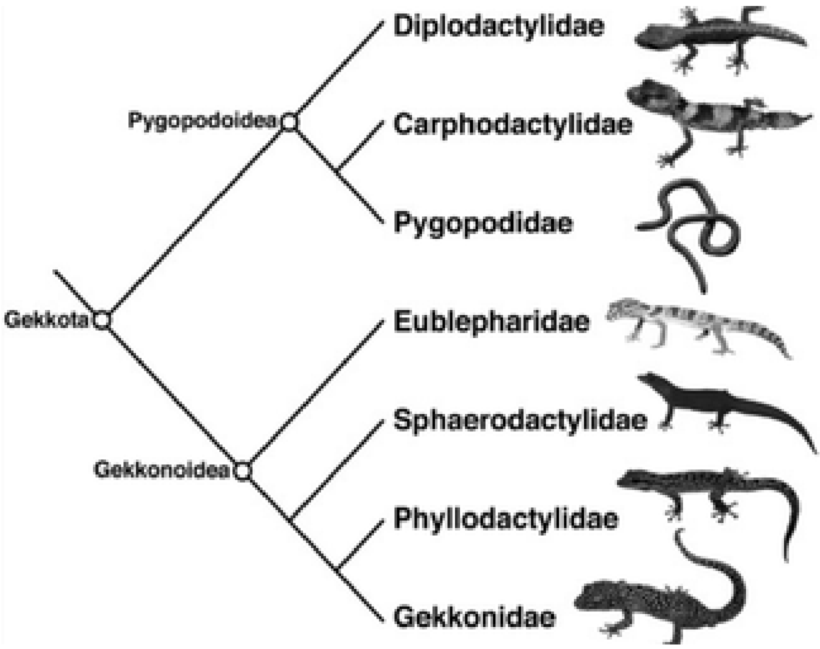

Plate 1: Geckos Phylogeny and Family Tree

Scientific Classification

Kingdom:	Animalia
Phylum:	Chordata
Class:	Reptilia
Order:	Squamata
Infraorder:	Gekkota

2.9 Research and Foraging Behaviours of Geckos

Several studies have investigated the distribution, ecology, and behavior of geckos, providing valuable insights into their adaptive strategies. Robbie and Kai (2017) examined the current distribution of five widely distributed invasive *Hemidactylus* species, *H. brookii*, *H. frenatus*, *H. garnotii*, *H. mabouia*, and *H. turcicus*, and predicted their potential future spread using species distribution models based on climate and elevation data. Their findings indicated that many regions with tropical and Mediterranean climates are suitable for these geckos. However, current and potential distributions suggest that climate alone does not fully explain their presence; competitive interactions and other ecological factors likely contribute to their patchy distribution. Climate change is expected to influence these ranges, with *H. brookii* potentially expanding into areas currently occupied by *H. mabouia* or *H. frenatus*, while *H. turcicus* may colonize regions not yet inhabited by any *Hemidactylus* species. Anchalee et al. (2006) studied the foraging behavior of *Gekko gecko* at the visitor complex of the Khao Khiao Open Zoo within the Khao Khiao-Khao Chomphu Wildlife Sanctuary. Observations revealed that geckos were active between approximately 18:01 and 09:00 hrs, with peak activity between 18:01 and 20:00 hrs. Retreat times were generally observed between 04:01 and 07:00 hrs. Territorial boundaries and foraging ranges showed no significant differences among males, females, and juveniles in terms of movement, prey capture success, or prey sizes consumed. The primary diet consisted of insects from the orders Lepidoptera, Orthoptera, and Coleoptera. *Gekko gecko* primarily employed a sit-and-wait foraging strategy, remaining stationary while waiting for mobile prey. When insect abundance was relatively high, individuals occasionally engaged in active scavenging. Males were generally more active foragers than females and juveniles, although some variation was noted among individuals. The foraging strategies observed align with the optimal foraging theory, indicating that geckos adjust their hunting and scavenging behavior according to prey availability and environmental conditions.

CHAPTER THREE

MATERIALS AND METHODS

3.1 Study Area

The gecko specimens for this study were collected from Danjuma Hostel, one of the female hostels within the University of Benin. The hostel is geographically located at Latitude 6°23′40″N and Longitude 5°37′42″E. Sampling was conducted from August to October 2022, covering different times of day to account for the nocturnal activity patterns of geckos. The study area was selected because it provides a typical urban habitat, with walls, ceilings, and crevices suitable for sheltering, foraging, and other natural behaviors of house geckos.

3.2 Sampling Method

Geckos were collected by hand from the walls and ceilings of the hostel. A broom was carefully used to dislodge the geckos without applying excessive pressure that could injure them. The broom also assisted in restraining the geckos while they were gently picked up by the neck region. Specimens were then placed in ventilated plastic containers and transported to the laboratory for identification and photography. All procedures were performed to minimize stress and ensure the safety of the animals.

3.3 Identification of Specimens

Specimens were identified based on their morphological and behavioral characteristics. Their skin was covered with small scales and lacked fur, while coloration was typically light pinkish-gray to brown. However, geckos could change color to blend with their environment. Under light at night, their bodies often appeared translucent with distinct white patterns, whereas cold or stressed individuals appeared paler or "washed out." They possessed large, bulging eyes with vertical slit pupils that were gray to brown with visible patterning. The body was elongated and well-adapted for climbing and wall-clinging. Each toe had adhesive pads with lamellae, which enabled the geckos to climb smoothly on vertical surfaces. Behaviorally, they were nocturnal, actively hunting insects during the night. Though they displayed defensive behavior when disturbed, their bites were harmless and of no medical significance. In this study, a total of 18 geckos were recorded: 10 *Hemidactylus mabouia* and 8 *Hemidactylus angulatus*.

3.4 Photography

Digital photographs were taken for all specimens to document coloration, body patterns, and morphological traits. Photography was conducted under standardized lighting, and all geckos were released back into their original habitats after documentation.

3.5 Diversity Index

The diversity of gecko species in Danjuma Hostel was determined using the formula:

Diversity Index=Number of species in the area/Total number of individuals in the area

With two species (*H. mabouia* and *H. angulatus*) and a total of 18 individuals, this index provides a measure of species richness relative to abundance in the study area.

The following diversity indices were calculated from the data:

- Margalef's Index (Taxa Richness): D□ = (S - 1) / ln(N) = (2 - 1) / ln(18) = 0.346

• Shannon–Wiener Index (H′): H′ = -Σ(pi ln pi) = 0.687

• Evenness Index (E): E = H′ / ln(S) = 0.991

3.5 Diversity Indices

- **Species Richness (S):** 2. While the richness is low, it is typical for a specialized urban microenvironment (hostel building) where only synanthropic species (those that live near humans) can thrive.
- **Species Evenness:** High. With a ratio of 10:8, the community is not heavily dominated by a single species, suggesting that the hostel environment provides ample resources for both to coexist without one displacing the other.

3.6 Percentage Relative Frequency Distribution

The percentage relative frequency of each species was calculated to determine the proportion of each species relative to the total number of individuals observed. The formula used is:

Percentage Relative Frequency=Number of individuals of a species/Total number of individuals of all species×100

Using this formula:

- *Hemidactylus mabouia*: 10/18×100=55.56%
- *Hemidactylus angulatus*: 8/18×100=44.44%

This shows that *H. mabouia* was the most frequently occurring species in the hostel environment.

3.7 Relative Abundance

Number of individuals of a species/Total number of individuals of all species

Using the recorded data:

- *Hemidactylus mabouia*: 10/18=0.56
- *Hemidactylus angulatus*: 8/18=0.44

This confirms that *H. mabouia* is the most abundant species in Danjuma Hostel, while *H. angulatus* is slightly less abundant.

CHAPTER FOUR

RESULTS

A total of 18 individual geckos were recorded during the study period, comprising two species: *Hemidactylus mabouia* (Tropical House Gecko) and *Hemidactylus angulatus* (West African House Gecko). Both species belong to the family Gekkonidae and were encountered across various sections of Danjuma Hostel, University of Benin, between August and October. Observations revealed that *H. mabouia* was slightly more abundant, accounting for ten individuals, while *H. angulatus* accounted for eight.

The geckos were frequently observed occupying diverse microhabitats within the hostel environment, including walls, ceilings, corridors, and regions near artificial light sources such as bulbs and lamps. These lighted areas appeared to attract numerous insects, serving as a convenient feeding ground for the nocturnal geckos. *H. mabouia* was more commonly found near brightly lit regions and upper walls, whereas *H. angulatus* was often seen in shaded or less illuminated corners, suggesting slight differences in habitat preference and behavior.

Their activity peaked during the night, particularly between 7:00 p.m. and midnight, when environmental conditions were cooler and insect prey more abundant. During the daytime, most individuals sought shelter behind wall crevices, ceilings, and corners to avoid predation and heat exposure. The consistent presence of both species throughout the study duration indicates that the hostel provided a suitable and stable microenvironment for their survival and reproduction.

4.1 Abundance and Frequency Distribution

Species	*Number of Individuals*	*Percentage Frequency (%)*	*Relative Abundance*
Hemidactylus mabouia	10	55.56	0.56
Hemidactylus angulatus	8	44.44	0.44
Total	18	100	1.00

Figure 1: Relative frequency distribution of gecko species in Ehanire Danjuma Legacy Hall of Residence.

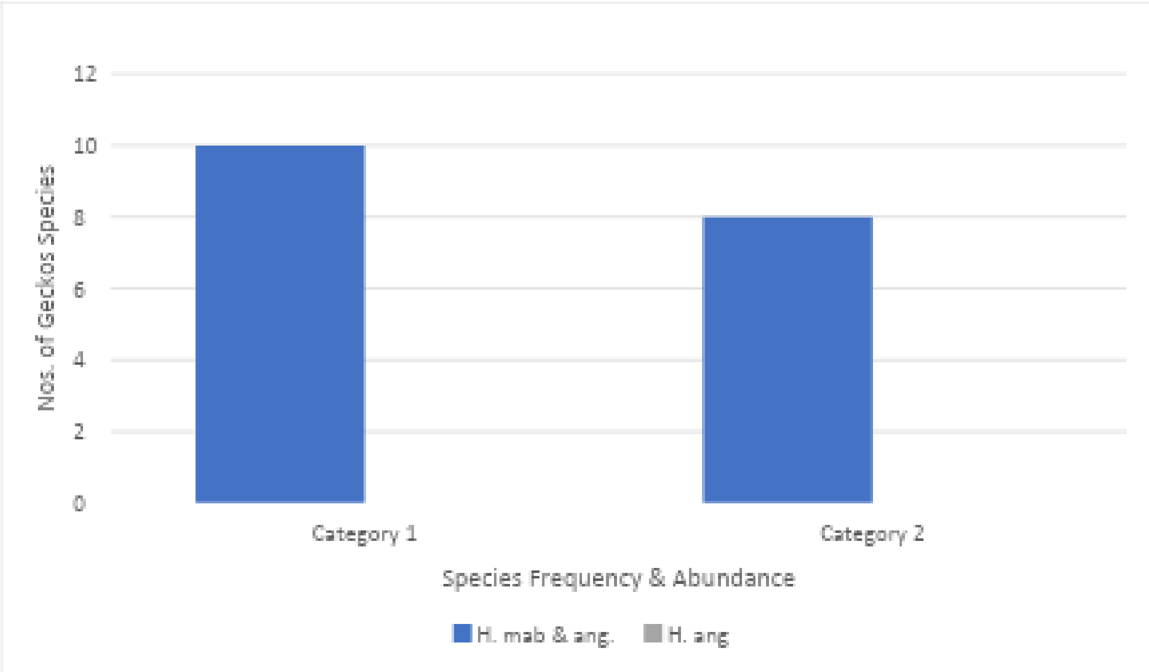

Figure 1: Number of Hemidactylus angulatus and Hemidactylus mabouia found in the Legacy Danjunma Hall of Residence.

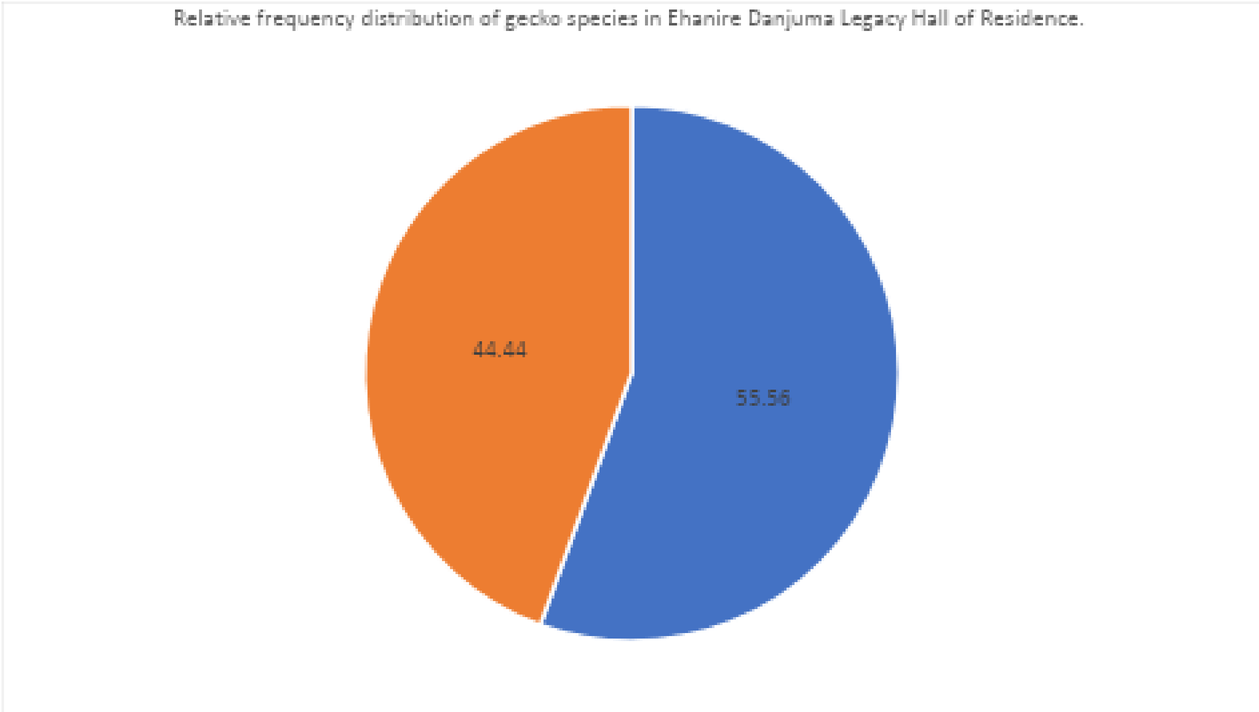

Figure 2: Relative Frequency of Hemidactylus angulatus and Hemidactylus mabouia found in the Legacy Danjunma Hall of Residence.

Plate 1: *H. angulatus* species found in Danjuma Hall of Residence

Plate 2: *H. mabouia* species found in Danjuma's Hall of Residence

CHAPTER FIVE

DISCUSSION

The results obtained from this study show that a total of 18 gecko specimens were examined from the Danjuma Hostel, University of Benin, representing two species, *Hemidactylus mabouia* (Tropical House Gecko) and *Hemidactylus angulatus* (West African House Gecko). The findings revealed a simple but balanced gecko community structure, characteristic of early-stage colonization in recently constructed buildings. *H. mabouia* was the most frequent and abundant species, accounting for 55.56% of the total individuals, while *H. angulatus* represented 44.44%, indicating both species coexist and share similar ecological niches within the hostel environment. The Shannon–Wiener diversity index (H = 0.687), close to the theoretical maximum (ln2 = 0.6931), implies a relatively high diversity despite the limited number of species observed. Likewise, the evenness index (E = 0.991) indicates that both species were almost equally distributed, suggesting an ecologically stable and balanced community. Margalef's richness index showed low taxa richness, which aligns with expectations for a newly colonized microhabitat. These findings collectively indicate that gecko colonization in Danjuma Hostel is still at an early but adaptive phase, with both *Hemidactylus* species displaying high tolerance to human-dominated structures.

Observational data further revealed distinct microhabitat preferences between the two species. *H. mabouia* was more abundant around light-exposed zones, such as corridor bulbs, ceilings, and open walls, and areas that attract insects, their primary prey. In contrast, *H. angulatus* preferred shaded or secluded areas, including wall cracks, corners, and window edges. This segregation in microhabitat use suggests niche differentiation, a phenomenon previously noted by Iyiola *et al.,* (2013) in their work on gecko assemblages at Obafemi Awolowo University, Ile-Ife, where spatial partitioning among *Hemidactylus* species was linked to light intensity and prey concentration.

In comparison, the University of Port Harcourt (UniPort) survey by Ekechukwu & Onwuteaka (2011) reported that plantation density, architectural design, and waste accumulation significantly influenced gecko abundance. The UniPort data reflected a higher species count due to surrounding vegetation and refuse proximity, conditions less pronounced around Danjuma Hostel of the University of Benin. This difference highlights how urban planning and cleanliness may directly shape reptile diversity and adaptability in human dwellings.

At University of Ibadan (UniIbadan), Akani *et al.,* (2012) documented *Hemidactylus* species with similar morphological traits and body proportions to those observed in this study. Their research established baseline morphometric data such as snout-vent length and tail proportions, which closely match those recorded from the Danjuma specimens, suggesting phenotypic consistency across regions despite minor environmental variations. This indicates limited local adaptation so far, possibly because the Danjuma Hostel population is still young and derived from a common urban *H. mabouia–H. angulatus* gene pool.

Meanwhile, a study at the University of Lagos (UniLag) by Ogunlana & Bakare (2017) revealed that refuse disposal areas and damp corridors tend to host the highest gecko densities, primarily due to increased insect abundance. Similarly, observations in Danjuma Hostel showed that *H. mabouia* aggregated around light sources, mirroring UniLag's pattern but substituting refuse-driven insect zones with phototactic insect congregation near bulbs. Thus, while the ecological drivers differ slightly, the underlying principle, prey availability dictating gecko abundance, remains consistent across environments.

Collectively, these comparisons align with earlier assertions that *Hemidactylus* species are adaptive synanthropes, capable of exploiting human structures for shelter, feeding, and reproduction (Rösler, 2000; Akani *et al*., 2012). However, the Danjuma Hostel study uniquely demonstrates the initial stages of colonization in a new structure, capturing a critical temporal window rarely documented in Nigerian Universities reptile studies. Unlike older, ecologically stabilized environments like UniIbadan or UniPort, Danjuma Hostel offers insights into early population establishment dynamics, including balanced species proportions, microhabitat segregation, and absence of territorial aggression.

These findings also bridge previously identified research gaps. Earlier literature (e.g., Ekechukwu & Onwuteaka, 2011; Akani *et al.,* 2012; Iyiola *et al.,* 2013) emphasized species distribution, habitat preference, and morphometric variation in older campuses, but lacked data from newer or recently constructed facilities. The Danjuma Hostel results now confirm that *H. mabouia* and *H. angulatus* are among the earliest colonizers of modern student accommodations, showing strong adaptability and resilience to artificial habitats. In summary, this study affirms that gecko diversity and abundance within Danjuma Hostel are products of structural factors (lighting, cracks, and ceiling designs) and biotic influences (prey concentration, temperature, and human disturbance). It reinforces patterns observed in other Nigerian universities, while providing a baseline for future long-term monitoring of species succession and ecological adaptation. Further studies incorporating seasonal variation, genetic analysis, and environmental parameters would deepen understanding of how these adaptable reptiles maintain stable populations across Nigeria's expanding urban and semi-urban landscapes.

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