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Assemblage of Small Sized Vertebrates in an Urban Community of Rivers State, Nigeria

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Abstract

Urbanization rapidly alters wildlife habitats leading to population declines. However, certain species are able to adapt to the landscape changes. This research investigated the ecological use by small vertebrates of an uncompleted building in an urban area of Rivers State, Nigeria. Sampling lasted from January 2016 to December 2018. As a routine, we carefully moved round the building dislodging stones, panels and checking for concealed small vertebrates within the multiple holes of the walls. The species relative abundance data was generated by combining the number of individuals preyed on by predators as well as those captured counted and tagged. This research revealed the presence of 173 individuals of 16 species belonging to 11 vertebrate families (Accipitridae, Agamidae, Bufonidae, Colubridae, Columbidae, Gekkonidae, Lamprophiidae, Muridae, Ptychadenidae, Sciuridae and Scincidae). Reptilians constituted 71.10% of the observations; the rainbow lizard (Agama agama) with a percentage frequency of 25.43% was the most common and abundant species from the community. The olive house snake (Lamprophis olivaceus) with a 0.58% frequency of occurrence was the least encountered species from the building. The existence of these animals within the confines of the studied structure is largely based on the economic condition of the owners of the building; the improvement in the financial condition of such owners would negatively trigger the unfortunate extirpation of the non-flying species from the area. We therefore, recommend the capture and transfer of such disturbed animals to forested zones before the completion of the building. More so, city planners and urban dwellers should also make concise efforts to create zones of habitation for displaced urban wildlife.

Keywords: : Urbanization, Community Ecology, Small Sized Vertebrates, Rivers State

INTRODUCTION

Urbanization of wildlife habitats have constantly led to the general depletion of floristic cover, fragmentation of animal populations, and the unintentional reduction of animal habitats as well as their limitation to the already crowded, available animal inhabitable spots (Darnell, 1976; Akani et al., 2008; Isakson and Sumasgutner, 2016). In Africa, urbanization has led to the disappearance of many animal species from their natural habitats. For instance, disturbed birds tend to fly to other areas in search of food and habitable trees, but reptiles, amphibians and non-flying mammals are faced with the problems of rapid adaption or extirpation (Gabor and Andras, 2015; Isakson and Sumasgutner, 2016). According to Gabor and Andras (2015) and Isakson and Sumasgutner (2016), wildlife exposure to urbanization has led to the division of habitats into undersized independent patches, with effects on host parasite and predator prey relationships, susceptibility to diseases and the long term exposure to heavy metals, noise, light, air and water pollution as well as the alteration of immune functions. Thus, in order to stay alive within urban areas, animal species are pressured by the challenges of finding food, shelter, avoiding enemies and retaining access to suitable breeding sites (Meek, 2017). Among animal communities, interspecific interactions such as predation and competition are essential to the stability and homeostatic wellness of such communities (Amadi, 2021). For instance, among some African snake communities; Causus maculatus and Crotaphopeltis hotamboeia are known for their predatory activities on the populations of toads and frogs within their foraging hotspots (Eniang et al., 2013; Mane and Trape, 2019). The regulatory activities of predatory snakes on anuran

communities are often useful in preventing anuran populations from exceeding the carrying capacity of their host

ecosystems. Similarly, the sand snakes (Psammophis phillipsi) as well as the African house snake (Lamprophis fuliginosus) have been helpful in the reduction of suburban rat pest populations of Southern Nigeria (Akani et al., 2003; Akani et al., 2008). More so, the consumption of anthropophilic rats by snakes has also aided in the reduction of rat pest populations and has also limited their ability to spread parasites and diseases to humans (Dubey and Frenkel, 1998; Ranque et al., 2000; Akani et al., 2008). Lizards and geckos are another clade of reptiles that are not only effective in regulating insect pest populations within residential areas, but are relevant prey items to various predatory species (Akani et al., 2003; Amadi et al., 2020a). They are widely consumed by many urban predatory species, and are by adaptation the most successful urban species of reptiles in Southern Nigeria (Thiollay and Clobert, 1990; Akani et al., 2014; Amadi et al., 2020a). Geckos for instance, are capable of adapting to dual foraging sites i.e. they are camouflaged to feed on arboreal insects in trees as well as the nocturnal insects that are attracted by artificial lights within and around human homes (Amadi et al., 2020a). As a way of evading nocturnal predators (such as cats, owls and snakes) and adjusting to the rapid urbanization of their habitats, Agama lizards have been observed to be sleeping under electrical panels which do not only serve as an artificial thermoregulatory spots but a retrieve site against predators and exposure to rainfall (Amadi et al., 2020b). Agama lizards have been so successful that they now directly compete for prey with the usually nocturnal Hemidactylus brookii for the insects that are attracted to fluorescent bulbs at night (Amadi et al., 2021). In this paper, we consider how vertebrates that have lost over 98 percent of their home range to urbanization interact within the confines of an abandoned uncompleted building. Thus, this study aims to determine (1) the diversity of resident vertebrate species of the community, (2) and ascertain the trophic relationships of the associated species within the altered ecological community

Materials and Methods

Study area

This ecological work was carried out in Rumuagholu Town (Latitude: 04o 53.0239'N and Longitude: 006o 58.7079'E) of Obio/Akpor Local Government Area of Rivers State, Nigeria. The locality also has the prevalent tropical wet climatic conditions of Southern Nigeria, with an average temperature range of 25 -28 o C (with a daily temperature reading of 32 - 34 o C). The wet season begins from April to September and the dry season commences from October to March (Amadi, 2020b). The study was conducted within the fenced premises of an uncompleted building of about 5metres high, 15m wide, and 30m long. The southern part of the premises was a dump site for biodegradable waste (i.e. spoilt bread, fruits, soup, beans, vegetables etc.). The building was the only area that had a veritable amount of plants in the neighbourhood. The structure also contained multiple brick holes which served as hiding spots for nocturnal species during the day.

The property was largely dominated by Asystasia gangetica, Aspilia africana, Cyperus rotundus, Musa sapientum, Moringa oleifera, Uvaria chamae, Euphorbia hirta, Sida acuta, Colocasia esculenta, Psidium guajava, Carica papaya, and some seasonally cultivated crops such as Zea mays, Abelmoschus esculentus and Vernonia amygdalina.

Research Protocols

A total of 36 months, beginning from January 2016 to December 2018 was spent on species monitoring and data collection. Species monitoring and data gathering was both diurnal and nocturnal. A total of 80 days (6-12 hours were spent collecting data on each sampling day) were systematically spent collecting data on the activities of the investigated vertebrates. Though, data collection was also by opportunistic encounter, a high (8m) monitoring station at a balcony in a building that shared a fence with the uncompleted building was established to maximise species detection and predator prey activities. The species relative abundance data was generated by combining the number of individuals preyed on by predators as well as those captured counted and tagged (Plummer and Ferner, 2012).

As a routine, we carefully moved round the building dislodging stones, panels and checking for concealed small vertebrates within the multiple holes of the walls.

Result

Our evaluation of the uncompleted building showed that 173 individuals of 16 species from 11 vertebrate families (Accipitridae, Agamidae, Bufonidae, Colubridae, Columbidae, Gekkonidae, Lamprophiidae, Muridae, Ptychadenidae, Sciuridae and Scincidae) live in or make incursions into the structure. We observed that the reptilians which constituted 71.10% of the four observed class of vertebrates, were the most common and abundant animal clade within the community (Table 1 and Figure 1). By virtue of their size (n=44), the rainbow lizard (*Agama agama*) with a percentage frequency of 25.43% was the most common and abundant species from the community. The olive house snake (*Lamprophis olivaceus*) with a 0.58% frequency of occurrence was the least encountered species from the building.

In terms of the community composition, the mammals were represented by 2 species, the birds were represented by 4 species (i.e. 3 birds of prey and a herbivorous dove), the reptilians were represented by 8 species (i.e. 5 snakes, 1 lizard, 1 skink and 1 gecko), and the amphibians were represented by two anurans (i.e. a frog and a toad). We observed that the mammals, reptiles and amphibians are residents of the uncompleted building but the birds (except the dove which nests on a Moringa tree) often make foraging incursions into the structure.

Table1. Diversity of vertebrates observed in the investigated uncompleted building from Rumuagholu community of Rivers State, Nigeria

Class	Family	Species	No. of sightings
Mammals	**Muridae**	***Rattus rattus***	**6**
	Sciuridae	***Xerus erythropus***	**11**
Birds	**Accipitridae**	***Milvus migrans***	**5**
		Kaupifalco monogrammicus	**3**
		Accipiter tachiro	**2**
	Columbidae	***Streptopelia semitorquata***	**2**
Reptiles	**Agamidae**	***Agama agama***	**44**
	Colubridae	***Crotaphopeltis hotamboeia***	**8**
		Philothamnus semivariegatus	**12**
		Toxycodryas blandingii	**5**
	Gekkonidae	***Hemidactylus brookii***	**31**
	Lamprophiidae	***Lamprophis fuliginosus***	**18**

		Lamprophis olivaceus	1
	Scincidae	*Trachylepis affinis*	4
Amphibians	Bufonidae	*Sclerophrys regularis*	15
	Ptychadenidae	*Ptychadena mascareniensis*	6
Total			173

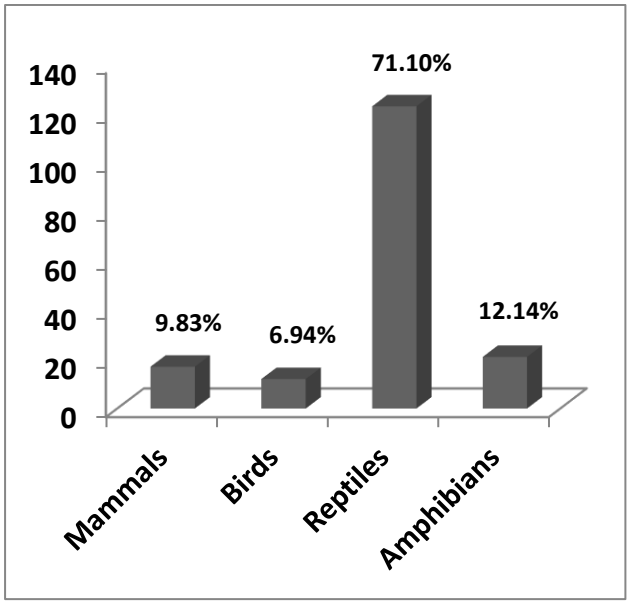

Figure 1. Abundance and taxonomic richness of the vertebrates recorded from the uncompleted building of Rumuagholu Town.

Ecological notes on selected species

1. **Mammalia**

The black rat (*R. rattus*) population of the structure are mostly nocturnal, and are preyed upon by two sympatric nocturnal house snakes (*L. fuliginosus* and *L. olivaceus*). The striped ground squirrel (*X. erythropus*) were never captured by any predator, but mostly foraged on the fruits of pawpaw and guava as well as the remnants of other discarded fruits. The sky facing holes of the blocks within the buildings were effectively converted to retrieve sites and the breeding chambers of this species.

2. **Birds**

Certain individuals of the African black kite (*M. migrans*) were responsible for the consumption of skinks and some Agama lizards. The lizards were often picked up while basking at the surface of the building. The lizard buzzard normally perches at the roof or fence of nearby buildings from where it swoops at unsuspecting foraging Agama lizards and skinks (Plate 1).

The African goshawk which often raided the nests of the red eyed dove was twice observed foraging on the juveniles of the dove.

Plate 1a. A Lizard buzzard actively stalking a prey

3. **Reptiles**

The Agama lizard population of the community are effective hunters of dragon flies (Odonata). After several attempts, the lizards became successful at preying on the dragon flies that are usually perched at the extended rods of the pillar of the building. They often acquire a target that is stalked and often lunge vertically to capture such targets.

The West African common house snake (*L. fuliginosus*), known for its nocturnal behaviour and generalist dietary preference (but not for cockroaches) (Akani *et al.*, 2008), was astonishingly observed on a 2.8m fence (11:23 pm) hunting a cockroach (*Periplaneta americana*) (Plate 2).

The diurnal spotted bush snake (*P. semivariegatus*) was the most active snake species within the building. In the course of searching for available prey, it literally ransacked the building, such that concealed nocturnal geckos were forced to flee to the wall in order to evade consumption. This snake was capable of spending hours entering one brick hole to another in search of prey but would disappear into the guava or drumstick tree once prey is captured (Plate 3).

Plate 3: A Spotted bush snake actively searching for prey in the multiple block holes of the uncompleted building.

Discussion

Urbanization is one of the major causes of habitat destruction and alteration forcing animals to adapt to constantly changing environmental conditions (Hunter, 2007). Human settlements and business areas are now occupied by animals that have adapted to the altered habitats around them (Snep *et al*., 2006). Results of this research confirm the occurrence of 173 individuals belonging to 11 vertebrate families. This implies that organisms have developed ways of adapting to every available habitat space. With the exception of fishes, the building and its associated biotic resources was able to support and sustain the presence of 16 vertebrate species from the class mammalia, aves, reptilia and amphibia. More so, the dominant trophic relationships within the community were predation and competition. Although on different periods, the birds of prey mostly foraged and competed for Agama lizards and skinks, whereas, the tetrad of *A.* agama, *H. brookii*, *S. regularis* and *P. mascareniensis* foraged and competed at different photoperiods for the invertebrate clade of the community.

The mammals, *Rattus rattus* and *Xerus erythropus*, were among the animals encountered in this research. *Rattus rattus* is very well adapted to urban life in virtually all regions of the world and has even been reported to threaten and replace native species in some locations (Feng and Himsworth, 2014; Banks and Smith, 2015). These organisms are considered as pests and reservoirs of zoonotic diseases.

Although the ground squirrel, *Xerus erythropus*, are common in vegetative areas (Shotuyo, 2011), they were also encountered in the uncompleted building examined in this report.

Birds, such as *Milvus migrans* and others reported in this research have developed traits to enable them overcome the constraints of urban life (Croci *et al*., 2008). These birds are attracted by food substances including fruits and seeds and the animals they prey on. So, prey and food availability are important factors in their habitat exploitation. These urban dwellers have been reported to exhibit phenotypic differences when compared with their rural conspecifics (Isaakson, 2018).

Species differentially exhibit capacity to adapt to threats such as urbanization. Urban dwellers from all animal classes have selective characteristics that enable them survive in urbanized planes; specialist species, on the other hand, either migrate or die off (Isakson and Sumasgutner, 2016). Eight reptile species were reported from this research: *A. agama, C. hotamboeia, P. semivariegatus, T. blandingii, H. brookii, L. fuliginosus, L. olivaceus and T. affinis.* On the other hand, two amphibians (*Sclerophrys regularis* and *Ptychadena mascareniensis*) species were found in the location under investigation. These urban dwellers are disturbance-tolerant species (Pearman, 1997) that have adapted to the altered landscapes. Generally, however, reptiles are reported to be more negatively impacted by urbanization than amphibians (Hamer and McDonnell, 2010).

Conclusion

Urbanization certainly has negative impacts on wildlife. However, it can provide opportunities to study adaptive responses of urbanization-tolerant species. This research revealed the ecological use of an uncompleted building by 173 individuals belonging to 11 vertebrate families (Accipitridae, Agamidae, Bufonidae, Colubridae, Columbidae, Gekkonidae, Lamprophiidae, Muridae, Ptychadenidae, Sciuridae and Scincidae). The existence of these animals within the confines of the studied structure is largely based on the economic condition of the owners of the building; the improvement in the financial condition of such owners would negatively trigger the unfortunate extirpation of the non flying species from the area.

We therefore, recommend that wildlife studies should not be restricted to natural habitats but include urbanized biotopes. Urban dwellers should also make concise efforts to create zones of habitation for urban wildlife.

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