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# Preliminary checklist and aspects of the ecology of small mammals at the University of Ghana Botanical Garden, Accra Plains, Ghana

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**Abstract**

Despite serving as a teaching, research and biodiversity conservation facility for over 60 years, the faunal composition at the University of Ghana Botanical Garden (UGBG) is virtually unknown. This study documents the richness, abundance, diversity, distribution and conservation status of small mammals at the UGBG. The methodology involved live-trapping using Sherman live-traps. Overall, 39 individuals belonging to three mammalian orders (Rodentia, Soricomorpha and Erinaceomorpha) and seven species, comprising of four rodents, two shrews and one hedgehog were recorded in 1,080 trap-nights. Overall trapping success and species diversity (Shannon-Wiener *H'* and Simpson's *1-D*) indices were therefore 3.61%, 1.59 and 0.76, respectively. Species richness and diversity were highest (four species; *H'* = 1.33, 1-D = 0.72) in shrubland and lowest (two species; *H'* = 0.48, 1-D = 0.3) in grassland. Overlaps of species among the study sites were low, with *C. olivieri* being the only species common to all sites. *Crocidura olivieri* was the most abundant species (41.2%) in the forest, whereas *M. erythroleucus* dominated (81.3%) in the grassland. *Arvicanthis niloticus solatus* and *C. oliviera* were equally abundant in shrubland. *Arvicanthis n. solatus*, *P. daltoni*, *C. oliviera*, *C. foxi* and *A. albiventris* are first records for the Accra Plains. These records add to the species list for the Accra Plains, and highlight the importance of the UGBG to small mammal zoogeography and conservation in Ghana.

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## Introduction

Knowledge of the faunal species of a region or specific geographic area, their abundance, distribution, habitat association and conservation status is an essential zoogeographic tool and prerequisite for their conservation (ACUC, 1998; Oduro and Anti, 2010). The composition of faunal species, especially small mammals, in most natural and human-dominated ecosystems in Ghana is however incompletely-known, highlighting the need for as many surveys as possible, especially in previously unsurveyed areas, to update the species list for the country (Decher, 1997; Decher *et al.,* 2005; Attuquayefio and Ryan, 2006). Reliable surveys are particularly imperative in areas experiencing unprecedented high rates of degradation and disappearance of the original vegetation cover due to rapid urbanization and agricultural expansion. One such area where the opportunity to collect scientific information on wildlife is rapidly diminishing, is the Accra Plains of Ghana. This geographically-distinct region encompasses an area of 2,800 km² (Decher and Bahian, 1999), and was originally a mosaic of dry forest of the 'south-east outlier type', thicket and tall grass savannah (Hall and Swaine, 1981). Currently, however, most of the original vegetation cover of the Accra Plains, particularly the forests, has totally disappeared due to rapid urbanization resulting from an ever-increasing human population growth and migration to Accra, the capital city of Ghana. Even traditionally-protected and revered 'sacred groves' have been encroached upon and largely degraded.

The University of Ghana Botanical Garden (UGBG), located on the main campus of the university, is one of the few areas that still harbour vegetation types that fairly reflect the original vegetation cover of the Accra Plains. The UGBG was established in 1950 to serve as a facility for teaching, scientific research and biodiversity conservation, and with over more than 60 years of its existence as a conservation and research unit, its faunal composition is still incompletely known. To date, there have been no records of small mammal fauna weighing less than 200 g in the UGBG despite the important ecological and functional roles these animals play in natural and human-dominated tropical ecosystems, as well as their importance as indicators of habitat quality (Attuquayefio and Ryan, 2006). The effect of encroachment for settlement and recreational activities resulting from an expanding university and fringe local communities on small mammal communities in the UGBG is not currently known.

The most detailed faunal study to date in the Accra Plains (Decher and Bahian, 1999) compared small mammal communities of the nationally-protected Shai Hills Resource Reserve, traditionally protected 'sacred groves', a secondary forest and a Gmelina tree plantation. The study recorded four species of shrews and nine species of rodents, with varying species abundance, diversity and composition among sites. It also found that forest remnants within the Accra Plains served as important refuges for some small mammal species. The present study compared the current abundance, diversity and composition of small mammals in the UGBG, and to previous studies in the Accra Plains, particular to determine whether any changes in the small mammal community has occurred. The small mammal assemblage at the UGBG is expected to represent a 'nested subset' of the local small mammal species pool of the Accra Plains (Patterson and Brown, 1991). Also, because the structure of vegetation plays a critical role in structuring small mammal occurrence and composition (Blaumt *et al.*, 2007), the similarity of species composition between habitats at the UGBG is expected to be low. Any significant deviations from these hypotheses are discussed in terms of the ecology of the species and the impact of recent anthropogenic activities in the study area.

## Materials and Methods

*Study Area and Sites*

The UGBG is located on the main campus of the University of Ghana, Legon (5°39.38' N, -0°11.31' E) and lies within the Accra Plains, a geographical region in southern Ghana that has undergone one of the highest urban expansions from growing human

populations and migration in the country (Otoo *et al*., 2006). The UGBG was established in 1950 to serve as a teaching and research facility for the Science Faculty, particularly the biological science departments, to conserve indigenous and exotic biodiversity, and also to serve as a recreational area for the University and fringing communities.

The vegetation of the UGBC consists of a mosaic of forest clumps, wooded shrubland and tall grass savanna typical of the Accra Plains. The climate is arid with a bimodal rainfall pattern and a low mean annual rainfall of 733 mm (Campbell, 2004). The major rainy season occurs from March/April to July/August, peaking in June, while the minor rainy season runs from September to November. The major dry season occurs from December to March and the minor dry season from August to September (Attuquayefio and Wuver, 2003). Three habitat types, notably tall savanna grassland, secondary forest and shruband are predominant in the UGBG. The savanna grassland has *Panicum maximum* and *Routiboulia cochichinensis* as the main grasses. The shrubland consists predominantly of homogeneous stands of woody vegetation with several main stems arising at, or near the ground. Trees are few and interspersed with sparse undergrowth. *Gliricidia sepium* (madre), *Peltophorum pterocarpum* (copper pod or yellow flame) and *Lonchocarpus cereceus* (West african indigo) are the main tree species, with *Rauvolfia ghaniensis* and *Acrostidius* sp. (swamp arum) forming the bulk of the dense shrubs. The secondary forest consists of young-growth forest with high density of small and medium sized trees (about 70% of stems with less than 40cm diameter at breast height) and old-growth forest with greater density of big trees (about 70% of stems greater than 40cm diameter at breast height). Trees in young-growth forest include *Hura crepitans* (sand box tree), *Peltophorum pterocarpum* (copper pod or yellow flame), *Ceiba pentandra* (silk-cotton tree) and *Delonix regia* (flamboyant tree) with *H. crepitans* being the dominant tree species. The old-growth is dominated by *Terminalia ivorensis* (black afara), *Triplochiton scleroxylum* (wawa) *Sterculia faetida*, and *Alstania boonei* (astonia). For the purposes of this study, the young and old growth secondary forests were considered as one and denoted "forest".

**Methods**

*Small Mammal Trapping*

Small mammals were live-trapped along two transects established at each study site, with 10 trap-stations per transect and inter-trap interval of about 10 m. In the forest transects were established such that the two growth stages were equally represented. Each trap station was supplied with one standard collapsible Sherman trap (7.6 x 8.9 x 22.9 cm; H.B. Sherman Traps Inc., Florida, USA) baited with a mixture of corn meal and groundnut paste (peanut butter). Traps were set during the day and checked the following morning between 07:30 and 09:30 hours GMT for six consecutive nights. There were three trapping sessions, with one trapping session per month from March to May. The total number of trap nights (one trap-night = one trap set for 1 night) was 1,080 (360 trap-nights per site). Captured individuals were weighed (in grams), sexed (using anal-genital distance, which is shorter in females), aged (assigning individuals to the three age-groups adult, sub-adult, and juvenile based on weight). The animals were then checked for reproductive condition (scrotal testes in males and perforate vagina, enlarged nipples and pregnancy in females), and marked by toe-clipping before being released at the point of capture. Small mammals were identified using Rosevear (1969) and Hutterer and Happold (1983) as key references, and by comparing captured specimens to voucher specimens at the Museum (Biodiversity Centre) of the Department of Animal Biology and Conservation Science, University of Ghana.

**Analysis of Data**

*Trapping Success (Ts)*

This was estimated as the total number of captures per 100 trap-nights (one trap-night = one trap set for one night):

$$Ts = \frac{Tc \times 100}{Tn} \quad \text{..... (1)}$$

Where:

*Tc* = total number of captures at a site

*Tn* = total number of trap-nights at a site

*Relative Abundance (Ar)*

The relative abundance of the $i^{th}$ species was estimated as the percentage abundance of this species in the total number of captured individuals of all species at a site. Thus

$$Ar = \frac{N_i \times 100}{Tc} \quad \text{..... (2)}$$

Where:

*Tc* = total number of captures at a site

*Ni* = total number of individuals of the *i*th species captured at a site

*Species Diversity*

Species diversity was estimated using the Shannon-Weiner (*H'*) and Simpson's indices (1-D) (Stiling, 1998) as follows:

$H' = - \Sigma Pi * ln (Pi)$ ..... (3)

$D = \Sigma (Pi)^2$ .....(4)

Where:

*Pi* = the proportion of the *i*th species in the total sample at a site.

*Similarity*

The similarity of small mammal composition between study sites was determined using the Sorenson's index (*S'*) (Krebs, 2001) as follows:

$$S' = \frac{2C}{a+b} \quad \text{.....(5)}$$

Where:

$a$ = number of species at the first study site

$b$ = number of species at the second study site, and

$C$ = number of species common to the two sites.

*Biomass*

The fresh biomass of each small mammal species was estimated as the mean weight (mass) of adult males and non-pregnant females. This was to avoid biases due to excess weight imposed by pregnancy. Total biomass was estimated as the product of the mean weight and the number of adult individuals recorded.

**Results**

*Relative Abundance, Diversity and Distribution*

A total of 1,080 trap-nights yielded 39 individual small mammals belonging to three orders (Rodentia, Soricomorpha and Erinaceomorpha) and seven species, comprising of four rodents, notably *Mastomys erythroeucus* (Multimammate rat), *Arvicanthis niloticus solatus* (African grass rat), *Praomys daltoni* (Dalton's meadow mouse) and *Rattus rattus* (common rat), two shrews *Crocidura olivieri* (Olivier's/African giant shrew) and *C. foxi* (Fox's shrew), and one hedgehog (*Atelerix albiventris*) (Table 1). Overall trapping success and species diversity as measured using Shannon-W iener (*H'*) and Simpson's (1-D) indices were therefore 3.61%, 1.59 and 0.76, respectively. Trapping success per sampling site ranged from 4.72% in forest and 1.67% in shrubland. Species richness and diversity varied among sites, with both being highest (four species; *H'* = 1.33, 1-D = 0.72) in shrubland and lowest (two species; *H'* = 0.48, 1-D = 0.3) in savanna grassland (Table 1).

**Table 1.** Abundance of small mammals captured in the University of Ghana Botanical Garden (% of total in parentheses).

| Species | Common Name | Forest | Grassland | Shrubland | Total |
|---|---|---|---|---|---|
| **Rodentia** | | | | | |
| *Praomys daltoni* | | 4 (23.5) | 0 (0) | 0 (0) | 4 (10.3) |
| *Rattus rattus* | | 6 (35.3) | 0 (0) | 0 (0) | 6 (15.4) |
| *Arvicanthis niloticus solatus* | | 0 (0) | 0 (0) | 2 (33.3) | 2 (5.1) |
| *Mastomys erythroleucus* | | 0 (0) | 13 (81.3) | 0 (0) | 13 (33.3) |
| **Soricomorpha** | | | | | |
| *Crocidura olivieri* | | 7 (41.2) | 3 (18.7) | 2 (33.3) | 12 (30.8) |
| *Crocidura foxi* | | 0 (0) | 0 (0) | 1 (16.7) | 1 (2.6) |
| **Erinaceomorpha** | | | | | |
| *Atelerix albiventris* | | 0 (0) | 0 (0) | 1 (16.7 | 1 (2.6) |
| **Total no. of individuals** | | **17 (100)** | **16 (100)** | **6 (100)** | **39 (100)** |
| **Number of species** | | **3** | **2** | **4** | **7** |
| **Number of trap-nights** | | **360** | **360** | **360** | **1080** |
| **Trap-success** | | **4.72%** | **4.44%** | **1.67%** | **3.61%** |
| **Shannon-Wiener index (*H'*)** | | **1.07** | **0.48** | **1.33** | **1.59** |
| **Simpson's index (D)** | | **0.35** | **0.7** | **0.28** | **0.24** |
| **1-D** | | **0.65** | **0.3** | **0.72** | **0.76** |

Overlaps of the small mammal species among the sites were low (*S'* = 0.40 between forest and savanna grassland, *S'* = 0.29 between forest and shrubland and *S'* = 0.33 between savanna grassland and shrubland), with *C. olivieri* being the only species common to all the three habitats (Table 2). *Mastomys erythroleucus* dominated (81.3%) the savanna grassland, whereas *Crocidura olivieri* was the most abundant species (41.2%) in the forest followed by *R. rattus* (35.3%) and *M. daltoni* (23.5%). In the shrubland, *A. n. solatus* and *C. olivieri* were equally represented, with each species contributing 33.3% of the total number of captured individuals. The single specimens of *A. albiventris* and *C. foxi* were captured in the shrubland.

**Table 2.** Composition of species in the different habitats at the University of Ghana Botanical Garden.

| Species | Forest | Grassland | Shrubland |
|---|---|---|---|
| *Arvicanthis niloticus solatus* | | | ■ |
| *Mastomys erythroleucus* | | ■ | |
| *Praomys daltoni* | ■ | | |
| *Rattus rattus* | ■ | | |
| *Crocidura olivieri* | ■ | ■ | ■ |
| *Crocidura foxi* | | | ■ |
| *Atelerix albiventris* | | | ■ |

*Biomass*

Mean weight and total weight varied among species, with the former ranging from 11 g to 154 g, and the latter from 11 g to 924 g. *Rattus rattus* and *C. foxi* recorded the highest and lowest mean and total biomass, respectively. The mean weight of *A. n. solatus* (88 g) was greater than those of *M. erythroleucus* (60 g) and *C. olivieri* (35 g), but because the former had only a couple of individuals, its total biomass (176 g) was lower than those of *M. erythroleucus* (780 g) and *C. olivieri* (420 g) (Fig. 1). Overall, biomass was greatest in the forest (1293 g) and lowest in the shrubland (337 g). The total small mammal biomass for the study area was 2515 g (Fig. 2).

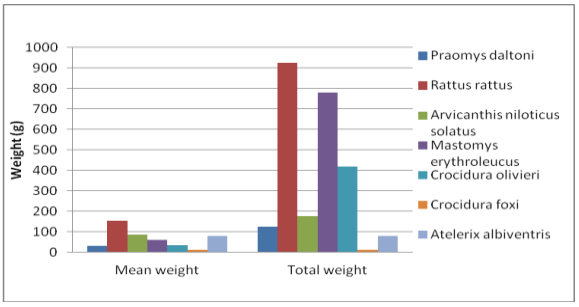


**Fig. 1.** Mean and total biomass of the different small mammal species recorded at the University of Ghana Botanical Garden.

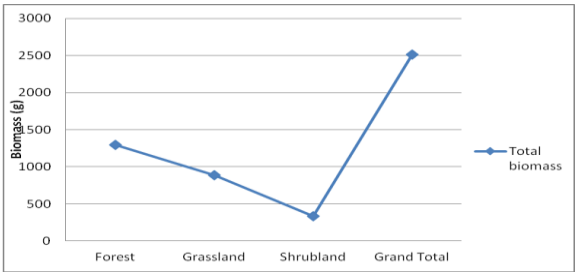


Figure 2: Total biomass of small mammals per habitat at the University of Ghana Botanical Garden

*Sex-ratio and Breeding Activity*

Male: female ratio of both *R. rattus* and *M. erythroleucus* was 2:1, whereas that of *P. daltoni* was 1:1, with the two individuals of *A. n. solatus* being both males. The shrews and hedgehog could not be sexed externally in the field. Two males and one female *R. rattus* showed signs of breeding activity (scrotal testes in males and perforate vagina in female), the two *A. n. solatus* males had scrotal testes, whereas three of the eight males and three of the five females of *M. erythroleucus* had scrotal testes and perforate vagina, respectively. None of the four *P. daltoni* individuals showed signs of breeding activity, and no lactating or pregnant females were recorded.

*Conservation Status*

None of the small mammal species captured at the UGBG is categorized as "Endangered" or "Threatened" (IUCN Red List of Threatened Species, 2010). All the species are listed as "Least Concern" because they are presumed unlikely to be fast declining due to their large population sizes, wide distributions and tolerance to habitat modifications.

*Species Taxonomic Accounts*

*Mastomys erythroleucus Temminck, 1853 (Guinea Multimammate Mouse)*

*Mastomys* spp. occur in natural clearings and farms, especially low scrubby vegetation, savanna grassland, thickets and man-made habitats. They are generalised opportunistic feeders on grass, leaves, seeds, seedlings, and insects, and adapt well to modified habitats. Even though they avoid closed habitats like forest interiors (Rosevear, 1969, Hapold, 1987), they may invade young secondary forests from neighbouring farmlands (Decher and Bahian, 1999; Holbech, 2013). The species is a known agricultural pest commonly found in anthropogenically-modified habitats (Habtamu and Bekele, 2012), and are usually most abundant in open savanna and thicket habitats and in more arid zones (Happold and Happold, 1991; Decher and Bahian, 1999; Attuquayefio and Ryan, 2006; Makundi *et al.,* 2009). All the 13 individuals recorded in the UGBG were captured in savanna grassland. This widespread species has been reported from several localities in the country, including the Accra Plains (Decher and Bahian, 1999), Muni-Pomadze Ramsar site in the Central Region (Ryan and Attuquayefio, 2000), Ankasa Conservation Area in the Westrn Region (Holbech, 2013) and Gyamera Forest Reserve in the Ashanti Region (Ofori *et al.,* 2013).

Praomys daltoni Thomas 1892 (Dalton's Mouse) (Synonym: Myomys daltoni)

This species is a widespread habitat generalist occurring in a wide range of habitats (e.g., open

forest, farmbush, shrubland, forest clearings, etc.) and depending on leaf litter (Decher and Abedi-Lartey, 2002). Specimens have been collected in forest clearings at Antwikwaaa within the Kakum National Park in the Central Region (Yeboah, 1998), primary forest at Muro Forest Reserve and fallow forest at Boako and Anwumere sacred groves, in the Western Region (Vodzogbe *et al.,* 2006), Okyem Kwaye sacred grove and shrubland in the Amansie West District in the Ashanti Region (Ofori *et al.,* 2013). The species was however not reported for the Accra Plains (Decher and Bahian, 1999), making it the first published record for this geographic region.

Arvicanthis niloticus solatus Thomas, 1925 (African Grass Rat)

This is a medium-sized rodent with head + body length between 159 and 202 mm, tail length between 125 and 173 mm and weight up to 200 g. The fur is rough, with upper parts of individual hairs yellowish with blackish tips and ventral parts whitish with base of hair blackish. Its natural habitats are dry and moist savanna, tropical moist shrubland, arable land, pastureland, irrigated lands, urban areas, and seasonally-flooded agricultural land. The two individuals recorded in this study were captured in wooded shrubland.

*Crocidura olivieri Lesson 1827 (Olivier's Shrew)*

This is a large African shrew with short brown fur, with colour varying considerably from black to grey or fawn, and darker dorsal pelage with lighter underside. Its tail is long (about 50% of body length) and mostly hairless, with few long hairs along its length. This species is found in a wide variety of habitats including moist and dry forests and savanna, degraded forest, farmbush, shrubland, and forest clearings. Specimens have been collected in Krokosua Hill Forest Reserves in the Western Region (Decher *et al.*, 2005), Ajenjua Bepo and Mamang River Forest Reserves in the Eastern Region (Barriere *et al.*, 2008), Apesokubi and Kyabobo National Park in the Volta Region (Decher & Abedi-Lartey, 2002), Ankasa and Bia (as *C. flavescens*) (Holbech, 2013), Kakum National Park in the Central Region (Yeboah, 1998), Keta and Muni-Pomadze Ramsar sites in the Volta and Central Regions, respectively (Attuquayefio *et al.,* 2005) and the Geni River and Gamera Forest Reserves in the Ashanti Region (Ofori *et al.,* 2013).

*Crocidura foxi Dollman, 1915 (Fox's Shrew)*

This is a large shrew with chocolate-brown to russet-brown dorsal pelage and grey ventral pelage. Its tail is short (about 57% of head + body length) and pale, with short hairs and numerous long bristles (Hutterer & Happold, 1983). The species occurs in moist savanna and forest edges. Specimens have been collected at Apesokubi in the Volta Region (Decher and Abedi-Lartey, 2002) and in Draw River Forest Reserve (Decher *et al.*, 2005). The single individual recorded in this present study was captured in the shrubland.

*Atelerix albiventris Wagner, 1841 (African Pygmy Hedgehog)*

This four-toed hedgehog has a more-or-less oval body with short legs, short tail and small beady eyes. The colour can vary greatly, but is typically brown or grey with spines having white- or cream-coloured tips. The species is more common in lowland areas, particularly savanna grassland. The single individual recorded in the present study was captured close to the edge of the wooded shrubland.

**Discussion**

The overall small mammal species richness (four rodents, two shrews and one hedgehog) and abundance (39 individuals) recorded at the UGBG is far below the previously-reported 241 individuals (nine rodents and four shrews) for the Accra Plains (Table 3) (Decher, 1997; Decher and Bahian, 1999). These differences could be attributed to the larger study area and the higher number of sampling sites and effort employed in the previous study. Generally, species richness and abundance increase with increasing area and sampling effort since there is more likelihood of recording rarer species (Fichet-Calvet *et al.,* 2009). Seasonal abundance of small mammals has also been reported (Attuquayefio and

Wuver, 2003; Nicolas and Colyn, 2003; Makundi *et al.,* 2005, 2009; Habtamu and Bekele, 2012). This survey was conducted in the dry season only, with a trapping-effort about nine times less than what was employed in the previous study (Table 3) (Decher, 1997; Decher and Bahian, 1999).

**Table 3.** Comparison of measured standard indices in this study (*) and previous study at the Accra Plains (Decher and Bahian, 1999).

| Habitat | Forest | | | | Savanna Grassland | | | Wooded Shrubland | |
|---|---|---|---|---|---|---|---|---|---|
| **Parameter** | **UGBG*** | **ASG** | **PF I** | **PF II** | **UGBG*** | **SHN I** | **SHN II** | **UGBG*** | **KFPS** |
| Number of individuals | 17* | 107 | 35 | 58 | 16* | 3 | 3 | 6* | 21 |
| Number of species | 3* | 5 | 3 | 3 | 2* | 2 | 1 | 4* | 4 |
| Number of trap-nights | 360* | 1200 | 1200 | 1200 | 360* | 1200 | 600 | 360* | 1200 |
| Trapping success | 4.72* | 8.9 | 2.9 | 5.7 | 4.44* | 0.3 | 0.3 | 1.67* | 1.8 |
| Shannon-Wiener index (H') | 1.07* | 0.86 | 0.12 | 0.37 | 0.48* | 0.58 | 0 | 1.33* | 1.6 |
| Simpson's index (D) | 0.35* | 0.68 | 0.96 | 0.89 | 0.7* | 0.76 | 1 | 0.28* | 0.41 |
| 1 – D | 0.65* | 0.32 | 0.04 | 0.11 | 0.3* | 0.24 | 0 | 0.72* | 0.59 |

Legend:
ASG = Adumanya Sacred Grove
PF I & II = Pinkwae Sacred Grove sites 1 & 2
SNN I & II = Shai Hill Resource Reserve Open Savanna Grassland sites 1 & 2
KFPS = Kpong Fire Protected Site (Wooded Shrubland)

In terms of habitats, however, the species richness recorded in forest, savanna grassland and wooded shrubland in the UGBG were comparable to those reported for corresponding habitats in the previous study (Decher and Bahian, 1999). Even though trapping success in this study was the lowest compared to those for the Adumanya and Pinkwae sacred groves (Table 3) (Decher and Bahian, 1999), species diversity (Shannon-Wiener) was highest at the UGBG forest. Because species diversity as measured by Shannon-Wiener index takes into account the species richness, abundance and evenness of distribution of individuals across species, sites with fewer species whose individuals are evenly distributed may score higher diversity values than those higher species richness but with disproportionate distribution of individuals across species. The same reason may account for the lower diversity recorded in UGBG savanna grassland and wooded scrubland habitats compared to those of corresponding habitats in the previous study by Decher and Bahian (1999). This explanation is supported by the Simpson's diversity index (D), which measures the probability that an individual chosen at random from a local species pool belongs to the same species. The highest diversity recorded in wooded shrubland in this study suggests that this site had the highest variety of food resources and microhabitats that provided enough cover, protection against predators and nesting materials for different species (Yahner, 1982; Stapp, 1997; Ryan and Attuquayefio, 2000; Attuquayefio and Wuver, 2003; Scott *et al.,* 2006).

The species composition of the present study was expected to be a 'nested subset' of the small mammal species pool of the Accra Plains reported by Decher and Bahian (1999), however, this was not the case. *Mastomys erythroleucus* was the only species common to the current and the previous studies. The other six species (*P. daltoni*, *A. n. solatus, C. olivieri,*

*C. foxi* and *A. albiventris)* are the first records for the Accra Plains. *Rattus rattus* is an invasive species known to dwell in urban areas and human-dominated landscapes (Jeffrey, 1977), but was not recorded in the previous study (Decher and Bahian, 1999). Generally, the small mammals recorded at the UGBG are non-specialized generalist species preferring grassland, farmbush, forest clearings and degraded forest. Such species are usually more common and widely-distributed in modified habitats, being less affected by habitat disturbance (Shepherd and Ditgen, 2005; Oduro and Anti, 2010). The absence of forest dependent species like *Hylomys* sp. and *Praomys tullbegi*, which were reported for the Adumaya and Pinkwae sacred groves by Decher and Bahian (1999), and the presence of *R. rattus*, may be an indication of a highly-disturbed forest habitat at the UGBG. The area however still provides suitable habitat for some important non-forest small mammals that were not previously recorded for the Accra Plains. This highlights the importance of the UGBG to the zoogeography and conservation of small mammals in this distinct geographic region and the country as a whole.

There is therefore an urgent need for effective protection of the UGBG, using proper management initiatives to reduce the rate of disturbance including regulated entry into the garden, particularly for social activities which often result in indiscriminate waste disposal and trampling of the vegetation. As the University community continues to grow, there will be constant temptation to encroach and to convert portions of the garden into infrastructural development. This temptation is an "ecological evil" which should be strongly resisted to avoid the irreversible serious negative ecological consequences not only to the small mammal fauna, but also other inhabitants like reptiles (snakes, monitor lizards, skinks, chameleons, etc.), and important bird species.

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