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The Unnoticed Benefits of City Dumpsites

KEYWORDS: City dumpsites, Biodiversity reservoir, Species richness.

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ABSTRACT *The aim of this paper is to ascertain the unnoticed benefits of city dumpsites with the central focus on its contribution to biodiversity conservation. This work sampled nine (9) dumpsites across the study area; highlighting the geographical coordinates, size and ascertain the species richness of each dumpsite. This was obtained using Geographic Position System (GPS) device, simple perimeter measurement and observations respectively. Furthermore, the strength of association was determined using correlation analysis while regression analysis served in ascertaining the percentage variation and standard coefficient. Result obtained show that dumpsites used in this study cover approximately 244,200m2. 136 bird observations were documented with 97 bird species representing 71.32%. Further, 65-land snail's observations recorded 17 species diversity (26.15%); 74 bird species (73.27%) came from 101 observations of birds; and 75 observations of mushrooms produced 20 species diversity (26.67%) of mushrooms. The coefficient of variation, explain that plants have the highest influence in explaining the variability of other taxa used in this study. The highest strength of association (0.0571) recorded is among plant and mushroom diversities. The results of the regression analysis show that dumpsite size, plants, land snails and mushrooms accounted for 50.20% of bird richness. The standard coefficient reveals that plant richness accounts for 98.8% of explanation of bird richness at city dumpsites. The result is obvious because birds depend on plants for nesting, breeding and roosting. Since city dumpsites can serve as interior biodiversity reservoirs, conservation planning should aim at providing better management for sustainability of life form capacity at city dumpsites. From this micro-survey, it is worth concluding that dumpsites accommodate a number of resources that research is to be ventured into, as bird are good asserts to test the viability of any ecosystem.*

Introduction

City dumpsites are sites of municipal waste also known as tips, refuse dump, rubbish, garbage dump or dumping ground. City dumpsites are common sights in most cities of the world particularly in fast growing population. Most of these sites are located at exurban, away from the city centre. The origin of city dumpsites is traceable to natural and anthropogenic activities separately or combined. The natural dumpsites are created when gullies from active erosion are later converted to dumpsites for municipal wastes such as household, commercial and demolition wastes. The municipal wastes are unwanted by-products of modern life generated by people living in urban areas; simply any substance that is discarded after primary use, and/or of no use, worthless and defective. The term is often subjective because what is term waste to one person may not necessarily be waste to another. On the other hand, unwanted materials that are recyclable are inaccurately classified as municipal wastes.

Over the years, environmentalist and governments have condemned city dumpsites near residential areas. Indiscriminate municipal wastes dot several parts of major cities in Nigeria, blocking motorways and making passage along highways and walkways difficult forming visible part of the general malaise of environmental degradation. According to Obianigwe (1998) the sites of decomposing refuse visible all over the commercial cities in Nigeria, are at worst a volcano waiting to explode. He added that the disaster could take the form of typhoid epidemic, cholera outbreak or even the bubonic plague. The challenges of city dumpsites' management and varying degrees of technical problems and prospects are no doubt self-explanatory. For most city dwellers, impoverishment and environmental degradation are getting more acute because of the government's policy of privatizing the production and use of urban space and services without any consideration for improving the quality of life of the generality of ordinary citizens.

The mental attitude of the two classes of city dwellers, the unconcern elite and the ignorant poor, constitutes a major obstacle to the effective implementation of existing waste management policies worldwide. The ignorant poor constitute a large percentage of the populace. The group is unfortunately under the condition of having to live with filth and myopically feel there is nothing they can do about waste around them. They lack the necessary empowerment to motivate the disposal authority or themselves into action. There is need to create a new sustainable development formula with the objective of safety which is in harmony with nature around city dumpsites. This could be achieved through participatory democracy, economic and ecological recovery, social justice and discipline that aims at preserving biodiversity.

A reoccurring decimal question one will ask is, "where is the '*Okon*' (Giant rodent) of Calabar"? This giant rodent peculiar to the dumpsites of Calabar in Cross River State, Nigeria, is fast becoming victim of species erosion in the neighbourhood. Will it be idle to watch this piece of heritage beauty and identity waste or go into extinction?

Loss of biodiversity has been in the forefront of conservation issues worldwide. Biodiversity conservation through restoring degraded habitat is currently being advocated for in United Kingdom Biodiversity Action Plan (Rahman, 2010). Newly created grasslands on restored landfill and

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city dumpsites are semi-natural habitats that could support a number of species. However, it is unknown whether these recreated habitats represent a significant resource in terms of biodiversity conservation. The content of the pocket of city dumpsites in Cross River State, the study area of this work, have not been assessed extensively as to know its content in terms of biodiversity richness.

There is a growing need to evaluate the impact of city dumpsites management on biodiversity in order to maintain and enhance wildlife value. Watt *et al*. (2005) while evaluating biodiversity in fragmented landscape in United Kingdom acknowledged that fragmented landscape can play important role in biodiversity. Dumpsites as fragmented landscape have parameters to ascertain the biodiversity status. The fragmentation of woodland habitat into smaller isolated patches pose one of the greatest threat to forest biodiversity; reducing habitat area and increasing patch isolation (Watt *et al*. 2005). According to Arthur and Wilson (1967), the reduction in area may lead to increase local extinction while increased isolation may cause a reduction in the exchange of individuals between isolated patches. Oka and Majuk (2016) highlighted that pristine habitat with high potential evapotranspiration (PET) can support high species richness even when the landscape size is small. This result fostered the use of size factor to ascertain the richness in dumpsites.

Belfrage *et al*. (2015) studying the effect of farm size and on-farm landscape heterogeneity on biodiversity in Swedish landscape, highlighted that to increase biodiversity, farm size need to be taken into consideration. The scope to which the increase is was not defined; whether increase in taxa, species or genetic diversity. The earlier work of Belfrage *et al*. (2005), compared diversity and abundance of birds, butterflies, bumblebees and herbaceous plants between six small farms (<52ha) and six large farms (>132ha). The result show largest difference between small and large farms; more birds in small organic farms than on large farms. Belfrage *et al*. (2005) therefore argued that the consideration of agriculture's effect on biodiversity should include factors affected by farm size. This brings to focus the importance of size and organic factors as determinants to biodiversity richness in a landscape.

Since habitat loss is one of the greatest threats to biodiversity in the world, neighbourhood habitats such as dumpsites are crucial pieces holding together an increasingly fragmented landscape. Variety of vegetation types influence land snail and bird species richness and distribution (Nation 2007; Oka 2014) in terrestrial ecosystem. Similarly, components of dumpsites determine the characteristics of the site and determine the carrying capacity of species.

Terrestrial plumonite gastropod mollusks commonly known as land snail, rank second only to insects when it comes to the number of species. The average lifespan of land snail is between 10 to 15 years; feeding on variety of items. Burch and Pearce (1990) highlight that land snails are useful biological indicators for soil quality and chemistry. Anderson and Coppolino (2009) running through the relationship of land snail diversity and environmental and ecological factors points that abundance and diversity has different environmental attributes except for habitat complexity. Further, highlight by Anderson and Coppolino (2009) show that habitat complexity is the strongest factor affecting land snail abundance and diversity in an area. To Barker (2001) land snails are essential part of many birds; 40 per cent of female turkey feed on sail eggs during span period. Dallinger *et al*. (2001) explain that birds obtain calcium, nutrient vital to the embryo, from sail eggs. In another study, Graveland *et al*. (1999) observe a decline in European forest passerine, traceable to decline in land snail population that is part of birds' main food. While Stevens (2005) point that fire could affect abundance and diversity of land snail in any ecosystem, Cejka *et al*. (2008) added that over-hydration in also a malady to snail survival in flood prone landscape. Allowing the aforementioned in city dumpsites can equally be harmful to land snails in such ecology. For proper conservation and management of land snails in dumpsites in Cross River State the gap existing on the inventory on snail diversity in city dumpsites (biodiversity reservoir) need to be up-dated.

The advancement in science and technology has brought to the open the nutritional and medicinal importance of mushrooms to the world. In most developing countries of the world, great varieties of edible and medicinal mushrooms come from the wild. In Nigeria due to inchoate mushroom farming, scouting for it is mainly by women and children (Okhuoya 1997). The reliance on naturally growing edible and medicinal mushrooms in forest and farmlands no doubt has greatly undermined the importance and benefit of mushrooms in city dumpsites. No doubt, Okhuoya *et al*. (2010) classify mushroom as underutilized non-wood forest resource in Nigeria. In the midst of this Labarere and Menini (2000), identified 25 species of edible mushroom of good repute whose knowledge were handed down generational lines via oral communication. According to Ene-Obong and Camovale (2000), edibility of mushroom is based on organoleptic property such as aroma, taste, flavor and texture. Further, Okhuoya *et al.* (2010) point to the fact that exploitation of indigenous mushroom is still over-shadowed by the preponderance of green plants. One of the strongest technical points recently besides providing food option is the conversion of ordinary valueless waste to value added products via permaculture system (Okhuoya *et al*. 2010). These wastes are ingredient for compost in mushroom cultivation. Over the years, dumpsites have propagated this function unnoticed in most developing countries though mushrooms are integral part of dumpsites. Okhuoya *et al*. (2010) is of the opinion that to tap into the mycorrization potentials of mushroom, it is important to improve the nation's knowledge of mushroom diversity. Without a proper understanding of the diversity and status of mushroom in dumpsites, for which this paper is set to achieve, the problem will remain unsolved. It is important to know the benefits of dumpsites apart from manure production. There is a frequently used slogan in current conservation circles: 'Think Globally Act Locally'. An in-depth study of the conservation status of city dumpsites in Cross River State can help to expose to the world the content of city dumpsites as another local hotspot of biodiversity.

Objectives

To enhance this study, the following objectives were set as guide to the work:

1. Highlight the geographical coordinates of the dumpsites in the study area.
2. To ascertain the species richness level in dumpsites in the study area.
3. Assess the strength of association between dumpsites size and diversity and between taxa.
4. Evaluate the influence of dump size, plants and land snails on bird richness.

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Significance and Scope

This paper is an attempt to initiate the beginning of regular taxa survey in city dumpsites, and provide better understanding of the microhabitat of dumpsites in the study area. Also in the bid, promote conservation and management of biodiversity in city dumpsites as reservoirs.

The scope of this study was limited to existing, government approved dumpsites in Cross River State, Nigeria. The word city dumpsite and dumpsite was used interchangeably but mean the same. Inventory on plants was limited to vascular plants and bryophytes that are not cultivated. Only bird species that are in the wild and those using the air space formed integral part of the study. Captive and domestic birds did not form part of the inventory. The shells of dead land snails served as surrogate for further inventorying of land snails in dumpsites.

Study Area

Cross River State is situated between longitude $7^0 50'$ and $9^0 28'$E, and latitude $5^0 32'$ and $40^0 27'$N; sharing common boundary with Cameroun Republic in the East, Benue State in the North, Enugu and Abia States in the West, and Akwa Ibom State in the South (**Figure 1**). The mean daily temperature range is between 18^0C - 27^0C all through the year; usually highest between February and April but does not exceed 35^0C. The mean daily minimum and mean annual minimum temperatures increase from the coast toward the interior because of the moderating influence of the sea. On the highlands of Oban Hills and Obudu Plateau, high relief reduces temperature to a mean annual temperature not exceeding 24^0C with southern part recording range from 26^0C to 27^0C. The total annual rainfall ranges from 1750mm to 3000mm, with rainfall probability between 30 to 58 per cent. The annual rainfall is always greater than the annual potential evapotranspiration. The relative humidity at the coastal area is between 80 and 90 per cent (Ofomata 1975).

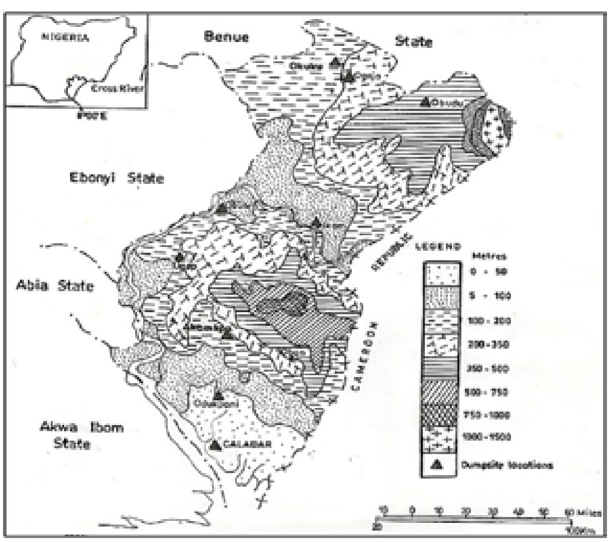

FIG. 1: Relief map of Cross River State showing dumpsites locations
Source: Cartography unit, Geography and Environmental Science Department., University of Calabar, Calabar.

The Coastal Plains Sand succeeds the lignite Series Formation consisting of yellow and white sand. This formation is marine, estuarial, lagoon and fluviolacustrine in origin. The Cross River Plain is notable for its groundwater mineralization and poor groundwater resources. The characteristic trend of the topography is that of a gradual ascent from the Cross River Plain to the Eastern Highlands of Oban Hills and Obudu Plateau. Generally, the landscapes of Cross River State fall into three distinct units: the plains and lowlands, cuseter landscape and highlands. The Obudu Plateau is a plateau-capped ridge, about 1,525metres above sea level (a.s.l), with picture of rugged landscape at the flanks of the ridge, forming disserted plateau that slopes gradually toward the southwest and fades out in the Cross River Plain. The Oban Hills consist of a series of flat-topped plateau, 1,005metres a.s.l, with the highest point about 1,125m a.s.l. (Ofomata 1975).

The Cross River, the main stream draining the State, is about 540Km long, rising from Mbu headwaters in Cameroun Republic at an elevation of about 1,525m a.s.l. The total drainage area is about 50,439Km^2 with 28,370Km^2 (56.25 per cent) in the Eastern States of Nigeria. There is a considerable influence of lithology on stream development, pattern and density of Cross River Basin. Agbokim waterfall consists of seven streams, each decending over a steep cliff, giving the scenery a beautiful seven-faced falls surrounded by green tropical trees, valleys and steep hills beautifully enveloped by a rainbow-like aura colours. The Kwa Falls is unique with its picture of sparkling water in the midst of thick evergreen tropical forest and the natural arrangement forming a chandelier-like pattern (Ofomata 1975).

The vast diversity of vegetation formations, comprise the dominant vegetal community of the Tropical rainforest; characterize by plants ranging from high deciduous evergreen trees to veritable forest giants including shrubs and epiphytes. Prominent among these are *Brachystegia leonensis, Cordia vignei, Dennettia tripetala, Dracaena ovate, Lophira alata, Milicia excels, Terminalia ivorensis* and *Terminelia superb*. Among the woody climbers are *Acridocarpus alternifolius* and *Combretum zenkeri*. The vast vegetal cover and the forest-savanna ecotone characteristics of the State make the environment habitat for vast biodiversity. Among the birds are *Kupeonius gilberti* (White-throated Babbler), *Ploceus bannermani* (Bannerman Weaver) and *Picatharles oresa* (Redheaded Rockfowl). Also found are *Gorrila gorilla* (Gorilla), *Drillus leucuphaeus* (Drills), *Pan trogboolytes* (Chimpanzee) and *Cercopithecus preusai* (Peruses' Guenon). With large stretches of forest reserves, the Cross River National Park (CRNP) manages the Oban and Okwangwo ranges. The State government gave a boast to its conservation effort by the gazzeting of the Afi Mountain Sanctuary and the establishment of the Estuarine Swamp forest reserve. This translates to 30 per cent area designated as conserved area in Cross River State (Cross River State: The Economic Blueprint, 2007 – 2011).

Methodology

Apart from the purpose of proper documentation and future research, the choice of dumpsites centered on environmental and geographical spread. Also functional government approved dumpsites were given priority in selection. Nine dumpsites each from Calabar, Odukpan, Akamkpa, Ugep, Obubra, Ikom, Okuku, Ogoja and Obudu (Figure 1) were surveyed for species diversity among taxa selected for this study. The planning, methodology and implementation of this study benefited greatly from pilot study carried out in July and October of the previous year before the formal study. The time originally proposed to search each dumpsite was six hours. When tested in the

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pilot study, this length of time compared to four hours search period yielded few additional species per taxa at each dumpsite hence the choice of four hours.

Observation and count among species of different fauna were conducted between 6.00am and 10.00am (Nigerian time) in the month of July and October. This is significant because movement by land snails and birds are minimal with little or no migration. Birds using the air space was taken into consideration during enumeration but domestic birds were avoided. The counts were done repeatedly to a state that no new species was added in each dumpsite. In addition, the habitat quality and landscape factors came to focus. The size of each dumpsite was ascertained by simple perimeter measurement while the Geographic Position System (GPA) device was used to collect data on the bearing of the central position of each dumpsite.

Plant species (vascular plants and bryophytes) data were collected by simple observation and direct count in all the nine city dumpsites used in this study. Vegetation was assessed at each dumpsite according to the list obtained from Cross River State Forestry Commission. The list was combined with the anecdotal evidence at the dumpsites since the lists provide a list of species by natural division and not by site.

One square meter quadrant is selected randomly from habitat types within dumpsites where land snails are likely to be found. These include leaf litter, area of high plant diversity, coarse woody debris, bases of trees and rotten logs. Bishop (1977) has suggested that random sampling is inappropriate in this type of study since many land snails have particular microhabitat preference they are often restricted (Nekola 1999). Cameron and Pokyryszko (2005) acceptance of stratified random sampling as most appropriate warranted the use of this technique in this study.

Participatory Appraisal was used to obtain data on species that may be nocturnal in nature or may not have been sighted during fieldwork. The identification of edible and non-edible species of mushrooms was obtained from indigenous people. Identification of all species in the field was not possible. The photographs of such species are presented to experts for proper identification and naming. While in the field such species are given pseudo-names that consistently served as names until the correct names are obtained.

Result and Discussion of Finding

TABLE 1

Spatial turnover in species composition per taxon in the dumpsites of the study area

S/N	Location	Size of Dumpsite (m²)	Geographic Coordinates	Plant	Land Snail	Bird	Mushroom
1	Calabar	48,800	08°37′22″E; 05°01′42″N	22	12	12	8
2	Odukpani	19,800	08°20′22″E; 05°07′56″N	10	12	10	8
3	Akamkpa	15,400	08°04′47″E; 05°04′47″N	18	15	12	10
4	Ugep	31,200	08°04′51″E; 05°48′32″N	16	10	10	12
5	Obubra	15,400	08°19′56″E; 06°04′58″N	14	6	10	10
6	Ikom	32,600	08°42′30″E; 05°58′30″N	20	4	15	16
7	Okuku	39,600	08°46′46″E; 06°42′58″N	10	2	6	3
8	Ogoja	22,200	08°48′00″E; 06°39′30″N	12	2	6	6
9	Obudu	19,200	09°09′34″E; 06°40′06″N	14	2	20	2
	TOTAL	244,200	Observation	136	65	101	75
			Species Diversity	97	17	74	20

Table 1 highlight the species diversity as observed in different city dumpsites in the study area. Compositional differences were found between and within taxa at different sites. In 136 observations of plants, 97 species (92 vascular plants and 5 bryophytes) was recorded. Survey revealed that the dumpsite at Calabar recorded 22 plant species representing 22.68 per cent of plant species richness in the study while Odukpani and Ogoja recorded the least with 10 plant species (10.31 per cent) each.

Further observation showed that from 65 observations of land snails, species richness was found to be 17 out of which dumpsite at Akamkpa recorded 15 species representing 88.24 per cent of the species richness of land snails in the study. Obudu, Ogoja and Okuku recorded two species of land snail each, accounting for 11.76 per cent on each of this dumpsite.

Out of 101 birds observed, 74 species richness was recorded; the highest recorded at Obudu dumpsite with 20 bird species representing 27.03 per cent of the species richness of birds in the study. Ogoja and Okuku recorded the least with six species (8.11 per cent) each.

Seventy-five observations of mushroom produced 20 species diversity; 8 edible and 12 non-edible. The highest diversity was recorded at Ikom dumpsite; 16 species representing 80 per cent of the species richness of mushrooms in the study. The least came from Obudu, two (10 per cent) species of mushrooms.

Generally, the data shows Calabar with the highest diversity of plants at dumpsites, 22 species, representing 22.68 per cent; 12 species of land snails (70.59 per cent), 12 bird species (16.22 per cent), and mushrooms eight (40.00 per cent). Akamkpa dumpsite recorded the highest diversity of land snails, 15 species, representing 88.24 per cent; 18 plant species (18.56 per cent), 12 bird species and 10 mushroom species (50.00 per cent). Obudu dumpsite had the highest record of bird richness, 20 species (27.03 per cent), plant richness 14 (14.43 per cent), land snails and mushroom richness two (11.76 per cent) on each site. Ikom dumpsite recorded the highest mushroom diversity, 16 species representing 80.00 per cent, plant richness 20 (20.26 per cent), land snail diversity four (23.53 per cent) and bird diversity 15 (20.27 per cent). The diversity of species recorded for each taxon among dumpsites in the study is shown in **Figure 2** (a – d).The uniqueness shown in this result is that no single dumpsite takes monopoly of being the custodian of the highest species richness of all the taxa in this study. These results further show that variability in the complexity of dumpsite is an important factor that is beckoning on future research. Instances that showed the same number of particular species, there was variation in species composition.

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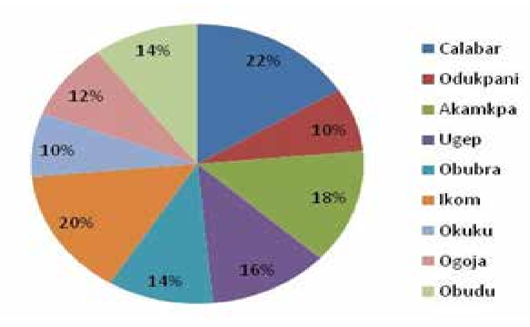
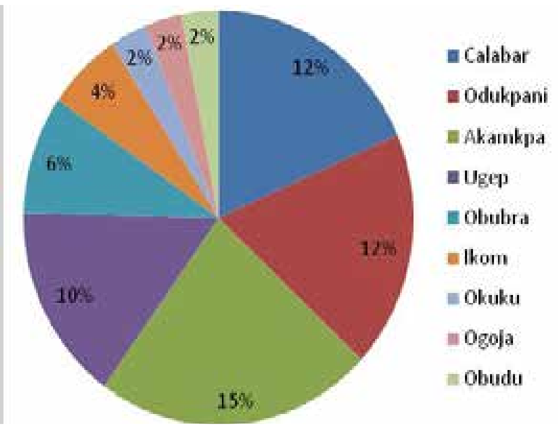
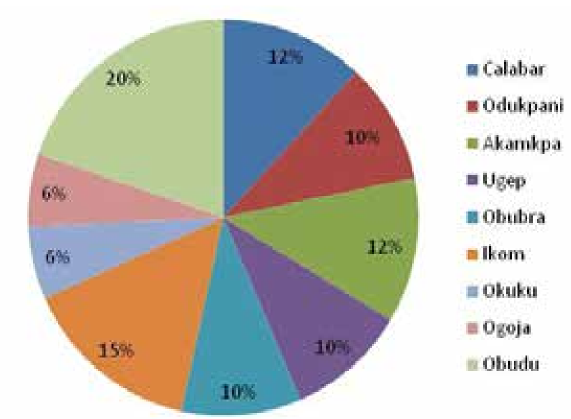


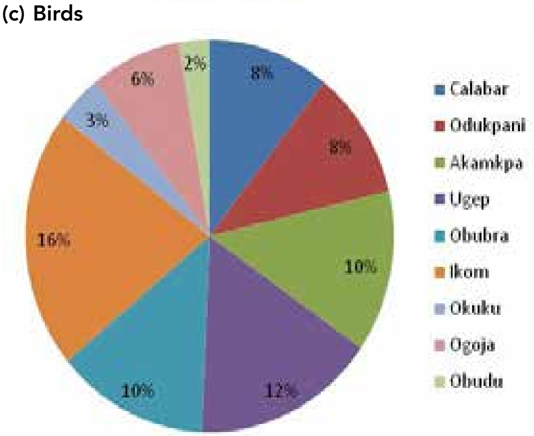
(a) Plants



(b) Land snails



(c) Birds



(d) Mushrooms

FIG 2: Representation of different species as observed at the dumpsites.

TABLE 2

Regression output on collective explanation of variance of bird species richness by dumpsite variables in the study area.

Descriptive Statistics:

	Mean	Standard Deviation	Vari-ance	N	Mini-mum	Maxi-mum
Areal extent	27133.33	11660.189		9	15,400	48,800
No. of plants	15.11	4.256	47.28	9	10	22
No. of land snails	7.22	5.094	56.60	9	2	15
No. of birds	11.22	4.353	48.37	9	6	20
Mush-rooms	8.33	4.359	48.43	9	3	16

Coefficients:

			Standardized Coeffficient		
Model	B	Std. Error	Beta	t	Sig
(Constant)	6.381	5.868		1.087	.338
Areal extent	.000	.000	-.542	-1.338	.252
No. of plants	1.010	.518	.988	1.949	.123
No. of land snails	-.221	.339	-..259	-.652	.550
Mushrooms	-.400	.451	-.401	-.888	.425

ANOVA:

Model	Sum of Squares	df	Mean Square	F	Sig
Regression	76.031	4	19.008	1.007	.497
Residual	75.525	4	18.881		
Total	151.556	8			

Model Summary:

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.708	.502	.003	4.345

Predictors: (constant), Mushrooms, Areal extent, No. of land snails, No. of plants
Dependent Variable: No of bird species

The descriptive statistics in TABLE 2 show that there are variations between the standard deviation and the mean in all the variables used. The coefficient of variation ranges from 47.28 – 56.60. This implies that variable with the highest coefficient of variation have limited chances of explaining the influence exerted on dumpsites. Thus, plants have the least coefficient of variation (47.28), meaning that it has higher influence in explaining the variability of land snails, birds and mushrooms at dumpsites.

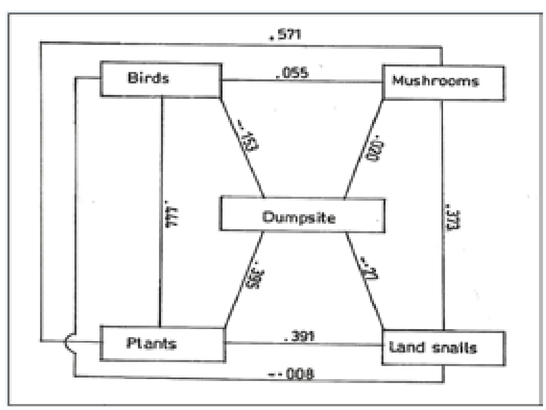


FIG 3: Structural association model between dumpsite size and richness of birds, plants, land snails and mushrooms.

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The correlation coefficient (r) result obtained between dumpsite size and richness of birds, plants, land snails and mushrooms is shown in Figure 3. The strength of association was higher with plants (0.395) when compared with birds (-0.153), land snails (-0.027) and mushroom (0.020). The strength of association between bird and plant species richness (0.444) was positive, moving in the same direction; the higher richness in plant species, the higher species richness of birds. The correlation coefficient between plants and the other bio-variables (land snails and mushrooms) are equally positive: 0.391 and 0.571 respectively.

Habitat quality and landscape variables were found to be significant predictors for different species. Underlying soils were found to be an important factor in determining the heterogeneity of plant communities within dumpsites that in turn dictates suitability of habitat for other taxonomic groups (birds, land snails and mushrooms). The main soil variation is either with depth due to leaching and surface litter fall, which can cause greater difference within and between dumpsites. At the dumpsites located at Ikom and Ugep, 80 per cent of the elements of dump litters are in the organic components and 20 per cent in the inorganic components. The problem of the choice of denominators was outstanding in all the dumpsites. Weight per area is probably the most useful since the total per annum is seldom known so that the proportion of this can rarely be given.

Restricted access to the center of the dumpsites enhanced the richness and abundance birds; Herons (*Ardea purpurea* and *A. cinerea*), Kingfisher (*Alcedo atthis*) and hornbill (*Ceratgymna elata*) observed at Calabar dumpsite, White breasted Guinea fowl (*Agelastes meleagrides*) at Obudu dumpsite. The common bird species observed in all the study sites are Magpie (*Pica pica*) and Village weaver (*Pioceus cucullatus*) Further, observation shows that dumpsites are important in conserving biodiversity, providing patchwork of wildlife-rich habitats and forming building blocks for biodiversity reservoirs and ecological sustainable landscapes.

From TABLE 2, R^2 for this regression analysis was 0.502; that is approximately 50.20 per cent of the variation in the bird species was accounted for by plants, areal extent, snails and mushrooms. Conversely, about 49.80 per cent of the variation remains unaccounted for by this model. A comparison of R^2 (0.502) and adjusted R^2 (0.003) for the study showed that the adjusted R^2 tends to increase as nonsignificant independent variables are added to the regression model.

The standardized coefficient show that plants has the value of 0.988. This implies that plants in dumpsites have the influence in explaining bird richness accounting for 98.8 per cent. The effect of plants on bird richness might be obvious because birds depend on plants and the more plants are in diversity in dumpsites the richer the dumpsites in bird diversity. In addition, plants are structural elements of bird habitats and increase the complexity of dumpsite vegetal structure.

Plants were observed to a strong association with mushrooms in this study. Among the edible mushrooms identified in this study, include *Fleurotus sqarrosolus, Volvariella volvacea, Pleurotus tuberregium, Auricularia auricular, Collybia butyracea, Coprinus atramentarius* and *Lactarius trivialis*. *Pleurotus tuberregium* was found in dumpsites at Ikom and Ugep due to the large quantity of bio-waste at the dumpsites. Herons (*Ardea purpurea* and *A. cinerea*) are identified with *Oyster mushrooms* at dumpsites because of its hardness and waterproof texture for the purpose of nesting and keeping the young warm at the initial period after hatching. Dumpsite trees that have the mushroom, *Fomes fomentarious* on its trunk equally attracts Woodpeckers as the latter weaken the tree trunk for easy excavation.

Recommendations

This study indicates that city dumpsites have potential biodiversity conservation value in complex modified human landscape. Hence, at maturity city dumpsites can be converted to green spaces within city centers, with no human interference or alternative developmental purpose. Conservation planning should specially address the issue of human settlement to underline the value of dumpsites for biodiversity conservation. This implies that management of city dumpsites and adjacent lands can be planned together since the dumpsites are found to be rich entities of biodiversity. Further research should be done for a better understanding of bioactivities within dumpsites and enhance the contribution to the sustainability of immediate surrounding environments and the life form capacity.

Conclusion

This paper should represent the beginning of regular taxa survey at city dumpsites for conservation purpose. Despite some obvious constraint on ecological function, city dumpsites provide important insight into biodiversity conservation. Plant around dumpsites have been found to provide habitats for land snail and birds; serving the later as feeding, breeding and roosting sites. This paper highlights the need for greater understanding of biodiversity status, the potential that city dumpsites have for conservation and the contribution needed to make this work. Local conservation actions are critical for addressing the conservation crisis such as species erosion, in the midst of developmental activities. Exotic species interfering with native plants survival at dumpsites equally need attention. The result of this study shows that all the taxa in the dumpsites are of mutual benefit for co-existence therefore need protection and conservation. More waits to come to lamplight from city dumpsite outside manure production and this work has set the ball rolling. Thus, city dumpsites are biodiversity reservoirs that can enhance species richness.

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