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Investigating the use of snags and downed logs by wild animals in Federal College of Wildlife Management, New-Bussa, Nigeria

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ABSTRACT

This study examined the uses of snags and downed logs in the Federal College of Wildlife Management, New Bussa. The research aimed to identify the kinds of trees that produce snags and deadwood logs in the study region as well as the ways that wild animals utilize these snags and deadwood logs in the study area. The methodology employed involves the use of plot sampling method. Field observation of plant species that have turned into dead trees was carried out. The data obtained were analyzed using descriptive statistics (tables and charts). The results showed that a significant number of plant species were identified as snags and down logs; the finding indicates that *Terminelia glaucocens* having (12.5%) occurrence and *Pterocarpus erinaceus* (10.71) was the predominant species in the study area. These dead trees species are used by wild animals in a variety of ways; for instance, 50% of wild animals use the snags and down logs for perching, 17.44% use them as foraging sites, and 4.65% use them as nesting sites. The most common users are squirrels, accounting for 13.95% of the total, followed by francolins birds (11.63%) and hawks (1.16%). Since many wildlife species rely on these trees to survive, it is imperative to protect these tree species inside the college estate to stop the extinction of wild animals. It is not advisable to remove snags.

Keywords: Snags; downed log; wild animal; FCWM woodland

INTRODUCTION

The value of a given forest for conservation is partly determined by how it is managed. For instance, numerous studies have discovered that, at the stand level, the preservation of structural features like dead wood and snags, as well as the ability of native plant species to tolerate succession in the understory, have a significant impact on the population of fauna in tree plantations (Hartley 2002). Snags are the standing trees dead for a natural process. They are an important environmental element and are essential for maintaining biodiversity in forest ecosystems (Ferris, and Humphrey 1999; Tavankar, *et al*., 2011). Snags are originated by any possible factor that contributes to tree mortality, such as lightning, storm breakage, fire, disease, insects, drought, flooding, forestry practices, and so on (Wolf *et al*. 2004; Bendix and Cowell, 2010). Snags are not only the base of a food-chain but also, they provide

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microhabitats for many living organisms, including fungi, epixylic lichens, bryophytes, invertebrates, birds, mammals, reptiles, and amphibians (Russell *et al*. 2006; Nascimbene *et al*. 2013).

Cavities in trees and snags provide suitable nesting sites for birds, bats and other wildlife species. In forest areas, an adequate and continuous availability should be ensured for preservation purposes (Tremblay *et al*., 2010). The potential benefits to wildlife from deadwood are dependent on several factors, size, species, level of decay, and location. Increasingly, snags have been studied in managed forests to determine snag dynamics (Chambers and Mast, 2005; Russel and Weiskittel, 2012). Most ground-dwelling wildlife species uses downed logs as cover, a way to escape from predators, a way to traverse through areas, and, in the case of amphibians, a potentially comfortable microclimate. Moreover, a variety of predators, both vertebrate and invertebrate, feed on the profusion of arthropods that fallen wood harbors (Lohr *et al.,* 2002; Ulyshen and Hanula, 2009).

Birds comprise the most conspicuous and best-known animal group using tree cavities as nest sites. The abandoned cavities resulting from their excavations are used by many other mammal and bird species, including American martens (*Martes americana*) and Vaux's swifts (*Chaetura vauxi*) (Bull and Holthausen, 1993). If only forest birds are considered, the proportion of cavity-nesting species is about 30% in northern Europe (Siitonen, 2001), 35% in central Europe (Wesołowski, 2007), 40% in North America and 20–30% in tropical Central America (Gibbs *et al.,* 1993), while we expect to find the highest diversity of tree-cavity nesters in the tropics (e.g., woodpecker diversity is highest in the Asian, South American and African tropics (Mikusiński, 2006; Winkler & Gusenleitner, 2015), The probability of cavity trees being occupied by vertebrates increases with the number of cavities per tree, diameter and crown senescence (Koch *et al*., 2008b). Most cavities used by vertebrates have an entrance diameter of at least 10 cm and are at least 30 cm deep Stokland *et al.* (2012). However, different species of arboreal marsupials show clear preferences in their choice of cavities. Similar to cavity-nesting birds, the preferences may vary in terms of entrance diameter and cavity volume, height above the ground, position on the tree (main stem or branches) and number of cavities per tree (Gibbons and Lindenmayer, 2002). Cavity volume is also an important factor in explaining cavity use because it can affect reproductive success (Martin *et al.,* 2004). Cavities with large internal size may allow for better thermoregulation and reduce competition for space among siblings. Therefore, the ideal cavity to maximize fecundity and minimize predation is a large-volume cavity with a small entrance (Martin *et al.,* 2004). The high proportion of cavity nesters is a compelling indication of the importance of living mature and dead standing cavity trees in natural forest ecosystems. The snags have become a major conservation issue in managed forest ecosystems. While managing quality saw timber with the single tree selection system often reduces the number of cavity trees and snags, because they are removed under an intensive timber management regime (Larrieu *et al.* 2012; Perry and Till, 2013).

There is an abundance of existing literature supporting the importance of snags and downed logs cavities to wildlife abundance and diversity (Stokland *et al.,* 2012). Unfortunately, most of this information has not been generated through study of the region. The objectives of the study are to identify the types of trees forming snags and *downed log* in the study area and to determine the uses of snags and *downed log* by wild animal in the study area, thereby providing relevant information required to meet the research needs of resource managers and conservationists.

MATERIALS AND METHODS

Study Area

Federal College of Wildlife Management is in New Bussa, the administrative headquarters of Borgu Local Government Area of Niger sate, it covers a total land mass of about 16,200km^2 and it is situated between latitude 9°53'N and longitude 4°31'E, it has a total population census of 171, 965 people. The length of the rainy season is about 175 to 190 days (5 – 6 months) during which 1000mm -1250mm rainy is recorded annually. The rainy season normally comes in April accompanied by strong wind and thunderstorm reaching its peak in July to August and declines in September. Generally, the temperature is high during dry season just before the rain. It declines during the rainy season from June to October and rises again in November and drop slightly in December and January due to Harmattan in the dry season. The mean maximum temperature is 35°C – 40°C but minimum temperature ranges between 14°C - 15°C in the Harmattan (Ekeke and Stopfords, 1984).

Study Design

Two plots of 100 m^2 were mapped out in the study area with measuring tape namely, thicket woodland (Site 1) open plantation woodland (Site 2), snags and downed logs ≥10m in height was identified and uniquely marked with numbered nylon tags, allowing us to distinguish existing snags from new snags when re-sampling plots. Also, wildlife species that uses the snags and downed logs were enumerated.

The study plots were located within the protected area of the College with minimal human activities. The study was carried out for a period of six (6) months (January to June 2019). Each site was visited ten (10) days in the month. The period of visit was between 6:00am – 9:00am in the morning and 4:00pm – 6:00pm in the evening. The size study area is 250 km^2.

Data Analysis

The data obtained were analyzed using Descriptive Statistics in form of frequencies and percentages (Tables and Charts).

RESULTS

Table 1 displays the types of trees that formed snags or downed logs, together with the size of their cavities and the percentage of occurrence in the research area. The table reveals that a total of 17 different tree species produced snags or downed logs in the study area. The most common species is *Terminalia glaucescens*, with a cavity size of 9 to 10.3 cm and a frequency of 12.5%. *Pterocarpus erinaceus* is next, with a frequency of 10.71% and a cavity size of 5 to 7.2 cm, and *Vitelaria paradoxa* snag with a frequency of 10.71%.

Table 2 shows the Kinds of wild animals and the trees snag/ down log they occur in FCWM. Results show that Snake, Vinaceus dove, and Squirrel are found using *Acacia gourmaensis* Snag/ Down log, while Francolin, Grey hornbill, Giant rat and Hare are found using *Pterocarpus erinaceus* Downed logs.

Table 1: Types of trees formed snags/downed log, their cavity size and percentage occurrence in FCWM

Tree species	Snag/down log	Cavity size	Trees frequency of occurrence	Percent
Acacia gourmaensis	Snag/ Down log	-	4	7.14
Acacia seyal	Snag	7.92	2	3.57
Afzelia Africana	Snag	-	2	3.57
Annona senegalensis	Snag	-	2	3.57
Anogeissus leiocarpus	Snag/ Down log	6 - 6.5cm	3	5.36
Azadirachta indica	Snag	-	4	7.14
Bridelia ferruginea	Snag	-	4	7.14
Combretum nigricans	Down log	4 - 4.8cm	2	3.57
Detarium microcarpum	Snag	-	2	3.57
Entada Africana	Snag	-	2	3.57
Gardenia aqualla	Snag	-	2	3.57
Gmelina arborea	Snag	-	3	5.36
Piliostigma thonningii	Snag	-	3	5.36
Prosopis africana	Snag	-	2	3.57
Pterocarpus erinaceus	Downed log	5 - 7.2cm	6	10.71
Terminalia glaucescens	Snag/ Downed log	9 - 10.3cm	7	12.5
Vitellaria paradoxa	Snag	-	6	10.71
Total			56	100

Table 2: Kinds of *wild* animals and the trees Snag/ Down log they are found in FCWM

Tree species	Components	Kinds of wild animals found
Acacia gourmaensis	Snag/Down log	Snake, Vinaceus dove, Squirrel
Acacia seyal	Snag	Cattle egret, Vinaceus dove, Squirrel
Afzelia africana	Snag	Eagle, Wood pecker, Vinaceus dove, Squirrel
Annona senegalensis	Snag	Cattle egret, Wood pecker, Vinaceus dove
Anogeissus leiocarpus	Snag/ Down log	Francolin, Abyssinia roller, Grey hornbill, Wood pecker
Azadirachta indica	Snag	Owl, Abyssinia roller, Cattle egret, Squirrel
Bridelia ferruginea	Snag	Cattle egret, Vinaceus dove, Squirrel
Combretum nigricans	Down log	Francolin, Weaver bird, Snake, Squirrel
Detarium microcarpum	Snag	Snake, Abyssinia roller, Wood pecker, Monitor lizard
Entada Africana	Snag	Blue headed wood dove, Hawk, Vinaceus dove, Squirrel
Gardenia aqualla	Snag	Blue headed wood dove, Snake, Squirrel
Gmelina arborea	Snag	Blue headed wood dove, Squirrel
Piliostigma thonningii	Snag	Weaver bird, Abyssinia roller, Squirrel
Prosopis africana	Snag	Weaver bird, Squirrel
Pterocarpus erinaceus	Downed log	Francolin, Grey hornbill, Giant rat, Hare
Terminalia glaucescens	Snag/Down log	Giant rat, Owl, Eagle, Squirrel
Vitellaria paradoxa	Snag	Blue headed wood dove, Wood pecker, Squirrel

The results in Figure 1 illustrate the total number that use snags and downed logs in the study area (%). Squirrels are the main users, with 13.95 percent, followed by francolins birds with 11.63%, and hawks with 1.16%.

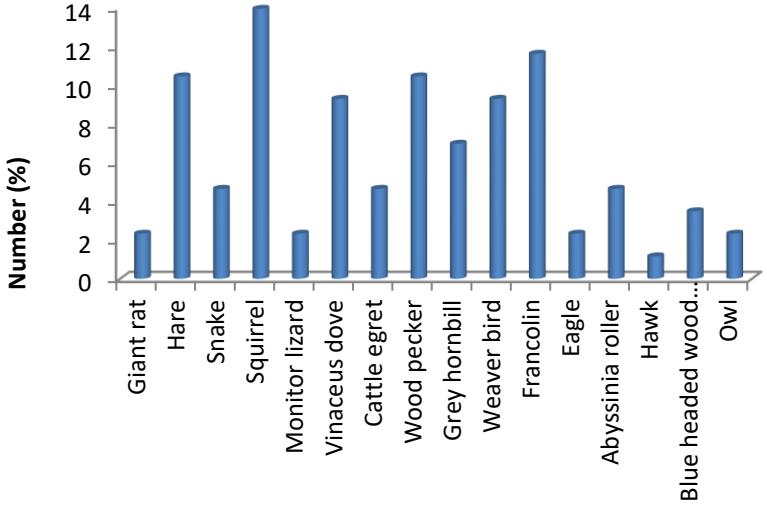

Figure 1: Total number of wild animals that use snags and *downed log* in FCWM

Table 3 shows the purposeful uses of snags and downed log by wild animals in *the* study area. Results show that wildlife uses snags and downed logs for specific purposes. The majority of wildlife uses snags and downed logs for perching, followed by 17.44% for feeding sites, 4.65% for nesting, and 4.65% for territorial displays.

Table 3. Purposeful Uses of Snags and *Downed Log* by *wildlife* in FCWM Area (%)

S/N	Uses	Frequency	Percentage (%)
1	Nesting	4	4.65
2	Roosting.	5	5.81
3	Foraging	15	17.44
4	Perching	43	50.00
5	Territorial displays	4	4.65
6	Shelter	6	7.00
7	Safety	9	10.46
	Total	86	100.01

DISCUSSION

The study found that many wildlife species rely heavily on using dead and dying trees, particularly fallen logs, for their survival. Snag contributes to the ecosystem's food chain, which in turn sustains the large number of animals by giving them food, cover, and safety. In the study region, a wide variety of tree species produced snags or downed logs. *Terminalia glaucescens, Pterocarpus erinaceus,* and *Vitelaria paradoxa* are the most common species. *Terminalia glaucescens* has a high cavity size of 9 to 10.3 cm, while *Pterocarpus erinaceus*

has a cavity size of 5 to 7.2 cm. The likelihood of a cavity being used increases with hollow depth and size at the level of individual cavities. This supports the claim put forth by Gibbons and Lindenmayer (2002) that birds that nest in cavities might have distinct preferences regarding the size, diameter, and volume of cavities in each tree. This is also consistent with the results of Koch *et al.* (2008b) and Gibbons *et al*. (2002) which show that the majority of the cavities used by vertebrates have an entrance diameter of at least 10 cm and a depth of at least 30 cm. Nonetheless, distinct species of arboreal marsupials exhibit distinct preferences when it comes to the cavities they choose. Mammals are more likely than cavity-nesting birds to engage in den-swapping behavior, which involves them routinely moving between denning sites and using many cavities on a regular basis. Accordingly, a decline in the variety and accessibility of cavities may result in a fall in the density of species that rely on them, which eventually may lead to the local extinction of these species (Gibbons and Lindenmayer, 2002).

Snags and downed logs have been used in the research region to identify a large number of wildlife species. In addition to growing mushrooms and being colonized by insects, deadwood also attracts a variety of animal species, such as snakes, vinaceous doves, squirrels, francolin, grey hornbills, giant rats, and hares. These animals come to the area to take shelter, make nests, and get protection from predatory enemies. According to Stokland *et al.* (2012), a large number of both vertebrate and invertebrate species use snags, logs, and cavities in trees for breeding and other purposes. This bolsters the findings of Russell *et al.* (2006) and Nascimbene *et al.* (2013), who state that in addition to serving as the base of a food chain, snags offer microhabitats for a wide variety of living things, such as fungi, bryophytes, insects, birds, mammals, reptiles, and amphibians.

It appears that dependency on cavities is as common in mammals as it is in birds, albeit the percentage of cavity users varies significantly between locations. Many wild animals, in the study area especially birds, use snags and fallen logs for a variety of purposes, including breeding, roosting, foraging, perching, and territorial displays. Findings show that the primary users of snags and downed logs in the research region are squirrels, followed by francolins and other birds. This is consistent with research by Bull and Holthausen (1993), which revealed that specific birds use tree cavities. These species include American martens (*Martes americana*) and Vaux's swifts (*Chaetura vauxi*), while mammal species like squirrels (including flying squirrels) (Sciuridae), and several mainly tropical families like New World porcupines (Erethizontidae) and scaly-tailed squirrels (Anomaluridae) (MacDonald, 2001), mice (McCay, 2000) to bears (Wong *et al.,* 2004) also use tree cavities and logs for cover and nesting.

CONCLUSION

This study on downed logs and snags has provided us with information on the significance of fallen logs and snags as a habitat for wildlife. The study has given us evidence to know that maintaining structural features like snags and dead wood has a major effect on the variety of species found in a wooded woodland environment. Thus, to improve the conservation and protection of the species both locally and throughout Nigeria, it is imperative to establish effective monitoring of the changes in the tree community within the research zone.

The study's findings lead to the following recommendations: Promoting environmental protection and the need to preserve deadwood logs and snags are crucial. It is

imperative to safeguard and manage fallen logs and snags in a manner that keeps wild animal species from going extinct. People with broad interests in forests and the preservation of the natural environment will be able to learn more about the species that inhabit woodlands. Snag removal ought to be avoided. Removal of snags should be discouraged.

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