



A Survey of Weaver-birds' Crop-raiding Behavioral Activity in Buea Municipality, Southwest Region, Cameroon

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Abstract: The entire surface of the earth is visited by the birds in view of their aerial flights and variable habitats in search of suitable breeding and feeding grounds. Flight, intelligence, adaptability and sight are some of the attributes that add to the diversity in the life of birds, consequently there is complexity in their overall behavioral pattern. The key objective of this study was to assess the weaver-bird crop-raiding activity in Buea municipality on different environmental parameters. The study was undertaken for three months, six days in a week, from 7:00am to 6:00pm. Scan observations were made on birds' activity on a five-minute interval period across the entire study area. Simultaneously, data was collected on the environmental conditions. The study recorded a significant association between weaver-bird activity on crop-land, $X^2 = 11.653$ df=14, $P < 0.005$ and $X^2 = 3.441$ df=4, $P < 0.05$ respectively. There was weaver-bird activity frequency of 51.63%, 45.35%, and 3.02% for *Ploceus luteolus*, *Ploceus cuculatus*, and *Ploceus melanocephalus* respectively. Moreover, a week association between bird activity and weather, $X^2 = 3.125$ df=3, $P < 0.05$ was recorded. The sunny and cloudy weather conditions recorded 53.26%, and 42.09% respectively, while the windy and rainy weather conditions were significantly low (3.26%). An association was recorded between atmospheric conditions and weaver-birds' activity on crops, $X^2 = 23.249$ df=21, $P < 0.05$. In addition, the most destroyed farms were *Elaeis guineensis* (32.33%), *Saccharum officinarum* (19.77%), *Zea mays* (17.44%), and *Mangifera indica* (15.58%) respectively, and the scale of destruction was very prominent on the foliage used by the birds for nest-building. Maize crops and oil-palms were among the crop species most subjected to destruction by birds. These crops were observed with poor foliage formation and fruits, consequently they withered, and since the local farming population in this municipality predominantly cultivate these crops most, a heavy toll is often taken on the annual farmers' income.

Keywords: Feeding, Nesting, Weaver-bird, Environmental Conditions, Crops

1. Introduction

The world population continues to grow, accompanied by rapid urbanization and industrialization. In 2009, more than 50% of the world's population was living in cities [48], with the most rapid urban growth in low income regions. In Africa the urban population is likely to triple, and in Asia it will be more than double in a few decades [48]. Loss of biodiversity is a worldwide phenomenon [8]. Even though cities only occupy 2.7% of the world's dry-lands, urbanization leads to

several environmental problems including damage to biodiversity [26, 22]. Birds are globally seen as a flagship group for conservation, ecological and evolutionary reasons, and they occupy a significant place in people's perception of nature. Birds are highly sensitive as well as mobile, and thus eminently suitable to study the impact of anthropogenic disturbance on biodiversity [9, 20].

The historical legacy of a landscape, which includes human traditions, patterns of disturbance, succession, and plant and animal use or introductions, strongly affects current biodiversity and prospects for restoration or change [51]. In

Before European colonization of the Americas, however, agriculture was mixed with hunting-gathering activities and overall land-use pressure was less intense than in Europe [42, 15]. With the long-term intense use of land in Great Britain and parts of Europe, birds that remain in farming systems are now collectively known as farmland birds and conservation efforts are primarily through agri-environmental policies focused within and around farm fields [50, 52]. In the Americas, birds in agro-ecosystems are still associated primarily with their native habitat types and consequently are managed by their primary habitat preference. In Europe, the United States, and Canada most clearing of new land has stabilized. There, conservation efforts associated with farming are primarily focused on soil and water and thus attempt to discourage planting row crops on highly-erodible land and encroachment on remaining natural habitats such as riparian areas or wetlands. Although benefits to wildlife are generally secondary outcomes, the habitat value of mid-term (10–15 years) set-aside areas to declining grassland birds is a recognized benefit of government programs [24].

Studies of the structural properties of nest materials are rare [41, 5, 4], so little is known about whether birds are generally selective of nest materials based on their biomechanical properties. Weaver-birds are crop-raiders in Cameroon and other countries in sub Saharan Africa. Their prolific reproductive behavior has given them the ability to invade crop-farmland in huge numbers, the reason crop farmers in most areas in Cameroon suffer annual crop-yield shortages. The crop-raiding behavior of weaver-birds also involves nest-building in the farming areas for breeding. This characteristic is the main reason their destruction on crop-farms is heavy and takes an annual income toll on its victims. Hence, this study was focused on the birds' destructive feeding and nesting activities on farm crops in Buea municipality.

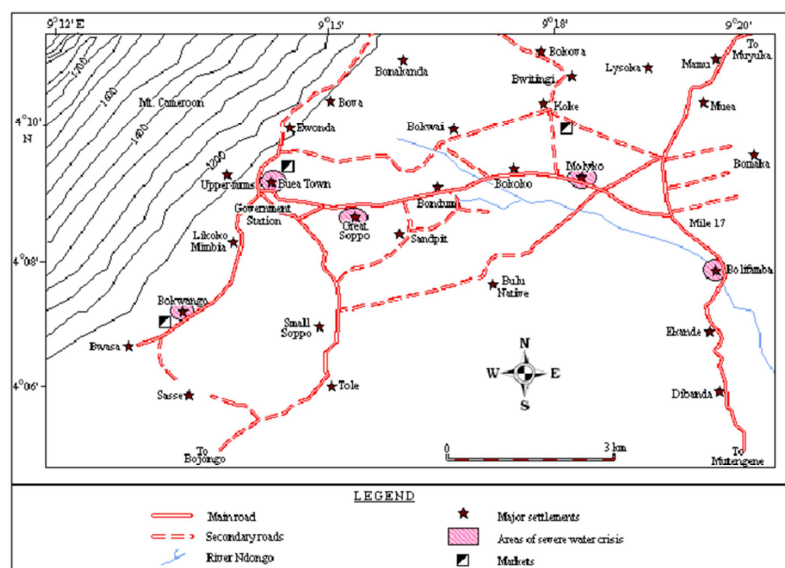


Figure 1. Map of Buea Municipality.

2. Materials and Methods

2.1 The Description of Study Area

Buea municipality is found in the Southwest Region of Cameroon, located between longitude 9° 16' E and latitude 4° 9' N (figure 1) [46, 14]. The municipality is bounded to the north by tropical forest on the slope of mount Cameroon (4100m above sea level). The population is estimated at about 300,000 people, of whom two-third live in the city of Buea, while the rest in villages. The settlement pattern forms a closed ring around the foot of the mountain with no permanent settlements on altitudes above 1500m. The indigenous people in the area are Bakweri, Bomboko, Balondo and Bakolle [11]. With an equatorial climate, temperature is moderate with a slight seasonal variation (rainy and dry season) [46]. The region is also very diverse in fauna with over 370 species of wildlife recorded. The sub-montane and montane habitats are part of Cameroon mountain endemic bird area. So far, 210 species of birds have been recorded, out of which 8 are threatened and 2 strictly endemic mount cameroon francolin (*Francolinus camerunensis*) and mount cameroon speirops (*Speirops melanocephalus*) [11]. Agriculture is the most important source of livelihood in the area accounting for about 80% of household income in most villages [31]. Other sources of income include hunting, timber and non-timber forest products (NTFP) exploitation, petty trading, and cattle rearing [46].

2.2 Data Collection Method

The research data collection program was done by a research team made up of four persons, the principal investigator and three other student colleagues. The three-month study was carried out in Buea municipality, and the research data was collected between 7:00am – 6:00pm each day of the study, and was done 6 days each week, Monday – Saturday. The team visited all the neighborhoods of the city on a daily bases to record observations on bird species, feeding activity, locations, and day-period. A five-minute-spot-count method was used throughout the data collection period [38]. Point counts (where the observer is sedentary at one place), is among the most frequently used techniques for monitoring terrestrial birds [39]. Bird population monitoring programs vary in how they are conducted. The Breeding Bird Survey (BBS), for example, is run in Britain and variants of it are used by 18 other European countries [45]. Five-minute point-based distance counts are used in France that specify the area of the sampling site and the distance bands used around each point, (<25m, 25-100-m, and >100-m) [45].

2.3 Data Analysis

The research data collected on check-sheets was analyzed by the use of SPSS version 20. And the main statistical model used was chi-square to test the relationships existing between the variables such as bird species, bird feeding and nesting activities, and the neighborhood location. Exploratory analysis was used to further examine the frequency of variables like

bird activity, environmental condition, and bird species

3. Results

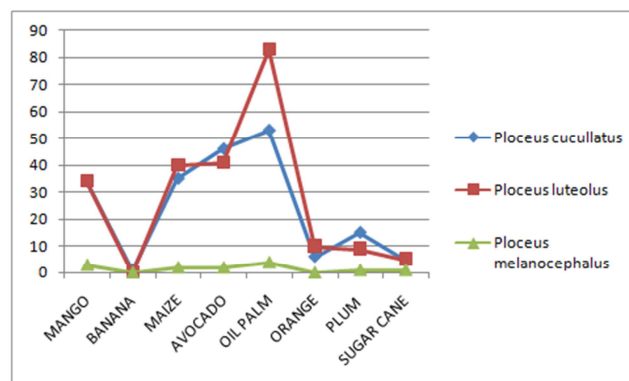


Figure 2. Weaver birds and agriculture.

The study recorded a significant association between weaver-birds activity on crop-land, $X^2 = 11.653$ $df=14$, $P < 0.005$ (figure 2) and $X^2 = 3.441$ $df=4$, $P < 0.05$ (figure 3) respectively. Birds are very important to the natural ecological sustainability, especially in the tropics where the rainforest is undergoing intensive depletion due to corruption and mismanagement of public funds. However, the touristic love for bird-watch on some species like weaver-birds has been controversial in wildlife conservation, due to the destructive role played some species of birds in croplands. The weaver-bird feeding activity on maize (*Zea mays*), avocado (*Persea americana*), and oil palms (*Elaeis guineensis*) was significantly recorded in this study. Crop-farming in Buea municipality and other parts of Cameroon has been rendered difficult by the weaver-bird feeding activity, one of the main reasons for the low crop-yield in most cultivation seasons.

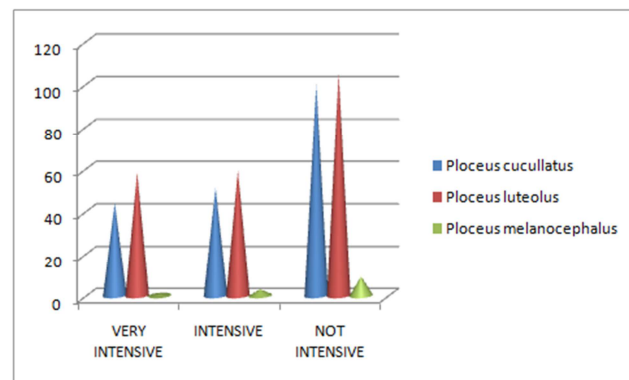


Figure 3. Weaver bird activity on cropland.

There was weaver-bird activity frequency of 51.63%, 45.35%, and 3.02% for *Ploceus luteolus*, *Ploceus cucullatus*, and *Ploceus melanocephalus* respectively (figure 4). These bird pests were not only frequent in the study area but are among the dominant bird pest in Cameroon and other countries in sub Saharan African region. The bird population is high and a nuisance to the local farming population,

affecting their crop-farm yield on both seasonal and annual bases. The major problem farmers in the local and remote communities are facing is fighting the weaver-bird population. Unfortunately, the primitive approach involving the use of stone-throw, drumming, shouting, and hand-clap chasing rather seems to escalate their problems since weaver-birds would fly off to neighboring farmlands during the application of such methods.

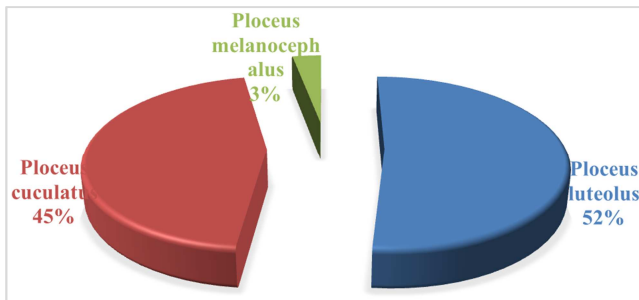


Figure 4. Frequency of weaver bird species.

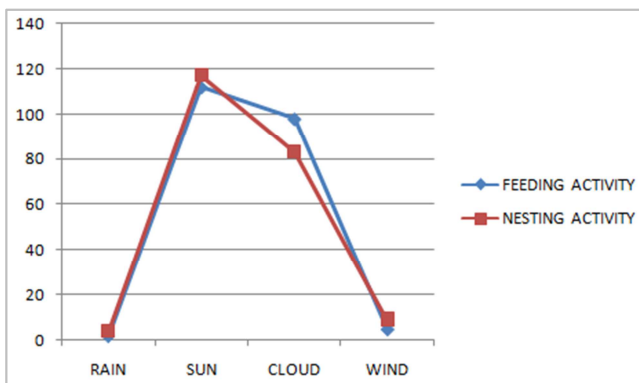


Figure 5. Bird activity and weather.

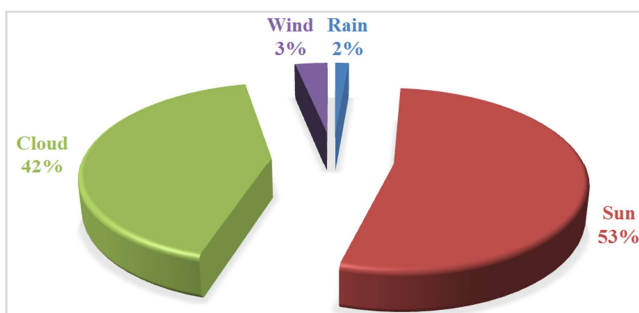


Figure 6. Frequency of activity and weather.

Additionally, a week association was recorded between birds' activity and weather, $X^2 = 3.125$ $df=3$, $P<0.05$ (figure 5). The effect of atmospheric conditions has been well known on wildlife behavioral activity changes, influencing both the social and individual activities. The sunny and cloudy weather conditions recorded 53.26%, and 42.09% respectively, while the windy and rainy weather conditions were significantly low (3.26) (figure 6). It must also be noted that the turbulent atmospheric condition in mount Fako is characterized with heavy rainfall, wind, and cloud in most parts of the year. Hence, any sunny weather condition,

especially in the rainy season is considered as an advantage to wildlife feeding activity. During heavy rains the birds were observed flying into their nests to shelter, waiting for a convenient atmosphere to intensify feeding and their nest-building.

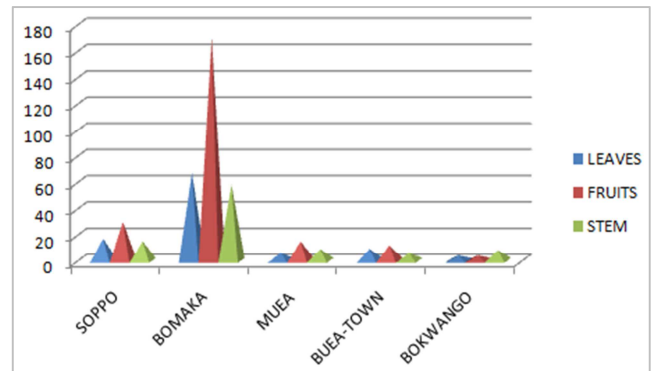


Figure 7. Human neighborhood and crop-portion destruction.

Furthermore, human neighborhood showed a significant association on crop species, $X^2 = 42.253$ $df=28$, $P<0.05$ (figure 8). Crop species such as maize, avocado, and oil palms were the most affected in Bokwango, Buea-town, Muea, and Bomaka neighborhoods, while Soppo neighborhood was the least affected. Human neighborhood and foliage destruction revealed a significance, $X^2 = 13.144$ $df=8$, $P<0.05$ (figure 7). Bomaka neighborhood still recorded the highest foliage destruction comparatively.

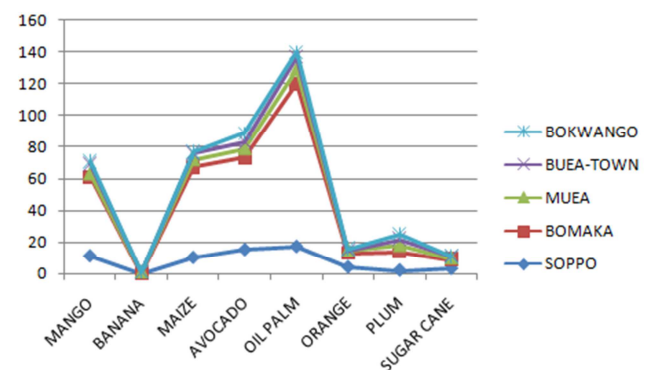


Figure 8. Human neighborhood and crop species.

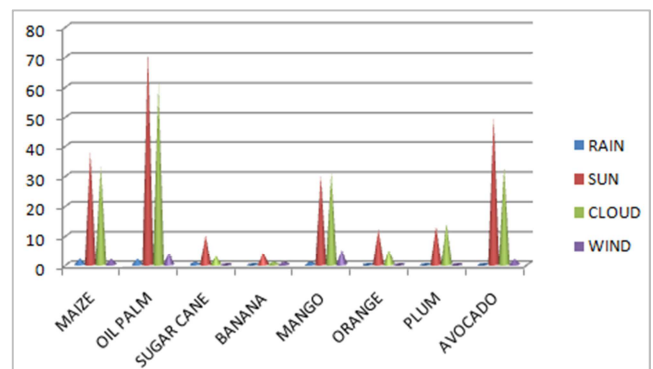


Figure 9. Atmospheric conditions and weaver-birds' activity on crops.

An association was observed between atmospheric conditions and weaver-birds' activity on crops, $X^2 = 23.249$ $df=21$, $P<0.05$ (figure 9). Three weather types, wind, cloud, and sun remarkably favored the activity of birds on maize, avocado, and oil-palm while their activities were low during rainy weather condition. Maize and oil-palms were among the crop species most subjected to destruction by birds. These crops were observed with poor foliage formation and fruits, consequently they withered. Since the local farming population in this municipality is predominantly cultivating these crops most, a heavy toll is often taken on the farmers' annual farm-income. In addition, the most destroyed farms were *Elaeis guineensis* (32.33%), *Saccharum officinarum* (19.77%), *Zea mays* (17.44%), and *Mangifera indica* (15.58%) (figure 10), and the scale of destruction was very prominent on the foliage used by these birds to build their nests.

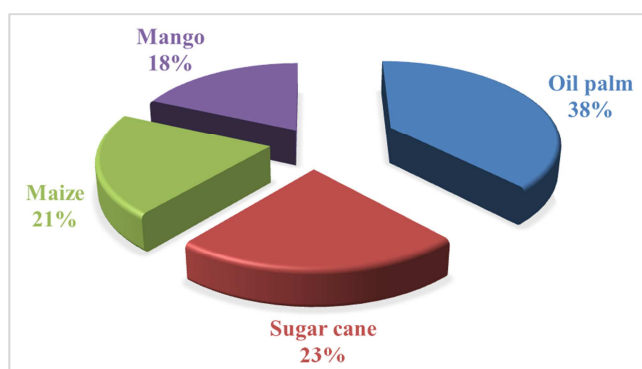


Figure 10. Frequency of farm destruction.

4. Discussion

Agricultural expansion into new areas and subsequent intensification of the production process brought associated impacts on bird habitats. Intensification of agriculture followed expansion, facilitated by the increased availability and use of synthetic nitrogen fertilizers and pesticides after WWII [3, 19]. Intensification can be described as taking a maximum proportion of primary production for human consumption, which results in less being available for the rest of nature [28]. Another characterization is that agricultural intensification is the use of practices that increase yields in the short term but that also typically result in land simplification and homogenization [10, 28]. Intensification normally means high-yielding crop varieties supported by applications of synthetic pesticides and fertilizers, mechanization, and often irrigation [28]. Intensification may also involve reduced crop diversity and simplified rotations, often monocultures, and land simplification through drainage and loss of non-crop areas [13, 10, 28, 8].

There are about 40 species of birds in North, East and Central Africa, which are considered as agricultural. Relatively a few number of all these species do appreciable damage to cultivated crops. Some bird species are extremely destructive, particularly to small grains as in the case of quelea and

Bishops. The activity pattern of birds in croplands is influenced by a number of factors such as crop type, non-crop physical structural arrangement and the agricultural practices [37, 7]. Shift in cultivation timing also significantly affects the activity pattern of cropland birds, which causes further reduction of the population of farmland birds [25].

Home-garden agroforestry systems (HAS) are complex combinations of multilayered and multispecies vegetation patterns [27] thereby, providing an ideal forest-like habitat to conserve wildlife species by providing sufficient nesting, breeding, food and temporary refuge opportunities all year round [21]. These habitats are suitable for bird species, such as Common Pigeon (*Columba livia*), Spotted Dove (*Spilopelia chinensis*), House Sparrow (*Passer domesticus*), Scaly-breasted Munia (*Lonchura punctulata*), Common Myna (*Acridotheres tristis*), Baya Weaver (*Ploceus philippinus*), among others, which are human-tolerant and adjusted to human habitats. These birds have been usually found to build nests and forage for food in and around human settlements [43]. Their breeding season lasts from May to October [1]. During breeding season, the males moult into a yellow and brown nuptial plumage, while females remain pale brown [1]. They are granivorous birds forming enormous communal roosts [18, 12].

Birds select habitats that fit their requirements for successful reproduction and survival though some generalist species may utilize several habitats [36]. Differences in requirement among bird species have caused specificity on habitat requirement [6]. For example Mountain plover (*Charadrius mountainus*) feeds primarily on insects (grasshoppers, crickets, beetles, flies, ants); uses ground for nesting and prefer short grass while Mongolian sand plover (*Charadrius atrifrons*) feeds on invertebrates (molluscs, worms, crustaceans especially crabs and insects), uses tree for nesting and prefer shore of the lakes. Therefore, habitats either terrestrial or aquatic restrict bird species distribution and diversity [30]. In most habitats, plant communities determine the physical structure of the environment, and therefore, have a considerable influence on the distributions, abundance and diversity of birds and interactions of other animal species. For example, for bird species diversity in forests, [47] evidenced that the physical structure of a plant community, i.e. how the foliage is distributed vertically, may be more important than the actual composition of plant species. [36] Found that farmland also has been an important habitat for farmland bird showing that some bird species are habitat specific though some are generalist.

5. Conclusion

Green revolution has contributed in enhancing human population growth and distribution around the world. Unfortunately, it's done at the cost of the wild and our surrounding environment that we all depend. The consequence of fighting land space with wildlife is inevitable and it's the main reason wildlife population has suffered a severe decline over many decades. On the other hand local crop-farming

areas have been molested by wildlife, especially weaver-birds known to be specialized on cereals, grains, fruits and foliage. Their nest-building activity and feeding on crop-farms have been a major problem faced by local crop-farmers in Cameroon and most parts of Africa. Reduction of the bird population on crop-land has given sleepless nights to both wildlife and agronomic researchers over years due to its prolific reproduction nature and its ability to cover long flight distances for crop-raiding. Though the bird population is not very high in southern Cameroon as compared to north, the damage on crop-farms is significantly embarrassing to the annual farm income of most farmers in places like Buea.

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