

## Bats and Christmas Trees/Spruce Trees: Curbing the Menace through Native Intelligence

**Justina Olufunke ARUNA**

Department of Sociology, Adekunle Ajasin University, Akungba-Akoko, Ondo State, Nigeria

E-mail: [justina.aruna@aaua.edu.ng](mailto:justina.aruna@aaua.edu.ng)

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### Abstract:

Bats are lower mammals belonging to the order of *Chiroptera*, which is subdivided into two classes/categories: *Megachiroptera* and *Microchiroptera*. While the former genus is made up of a single family consisting of the flying foxes and the fruit-and-flower-eating type, the latter is made up of the rest of the bat species. The study, however, is focusing on the *Megachiroptera* genus. By adopting native intelligence, the study seeks to explore a sociological solution to the recurring problem of bats causing tremendous damage to Christmas trees, especially spruce trees. From analyzing the available data/information to establish any correlation between bats and spruce trees' 'interaction,' the study combines both scientific and conventional techniques towards effectively curbing the negative impact of bats on spruce trees as well as tremendously reducing noise pollution brought about by the bats fluttering their wings in unison. Through the innovative method thus developed for the study, it is quite possible to significantly reduce the extent of damage to spruce trees by bats and, thereby, substantially reduce the losses often suffered by the Christmas tree 'farmers, especially in the future. Hence, by highlighting the relevance of native intelligence to resolving social problems, especially in the context of the environment and/or noise pollution, the study essentially shows that native intelligence has immense functions to perform for social harmony in the 21st century against the myopic advocacy of modernity's sole dependence on wholly scientific breakthroughs.

**Keywords:** Bats, Christmas/Spruce Trees, Environment, Native Intelligence, and Noise Pollution.

### Introduction:

Bats are some of the most fascinating and ecologically important animals in the world. However, they are also one of the most misunderstood groups of animals in the world, which has led to many irrational fears and myths about bats.

Bats are lower mammals; they give live births and nurse their babies, though they are not rodents, as is often erroneously believed. They belong to the mammalian order of *Chiroptera*, a Greek word meaning "hand-wing," which accurately describes the animal's most unusual anatomical feature, being the only group of mammals to ever have

evolved through flight. There are over 1,400 species of bats in the world, which makes up about one-fifth of all known mammalian species. The order is divided into two suborders, the *Megachiroptera*, consisting of a single family, the flying foxes and their Old World fruit-and-flower-eating relatives, and the *Microchiroptera*, composed of the rest of the bat genus, some 17 in all. These families are further classified into about 180 genera and over 900 species, but only rodents have a greater number of species. Even though the names imply otherwise, not all megabats are larger than microbats. Although it is true that

certain species of flying foxes have wingspans of up to 5 feet, one member of the *Megachiroptera*, the flower-feeding *Macroglossus*, has a wingspan of only 10 inches. However, some of the *Microchiroptera* are very tiny; the smallest is probably the Philippine bamboo bat, *Tylonycteris pachypus*, with its forearm measuring only 22 mm and weighing only 0.05 ounces. The largest microbat is the tropical American false vampire, *Vampyrus spectrum* with a wingspan of up to 40 inches.

Many bat species are insectivorous, but several species eat nectar or fruit, while three other species drink blood—though rarely from humans. Bats are known for their voracious appetites; for instance, a bat can eat thousands of insects such as moths, beetles, gnats, and crickets in one night (<https://www.modernpest.com/pest/nuisance-wildlife/bats/e/bats/bats/>). With such ravenous appetites, bats are an important form of ‘natural’ pest control. It has been estimated that bats save farmers, especially in the southwestern United States of America (USA), hundreds of millions of dollars in reduced pesticide every year (Smithsonian, 1980).

Insect-eating bats use echolocation to locate and capture their prey. They emit ultrasonic clicks and buzzes above the range of human hearing, which bounce off the potential prey and back to the bats’ sensitive ears (Smithsonian, 1980; Mickleburg, Hutson & Racey, 2002).

Bats often live long for their size, living up to ten and twenty years in many cases. Most bats give birth to only one baby a year, called a pup, though some species have four mammary glands and can give birth to up to 4 pups each year. Bats mate in the fall/autumn before and during migration and swarming but delay fertilization until spring, after emerging from hibernation or migrating back to their summer home range. The gestation period for bats is around 60 days. The mother bat nurses the young, and after about three weeks the young are able to fly by themselves. Because of their life history, bats as a group have slow population growth rates and are susceptible to drastic drops in population (<http://wiatri.net/inventory/batss>).

Some bats prefer to roost in barns, attics, caves, or abandoned mines, with those shelters providing safety from predators, protection from fluctuations in the weather, and seclusion for rearing the young. Other species select hollow trees or rock

crevices as their daytime resting sites, while some others are known to roost in exposed locations, clinging to tree trunks or hanging upside down from tree branches. To survive in colder regions, bats either hibernate in shelters with high humidity and temperatures above freezing or migrate to warmer areas where food is available.

A few species of bats are carnivorous, eating small frogs, lizards, and birds. Other species are known for their fish-eating habits and are usually specialized with their huge hind feet and claws. The best known of the fish-eating bats is the fishing-bulldog-bat, *Noctilio leporinus*, of Central and South America. How this bat actually finds its food is not completely understood, but many authorities believe that sonar is used to detect ripples on water made by fish. It catches its prey with large hooked claws, spears the fish with its canine teeth, gathers it up in the wing membrane, bites through the skull, and eats it, all in a matter of seconds (Smithsonian, 1980).

Most of the Old World fruit-and-flower eaters rely on vision and sense of smell to locate food items rather than sonar. Unlike birds, bats are colorblind, therefore, not dependent on color for locating and choosing their food. Many prefer dark green or brown fruits with musty or sour odors instead of the more colorful varieties. These fruits usually hang from vines or grow from the trunk of a plant unobstructed by heavy tropical foliage.

Spruce is not native to the Western Hemisphere, but with a number of its varieties, it is commonly planted in the USA for ornamental and Christmas-tree purposes. Spruce needles are four-sided, 1/2 to 1 inch long, sharp, and somewhat blunt at the tip. Needles are generally dark green. At the base of each needle is a sterigmata, which remains after the needle is lost. Spruce is adapted to cool temperate climates. Growth is best in full sunlight in deep, rich, moist soils. It is generally shallow-rooted and does not produce a taproot; thus, it is subject to being blown over by wind. By being shallow-rooted, spruce is easier to dig and more likely to survive when planted after the holidays than are many other species as Christmas trees (McKinley & Hazel, 2014).

Although there is some clinical evidence for spruce use in treating wounds and skin infections, it is more commonly used in relieving coughs. The fresh spruce tips are the new growth of the trees annually and used traditionally as tea. In

addition, the essential oil is often used in cough syrups and throat pastilles, which are most notably antiseptic, antimicrobial, and an incredible source of vitamin C. After a long winter, spruce offers an immune boost and a fresh, lemony flavor that wakes one up from hibernation/slumber (<https://www.calicoandtwine.com/blog/spruce-tips-benefits-and-uses>). That may, however, be why bats love to roost on it.

### Statement of the Problems:

Bats roost in a variety of structures, including caves, man-made structures, rock crevices, and trees. And they are believed to help controlling night-flying insects while, in some other instances, pollinating flowers and scattering the seeds of plants. Their guano is rich in nitrogen and often sold as fertilizer (Smithsonian, 1980). Despite the roles bats play in contributing to a healthy ecosystem in the United Kingdom (UK), their natural habitats have been lost, and like barn owls and swifts, bats have adapted to roost in buildings for shelter (<https://www.bats.org.uk/advice/what-do-i-need-to-know-about-having-bats/having-a-bat-roost-101>). Being nocturnal mammals, bats are very active at night. They use echolocation, a biological sonar, to both navigate and hunt for food in the dark. Bats emit high-frequency sounds that bounce off objects and return to them. They can, therefore, determine the location, size, and shape of objects around them. Bats are quite fascinating creatures that often evoke a mixture of curiosity and fear in human beings. They play a crucial role in our ecosystem by controlling insect populations and pollinating plants. However, when bats take up residence in one's home, they can become a nuisance; they defecate, soil, and tear up insulation or bring in parasites like mites, fleas, and ticks

(<https://www.modernpest.com/pest/nuisance-wildlife/bats/>). Bat colonies can cause structural damage to homes, while their droppings can accumulate and damage insulation, wood, and other materials. Consequently, over time, this can lead to costly repairs. Bats are most active at dusk and throughout the night. In most cases, as they leave their roost to hunt for food, they generally flap their wings as they exit and return to their roosts. If they are roosting in the attic or walls, there is usually increased activity during these times.

During the breeding season, typically in the spring and summer, female bats form maternity colonies to raise their young. Maternity colonies can be quite noisy due to the presence of the babies, or pups, such that there are high-pitched squeaks and chirps as the pups communicate with their mothers and/or each other. Furthermore, bats can be very noisy when they are threatened or disturbed. If they are accidentally trapped or if there is a significant change in their environment, they often emit louder sounds. For example, if one enters an attic where bats are roosting, the sudden disturbance can cause them to become more vocal (Covenant-wildlife, 2024). Bats make social calls, especially when roosting at night, by using their chirps to communicate. When bats are disturbed or interacting closely with one another, they increase their squeaks and chattering sounds; and, when bats compete for space or mates, they emit louder, more aggressive sounds. Thus, bats contribute great noise pollution to the environment, especially at night, and while roosting, they cause a lot of damage to the spruce trees.

### Theoretical Framework:

The theoretical framework underpinning this study is ecofeminism theory. The term "ecofeminism," or "ecological feminism," was first proposed by the French feminist Françoise d'Eaubonne in her book *Feminism or Destruction* ( *Le Féminisme ou la mort*) in 1974. Through her contribution, she called on women to lead an ecological revolution and establish new relationships between humanity and nature as well as man and woman (Chen, 2014). Ecofeminism as a theory uses the basic tenet of feminism, which is the equality between the genders. It revalues the non-patriarchal and non-linear structure of society. The theory advocates an alternative view of the world: the earth is holy, the sacredness of the earth, human life is based on the natural world and it embraces all life as valuable. Feminist theory is in support of giving women access to power in all strata of human interaction. Feminists have also argued that patriarchal structure serves as a bane or limitation to women's aspiration.

Ecofeminism is a political and intellectual movement that argues that the subjugation of women and the degradation of the environment are integrated, and both are rooted in patriarchal systems, and promotes a shift towards the values of care and cooperation to benefit both society and the natural world, essentially linking the

domination of nature with the subjugation of women, highlighting the importance of a more nurturing and holistic approach to both human and environmental issues.

The theory explains further that any strategy to address one must take into account its impact on the other so that women's equality should not be achieved at the expense of worsening the environment, and neither should environmental improvements be gained at the expense of women. Indeed, ecofeminism proposes that only by reversing current values, thereby privileging care and cooperation over more aggressive and dominating behaviors, can both society and the environment benefit (Buckingham, 2015).

Bats play a crucial role in the ecosystem, as they are believed to help controlling night-flying insects while, in some other instances, pollinating flowers and scattering the seeds of plants. Their guano is rich in nitrogen and often sold as fertilizer (Smithsonian, 1980). They are also known to maintain ecological balance. Here, ecofeminism emphasizes the importance of care, compassion, and reciprocity in human relationships with the natural world. In the context of bat noise pollution, the care ethics in ecofeminism theory encourage us to consider the well-being of bats and their habitats than simply viewing them as a nuisance, but also to keep in mind their crucial role in the ecosystem. As we are exploring ways to mitigate the disturbance caused bats, it's, it's also good to think of protecting bat habitats and populations.

At the same time, ecofeminism emphasizes intersectionalism; here, ecofeminism recognizes the interconnection between the social and environmental issues. In this wise, the noise pollution caused by bats intersects with human well-being and environmental health, as their noise causes sleep disturbance to man, and bat colonies can also cause structural damage to homes while their droppings can accumulate and damage insulation, wood, and other materials. Consequently, over time, this can lead to costly repairs. They also cause a lot of damage to the spruce trees by roosting on them due to the medicinal benefits spruce offers. (<https://www.calicoandtwine.com/blog/spruce-tips-benefits-and-uses>). Here the study also suggests that with the use of fishnets this will protect the spruce trees and keep the bats away without causing much damage, and if the trees are

protected, there will be a reduction in noise pollution.

By applying ecofeminism theory to the issue of bat noise pollution, we are trying to develop a more subtle understanding of the complex relationships between humans, animals, and the environment. This view encourages us to place care, reciprocity, and non-human agency, in the end encouraging a more sustainable and just coexistence.

### **The Study Area:**

Okitipupa town is the headquarters of Ikale Local Government Area (LGA) Ondo State, Nigeria, and part of the Ikale-speaking people of Yoruba extraction. "Okiti-pupa" is thus derived from the Ikale-Yoruba words "okiti" (hill) and "pupa" (red), which became the name used by people travelling from other communities to trade in the town's central market. Okitipupa has always been the major town for the inhabitants of Ondo South Senatorial District—made of Okitipupa, Irele, Ilaje, Ese-Odo, Odigbo, and Ile-Oluji/Okeigbo LGAs—due to having basic amenities. It was a district headquarters in colonial times, before Nigeria's independence in 1960. It has a public university, a specialist hospital, several private hospitals, a magistrate court, a high court, Nigerian Police Force (NPF) area command divisional police offices (DFOs), an army barrack, commercial banks, a telephone exchange, a post office, and numerous primary and secondary schools. Okitipupa people are predominantly farmers, while the major cash crops are oil palm, rubber, and cassava. They also cultivate yams, beans, okra, pepper, melon, and vegetables. The staple foods include, but are not limited baked cassava popularly known as "pupuru," yam, rice, yam flour, and cassava flakes (garri), among others (<https://en.wikipedia.org/wiki/Okitipupa>).

### **Methods of Social Research:**

For the study, roost sites were located after consultations. Trees with good roost site potentials were selected at these locations within the study area. To know more about the activities of bats, the first method adopted involved watching trees at dusk for emerging bats and thereafter observing them for 10 to 30 minutes after (local) sunset. After three months, one of the sites that was patronized was concentrated on for better results. The study was conducted for about eighteen (18) months, and significant incidents of major concern

were duly recorded through snapshots and later presented in plates.

**Fishing net:**

A fishing net is used for fishing; the nets are usually meshformed by knotting a relatively thin thread. The early nets were woven from grasses, flaxes, and other fibrous plant material, but later with cotton. The modern nets, on the other hand, are usually made of artificial polyamides like nylon (https://nettingland.com/mesh-size-of-fishing-nets/). The fish nets for the study are made of artificial polyamides like nylon, and they have smaller mesh sizes; that is, the nets have openings or holes, and this is preferred because smaller

mesh sizes are typically more selective. Just as when a fish swims into the net and the gills or body become entangled in the mesh of the net, preventing it from swimming away, in the same regard, if the bats become entangled in the mesh of the net, they will not be able to fly away. Although mist nets are equally made of nylon or polyester mesh suspended between two poles, resembling a volleyball net, and are used to capture wild birds and bats, for the purpose of this study, a fish net is preferred for the local intelligence experiment.

**Discussion of Findings:**

The results of the study were presented in plates as below:



Plate 1: Source: 2023 Field Research: Colony of bats flocking together in search of roosting sites. Plate I above shows that bats in the study area

migrated in colonies and were seeking roosting sites.



Plate II: Source: 2023 Field Research: Bats roosting on a spruce tree in the study area.

Plate II depicts bats roosting on a spruce tree, indicating a clear preference of spruce trees over other available trees in the study area.



Plate III: Source: 2023 Field Research: Bats captured by fishnets at night.

Plate III above illustrates the severe damage inflicted by bats on the tree tips. This damage may

be attributed to the attractive properties of spruce trees, which are known for their antiseptic, antimicrobial, and high vitamin C content. However, the exact reason for this preference is unclear. Notably, the level of damage is

substantial. Further observation revealed that the bats interacted closely with each other while feeding on the tree tips, producing high-pitched squeaks and chattering sounds that can be

disturbing, especially at night. Following the extensive damage, fishnets were employed to cover the spruce trees, and incidentally, some bats became entangled in the nets.



Plate IV: Source: 2023 Field Research: Two Spruce trees one covered with fishnets, though later, the other tree was damaged because it was not covered early.

Plate IV illustrate the impact of delayed coverage on spruce tree damage. The first tree, which was not covered early, suffered significant damage. In contrast, the second tree, which was covered later, incurred relatively less damage.



Plate V: Source: 2023 Field Research: Well-Covered and Protected Spruce Tree with Fishnets. There is no damage at all.

Plate V shows no damage to the tree, attributed to its early coverage with fishnets. After covering all the focal trees in the study, it was observed that

bats consistently avoided them throughout the study period. The spruce trees remained covered with fishnets after the experiment concluded. However, nightly observations revealed that 2-3 bats were trapped in the fishnets, leading to a gradual decline in the colony's population, until they eventually disappeared from the study area.

### Recommendations:

This study recommends maintaining a house with intact walls as a sufficient measure to deter bats. Furthermore, using fishnets to protect spruce trees from bat damage is strongly advised, as it is a cost-effective and humane solution. Additionally, this study suggests that further research be conducted to explore the potential medical benefits of spruce trees, which could lead to new uses and advantages for society.

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