

Bats as Indicator Species

Introduction

With increasing human encroachment on the Amazon rainforest and its diverse faunal constituents, monitoring its impacts on the habitat and ecosystems becomes proportionally more imperative. Though satellite imagery, soil sampling, water analysis, and detailed air sensory may give researchers an idea about the general health of the habitat, the information provided by these techniques would not give a very clear picture of how human encroachment is impacting the animal life of the rainforest. Due to the sheer mass and diversity of the rainforest, it would be extremely difficult and probably completely unfeasible to attempt to monitor all of the animals that exist in the Amazon rainforest.

Here is where indicator species come in: due to their inherent characteristics, preferred habitat and place in the food web, indicator species are extremely sensitive to the overall health of the rainforest's ecosystems. By monitoring the progress of these species over time, researchers are able to easily determine whether or not an ecosystem is being affected by unusual or adverse conditions. One particular type of animal that has been selected to be a primary indicator species is the bat. Their commonplace occurrence in every trophic level in the canopy and their relative immobility by their maintenance of a permanent roosting place, bats are relatively easy to find in the rainforest. They are also significant contributors to the ecology of the rainforest, helping to maintain insect populations, pollinating flowers and dispersing seeds over broad areas.

Characterization

Bats are of the order Chiroptera, which is divided up into 18 families, in all totaling 986 known species in the world.¹ They inhabit most temperate and tropical regions of the globe and are one of the most numerous forms of mammals on the planet. Only rodents have more species than bats.² The most obvious and unique distinctive feature that bats have is the capability of flight. They are the only mammals who have this capability, which is granted to them by skin membranes that extend out from the side of their bodies and their tails to connect their limbs with their main bodies. The forearms and fingers have been adapted to support these membranes, with long extended fingers and slender bones. The entire body of the bat is designed for flight, with flattened ribs, an extremely well supported shoulder girdle and clavicle, and a rigid sternum.

Another highly unique characteristic of bats are their employment of echolocation for nocturnal orientation. Vocal sounds emitted through the nose or mouth by a bat in flight bounces off surrounding objects, effectively giving them a sensory system analogous to radar. This extra sense allows bats to avoid running into obstacles at night and to detect the position of flying insects or other potential food sources.

Bats generally tend to roost in a permanent shelter, consistently returning to the same place to rest. Shelters can include caves, trees, crevices, and even buildings. These relatively secure areas are where bats hibernate when conditions are unfavorable, such as a climactic change or reduction in food supply. During hibernation their body

¹ Order Chiroptera: Bats. John Hopkins University Press, 1997
<www.press.jhu.edu/books/walkers_mammals_of_the_world/chiroptera/chiroptera.html>

² Ibid.

temperatures drop significantly, reflecting a marked decrease in metabolism and oxygen consumption. Temperatures and metabolism return to their normal states immediately following the reawakening of the bats.

A common method of characterizing bats is differentiating them by their distinct diets. Because of the overall species diversity of bats, these diets spread over a large range of food sources. Many can be characterized as follows:³

- *Insectivorous*:
 - most insect food obtained by flying
 - most will eat some fruit
 - largest and most diverse group of bats
- *Fruit-eating*:
 - feed almost exclusively on fruit
 - will eat some green vegetation
 - sometime work together in groups
 - live in tropical environments where fruit is constantly ripening
- *Flower-feeding*:
 - diet consists mainly of pollen and nectar
 - will eat some insects found in flowers
 - mainly tropic and subtropical bats
- *Carnivorous*:
 - prey on frogs, birds, lizards, small mammals, other bats
 - extremely varied diet
- *Fish-eating*:
 - catch fish near or at the water surface

All of the above types of bat can be found in the Amazon rainforest, making them an exceptionally good indicator species, since they are affected by multiple factors due to their reliance on a diverse amount of food resources. Due to the large biomass and abundance of life in the rainforest, the Amazon is an especially ideal environment for large colonies and an assorted number of bat species that can be monitored at all different levels of the canopy.

³ Ibid.

