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UNWANTED GUESTS: EVICTING BATS FROM HUMAN DWELLINGS

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ABSTRACT: Bats are the second largest order of mammals in the world. Their 925 species are found on all continents except Antarctica. Bats are in serious decline world-wide from shrinking habitat, persecution and pesticides. Historically, bats were recognized for consuming insect pests, but only recently has the critical additional importance of bats in pollination and seed dispersal of semi-tropical and tropical plants been recognized. Bats use artificial structures in place of lost natural habitat, resulting in their destruction out of fear and ignorance. The health risk to humans from bats in buildings is extremely low, but where bat removal is necessary, non-lethal exclusion methods can be very effective.

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INTRODUCTION

Bats are the second largest order (Chiroptera) of mammals in the world, and the only mammal capable of true flight (Bat Conservation International 1992). The 925 species of bats represent nearly a quarter of all the species of mammals on earth. The majority live in tropical and semi-tropical regions using a wide variety of roosts in foliage, hollow trees, rock crevices, caves, or burrows of other animals (Fenton 1983). Of the 44 species in North America, all but four prefer cavities for hibernating and raising their young. Surprisingly, Tuttle (1988) discovered that only 5% of temperate zone caves have the right temperature ranges to be useful to bats. World-wide, bats are in decline from shrinking habitat, persecution, and pesticides. Bats use human dwellings in place of lost habitat, causing further conflicts. The recent discovery of the tremendous importance of bats in ecological systems has set off a much belated effort to reverse their decline.

WHY DO BATS USE HUMAN DWELLINGS?

Thousands of years ago, the cavities bats preferred were abundant as hollow trees, natural rock cracks and caves (Racey 1992). As humans began to clear the forests, first in Europe, then in North America, the hollow trees disappeared and increasingly bats moved into human dwellings to take advantage of the increase in insects provided by agriculture and domestic animals. Clearing the forests also exposed the cave entrances which people began to explore and utilize, driving more bats to find new homes.

Fenton (1983) added that early Europeans lived harsh lives filled with superstition. He pointed out that these small, screeching, flying beasts, who emerged only at night from secret holes and caves, became the myths of bloodthirsty vampires, drafty, dark castles, and evil spirits. Fenton (1983) remarked that we got past the evil spirit part, but continued to consider them dirty, dangerous, common carriers of rabies, and ugly creatures that get tangled in our hair.

The 20th century has seen the most rapid decline in bat numbers in history (Tuttle 1991). Tuttle listed three reasons for this accelerating decline: 1) increased logging in tropical and semi-tropical forests, 2) increased year-round use of caves for recreational exploring, and 3) deliberate killing from ignorance or as part of vampire bat eradication programs. Fenton (1992b) added a fourth reason: the massive increase in the use of chemical pesticides against insects (70% of bats eat insects), and against bats directly. Bats use human dwellings in summer as well as winter. Female bats seek very warm environments in which to give birth and keep their flightless young. Audet and Fenton (1987) commented that this environment might allow mother and pup to use all available energy for lactation and growth, and waste none on keeping warm. In cooler northern climates, bat nurseries would have been in the trunks of sun-warmed trees, dry wood being an excellent insulator (Kurta 1985). The hot summer attics of older homes, in temperate regions of the world, became roomy substitutes for missing trees. Access to dwellings was through any small crevice, plentiful in older homes, where settling opened cracks around chimneys and walls (Fenton 1992b). Fenton found that the small *Myotis* spp. could squeeze through a crack only 5 mm high. In winter, cold-tolerant species such as the big brown bat (*Eptesicus fuscus*) in North America, and *Pipistrelles* spp. in Europe, hibernated in the walls of homes where they tolerate temperatures down to 0^0C (Ransome 1990).

House Bats and Human Conflict

House-using bats create three common problems that cause people to seek their removal: stains and odor, noise, and fear of disease (Fenton 1992a). Interestingly, in radio-tracking bats all over Canada, M. Fenton (pers. commun. 1992) discovered that 80% of people who had maternity colonies in their dwellings were unaware of their presence, and that hibernating bats, who are quiet and deposit no guano, are almost never detected. He explained that nursery colonies can deposit large piles of guano under their roosting areas, creating a bad odor and staining the ceiling of the living area below. In addition, nursery colonies are quite noisy with the nonstop squeaking and fluttering of moving bats.

Once people detected the bats, Tuttle and Kern (1981) reported that they became fearful of getting diseases from the animals themselves or their guano. They noted that only two diseases can result from contact with bats: rabies and histoplasmosis. Additionally, they pointed out that less than 1% of bats carry rabies, a lower rate than skunks, fox, or domestic dogs. Tuttle and Kern (1981) and Constantine (*in* Kunz 1987) reported less than a dozen human deaths from bat-strain rabies virus in North America since 1955, and that healthy bats do not attack people.

The other infection, histoplasmosis, causes a nonfatal lung infection in humans who breath in the fungal spores in dust contaminated with chicken, pigeon or bat droppings (Tuttle 1988). It is considered an occupational hazard of chicken farmers, pigeon fanciers, bat biologists, and cave explorers in the eastern United States, but Constantine (*in* Kunz 1987) found that histoplasmosis was absent in most of the dryer Western states. Additionally, M. Fenton (pers. commun.) added that histoplasmosis is not known to occur in Canada. Tuttle and Kern (1981) recommended the use of a respirator, with a 2 micron filter, when handling any dry dung. Fenton (1988) reported that the various parasites found on bats, and in their roosts, were species-specific and did not bite humans.

THE VALUE OF BATS

How are bats any different than the millions of other commensal animals, like mice and rats, that humans attempt to control world-wide each year? Notably, bats cause little harm to humans and, in fact, are beneficial globally. The biology and ecology of bats is unique among animals. Bats eat the widest variety of foods of any animals on earth. This diet includes insects, arachnids, fish and krill, reptiles and amphibians, rodents and other bats, birds, blood, nectar, and pollen, which has allowed them to colonize all the life zones of the world (Fenton 1992b).

Seventy percent of the world's bats eat insects, many of which carry disease or are agricultural and timber pests, especially nocturnal moths and beetles (Whitaker, *in* Kunz 1987). Whitaker (1993) observed that just one bat can consume 600 mosquito-sized insects per hour, and its own body weight in insects daily. In one summer season, he recorded that 150 bats, an average maternity colony in the Midwest, could easily eat 38,000 cucumber beetles, 16,000 June bugs, 19,000 stink bugs, and 50,000 leaf hoppers, among other insects. Tuttle (1990) added that the guano under large bat colonies is a valuable source of fertilizer for rural agricultures in developing countries. Of possibly greater importance is the recent discovery that nectar and fruit-eating bats are the major pollinators and seed dispersers of hundreds of species of tropical and semi-tropical plants, many of which produce crops valued in the hundreds of millions of dollars annually in cash-poor developing countries (Bat Conservation International 1992, Fenton 1992b). Thomas (1991) observed that when areas of tropical rain forest are clear-cut, seeds deposited by fruit-eating bats are the first plants to recolonize these disturbed areas.

SOCIAL BEHAVIOR AND MORTALITY

In and of themselves, bats are valuable because they are such a unique and diverse life-form. Ironically, these gentle, shy, and fascinating creatures are very vulnerable to destruction because of their highly social behavior of roosting in very large groups in trees, buildings, caves, and mines easily accessible by humans (Tuttle 1991). Fenton (pers. commun.) observed that female colonial bat species have only one pup per year, and disturbance of the large summer nursery colonies caused females to abandon the pups. In some countries bats are shot (Rainey 1990) or netted for food (Tuttle 1990, Bat Conservation International 1992). During hibernation, disturbed bats, awakened unnecessarily, waste critical calories needed to endure up to eight months of fasting, and may starve to death before spring arrives (Tuttle 1991). Bats have been used for target practice, and have been burned and dynamited in the mistaken belief that they were vampire bats (Murphy 1991). Murphy reported that only three species of bats in Central and South America drink blood, and one of these feeds exclusively on birds.

WAR ON BATS

World War II saw the further acceleration of the decline of bats globally, resulting from the massive development and application of chemical pesticides (Fenton 1992b). Fenton reported that, at first, bats died from consuming insects sprayed with DDT and sulfur. Following World War II, many more insecticides were developed and became available to the public for home use. Pest control companies sprang up to take advantage of this quick and easy way to rid homes and farms of all pests, including bats. What followed was 30 years of dosing millions of homes and buildings with a variety of pesticides, some with killing power lasting decades (Fenton 1983, pers. commun. 1992; Tuttle 1988, Racey 1992).

Tuttle (1988) reported what followed. Thousands of bats sickened, left their roosts, and fell dying for miles around the area, frightening people and starting the unfounded belief that most bats were rabid. These roosts were constantly refilled with more bats seeking shelter, providing steady repeat business for exterminators. People and pets sickened and died, because the poisons affected all mammals. Tuttle (1988) went on to add that moth balls, chloroform, bright lights, and fans were tried and all failed. Bomford and O'Brien (1990) reported test results on two high-intensity ultrasonic devices designed to repel rodents and bats, and found that neither worked. Tuttle (1988) reported that ultrasonic devices, in some cases, attracted bats! Millions of dollars were wasted and countless animals and humans suffered because no chemical or electric device has ever been found to repel bats permanently.

HUMANE SOLUTIONS TO BAT PROBLEMS

There are, however, two proven options to the problem of bats in human structures. The first is called exclusion or roost sealing, and entails locating and closing all the holes the bats are using to get into buildings. The second involves educating the would-be evictors to coexist peacefully with the bats.

Fenton (1992b) described the first option as two different problems. Residents frequently encountered a bat the first time when it happened to enter a room and fly about. These stray bats were often youngsters from a nursery colony, just learning to fly. Fenton suggested the simple solution of opening a window or door, removing the screen, turning off the light and letting it fly out. With the more confident homeowner, he suggested waiting for it to land, scooping it up in a thick towel, carrying it outside, and gently shaking it out. Fenton cautioned that all bats bite in self-defense when frightened, and should always be handled when wearing gloves.

The second problem addressed by both Fenton (1992b) and Tuttle (1988) dealt with the colony itself. They noted that most colonies of bats use either spaces in walls or attics which they have accessed through small openings in the building. They noted that the entry hole or holes often showed some brown staining or guano spatter marks around them, and when bats are in residence, they can be observed by flashlight leaving the hole after dark. In addition, small, crumbly brown bat droppings often accumulate on the ground under an entry hole, giving a clue to the location of hard to spot entrances. Bat researchers generally recommend sealing holes in late fall, winter, or early spring, when the roost area is naturally empty. At these times, attic areas are cooler to work in and daylight showing through cracks will help the evictor locate and plug the holes with putty, foam insulation, steel wool, or tape. Bats do not chew entrance holes like rodents, and will not chew their way back in next spring (Fenton 1992b).

If guano piles are to be removed, Tuttle (1988) recommended wearing a 2 micron mesh filter respirator. Hanks (1991), a professional bat excluder, once removed 2,268 kg of guano from a 19th century building. Guano is a superb fertilizer and gardeners carried it all away.

When adult bats are in the roost, Fenton (1992b), Hanks (1991), Tuttle (1988), and E. Pierson (pers. commmun. 1994) described a number of simple ways to evict bats without harming them. First, locate all the holes the bats are using and seal all but three or four main exits. Second, hang some barrier material over the holes. This can be heavy plastic netting (1 cm^2 mesh), window screening, or opaque or clear plastic sheeting. Pierson cautioned against using fruit tree bird netting, because small bats can become tangled in its larger hole size and die. Use duct tape or staples to secure the barrier material 4 to 6 cm above the holes, extending at least 30 cm to each side, and 30 to 60 cm below. It should hang loosely so the bats will be able to crawl below the barrier to take flight. When bats return, they try to land directly at the hole which the barrier now prevents them from entering. The exit holes should be checked nightly for several nights, or over several weeks, to make sure all the bats are out of the roost before sealing the last holes and removing the barriers.

Hanks (pers. commun. 1994) has invented a simple excluder of quarter-inch hardware wire cloth, formed into a 20 cm long cylinder, approximately 8 cm in diameter. He cuts one end of the cylinder into 8 to 10 tabs, each 2 to 3 cm long, flared like flower petals. These cylinders are placed over the exit holes and secured by the tabs. The protruding end of each cylinder is pinched into a narrow, flattened oval just wide enough for a bat to exit through. He has installed thousands of these wire cloth excluders which are left permanently in place. Under no circumstances should a roost be sealed when flightless young are present. Not only is this a cruel, unnecessary death of a valuable animal, but it could cause a serious odor problem.

LIVING WITH BATS

Bat control, however, may not be compatible with bat conservation. Brigham and Fenton (1987) radio-tracked pregnant big brown bats (*Eptesicus fuscus*) as they were excluded from roosts in five buildings in Canada. They discovered the females moved to the nearest other building with a suitable roost, often only 100 m away. In rural areas, they reported the females often just moved to the nearest available building. Using bat detectors, they recorded 262 attempts per night to reenter the old roost, and if any new hole was found, the entire colony moved back immediately. Of concern was the fact that these researchers noted a 66% mean infant mortality rate in evicted pregnant bats, as opposed to only a 14% mean infant mortality rate for pregnant females using familiar, undisturbed roosts.

The second option requires educating the public to the enormous value of bats, and the need to protect and coexist with them. As Fenton (pers. commun.) noted previously, 80% of people are unaware of existing bat colonies in their homes, with no detrimental effects on these homeowners. He found this to be especially true if the home was well insulated. The growing interest in composting and pesticide-free gardening might be the incentive for reluctant bat-roost owners to realize quick benefits from such a colony. Removing old guano in fall or winter would stop the odor problem. The attic could then be well insulated, saving the resident heating and cooling dollars, and stopping bat noise. A heavy layer of heat-tolerant plastic, under the colony roosting site, would facilitate the yearly harvest of the rich fertilizer as a renewable resource. If the bats are evicted from the house walls, the attic or other out-buildings, could be prepared and made available for the colony. This will become a long lasting friendship as bats live up to 32 years (Fenton 1992b). Where total bat exclusion is necessary, bat houses could be constructed in the area to provide alternate roosts and encourage the bats to stay in the area (Tuttle and Hensley 1993). In England, as well as Europe, Racey (1992) reported a growing interest in reversing the decline of their once abundant bat populations. He reported that in Britain, a permit, plus approval of the local wildlife authorities, is required to evict bats from a building or cut down a hollow tree.

SUMMARY

For thousands of years bats have been mislabeled as evil, dirty, and dangerous to humans. It was not until 1930 that researchers understood their echolocation. Even though they make up nearly 25% of the world's mammals, they have been so understudied that their tremendous value as insect pest controllers is now being fully appreciated, and their role in plant seed and pollen dispersion, was virtually unknown before 1950. As a consequence, superstition and ignorance controlled needless persecution and slaughter of these beneficial, flying animals.

Driven from their forest and cave homes, the dwindling number of bats sought refuge in remaining forest tracts and human structures, where they continued to be chemically assaulted and evicted. A massive, 11th hour public education campaign is now under way by such organizations as Bat Conservation International in the U.S., and the Bat Conservation Trust in Britain, to undo the ignorance and promote tolerance of bats. This must include protecting their critical cave and mine roosts, allowing them to share our buildings, and in fact, welcoming them by building them bat houses. A better, healthier world for bats will result in a better, healthier world for humans.

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