VOLUME 14, NO. 4 Winter 1996

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Bats & Streetlamps
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Some bats rely on streetlamps for easy meals, but new kinds of lights may leave them hungry . . .

By Jens Rydell and Hans J. Baagøe

Insectivorous bats are masters at finding concentrations of insects. It makes no difference whether these concentrations are "natural," such as mating swarms of mayflies over water, or "artificial," such as midges swarming at sewage treatment works. One of the most common and plentiful artificial feeding grounds is under streetlamps. As each of us has probably witnessed on our own patio at night, strong lights attract insects, and the insects frequently get trapped in the cone of light projecting out from the lamp. Bats are quick to take advantage of the captive meals any light affords them, and the placement of streetlamps, typically very high up and in the open, creates the ideal dining environment.

If, then, bats patrol streets and roads searching for insects attracted by streetlamps, there must be important and wide-ranging implications for bat conservation. Because this kind of predation can occur on such a large scale, it may also affect the welfare of insect populations. Consequently, we thought the relationships between streetlamps, insects, and bats deserved a closer look. In particular, do bats really come to the streetlamps specifically to hunt insects, as assumed, or are there also other reasons? Which species of bats forage around streetlamps, how frequently, and what overall importance might streetlamps have on the populations of these bats?

Without the aid of ultrasonic equipment, it's difficult to appreciate the number of bats that hunt at streetlamps. The bats often cannot be seen; they tend to fly above the lamps, only now and then diving into the light cone in pursuit of insects. For this reason, and in order to monitor as many streets and roads as possible, we used both a bat detector and a car in our research.

The car-and-detector method was originally developed in the 1970s by Ingemar Ahlén at the Swedish Agricultural University when he mapped the distribution of bats over large areas of Sweden. While driving slowly (about 30 m.p.h.), he listened for the bats' echolocation calls through earphones connected to a bat detector, and counted the bats as they passed. The detector was attached inside the car and the microphone was directed out through the roof hatch. When using a car in this manner, researchers must tune their detectors only to the narrow frequency band used by a particular bat species in order to filter out unwanted car noise. This means only one species can be monitored at a time.

Over several years, we have monitored bats following certain transects (i.e., consistent patterns) throughout the year in various habitats in Denmark and Sweden. In cooperation with Dr. Paul Racey and his students at Aberdeen University, we also have monitored bats in the same way in England and Scotland. After observing bats foraging around streetlamps in several countries in Europe, we now believe we can make some fairly general conclusions.

When driving along the different transects in spring, summer and autumn, we normally found between four and seven foraging bats per mile of illuminated road (two to five per km) and in some places as many as 32 bats per mile (20 per km). In contrast, we always found fewer than two bats per mile (one per km) of unlighted road. The concentrations of bats in lighted areas seemed to occur independently of the surrounding habitats; they were just as equally dense in towns and villages as in areas dominated by forest or farmland, with the exception of large cities,

where bat and insect faunas may be depleted. These data suggest that the lamps are the main attraction for the bats, rather than any other features along the roads such as trees or houses.

More supporting evidence for this hypothesis came from the differences in bats' behavior from one part of Scandinavia (i.e., Norway and Sweden) to another. For example, when traveling north, the summer nights become lighter and shorter, causing a decreasing contrast between the lamps and the background. Thus, the streetlamps attract fewer and fewer insects. Above the Arctic Circle there is no darkness at all, and the midnight sun makes streetlamps completely useless for people and bats alike. Accordingly, northern bats (*Eptesicus nilssonii*), which range as far as northern Scandinavia, spend less and less time foraging over roads the further north they go. Clearly, bats come to the lamps and not to the streets and roads themselves.

After observing and listening to the bats with bat detectors, it was obvious from their calls that feeding, not other needs, was their primary purpose in coming to the lamps. By catching and weighing insects, we could also conclude that the bats caught bigger insects at the lights than they did in most other habitats, and hence took in more food. Most likely, therefore, bats that regularly feed at streetlamps have a better food supply than most.

Which bat species, then, come to the streetlamps to feed? Although up to 10 species may occur in any one place in southern Sweden, only the northern bat is common at streetlamps. This species is absent from Denmark, but its close relative, the serotine (*Eptesicus serotinus*), dominates around Danish streetlamps. A couple of other species, such as the parti-colored bat (*Vespertilio murinus*) and the noctule (*Nyctalus noctula*), also feed near Swedish and Danish streetlamps, but mostly in areas where northern bats or serotines are absent or less abundant. The noctules typically fly faster and a great deal higher than the other species, so they make use of the lamps in a slightly different way.

Since none of the three dominant Scandinavian streetlamp bats are common in most of Great Britain, we were eager to see which species, if any, replace them at the streetlamps there. It proved to be mostly the common pipistrelle (*Pipistrellus pipistrellus)* and the noctule. Interestingly, the densities of these two species over lighted streets in Britain was similar to those of the three species in Scandinavia. Although pipistrelles and noctules also occur in Scandinavia, they seldom appear at streetlamps there. We think, therefore, that frequently the commonest species in an area may take over a lighted roadside to the extent that other species are often entirely excluded and choose to feed elsewhere.

According to the work of M. B. Fenton and his students in Canada, the situation in North America is very similar to that in Europe except, of course, that the species are different. Not surprisingly, the most common bat found around lights in Canada and the U. S. seems to be the big brown bat (*Eptesicus fuscus*), a close relative of the northern bat and the serotine in Europe. Red and hoary bats (*Lasiurus borealis* and *L. cinereus*) typically also turn up over lighted roads.

Although the various species of streetlamp bats differ greatly in size, ranging from the four-gram pipistrelles to the 25- to 30-gram noctules and hoary bats, they all hunt insects in a similar way. When not around streetlamps, they typically feed in open places by flying rapidly back and forth along regular routes, using intense echolocation calls for long-range detection of insects. In contrast, several other bats, such as long-eared bats (*Plecotus* spp.) and all the Myotis species, seem to avoid open places most of the time, preferring to feed in woodlands or low over water. These species fly relatively slowly and use less intense echolocation calls. They seem less well adapted to feed along streets and in other open places.

Slow-flying bats are sometimes seen catching moths and other insects around lights, usually at isolated lamps in gardens, parks, and other places surrounded by vegetation. Their hunting strategy is quite different from that of the typical streetlamp bat, however. They tend to turn up in the light cone very briefly, grab a moth, and then disappear again into the vegetation.

Perhaps these slower bats are more vulnerable to owls which frequent open, lighted places. If so, the streetlamps

may not benefit them to any extent. Interestingly, in Europe, it is among these relatively slow-flying bats that most of the threatened species are found.

There are clear differences between the various types of streetlamps in their attractiveness to insects and bats. Concentrations of bats and insects are found only over roads with white or bluish-white lamps the type which contain mercury vapor or a mixture of sodium and mercury. Ironically, for environmental reasons, these lamps are being replaced by monochromatic orange sodium lamps which attract neither insects nor bats. In fact, streets and roads illuminated with these lamps do not have any more bats than unlighted roads, and the insects around orange lamps are just as few as around lamps which have been turned off.

Thus the replacement of old mercury lamps, though beneficial in some ways, may have a negative impact on bats. This scenario is certainly not the first example of animals adapting to an artificial structure in their environment and then being forced to adapt again when the structure is removed. The situation demonstrates the perpetual need for more thorough consideration of changes to structures or conditions that have become integral parts of wildlife habitat. Still, in the innumerable places where old-style lamps remain, bats continue their nightly feeding, reminding us that sometimes we can benefit wildlife even as we intrude upon their habitat.

(bio 1)
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(bio 2)
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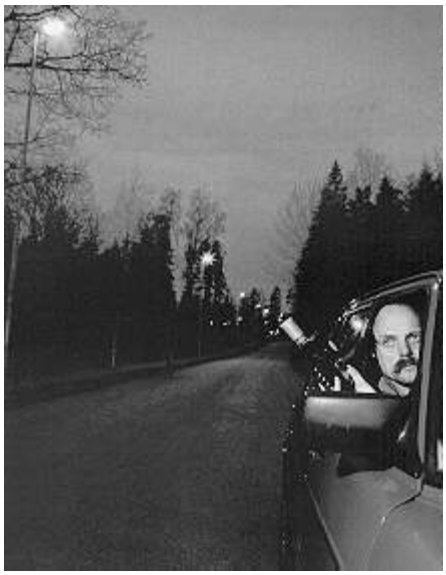
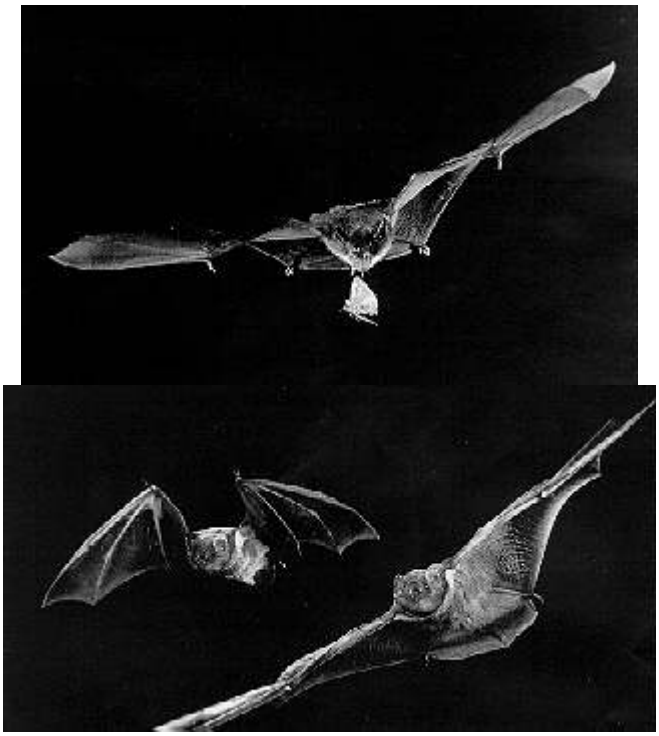
A mother bat takes advantage of a moth-and-beetle buffet in the light cone of a streetlamp.



Jens Rydell listens for bats on his bat detector along a row of streetlamps in Sweden.



Big brown bats (below, left) and red bats (above) are two of North America's more common streetlamp foragers.

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- Wish List
- Look for "Masters of the Night: The True Story of Bats"* at these locations:
- Newly Announced 1997 Workshop and Volunteer Opportunities