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Science for Environment Policy

Noise from human activity can impair foraging in bats

Human-generated noise can reduce the foraging activity of wildlife and should be taken into account during conservation planning, a new study suggests. The test showed that traffic noise decreased the foraging activity of Daubenton's bat (*Myotis daubentonii*) by inducing an avoidance response. The new experimental approach could be used to identify how noise disturbs any species capable of detecting noise.

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Anthropogenic noise — or noise that is a result of human activity — has been on the rise since the Industrial Revolution. Noise levels have increased due to a combination of factors including urbanisation, resource extraction, and modern transportation (traffic noise). Anthropogenic noise can have a significant impact on wildlife yet it is difficult to investigate the mechanisms responsible for this, particularly as several may operate simultaneously.

There are three possible mechanisms by which noise could affect wildlife: acoustic masking, reduced attention, and noise avoidance. Acoustic masking refers to when noise interferes with an animal's detection of a target sound, because the noise and target sound have similar qualities such as frequency. This can for example occur when the noise is similar in frequency to a bat's own echolocation calls to find prey. As searching for food requires a large amount of cognitive resources, it is also thought that noise can reduce available resources by occupying the animal's attention. This also decreases foraging efficiency, because foraging with reduced attention takes more time and energy. The final hypothesis is that noise pollution results in animals avoiding a noisy foraging area altogether.

The scientists developed a novel diagnostic framework to investigate whether traffic noise would disturb foraging in a Eurasian species of bat called Daubenton's bat, and which mechanism of disturbance would be responsible. These bats find prey using echolocation, sending out ultrasonic sounds and then navigating to the prey by picking up the sounds that bounce back at them. Daubenton's bats can be observed over many water habitats, where they skilfully skim insect prey from the water surface.

Four bats were allowed to forage individually for beetle larvae on top of an artificial pond under different conditions — each designed to test one of the possible mechanisms, while ruling out the others. The study used two types of traffic noise. One was composed of unchanged sounds produced by vehicles on the highway, and included the same frequencies used by bats to detect prey (overlapping noise). These frequencies were artificially removed from the other noise type (non-overlapping noise), so that it could not disturb bat echolocation.

The results showed that both types of traffic noise significantly reduced the rate at which the bats successfully caught their prey. Both noise types also reduced the number of search flights the bats took to look for prey, showing that the noise decreased their foraging activity. Compared to those in silence, the bats made an average of 1.3 fewer search flights when exposed to the non-overlapping noise and 1.7 fewer when exposed to normal traffic noise. These results, as well as those from other experimental conditions in the study, ruled out the acoustic masking hypothesis and suggested anthropogenic noise acts as an aversive stimulus which causes noise avoidance in this species. The reduced attention hypothesis was eliminated by the result that bats needed the same number of search flights to catch a food item in silence and in noise.

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The researchers suggest that their work shows how anthropogenic noise can have negative effects on the foraging behaviour of Daubenton's bats, and possibly further species. Previously, it was thought that noise disturbance mainly affected species that use overlapping sound. However, as even non-overlapping sound disturbed bat foraging behaviour, anthropogenic noise may also negatively affect the foraging behaviour of other species, including those that do not rely on sounds. Many other biological processes, most importantly reproduction, are reliant on successful foraging.

The researchers hope that their diagnostic framework will be applied by others to test the effect of noise on different species. Anthropogenic noise could therefore be taken into account when assessing environmental impacts and planning conservation policy, even for species which are currently not expected to suffer from noise disturbance.