Bat Conservation Trust
www.bats.org.uk

The potential impact of radio frequencies and microwaves on wildlife

A number of studies have been carried out to investigate the impact of radio frequencies and microwaves on wildlife.

Radio frequency (RF) is a rate of oscillation in the range of about 3 kHz to 300 GHz, which corresponds to the frequency of radio waves, and the alternating currents which carry radio signals. Microwaves are electromagnetic waves with wavelengths ranging from as long as one metre to as short as one millimetre, or equivalently, with frequencies between 300 MHz (0.3 GHz) and 300 GHz. They are used for mobile telecommunication systems such as wireless internet and mobile telephone calls.

Wi-Fi antennas transmit and receive radio waves in order to allow wireless connections. The devices operate in certain frequency bands near 2.4 and 5 gigahertz (GHz). Mobile telecommunication systems transmit at a similar frequency and also use digitally pulsed information carrying signals. These characteristics are sufficiently close to consider in conjunction the potential impacts of mobile phones, their base stations and exposure from Wi-Fi masts.

Studies concerning bats

To date, results from studies[1] carried out investigating the aversive effect of electromagnetic radiation on foraging bats have been largely unclear. Bat activity was significantly reduced in habitats exposed to an EMF (electromagnetic field) strength of greater than 2 v/m when compared to matched sites registering EMF levels of zero. The reduction in bat activity was not significantly different at lower levels of EMF strength within 400m of the radar. This suggests that a signal with certain pulse characteristics can induce an aversive response in foraging bats. However, it was largely predicted that the reduction in bat activity within habitats exposed to electromagnetic radiation may be a result of thermal induction and an increased risk of hyperthermia rather than the direct impacts of radio and microwave frequencies.

The potential impact on bats

Microwave radiation**:**

Some studies have shown a negative effect on the reproductive output of insects and birds in the vicinity of mobile phone masts. If the reproductive output of insects within a certain area is impinged there is the possibility that this could have an effect on the localised insect population and consequently the presence of bats, but this is speculative.

[1] Nicholls B & Racey P (2009) - '*Bats Avoid Radar Installations: Could Electromagnetic Fields Deter Bats from Colliding with Wind Turbines?*' http://www.plosone.org/article/info%3Adoi%2F10.1371%2Fjournal.pone.0000297 & '*The Aversive Effect of Electromagnetic Radiation on Foraging Bats—A Possible Means of Discouraging Bats from Approaching Wind Turbines*' http://www.plosone.org/article/info:doi/10.1371/journal.pone.0006246

Mobile phone and Wi-Fi masts transmit an EMF of 0.5 – 2 v/m. It is therefore felt that the power output of these masts is too low to have a significant negative impact on bats. However, studies are still in their infancy and little is known on the impact of a mast in the direct vicinity of a roost.

High frequency noise

Ultra high frequency noise transmitted via Wi-Fi and mobile phone masts (2.4 and 5 gigahertz GHz) are considered too high for bats to hear. High frequency noises such as mosquito boxes (~17 kHz) can be heard by bats, but are generally considered to transmit at a sufficiently low frequency to avoid interfering with the echolocation calls for most UK bat species.

Nyctalus species such as noctules that echolocate at lower frequencies (~20 kHz) may hear these frequencies. In addition, many other species produce social calls below these frequencies (<20 kHz). However, bats exhibit an ability to tune out the calls of other bats. This suggests they may also be able to filter out these additional noises, unless the sound is extremely loud i.e. if it completely drowns out the bat calls, or if the structure of the signal is similar to those shown to elicit a response in bats (rapid broadband signal, gradually rising narrow bandwidth pulses).

Advice

As a precaution it is recommended that:

- the erection of masts should be carefully considered, locating the mast on a part of the building as far from known roosting locations and flight paths as possible
- advice should be sought to ensure that the obstruction of any access points, or damage of any roosts is avoided
- bat populations within the buildings should be surveyed on an annual basis to monitor any potential impacts