BSG | ecology

SUMMARY | BCT ARTIFICIAL LIGHT AND WILDLIFE SYMPOSIUM 2014

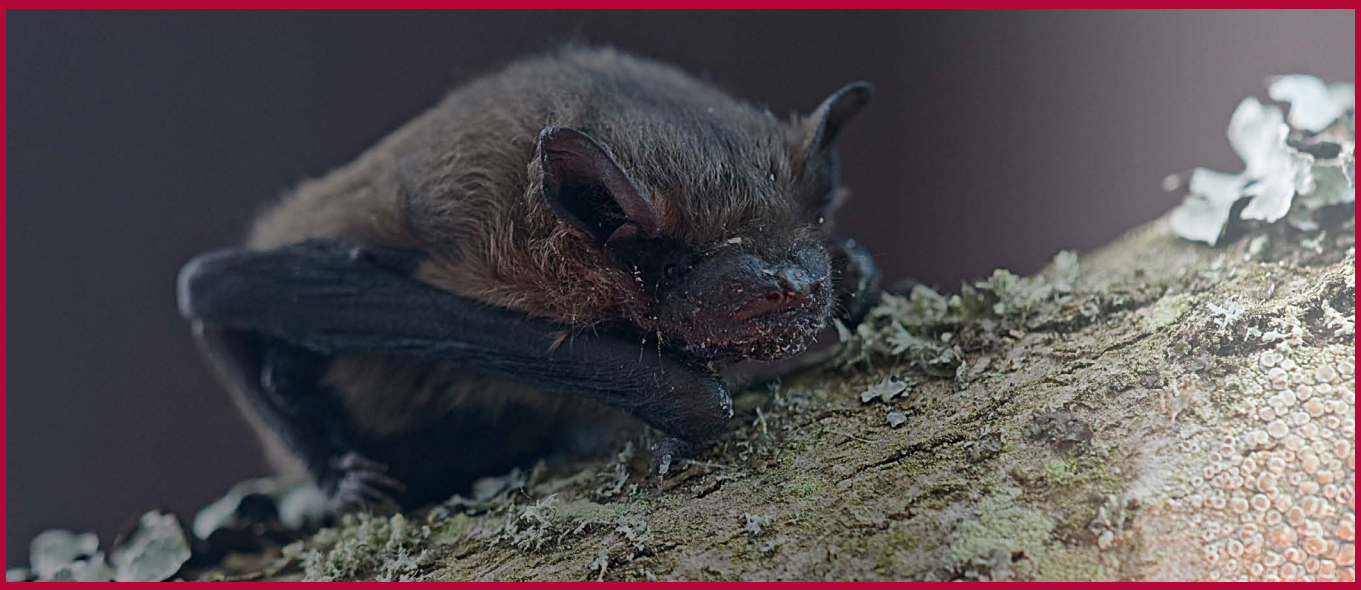

Photo by: Steve Betts, Newcastle Office

Background

Our use of artificial light in towns and cities is not something new; we have been lighting our streets in one way or another for hundreds of years. However, the extent to which we light our night time environment has greatly increased in recent decades. Urban areas have expanded and we are increasingly lighting our countryside, with night time lighting encroaching on areas that are protected on both nature conservation and landscape grounds.

Speakers noted that the effects of light pollution, not just on wildlife, but on humans too, appears to be relatively little studied in comparison (for example), to the effects of air or water pollution, and yet impacts are potentially just as wide ranging, including those to our general health and wellbeing as a result of interference with our circadian rhythms and the suppression of immune responses.

Being organised by BCT, presentations at the Symposium naturally focussed on the effects of lighting on bats. However, there were also accounts of wider research regarding invertebrates, including moths and glow-worms; birds and other small mammals, as well as presentations on lighting design and manufacture and on specific lighting schemes as examples of good practice.

Effects of Lighting on Bats (and Invertebrates)

Bats have evolved to be behaviourally and physiologically adapted to low light levels. They typically avoid light to avoid predation. Different bat species are affected by light to differing extents, but impacts of increased lighting typically include: increased risk of predation, delayed emergence, abandonment of foraging areas and roost sites, reduced foraging time, reductions in insect prey abundance away from light sources and the alteration of the competitive balance (i.e. some bat species are more tolerant of increased light levels than others and are not therefore excluded from lit areas). There are currently no agreed acceptable limits for the levels of light spillage onto areas important for foraging or commuting bats. However, intensities as low as 1 lux (roughly equivalent to a full moon) are known to result in avoidance behaviour in some species (NB. street lighting is typically 10 lux; lighting at major road junctions and car parks up to 50 lux and lighting on typical sports pitches 300 lux).

One of the key factors to consider is the spectral composition of the artificial light source. Modern artificial 'white lighting' is typically rich in short wavelengths in the blue and ultraviolet range of the spectrum. Research suggests that bats not only tend to avoid well lit areas due to the altered risk environment, but that shorter wavelength light has a greater adverse impact on bats than longer wavelength light, such as orange or red light. The spectral composition also has an effect on bat prey, with flying invertebrates typically being more attracted to shorter wavelength light sources. This can result in an increase in insect abundance at light sources and an associated local decrease away from light sources. Bat species more tolerant to light may be able to take advantage of this effect, but this will likely be at the expense of those which are less tolerant. The insects which are more attracted to the light source (typically due to eye morphology) may become more vulnerable to predation; they are also distracted from feeding and reproducing and may die from the exhaustion of the encounter with the light source before completing their life cycle.

The natural tendency for bats to avoid artificially lit areas and the influence this has on their foraging behaviour and on their prey can have significant long-term impacts. For example, research in Slovenia has shown that lighting near bat maternity roosts (where females raise young) delays bat emergence time. This can result in bats missing much of the optimum period for foraging, which is typically within two hours of dusk, when insect abundances are greatest. As discussed above, the lighting can also draw insects away from the darker areas, resulting in lower insect abundances in the darker areas where the bats are feeding. Consequently, lactating females must expend more energy to capture less prey and this means that they produce less milk to feed their young. It is suggested this may result in slower growth rates of juveniles, which, as a result of reduced fat reserves, may then be less able to sustain themselves during winter hibernation, impacting on the survival of the colony.

Products and Strategies Designed to Mitigate Impacts on Bats and Birds

A presentation from Philips (lighting manufacturers) looked at the development of light sources aimed at reducing impacts on wildlife. A scheme aimed at reducing the disorientating effects that brightly lit offshore platforms can have on migratory birds, in an otherwise dark North Sea, has seen the development

of light sources with a reduced red component. Apart from mitigating impacts on birds, this lighting has the added bonus of improving contrast and reducing the glare of 'conventional' lighting, potentially improving the safety of the night time working environment. Further developmental research by Philips includes the production of a light source which has an increased red component and decreased short and medium wavelength (green and blue) components; the aim being to produce a light source which has a reduced negative impact on bats and invertebrates, without any perceptible difference to the human eye.

There are already numerous local authority schemes for part-night lighting, where streetlights are switched off or dimmed for the part of the night where there is less of a human requirement for the light. The primary aim of these schemes is to save money. However, they are also likely to have inadvertent benefits for wildlife. Projects in London and the Netherlands have taken this one step further and designed intelligent street lighting which only comes on when it is required, where the primary aim is to reduce impacts on wildlife. These lighting schemes typically work using motion sensors and each lighting column has the ability to communicate with the two columns either side of it. When the lit area is not in use, the luminaires are either off or dimmed (e.g. working at 20% power). As a person or vehicle moves through the area, sensors detect the motion and fully power-up the nearest luminaire, as well as the next luminaire in the sequence and the luminaire behind them, so that the person can see ahead and behind. Such schemes use LED luminaires for increased efficiency and for maximum control over light spillage or trespass. LED luminaires can even be manipulated to produce different light intensities and colours throughout the night or year to account for variations in use of an area by wildlife. These are exceptionally flexible and transferable schemes which can likely be adapted to fit into the green infrastructure of many new and existing developments in the UK.

What lighting is necessary?

When a lighting scheme for a new or existing development is being prepared, increasingly, designers and decision makers need to be asking themselves whether that lighting is necessary. For example, is the lighting necessary for social safety – is there any real evidence for this? Where lighting is required, then consideration must be given as to how much light is necessary and care taken not to over-light an area (i.e. by installing more lights than is necessary, lights which are unnecessarily bright or lights which spill into areas which don't need to be lit). We light our streets in a way that is perceived to be helpful to humans, but we should consider that different species have different perceptions of light, due to differing eye morphologies. It is particularly worth noting that there is no statutory requirement to provide road lighting.

The Policy Basis

The National Planning Policy Framework (NPPF) recognises the potential for effects as a result of light pollution in paragraph 125, advising that "by encouraging good design, planning policies and decisions should limit the impact of light pollution from artificial light on local amenity, intrinsically dark landscapes and nature conservation". However, guidance on how to limit these impacts is somewhat lacking or out of date (for example, the increasing use of LEDs means that some current guidance on light intensity and light spacing is out dated, as it applies to different light sources, such as high pressure sodium). There is no light pollution legislation in the UK and what guidance there is tends to focus on aspects such as light trespass, only when they affect humans. There therefore appears to be a need to add a more nature conservation-focussed element to policy, and to consider how this might be best enshrined in law.

How to Move Forward

It is evident from the Symposium that several different professional disciplines are concerned about the impacts of light pollution on wildlife and that there is an opportunity to work together.

To move forward, decision makers need to apply more scrutiny to lighting schemes for developments, preferably requesting more information about the specifics of lighting design when planning applications are submitted. Lighting Engineers and Landscape Architects need to collaborate with Ecological Consultants on development projects to ensure lighting is considered at an early stage. This should result in lighting strategies which take account of the latest research and guidance, and the use of products designed to reduce harmful lighting (carefully considering need, positioning, timing, spillage, intensity and how it can be screened). These strategies also need to balance the ecological impacts of lighting with the need for public safety and energy efficiency.

In many instances, lighting schemes designed with wildlife in mind will be more energy efficient and this must be a key driver towards their implementation (given that the UK is thought to expend around 20% of its energy on lighting).

Finally it is clear that, to continue to develop our understanding of lighting impacts on wildlife, a requirement for the post-development monitoring of new lighting schemes would be beneficial to inform future improvements.

Overall, the take away message from the conference was a positive one: it was well balanced, with good quality speakers, presentations on novel and pioneering research, and a wide range of industry attendees. While it is clear that we don't have all the answers, there is a need to reach wildlife-friendly solutions given predicted future lighting scenarios, and it is reassuring to see that there is some impetus towards achieving such solutions.

David Stiles & Hannah Bilston
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Should you wish to discuss lighting schemes for developments, please get in touch with one of our staff:

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