INSIDE JEB

Brighter nights risk extinguishing glow-worm twinkle

A female glow-worm in the dark (right) and with light from a camera flash (left). Photo credit: Jeremy Niven.

The bright lights of big cities are wonders of the modern world, intended to help us work, stay safe and enjoy the world around us long after the sun has set. Although artificial light has been great for increasing human productivity, some nocturnal animals, and even people, pay a price for this illumination. From increasing the amount of time that predators are active to disrupting migrations, light pollution affects many animals; but how do animals that use their own luminescence to lure food or attract mates fare against this new, brighter background? Female common glow-worms (*Lampyris noctiluca*) emit a green glow from their abdomen to attract flying males, but they are unable to fly themselves to new locations to escape light pollution. Because of this, Estelle Moubarak, Sofia Fernandes, Alan Stewart and Jeremy Niven of the University of Sussex, UK, wondered how hard it is for male common glow-worms to find mates in an ever-brighter environment.

After collecting glow-worms at night from the South Downs, UK, the researchers transported them back to the lab, before beginning the tricky task of transferring the male insects to a Y-shaped 'maze' without exposing them to artificial light. The team placed the male glow-worms at the bottom of the Y-maze and a green LED, which mimicked a female's glow, at the top of one of the arms, which the male had to walk towards. They then recorded if and how long it took the males to find the fake female. Then, the team switched on a white light above the maze, ranging from 25 lx (25 times brighter than moonlight) to 145 lx (equivalent to the light beneath a streetlamp). Although all of the glow-worms found the LED in the dark, only 70% found the LED at the dimmest levels of white light, and just 21% of the insects found their potential mate in the brightest light.

Not only did the white light affect the glow-worm's ability to find a female, but it also caused them to take longer to reach the LED. In the dark, the worms took ∼48 s to reach the female-mimicking LED; however, it took the same glow-worms ∼60 s to reach the LED in the lowest white light levels. Illuminating the maze also caused the male glow-worms to spend more time in the bottom part of the maze without moving towards a female. In the dark, the insects only spent ∼32 s in the bottom of the Y-maze, whereas they spent ∼81 s in the bottom of the maze in the brightest conditions.

Moubarak suggests that male glow-worms were unable move towards the females when dazzled by white light because they cover their compound eyes with a head shield, which acts like a pair of sunglasses, reducing the amount of bright light they see. In fact, when the white light illuminated the area with the fake female LED, the glow-worms shaded their eyes for ∼25% of the trial compared with only ∼0.5% of the time when the maze was in the dark. 'Keeping their eyes beneath their head shield shows male glow-worms trying to avoid exposure to the white light, which suggests that they strongly dislike it,' says Niven. So, although our bright night-time world has helped give rise to our modern society, it has had a drastic impact on male glow-worms and their ability to find mates. If this trend persists, meadows and heaths across Europe and Asia that have lit up with the twinkling of the female glow-worms for millions of years will fall dark.

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