Scientists find blue light makes buildings more deadly to migrating birds

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Bird collisions with buildings are nothing new, but a new study by scientists at The University of New Mexico sheds light on a potential cause.

The study, "Disentangling the biotic and abiotic drivers of bird-building collisions in a tropical Asian city using geological niche modeling," led by UNM scientists David Tan and Nicholas Freymueller, was recently published in the journal *Conservation Biology*.

It presents a novel finding revealing that night-migrating birds are at greater risk of colliding with buildings lit up with high levels of blue light at night, a factor that has not been extensively studied before.

The phenomenon is global, but significant gaps exist in our understanding of bird-building collisions. In North America, where the vast majority of bird collision studies have been conducted, between 365 million and 988 million are estimated to die from building collisions every year, mostly involving migratory birds. According to the study, only a small number of studies have focused on the tropics, especially the Asian and African tropics, and very little is known about where and why birds collide with buildings in these parts of the world.

Additionally, most studies of bird-building collisions have been based on surveys conducted on a small handful of buildings, generally in city centers or university campuses. These studies suggest that bird-building collisions are connected to the ways buildings are designed, and that larger, glassier, and more light polluted buildings tend to kill more birds, but very little is known about whether these factors apply across the entire breadth of large cities.

Tan, a Ph.D. candidate in Professor Michael Andersen's lab at the UNM Department of Biology, whose research focuses on the biogeography, evolution, and conservation of birds in Southeast Asia, led the research based in Singapore and studied the issue using a different approach than previous studies.

Instead of surveying just a small number of buildings in the city center,

Tan and co-lead author Nicholas Freymueller collected community science observations of dead birds from across the entire island of Singapore, a densely populated city-state that's slightly smaller than New York City (734.3 square kilometers/283.5 square miles), with more than 100,000 buildings island-wide.

With these observations, Tan and Freymueller used ecological niche modeling—a method normally used to estimate where animals live—to instead predict where birds were most likely to die from building collisions, by reconstructing the "death niche" of the city's birds.

"It's a counterintuitive way to think about niche models," said Tan, "But if we can use environmental factors like temperature and rainfall to predict where living animals occur, it makes sense that the same methods can also be used to predict where birds might die from building collisions since these collisions are strongly affected by the urban environment."

Together with collaborators from the National University of Singapore (Singapore) and the Nanyang Technological University (Singapore), the researchers compiled nearly 225 confirmed bird-building collision records during 2013–2020, including migrant and resident species, and discovered several notable findings, including that pittas accounted for the majority of migratory bird collisions, while collision mortalities were dominated by pigeons for the resident species.

"In particular, we found that pittas, a group of colorful but secretive birds that collide extremely frequently (i.e., 'supercolliders') with buildings across South, East, and Southeast Asia, are particularly sensitive to blue light pollution and that future shifts to white LED streetlights are likely to increase the number of pitta collisions with buildings dramatically," said Tan.

"These results confirm what we previously suspected about pittas from bird banding studies conducted in the 1960s—that pittas are strongly attracted to light when they migrate at night—and this is the first time anyone has demonstrated a specific attraction to blue light in this group of birds," Tan added.

Among non-migratory birds such as the green pigeons and emerald doves, the researchers also found that these species tend to collide with buildings near the edges of forests, which may be due to the fact that these forest-dwelling species often move through cities as they transit between fragmented forest patches.

"Our results also show how forest-edge buildings, especially short buildings under 20 meters in height, should be areas of high priority for deploying anti-collision measures," said Tan.

Based on these findings, the scientists were able to identify several future residential and industrial developments in Singapore that were likely to experience high collision rates, mainly due to their proximity to forested areas and the high levels of blue light pollution emitted by LED streetlights.

"One of the benefits of working in Singapore is that the government tends to plan everything well ahead of time," said Tan. "Because of this, we were able to use long-term land-use plans published by the Singapore government to predict where future collision hotspots might occur, which will in turn allow urban planners and developers to incorporate bird-friendly measures into building designs even before the first foundations are laid."

As a possible solution, the scientists suggested that buildings in future collision hotspots should incorporate collision-mitigation measures such as bird-safe glass into their façades, which will make glass surfaces more

visible to birds and reduce the chance of collisions. Other glass shading measures such as mullions and louvers could also be incorporated into the way buildings are clad in high-risk zones near forests, the scientists said.

And as for the impact of blue light pollution, especially from white LED lights, the researchers were keen to stress that they were not opposed to the widespread adoption of more energy-efficient LED lights, but added that shifting to warmer, more orange color tones and using shielding to minimize the amount of light pollution spilling upwards into the sky might help reduce the impact of nocturnal blue light pollution on migrating birds.

"Our discovery that blue light pollution increases the building collision risk of night-migrating birds in tropical Asia adds to the small but growing number of studies worldwide showing that blue light pollution attracts migratory birds," said Tan, "Reducing blue light emissions at night during the migratory months could help reduce the number of bird deaths in cities, especially in tropical Asia."

More information: David J. X. Tan et al, Disentangling the biotic and abiotic drivers of bird–building collisions in a tropical Asian city with ecological niche modeling, *Conservation Biology* (2024). DOI: 10.1111/cobi.14255

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