Capturing the Light: Investigating the Photography and Surveillance of Dark Sky Reserves

by Anisha Nilakantan

As humans, we have let our infatuation with glowing cities and attractive illumination run rampant, to the point where you might never see a dark sky in your lifetime. Selfishly, this possibility robs us of a beautiful experience, but the consequences are far more widespread. As we struggle to internalize the long-term effects of something as seemingly benign as streetlights or advertisements, we invite a plethora of damaging ecological change (Barentine 2019): "Animals can experience increased orientation or disorientation from additional illumination and are attracted to or repulsed by glare, which affects foraging, reproduction, communication, and other critical behaviors[1]."

It's inevitable that some of this light pollution will grow as our society continues to advance, technologically and economically. Therefore, as we do with landmarks and endangered species, we try to conserve "the remains of the planet's natural nighttime darkness (Barentine 2019)." Dark skies have become a scarce resource. But in the fast-paced evolution of the light-polluted world, how can we successfully keep track of parks/reserves to enact the best conservation methods?

In his paper "Method for Assessment and Monitoring of Light Pollution around Ecologically Sensitive Sights," published in the Journal of Imaging, John Barentine describes the challenge of quantifying light pollution threats. We know it's there–we see our streets lit up, prominent effects on our nightlife, and our view of stars diminishing rapidly. But currently, no available light pollution assessment method seems comprehensive and affordable. Available

[1] "Ecological Light Pollution" (191)

methods don't accurately represent the entire threat of light from the area surrounding a conservation site. And if we can't quantify light pollution, how do we study its trends and manage it and its effects?

The pressure to monitor light sources in these conservation areas is of paramount importance so we can assess their state, "…identify emerging threats, [and] suggest land management (Barentine 2019)." Especially as astrotourism–visitors arriving to observe dark skies and its wildlife–increases at conservation sites, timely and accurate monitoring is needed. In his meta-analysis, Barentine delves into the major milestones of sky surveillance.

The DMSP, a pivotal light-mapping satellite, photographed light that's essentially escaped Earth's atmosphere. Used to find light sources, the DMSP scanned the night sky, using those measurements to map the distribution and intensity of light on Earth (Barentine 2019). However, the DMSP is insensitive to blue light, the most harmful wavelength that's become pervasive through increasing LED fixtures worldwide. As published in ScienceDaily, "the worst nighttime lights are intense blue and white colors – some affect species as much as the brightness of midday sun – and three times more than yellow or green lights designed with wavelengths less disruptive to wildlife[2]."

Then there's "calibrated all-sky imagery"–2D models made by photographs taken with a variety of lenses and calibrated electronically. It uses SQM technology to supplement aerial views, assessing light from the ground looking up. These complementary perspectives are imperative to encapsulate how wildlife is affected by night light as they move around on Earth. In a temperature-controlled, networkable approach, SQM allows scientists–and untrained observers–to share data (Barentine 2019).

[2] "Putting animals in their best light: Some shades of LED lamps threaten wildlife" University of Southern California

Unfortunately, alone, these features compromise on the resolution and universal interpretation of data. All-sky 2D maps allow conservationists to interpret external light threats over a larger area, but require intense human labor. Individuals must take, process, and operate the machinery, exhausting the technology and money. It appears that SQM has reached its limit (Barentine 2019).

Alternatively, the budding drone-based imagery method looks promising for the future. Using drones to take aerial pictures of sites, conservationists can locate and pinpoint light sources (Barentine 2019). These images are then following through ground-based validation. As drones become more advanced and cheaper, accessibility and standardization of the industry can follow, opening doors for the conservation of dark skies.

It is essential that a comprehensive remotely-deployable, autonomous all-sky imagery process be developed in the future to ensure the preservation of dark skies. Without accessibility and decreasing labor, a lack of real-time monitoring of threats and status will undermine any conservation efforts. Without standardization of assessment, the very notion of "dark sky" is impossible to define, and even harder to preserve. To prioritize wildlife above "human aesthetic" (Barentine 2019) requires the initial step of accurate assessment of the current situation. Without it, our ecosystems may be left flailing to defend itself yet again against our globalizing world.

References:

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