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« La pollution lumineuse n'est pas une fatalité »

Skyglow stimulates cyanobacteria growth and lake metabolism

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Skyglow describes the bright glow at the night sky, mainly caused by anthropogenic illumination, which doesn't only hinder the observation of stars by stargazers, but also severely disturbs the human circadian rhythm and other natural, light-controlled processes. This holds also true for aquatic ecosystems which are often highly illuminated in urban systems (e.g. water side promenades, bridges, etc.). Yet, the effects of Skyglow on aquatic organisms and biochemical processes remain largely unknown. Therefore, a team of international researchers under the lead of IGB has performed a globally unique experiment in a large-scale enclosure facility (IGB's LakeLab, **Fig. 1**) to uncover changes in aquatic community composition and biochemical functions under near-realistic conditions, yet with full control of light conditions at night mimicking different degrees of light pollution (0,06 Lux: typical Skyglow; 6 Lux: highest-documented Skyglow level, so far; and non-illuminated controls).

Figure 1: *Experimental Skyglow Setup in IGB's large-scale enclosure facility (https://www.igb-berlin.de/en/infrastructure/lakelab). | Foto: Andreas Jechow*

In their recent study in the international journal Water Research (278(2025), 123315; http://dx.doi.org/10.1016/j.watres.2025.123315) the research team shows artificial light at night favors light-sensitive **cyanobacteria**, including those forms producing cyanotoxins. Furthermore, Skyglow stimulated the planktonic carbon cycle at night with profound consequences for the lake's metabolome. Consequently, the study suggests that natural carbon sequestration and greenhouse emissions are altered, i.e. the more bouyant cyanobacteria will reduce C-sequestration, but the higher lake metabolism will increase greenhouse gas emissions to the atmosphere and thus interfere with natural climate feedbacks. The experiment began with almost the same starting conditions in each enclosure throughout the one-month experiment. Cyanobacteria, but also other bacteria using light energy for growth (so-called anaerobic anoxygenic phototrophs [AAP]) increased by 32-fold in the illuminated treatments, compared to non-illuminated controls. These bacteria play an important role either as primary producer or destruents of organic matter, forming the base of any aquatic foodweb. By using modern molecular and biochemical tools it became clear that overall microbial degradation of algal organic matter as well as aquatic carbon cycling were stimulated by Skyglow. Consequently, Skyglow and other anthropogenic illumination may lead to two phenomena of concern: 1) phytoplankton blooms of unwanted species can be induced or at least prolonged and 2) alteration of lake metabolism with potentially positive feedbacks on current global warming. To minimize the negative consequences of artificial illumination at night, light emissions should be either avoided or at least reduced, e.g. by turning off the light when not needed. Today, intelligent systems recognizing when light is needed, a better shielding of light sources to minimize illumination of adjacent areas, and an optimization of light quality and quantity are efficient measures to reduce negative effects of artificial illumination at night, i.e. alteration of natural circadial cycles of organisms and natural processes, and thus unwanted impacts on human and environmental health.