

Coastal cities leave up to 75% of seafloor exposed to harmful light pollution

July 30 2020, by Mr Alan Williams



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The global expansion of coastal cities could leave more than three quarters of their neighbouring seafloor exposed to potentially harmful levels of light pollution.

A study led by the University of Plymouth (UK) showed that under both cloudy and [clear skies](#), quantities of [light](#) used in everyday street lighting permeated all areas of the water column.

This could pose a significant threat to coastal species, with recent research also involving the University showing that the presence of artificial skyglow can disrupt the lunar compass that species use when covering long distances.

However, the current study found that the colour of the wavelengths shone at the surface had a marked effect on how much biologically important light pollution reached the seafloor.

Many of the white LEDs now being used to illuminate the world's towns and cities use a mixture of green, blue and red wavelengths to generate their brightness.

Green and blue wavelengths left up to 76% and 70% of the three-dimensional seafloor area exposed to light pollution, respectively, while the presence of red light was less than 1%.

The research—which also involved Bangor University, the University of Strathclyde and Plymouth Marine Laboratory—is published in *Scientific Reports*, an online journal from the publishers of *Nature*.

It is the first study in the world to quantify the extent to which biologically important artificial light is prevalent on the seafloor and could, in turn, be having a detrimental effect on [marine species](#).

Dr. Thomas Davies, Lecturer in Marine Conservation at the University of Plymouth and the paper's lead author, made the following statement:

"The areas exposed here are not trivial. Our results focused on busy

marine areas and demonstrate that the light from coastal urban centres is widespread across the sea surface, sub-surface and seafloor of adjacent marine habitats. But Plymouth is still just one coastal city with a population of 240,000 people.

"Seventy-five percent of the world's megacities are now located in coastal regions and coastal populations are projected to more than double by 2060. So unless we take action now it is clear that biologically important light pollution on the seafloor is likely to be globally widespread, increasing in intensity and extent and putting marine habitats at risk."

Funded by National Geographic, the European Regional Development Fund and the Natural Environment Research Council, the study focussed on Plymouth Sound and the Tamar Estuary, which together form a busy waterway and are home to the largest naval port in Western Europe.

It was conducted over four nights in 2018 when there was little or no moonlight, and blue, green, and red artificial light was shone at the sea surface during both clear and cloudy conditions and at low and high tide. A combination of mapping and radiative transfer modelling tools were then used to measure exposure at the surface, beneath the surface and at the seafloor.

The researchers are now calling for a more comprehensive review of the full impacts of coastal [light pollution](#) to try to mitigate the most harmful effects as coastal cities grow globally.

Dr. Tim Smyth, Head of Science of Marine Biogeochemistry and Ocean Observations at Plymouth Marine Laboratory, said, "Light pollution from coastal cities is likely having deleterious impacts on seafloor ecosystems which provide vital ecosystem services. We investigated this by visiting the Tamar, Plym and Plymouth Sound for four successive

nights in September 2018. The time-lapse video of our trips really highlights how bright our shorelines are at night. During the fieldwork we measured the above-water light field and in-water optics as well as running in-water light modelling simulations in order for us to map the light field across the whole of the Tamar Estuary network."

The full study—Davies et al., Biologically important artificial light at night on the [seafloor](#)—is published in Nature's *Scientific Reports*.

More information: Thomas W. Davies et al. Biologically important artificial light at night on the seafloor, *Scientific Reports* (2020). [DOI: 10.1038/s41598-020-69461-6](#)

Provided by University of Plymouth

Citation: Coastal cities leave up to 75% of seafloor exposed to harmful light pollution (2020, July 30) retrieved 27 April 2024 from <https://phys.org/news/2020-07-coastal-cities-seafloor-exposed-pollution.html>

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