

## Editorial precomment

Dear readers,

We believe that open discussion on various research topics plays a key role in scientific progress as an essential stage for open and respectful communication of scientists. Therefore, here, along with the original work of [Zaimenko et al. \(2023\)](#), we publish a respective critical letter of Dr. Mykyta Peregrym, which we received after. We encourage other researchers to express their opinion on this topic and contribute to the discussion.

Besides this, we inform you that the paper of [Zaimenko et al. \(2023\)](#) passed three rounds of revision before it was finally accepted for publication, and most of the issues mentioned by Dr. Mykyta Peregrym were hardly debated

with authors during the review process. The manuscript was received on November 11, 2022, and published only on May 3, 2023, when all critical issues were resolved. In particular, the authors have proved the correctness of *Tilia* identification during the review process by providing additional photos not included in the original publication. The potential influence of the soil properties has also been constructively discussed with the authors and, as we agreed, will be more precisely investigated in future. Hence, we believe the mentioned paper deserves to be published despite some weak moments. We expect that it is a viable pilot project that will result in further, more comprehensive investigations on ALAN, which has a vast perspective in Ukraine.

Dr. Andriy Novikov on behalf of the  
Editorial Office of Plant Introduction

<https://doi.org/10.46341/PI2023005>

UDC 581.1 : 581.5 : [58.02 + 58.05]

CORRESPONDENCE

## One more consequence from the impact of artificial light at night

 Mykyta Peregrym<sup>1,2</sup>

<sup>1</sup> Department of Landscape Gardening and Ecology, Luhansk Taras Shevchenko National University, Hohol' str. 90, 37600 Myrhorod, Poltava region, Ukraine; [mykyta.peregrym@gmail.com](mailto:mykyta.peregrym@gmail.com)

<sup>2</sup> Ecology and Genetics Research Unit, University of Oulu, P.O. Box 3000, 90014 Oulu, Finland; [mykyta.peregrym@oulu.fi](mailto:mykyta.peregrym@oulu.fi)

**Received:** 22.06.2023 | **Accepted:** 07.08.2023 | **Published online:** 11.08.2023

---

### Abstract

Using artificial light at night gives a lot of benefits for humanity, but, at the same time, it has changed our planet significantly. However, the problem was not taken seriously until its scale became noticeable. Though, skepticism, even among many recognized researchers, is still present, although this is expressed mainly in personal conversations. But, in any way the number of studies on this topic is increasing quite rapidly. Unfortunately, a part of these publications is not qualitative, published apparently without proper review, and this can seriously distort the understanding of the problem, have an impact on other scientific research, and also complicate the search for optimal ways to solve the problem of light pollution. One of such recently published works with the title "The effect of nighttime lighting on the anatomical and physiological features of the leaves of linden, horse chestnut, and plane trees in garden-park and street plantings of Kyiv" has caused a desire to pay attention to this situation, and to prevent similar ones in the future. So, the critical review of the mentioned study is presented here.

**Keywords:** review, methodology, terminology, research quality

Using ALAN (artificial light at night) gives a lot of benefits for humanity (Gaston et al., 2015), but, at the same time, it has changed our planet significantly. Probably, it is impossible to find another anthropogenic factor which has a stronger, faster and more global impact than ALAN. Almost everyone can observe the lit Earth's surface traveling by airplane in the late evening or night time, but watching starry skies at nights standing at the land becomes more and more complicated. Some facts about the level and dynamics of the present light pollution have caused a shock: a) more than 80% of the population of the world and more than 99% of that of the U.S. and Europe live under light-polluted skies; b) the Milky Way is hidden from more than one-third of humanity, including 60% of Europeans and nearly 80% of North Americans; c) 23% of the world's land surface area between 75°N and 60°S, 88% of Europe, and almost half of the United States experiences light-polluted nights (Falchi et al., 2016). ALAN consequences are deep and severe, because they have a significant impact on reproduction, navigation, behaviour, foraging, habitat selection, communication, and social interactions of all living beings (Cho et al., 2015; Dominoni et al., 2016; Schroer & Hölker, 2017; Grubisic et al., 2019; and others). It causes cascading effects with unpredictable results in terrestrial and water ecosystems (Perkin et al., 2011; Bennie et al., 2015; Bolton et al., 2017; and others). Besides, ALAN can be considered as a driver of evolution across urban-rural landscapes (Hopkins et al., 2018). However, though new data appears about ALAN impact almost every month, there are still many gaps in our knowledge about the process.

Back to the past, we can see that the problem connected with ALAN using was not taken seriously until its scale became noticeable. People thought that ALAN was only a difficulty for astronomical investigations and did not have any significant effect on them and other living organisms. Skepticism, even among many recognized researchers, is still present, although this is expressed mainly in personal conversations. But, in any way the number of studies on this topic is increasing quite rapidly (Pérez Vega et al., 2022). Unfortunately, a part of these publications is not qualitative, published apparently without proper review, and this can seriously distort

the understanding of the problem, have an impact on other scientific research, and also complicate the search for optimal ways to solve the problem of light pollution. Actually, one of such recently published works with the title "The effect of nighttime lighting on the anatomical and physiological features of the leaves of linden, horse chestnut, and plane trees in garden-park and street plantings of Kyiv" (Zaimenko et al., 2023) has caused a desire to pay attention to this situation, and to prevent similar ones in the future. This may sound somewhat sarcastic, however, the rapid increase in the number of publications devoted to the study of the ALAN impact, as well as the appearance of a certain percentage of low-quality publications, can be considered as an indirect ALAN effect on human (namely researchers), since this phenomenon is increasingly arousing their interest, as well as the desire get quick dividends (the high number of citation, the increasing *h*-index, etc.) from their publications.

What are the main problems of the mentioned paper by Zaimenko et al. (2023) and why we cannot trust this research? Their list is relevantly long, so they will be analysed from "Introduction" to "Conclusions". First of all, the authors wrote that "Despite the world scientific community's considerable attention to the ecological consequences of light pollution, such studies have been practically absent in Ukraine until recently". It is a false assertion, because such studies have already been carried out in Ukraine (Peregrym et al., 2018, 2019, 2020) as well as they are going on. Further, *Tilia cordata* Mill., *Aesculus hippocastanum* L. and *Platanus acerifolia* Willd. were selected as model species for the current research, however it would be perfect to have a confirmation (as photographs in the text or herbarium specimens in any herbarium collection) of the correct identification of these species, especially taking into account the diversity of species and their hybrids of the genus *Tilia* L. which are used for plantings creation within Kyiv. It is important to increase trust in data, because no one from the authors are dendrologists, as well as the journal *Plant Introduction* published articles early where the species were named mistakenly. A striking example is the paper "Expansion of *Parthenocissus quinquefolia* (L.) Planch. into plantings of Kryvyi Rih area" (Korshikov &

Bondarenko, 2017) where clearly seen from pictures of this article that *P. inserta* (A. Kern.) Fritsch was studied in this research instead of the species mentioned in the title and within all text.

However, most questions arise to the article section “Material and methods”. In the first sentence, the authors specified that ‘the territory of the M.M. Gryshko National Botanical Garden (Site 1), which is not exposed to nighttime artificial lighting, and on the street plantings of Lesia Ukrainka blvd. (Site 2) exposed to significant artificial lighting’. But it is absolutely unclear what data was used to make such a claim. Though we do not know the accurate geographic coordinates of the selected sites and test plots, but even only taking into account the approximate locations of these experimental sites what is possible to estimate from Figure 1, and look at the online version of the “New world atlas of artificial sky brightness” (Falci et al., 2023) or summarized data for 2021 from Visible Infrared Imaging Radiometer Suite (VIIRS – Stare, 2023), we will not note any significant differences in the high level of light pollution of these areas. Unfortunately, only this error calls into question the reliability of the experiment, as well as the conclusions based on its results. Moreover, it is worth paying special attention to Figure 1. It shows the location of the experimental sites, but there is no scale as well as it is unclear which exact satellite image was used for the preparation of this illustration and whose company this product can belong. This situation looks like it would infringe copyright rights. Also, there is a severe question, if we know nothing about the accurate locations of test plots, in the sense of using data from VIIRS with a 500 m spatial resolution night sensor. How useful, valuable, and objectively was that?

The next confused moment is the period when the authors measured the illumination and temperature on the soil surface. They did not explain for which reasons it was carried out in the day time, as well as why the time between 21:00 and 00:00 were chosen to be night measurements. It is especially interesting because twilight time is absolutely different from May to September (the time of the research) on the latitude of Kyiv, and for example even civil twilight starts after 21:00 in the second

part of June. Another significant drawback of the article section is that the authors did not indicate how many times they collected soil samples and at what time. Therefore, it is possible to suggest from Table 3 that it was done only one time, not sure that in the same day, so this data cannot be considered as a proof that the described morphological differences of studied trees are solely a consequence of the ALAN impact.

Further, a discussion moment is the authors’ approach to the collection of tree leaves for quantification of photosynthetic pigments. It is noted that ten leaves from each sample site, 50 leaf samples for each tree species were selected three times during the experiment. It is not clear what ‘sample site’ is, because this phrase did not explain and is used just once in the article. However, it is more important that the authors did not pay attention that leaves of every side of the studied trees, at least along Lesia Ukrainka blvd. is under different levels of the ALAN impact at night time. It is because of the location of lighting pole lines there. Hence, one side of a tree can be constantly more illuminated and at the same time another one can be in shadow. Therefore, the sense of mixing all the leaves from different sides of the trees for one experiment is questionable.

The discussion of the following sections of the article by Zaimenko et al. (2023) makes little sense, since, as shown above, this research experiment was conceived, designed and performed incorrectly. Most importantly, there is no conclusive evidence that any changes of the anatomical and physiological features of the leaves of the studied species in garden-park and street plantings of Kyiv were influenced by ALAN. However, even if these changes actually happened, the authors in their “Conclusions” do not say a word about the significance of this fact and its possible practical value.

Finally, it is vital to pay attention to the terminology of this paper. The authors use the following terms ‘artificial illumination’, ‘nighttime lighting’, ‘light at night’, ‘light pollution’, ‘nighttime illumination’, ‘night illumination’ and simply ‘illumination’ within their text in the same sense that is absolutely incorrect. The differences in these terms is explained in the article by Pérez Vega et al. (2022), and also other terminologies and definitions accepted in research of light

pollution and its consequences are given in the mentioned publication.

Thus, it would be wrong to say that the fact that there are new studies on the ALAN impact on biodiversity and ecosystems in Ukraine is bad. However, these studies should be of a qualitatively different level, and when they are published, a conflict of interest should not be allowed. The situation when the first author of an article is the editor-in-chief of the journal where it is published, the director of the organization of the National Academy of Science of Ukraine, which finances the publishing of this journal, with all administrative functions and capabilities, and a corresponding member of the National Academy of Sciences of Ukraine with a certain influence on the decisions of this structure, at the same time is not an example of academic integrity.

Last but not least, I would like to thank the Armed Forces of Ukraine for their heroic efforts to save life activity within the country that gives possibilities to have this discussion on the pages of a Ukrainian scientific journal as well as to continue investigations for my colleagues who stay in the country. Also, I am very grateful to the Biodiverse Anthropocenes research project (University of Oulu, Finland), supported by the Academy of Finland PROFI6 funding (2021–2026), project Nr 336449, for their strong support of Ukrainian researchers in the time of the Russian invasion in Ukraine that in particular allows me to express my opinion about the latest studies of the ALAN impact on biodiversity and ecosystems.

## References

Bennie, J., Davies, T.W., Cruse, D., Inger, R., & Gaston, K.J. (2015). Cascading effects of artificial light at night: Resource-mediated control of herbivores in a grassland ecosystem. *Philosophical Transactions of the Royal Society B: Biological Sciences*, 370(1667), Article 20140131. <https://doi.org/10.1098/rstb.2014.0131>

Bolton, D., Mayer-Pinto, M., Clark, G.F., Dafforn, K.A., Brassil, W.A., Becker, A., & Johnston, E.L. (2017). Coastal urban lighting has ecological consequences for multiple trophic levels under the sea. *Science of The Total Environment*, 576, 1–9. <https://doi.org/10.1016/j.scitotenv.2016.10.037>

Cho, Y., Ryu, S.-H., Lee, B.R., Kim, K.H., Lee, E., & Choi, J. (2015). Effects of artificial light at night on human health: A literature review of observational and experimental studies applied to exposure assessment. *Chronobiology International*, 32(9), 1294–1310. <https://doi.org/10.3109/07420528.2015.1073158>

Dominoni, D.M., Borniger, J.C., & Nelson, R.J. (2016). Light at night, clocks and health: from humans to wild organisms. *Biology Letters*, 12(2), Article 20160015. <https://doi.org/10.1098/rsbl.2016.0015>

Falchi, F., Cinzano, P., Duriscoe, D., Kyba, C.C.M., Elvidge, C.D., Baugh, K., Portnov, B.A., Rybnikova, N.A., & Furgoni, R. (2016). The new world atlas of artificial night sky brightness. *Science Advances*, 2(6), Article e1600377. <https://doi.org/10.1126/sciadv.1600377>

Falchi, F., Cinzano, P., Duriscoe, D., Kyba, C.C.M., Elvidge, C.D., Baugh, K., Portnov, B.A., Rybnikova, N.A., & Furgoni, R. (2023). *The new world atlas of artificial night sky brightness*. Matthew Price/CIRES. <https://cires.colorado.edu/Artificial-light>

Gaston, K.J., Gaston, S., Bennie, J., & Hopkins, J. (2015). Benefits and costs of artificial nighttime lighting of the environment. *Environmental Reviews*, 23(1), 14–23. <https://doi.org/10.1139/er-2014-0041>

Grubisic, M., Haim, A., Bhusal, P., Dominoni, D.M., Gabriel, K.M.A., Jechow, A., Kupprat, F., Lerner, A., Marchant, P., Riley, W., Stebelova, K., van Grunsven, R.H.A., Zeman, M., Zubidat, A.E., & Hölker, F. (2019). Light pollution, circadian photoreception, and melatonin in vertebrates. *Sustainability*, 11(22), Article 6400. <https://doi.org/10.3390/su11226400>

Hopkins, G.R., Gaston, K.J., Visser, M.E., Elgar, M.A., & Jones, T.M. (2018). Artificial light at night as a driver of evolution across urban-rural landscapes. *Frontiers in Ecology and the Environment*, 16(8), 472–479. <https://doi.org/10.1002/fee.1828>

Korshikov, I.I., & Bondarenko, I.O. (2017). Expansion of *Parthenocissus quinquefolia* (L.) Planch. into plantings of Kryvyi Rih area. *Plant Introduction*, 75, 49–55. <https://doi.org/10.5281/zenodo.2324138> (In Ukrainian)

Peregrym, M., Péntzesné Kónya, E., & Falchi, F. (2020). Very important dark sky areas in Europe and the Caucasus region. *Journal of Environmental Management*, 274, Article 111167. <https://doi.org/10.1016/j.jenvman.2020.111167>

Peregrym, M., Péntzesné Kónya, E., & Vasyliuk, O. (2018). The impact of artificial light at night (ALAN) on the national nature parks, biosphere and nature reserves of the Steppe zone and Crimean Mountains within Ukraine. *Paelearctic Grasslands*, 39, 8–14. <https://doi.org/10.21570/EDGG.PG.39.8-14>

- Peregrym, M., Vasyliuk, O., & Kónya, E.P. (2019). Artificial light at night as a new threat for nature conservation in Ukraine. *Vestnik Zoologii*, 53(6), 459–470.
- Pérez Vega, C., Zielinska-Dabkowska, K.M., Schroer, S., Jechow, A., & Hölker, F. (2022). A systematic review for establishing relevant environmental parameters for urban lighting: translating research into practice. *Sustainability*, 14(3), Article 1107. <https://doi.org/10.3390/su14031107>
- Perkin, E.K., Hölker, F., Richardson, J.S., Sadler, J.P., Wolter, C., & Tockner, K. (2011). The influence of artificial light on stream and riparian ecosystems: questions, challenges, and perspectives. *Ecosphere*, 2(11), Article 122. <https://doi.org/10.1890/ES11-00241.1>
- Schroer, S., & Hölker, F. (2017). Impact of lighting on flora and fauna. In R. Karlicek, C.-C. Sun, G. Zissis, & R. Ma (Eds.), *Handbook of advanced lighting technology* (pp. 957–989). Springer International Publishing. [https://doi.org/10.1007/978-3-319-00176-0\\_42](https://doi.org/10.1007/978-3-319-00176-0_42)
- Stare, J. (2023). *Lightpollutionmap* (v2.8.23). <https://www.lightpollutionmap.info/>
- Zaimenko, N., Klymchuk, D., Akimov, Y., Kuchma, T., Didyk, N., Chudovska, O., & Ivanytska, B. (2023). The effect of nighttime lighting on the anatomical and physiological features of the leaves of linden, horse chestnut, and plane trees in garden-park and street plantings of Kyiv. *Plant Introduction*, 97–98, 33–45. <https://doi.org/10.46341/PI2022021>

## Ще один наслідок впливу нічного штучного світла

Микита Перегрим<sup>1,2</sup>

<sup>1</sup> Кафедра садово-паркового господарства та екології Луганського національного університету імені Тараса Шевченка, вул. Гоголя, 90, м. Миргород, Полтавська область, 37600, Україна

<sup>2</sup> Відділ досліджень екології та генетики, Університет Оулу, а/с 3000, 90014 Оулу, Фінляндія

Використання нічного штучного світла надає багато користі для людства, але, в той же час, істотно змінило нашу планету. Однак до проблеми серйозно не ставилися, поки не стали помітні її масштаби. Хоча скептицизм, навіть у багатьох визнаних дослідників, все ще присутній, висловлюється він переважно в особистих розмовах. Але, у будь-якому випадку кількість досліджень на цю тему зростає досить швидко. На жаль, частина цих публікацій є неякісними, опублікованими, очевидно, без належного рецензування, що може серйозно спотворити розуміння проблеми, вплинути на інші наукові дослідження, а також ускладнити пошук оптимальних шляхів вирішення проблеми світлового забруднення. Одна з таких нещодавно опублікованих робіт під назвою “Вплив нічного освітлення на анатомо-фізіологічні особливості листя липи, каштана кінського, і платана в садово-паркових і вуличних насадженнях Києва” викликала бажання звернути увагу на цю ситуацію, та не допустити повторення у майбутньому. Отже, тут подано критичний огляд згаданого дослідження.

**Ключові слова:** рецензія, методологія, термінологія, якість дослідження