
Heat islands and chronic stress ”Impacts of rising temperatures on living organisms”.

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Résumé

At a time when human populations are undergoing unprecedented demographic change, cities are having to accommodate more and more city dwellers. Urban sprawl is leading to the gradual loss of green spaces, which, combined with global warming, is encouraging the formation of urban heat islands (UHIs). Our study aims to compare and combine two open-access methods for locating and characterising current UHIs in the city of Poitiers (France). The first method is implemented in Invest 3.8.7 software and takes into account several parameters such as albedo, evapotranspiration, shade of trees over 2m and land use in order to provide a heat attenuation index (i.e. HMI) and therefore to model the distribution of heat zones, particularly during the summer period when temperatures are hottest. The second method is based on temperature data recorded by Landsat (LST) satellites and compares these with the spatial distribution of previously modelled HMI values. By compiling both methods and databases, we can reliably identify and characterise the UHIs within our study area. Secondly, we apply this approach to a map of the study area in 1993 in order to estimate the spatio-temporal evolution of UHI between 1993 and currently.

The mapping of current UHIs enabled us to draw up our sampling plan across the study area in order to study and understand the effects of heat islands (UHIs) and cool islands (UCIs) on urban biodiversity. To do this, we focused on birds, chiropterans and terrestrial isopods (woodlice). Firstly, we assessed the species richness of birds and estimated the potential for bats to avoid UHIs. Secondly, we used the methodology previously developed by Depeux et al (2020, 2023) to quantify the stress on woodlice sampled within the ICU and IFU.

The results show a spatio-temporal change in heat zones between 1993 and currently. Moreover, biodiversity indices suggest a higher species richness in UCI than in UHI. Although we expect increased stress in sowbugs from UHI, analyses are ongoing. The results of this study could help and guide future local urban planning in order to improve the mitigation and cooling potential of UHIs in the cities of tomorrow.

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Mots-Clés: Urban heat islands, HMI, Landsat, temperature, spatio temporal evolution.