

Does street lighting change the composition of arthropod communities?

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Introduction

Widely present electrical lights are introducing light at times and places where it does not naturally occur. This 'light pollution' has been shown to be harmful to a variety of animals, including arthropods (Davies et al., 2012.). It can impede communication among arthropods, diminish their average lifespans, and even change their physiology (reference). Species abundances and the composition of arthropod communities can be altered by different behaviour towards light sources between different animal groups (reference).

In this study, we asked whether artificial street lighting significantly affects abundance and alpha diversity of the terrestrial arthropod communities.

Materials & Methods

The study was conducted on multiple sites in and near the National Park Neusiedlersee-Seewinkel (Illmitz), during the nights of April 25th and 26th, 2019. The locations were chosen to represent similar meadow habitats, but some variance was inevitable.

During the two nights, ten pitfall traps were set, five each in artificially illuminated and dark locations, resulting in twenty samples total at four locations total. At each trap, the coordinates and light intensity were measured via smartphone using Locus Map, Ver. 3.37.2 and Lux Meter, Ver. 18.08.29, respectively. Vegetation and time were documented by smartphone camera.

The animals in each trap were counted and identified as accurately as possible to get an estimate of relative abundance and diversity. When identification was not possible, morphotypes were defined.

Statistical analyses were conducted in R version 3.5.1 (R Core Team, 2015), using packages *vegan* (Oksanen et al., 2007) & *ecodist* (Goslee & Urban, 2007). The effects of light and environmental variables on abundance and alpha diversity (Shannon) were analyzed using a linear model, tested for normality. To visualize differences in the community compositions of light and dark locations we used non-metric multidimensional scaling (NMDS) plots.

Results & Discussion

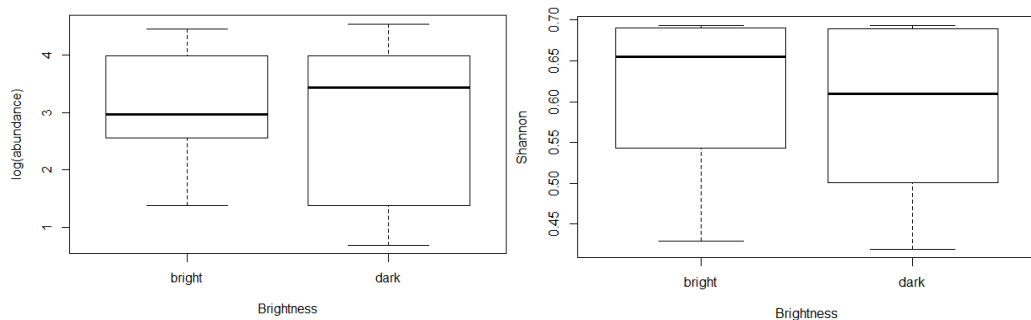


Fig. 1: Boxplot showing the differences in log(abundance) and Shannon diversity (on which level?) between bright and dark areas.

In total we counted 493 individuals of 87 morphotypes. During the second night, counts of individuals and morphotypes were much lower; this might have been due to lower temperatures, because arthropods tend to be less active when temperatures drop (Bergmann et al. 1996, Mellanby, 2012). The statistical analyses showed no significant difference between light and dark locations in either abundance or diversity (Figure 1). Vegetation density showed a tendency to influence both positively, but this may be due to the densest spots being sampled in the first, warmer night, and was not significant. The NMDS showed no significant results. Missing: what does this mean? No discussion.

References

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