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Biomass, abundance and diversity of nocturnal insects – with a focus on moths (Lepidoptera) – in organic and conventionally managed vineyards

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Introduction

We studied the community composition of nocturnal insects – especially moths (Lepidoptera) – in the agricultural landscape with a special focus on a comparison of organic and conventionally managed vineyards.
Moths play an important role in pollination (Scoble 1995) and they are a major food source for bats and – mainly as caterpillars – for birds (Fox et al. 2006). But some moths are also pest organisms in agriculture and they are targeted with insecticides or pheromones (e.g. the European Grapevine Moth (*Lobesia botrana*) and the Vine Moth *(Eupoecilia ambiguella)* in vineyards).

Material and Method

Insects were sampled by means of light-traps (Figure 1) from June to September 2008. We used a matched pair design of organic and conventional acreage with four pairs of vineyards in a region in the southern part of Rhineland-Palatinate (Figure 2). The insects were trapped during the same nights for every pair to afford a direct comparison between the organic and conventionally managed acreage. The trapped insects were classified to order, the macrolepidoptera to family and the Noctuidae (deltoid moth) to species-level. Biomass was calculated with body length to body mass conversion equations, which were developed during the study.
The abundance and biomass of the sampled insects and the species-richness of Noctuidae were compared for the different pairs.

Figure 1: Light-trap

Figure 2: Organic vineyard of the study site.

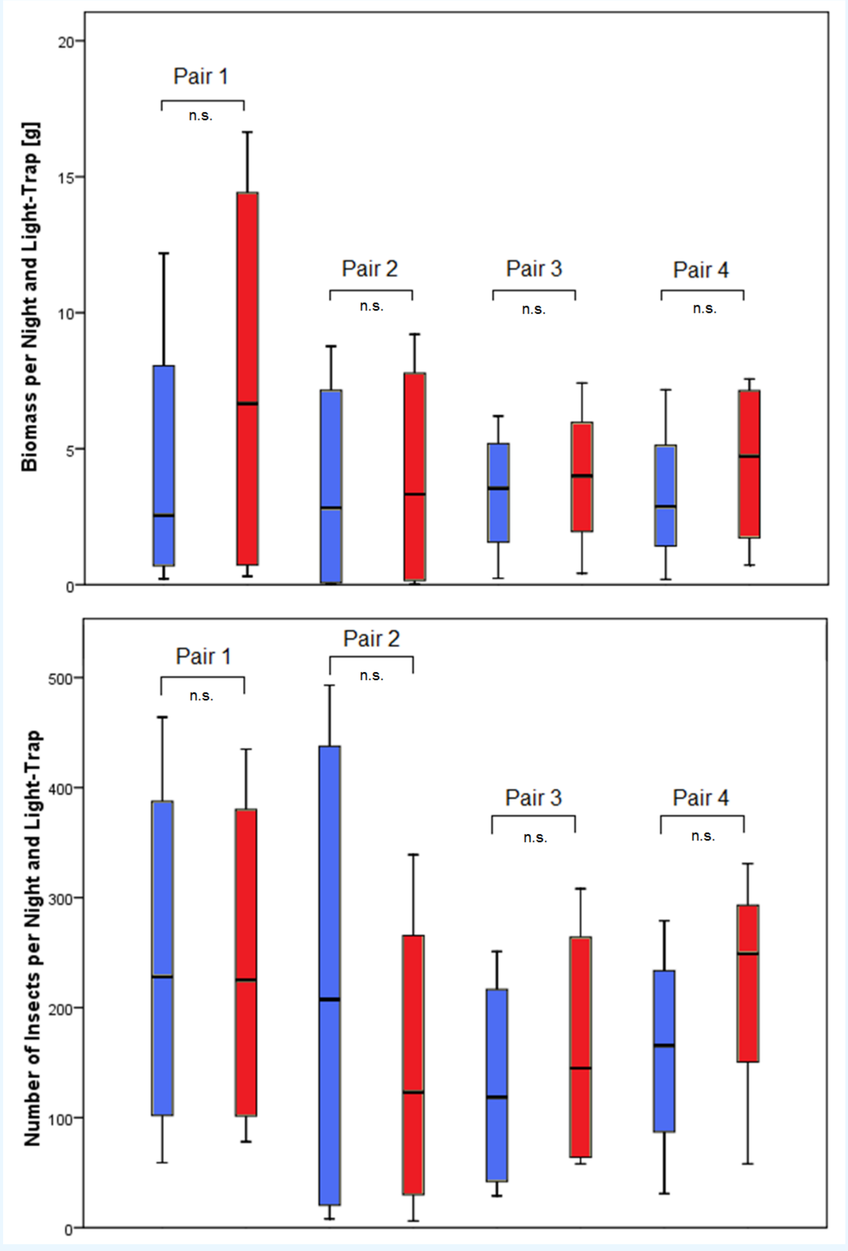

Figure 3: Box-plot of biomass and number of insects per night and light-trap of four pairs of organic (red) and conventional (blue) vineyards. N = 4. Mann-Whitney-U: n.s.: no significance

Results und Discussion

For this examination 6.150 insects were trapped in the eight vineyards.
No statistically significant differences between organic and conventional vineyards in abundance and biomass of all insects trapped per night (Figure 3) and the frequently sampled insect orders (Lepidoptera, Coleoptera, Diptera, Heteroptera, Hymenoptera and Trichoptera) have been found (Mann-Whitney-U). The species-richness of the Noctuidae has been comparable anent the vineyard-pairs, too.
In the vineyards of the study site the two important pest organisms (see Introduction) have been treated with pheromones instead of insecticides. Concerning this treatment, there was no difference between both vineyard types. A greater plant-diversity in organically managed vineyards was found but the occurrence of the frequently growing plants were similar in organic and conventional vineyards. These could be some reasons for finding no differences.

Conclusion

Our findings that there are no differences between organic and conventional sites are in accordance with results of Weibull et al. (2003), who discussed that the landscape heterogenity could be more important for biodiversity than the managing form of the acreages. However, management effects could be masked since organic vineyards are only representing a small proportion of the landscape and moths are integrating over a larger area of the landscape.
Most of the trapped insect orders are known as food source for bats, so that in this vineyards the insect resources comply to the food-requirements of different bats.

Literature:

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Figures:

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