

Community in a box:
Ecology of a miniature trophic network

Habilitation thesis

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ABSTRACT

The present habilitation thesis provides the summary of my studies undertaken between 2011 and 2018, after I finished my PhD. During these studies I targeted ecological community characteristics, including composer species abundances, life history, adult sex ratio and system stability of the gall inducer *Diplolepis rosae*. These studies derived from a large-scale dataset collected in different regions of the Carpathian basin through several years.

Plant galls – intriguing structures made by a host plant but induced by another living organism – provide a special substrate for a large group of herbivorous animals, mostly insects, where they can feed, and where they are protected against unfavourable environmental conditions and their predators during larval development. One of them, maybe the most well known in the Western Palearctic, is the rose bedeguar gall (*Diplolepis rosae*) which appears on a large range of wild rose species. Despite the rose bedeguar is the most abundant rose gall in Europe and some aspects of their life history and that of the community composers is already known, ecological and landscape level characteristics of the gall inhabiting community were vaguely studied.

The enemy hypothesis, which explains plant gall structural diversity and predicts that gall traits will influence natural enemy (a predator that consumes its prey slowly: parasitoid) attack rates, and that galls with contrasting morphologies will support different parasitoid communities was not studied in the case of rose galls. Multispecies coexistence from the perspective of common and rare species, as bird predation effects were neither studied before in this case. Parasitoid adult sex ratios (ASRs) are known to be strongly biased, but less information is available on large scale variable effects such as landscape composition or fragmentation. Large scale effects on parasitoid ASR are also of great interest since generalisations are needed for applicability in conservation efforts. The ecological background of biased parasitoid ASRs also need a research effort from the perspective of this community. Investigations targeting characteristics of networks formed by rose bushes and quantitative webs of rose gall parasitoids along land-use intensity gradients were also missing. The before mentioned aspects rely also on the spatial and landscape level environmental changes of rose galls.

Results regarding the enemy hypothesis confirm that gall extended phenotypes can significantly influence enemy attack rates, so these are consistent with the 'enemy hypothesis'. Parasitism rates and parasitoid incidence showed correlations with local characteristics in some cases, with landscape characteristics in others and, in some other cases with both. Differences between species-specific and overall responses highlight the importance of species characteristics when considering multiparasitoid communities, and support both fine and coarse partitioning between different species coexisting in the community. Regarding biased parasitoid ASRs results support the hypothesis that large-scale environmental characteristics affect parasitoid ASRs besides intrinsic and local ones. Rare species of the community are more sensitive to landscape-level changes than common species. Similarly, to parasitoids, bird predation makes a considerable contribution to the mortality of gall inducer larvae, and its influence on gall size is in direct contrast to the effect of parasitoids. This suggests that the balance between predation and parasitoid attack shapes the optimal size of *D. rosae* galls. Based on the results of network and web characteristics studies involving rose galls, it can be affirmed that stability of these communities can increase as landscapes become less complex. This is an intriguing aspect of landscape homogenisation effect on biological communities that contrasts with most expectations and the majority of the relevant literature, where decreasing community stability is usually associated with landscape homogenization.

In the last part of habilitation thesis are presented the future scientific development plans of the candidate.