Landscape dynamics of tachinid parasitoids

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Habitat fragmentation and the intensification of agricultural landscapes are among the main drivers affecting parasitoid diversity. Although many empirical and theoretical studies have elucidated the effects of these processes on populations and communities of parasitoids, the majority of the research has been focused on specialized groups of hymenopterans. For this reason, for my PhD thesis I studied the highly-diverse group of tachinid parasitoids as an alternative model system to test the effects of landscape fragmentation and agricultural intensification on the third trophic level (Fig. 1). Last year I completed my PhD program at the university of Padova in Italy under the supervision of Dr. Lorenzo Marini, Prof. Andrea Battisti and Dr. Pierfilippo Cerretti.

During my PhD project I sampled with pan-traps a variety of habitats from Mediterranean grasslands to Alpine forest. This allowed me to work with a great diversity of tachinids. Specifically, I collected and identified more than 18,900 individuals belonging to 240 species. Interestingly, four species were recorded for the first time in Italy: *Chetogena micronychia* (Masson), *Linnaemya zachvatkini* Zimin, *Oswaldia eggeri* (Brauer and Bergenstamm) and *Pseudomintho diversipes* (Strobl).

The thesis is divided into six main chapters, where the first chapter includes a general introduction. In the second chapter, the effects of habitat fragmentation on the diversity of tachinids are evaluated (Inclán et al. 2014). This chapter evaluates the relative importance of habitat loss, decrease of connectivity and their potential interaction on tachinid diversity. This chapter shows that the reduction of habitat area and the loss of connectivity significantly interacted, suggesting that management practices aimed at mitigating the negative effect of habitat fragmentation need to consider the connectivity in the surrounding landscape.

In the following chapters, diverse components of the intensification of agricultural landscapes are evaluated. In Chapter III, the diversity of tachinids are examined in relation to farm management (organic vs. conventional) at different spatial scales (Inclán *et al*. 2015a). This study shows that organic management improved the diversity of tachinids at both the local and landscape scales but only in arable crops while the effect in grasslands was neutral. Thus, any attempt to enhance parasitoid diver-

Figure 1. Author collecting tachinids in a meadow in Italy.

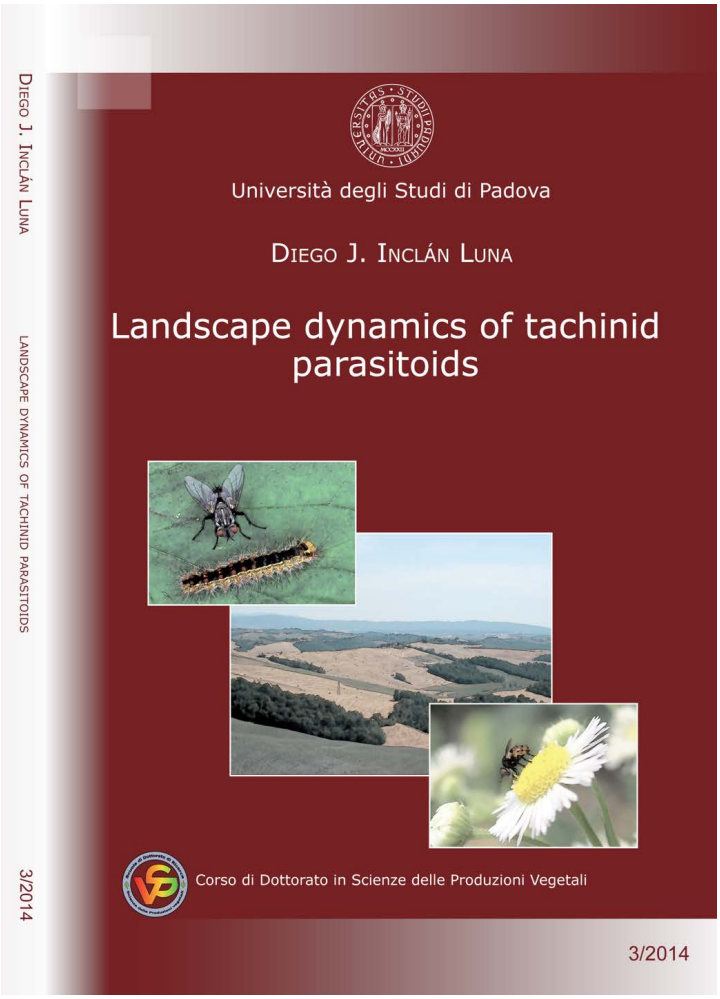

Figure 2. Cover of PhD thesis.

sity needs to consider the local farming system in relation to the agricultural management in the surrounding landscape.

In Chapters IV and V the spatial dynamics and movement of parasitoids between crop and non-crop habitats are evaluated (Inclán *et al*. 2015b, Inclán *et al*. 2016). These chapters show that the spillover of tachinid parasitoids are favored by the low contrast in habitat structure between the crop and non-crop habitats. The highest spillover of parasitoids to arable land was found from herbaceous semi-natural habitats, while woody structure reduced the exchange of individuals between arable crop and non-crop habitats. Finally, in the last two chapters the effects of different field margins to enhance farmland biodiversity are examined (Dainese *et al*. 2015, Inclán *et al*. 2016). The results from these chapters demonstrate that the positive effect of field margins to enhance the diversity of tachinids was related to the type and complexity of these semi-natural habitats.

This research provides new insights into the consequences of landscape changes on the diversity of a key functional group that has been long overlooked in ecological and conservation studies. The results will provide guidelines to implement conservation measures to halt or reduce biodiversity loss of this important group of parasitoids.

Full text link to thesis (Fig. 2):
http://paduaresearch.cab.unipd.it/7731/1/Inclán_PhD_thesis_final.pdf

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