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Host-Natural Enemy Network in a bee-wasp community from a fragmented Atlantic Forest

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Top-down factors, such as predation and parasitism, are important mechanisms of population control. Most antagonist interactions are highly specialized, both in phylogenetic terms and in the number of interacting species. Our objective was to describe the interactions between trap-nesting solitary bees and wasps and their natural enemies in a fragmented Atlantic Forest. Trap-nests placed on the edge of forest fragments were used to sample 29 sites in the Cantareira Hill, São Paulo state, in a hot and wet season from September/2015 to March/2016 and September/2016 to March/2017. The following network metrics were calculated: weighted nestedness (weighted NODF), Specialization (H_2') and Modularity (M). We also performed a niche overlap analysis to determine the percentage of host species shared among natural enemy species and the percentage of natural enemies shared among host species. A generalized linear model (GLM) was used to test the relationship between natural enemy species richness and host species richness and abundance. The community consisted of 3 host bees and 11 hosts wasps that interacted with 12 parasitic wasps of the Chrysididae family, 5 parasitic bees of the Apidae family, 1 species of Ichneumonidae, 3 species of Leucospidae, 2 species of Diptera and 2 species of Coleoptera. Natural enemy richness was positively related to host species richness ($F=24.85$, $p=0.001$) and host abundance ($F=22.62$, $p=0.001$). The network was significantly modular ($M=0.63$, $p=0$), but nestedness was low (weighted NODF=10.42). The network was less specialized than expected by chance ($H'_{obs}=3.36$; $H'_{ran}=3.84$; $p<0.0001$). In spite of this low level of specialization, the percentage of host species shared among natural enemy species (16.71%) and natural enemy species among host species (8.76%) was low. The presence of 7 modules in the network indicates that there are species that interact more with each other than with other network components, in agreement with the high levels of modularity in antagonist networks.

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