

Population dynamics of the ladybird beetle *Harmonia axyridis* (Coleoptera: Coccinellidae) in a field: resource tracking mechanisms and population characteristics

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Abstract

To clarify functional and numerical responses to temporal and spatial variations of resource tracking, and population characteristics of the ladybird beetle *Harmonia axyridis*, I analyzed the results of a 3-year field observation at 7 species plants on 8 species of aphids. The estimated values of population parameters suggested much immigration and emigration of the *H. axyridis* population, although reproductive rates between spring and summer were rather stable all three years. The time spent at each patch and the daily number of adults and eggs were influenced not only by a single factor, but also by interactions among the time and quantity and quality of the prey aphid. The adult movement showed two patterns, which corresponded with the movement within and between the sub-populations. The adult movement intensely occurred within a sub-population. However, the beetles moving between sub-populations had a significantly greater chance to reach the habitat with a higher aphid density. The habitats of *H. axyridis* could be categorized into three types: dominant and suitable habitats for food and reproduction, refuge habitats mainly for food, and refuge habitats for food and reproduction. Thus, *H. axyridis*, with high ability of prey searching and reproduction, maintains a stable population in heterogeneous and temporal habitats by its resource tracking mechanisms, which make *H. axyridis* a top predator at aphidophagous guilds.