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Tillage and Cover Crop Effects on Beneficial Insect Larvae

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Granivorous ground beetles (Coleoptera:Carabidae) are abundant and ubiquitous throughout most agricultural systems, and have the capacity to decrease weed seedbank densities, improving suppression in herbicide-free crop environments. While much research has focused on adult activity patterns and the conservation biological control services they provide, little is known about their biology and habitat requirements during larval stages, despite the fact that adult recruitment is determined by factors that promote larval survival. Our work focuses on *Harpalus pennsylvanicus*, one of the most common and widespread species of invertebrate seed predators in North America, whose peak foraging activity period coincides with senescence of many agriculturally important summer annual weed species. We present results of larval pitfall trap surveys of *H. pennsylvanicus* from two separate experiments, examining its phenology and distribution across tillage and cover cropping gradients in market tomato systems. Larvae emerged predictably 4-6 weeks after the peak in adult activity in 2011 and 2012, and had strong associations with no-till environments, although we found no significant differences in trap capture between killed cover crop types, and surprisingly low larval captures in perennial margins. Compared with adults, larvae are relatively immobile and vulnerable to disturbance; thus, larval distributions should be considered when implementing cultural strategies to enhance weed seed biological control.