A SPACE-TIME ODYSSEY: MOVEMENT OF GYPSY MOTH AND ITS PATHOGENS

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ABSTRACT

Gypsy moth (*Lymantria dispar* (L.)) populations in the United States are constantly spreading to the west and south, although spread is slowed significantly due to the activity of the Slow the Spread Program (Tobin & Blackburn 2007). As gypsy moth spreads, newly established populations can increase quickly. We investigated the period of time required for the entomopathogens and parasitoids infecting gypsy moth to catch up with newly established gypsy moth populations. The specific entomopathogens we investigated were the gypsy moth fungus (*Entomophaga maimaiga*) and the gypsy moth nucleopolyhedrovirus (*Ld*MNPV) and the parasitoids we investigated were tachinids. We identified sites where both pathogens had been released in the past. Studies were conducted in sites with low densities of gypsy moth (quantified using male moth pheromone catches) in south-central Wisconsin from 2005-2007. During 2005 and 2006, studies included: 1) caging larvae at bases of trees; 2) caging larvae in the lower canopy; 3) caging larvae on soil samples in the lab; 4) collecting cadavers in the field; and 5) collecting living larvae in the field and rearing them. In cases when gypsy moth densities were so low that we could not find larvae in the field, we still did not detect any levels of infection in larvae when deployed in the field in cages, or when exposed to field-collected soil under laboratory conditions. Comparing sampling methods from 2005 and 2006 demonstrated that we detected higher levels of infection when rearing field-collected larvae so during 2007 we only employed this latter method.

During 2007, *E. maimaiga* was detected at 38.7 percent of the 31 sites, yielding an average of 12.4 $\pm$ 4.8 percent infection at sites where it was present. Across all years, levels of infection were not associated with distances from release sites although infection was positively associated with male moth density the previous year and negatively associated with male moth density later that same year. *E. maimaiga* infection was also associated with rainfall during the first 3 (2006) and 2 (2007) weeks of April. During 2007, *Ld*MNPV was detected at 20.8 percent of sites, yielding 2.0 $\pm$ 0.5 percent infection at sites where it was present. The male moth density the previous year was positively associated with infection but male moth density that same year was not significant. We estimated that fungal and viral presence were more likely to be detected at moth densities of at least 68 and 158 gypsy moth males/trap in the prior year, respectively. During 2007, 85.7 percent of tachinid parasitism was due to *Compsilura concinnata*, with tachinids present at 34.4 percent of sites, although parasitism averaged only 1.3 $\pm$ 2.0 percent. More gypsy moth larvae were parasitized with higher male moth densities later that year but there was no association of parasitism with the previous year's gypsy moth density.

In summary, *E. maimaiga* and *Ld*MNPV dispersed and arrived fairly quickly at newly colonized gypsy moth populations. Presence of both of these entomopathogens was associated with the prior year gypsy moth density while only *E. maimaiga* was associated with decreased gypsy moth density later that same year. Tachinid parasitoids also responded to these low density gypsy moth populations, being found at over one-third of the sites.

References

Tobin, P.C.; Blackburn, L.M. 2007. **Slow the Spread: a national program to manage the gypsy moth.** Gen. Tech. Rep. NRS-6. Newtown Square, PA: U.S. Department of Agriculture, Forest Service, Northern Research Station.109 p.