

Progrediens Rebound Following Predation on HWA Sistens Ovisacs at Various Eastern Sites

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Background Simulation models of HWA dynamics (Elkinton et al. 2012) showed that density dependent survival during the progrediens generation almost completely compensates for any egg mortality in the overwintering sistens ovisacs caused by *Laricobius* feeding. High egg mortality in the model was followed by higher progrediens survival so that by the end of the progrediens generation, densities of HWA had largely returned to where they were before the egg mortality. Only when we added other sources of mortality (e.g. summer and fall predators) did natural enemies succeed in reducing HWA populations. We had tried to test this model prediction in North Carolina in 2014. However, in that experiment, we had insufficient densities of *Laricobius* to test it. Now, thanks to data compiled by Carrie Jubb, we have substantial *Laricobius* feeding on HWA ovisacs at many sites, so we could test this prediction.

Experimental protocol After the spring sample of HWA ovisacs for Carrie Jubb at Virginia Tech, all our cooperators removed the anti-predator bags and placed fine-mesh anti-dispersal bags on both the previously bagged and unbagged branches at each of five sites for a short period of time while the progrediens generation was hatching. The purpose of these bags was to confine the hatching progrediens generation onto the experimental branches. The anti-dispersal bags were removed after progrediens settled. In June, cooperators collected branchlets from previously bagged and unbagged branches and sent them to UMass, so that we could count the number of progrediens adults. Predictions of the model (Elkinton et al 2012) are shown below (Fig. 3a). Data from the field are shown in (Fig. 3b).

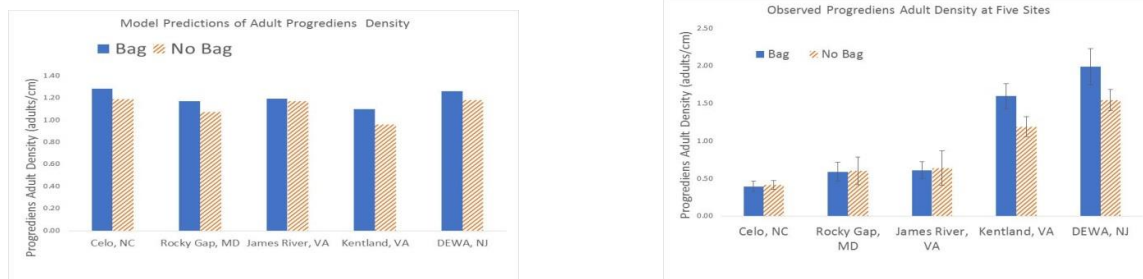


Fig. 3a. Density of adult progrediens predicted a) by the model (Elkinton et al 2012) and b) observed at five sites

Conclusion: The field data largely confirm the prediction that density dependent survival in the progrediens stage largely obliterates the effects of predation on sistens ovisacs. Adding mortality later in summer or fall, however, completely overcomes this effect and produces the large impact of predators on HWA density we have demonstrated in Seattle. That was the conclusion reached by Elkinton et al (2012), and that is the future of HWA biocontrol.

Reference cited

Elkinton, JS, R.T. Trotter, and A. F. Paradis. 2012. Simulations of population dynamics of Hemlock Woolly Adelgid and Potential Impact of Biological Control Agents. Pp. 15-24. In: Implementation and Status of Biological Control of the Hemlock Woolly Adelgid. US Forest Service Publication FHTET-2011-04 (B. Onken and R. Reardon eds.) 230pp