Early-season dynamics of alligatorweed biological control by *Agasicles hygrophila* in Louisiana and Mississippi

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Timing of management can be critical to long-term biological control of weeds, but may vary by location with arrival (or releases) of agents during times when conditions are unsuitable for agent population development. We investigated, during spring and summer, the timing of occurrence and intensity of damage (percentage of leaf area consumed) caused by the biological control agent alligatorweed flea beetle (*Agasicles hygrophila* Selman and Vogt) on alligatorweed [*Alternanthera philoxeroides* (Mart.) Griseb.] at two sites in southern Louisiana and two sites in northern Louisiana/central Mississippi. Alligatorweed flea beetle population peaks were documented at southern sites in May (7.6 ± 3.45 insects $stem^{-1}$) and June (3.35 ± 0.25 insects $stem^{-1}$). Mean leaf damage at southern sites was 21 ± 2% and maximum leaf damage was 76%, which coincided with the first peak. At northern sites, where annual recolonization must occur because of overwintering limitations, alligatorweed flea beetles first appeared later in the season (June) and insect populations never formed a distinct peak or reached similar abundances to the southern sites. Mean leaf damage at northern sites was 7 ± 3% and maximum leaf damage was 25%. Alligatorweed in northern sites, subjected to less herbivory, maintained a positive relative growth rate (RGR) of 0.012 ± 0.016 (mm^2 leaf area [m^2 water surface area] $^{-1}$ day^{-1}) during the study period, whereas alligatorweed in southern sites, subjected to early-season damage, had a RGR of 0.027 ± 0.035. Overall, insect abundance was positively associated with percentage of leaf damage ($R^2 = 0.56$) and negatively associated with RGR ($R^2 = 0.58$). Our data support the notion that an early-season herbivore peak, associated with near total defoliation, was responsible for the reduced RGR and suppression of alligatorweed at sites within the southern range of the alligatorweed flea beetle. Northern sites experienced delayed and lower impact from the insects. Although previous authors have suggested the importance of this early-season phenomenon, this study represents the first quantification of early-season alligatorweed flea beetle population dynamics and associated plant impacts in the southern United States.