Challenges to Establishing *Diorhabda* spp. for Biological Control of Saltcedars, *Tamarix*, in Texas

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Abstract

Saltcedars, *Tamarix* spp., are exotic, invasive shrubs and small trees infesting an estimated 500,000 acres in arid west and southwest Texas. Since 2004, three species of *Diorhabda* spp. (Chrysomelidae) have been released in Texas. In 2006, the Saltcedar Biological Control Implementation Program was initiated to re-distribute leaf beetles throughout west Texas. However, after two years of effort, beetle populations were established at only 1 of 20 sites. To improve establishment success, studies were conducted to identify species adapted to ecological regions of the state and evaluate the impact of ant predation on the pupal stage. Field studies demonstrated that the Mediterranean tamarisk beetle, *Diorhabda elongata* (Brullé), established in the grasslands region of northwest Texas (latitude 32.5-34ºN) whereas the larger tamarisk beetle, *Diorhabda carinata* (Faldermann), failed to establish. On the Rio Grande River in southwest Texas (latitude 29ºN), the subtropical tamarisk beetle, *Diorhabda sublineata* (Lucas), established and dispersed much faster than *D. elongata*. The impact of ant predation on pupal survival was evaluated using an insecticide bait to exclude ants from field plots. Survival of *Diorhabda* spp. to the adult stage was ten times greater in cages where ants were excluded. Mortality of sentinel pupae after 4 days in the field was 30% when ants were excluded compared to 55% when ants were undisturbed. Sentinel pupae were also observed from sunset to midnight to identify predators attacking exposed pupae. Ants were the most common predator observed feeding on *Diorhabda* pupa and represented 48-87% of all predation events. Unexpectedly, pillbugs (Isopoda) were the second most common predator. These studies confirmed the vulnerability of the pupal stage to predation, primarily by ants. Treating release sites with ant-specific insecticidal bait was incorporated into the release protocol in 2008. During 2009-2010, the Saltcedar Biological Control Implementation Program field collected and released 700,000 adult *Diorhabda* spp. at 17 sites in Texas. The rate of establishing new populations increased from 5% in 2008 to 70% in 2010.