

USE OF *CYBOCEPHALUS NIPPONICUS* (COLEOPTERA: NITIDULIDEA) FOR BIOLOGICAL CONTROL OF ELONGATE HEMLOCK SCALE, *FIORINIA EXTERNA* (HOMOPTERA: DIASPIDAE), IN PENNSYLVANIA FORESTS

E. Michael Blumenthal¹, Shahla M. Werner², and Bradley S. Regester³

^{1,2}Department of Conservation and Natural Resources, Bureau of Forestry, Division of Forest Pest Management, 208 Airport Drive, Middletown, PA 17057 ebumentha@state.pa.us

³Department of Conservation and Natural Resources, Bureau of Forestry, Division of Forest Pest Management, Northern Area Office, Wellsboro, PA

We have released 82,000 predatory scale-feeding Korean nitidulids, *Cybocephalus nipponicus*, at 25 hemlock sites infested with the exotic elongate hemlock scale, *Fiorinia externa*, in southern, eastern, central and northern areas of Pennsylvania in 2003 and 2004. We released 40,000 *C. nipponicus* at 14 sites, and made augmentative releases at 5 of these sites, between June and November 2003. We released 42,000 *C. nipponicus* at 11 new sites and made augmented releases at 12 sites between May and November 2004. We plan to release 14,000 *C. nipponicus* at seven (preferably new) sites in 2005. We are working out the details of timing the seasonal releases with the Alampi Laboratory. It is possible that we may make releases later in the season to ease time constraints involved with completing projects.

Area Forest Pest Management Specialists used beating sheets to evaluate overwintering and reproduction of *C. nipponicus* in the field. Forty *C. nipponicus* adults were recovered at sites where the predator was released in 2003. Of these, nine were recovered in the spring, and 31 were recovered in October. Most recoveries were at a site in the southern area. The presence of adults confirms that the beetles are able to overwinter in the field. Although we have not yet recovered the tiny beetle larvae, we assume reproduction is also occurring because of the short lifespan of the adults. These preliminary results are encouraging for establishing this biocontrol agent in the field.

We assessed the effectiveness *C. nipponicus* in reducing *F. externa* populations by comparing the number of live *F. externa* on branch samples from a control and release tree at a site in Lycoming County, PA in 2003 and 2004. Several samples contained white hyphae and a black fungus, some of which were confirmed to be *Aschersonia*. There were also some tiny black arachnid predators and parasites present on many of the branches.

On 07/23/03 we observed 1,867 live *F. externa*, 1,222 on 20 branches (Mean=61.1± 6.1 per 3cm branch) from a control tree, and 645 on 20 (32.3 ± 3.9) branches on a tree where 2,500 *C. nipponicus* were subsequently released. A predatory neuropteran in the family Coniopterygidae was present on one branch. Many parasitized scales were present. Three months after we released *C. nipponicus* on 10/10/03 we observed 1,149 *F. externa*, 675 on 20 control (33.75 ± 5.3) and 474 (23.7 ± 3.6) on 20 release branches. We then revisited the site the following year, when we decided to evaluate only ten branches on each control and release tree. On 06/10/04 we observed 345 *F. externa*, 202 on 10 control (20.2 ± 5.1) and 143 (14.3 ± 2.8) on 10 release branches. No mature males were observed. On 07/29/04 we returned for a final evaluation and observed 754 *F. externa*, 555 on 10 control (55.5 ± 6.9) and 199 (19.9 ± 5.2) on 10 release branches. Nymphs were mostly on new growth, which was more abundant on the control tree. This may help explain differences in abundance between control and release trees more than the release of the predatory beetle, but it is still encouraging to see fewer live scales on the CN release vs. the control tree for all evaluations we made. Jim Lashomb and a graduate student from Rutgers are currently assessing the efficacy of *C. nipponicus*. We will follow his investigations closely to determine if we will continue to use *C. nipponicus* for biocontrol of *F. externa*.