

Scientific Name: *Laricobius osakensis*

Family: Derodontidae

Order: Coleoptera

Authors: Katlin Mooneyham and Dr. Scott Salom



***Laricobius osakensis* (L.o.)** is a predatory beetle that feeds on the non-native hemlock woolly adelgid (*Adelges tsugae*). This beetle is the primary predator of HWA in its native range in Japan and the two species have co-evolved life-cycles as a result of this shared environment. In March 2006 beetles were brought back to the Beneficial Insects Quarantine Lab at Virginia Tech and after rigorous testing, a FONSI was issued in 2010 allowing these beetles to be released in the United States.

Identification: Adult L.o. are between 2-3 mm in length and are dorsally convex and ventrally flattened. Its antennae have eleven segments with a three segmented club, elytra are seriate or striate and the abdomen has five visible sternites. Lack of ocelli is the primary way to distinguish *L. osakensis* from other *Laricobius* species. Adult *L. osakensis* have two color morphs to help distinguish between sexes. Beetles with reddish elytrae and glossy in appearance are females while those that are nearly black with no gloss are males (Fig 1 & 2).

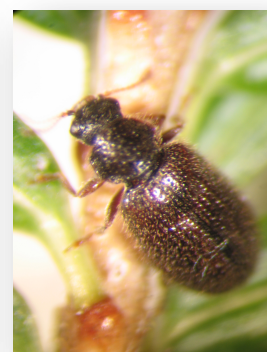


Fig 1 & 2. Female L.o. on left and male L.o. on right



Fig 3. L.o. egg in HWA ovisac

Fig 4. L.o. Larva



Fig 5. L.o. adult on HWA infested branch

Biology: This predator was first discovered in Japan in 2005 from a systematic sampling effort on *Tsuga sieboldii*. In late December adults begin laying eggs in synchrony with HWA oviposition. Eggs are laid in the woolly ovisacs of the adelgid. Larvae hatch and feed on the eggs of HWA. Once feeding is complete, mature larvae drop to the soil to pupate. Adults remain in the soil for an aestival diapause period over the summer and emerge in the fall the same time the aestivating nymphs of HWA resume development (Fig 3-6). *Laricobius osakensis* shows promise as a biological control agent due to its synchronous life cycle with HWA and its voracious feeding behavior compared with other species of *Laricobius*.

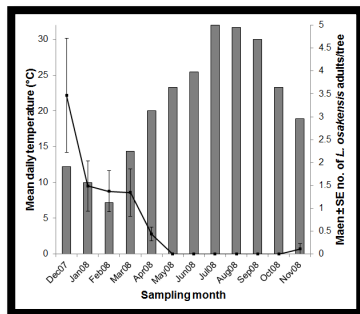


Fig 6. Abundance of L.o. adults in relation to month and temperature

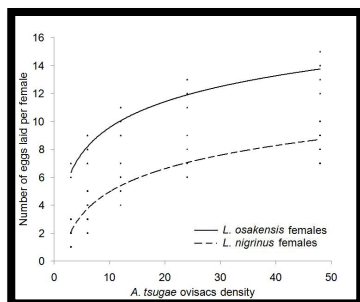


Fig 7. Numerical response of *Laricobius* spp. predators on HWA

Current Activities: Currently this beetle has been released in the field to monitor their colonization and reproduction in the eastern United States. In the fall of 2012 *Laricobius osakensis* was released in the field for the first time in Summersville, West Virginia and Giles County in southwest Virginia. Two more releases were made this past fall in Goshen, Virginia and Saltville, Virginia. Release of adults occurs in the fall and egg releases occur in the spring (Fig 8 & 9). Colonization will be monitored by monthly beat sheet sampling in the fall for adults. Reproduction is monitored by branch clipping in the spring where the clipped branches are brought back to the lab at Virginia Tech and the larvae that drops is then quantified. All beetles that have been released were reared in the Insectary at Virginia Tech with this past year's rearing yielding 6,000 beetles for field release.



Fig 8. Release of adult L.o. on HWA infested foliage

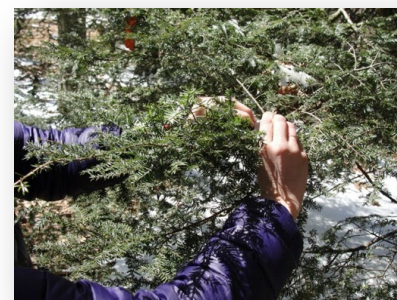


Fig 9. Release of L.o. eggs of HWA infested foliage.

Resources:

- Fisher, M. PhD Dissertation 2013
- Lamb A, Montgomery ME, Vieira LC, Shiyake S & Salom S (2011) 90-96. *Laricobius osakensis* a hemlock woolly adelgid predator from Japan. In: Onken B, Reardon R (eds.). Implementation and Status of Biological Control of the Hemlock Woolly Adelgid. USDA Forest Service FHTET-2011-04.
- Lamb A, Shiyake S, Salom S, Montgomery M, & Kok L (2008) 29-36. Evaluation of the Japanese *Laricobius* sp. N. and other natural enemies of hemlock woolly adelgid in Japan. In: Onken B, Reardon R, (eds). Fourth Symposium on Hemlock Woolly Adelgid in the Eastern United States. USDA Forest Service. FHTET-2008-01; 2008.
- Montgomery ME, Shiyake S, Havill NP & Leschen RAB (2011). A new species of *Laricobius* (Coleoptera: Derodontidae) from Japan with phylogeny and a key for native and introduced congeners in North America. Systematics 104: 389-401.
- Story HM, Vieira LC, Salom SM & Kok LT (2012). Assessing performance and competition among three *Laricobius* (Coleoptera: Derodontidae) species, predators of hemlock woolly adelgid, *Adelges tsugae* (Hemiptera: Adelgidae). Environmental Entomology 41: 896-904.
- Vieira LC, McAvoy TJ, Chantos J, Lamb AB, Salom SM & Kok LT (2011). Host range of *Laricobius osakensis* (Coleoptera: Derodontidae), a new biological control agent of hemlock woolly adelgid (Hemiptera: Adelgidae). Environmental