

## Research on native tiger moth caterpillars and a European biocontrol weevil candidate species feeding on the noxious weed houndstongue

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Once in a while, folks find polyphageous caterpillars - meaning those caterpillars that can feed on anything that is green - to consume leaves or flowers of the poisonous exotic rangeland weed houndstongue (*Cynoglossum officinale* L.). This story, however, is different.

We have begun intensive research on two native tiger moth species in the Eberidae (formerly Arctiidae) family, *Gnophaela vermiculata* (Grote, 1864) also known as 'Police car moth' and *Gnophaela latipennis* (Boisduval, 1852). The genus *Gnophaela* comprises only 5 species in western North America. All of them are specialist herbivores – meaning the range of plant species they rely on as their food source is very restricted – in this case to a few native plant species in the borage family, especially bluebells (*Mertensia* species) and stickseeds (*Hackelia* species). But caterpillars of both species were also found to readily feed and even defoliate entire plants of the noxious weed houndstongue. This is highly unusual because houndstongue is a very toxic plant and only few herbivore insect species are capable of tolerating or digesting these toxins and these insects are typically found in the native range of the plant, that is, in Europe. We found the two native tiger moth species for the first time during the summer of 2012 feeding on houndstongue plants at several locations in Montana and also in Oregon and California. In addition, to severely damaging houndstongue plants through the consumption of foliage, the caterpillars also showed quite a strange behavior: a few caterpillars would work together to cut off flowering stems at the base of the plants, which consequently will dry up and produce no seeds.



Picture 1: *Gnophaela vermiculata* caterpillars severing a houndstongue stem.

Currently, investigations at our lab (<http://www.cals.uidaho.edu/epic/>) focus on 3 topics. We study the biology and life history of both, the Oregon and Montana 'Police Car Moth', so that we can easily produce caterpillars in large numbers. We also need to verify that the moths are able to complete their life cycle on houndstongue in the absence of any of their native borage food plant species, a precondition to use them as a management tool for the noxious weed. Most importantly, we have to investigate the preference of the adult moths for one or another plant species, or in other words we have to find out whether the moths would seek out houndstongue plants to lay their eggs on. The results of the above investigations will tell us how likely it is that the moths will be able to establish and continuously damage houndstongue infestations elsewhere.

In addition to the obvious land management implications, this is also a scientifically appealing story. It is rare that a specialist insect herbivore changes its behavior to include a new plant species into its diet.

We call this a ‘host range expansion’ in scientific jargon and if it involves an exotic noxious weed that, on top of everything else, is highly toxic, you have found yourself an ecologically thrilling research project with a very pragmatic goal because it may lead us to an indigenous biological control option for houndstongue.

So far, we conducted a number of smaller experiments in our laboratory during the past summer: We tested whether the moth species grow and complete their development when we feed them only with houndstongue (they did) and in fact grew more compared to caterpillars fed with some native borage species); we set up rearing colonies for both species and mass produced caterpillars that we released on two houndstongue infestations in Idaho and Montana, respectively; but most importantly, we setup permanent research plots in Montana and Idaho (and will setup more in Oregon and California in 2013 or 2014) to study the population growth of the moths and the impact they have on houndstongue at field sites with weed infestations in these states. The houndstongue infestations at Idler’s Rest are very important for the research on the native caterpillars. We use the plants as food source for our rearing colonies and for bioassays on the food plant preferences. We also would like to release caterpillars at Idler’s Rest to see whether the moth species (in this case *G. vermiculata*) will establish at this site.

But the Idler’s Rest houndstongue plants are also important for entirely different reasons and an entirely different insect biocontrol candidate species of houndstongue that we are studying at the University of Idaho. Before we can request the permit to release a biocontrol agent from the native range of a weed we have to assess its environmental safety. We do this for a seed-feeding weevil, *Mogulones borraginis* F. (Coleoptera, Curculionidae) a small endangered Eurasian weevil that is specialized to develop in the ripening seeds of houndstongue. For the houndstongue seed weevil we are evaluating the role of olfactory (the scent) and visual (color and shape) cues of plant species in the host plant selection behavior of the insect. We do this to demonstrate that the weevil seeks out houndstongue plants based on its scent and ‘looks’ over other native plant species in the Boraginaceae family, especially those that are federally or state listed as threatened or endangered. For this research we need naturally growing houndstongue plants that are not damaged by any insects or other management practice to collect volatile organic compounds (VOC), the scent of healthy plants (damaged plants have a different scent or VOC composition). . The houndstongue patch at Idler’s Rest is ideal to fulfill this purpose. Ikju Park, a Ph.D. student at the University of Idaho is conducting this research and is shown collecting floral scent from houndstongue plants at Idler’s Rest in the picture below. Since there are currently no biological control agents permitted for the management of houndstongue in the U.S., our research is time sensitive. We hope to submit the petition the release of the insect in the U.S. this year but it typically takes up to two years



Picture 2: Ikju Park collecting volatile organic compounds (VOC) or the floral scent from houndstongue plants.

before all federal reviews are completed and during that time we would very much like to continue collecting floral scents from houndstongue plants at Idler's Rest, while helping control the plant outside of the population needed for this work. Ultimately, we hope that our research would benefit the Palouse Land Trust in that we would be able to provide environmentally safe biological control agents for houndstongue in the near future.

**For more information on houndstongue research at the University of Idaho :**

Visit our lab blog [www.weedblog.blogspot.com](http://www.weedblog.blogspot.com), or contact Mark Schwarzländer [markschw@uidaho.edu](mailto:markschw@uidaho.edu) or our outreach specialist Marijka Haverhals [marijka@uidaho.edu](mailto:marijka@uidaho.edu)