Volume 2017 Number 2
Summer 2017

Bulletin of the
Oregon Entomological Society

A new moth for Oregon: *Epirrita pulchraria* or Whitelined Looper

Jim Johnson

While in coastal Tillamook County, Oregon, on 15 March 2017, I came across a nicely patterned moth at one of the public restrooms in Nehalem Bay State Park. I have gotten into the habit of checking for moths around the exterior lights of public restrooms lately—while carrying a camera, and my wife is sure that this activity will land me in a jail cell some day. But I digress. . . Although superficially similar to some local species, I was pretty sure it was new to me, so I took some photos (Figure 1). With a bit of online snooping that evening, I determined the moth was *Epirrita pulchraria* or Whitelined Looper.

Judging from the usual online sources like BugGuide.net, Moth Photographers Group (`<http://mothphotographersgroup.msstate.edu/>`), and iNaturalist.org, this species has a fairly extensive range along the Pacific Coast from southeast Alaska to northern California, but there aren't many records. Although the site has not been updated for several years, the map at Moth Photographers Group provides an indication of how sparse these records are: `<http://mothphotographersgroup.msstate.edu/large_map.php?hodges=7435>`. The low number of records at these online sources, in and of itself, is not especially telling—especially for some species that are not easy to identify, so I wrote to Dana Ross and Paul Hammond just in case it was of interest to them.

Dana checked the Oregon State Arthropod Collection at OSU and found that they have no specimens of the species, and that there are few specimen records from anywhere. As far as he could tell, my *Epirrita pulchraria* find was a first for Oregon. I was implored to return and "bag that sucker," but when I returned late the next day it was gone (it was still there the morning of 16 March, but something or someone must have spooked it off by the time I returned later to collect it). I am not a lep collector, although I am certainly willing to collect in cases like this when they are significant. However, my knowledge of moths is rudimentary enough that I usually don't know when I find a moth that is significant until sometime later when I share a photo with someone who knows a lot more than me.

But the story of *Epirrita pulchraria* in Oregon doesn't end there. During a return visit to the coast on 26 March, I found another individual at Ecola State Park, Clatsop County—at another public restroom, of course. It seems that the door is left open habitually, so several moths, including the *Epirrita*, were inside the restroom. After returning to my truck to retrieve my camera, I had to wait several minutes before the restroom was vacant and no one was making an approach. I really don't want to be seen photographing anything inside a public restroom. I quickly took some photos and popped the specimen into a glassine envelope for Dana (Figure 2).

But that isn't even the end of the story. The same day I found the Ecola State Park *Epirrita pulchraria*, I visited a friend in Seaside who occasionally hangs up a black light in his back yard. He had one moth lingering from the previous night that was rather dark and obscurely patterned. Not knowing what it was, I took some photos (Figure 3). Only later did I realize that it was likely a

Figure 1. *Epirrita pulchraria*, Nehalem Bay State Park, Tillamook County, Oregon; 15–16 March 2017.

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melanistic *E. pulchraria*, and Dana agreed when I sent a photo for his opinion.

So that's three records of a "new" moth for Oregon over the span of 12 days. Mid to late March seems to be prime time on the northern Oregon coast. This spring was cooler and wetter than normal, but I don't know whether that has an impact on this species. There are three records on BugGuide.net from just across the Columbia River in Pacific County, Washington, and those range 12–16 March (<http://bugguide.net/adv_search/bgsearch.php?taxon=238257&location[]=WA>). Be sure to check those public restrooms the next time you're on the Oregon coast during the month of March!

Figure 2. *Epirrita pulchraria*, Ecola State Park, Clatsop County, Oregon; 26 March 2017.

Figure 3. *Epirrita pulchraria*, Seaside, Clatsop County, Oregon; 26 March 2017.

Oregon *Eudioctria* (Diptera: Asilidae)

Ron Lyons

Adisoemarto and Wood (1975) list 14 species in the Nearctic dipteran robber fly genus *Eudioctria*, and provide distribution maps. Of these, 3 species have been recorded from Oregon and 1 species can probably be added from southwest Oregon, if sufficient survey work is done. The species present are:

Eudioctria media (Map 13),
Eudioctria nitida (Map 14), and
Eudioctria sackeni (Map 21) – 2 color morphs.

These species are all represented in the Oregon State Arthropod Collection (OSAC) with Oregon collection localities. They are also represented in the Oregon Department of Agriculture (ODA) collection in Salem, based on the ODA collection database.

Eudioctria doanei (Map 19) has been recorded only from California but the northernmost point, Crescent City on the coast in Del Norte County, is just a few miles south of the Oregon border, so it seems reasonable to assume this species can probably be found in Oregon, at least in the extreme southwestern corner.

Reference

Adisoemarto, S. and D.M. Wood. 1975. The Nearctic Species of *Dioctria* and Six Related Genera (Diptera, Asilidae). Quaestiones Entomologicae 11: 505–576. (Available as a PDF from <http://nature.berkeley.edu/~kipwill/QE%20documents%20for%20public/Adisoemarto%20and%20Wood%201975%20QEv11n4%20505_576%20CC%20released.pdf>.)

Eudioctria sackeni photographed 2017 June 25 in my garden near Bandon, Coos County, Oregon. The head inset is from a photograph taken in the same area 2014 May 10. I have also photographed this species in the garden 2016 April 30 and May 9. Individuals seem to be generally tolerant of the activity associated with close-up photography.

How I Beat the Flying Berlese Bothers: A Carry-on-Friendly, TSA-Friendly Litter Extractor (Did I say it's cheap, non-breakable, and doubles as a litter sieve?)

Loren Russell

The 2017 Great Alaskan Funnybug Expedition was on for the last week of May—and after ticketing I had a full three months to get ready for my week in Sitka and in Ketchikan (where I would meet my co-conspirator Wes Bicha). For me, anything more than 24 hours of planning for a trip is rare; three months in hand deserved a performance. The problem, of course, was that I would be flying in and out. In the era of TSA security and checked-baggage fees, the trick would be to make my wet-weather clothing and collecting equipment pack compactly, and to bring back a good quantity of high-value bryophyte samples for processing at home. When space is tight I observe the usual tricks of the trade: bring changes of clothes that I can discard, turn my socks and underwear inside out if there's no time to wash, and wear extra layers on the flight home.

My equipment? I would certainly bring my brush and paint-strainer "accumulator" [see "Collecting techniques for *Caurinus*", Bulletin of the Oregon Entomological Society, Winter 2016/17], and bag the brushings along with promising grab samples of bryophytes for later processing and examination. I expected to reduce the volume of my samples by pulling apart the bryophytes, then sieving and discarding the coarser material. A conventional soil screen would be clunky and heavy to pack for my expedition, but, as I had four years previously on Prince of Wales Island [POW], plastic nursery flats (Figure 1) serve as light, compact and disposable sifters. As I went through my stack of flats in my basement, the light bulb came on. I thought: Would a flat work as the frame for a packable Berlese funnel? I was thinking of the collapsible Berlese used in my previous *Caurinus* expeditions by Derek Sikes' group on POW, and by David Blades on Vancouver Island. The Bioquip funnel is a nice design, though at 11–12 inches diameter it's a bit small for my taste, and it uses a conventional 25 W incandescent light bulb. Light bulbs are problematic for air travel—fragile, the elements often breaking even when the glass is intact. And who knows—broken glass may be considered a weapon. Finally bulbs are getting a bit hard to find, though the coal-rollers running EPA will no doubt make incandescents an American virtue and Tullgren funnels great again. But I digress**. . .**

I read the Bioquip copy again and noted that they sell heat packs for their funnels. So, I thought, perhaps I could dispose of the bulb and use an electric heating pad as the heat source. With that in mind I made a mockup with a nursery flat, plastic bag, and the long, skinny heating pad in my closet. From there, I made paper scale models of the tent/funnel, ending up with four panels that flared slightly above the shoulder where the flat would sit, and a drawstring closure at the top. A second drawstring at the bottom of the funnel secured the sample holder.

The Build (Figure 2)

– *Tent/funnel*: White uncoated nylon taffeta was purchased at an outdoor fabric store (The RainShed, Albany Oregon: 96 linear inches of 60-inch wide fabric for two funnels). For each funnel, four panels—two "A" [wide] and two "B" [narrow]—were cut to the dimensions in Table 1 with an added ½-inch allowance for seams, and a 1-inch allowance on the top and bottom of "A" panels. The panels were sewed together, and the excess at the top of "A" and at the bottom of all four panels was pinned back and sewn to hold drawstring closures.
– *Tray/screen*: Anderson 10/20 nursery flats (two flats for two funnels). Actual external dimensions vary slightly; mine are 10 ¾" x 21 1/8" x 2 3/8". These rectangular flats are widely used in the nursery industry, and new or used flats can be obtained at almost any retail or wholesale nursery for a

Figure 1. Anderson 10/20 flats: the openings on the left are 7/16" square and suitable for leaf and needle litter; on the right 7/8" square and suitable for most bryophyte samples.

Figure 2. My kit: two cloth funnels, two heating pads, two aluminum cookie pans, and clips and string, fitted in two nested 10" x 20" x 2.5" nursery flats. (12" ruler for scale)

Figure 3. The funnels deployed: A clean set-up like that on the left is possible if your motel closet has hangers with pants clips and is within reach of an electric outlet. In other cases, you may face a bit of a bodge—the one on the right required a belly-crawl to get to the toilet.

nominal price. The main caveat is to ensure that your flats are all the same size and nest cleanly.

– *Drawstrings*: Nylon clothesline cord (6 feet) was threaded through the two drawstring channels at the top of the "A" panels, and the ends joined by a barrel cord lock. I brought along two 12-foot pieces of the clothesline to rig the funnels from available door knobs, shower faucets and bed tables (Figure 3). The lower (sample container) drawstring was cut from cotton boot laces, and secured with a smaller cord lock.

– *Sample holder*: I initially envisioned attaching a screw lid to the funnel, but found it simpler to attach by friction using similar sized plastic cups with different taper. I nested two of the 8-ounce cups with less taper (i.e., a wider bottom), cut them off at 1 3/8", and glued them together with silicone caulk. This provided a 1/8" channel at the top that the drawstring fit into, and held other 6-ounce (generic yogurt containers) and 8-ounce cups very nicely. This configuration would also allow use of 8 ml or 20 ml Whirl-Pak® bags; my 4 ml Whirl-Pak® bags were just a bit small to fit.

– *Heat source*: Sunbeam heating pad (model number 731500). This widely available 12" x 15" heating pad has a list price around $20; I was able to get two units for $25 from an online source. There are three heat settings: high power is about 50 W, and low setting probably around 25 W. [Note: 10" x 19" seed propagation mats would fit the flats exactly, but do not generate enough heat to run the Berlese. In operation, the two inches of exposed sample at either end of the Sunbeam pad may be an advantage, as it seems to speed drying of the sample.]

– *Heat reflector*: This wasn't in my plans, but Wes happened to bring two 10" x 16" aluminum cookie trays, and positioning them over the heating pad seemed to speed up extraction. Like the flats and sample cups, the trays are disposable if luggage space is at a premium coming home.

Total cost of materials for each funnel was about $24, and that would come down if a used heating pad can be had at thrift shop prices. Since I don't own a sewing machine, I paid a seamstress $20 to cut and sew the two funnels. The rest, including shoe-strings and plastic cups, was scavenged.

Figure 4. Pattern for my funnels: Each funnel was sewn from two wide and two narrow cloth panels. The panels are just wide enough to fit the nursery flats, with a slight flare above the shoulders. The depth of the funnels was dictated by the dimensions of a full sheet of the New York Times.

Table 1. Cloth panel measurements for funnel fitting Anderson 10/20 nursery flat (add ½" for all seams between panels and 1" at top of Panel A and 1" at bottom of both A and B)

	Panel "A"	Panel "B"
Transverse measurements		
Width at top	21 ¾"	11"
Width at shoulder*	20 ½"	9 ¾"
Width at bottom	2 ½"	2"
Vertical measurements		
Height of upper "tent"	9 ½ "	10"
Height of lower "funnel"	9 ¾"	10 ½"

* – "Shoulder" is the point at which the bottom of the Anderson flat should rest; this is the transition from the gently widening "tent" to the strongly sloped funnel.

Field Tests

I had just enough time before my departure to check the heat output of the heating pad and to mock up the rigging in my bathroom. I found that when the pad was placed on a nursery flat containing 2 inches of dryish moss with a folded towel on top of the pad, the following surface temperatures could be attained: 100° F at low setting; 115° F at medium setting; and 125° F at high. The temperatures attained in a free-hanging funnel turned out to be at least 10° F lower, so in the field I used a 3 step protocol. The funnels were started at the low setting for 3–8 hours, on medium for about 24 hours, and if time was available, finished at high power for a few hours until the sample was dry.

On my Alaska trip I ran two funnels for 2 ½ days in Sitka, and a single funnel for 3 ½ days in Ketchikan. The flats were typically filled with 3 inches of moss/liverworts, and a total of 4 to 5 times the packed volume of the funnels was processed—a clear gain, since my luggage (checked duffle and carryon backpack) was stuffed to the gills with samples on my return. And yes, to make room for more liverworts, I did leave a couple of flannel shirts behind.

How effective were my funnels? I recovered three adults the first night and eventually a total of 19 adult *Caurinus* from two Sitka localities, at pretty much the same recovery rate I saw for the other Sitka samples at home. So only 36 hours into my visit I had comfort in knowing that *Caurinus*, probably *C. tlagu*, were present (a range extension), giving me the opportunity to widen my planned sampling scheme. Similarly, at Ketchikan with three *Caurinus* overnight from our first hike, I was able to confirm my 2013 collections, and give Wes peace of mind that we should get a good sample of *Caurinus* for Wes' DNA database. (Wes had come all the way from Tennessee and had to squeeze the Alaska trip between other trips to New Mexico and to Japan, so he appreciated knowing it wasn't a goose chase.)

In addition to *Caurinus*, the hotel-room funnels yielded pretty much the same range of arthropods that I saw in samples run later at home: beetles (mostly byrrhids and staphylinoids), insect larvae, millipedes and centipedes, spiders, and hordes of mites (mostly oribatids) and collembola. All in one, my extractor does work, and each unit seems to yield at least twice the volume I saw for the Bioquip funnels running similar samples on Vancouver Island.

What would I do differently? For starters, bring an extra Anderson flat—in Sitka, both flats were in use in the funnels, when I would have been well-served to have a sifter to segregate samples in a muskeg that was very diverse in liverworts. As it was, I ended up with a fairly large volume of grab-samples and no way of determining which associations contained *Caurinus*. Aside from this, I can hardly imagine a more successful collecting trip.

A couple more pro tips:

1) Since liquid ethanol is a no-no on planes, I generally resign myself to buying 70% isopropanol at my destination. On this trip I included a dozen antiseptic wipes containing isopropanol in my first aid kit with the usual pills, bandages, antiseptic scrubs, antibiotic cream, and non-aerosol DEET. This went through checked baggage with no question. Eventually I did pick up isopropanol in Ketchikan. But I was able to get by in Sitka with the antiseptic pads alone. I placed two of the wipes in the sample cups. I found that they remained moist over 12 hours, and killed and preserved the collected arthropods. I then transferred the contents including the towelettes directly to a 4 ml Whirl-Pak® bag. If you are using a TSA-permissible preservative [e.g., a couple of ounces of glycol], I would suggest soaking small pads of Kleenex® tissue to minimize the free liquid.
2) Hotel maids, especially the overworked ones at Ketchikan Super8, are very happy to be told to "just put out clean towels" and to ignore your odd tent, as long as you make some effort to sweep up your litter. And leave a tip!

Addendum: After I returned from my Alaska trip, I spotted some cheap plastic mini-hangers, about 11" wide, in the local dollar store. By attaching two hangers with safety pins to the ends of the cloth bag, I have a cleaner and easier-to-set-up rigging for my extractors (Figure 5).

Figure 5. Improved suspension for the funnel provided by plastic clothes-hangers pinned to the corners.

Loren Russell in the News

To learn more about Loren in Alaska, see the report by Robert Woolsey, News Director KCAW-FM Raven Radio (Sitka, Alaska) at <http://www.kcaw.org/2017/06/21/funnybug-serious-clue-ice-age-ecology/>.

The brass shown opposite is a pre-Revolution Russian samovar It just reminds me of Berlese's original water-jacketed funnels—these were beautiful objects that would probably cost a thousand dollars apiece to build today—if you could find a craftsman! Photograph by Loren Russell.

Ceci n'est pas un Berlese! *Loren Russell*

An entertaining article on the history of Berlese funnels and the many later extractors inspired by Berlese's invention can be found on Simon Leather's blog "Don't Forget the Round-Abouts" at `<https://simonleather.wordpress.com/tag/antonio-berlese/>`. The take-away is that Antonio Berlese may not have owned a samovar, but he probably contracted with a brass-smith who knew how to make one.

Upcoming Events

North American Butterfly Association (NABA) Eugene-Springfield Chapter

The field trip and meeting schedule for the Eugene-Springfield Chapter can be found on their website at `<http://www.naba.org/chapters/nabaes/>`. Please check the website for details. The following trips are scheduled:

July 1, Saturday – Butterflies & Dragonflies Walk
July 4, Tuesday – Eugene 4th of July Count
July 7, Friday – Metolius River Area Butterfly Count
July 22, Saturday – Iron Mountain Butterflies
July 15, Saturday – Cascades Count "Browder Ridge"
July 29, Saturday – Groundhog Mountain

Washington Butterfly Association (WBA)

Information on WBA activities can be found on their website, `<http://wabutterflyassoc.org/>`. The annual conference will be held in and around Ellensburg, Washington on the weekend of July 14–17, 2017.

39th Northwest Lepidopterists' Workshop

The next workshop will be held at Oregon State University in Corvallis on the weekend of October 21–22, 2017. The program will be published in the Fall issue of the Bulletin.

The groups of emphasis in 2017 will be:
- ►Butterflies: Swallowtails (*Papilio*), Pieridae in general
- ►Moths: Erebidae in general

Siskiyou Field Institute Invertebrate Classes

For information on classes offered by the Siskiyou Field Institute, please visit their website, `<http://www.thesfi.org>`. Two invertebrate courses are offered this summer:

Date: TBA
Beginning Dragonflies
Instructor: Jim Johnson

Date: Monday–Tuesday, August 7–8, 2017
Aquatic Invertebrates in Stream Ecology and Biomonitoring
Instructor: Celeste Searles Mazzacano

Other Butterfly Field Trips

Please email the contact person **beforehand** for updates and information if you are interested in participating in any particular event.

Location	Date	Contact Person	Email	Highlights
Oregon Caves NM(OR)	1 July	Dana Ross	moreyross(at)comcast.net	National Monument
Yuba Pass	3 July	Paul Opler	PAULOPLER(at)comcast.net	Sierra N Field Camp, 70 species in 2015
Butterfly Valley	4 July	Paul Opler	PAULOPLER(at)comcast.net	
South Lake Tahoe	16 July	W. Richardson	will(at)tinsweb.org	
Mt Lassen	22 July	Joseph Smith	foxglove1985(at)yahoo.com	Lassen Volcanic National Park, 74 species 2016
White Mountains	29 July	Chris Tenney	tenneyx2(at)mac.com	highest elevation count in California
Yosemite NP	31 July	Sarah Stock	sarah_stock(at)nps.gov	National Park

The Rising Tide of Exotic Terrestrial Invertebrates in Oregon*

James R. LaBonte[1]

Just as elsewhere in the world, the price of global trade in the form of exotic species introductions is a major problem for Oregon. Oregon's terrestrial invertebrate fauna is estimated at about 25,000 species. Of these, approximately 1,000, or 4%, are exotic species. Exotic species continue to be introduced into and established in Oregon at an alarming rate. Ninety-nine species of established exotic terrestrial invertebrates have been documented from Oregon in the past ten years, primarily through surveys by the Oregon Department of Agriculture. The average rate of such detections over this period has been remarkably constant at 9.9 species per year. Nineteen species (19%, or about 1 in 5) were known significant pests, including azalea lace bug, *Stephanitis pyrioides* (Scott) and spotted-wing drosophila, *Drosophila suzukii* (Matsumura). At this rate, odds are that Oregon will have at least one new significant exotic invertebrate pest detected every year for the foreseeable future. Analysis of probable introduction pathways revealed almost 80% of these species were associated with live plants, indicating that the live plant exotic species pathway continues to be very active, despite international regulatory efforts to mitigate exotic terrestrial invertebrate dissemination. These findings underscore the need for continued exotic species surveillance.

* – Presented in "Solutions and Challenges with Invasive Species: The Past, Present, and Future" at the meeting of the Pacific Branch of the Entomological Society of America, April 4, 2017.

1 – Oregon Department of Agriculture, 635 Capitol Street NE, Salem, OR 97301–2532. Email <jlabonte@oda.state.or.us>

Exotic Carabidae: Cultural Steppe Denizens, Disturbance Specialists, or Invaders*

James R. LaBonte[1]

There are 67 species of exotic Carabidae (carabid or ground beetles) known to be established in North America. Of these, 35 species are known from the Pacific Northwest (29 in British Columbia, 11 in Idaho, 24 in Oregon, and 26 in Washington). Exotic Carabidae in North America have traditionally been perceived as benign predators providing added pest control, especially in agricultural settings. Several hypotheses about their ecological roles in North America have focused on habitat utilization. In 1988, J.R. and D.H Spence proposed that exotic Carabidae are pre-adapted specialists, utilizing the mostly vacant (with regard to carabids) and novel anthropogenic habitats via relatively precise habitat matching. In 1990, J.R. Spence suggested that exotic carabids are instead habitat generalists successful in anthropogenic habitats (the "cultural steppe") through a combination of flexible habitat usage (rather than by precise habitat matching) and superior competitive abilities.

Based on my studies of Pacific Northwest Carabidae, I believe exotic carabids in North America exhibit three habitat utilization strategies. Anthropogenic habitat specialists, such as *Agonum muelleri* (Herbst), *Calathus fuscipes* (Goeze), and *Trechus obtusus* Erichson, are more or less confined to the cultural steppe and are almost always associated with many other exotic carabid species. Disturbance specialists, such as *Elaphropus parvulus* (Dejean) and *Harpalus affinis* (Schrank) inhabit both the cultural steppe and natural habitats with high disturbance frequencies (e.g., beaches and riparian areas) and are often among only a few exotic carabid species in otherwise indigenous carabid assemblages. Finally, there are a few truly invasive species inhabiting not only the cultural steppe but also natural habitats with low disturbance regimes, such as alpine meadows and old-growth forest stands. These species are often the only exotic carabids among strictly indigenous carabid assemblages. Such invaders are the equivalent of Spence's (1990) "habitat generalists" and may well be "superior competitors", although that aspect is speculative. In the Pacific Northwest, these species are *Carabus nemoralis* (Müller), *Nebria brevicollis* (Fabricius), and *Pterostichus melanarius melanarius* (Illiger). Both *C. nemoralis* and *P. melanarius* have been found invading conifer forests in the Pacific Northwest (including at elevations above 2100 m) and *P. melanarius* has also been found invading alpine meadows in northeastern Oregon. *Nebria brevicollis* appears to be the most successful carabid invader and can be abundant in habitats from the most heavily degraded urban industrial sites to old-growth noble fir stands in the Oregon Coast Range and the foothills of the Oregon Cascades, where it is the only exotic species of carabid to be found. Studies of the competitive abilities of these invasive Carabidae and the mechanisms by which they enter and persist in non-anthropogenic habitats could be extremely rewarding.

References

Spence, J.R. and D.H. Spence. 1988. Of ground beetles and men: introduced species and the synanthropic fauna of western Canada. Memoirs of the Entomological Society of Canada 144: 151–168.

Spence, J.R. 1990. Success of European carabid species in western Canada: preadaptation for synanthropy? Pp. 129–141, in: Stork N.E. (ed.). The role of ground beetles in ecological and environmental studies. Intercept Limited, Andover, Hampshire, UK.

* – Presented in "Western Insect Range Expansion in the Anthropocene" at the Pacific Branch of the Entomological Society of America meeting, April 5, 2017.

1 – Oregon Department of Agriculture, 635 Capitol Street NE, Salem, OR 97301–2532. Email <jlabonte@oda.state.or.us>

Surprise! A subtropical thrips survives (and apparently thrives) on the southwestern Oregon coast: *Heliothrips haemorrhoidalis* (Bouché), Greenhouse thrips (Thysanoptera: Thripidae) *

Chris Hedstrom[1], James R. LaBonte[1], and Wyatt Williams[2]

Introduction

Heliothrips haemorrhoidalis, greehouse thrips, was first described in 1833 in Europe from specimens found in a greenhouse. However, this species was introduced to Europe from South America on shipments of imported ornamental plants. It was first reported in the United States in 1870. It is now found worldwide because of its ability to survive in greenhouses. Although a greenhouse pest across the United States, greenhouse thrips is only known to have established outside of greenhouses in southern Florida and southern California. Populations have recently appeared along the southern coastal range of Oregon, a climate dissimilar to that found in the thrips native range and where it has established in the United States. It has been documented in Oregon causing significant damage to salal and other plants, such as azalea, boxwood, and rhododendron, and there is concern that it could become an economic and ecological pest.

Adult greenhouse thrips have a darkly colored thorax, with a black or orange colored abdomen. They are found on the undersides of leaves. Photograph by Tom Valente, Oregon Department of Agriculture.

Life cycle and description

Adults are about 1 mm in length. Females are parthenogenetic and lay their eggs below the surface of leaf tissue. Only the tips of the eggs are visible. Larvae are translucent and white when young, becoming yellow when more mature, with red eyes. The entire life cycle is one or two months, depending on temperature. Multiple generations can occur depending on conditions.

Juvenile greenhouse thrips (left). Photograph by Tom Valente, Oregon Department of Agriculture. Adult greenhouse thrips (right). Photograph by Thomas Shahan, Oregon Department of Agriculture.

Damage to native plants in the coastal mountain range of Oregon

Thrips use their mouthparts to pierce plant cell walls and remove the cell contents. This damage initially causes a distinctive greyish or silver cast, or "silvering", along leaf margins. Unlike most thrips, greenhouse thrips feeds throughout the underside of a leaf

Damaged leaves appear silvered. Here a large number of affected plants are shown in 2016 along a trail in SW Oregon. Photograph by Randy Wiese, Oregon Department of Forestry.

* – Poster paper from the meeting of the Pacific Branch of the Entomological Society of America, April 2017. Reformatted and edited for publication.

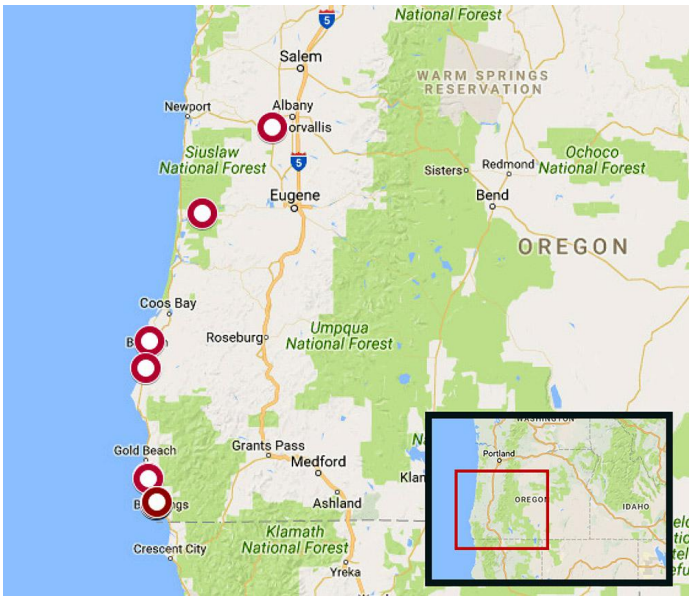
1 – Oregon Department of Agriculture, 635 Capitol St. NE, Salem, OR 97301.
2 – Oregon Department of Forestry, 2600 State St., Bldg. D, Salem, OR 97310.

Silvery patch of dead leaves (upper image) Photograph by Neil Bell, OSU extension agent for Marion and Polk Counties. Silvered leaves are often also covered in frass on the undersides where the thrips have fed on foliar tissue (lower image). Photograph by Thomas Shahan, Oregon Department of Agriculture.

and, as more damage occurs, the entire leaf surface becomes silvered. Severe infestations cause most or all of a host plant canopy to become silvered or appear as brown stippling, which can be spotted from a distance. A diagnostic characteristic of greenhouse thrips are the extensive fecal drops on the underside of the leaf, exuded by the feeding thrips as a predator deterrant. Wild salal in the coastal range of SW Oregon has been found with this damage.

The situation in Oregon

Greenhouse thrips was identified in Oregon in 2014 on salal on the Oregon coast by the Oregon Department of Agriculture. However, following a pest alert, damage has been reported from multiple areas as far back as 2007. The Oregon Department of Forestry has reported seeing damage on salal along the Oregon coast and in some inland areas within the coastal range. There have also been reports of damage to salal spreading in the winter months, but this has not been verifed. It is possible that damage by greenhouse thrips could be confused with that of azalea lace



Areas in Oregon where greenhouse thrips have been reported are identified by red circles. Reports of damage to salal increased following a pest alert by ODA in 2016.

bug (*Stephanitis pyrioides*; Hemiptera: Tingidae).

What's the plan now?

As greenhouse thrips has only recently become a noticeable pest in Oregon, its range is still being determined. However, its threat as a severe pest to native forest understory vegetation is apparent. Surveys to determine the range of the pest in the state are planned for 2017. *Thripobius semileuteus* (Hymenoptera: Eulophidae) was introduced as a biological control agent in California in 1986 and 1988, and in Italy in 1995 and in New Zealand. Surveys for this and other natural enemies that might be attacking greenhouse thrips in Oregon are also planned for 2017.

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