Year-end Report on Portland Millipedes

12/31/2018

Picture descriptions –

Upper image: Male and female of a large parajulid species on fern fronds late at night.

Lower images: (L) Thrinaphe hargeri showing banding pattern visible under ultra-violet light (the animal is not blue under normal light). (M) Kepolydesmus anderisus male. (R) Octoglena anura

Year-end Report on Portland Millipedes

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Objectives

This report is an update of the last report submitted 12/31/2017. The original purpose of this project was to collect from East Butte properties two species of striariid millipede (Family Striariidae, Order Chordeumatida), one potentially undescribed, and a second suspected to be the long-lost species *Amplaria nazinta*. Collections were done under the direction of Dr. William Shear, Professor Emeritus of Hampden-Sydney College, who also dissected and identified specimens. Since the successful completion of this objective, collections have continued and expanded known species distributions (in one case by over 200 miles), uncovered other specimens of interest, and established the beginnings of a baseline of millipede species for the Portland area east of the Willamette River to Boring and south to Oregon City.

Geographic Scope

A total of ten properties were surveyed during this project. They include the Portland Parks and Recreation properties Powell Butte Nature Area, Oaks Bottom Wildlife Refuge, and Forest Park, and the Metro properties West Bliss Butte/East Bliss Butte, Towle Butte, Gabbert Butte, Grant Butte, Canemah Bluff, River Island Natural Area, and the Buck and Gordon Creeks property.

A total of 5 properties lie within the East Buttes region, a field of extinct volcanic cinder cones associated with the Boring Lava Flow. One property exists east of this area, Buck and Gordon Creeks, which is situated along the eastern side of the Sandy River. Two more southern properties are River Island Natural Area in Barton, Oregon on the Clackamas River and Canemah Bluff Nature Park in Oregon City along the Willamette River. To the west are Oaks Bottom Wildlife Refuge, a large wetland alongside the Willamette River, and the vast Forest Park area stretching from downtown Portland northwest to Newberry Road.

These properties were mostly surveyed during the late fall, winter, and early spring months, when most millipede species are active and individuals have reached maturity. Occasional surveys were done during the summer at locations such as Oaks Bottom Wildlife Refuge and Grant Butte.

What constitutes a "Survey"?

Places to Look

A typical survey involves locating an area with a good covering of leaf litter (preferably Big-leaf Maple; fir needles seem also to be beneficial), ferns, and woody debris. Leaves are turned over, individually or in small clumps, and examined carefully for millipedes. Many millipedes inhabit the leaf litter and may be found resting on the leaf surfaces. *Retrorsia*, possibly the most common millipede in maple leaf litter, is nearly a centimeter long and dorsoventrally flattened, so it is able to creep in between tightly pressed leaves or other small nooks and crannies. It is bright white in color (and

stunning in body structure under the microscope) so once exposed it is easy to see. Other millipedes, however, such as *Tingupa*, have a similar body shape but are brown in color, and thus are much easier to overlook.

During the nighttime on my own property I have occasionally used a millipede rake (Means, 2015) to turn leaves and scrape the upper layers of duff/soil while shining an ultra-violet light on the ground. Xystodesmids (*Harpaphe* and *Thrinaphe*) fluoresce somewhat brightly under ultra-violet light and can be found with ease using this method. This fluorescence continues after death, and tiny fragments of fluorescent exoskeleton from the remains of a dead xystodesmid may be found in the soil.

The duff underneath the leaf litter is important to check, as it often is host to an array of different chordeumatidans. In areas where duff is absent, wanting, or somewhat coarse (fir needles may play a role in making up good duff), the caseyids may be noticeably absent or diminished in diversity. The soil layer underneath the duff may also be checked to a few inches in depth to find *Uroblaniulus* or more Chordeumatida.

Woody debris may be in the form of small branches, logs, or bark lying on the ground. Turning over bark on the ground may uncover chordeumatida and *Retrorsia*; turning logs may locate striariids such as *Amplaria*, spirobolids (*Tylobolus*), or *Uroblaniulus*. Logs that are not powdery from decay seem to be preferred. The underside of bark still attached to logs often turns up particular millipede species such as *Tingupa*, *Taiyutyla*, and *Polyxenus*. At Towle Butte, several logs near the entrance are host to thriving populations of *Taiyutyla*, with the animals preferring to stick near the papery layer between the bark and the trunk.

The undersides of rocks are reportedly good places to look for millipedes, but as far as I can tell, only in regions other than here. I have never had much luck finding millipedes underneath rocks at any location, although occasionally *Polyxenus* may be found.

Plants may also warrant inspection in some cases – western sword ferns often have a moist, protected environment at their base, underneath their fronds. This may be a good location to find caseyids and *Octoglena*. In early fall during the nighttime on my own property adjacent to West Bliss Butte, the Oregon grape, ferns, and even small trees like vine maple and elderberry may be host to a number of climbing *Scytonotus*, *Uroblaniulus*, and an unidentified, large parajulid species. During the day time, Oregon grape leaf litter is often worth examining.

Survey Methods

Surveys conducted during this project are informal visits to a property with the goal of finding (and collecting, if deemed important) a species of interest. Collections are done in a way that minimizes the impact to the structure of the microhabitats and to the site itself, both functionally and aesthetically. Holes (at most 3 to 4 inches deep, 6 inches wide) are dug (by hand) infrequently, but when done are re-filled with the same soil. Where leaf litter has been disturbed, the leaves that were moved are replaced to cover the ground with the goal of reforming a layer of leaf litter protection to the duff below and preventing the formation of potentially unsightly patches on the ground. Logs and rocks are always replaced after being turned over, taking care to remove salamanders and other large animals first, placing them adjacent to the rock or log after it has been replaced. Bark, also, is always replaced on logs after removal. Damage to plants is

avoided by not digging through root structures. When off trail, steps are taken to minimize damage to fragile forest floor structures and to highlighting paths that could become unauthorized trails.

Selection of Specimens

Specimens of interest are those that I do not personally recognize or are members of relatively speciose clades that must be dissected under a microscope to identify to species (such as *Taiyutyla* and *Bollmanella*). An effort is being made to collect a representative of each species from each park to provide a permanent record of the species diversity and distribution in the Portland area. Collection of commonly occurring species is infrequent as they can often be visually assigned to species or morphogroup without the need for dissection.

A goal of this project in creating baseline data for millipede diversity and distribution in the Portland area is to also make these species recognizable in the field without having to take a specimen and dissect it. Fundamentally this means assigning names to images to begin building a "field guide" and to help develop a search image for the organism and its relatives in the future. To this purpose, all specimens that are collected are photographed so that a photographic record can accompany species identifications.

If dissection is required to identify a particular species, as is necessary in species such as the *Taiyutyla* spp., a mature adult male must be collected. Adult male millipedes possess secondary sexual structures called gonopods which are complicated structures that evolved from legs on the 7th and 8th segments of the body and function in transferring spermatophores to the female. These gonopods must be dissected out and examined under a microscope to identify a specimen to the species level. In many cases, the structure of gonopods is the only reliable characteristic that separates multiple species. It is thought that they are part of a sort of "lock and key" isolation mechanism (Hopkin, 1992) with males being unable to mate with females of a different species due to gonopod structure.

Females and juveniles are thus often entirely useless in identifying a millipede to species. Some efforts in the literature have been made to include the structure of cyphopods, the openings to the female genitalia on the 2nd segment, with other features for identification of some species, but male gonopods remain the gold standard.

To determine whether a given millipede is an adult male, the presence of gonopods must be determined in the field. This is done by placing the specimen in a clear plastic vial or other small container and examining it under (at least) 20x magnification. I use a jeweler's loupe with 20x magnification.

Gonopods may appear as, for example, lobes visible to the naked eye as in caseyids, curved shield-like structures as in some julids, "periscope" shaped gonopods as in conotylids, or pseudo-leg-like appendages with various hooks and processes in polydesmida. Regardless of the form of the gonopods, the presence of non-leg structures taking the place of legs on the underside of a millipede at the 7th or 8th ring usually indicates a mature male.

Summary of Portland area taxa and their distribution

Descriptions of local families of millipedes

Sixteen families in six orders have been identified from the properties surveyed. The six orders are, in alphabetical order, Chordeumatida (16 species), Julida (6 species), Polydesmida (8 species), Polyxenida (1 species), Polyzoniida (2 species), and Spirobolida (1 species). Two other orders exist elsewhere in Oregon: Platydesmida, a group of often brightly colored and sometimes social millipedes, and Callipodida, which reportedly have a unique odor. Chordeumatida appears to be the most speciose order in our area, with successful diversification into a number of different microniches. The genera and general characteristics of species identified by this project are given.

There are five families in the Chordeumatida: Caseyidae (6 species), Conotylidae (5 species), Rhiscosomididae (1 species), Striariidae (2 species), and Tingupidae (2 species). Fun fact: Many of our caseyids and conotylids, when stationary, can be encouraged to move by tapping their posterior end with a light, anteriorly directed brushing motion.

The Caseyidae (pages 13–14) are small torpedo-shaped millipedes that are usually found in the leaf litter or duff. Several species have complicated patterns of spots and smudges along their dorsum and sides that may be difficult to parse in the field, though there are a few morphotypes that can be quickly recognized. They are often found partially curled up, and when disturbed they are among the faster millipedes, easily disappearing into the leaf litter or duff. Genera include *Vasingtona* (1 species), *Ochrogramma* (2 species), and *Opiona* (2 species). Other genera may be added in the near future.

Conotylids (page 15) often appear, especially when discovered underneath bark, as though they might be centipedes instead of millipedes, but a careful look shows that they have two pairs of legs per segment instead of one and an overall smaller, more docile appearance. When disturbed they may choose to walk away, but sometimes break into a run. They are usually brick red in color and have a number of especially long setae along the body. Genera include *Taiyutyla* (3 species) and *Bollmanella* (1 species).

The Rhiscosomididae (page 16) are, when fully grown, about a centimeter long. They are often found associated with woody debris. The first segment, called the collum, extends into a hood-like structure that overhangs much of the head. One genus: *Rhiscosomides*.

Striariids (page 17) are striking millipedes. They have a number of longitudinal ridges on each segment and a small hooded (and ridged) collum. They are generally slow moving and are found in the leaf litter, duff, or under woody debris. The most commonly encountered species in our region is currently undescribed and is just short of a centimeter in length, white, and very thin. They are often curled into discs in the soil or duff and escape notice due to their small size. A larger species, *Amplaria*, is nearly an inch in length when fully grown, and is a truly beautiful animal. It is creamy brown in color and often has a number of small specks of darker brown dirt particles along the back that get stuck in the ridges. Juveniles are often found in low numbers near the adults under big-leaf maple branches or in maple leaf litter/duff. Two genera have been found: *Amplaria* (1 species) and an unnamed genus.

The most common of the Tingupidae (page 18) is brown and approximately the same size as the rhiscosomidids. It has several longitudinal stripes along the dorsum of alternating dark and light shades of brown. The collum does not form a hood as in Rhiscosomididae. This species may be found in leaf litter or under the bark of logs. One genus has been identified: *Tingupa* (2 species).

Julida is represented by the families Parajulidae, Blaniulidae, and Julidae in our region. Julidae and Blaniulidae are entirely non-native families. They are usually introduced through human means, especially gardening, being brought in with potted plants. Parajulidae is a native family.

Of the Parajulidae (pages 19–20), *Uroblaniulus* is an especially common millipede found in the soil, duff, leaf litter, and woody debris. It can grow to about an inch in length and is a warm brown with some black markings along the body. Another genus of parajulid millipede has been found wherein the individuals may slightly exceed two inches in length. It is nocturnally active, climbing low in small trees and ferns, and is the largest (by length) species of millipede where it is found.

The invasive julids (page 21) are comparable in size to Uroblaniulus, reaching only an inch or so in length at most. They may be especially thin and white, as with the blaniulids, or of average girth and grey or brown, sometimes with two white spots on the head.

Polydesmida are known as flat-backed millipedes due to lateral extensions they have on the dorsum of each segment called paranota. Families in this order so far found in the Portland area include Paradoxosomatidae with one non-native representative, Polydesmidae, of which some are invasive and others native, Macrosternodesmidae, and Xystodesmidae. Fun fact: All polydesmids are eyeless.

Macrosternodesmidae (page 22) contains two genera that look very similar to each other, *Nearctodesmus* and *Kepolydesmus*. Somatic characters for separating the two genera have so far escaped my eye, but a good look at the gonopods usually works to identify to genus. This can be done in the field with sufficient magnification. These millipedes are often associated with woody debris along the edge of bodies of water or near creeks, and are bright red with yellow spots on the paranota.

Paradoxosomatidae (page 23) is represented by the non-native greenhouse millipede, *Oxidus gracilis*. As its common name implies, it also owes its introduction to nurseries. It is like a xystodesmid in body form, but smaller and more tubular.

Polydesmidae (pages 23–24) consists of native leaf-litter inhabiting millipedes such as the ever-present *Retrorsia*, and the common *Scytonotus*, a millipede about an inch long with a warm golden-red color. The invasive representatives are from the genus *Polydesmus* and, like the non-native julids, are introduced from Europe.

The Xystodesmids (page 25) are relatively large millipedes of the soil, duff, and at the right time of year, open forest floor. *Harpaphe* is a commonly encountered millipede that is jet black with yellow to orange spots along the paranota as an adult. *Thrinaphe* may be light brown, chocolate brown, root beer colored, or entirely jet black. Both emit hydrogen cyanide gas when disturbed. This is not particularly dangerous in the low concentration in which it is emitted, and has an aroma of sweet almond.

Polyxenida (page 26) is an ancient group of millipedes that really look unlike any other millipedes. They are only a few millimeters long and are covered in dense bunches of hairs giving them a fuzzy appearance. They lack gonopods and identification may use

characters such as the morphology of the hairs. They are sometimes found in colonies of up to fifty or more individuals on pieces of bark. One genus: *Polyxenus*. Fun fact: They have a specialized physical defense mechanism in the form of a posterior tuft of hairs that, when triggered, shoots entangling hairs at small predators.

Polyzoniids (page 27) are also strange looking millipedes. They are flat with wide, orange bodies and small heads. The most common form, *Octoglena*, is slow moving and is often found in leaf litter or on small, wet branches lying on the ground, sometimes in groups of twenty or more.

The only Spirobolid (page 28) we have in our region, *Tylobolus uncigerus*, is the undisputed largest species. Reaching around four inches in length for some specimens, this species has a weight you can feel on your hand. Despite possessing a chemical defense (which is harmless; it produces small orange stains upon contact with the skin that wash off over time without ill effect) it may be handled for closer inspection in the field.

Distribution

Many of the more common millipedes are found at almost every site – these include *Retrorsia*, Caseyidae, *Uroblaniulus*, Striariidae, and *Octoglena*. Other species are found at only a few sites, such as the large spirobolid *Tylobolus uncigerus*, which is rather common at Oaks Bottom and Powell Butte, but has not yet been found at any other site.

Though the native polydesmida are typically ubiquitous across sites, non-native polydesmids appear limited in distribution. So far they have been found only at Oaks Bottom Wildlife Refuge (*Oxidus* and *Polydesmus*). Invasive julids are more widespread and have been found at Grant Butte, Oaks Bottom Wildlife Refuge, and River Island Natural Area, where they may be associated with logs brought in for restoration purposes or introduced from nearby Barton Park.

Though the same species may not be found at every site, relatives often are. For example, the diversity of caseyids may differ slightly from one site to another. Photographing and identifying all caseyids in the Portland area is a major goal since their complex spotted patterns may allow for species or at least genus identification in the field without needing to take a specimen.

A table (**Table 1**) showing the presence/absence of millipede species at each site is shown on the following page.

Tylobolus uncigerus

Table 1: A checklist of millipede species identified in the Portland area by this project. Presence of a species or higher taxon is indicated at a given site by a YES. A ‡ symbol indicates that a millipede probably belonging to the indicated species was found at a given site but that the specimen was not conclusively identified by an examination of gonopods. ‡‡* indicates more uncertainty in the identification. 34 species total, from 15 families and six orders.

Sites:	Towle Butte	Gabbert Butte	West/East Bliss Butte	Powell Butte	Forest Park	Oaks Bottom	River Island	Grant Butte	Buck and Gordon	Canemah Bluff
Chordeumatida; Caseyidae										
Ochrogramma bentona										YES
Ochrogramma formosula			YES						‡	
Opiona sp. 1	YES	YES	YES		‡		‡		YES	
Opiona sp. 2							YES			
Vasingtona irritans	‡	‡	‡	‡	‡		YES	‡		
Unid. Caseyid 1							YES			
Unid. Caseyid 2					YES					
Chordeumatida; Conotylidae										
Bollmanella bifurcata?		‡	YES							
Taiyutyla corvallis		YES	YES							
Taiyutyla lewis	YES									
Taiyutyla variata	YES									
Chordeumatida; Rhiscosomididae										
Rhiscosomides benedictae	YES	YES	YES	YES			YES		YES	YES
Chordeumatida; Striariidae										
Amplaria nazinta	‡	‡	‡	YES			‡	‡		‡
Striariidae (undescribed)	YES	YES	YES	YES	YES		YES	‡	YES	YES
Chordeumatida; Tingupidae										
Tingupa sp.		YES								
Tingupa causeyae			‡	‡	‡					YES
Julida; Parajulidae										
Uroblaniulus sp.	YES	YES	YES	YES	YES	YES	YES			YES
Large Parajulidae			YES				‡‡*			
Julida; Julidae										
Julidae sp. 1						YES	‡			
Julidae sp. 2	‡					YES				
Julidae sp. 3						‡	YES			
Julida; Blaniulidae										
Blaniuluid sp.								YES		
Polydesmida; Macrosternodesmidae										
Kepolydesmus anderisus	‡	‡	YES					YES		
Nearctodesmus insulanus						YES				

Polydesmida; Paradoxosomatidae										
Oxidus gracilis						YES				
Polydesmida; Polydesmidae										
Polydesmus inconstans						YES				
Retrorsia leonardi	YES	YES	YES	YES	YES		‡		YES	YES
Scytonotus insulanus		‡	YES	‡	‡	‡	‡			‡
Polydesmida; Xystodesmidae										
Harpaphe haydeniana		YES	YES	YES		‡‡	YES	YES		YES
Thrinaphe hargeri			YES	YES						
Polyxenida; Polyxenidae										
Polyxenus sp.	YES	YES	YES		YES	YES	YES	YES		YES
Polyzoniidae; Hirudosomatidae										
Octoglena anura		YES	YES	YES	YES		YES	YES	YES	YES
Stenozonium benedictae					‡		‡			
Spirobolida; Spirobolidae										
Tylobolus uncigerus				YES		YES				

Notable results

Striariidae: The two initial target species, both members of the family Striariidae, were successfully collected, and the taxonomic status of one (*Amplaria nazinta*) has been officially resolved and published in the journal Zootaxa. A second species, which is apparently widespread and common in the Portland area (see **Table 1** above), is currently undescribed.

Taiyutyla: A population of *Taiyutyla variata*, a species of conotylid millipede that has only one previous known record (Shear, 1976) from Jackson County, Oregon was discovered on Towle Butte. Since its initial collection it has not been found again, though *Taiyutyla* remains a common genus at the site. *Taiyutyla corvallis*, another infrequently collected species (last collection from the 1950's) and the type species of the genus *Taiyutyla*, was also found at several locations.

Bollmanella: A species that may be *Bollmanella bifurcata* was collected from property adjacent to West Bliss Butte. The nearest known population of *Bollmanella bifurcata* in Oregon is from the Blue Mountains to the east.

A total of 34 species have so far been recorded for this project (an increase of almost 50% from last year); they are listed in **Table 1** above, and photographs of most are given in the illustrated species profiles below, providing the first, to my knowledge, photographic guide to millipede species of the Portland region.

Future Goals

- Finish cataloguing caseyidae species, with several species additions expected.
- Identify non-native species of Julida.
- Continue exploration of the more peripheral properties to identify additional species.
- Begin moving away from collection for identification and towards exploration of life histories and ecology.

Conclusion:

I hope to continue this project into 2019. It is my hope that the beginnings of a baseline list of local millipede species has been established by these collections and the identifications by Dr. Shear, and that others interested in Portland area millipedes in the future will be able to negotiate the taxonomic waters somewhat more swiftly.

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Species Profiles and Photographic Guide

MILLIPEDE CHECKLIST:
34 species, 16 families, 6 orders

Chordeumatida: Caseyidae

- Generally found in leaf litter or duff; under fronds or in litter between ferns may be a good place to search. The unidentified Opiona species 1 seems to be found often in soil/duff.
- Fast, torpedo shaped
- Gonopods can clearly be seen without aid of magnification as large lobes on underside of body around 7th segment.

Ochrogramma bentona


Figure 1 (L): Ochrogramma bentona adult male, Canemah Bluff; Figure 2 (R): Ochrogramma bentona adult male, Canemah Bluff; Both December 20, 2017.

Ochrogramma formosula


Figure 3 (L) and Figure 4 (R): Ochrogramma formosula, from property adjacent to West Bliss Butte. December 14, 2017.

Opiona sp. 1

Figure 5 (L) and Figure 6 (R): Opiona sp. from Towle Butte, December 20, 2018.

Opiona sp. 2

Vasingtona irritans

Figure 7 (L): Opiona sp. from River Island, July 2, 2018. Figure 8 (R): Vasingtona irritans from River Island, September 16, 2018

Unidentified Caseyidae 1

Unidentified Caseyidae 2

Figure 9 (L): Unidentified caseyidae from River Island, December 16, 2018. Figure 10 (R): Unidentified caseyidae from upper Forest Park, Firelane 15 trail, December 30, 2018.

Chordeumatida: Conotylidae

- Two genera have been identified in the Portland area – all species pretty much look the same somatically.
- Bollmanella is orange in color; Taiyutyla is cream colored with a reddish dorsal midline stripe.
- Often underneath the bark of logs or in leaf litter.

Bollmanella (bifurcata?)

Taiyutyla variata

Figure 11 (L): Bollmanella (bifurcata?) from property adjacent to West Bliss Butte, January 4, 2018. Figure 12 (R): Taiyutyla variata from Towle Butte, November 11, 2016.

Taiyutyla lewis

Taiyutyla corvallis

Figure 12 (L): Taiyutyla lewis from Towle Butte, January 12, 2018. Figure 13 (R): Taiyutyla corvallis from West Bliss Butte, November 18, 2017.

Chordeumatida: Rhiscosomididae

- One species so far – Rhiscosomides benedictae
- Small (Almost a cm in full length). Adults are brown with a white head and collum. Juveniles look like miniature replicas of the adults except the brown is usually faded to greyish, or in very young individuals, a very light grey to almost white.
- Similar to Tingupa, a single prominent hair extends from each paranotum.

Figure 14 (Top): Rhiscosomides from Gabbert Butte, December 28, 2018. Figure 15 (Bottom Left): Rhiscosomides from West Bliss Butte, April 2, 2016. Figure 16 (Bottom Right): Rhiscosomides coiled on top of a subadult male Amplaria from Canemah Bluff, October 22, 2017.

Chordeumatida: Striariidae

- Two types have been identified. A large, golden species (Amplaria nazinta) and a smaller, unnamed species.
- Amplaria is often associated with big-leaf maple woody debris, but is sometimes found in leaf litter. The unnamed species is abundant in leaf litter and soil/duff where it may be found coiled in tight, thin disks that are easily overlooked.

Unnamed Striariidae

Figure 17 (L): Unnamed Striariidae from Towle Butte, December 20, 2018. Figure 18 (R): Unnamed Striariidae from West Bliss Butte, March 20, 2018.

Amplaria nazinta

Figure 19 (Upper Left): Amplaria nazinta‡ from Towle Butte, December 20, 2018. Figure 20 (Upper Right): Juvenile Amparia nazinta (left) compared with an adult of the unnamed striariidae (right) from West Bliss Butte March 20, 2018. Figure 21 (Lower Right): Amplaria nazinta‡ from Towle Butte, December 20, 2018.

Chordeumatida: Tingupidae

- Small, inconspicuous millipedes that blend in well with their environment (generally leaf litter or under bark).
- *Tingupa causeyae* is the more common species (larger and brown). The other Tingupa species (very small and white) has been found at Gabbert Butte.

Tingupa causeyae

Figure 22 (L): Tingupa causeyae from Canemah Bluff, December 20, 2017. Figure 23 (R): Tingupa causeyae‡ from Powell Butte, December 14, 2018.

Tingupa sp.

Figure 24 (L): Tingupa causeyae‡ from property adjacent to West Bliss Butte, February 10, 2018. Figure 25 (R): Tingupa sp. from Gabbert Butte, December 21, 2017.

Julida: Parajulidae

- Cylindrical millipedes found just about everywhere (woody debris, leaf litter, soil, even trees).
- Brown with mottled markings, adult males have enlarged first leg pair, hooked epiproct (posterior projection).
- The larger parajulid species appears to be somewhat nocturnal and motivated to climb ferns, Oregon grape, and small trees. During the day I have found it hiding in soil.
- "Uroblaniulus" was formerly called "Bollmaniulus" in previous reports.

Uroblaniulus sp. (all this page)

Figure 26 (Top): Uroblaniulus sp. from Oaks Bottom, December 19, 2018.

Figure 27 (Middle Left): Uroblaniulus eggs.

Figure 28 (Middle Right): Young juvenile of Uroblaniulus.

Figure 29 (Lower): Uroblaniulus sp. from property adjacent to West Bliss Butte, January 28, 2018.

Figure 30 (Upper Right): Unidentified Parajulidae on top of Western Sword Fern at 1:10 am in forested property adjacent to West Bliss Butte, October 13, 2018.

Figure 31 (Middle Left): Unidentified Parajulidae with commensal mite riding on back from property adjacent to West Bliss Butte, September 11, 2018.

Figure 32 (Middle Right): Unidentified Parajulidae on underside of *Tsuga* branch approximately seven feet off of the ground on property adjacent to West Bliss Butte, September 23, 2018.

Figure 33 (Lower Left): Unidentified Parajulidae in tight defensive curl showing pinkish tinge to legs; from property adjacent to West Bliss Butte, September 23, 2018.

Figure 34 (Lower Right): Unidentified Parajulidae crawling on Vine Maple branch approximately six feet off of the ground at night on property adjacent to West Bliss Butte, September 21, 2018.

Unidentified Parajulidae

Julida: Julidae and Blaniulidae

- Usually about an inch or so long, cylindrically-shaped. Though some may have patterns that look similar to Uroblaniulus, they lack the hooked epiproct and enlarged first pair of legs on males.
- All introduced species

Figure 35 (Upper Right): Julidae species 1, from Oaks Bottom, August 10, 2018. Figure 36 (Middle Left): Julidae species 1, from River Island, January 28, 2018. Figure 37 (Middle Right): Julidae species 2, from Oaks Bottom, December 19, 2018. Figure 38 (Lower Left): Unidentified Julidae species 3 from River Island, December 16, 2018. Figure 39 (Lower Right): Unidentified Blaniulid species from Grant Butte, June 29, 2018.

Julidae species 1

Julidae species 2

Julidae species 3

Unidentified Blaniulid

Polydesmida: Macrosternodesmidae

- Moderately large and noticeable millipedes, brightly colored in red with yellow spots.
- Often found near water (creeks or large ponds), sometimes in abundance.
- Two species in two different genera have been identified and they look pretty much the same. They can be told apart by their gonopods, sometimes in the field with the use of magnifying optics.

Kepolydesmus anderisus

Figure 40 (Upper Left): Kepolydesmus anderisus, from property adjacent to West Bliss Butte, September 11, 2018. Figure 41 (Middle Left): Kepolydesmus anderisus‡ from Gabbert Butte on stump, October 1, 2017. Figure 42 (Middle Right): Kepolydesmus anderisus‡ juvenile from Gabbert Butte, March 31, 2016. Figure 43 (Lower Left): Nearctodesmus insulanus from Oaks Bottom, July 6, 2018. Figure 44 (Lower Right): Nearctodesmus insulanus from Oaks Bottom, July 19, 2018.

Nearctodesmus insulanus

Polydesmida: Paradoxosomatidae and Polydesmidae

- Oxidus gracilis, the lone Paradoxosomatid, is an introduced species. It resembles a miniature xystodesmid and is colored in dark olive tones.
- Of the genus Polydesmus, all are introduced here. A single species, Polydesmus inconstans, was found at Oaks Bottom.
- Scytonotus is a native genus, and one species, S. insulanus, has been identified here. It inhabits leaf litter and can blend in with its environment well due to its brown/red coloration and rough dorsum.
- Retrorsia leonardi is a small, white, apparently ubiquitous native millipede that inhabits the leaf litter.

Oxidus gracilis


Figure 45 (L) and Figure 46 (R): Oxidus gracilis from Oaks Bottom, July 19, 2018 (L) and August 10, 2018 (R)

Polydesmus inconstans


Figure 47 (L): Polydesmus inconstans from Oaks Bottom, August 10, 2018. Figure 48 (R): Polydesmus inconstans[‡] from Oaks Bottom, March 5, 2016.

Scytonotus insulanus

Figure 49 (Top): Scytonous insulanus from northern Forest Park (Firelane 15 Trail) December 30, 2018.
Figure 50 (Middle Left): Scytonotus insulanus from Oaks Bottom, December 19, 2018.
Figure 51 (Middle Right): Scytonotus insulans from Oaks Bottom, December 19, 2018.
Figure 52 (Lower Left): Retrorsia leonardi‡ from property adjacent to West Bliss Butte, November 26, 2016
Figure 53 (Lower Right): Retrorsia leonardi‡ from Powell Butte, December 14, 2018.

Retrorsia leonardi

Polydesmida: Xystodesmidae

- Xystodesmids are large, mostly black millipedes that commonly roam forest floors during late spring and early summer.
- They secrete a chemical defense composed of hydrogen cyanide, resulting in a characteristic sweet almond odor when disturbed.

Harpaphe haydeniana

Figure 54 (Top): Harpaphe haydeniana‡ mating, from property adjacent to West Bliss Butte, May 6, 2015. Figure 55 (Middle Left): Juvenile Harpaphe haydeniana‡ from property adjacent to West Bliss Butte, December 30, 2015. Figure 56 (Middle Right): Adult Thrinaphe hargeri‡ from Powell Butte, April 9, 2017. Figure 57: Adult Thrinaphe hargeri‡ from property adjacent to West Bliss Butte, April 28, 2015. Figure 58: Adult Thrinaphe hargeri‡ under ultra-violet light, showing characteristic fluorescent banded pattern (Harpaphe also fluoresce, but lack the banding pattern) from property adjacent to West Bliss Butte, November 26, 2017.

Thrinaphe hargeri

Polyxenida: Polyxenidae

- Tiny (about 2 mm long), furry millipedes that look unlike any of our other local species.
- Often found in congregations on bark or rock surfaces.

Figure 59 (Top): Polyxenus sp. congregation on bark from Towle Butte, November 8, 2016. Figure 60 (Middle Left): Polyxenus sp. from West Bliss Butte on underside of rock, November 28, 2015. Figure 61 (Middle Right): Polyxenus sp. next to head of Uroblaniulus sp. for size comparison; from West Bliss Butte, March 20, 2018. Figure 62 (Lower): River Island, January 28, 2018.

Polyxenus sp.

Polyzoniida: Hirudosomatidae and Polyzoniidae

- Small to medium-sized oblong, flattened orange millipedes.
- Octoglena anura is similar in coloration and shape to juveniles of Stenozonium benedictae, and reaches perhaps a half inch in length in large individuals. Stenozonium benedictae is a longer and thinner millipede, and also somewhat lighter in coloration.
- Octoglena anura is common and widespread in litter, among small wet branches, and in ferns. Stenozonium has been found at River Island on the underside of a log and in Forest Park at the base of a fern.

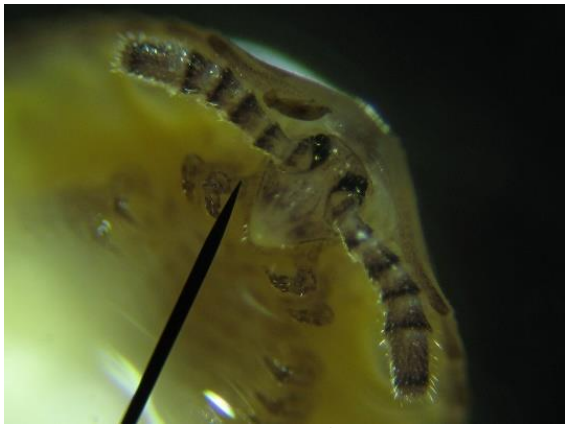

Figure 63 (Top): Octoglena anura from West Bliss Butte, November 22, 2015. Figure 64 (Middle Left): Octoglena anura; close-up of the small head of a polyzoniid. Figure 65 (Middle Right): A congregation of Octoglena anura on the underside of woody debris from property adjacent to West Bliss Butte, November 29, 2015. Figure 66 (Lower Left): Stenozonium benedictae‡ from River Island, December 29, 2018. Figure 67 (Lower Right): Stenozonium benedictae‡ from Forest Park (Firelane 15 Trail), December 30, 2018.

Stenozonium benedictae

Spirobolida: Spirobolidae

- The largest species of millipede in our area. Often found under rocks or logs where it may have stored up an impressively large pile of feces.
- Especially common at Oaks Bottom Wildlife Refuge; also common under ferns and woody debris at Powell Butte Nature Park.

Tylobolus uncigerus

Figure 68 (Top): Tylobolus uncigerus secreting defensive chemicals that would later stain a small area of my hand an orange color; from Oaks Bottom, March 5, 2016. Figure 69 (Bottom): Three good sized Tylobolus uncigerus that were living under a small log amidst an impressive mound of feces; from Oaks Bottom, July 6, 2018.