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Two Monarchs: Two Amazing Journeys!

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In a year not too far into the future, it is not too fanciful to believe that scientists will follow individual Monarch butterflies on their migration by inserting an electronic chip in the thorax and monitoring their journey by satellite. When this happens we will know in real time exactly the route a Monarch takes, how time is partitioned into flight, resting and nectaring and how many actually survive the migration and arrive at overwintering sites. Think of the amazing and illuminating data we would get from electronic-tagging just a few Monarchs!

However, in 2017 we still do what we have done since Fred Urquhart pioneered Monarch tagging in the 1950s: use sticky adhesive labels. Some of the early tags involved glue, but fortunately, with the advent of small, circular, lightweight, weatherproof adhesive tags introduced by Monarch Watch in 1992, tagging is still a remarkably simple and effective way of monitoring the Monarch migration. In more than 20 years of Monarch tagging in the eastern United States, about 14,000 tags, approximately 1% of all the Monarchs tagged, have been recovered at the overwintering sites in Mexico. Each tag recovery provides information on the date and location of release and recovery. Most of the tag recoveries in Mexico are of dead butterflies found on the forest floor often months or years after the butterflies have departed. Tagging provides no information on migration routes or residency duration at the overwintering site.

Tagging Monarchs in the western United States has been very limited until recently, so we know very little about Monarch migration in the West compared to what we know about the eastern population. However, significant citizen scientist-based tagging programs in Arizona and the Pacific Northwest over the past few years have begun to provide much-needed data on the fall migration of Monarchs in the West. However, the limitations are the same as with eastern migrants; we usually only get information on release and recovery.

In 2016 two Monarchs tagged by citizen scientists as part of the

Washington State University Pacific Northwest tagging program, provided a whole lot more data on their journeys and overwintering than just the date/location of tagging and recovery! Their stories are also now etched in the minds and imaginations of the children that helped give these two Monarchs their lives and journeys. The case histories of these two remarkable Monarchs and the impact they have had on the children that helped raise them are described here.

Amelia's Monarch, Ms A4853, reared, tagged and released by Molly Monroe and Amelia Jebousek in Corvallis, Oregon

Molly Monroe and her five year old daughter Amelia reared their female Monarch during August 2016 from an egg laid on their backyard milkweed by a visiting female. They also reared 23 others and ended up tagging 22 of them. Amelia's Monarch was tagged with the serial number A4853 and released at her 'Growing Oaks' preschool in Corvallis on August 30 (Figures 1–2). We can only speculate on the route that Amelia's Monarch took after her

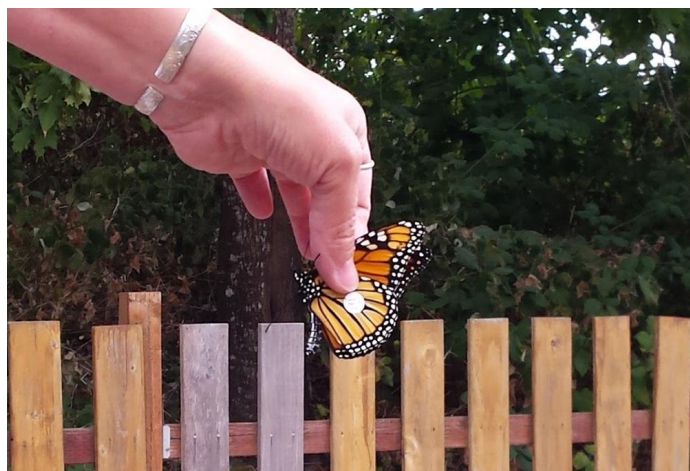


Figure 1. Amelia's Monarch, Ms A4853, on the day of her release at 'Growing Oaks' preschool in Corvallis, Oregon. Photo by Melissa May.

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Figure 2. Molly Monroe showing Amelia's Monarch to the preschool class before release on August 30, 2016. Amelia watches from the far right. Photo by Melissa May.



Figure 3. Amelia's Monarch visiting Lisa De Angelis' rooftop garden for nectar in North Beach, San Francisco, CA during 5-7pm on September 18, 2016. Photo by Lisa De Angelis.

release but given that the south was her destination, it seems likely that she followed the Willamette Valley through Eugene and Roseburg and perhaps followed the I-5 corridor through Grants Pass into northern California. She may then have passed through Redding and down through the open agricultural flood plain of the Sacramento River heading towards the San Francisco area.

One thing we do know is that Amelia's Monarch appeared in Lisa De Angelis' roof deck garden of her 4th story apartment in North Beach, San Francisco on September 18! Lisa had her iPhone® at the ready and took an iconic picture of Ms A4853 nectaring on *Verbena*, showing the unmistakable San Francisco skyline (Figure 3).

Amelia's Monarch hung around Lisa's blooms for two hours from 5-7 pm spending most of her time feeding from *Lantana*, before flying off. Ms A4853 had taken just 19 days to fly the 470 air miles south to San Francisco or an average of 24.7 miles a day.

Undoubtedly her route was more meandering; thus she probably flew many more miles. Traveling had not taken a discernible toll

on her condition; her wings were still vibrantly colored and in excellent condition. Clearly, North Beach, San Francisco was a refueling stop and she had not reached her overwintering destination.

We thought the odds of seeing Amelia's Monarch again were slim but amazingly 23 days later, long-time Monarch biologist John Dayton spotted Ms A4853 amongst 10,000 or so Monarchs on a cypress at the Santa Cruz Lighthouse Field overwintering site (Figure 4)!

She had flown another 64 miles south-south-east to Santa Cruz and, if she was flying at the same rate as prior to her San Francisco stop, she probably arrived in Santa Cruz around September 21. John Dayton's photo shows Amelia's Monarch to still be in excellent condition (Figure 4). The Lighthouse Field overwintering site consists of a small grove of *Eucalyptus* and cypress trees just a few hundred yards from the ocean and is as nice a place as any to hang out for the winter as a Monarch could wish for. However, perhaps she didn't get on with her fellow Monarchs or perhaps the marauding crows that would sometimes



Figure 4. Amelia's Monarch roosting on a cypress tree at the Lighthouse Field overwintering site, Santa Cruz, CA on October 11, 2016. Photo by John Dayton.



Figure 5. Amelia's Monarch at Moran Lake, Santa Cruz, CA seen for the last time at an overwintering site on December 30, 2016. Photo by John Dayton.

dive into the Monarch colony feasting on the unlucky few, freaked her out. Whatever the reason Ms A4853 decided to set off again for a short 1.6 mile hop westwards to the much more famous Santa Cruz overwintering site at Natural Bridges State Park. Far fewer Monarchs (~3000) resided at Natural Bridges in October–November and Amelia’s Monarch was spotted there in a high cluster on eucalypts on November 25 by Aleece Townsend, an active Monarch tagger in our program in southern Oregon. Perhaps this was Ms A4853’s final winter home? No it wasn’t.

She turned up again on December 30 at yet another Santa Cruz overwintering site, this time at Moran Lake which is about 4.6 miles east of Natural Bridges. Amelia’s Monarch likely flew right over Lighthouse Field and part of Santa Cruz Bay to get to Moran Lake. The Moran Lake site is a eucalypt grove that surrounds a waste treatment works and the Monarch population there varied from 2–6000 during October–December. John Dayton spotted Amelia’s Monarch at Moran Lake and I was fortunate enough to be with him on December 30 to see the by now famous and widely traveled Ms A4853 for myself! John took the final photograph we have of Amelia’s Monarch and she was still in remarkably good condition for a well-traveled four month old Monarch (Figure 5).

January and February 2017 were stormy, wet and windy in Santa Cruz and all of the Monarch colonies substantially dispersed by mid–late February. Amelia’s Monarch was not sighted again but this tenacious Monarch very likely flew inland eastwards or northwards looking for newly sprouting milkweed. Hopefully she laid enough eggs in northern California to produce another generation of Monarchs whose progeny would reach Corvallis and perhaps lay eggs on Molly and Amelia’s milkweed!

Monarch A6504 (Journey), reared, tagged and released by Susie Werts and her middle school students at Sisters, Oregon

In spring 2016 Susie Werts and her middle school students at Sisters, Oregon created a Monarch waystation at their school by planting milkweed and butterfly nectar plants. Susie also taught her class about Monarchs and the problems they face. They also reared five Monarch caterpillars obtained from a southern Oregon backyard and watched transfixed as two of them emerged as adult butterflies, a male and female, on Friday September 16 (Figure 6).

Susie’s 9 year old son, Kellen, named the male ‘Journey’ and the female ‘Hope.’ Both were tagged and released the following day at the school’s waystation. Ironically, Journey and Hope paid no attention to the available nectar and soared away over the baseball field to the south shortly after midday.

Fifty-five days later and 700 miles to the south in coastal Carpinteria near Ventura in southern California, Journey was seen again! Susie, Kellen and all the Sisters Middle School students were ecstatic! Their butterfly that they had watched grow from a tiny caterpillar to an adult had made this amazing journey to

southern California. In conversations they imagined the perils and adversaries Journey had overcome to find his way to Carpinteria. The trucks, the birds, the weather, finding nectar, so many obstacles to overcome but he had made it! So inspired by Journey’s journey were these children, that they put their imaginings into words, chapters of which will feature in a forthcoming book called “The Amazing Migration of a Western Monarch” put together by Jean Russell Nave of Bend.

Carpinteria Creek is bordered by a dense undergrowth of bushes, small trees and towering eucalypts, mostly blue gum, *Eucalyptus globules*. The creek runs through suburbia and a small area just one third of a mile from the ocean is where the butterflies roost. The creek has been known as an overwintering site for Monarchs since at least 1997, however, few people know about it. On November 11 Joe Billings of MonarchQuestAZ was visiting for the first time in search of Monarchs he had tagged during the fall in Arizona. His tags are fluorescent orange but as he used his spotting scope to scan a long pendulous string of Monarchs packed together tightly on a thin downward-arching branch, he sighted a white tag! However, it was at an impossible angle to read. Noting a dead branch as a reference point, Joe relocated his tripod and scope to a more favorable position but he couldn’t find the butterfly with the tag! Once again he relocated setting up at an almost opposite position to the original sighting. Focusing on the lower portion of the cluster Joe was elated when the tagged butterfly appeared in his scope again. Even now the butterfly was at an angle but when he zoomed in close, he could clearly read the tag:

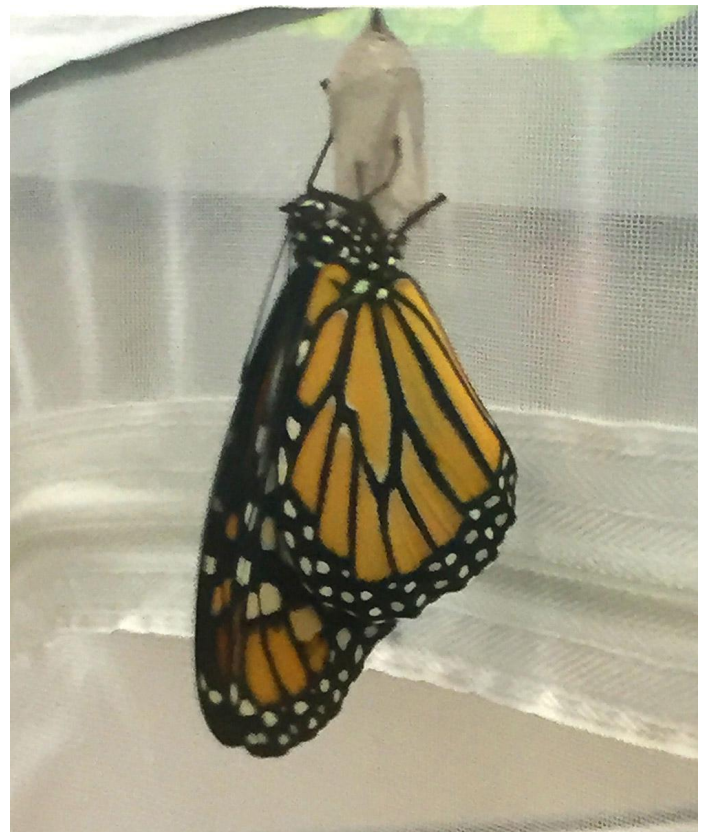


Figure 6. Journey, shortly after emergence in a Sisters Middle School classroom on September 16, 2016. Photo by Susie Werts.

monarch@wsu.edu A6504... Journey!!!

Joe reported the weather as clear and still, temperature 78°F and he could hear the waves crashing on the nearby beach. Joe is a naturalist dedicated to understanding our natural world and Journey was the first of eight PNW-tagged Monarchs he found for us at various California overwintering sites during 2016/17. Although Journey was sighted at Carpinteria 55 days after release, it is likely he arrived in the area three to four weeks after release, probably in mid-October. Fall migrating Monarchs average 25–30 miles a day, as Amelia's Monarch did. Journey is the first Monarch tagged in the Bend area to be recovered in California. He also holds the record for longest distance traveled by an Oregon Monarch and Carpinteria is to date the furthest south that a PNW-tagged Monarch has been found since we began tagging in 2012.

On November 26 my wife, three daughters and I visited Carpinteria Creek on the first day of our annual Thanksgiving PNW-tagged Monarch search and estimated at least 7000 Monarchs were roosting there, most on a large *Eucalyptus* tree. My thirteen year old daughter Jasmine was the first to spot a tagged Monarch... a fluorescent orange tag, one of Joe's! Nice karma! Scanning 7000 Monarchs takes a little time but within a few minutes I'd found Journey perched high in a cluster and very readable. So he was still here but even in this mini-cathedral of Monarchs dangers lurked. A male Monarch struggled in an orb spider web as the spider moved closer to its prey. I intervened and the Monarch flew free. This was the second time in two years I had rescued a Monarch from a spider web at Carpinteria Creek!

Joe Billings revisited Carpinteria Creek in early January 2017 and found that the entire population of Monarchs had disappeared! Journey was gone. Joe then checked another Monarch overwintering site in Carpinteria (Dump Road) located within an oil and gas processing operation, 0.4 miles east of the creek site on January 11 and found about 4,000 Monarchs roosting high in tall eucalypts. It didn't take long for Joe to find Journey in a dense cluster (Figure 7). Joe returned on January 23 and 26 and sighted



Figure 7. Journey at the Dump Road overwintering site in Carpinteria, CA on January 11, 2017. Photo by Joe Billings: MonarchQuestAZ.

Journey both times, taking photographs on the 26th (Figure 8). This is the last photograph of Journey who likely participated in the pre-dispersal mating activities then left Carpinteria some time in February following females inland to seek out newly sprouting milkweed to lay their eggs.

Amelia's Monarch and Journey told us more about their remarkable journeys than we could have ever expected thanks to the observant eyes of Lisa De Angelis, John Dayton, Aleece Townsend and Joe Billings! Clearly, some Monarchs like Amelia's and Journey like to move between overwintering sites during winter. We also know from other tag sightings that some stay put in the same overwintering site from October to January. The increased awareness of Monarchs among the general public and renewed interest in visiting overwintering colonies in California should combine to provide more sightings of tagged Monarchs and further insights into winter movements of Monarchs. The ubiquity of smart phones makes us all ready to photograph and report a tagged Monarch at a moment's notice.

However, the real value of opening a window on the life and travels of a Monarch butterfly raised from an egg by a child is the magic and understanding it brings to that child. For a child to learn that the seemingly insignificant piece of life that he or she nurtured can become a winged wonder that travels and triumphs

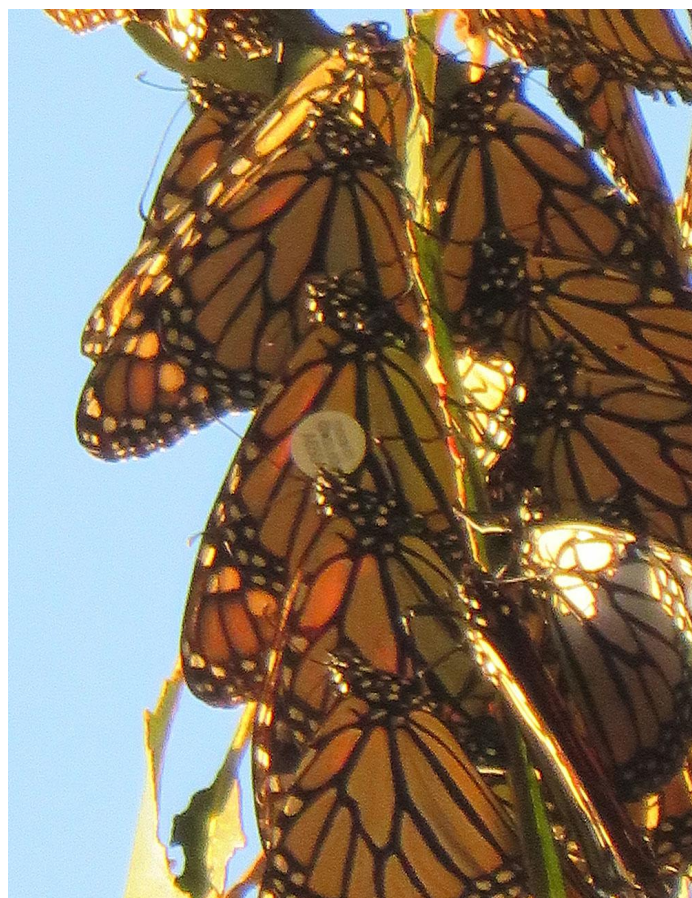


Figure 8. The final photograph of Journey roosting with many friends at the Dump Road, Carpinteria, CA overwintering site on January 26, 2017. Photo by Joe Billings: MonarchQuestAZ.

over adversity has the potential to be a defining experience for that child. To learn about and see the travels of your little piece of nature in real time is a priceless educational experience. No text book narrative can hit home that hard! Amelia and her friends will never forget her Monarch of 2016 and the Sisters Middle School students will never forget Journey. Both Monarchs will live long in the memories of these children and hopefully will create awareness in these future guardians of our planet of the need to protect even the ‘insignificant’ bits of life.

Acknowledgments

I extend my heartfelt gratitude to Molly Monroe, Amelia Jebousek, Susie Werts, Kellen Werts and all the children at the Growing Oaks preschool (Corvallis) and the Sisters Middle School who helped rear Amelia’s Monarch and Journey and watched as they began their journeys. I also thank Lisa De Angelis, John Dayton, Aleece Townsend and Joe Billings of MonarchQuestAZ for playing their equally critical roles in finding and reporting Amelia’s Monarch and Journey in the various locations they traveled to. Without you all none of this would have been possible!

Xerces Monarch Watch Program

The Xerces Society has launched a new web-based mapping project—the Western Monarch Milkweed Mapper—to track Monarch and milkweed occurrences across the West. This website has been created through a partnership between Xerces, Idaho Department of Fish and Game, and the Washington Department of Fish and Wildlife, with funding from the National Fish and Wildlife Foundation and a State Wildlife Grant from the US Fish and Wildlife Service. If you know where milkweed grows or see Monarch eggs, caterpillars, or adult butterflies in the West, please contribute your observations to our growing database. Data collected from these efforts is publicly available to view and download and is already being used to inform Monarch conservation and answer pressing research questions. Visit the site, <http://www.monarchmilkweedmapper.org/>, to learn more.

The Funnybug Chronicles—Episode 5: “Ancient and Forever”

Loren Russell

“Glancing at your *Caurinus*... made me question whether the assignment to the Boreidae is well supported by morphology. ... Why did you decide to end up placing it there?”—letter to Loren Russell from Michael Whiting, June 3, 1996

“Among the Tlingit, for example, there are two kinds of stories, *tlagu* (of the long ago) and *ch’kalnĭk* (it really happened).” —J Bierhorst, *The Mythology of North America*, quoted by Derek Sikes and Jill Stockbridge (2013)

a. *ch’kalnĭk*—it really happened

May 18, 2013: I watch Ketchikan recede in the distance as the M/V Stikine leaves the narrows on its three-hour passage to Prince of Wales Island (“POW”). The ferry is crowded: most of the passengers are local people, including a boisterous group of high school students, most apparently Native American, on their way home from an archery tournament in Kentucky. Clustered around a few tables in the forward cabin there are some out-of-state hunters who’ve come in for the spring bear hunt. (Why were they bothering, I thought, coming this far for black bears just out of their dens, too starved to be eaten and too ratty to be worn!) Making my way to the forward lounge, I locate Derek Sikes, curator of the University of Alaska (UA) insect collection. This is our first meeting, and we’re on our way to POW to link with two of Derek’s students who are studying forest floor insects in POW’s vast “recovery forests.” Like the rifle-toting boys from Pennsylvania and Texas, Derek and I are there to hunt—but we will be looking for much smaller game: *Caurinus tlagu*, the Alaska

Funnybug. The bear hunters, I’m sure, would be unimpressed... why would anyone bother?

I’ve started in the middle of my story, so let me backtrack as I told it to Derek. (Please note: the following monolog is in part a narrative device, to bring the plot to the present decade. So the sequence may be a bit off. Still, it really happened!)

How had I happened to return to entomology and to my study of the funnybugs? After all, I make Rip Van Winkle a piker! Rip, the legend says, slept for 20 years, but over 30 years had passed since I published my last paper in entomology, on the life history of *Caurinus*. It’s complicated, I said, but mostly this renewal came down to my habit of web-surfing. I have a set daily routine for this: first I check my email, after which I rotate through my bookmarked sites for news, political opinion and satire, and science/natural history/evolution, pretty much in that order. At the end of February 2012 (Leap Year Day, in fact) I was ending my routine stop at Science Daily News (<http://www.sciencedaily.com>), a useful aggregator for science/technology press releases). I fairly jumped at that day’s lead story, “Super-sized fleas adapted to feed off dinosaurs: Earliest fossil species had armoured mouthparts to attack thick hides” (Brian Switek 2012). The press release was interesting, but brief and nontechnical—it was intended for a general audience. A week later, the giant fleas made their splash as the cover story in *Nature* (Huang et al. 2012). As I read the abstract and then the full article, I wondered—the fossil insects are clearly ectoparasitic and clearly mecopteroid, but are they really fleas? I do have a dog in

this fight, as I'll eventually disclose... but here I need to digress, as I did then, by an entry in the paper's bibliography. I found that Prof. Rolf Beutel (University of Jena) had published a monograph on the head of *Caurinus* (Beutel et al. 2008). A very impressive, even beautiful article, with SEMs and CAD-generated 3D diagrams of the muscles, nerves and foregut as well as detailed examination of the external and internal skeletal structures, this paper was also personally gratifying. In it, the authors refer to *Caurinus* as "one of the most bizarre and cryptic species of Mecoptera and endopterygote insects," and, I was relieved to find, corroborate most of my thesis findings. Very interesting, indeed...

Within the hour I sent an email to Dr. Beutel. I thanked him for crediting my unpublished thesis, and went on to correct his inference that *Caurinus* are at least partially predacious, with mandibles and maxillary palps that are "very suitable for catching collembolans or other very small arthropods." *Caurinus*, I assured him, are most certainly vegan, and their mouthpart structures very well-adapted to feed on the cell contents of leafy liverworts. And by the way, I said, would you like additional specimens? It was about 2 am when I sent my email and Rolf's answer came back in about 20 minutes, from a conference he was attending in China. Yes, Rolf said, yes he would be thrilled to get fresh material of adults and larvae, and by the way there are some other people who I should talk to. Soon, I was collecting, processing, and dissecting *Caurinus* for scholars at universities in Germany and Italy.

Scholarly connections piled up, some by happy coincidence. One came a couple months later, when I came by the Oregon State Arthropod Collection (OSAC) to pick up a vial of FAA fixative. Chris Marshall had some news: had I heard that *Caurinus* had been found in Alaska? Perhaps I should contact Derek Sikes at UA-Fairbanks, he said. And that's how I learned of *C. tlagu*, and how, after a year of correspondence with Derek, here we were on the Stikine.

There were more coincidences, I told Derek. In late January or early February 2013, I happened to be in the OSAC talking with Chris Marshall when Alan Mudge (Oregon Department of Agriculture) came in to look at some moths. I chatted with Alan, and learned that he had a friend coming in from Tennessee to look for *Caurinus*. So, a week or two later, I met Wes Bicha for three wonderful days in the field on the upper Siletz near Valsetz and on both sides of Marys Peak. Rick Westcott was expected to accompany us, but he had to beg off with a bad knee. Too bad, since Rick was a survivor of the very first Funnybug Notch expedition. Wes, a mecopteran specialist with an engineering day-job, lays claim to having collected all but one or two North American Mecoptera. So it was with his great pleasure that he came away from his trip to Marys Peak with a few *Hesperoboreus* and nearly 100 *Caurinus*, many of which he has donated to institutional collections across North America.

Did you wonder, I asked Derek, where Rolf Beutel got the material for his study that brought me back to *Caurinus*? I found, on my second reading of his article, that his specimens—or rather

just the heads of specimens—were some that I had collected for one of his co-authors, Michael Whiting, in 1996. Whiting, then completing a postdoc at AMNH, and later at Brigham Young University, wanted to include *Caurinus* in his DNA-based phylogenies of endopterygotes. (There's yet another shaggy-dog story here of how Whiting tracked me down, but perhaps another time. A spoiler alert, though: Whiting sez *Boreus+Caurinus* do nest with fleas. Woof!). Of the 20 or so *Caurinus* adults that I sent to Whiting, one or two were kept by him as vouchers, while the others were ground up for the DNA study. Whiting only needed the thoracic muscles, but he held onto the severed heads, and these eventually were made available for Beutel's 2008 study. Opportunistic and efficient, this cycle of science, but leading me to imagine some savant publishing a monograph of the cranial anatomy of French aristocrats in the wake of the Reign of Terror!

Now I had to wind down my story; the Stikine was already backing into its pier at Hollis on POW. We all debarked, filing toward the passenger gangway, passing the Pennsylvanians with their shining-new, hard-shell gun cases who were heading for their RV on the car deck, and joining gaggles of the kids from Craig with their hand-beaded archery kits and duffles. Onshore, Derek's associate, Jozef Slowik, was waiting: he would drive us to Craig on the west side of POW where we would join up with Jill Stockbridge, co-describer of *C. tlagu*. Dinner and bed followed, and in the morning, we hoped, there would be funnybugs.

b. tlagu—ancient and forever; of the long ago

"We name this species in honor of the place it occurs, its people, and history, in addition to the apparent great age of the genus *Caurinus*." —D. Sikes and J. Stockbridge (2013)

Prince of Wales Island lies directly west of Ketchikan. Somewhat larger than the state of Delaware, it is the largest island in the Alexander Archipelago. In the 1970s, as a demonstration project, the Tongass National Forest turned the management of the island over to Ketchikan Pulp (KP)—for 'sustained yield.' KP, in the manner that was so fashionable in '70s and '80s forestry, had converted the massive old growth conifers to plantations on a planned 40-year rotation. After 40 years, unfortunately, the new forests on POW were only toothpicks—very crowded toothpicks! Western hemlock that grew a foot apart, shaded out and locked into minimal growth increments. Such a forest would likely recover in Oregon—so why not here on POW with its 150 inches of annual rainfall? The answer I think lies in the "long ago"—this was a glacial land, with an unburning virgin rain forest, and with the soil nutrients locked in the living forest and in the ancient nurse-logs below. With clear-cutting, the nutrients washed into the sea and the new forest stood stunted. Tongass, to their credit decided to make lemonade from their stunted forest, and eventually embarked on a program of thinning. Happily, they commissioned ecological studies as well. Derek's survey of soil and litter arthropods was part of this effort and he soon found *Caurinus* in pitfall trap samples from the thinned plots. These were *C. tlagu*, later described by Derek and Jill (2013). Though *C.*

tlagu is morphologically nearly identical to *C. dectes*, DNA evidence suggests the two species have been separate for 10 million years. Using my brushing technique, we found adults within 15 minutes on the first stop, and continued finding them at most of Derek's established sites on a transect across POW. The *Caurinus* could not be found at the two unthinned sites (not surprising, with the understories too shaded for even bryophytes to grow). I also failed to find them at one magnificent old-growth site—but there was little time to explore, and I think they probably were there. In a day and a half of work, we had about 35 specimens, equaling Derek's take from 3 years of pitfall-trapping. We also established that *C. tlagu* was associated with the same hosts as *C. dectes*: generally on *Scapania bolanderi* in the survey sites, but I also found one adult in *Porella navicularis*, the common epiphytic liverwort on deciduous trees and shrubs.

After our fieldwork, we returned to Ketchikan on a much quieter Stikine—this time, no bear-hunters and no giggling high school kids. Derek took his late afternoon flight back to Fairbanks, while I had a little over 24 hours to kill in town. I had enough time to take two hikes and found two more *Caurinus* sites on the “mainland*,” one on Deer Mountain, the second near downtown within spitting distance of the UA-Ketchikan biology building, on another liverwort host that I had documented on Marys Peak, *Calyptogeia fissa*. (*Fun fact: Ketchikan, though on the east side of the Inside Passage, is on Revillagigedo Island.)

A reverie: On the way home I kept returning to a topic that Derek, Jill and I had discussed over the last few days. How had *C. tlagu* come to be on POW? To me, it seemed clear that they never were far away, even though the entire landscape we had traveled through seemed to have been covered by thousands of feet of glacial ice... the same huge glaciers that carved the fjords and channels of the Inside Passage. Ice that seemingly would have formed a uniform front of iceberg-calving walls out to the edge of the continental slope, for 2000 miles. It would be certain, by this telling, there would be no bare land at the coast, and no forest. And no continuity with the coastal forests of the preglacial times.

When we consider the present distribution of plants and animals, this “uniform, unbroken front of glaciers” idea seems problematic. Pleistocene coastal refugia have been proposed by botanists and mammalogists to account for patterns of endemism and gene distribution, but the best evidence should be in our ball park—if anyone cares to look. There are just too many wingless, low-vagility forest arthropods like *Caurinus* that most likely survived the Pleistocene in the region. These forest remnants may have been muskegish, dwarfed spruce-hemlock, but still there must have been forest. Now, recent geological studies by Carrara and associates suggest as many as eight coastal refugia could have existed on the western edge of this archipelago alone, with the implication that there would have been multiple refugia further south along the British Columbia coast. These refugia “could have served as centers of biotic dispersal upon regional deglaciation and as stepping stones for early humans with a maritime tradition entering the western hemisphere from Asia” (Carrara et al. 2007).

By this understanding, the Ice Age seal and salmon hunters, who were the ancestors of the Haida and Tlingit and so many other coastal peoples, were the first people to reach the Americas south of Beringia. In fact there is ample evidence that these maritime peoples settled the coastline, reaching as far as southern Chile, long before the Clovis-point wielding mammoth hunters in interior Alaska were able to walk down through Alberta. But first they had to find the stepping stones along the ice front, and at each stepping stone—each habitable beach and inlet that these sea people found in their southward exploration, there would have been forest floor habitat, and given that, *Caurinus* were there. (Note: This “sea route first” hypothesis was strongly opposed by most anthropologists as recently as 25 years ago. Recent work including contributions by OSU's Loren Davis seems to have given the idea wide acceptance.) In human terms, then, the Alaskan Funnybug is “tlagu”, ancient, and (I hope), forever. But even *Caurinus tlagu* and its sister funnybugs have an ancestor's tale. One that leads to central Asia, to a time a thousand times older than the glaciers. I'll continue that story next time.

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Earlier Episodes of the Funnybug Chronicles

The first episode of the Funnybug Chronicles appeared in the Fall 2013 issue of the Bulletin. Susequent episodes appeared in the Winter 2013/2014 issue, the Fall 2014 issue and the Winter 2014/2015 issue.

Earliest Record of *Cimex* Found in Oregon! (Hemiptera) *Martin E. Adams¹*

The earliest specimens of the genus *Cimex* (Hemiptera: Cimicidae) have been recovered from an archaeological site in south-central Oregon (Lake County). The Paisley Caves site (35LK3400) is a pre-Clovis rock shelter site in the northern Great Basin. The site consists of a series of eight caves on a west-facing ridge of Miocene aged basalt and rhyolite, and the focus of this research is on Cave 2.

Human occupation and use of Cave 2, though most likely seasonal, continuously spans from almost 13,500 calibrated years before present (cal. yr. BP) to around 3,000 years ago. There is evidence of human use after that time, but it is sporadic. In addition, skeletal remains and guano suggest that the cave was occupied continuously by bats from at least 12,600 cal. yr. BP until approximately 2,000 years ago, when the roof collapsed, exposing the cave to more sunlight and, likely, making it less attractive to bats. Thus, humans and bats cohabited in Cave 2 for almost 10,000 years, possibly longer.

During the course of archaeological excavations, 14 cimicid remains were recovered from Cave 2, all of which are local, native species. One specimen, a female *Cimex antennatus*, is ~5,100 years old. The other 13 individuals range in age from 9,400 to almost 11,000 years old, and are represented by *Cimex latipennis* (3 individuals) and *Cimex pilosellus* (5 individuals). Five others were classified to the genus *Cimex* but were too fragmented to identify

further. Of the 14 individuals, 11 of them were females. The remaining 3 were not complete enough to determine gender.

It is widely believed that the common bed bug (*Cimex lectularius*) became a human parasite thousands of years ago when Old World human populations shared caves with bats in them. *Cimex lectularius* is an obligate ectoparasite of bats that most likely fed on humans when the opportunity presented itself, and when human populations left the cave environment bed bugs went with them, adapting very well to human environments and eventually enjoying a cosmopolitan distribution. While *Cimex lectularius* has been recovered from other archaeological sites, their discovery is rare. The hitherto oldest remains of *Cimex* were ~3,500 years ago from Tell El-Amarna in Egypt. In the fossil record, there is no record of the genus *Cimex*; the only fossil cimicids are represented by *Quasicimex eilapenastes*, a stem-group of the Cimicidae. The Paisley Caves specimens represent the oldest remains of the genus *Cimex* thus far recorded, and it is very likely that the lengthy span of cohabitation with humans and bats meant that humans acted as an opportunistic host.

The paper, "An Early Holocene Record of *Cimex* (Hemiptera: Cimicidae) in Western North America" by Martin E. Adams and Dennis L. Jenkins, is set to be published in an upcoming issue of the Journal of Medical Entomology, with a full description of the 3 species recovered.



Photo of the dorsal (left) and ventral (right) views of specimen 1961-PC-2/7B-11-4A, a female *Cimex latipennis*, dated to 9,400 calibrated years before present. The scale bar is 1 mm. Only the abdomen is present in this specimen. Image courtesy of Martin Adams.

¹ Archaeoentomologist, Paleoentomology Research, PO Box 17650, Portland, OR 97217. Email: <paleoentom@gmail.com>, Website: <<http://paleoentom.com>>.

Osmia aglaia—the West Coast Green Raspberry Bee

Evan Sugden¹

Pollination keeps on truckin' right out of the orchard and into the berries! Pollination experts and gardeners are familiar with our widespread native fruit tree pollinator, the Blue Orchard Bee (BOB), *Osmia lignaria*, which has been under commercial cultivation for 30 years. In recent years, a cousin of this species, *Osmia aglaia*, has debuted on the agricultural pollination scene. The USDA Bee Lab in Logan, Utah, under Dr. Jim Cane, has had a research program for nearly 10 years aimed at developing this species. Those of us involved in it now are gratefully making use of the hand-down results.

I have dubbed *O. aglaia* the “West Coast Green Raspberry Bee” (WCGRB). Kind of a mouthful but in marketing this definitive West Coast species, I wanted to instill in the retailers the importance of restricting distribution to the native range. So far, the name has been working, although it is shortened in context to “Green Berry Bee” or “Green Bee” or “G-bee”!

The species differs from BOBs in several important respects. Firstly, its natural range is restricted to the Central Valley of California and foothills into the Willamette Valley of Oregon. Secondly, this is a hot weather bee and flies later in the year. Its flight season begins late April through mid-May and continues through the end of July. Finally, the bees prefer *Rubus* spp. (“cane” berries), and are valuable for this as alternative commercial berry pollinators. But beyond *Rubus*, they can thrive on Himalayan blackberry, which is an advantage in extending their production season, and will visit a vast range of other flowers. This species is a great way to spread out pollination potential beyond the early fruit tree season to which BOBs are limited—you can have controlled solitary bee pollination for almost any crop in the garden.

Female WCGRBs are only about 1/3 the size of BOBs and brilliant metallic green; the males are slightly smaller and tend to have a brassy color. General biology is similar to that of BOBs: as in BOBs, development ends in fall and overwintering is in the adult stage. The preferred nest cavity diameter is 5mm but other aspects of nest preference (depth, material) are similar to BOBs. Nest partitions are made of chewed leaf material, relatively thin, and placed to form apparently random series of vestibules between the larval cells, which is likely a predator-avoidance strategy. Handling the nests does not produce the dust that accompanies the mud nests of BOBs.

Another advantage to dealing with this species is that it does not harbor the “pollen mites” so destructive of BOBs. The larval season occurs too late in the year for the mite, which prefers cool, moist conditions. In my experience, the bee’s parasite load is more diverse than in *Osmia lignaria*, at least in the Willamette Valley, but the most pervasive pest is the minute chalcid wasp, *Melittobia chalybii*.



Female *Osmia aglaia*. Photo © Will Peterman, used by permission.

Female WCGRBs are aggressive nesters! Once a population has been released, they will rapidly dominate a nest structure and the producer will find few other cavity-nesting species utilizing the nest holes, despite the species-rich summer flight season.

The sole retailer of WCGRBs so far is Raintree Nursery in Morton, Washington, to whom I have been wholesaling the bees since 2013. My production peaked in 2016 and I have a surplus of bees! I am willing to sell directly to OES members with the 10% discount I have made customary to bee or bug folks. Anyone who is interested, should contact me soon at <info@entomologic.com>. I can ship (or perhaps deliver) through April. To get started, I recommend a minimum of 40 bees (1:2, male:female.) Two caveats: this is truly a HOT weather bee! It will do fine in the Central or Willamette Valleys but beyond the hot valley centers, you will need a sunny microhabitat to maintain a population. (I have successfully propagated the species in select microhabitats in Seattle but it does not seem to maintain a permanent escaped population there.) And finally, please keep this bee west of the Sierra/Cascade ranges where it belongs!



Production shelter and nest boxes for *Osmia aglaia*. Fine bird mesh covers the face of the shelter. Metal box is the release system, preventing re-nesting in old nest tubes. The burlap below is to prevent weeds from growing up into the boxes and to provide basking space for the bees. Photo ©Entomo-Logic..

¹ Entomo-Logic, Seattle, Washington. Email: <info@entomologic.com>.

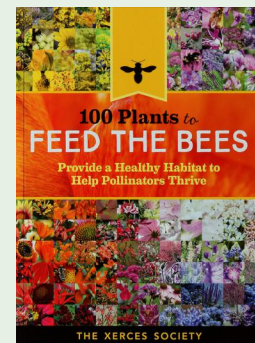
Odonata Revision

A recent paper has split the North American species in the genus *Gomphus* into four genera: *Phanogomphus*, *Gomphurus*, *Hylogomphus*, and *Stenogomphurus*. The genus *Gomphus* is now restricted to Eurasia.

For the Oregon species, what was *Gomphus kurilis* is now *Phanogomphus kurilis* and what was *Gomphus lynnae* is now *Gomphurus lynnae*. A PDF of the paper can be downloaded from https://www.researchgate.net/publication/310598929_Phylogenetic_relationships_of_North_American_Gomphidae_and_their_close_relatives_Phylogenetic_relationships_of_Gomphidae.

100 Plants to Feed the Bees

Recently published by the Xerces Society, this book documents a number of native wildflowers, native and introduced trees and shrubs, introduced herbs and ornamentals as well as pasture plants that will attract and support bees and other pollinators. The common and scientific names are provided as well as some of the varieties.



Visit the Xerces Society store at <http://www.xerces.org/store/> for information or to order.

On Brown Recluse Spider Bites *Rick Vetter*

This paper provides an acronym "NOT RECLUSE" for many of the signs that a physician would see in a skin lesion that are NOT part of the recluse bite syndrome. For example, the REC of NOT RECLUSE stands for Red centrally, Elevated and Chronic. Recluse bites are typically white, blue or purple at the bite site (not red), flat (not elevated) and heal within 3 months. So if a person has a lesion that is red at the bite site or elevated more than 1 cm or takes longer than 3 months to heal, a diagnosis other than recluse bite should be entertained. For those of you who still have to deal with doctors who are diagnosing Brown Recluse bites outside of indigenous recluse territory, this article may be useful in arguing down a physician's diagnosis. Obviously it isn't going to allow you to tell a person what is and isn't a recluse bite but it should give you a strong point from which to argue.

Stoecker, W.V., R. S.Vetter, and J. A. Dyer. 2017. NOT RECLUSE—A Mnemonic Device to Avoid False Diagnoses of Brown Recluse Spider Bites. *JAMA Dermatology*. E1-E2 (Published online February 15, 2017).

Read the abstract and page E1 at <http://jamanetwork.com/journals/jamadermatology/article-abstract/2603498>.

Event Reminder

Pacific Branch Meeting

The Pacific Branch of the Entomological Society of America will meet at the DoubleTree by Hilton in Portland, Oregon Sunday, April 2–Wednesday, April 5, 2017. For details, please visit <http://www.entsoc.org/pacific/2017-pacific-branch-annual-meeting>.

Xerces Society Events

Please check the Xerces website, <http://www.xerces.org/event/>, for events scheduled in the Pacific Northwest or webinars.

OSU Department of Integrative Biology Seminars

For information on the seminar schedule, please visit <http://ib.oregonstate.edu/smnr>. Seminars are held at OSU in room ALS 4001 at 3:30 pm (unless otherwise noted). Seminars are free and open to the public. Details for accessing the seminar online can be found on the website.

Through the Net – Errata

Dr. Sujaya Rao indicated that the picture on page 12 of the Winter 2015/2016 issue of the Bulletin showing Dr. W.P.

Stephen standing in front of the mountains was probably taken in North America not South America as indicated in the caption. The picture was one of a number of pictures she had from various sources.

Invertebrate Classes offered by the Siskiyou Field Institute

The Siskiyou Field Institute is located in Selma, in the Illinois Valley about 20 miles south of Grants Pass off Highway 199. Many field courses originate there—but you can also find classes that take place in other parts of the Oregon.

Thursday–Friday, March 30–31, 2017

A Naturalist's Guide to Beetles of Southern Oregon

Instructor: James LaBonte

Almost 5,000 species of beetles are known to live in Oregon, including blind soil beetles, wood-boring beetles, dung beetles and fungi-eating beetles. Beetles are the predominant pollinators of some plants in Oregon. In this “Beetles 101” field course, students can expect to acquire general knowledge about species diversity, behaviors, ecological roles, and natural histories of the beetles found at and near the Institute. Although we'll consider beetles in all accessible habitats, we'll focus on those inhabiting leaf litter and soil.

Saturday, April 1, 2017

Ticks of Southern Oregon: Identification, Ecology and Protection

Instructor: Jim Clover

Essential health information for anyone working in the field, also hikers and amateur naturalists. In this one-day workshop, we'll discuss common tick species of southern Oregon and their ecology. Some of the topics addressed will include identification, habitats and hosts, disease (with an emphasis on Lyme disease), and tick removal and safety.

Tuesday, May 23, 2017 (free lecture)

An Overview of Our Native Bumble Bees

Tuesday–Wednesday, May 23–24, 2017

Siskiyou Bumble Bees

Instructor: Robbin Thorp

They're essential to native plant reproductive success, but did you know that bumble bees also pollinate many North American greenhouse and field food crops including tomatoes, peppers, alfalfa, berries and fruit trees? Several western species are in decline due to disease and habitat loss. The Western Bumble Bee (*Bombus occidentalis*) was a candidate for the Endangered Species list but certain regional populations are resurging. Franklin's Bumble Bee (*Bombus franklini*) was last seen in 2006. This workshop will provide opportunities to learn identification of various *Bombus* species native to our bioregion—in labs, lectures and by observing and collecting in the field. We will study morphological, behavioral and seasonal differences among the major species, learning bumble bee terminology including eusocial, sonication and corbiculate, along the way.

Sunday, June 4, 2017

Pollinator Ecology

Instructor: August Jackson

Enhance your appreciation for our ecoregion's native plant

communities by learning how plants partner with pollinators to ensure fertilization and survival of the species. Become familiar with a number of prominent pollinators. We will cover the basic concepts of pollination ecology and develop an understanding of the factors which contribute to our region's unique assemblage of pollinating insects.

Tuesday, June 6, 2017

Basic Microscopy Webinar

Wednesday, June 7, 2017

Basic Microscopy Workshop

Instructor: Janel Johnson

A one-day overview that will tell you everything you've always wanted to know about microscopy. Find out how to evaluate and purchase your own microscope for use at work or home. You'll then learn how to operate it: the basics of slide preparation, focusing and lighting. We'll also teach you safe ways to clean, maintain and store your scope.

Monday–Wednesday, June 19–21, 2017

Butterflies and Moths of the Siskiyou

Instructor: Dana Ross

We will explore the world of Lepidoptera—the butterflies and moths—in this three-day course. Starting with an overview of butterfly/moth morphology, life cycles, ecology and behavior, we'll then inspect images and specimens of Siskiyou species in the classroom. Students will work in the field netting and inspecting butterflies and learning proper netting and collection techniques.

Saturday–Sunday, July 8–9, 2017

Beginning Dragonflies

Instructor: Jim Johnson

From flight dynamics and courtship to structural coloration and anatomy, the study of these Odonates is full of fascinating facts. This is a beginner's guide to the dragonflies and damselflies that inhabit Siskiyou ponds and lakes, their larval stages under water, nymphal emergence, food sources, habitats, species and gender identification.

Monday–Tuesday, August 7–8, 2017

Aquatic Invertebrates in Stream Ecology and Biomonitoring

Instructor: Celeste Searles Mazzacano

An overview of aquatic invertebrates and their use in assessing habitat quality, responses to restoration and streamflow duration. Design, implement and understand aquatic invertebrate-based biomonitoring methodologies.

These write-ups have been slightly abbreviated. For the full information on the classes and registration information, please visit the Institute's website <<http://www.thesfi.org>> where you can download the full catalog of their offerings and activities for 2017. Most classes have a cost associated with them and involve some field and/or lab work.

Lepidoptera Activities in 2017

Butterfly Field Trips for Northern California and Some for Oregon

Joseph Smith provided the following list of field trip/counts of interest to butterfly enthusiasts. 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
Big Chico Creek	2 June	Don Miller	GMiller(at)csuchico.edu	35 species in 2016
San Bruno Mountain.	3 June	Patrick Kobernus	crecology(at)gmail.com	3 endangered species possible. 25 species regular
Marin County	3 June	Wendy Dreskin	bdreskin(at)comcast.net	Audubon Canyon Ranch to Ring Mountain
Pinnacles NP	4 June	P Johnson	pjjpolliwog(at)yahoo.com	National Park, 40 species in 2016
Big Creek(Big Sur)	9 June	Chris Tenney	tenneyx2(at)mac.com	UC Nature Reserve
Monterey	10 June	Chris Tenney	tenneyx2(at)mac.com	coastal, 46 species in 2016
Hastings	11 June	Chris Tenney	tenneyx2(at)mac.com	Unsilvered Fritillary, unique species
Berkeley	16 June	Jerry Powell	powellj(at)berkeley.edu	regularly records 40+ species
San Joaquin	17 June	Kathy Schick	kschick2(at)gmail.com	38th year of count
Cosumnes Preserve	17 June	Kyle Bowlin	bowlink(at)saccounty.net	Nature Conservancy preserve
Cascade-Siskiyou NM (OR)	17 June	Diane Keller	diannekeller18(at)gmail.com	National Monument
San Francisco	18 June	Liam O'Brien	liammail56(at)yahoo.com	national record high for Anise Swallowtail
Benicia	? June	Paul Johnson	paul_johnson(at)nps.gov	5 swallowtail species, 37 species in 2015
Mount Diablo	19 June	Rich Kelson	rkelson(at)sftp.com	regularly records 40+ species
Warner Mtn North	24 June	Joseph Smith	foxglove1985(at)yahoo.com	90 species in 2016
Lava Beds NM	26 June	Joseph Smith	foxglove1985(at)yahoo.com	National Monument, averages 44 species
Point Reyes NS	30 June	Ben Becker	ben_becker(at)nps.gov	National Seashore, 28 species average
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

North American Butterfly Association (NABA) Eugene-Springfield Chapter

The field trip and meeting schedule for the Eugene-Springfield Chapter including the results from some of their past outings can be found on their website at <<http://www.naba.org/chapters/nabaes/>>. The following trips are scheduled:

- June 10, Saturday Eugene Butterfly Count
- July 1, Saturday Ochocos Butterfly Count
- July 7, Friday Metolius River Area Butterfly Count

Please check their website for changes and/or additions to the event schedule as well as the event details.

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 14–18, 2017.

39th Northwest Lepidopterists' Workshop

The 2017 Northwest Lepidopterists' Workshop will be held at Oregon State University in Corvallis on the weekend of October 21–22, 2017.

The groups of emphasis in 2017 will be:

- ▶ Butterflies: Swallowtails (*Papilio*), Pieridae in general
- ▶ Moths: Erebidae in general

The full program will be published in the Fall issue of the Bulletin.



Ron Lyons