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The Speckled Gall Wasp, *Cynips mirabilis* (Hymenoptera: Cynipidae)

text and accompanying photos by Cary Kerst

The leaves are falling from the trees, and along with them, come the homes of some interesting insects like the galls on the leaves of our oak trees pictured below. The forms are characteristic for the species of wasp and come in many shapes, sizes, and colors. We've all seen them on plants. The plant growth provides an abode for the larvae as well as food, protection, and shelter from the weather. How cool is that?

One of my favorite galls is the Speckled Oak Gall commonly found on the underside of oak leaves around Oregon (Figure 1). These galls are, of course, the homes of tiny wasp larvae. There are about 1300 species of gall wasps described worldwide. The wasp causing the Speckled Oak Gall is *Cynips mirabilis* which is very small at just a few millimeters long. This wasp was originally placed in the *Besbicus* genus but later moved to *Cynips* (Melika and Abrahamson 2002). While *C. mirabilis* was originally considered to be agamic as it was only known from females, Evans (1967) discovered and described the bisexual generation.

Figure 1. Speckled Oak Gall on underside of oak leaf.

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Evans describes the life cycle of *C. mirabilis* as follows. The female from the agamic generation lays eggs in the oak leaf bud from late December to early February. Secretions from the egg and larvae prompt the plant to form a gall which is described as 3 mm and brown. Little seems to be known about the enzymes involved in promoting the plant growth but it is assumed that there must be a complex list of enzymes as there are many species of wasps producing a diverse list of galls. Development of the *C. mirabilis* larva is slow through the cool spring but pupae can be found from April through May. Adults emerge and chew a hole in the gall to escape and mating occurs. The heterosexual generation oviposits from late April to mid-June. Cyclical parthenogenesis is now known to be the common life cycle of the *Cynips* genus of gall wasps. In the past, the asexual and sexual forms of a species were often described as different species as they varied a little morphologically. Later, it was found that a species described upon the basis of one generation was actually the unknown generation of another described species (Pujade-Villar et al 2001).

The typical oak galls for the agamic generation appear from mid-May through late August. This is the gall that is more familiar to us. Development requires about 10 weeks with adults emerging from mid-December to early January when temperatures are above 40° F. Evans indicates that adults may live for as long as 6 weeks. He also found that some late instar larvae and pupae may go into diapause for several months complicating the life cycle and resulting in an augmented population in 2-year cycles.

Opening the Speckled Oak Gall, one finds a center structure with strands extending in all directions to the shell of the gall (Figure 2). The round dark pupal case of the wasp (Figure 3) is found in the center of the mature gall. Inside the pupal case, the mature pupa awaits the proper time to emerge (Figure 4). Based upon the life history, all of this fall brood are females.

I opened 22 galls that I brought in the house on November 25 and had in the house for about 12 days. About half appeared to have been parasitized. In the remainder, there were 5 adults and an equal number of larvae/pupae. One gall contained a Lepidoptera larva, likely a small moth. Evans (1967) found the larva of the Filbertworm, *Melissopus latiferranus* (Walsingham), in 9% of galls causing mortality of *C. mirabilis* larva. Evans also documented a number of other Hymenoptera from the galls including parasites.

I also opened 5 galls found outside on November 26 finding only 2 that contained adults (Figure 5). The others appeared to have been parasitized. The number of adults in the galls would seem to indicate that they were awaiting appropriate weather conditions and/or development to exit the gall.

References

Evans, D. 1967. The bisexual and agamic generations of *Besbicus mirabilis* (Hymenoptera: Cynipidae) and their associate insects. The Canadian Entomologist 99: 187–196. (Read the abstract at <https://doi.org/10.4039/Ent99187-2>.)

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Melika, G. and W.G. Abrahamson. 2002. Review of the world genera of oak cynipid wasps (Hymenoptera: Cynipidae: Cynipini). Pp. 150–190 in: Melika, G. & C. Thuroczy (eds). Parasitic Wasps: Evolution, Systematics, Biodiversity and Biological Control. Agroinform, Budapest. 500 p. (Access the publication from <https://www.researchgate.net/publication/254570300_Review_of_the_world_genera_of_oak_cynipid_wasps_Hymenoptera_Cynipidae_Cynipini>.)

Figure 2 (left). Open gall showing strands extending radially out from the center. The other half of the gall can be seen in the background.

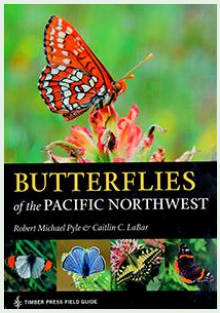
Figure 3 (above). The dark pupal case of the wasp has been removed from the center of the gall.

Pujade-Villar, J., D. Bellido, D. Segú and G. Melika. 2001. Current state of knowledge of heterogony in Cynipidae (Hymenoptera, Cynipoidea). Sessió Conjunta d'Entomologia ICHN-SCL 11(1999): 87–107. (Download the PDF from <https://core.ac.uk/download/pdf/39032521.pdf>.)

Figure 4 (above). Inside the pupal case, the mature pupa is found. You can see the wings and legs folded up.

Figure 5 (right). *Cynips mirabilis* adult wasp.

Regional Butterfly Guide Honored



"Butterflies of the Pacific Northwest" by Washington lepidopterists Robert M. Pyle and Caitlin LaBar, published earlier this year by Timber Press, won the Nature Guidebook category of the 2018 National Outdoor Book Awards (NOBA).

The announcement was made on the NOBA website. A review and image of the cover appears on the winner's page at: <http://www.noba-web.org/books18.htm>.

The National Outdoor Book Awards is an educational program which annually honors outstanding writing and publishing in the outdoor field. The managing body of the awards is the NOBA Foundation, a non-profit, volunteer organization.

The Book Awards Facebook page can be found at <https://www.facebook.com/National-Outdoor-Book-Awards-902592509952107>.

Insects and Education

In light of the recent ongoing concern about declines in insect biomass being reported in various areas, and the long-time concern about pollinators becoming more visible to the general public, Bulletin readers might be interested in this recent article on entomology and education:

Gangwani, K. and J. Landin. 2018. The Decline of Insect Representation in Biology Textbooks Over Time. American Entomologist 64(4): 252–257. (Available online at <https://doi.org/10.1093/ae/tmy064>.)

Woodland Skippers and the 2016 Eclipse

Bob Pyle recently published a paper about the response of Woodland Skippers (*Ochlodes sylvanoides*) at his home in Gray's River, Washington to the temperature change which resulted from the near-total eclipse in 2016.

Pyle, R.M. 2018. Behavior of *Ochlodes sylvanoides* during a Near-Total Solar Eclipse. Journal of the Lepidopterists' Society 72(3): 247–249.

Citizen Science – The Oregon Bee Atlas Project

The following is reprinted from the home page of the Oregon Bee Atlas (click on the Bee Atlas link on the Oregon Bee Project's home page at <https://www.oregonbeeproject.org/>), a citizen science project to document Oregon's bees.

"Although we estimate there are 500 species of bees in Oregon, there has never been a concerted survey of the state's bees. Without even a checklist of species, it is very difficult to know whether the health of Oregon bees is improving or declining. The Oregon Bee Atlas represents the first step towards confronting the gulf in our knowledge about the bees of Oregon.

The success of the Oregon Bee Atlas, like Oregon Flora, rests on the shoulders of committed volunteers. The Oregon Bee Atlas' four year mission (2018–2021) is to train volunteers to explore Oregon Counties, to seek out new native bee records for the state, to boldly go where no amateur melittologist has gone before! These new specimen records will be added to newly digitized historic records from the Oregon State Arthropod Collection to build the first comprehensive account of the native bee fauna of Oregon. Volunteers are also assisting with new survey initiatives, notably the new Pacific Northwest Bumble Bee Atlas led by the Xerces Society.

The Atlas is an initiative of the Oregon Department of Agriculture, the Oregon State University Pollinator Health Program and the Oregon State Arthropod Collection and is currently supported by generous contributions from the Foundation for Food and Agriculture Research (FFAR) Pollinator Health Fund, GloryBee, Central Oregon Seeds, and the Oregon State Beekeepers Association."

If you are interested in participating in this effort, you can also register for a Bee Atlas training class from this page. Other related activities are indicated in the green box below.

Digger bee constructing nest in sand. Photo by Ron Lyons.

PNW Pollinator Summit and Conference Thursday through Saturday February 14–16, 2019

This two-day conference (February 14–15) with an additional day of workshops (February 16) is designed to "connect-the-dots" between research, extension and application. This meeting is for extension agents, natural resource professionals, land managers, educators, as well as pollinator enthusiasts who want to develop or enhance the pollinator programming in their area. Conference talks will be mixed with discussion sessions, allowing participants to network and identify local knowledge and education gaps.

$150 – Early bird registration, includes lunch each day and Thursday banquet [ends January 12, 2018].
$175 – Late registration (after January 12), includes lunch each day and Thursday banquet.
$75 – Registration for Oregon Bee Atlas and Oregon Master Beekeeper members, includes lunch each day and Thursday banquet.

For more information or to register, please visit <https://www.oregonbeeproject.org/pnwpollinators2019>.

Fifth Annual BEEvent Pollinator Conference Saturday, March 2, 2019

If you are interested in learning how to help pollinators in your backyard or garden, check out the BEEvent Pollinator Conference offered by the Linn-Benton County Master Gardeners at the Linn County Fair and Expo Center.

For more information or to register, please visit <https://extension.oregonstate.edu/mg/linn-benton/events/beevent-pollinator-conference>. Tickets cost $30.

Eugene–Springfield Branch of the North American Butterfly Association (NABA)

The Eugene–Springfield Branch will meet Monday, April 9, 2019 at Eugene Garden Club, 1645 High St., Eugene. Sarah Kincaid will speak on the Oregon Bee Project/Oregon Bee Atlas. Doors open at 7:00 pm; the presentation begins at 7:30 pm. There is no charge.

For the latest information, please visit their website at <https://www.naba.org/chapters/nabaes/>.

A new record of *Alpinobombus* Skorikov 1914 in the Pacific Northwest (Hymenoptera: Apidae: *Bombus*)

Riley Duncan[1] and Christopher J. Marshall[2]

The subgenus *Alpinobombus* constitutes a relatively small group of bumble bee species, most of which are found in arctic and subarctic habitats of Eurasia and North America. Members serve as pollinators for flowers in some of the northernmost habitats on Earth and can be the dominant bees in some arctic and alpine habitats (Richards 1973; Williams 2018). The greatest primary threats to members of the subgenus are likely related to climatic warming. These threats may be direct, such as the thermotolerance of individual bees, or indirect, such as increased pressures brought on because warmer climate allows less cold-tolerant *Bombus* species to inhabit the immediate surroundings of *Alpinobombus* species, bringing both increased competition for nectar sources and exposure to novel pests and pathogens (Hatfield et al. 2016).

Members of the subgenus can be difficult to identify based on color pattern alone, as they display relatively high levels of intraspecific color pattern variation. Dubiously identified specimens, in conjunction with complex nomenclatural histories, make it hard to confidently apply names from published and online checklists and faunal treatments (Thorp 1962; Williams 2018). Recent molecular data is helping to clarify the situation. Using molecular data, Williams et al. (2015) concluded that the near 30 historically named entities could be attributed to 9 valid names. They also demonstrated that the North American species, *Bombus kirbiellus* Curtis 1835, long treated as a junior synonym of the palearctic *Bombus balteatus* Dalhbon 1832 is in fact a distinct species. In addition to sorting out historical species concepts, molecular data has also revealed at least one novel species, *B. kluanensis* Williams, Canning & Corey 2016 (Williams et al. 2016).

The majority of North American *Alpinobombus* records are associated with species and locations that are restricted to Canada and Alaska, north of 50° N latitude. Notable exceptions are populations from alpine sites throughout the Rocky Mountains as well as the Sierra Nevadas of central California (Hatfield et al. 2014). These southern observations are often attributed erroneously, especially in historical literature, to the palearctic species *B.* (*Al.*) *balteatus*. Based on the checklist of Williams et al. (2015) most of these records will now likely be attributed to *B.* (*Al.*) *kirbiellus*.

Figure 1. *Bombus* (*Alpinobombus*) *kirbiellus*. lateral view. OSAC_0001019169 (image available via Duncan [2019 supplemental file]).

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In the northwestern part of the contiguous United States, *Alpinobombus* is known from Montana, Idaho and Washington. A review of GBIF turns up another specimen, collected in May 1970 from Pot Hole, Washington (Grant County), USNM Specimen# 01002263 (<https://collections.nmnh.si.edu/media/index.php?irn=10707343>). No records are known yet from Oregon. Both Oregon and Washington are well surveyed for bumble bees in general (Hatfield et al. 2014), but it is questionable as to whether past surveys included the alpine habitat where *Alpinobombus* occurs at these southern latitudes.

This note reports a newly discovered specimen (Figures 1–3) collected by D. Shaw on August 06, 1980 from Mt. Baker, in northern Washington (Whatcom Co.) (Duncan 2019). This specimen provides empirical corroboration in support of earlier suspicions that *Alpinobombus* might be found in the North Cascades (Strange et al. 2015).

By publishing this observation, in conjunction with label data for the other *Alpinobombus* specimens housed at the Oregon State Arthropod Collection (Duncan 2019), we augment the historical baseline data for this interesting subgenus of bumble bee, and hopefully provide some encouragement for those interested in searching in the vicinity of Mt. Baker and at other similar sites in Washington or further south in Oregon. More recent records for *Alpinobombus* from this part of Western North America are especially important as they not only provide important geographic and historical documentation, but these newer specimens are more apt to provide DNA sequence data that could demonstrate whether these more southern populations are genetically isolated from the larger populations known to the north and south.

Acknowledgements

This work (digitizing bee specimens) was supported by the Foundation for Food and Agriculture Research under award number 549024. The content of this publication is solely the responsibility of the authors and does not necessarily represent the official views of the Foundation for Food and Agriculture Research.

References

Duncan, R. 2019. Specimen records of *Bombus* (*Alpinobombus*) in the Oregon State Arthropod Collection as of December 2018. Catalog: Oregon State Arthropod Collection 3(1): 4–6. (Download this from <http://dx.doi.org/10.5399/osu/cat_osac.3.1.4560>.)

Hatfield, R., S. Colla, S. Jepsen, L. Richardson, R. Thorp, and S. Foltz Jordan. 2014. IUCN Assessments for North American *Bombus* spp. North American IUCN Bumble Bee Specialist Group, Technical Report. 56 p. (Download the PDF from

Figure 2 (left). *Bombus* (*Alpinobombus*) *kirbiellus*. dorsal view. OSAC_0001019169 (image available via Duncan [2019 supplemental file]).

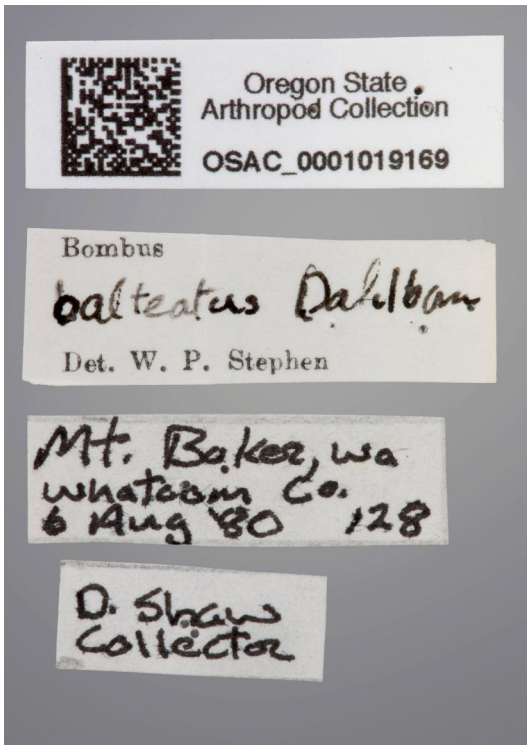

Figure 3 (above). Specimen labels for specimen OSAC_0001019169 (image available via Duncan [2019 supplemental file]).

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Thorp, R. 1962. Notes on the distributions of some bumblebees of western North America. The Pan-Pacific Entomologist 38: 21–28.

Williams, P. 2018. *Bombus*, bumblebees of the world. <http://www.nhm.ac.uk/research-curation/research/projects/bombus/al.html> [accessed December 12, 2018].

Williams, P., S. Cannings, and C. Sheffield. 2016. Cryptic subarctic diversity: a new bumblebee species from the Yukon and Alaska (Hymenoptera, Apidae). Journal of Natural History 50(45–46): 2881–2893. (Access the abstract at <https://doi.org/10.1080/00222933.2016.1214294>.)

Williams, P.H., A.M. Byvaltsev, B. Cederberg, M.V. Berezin, F. Ødegaard, C. Rasmussen, L.L. Richardson, J. Huang, C.S. Sheffield, and S.T. Williams. 2015. Genes Suggest Ancestral Colour Polymorphisms Are Shared across Morphologically Cryptic Species in Arctic Bumblebees. PloS ONE 10(12): e0144544. (Download the PDF from <https://doi.org/10.1371/journal.pone.0144544>.)

Funding Opportunities

Pacific Northwest Lepidopterists' Fund in Honor of Harold Rice

"In honor of Mr. Rice, we [the Oregon State Arthropod Collection (OSAC)] have allocated funds to support the community of Pacific Northwest lepidopterists to which Harold belonged. In particular, we hope the fund will encourage and facilitate the valuable research, work and contributions made each year by individuals, who like Mr. Rice, were not employed fulltime as lepidopterists, yet spend much of their personal time and resources collecting and studying these amazing creatures."

– excerpted from the Fund's write-up

This fund, which provides one or two awards for up to $500 each, is given annually to encourage activities directly related to PNW Lepidoptera and/or activities related to the improvement of OSAC's Lepidoptera collection.

More information, as well as directions for how to apply, can be found at <http://osac.oregonstate.edu/PNWLepidopteristsFund>. The website contains a sample application. For full consideration, applications must be received by January 31; late applications will be considered if funds are available.

If you have any questions (e.g., am I eligible?, would this project qualify?) or need some advice on writing your proposal (e.g., how specific do I need to be?), please contact Chris Marshall at OSAC, <Christopher.Marshall@oregonstate.edu>.

US Fish and Wildlife Service Section 6 Opportunity—Oregon

The US Fish and Wildlife Service and the Oregon Parks and Recreation Department have requested proposals for rare invertebrate research projects to be funded under their section 6 program for fiscal year 2019. Funds will be available to study federally listed, proposed, and candidate invertebrate species, or those having a state status similar to the federal equivalent. Project budgets need to show at least 25% non-federal matching funds. The money from these grants will be used for projects in the 2020 field season, and projects are expected to be completed by December 31, 2020. Proposals, with estimated costs and match amounts, need to be submitted to Eleanor Gaines at the Oregon Biodiversity Information Center by February 14, 2019. If you are interested in submitting a proposal, please contact Eleanor at <egaines@pdx.edu> for information on the proposal format and the funding timeline.

Pacific Branch 2019 Meeting

The Pacific Branch of the Entomological Society of America will meet in San Diego March 31 through April 3, 2019. For more information, please visit <https://www.entsoc.org/pacific/2019-branch-meeting>.

Northwest Lepidopterists' Workshop 2018

On 13–14 October 2018, over 60 people gathered in Cordley Hall on the campus of Oregon State University for the 40th annual workshop for lepidopterists of the Pacific Northwest. The meeting was hosted by Drs. Paul Hammond and David McCorkle and sponsored by the Oregon State Department of Integrative Biology and the Oregon State Arthropod Collection (OSAC).

Oral presentations were made by David Maddison, Chris Marshall, Ann Potter, Dana Ross, Alison Center, Joseph Smith, Steve Kohler, Paul Hammond, Jim Reed, David Specht, David Lee Myers and Tyson Wepprich.

On Saturday afternoon Chris Marshall hosted an open house in the Oregon State Arthropod Collection. The Saturday evening keynote address was given by Dana Ross.

In the pages that follow, I (Ron Lyons) have summarized most of the presentations, as well as some of the other conversations. Dana Ross summarized his own contribution. The summaries have been looked over and enhanced and/or corrected as necessary by the various speakers. Resources (in print and online) mentioned at the meeting are included with the relevant material.

The groups of Lepidoptera for emphasis this year were:
- Butterflies: *Phyciodes*, *Chlosyne* and Hesperiidae (skippers)
- Moths: Sphingidae

David Maddison—Welcome

David Maddison, Director of the Oregon State Arthropod Collection (OSAC) and the Harold and Leona Rice Professor in Systematic Entomology in the Department of Integrated Biology, welcomed the group on behalf of the University, the Department, and the OSAC.

David provided an update on the scheduled renovation of Cordley Hall. The building will be remodeled in two stages with the older half currently scheduled for work from spring 2020 to spring 2022. The arthropod collection is located in that part of the building and will be moved to an off-campus facility during the renovation. After the first stage is completed, the current plan is to house the collection on the 2nd floor of Cordley Hall (rather than the 4th floor where it now sits). Relocating the collection on the 2nd floor will allow the use of compactors for the specimen cabinets.

Chris Marshall—Oregon State Arthropod Collection (OSAC) Update

Chris Marshall, Curator and Collections Manager of the Oregon State Arthropod Collection (OSAC), welcomed the group and discussed recent activities centered on the arthropod collection.

Chris pointed out that the Lepidoptera collection is still growing. Specimen contributions were received from a number of people including Dave McCorkle, Paul Hammond, Bruce O'Hara, Jeff Miller, Terry Stoddard, Gary Parsons, Gary Peters, Dana Ross and Jon Shepard. Chris pointed out that gifts of specimens are always appreciated but noted that resources in small collections such as the OSAC are limited. That includes space and finances for aquiring proper housing for donated material. Donors of specimens are encouraged to consider the housing needs of their collections and discuss this with the curators. While it is not necessary, some donors have provided moderate funds along with their material to help in the purchase of appropriate drawers, unit trays or even entire cabinets. Chris also repeated his interest in obtaining papered material, which requires very little space to store and has exceptional research value.

The collection is operating with 2 large grants right now—one for butterflies and moths, the other for pollinators, mainly bees. Work on the LepNet project—a joint project with a number of other collections to database North Amercian butterfly and moth specimens—is ongoing. Towards that end, all of OSAC's North American Pieridae, Papilionidae, Hesperiidae, and Lycaenidae specimens have been databased. There is a new federally funded project to understand the distributions of pollinators, specifically bees, around Oregon. As part of the Oregon Bee Atlas Project, OSAC is providing historical baseline data for Megachilidae and bumble bees. They hope to extend this dataset with additional funding to capture other bees and pollinators (flies, beetles). Students are now capturing bee as well as Lepidoptera specimen data.

The personnel in the various natural history collections are working to raise student and public awareness of the importance of the university's research and teaching collections. In connection with that, a book on the various collections was created through a cross-departmental collaboration with the OSU Photography and Scientific Writing programs. The coffee table book is full of beautiful photographs and student writing about the collections and is in the final stages of production. The OSAC is also still working to develop the new (~3 years old) undergraduate club: Natural History Collection Club.

Northwest Lepidopterists' Workshop 2018 (cont.)

Activity Report—Washington

Ann Potter works as a Wildlife Biologist specializing in insect conservation for the Washington State Department of Fish and Wildlife, and collects and reports Washington butterfly records for the annual Lepidopterists' Society Season Summary.

Lepidopterists are getting out in Washington and sharing a lot of material online through NW Leps and other resources—which is great! Be aware, reported sightings often cannot be incorporated into records because critical information, typically location details, is missing. She recommended including latitude and longitude coordinates or maps when sharing observations, if an observer wants the encounter to become a part of the record. One note about solely using place names for a locality; they can be confusing (for example, there are over 10 Rock Creeks in Washington; place names are often locally but not widely known; place names like 'Slate Peak' refer to very large areas) and are therefore not always informative to future lepidopterists searching for a butterfly. To communicate a location, it is always best to use both a locality name and coordinates.

Ann briefly reviewed the 2018 butterfly season in Washington, with the aid of a travelogue. Early spring reports came in from the Columbia River Gorge, including outings from Caitlin LaBar, Bob Pyle, and Jeannette Barreca, who reported a Skamania County record of Sheridan's Hairstreak (*Callophrys sheridanii*).

Moving north, Ann started a new project on a site on the Kitsap Peninsula, which juts out between Hood Canal and Puget Sound (Kitsap and Mason Counties). Ann began surveys in the Mason County portion encountering several species not documented there for decades, including Propertius Duskywing (*Erynnis propertius*), and Bramble Green Hairstreak (*Callophyrys dumetorum*).

In eastern Washington there were a number of surveys and field trips by the members of the Washington Butterfly Association (WBA), often led by John Baumann and David James, including efforts to revisit historical locales of *Bolora selene* (Silver-bordered Fritillary) and determine their current status. *Boloria selene* is considered a species of greatest conservation need in Washington. It was also documented this season from Douglas County by Jon Pelham, a county record, using recent photographic records. John Baumann spent time again this year getting out to places in eastern Washington that have very few butterfly records—Adams, Lincoln and even Spokane County. He found European Skipperling (*Thymelicus lineola*) in Spokane County, a county record.

In Washington, the year was characterized by a paucity of Monarchs (*Danaus plexippus*) in particular and an explosion of California Tortoiseshells (*Nymphalis californica*).

Bob Pyle indicated that one of the most interesting records all year in either state came from Dan Nelson, a naturalist in Vancouver. Dan found the very first Eastern Tailed Blues (*Cupido comyntas*) in western Washington on a semi-disturbed site along Vancouver Lake. Bob confirmed the identification and collected a voucher series.

In mid-July last year, Bob began a butterfly big year for the state to celebrate his 71st year. During this time, Bob recorded the Long Dash *(Polites mystic*) in Okanagan County that seems to be a county record. Bob indicated that his most exciting moment came one evening on Steptoe Butte above the Palouse when he had all 4 *Vanessa* species flying about together. By the end of his big year Bob had seen 127 of the 153 species known from Washington! To read more about Bob's big year adventures, read his column "Watching Washington Butterflies with Bob Pyle," in the WBA newsletter G'Num—access the newsletter archive (<https://wabutterflyassoc.org/links-and-downloads/newsletter-archive/>) and download the newsletters for September 2017, November 2017, May 2018, August 2018 and November 2018.

Activity Report—Oregon

Dana Ross is the keeper of the Oregon records for both butterflies and moths.

With help from Linda Kappen and Gary Pearson, Dana documented a healthy population of a newly described subspecies of the Western Sulphur, *Colias occidentalis primordialis*, at Grizzly Peak (Jackson County about 6 miles northeast of Ashland). This is a northwest extension of a series of populations.

Once again at Sampson Creek, Linda Kappen grabbed a fresh *Hemeris thysbe*—a clear winged sphinx moth that is rarely collected in the Pacific Northwest, at least in Oregon.

While out looking for the Silver-bordered Fritillary (*Boloria selene*) and Johnson's Hairstreak (*Callophrys johnsoni*) over in Grant County, Dana came across a small population of the Garita Skipperling (*Oarisma garita*). This location amounts to a range

Northwest Lepidopterists' Workshop 2018 (cont.)

extension and a county record.

Trevor McNeese showed the Silver-bordered Fritillary (*Boloria selene*) he caught down on Little Hay Creek Road in Crook County (see Trevor's story in the Bulletin of the Oregon Entomological Society 2018[3]: 1). Dana indicated that he and Gary Pearson had surveyed the area at one time and did not find them.

North American Butterfly Association Eugene–Springfield Chapter

Alison Center, president of the Oregon/Eugene–Springfield Chapter of the North American Butterfly Association (NABA), reported on the group's activities. The Chapter hosted 2 field trips and 2 butterfly counts—a Eugene count and a Cascade count. The past couple of years members of the group have also carried out butterfly surveys for the Bureau of Land Management, the city of Springfield, the Army Corps of Engineers, and the Forest Service.

On the Eugene 4th of July count, participants saw 20 species for a total of 296 individual butterflies from 8 sites. The most common species were the Western Tiger Swallowtail (*Papilio rutulus*), Mylitta Crescent (*Phyciodes mylitta*), Lorquin's Admiral (*Limenitis lorquini*) and the Ochre Ringlet (*Coenonympha tullia*). One surprise this year was that they didn't see any *Vanessa* species.

For the Browder Ridge count—actually 2 sites, Frissell Ridge and Iron Mountain both near Blue River in Lane County—participants counted 40 species, 1180 individual butterflies. The most common were the Clodius Parnassian (*Parnassius clodius*), Lilac-bordered Copper (*Lycaena nivalis*), Anna's Blue (*Plebejus anna*), Boisduval's Blue (*Icaricia icarioides*), Hydaspe Fritillary (*Speyeria hydaspe*), Snowberry Checkerspot (*Euphydryas colon*) and California Tortoiseshell (*Nymphalis californica*). Highlights were the Thicket Hairstreak (*Callophrys spinetorum*) and a Zerene Fritillary (*Speyeria zerene*). This count is always on the 2nd or 3rd Saturday in July, so, depending on what the weather and the winter snowfall have been like, some years there are more spring species and other years more summer species—this year there were more summer species.

The results from these counts can be found on the Chapter's website, `<https://www.naba.org/chapters/nabaes/>`. (The group is based in the Eugene–Springfield area, but is the only NABA Chapter in Oregon.)

Activity Report—California

Joseph Smith runs butterfly counts in Lava Beds National Monument, Lassen Volcanic National Park, and the north Warner Mountains. This past year the counts were quite good—Lava Beds about 60 species and nearly 5000 individuals; Lassen 86 species and about 6,000 individuals; the north Warners 90 species and almost 10,000 individuals. These results were probably related to a really diverse wet year after a long drought. In addition, there was an extension of the rain into the spring apparently stretching the hatch for some species. As a result participants saw species they usually don't see in the count period.

Some very serious fires occured in Shasta County this summer—the Hirz Fire, the Delta Fire, and the Carr Fire, all of which could be safely categorized as catastrophic fires—the fires were unusually hot and burned thousands of acres, some people died and considerable property was destroyed. With respect to butterflies, the fires also swept over some well-known colony locations. Affected colonies in the area include those for: Indra Swallowtail (*Papilio indra*), Moss's Elfin (*Callophrys mossii wyandot*), Bramble Green Hairstreak (*Callophrys dumetorum*), Columbian Skipper (*Hesperia columbia*), Leanira Checkerspot (*Chlosyne leanira*), California Dogface (*Zerene eurydice*), Western Sulphur (*Colias occidentalis*), Blue Copper (*Lycaena heteronea submaculata*), and Pipevine Swallowtail (*Battus philenor*). It remains to be seen which colonies have survived and can recover.

Activity Report—Idaho and Utah

Over the summer, Jon collected moths at 3 sites in Utah and 3 in Idaho. Since moths have not been collected much in Utah, almost everything he found was a county record. A large percentage of the moths he collected in Idaho were also county records and some were even state records. In Bonneville County southeast of Idaho Falls, Jon collected *Coloradia doris*, a silkmoth previously unrecorded in the Pacific Northwest.

While traveling through the Sawtooth Mountains of Idaho, Jon came across a huge outbreak of California Tortoiseshells (*Nymphalis californica*) on the summit of the pass.

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Coloradia doris (Black Hills Pandora Moth [Powell, J.A. and P.A. Opler. 2009. Moths of Western North America. University of California Press, Los Angeles, California. p. 238.], Doris' Pinemoth [<https://www.butterfliesandmoths.org/species/Coloradia-doris>]) collected in Bonneville County, Idaho, southeast of Idaho Falls by Jon Shepard using a black light.

Activity Report—Montana

Steve Kohler continued his work documenting the butterflies in Montana. He pointed out that it is really hard to get new county records in western Montana but nobody ever goes to eastern Montana so he went there. Through late June to early July, he got 23 new county records most of them from the Little Rockies (the north slope is in Blaine County and the south slope is in Phillips County—the old mining towns Landusky and Zortman are in the area).

New records for Blaine County included: Common Roadside-Skipper *(Amblyscirtes vialis*), Garita Skipperling (*Oarisma garita*), Hobomok Skipper (*Poanes hobomok*; a couple hundred miles west of any known locality that he has), Canadian Tiger Swallowtail (*Papilio canadensis*), Western Tiger Swallowtail (*Papilio rutulus*), Christina's Sulphur (*Colias christina*), Northern Checkerspot (*Chlosyne palla*), Viceroy (*Limenitis archippus*) and White Admiral (*Limenitis arthemis*; there was a population explosion of these), California Tortoiseshell (*Nymphalis californica*; there was a large population flying over most of western Montana) and Hydaspe Fritillary (*Speyeria hydaspe*).

Activity Report—Wyoming

Paul Hammond did most of his collecting in Wyoming this past summer where he made multiple visits to the Green Mountains, an interesting east-west range between the Wind River Range and the Laramie Mountains. The Green Mountains stretch from semi-desert at the lowest elevations to sub-alpine meadows at the highest ones. Interestingly, Paul could not find any indication that lepidopterists had ever visited these mountain before. He found sizeable populations of a number of fritillaries (*Speyeria* spp.) as well as Queen Alexandra's Sulphur (*Colias alexandra*) and Scudder's Sulphur (*Colias scudderi scudderi*).

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Documenting Lepidoptera Biodiversity in the Pacific Northwest: Reflections on the Past 24 Years

Dana Ross

After sharing a few memories of his childhood as a kid with a net in Southern California, Dana went on to summarize the many Lepidoptera projects that he has been involved in over the past two-plus decades here in the Pacific Northwest. In 1994, Dana began working as a research assistant, and later as a graduate student, in the lab of Dr. Jeffrey Miller in the Department of Entomology at Oregon State University. It is also when and where he met Dr. Paul Hammond.

As a trio, Miller, Hammond and Ross performed an intensive inventory of moths at the H.J. Andrews Experimental Forest, where Dana documented and mapped the butterfly community for his MS research. Dana went on to study butterflies and moths, often in the form of inventory projects, in places like Crater Lake National Park, Oregon Caves National Monument, Cascade-Siskiyou National Monument, Grizzly Peak and Sampson Creek Preserves near Ashland, where he also teaches a course or two each year at the Siskiyou Field Institute in Selma. He has inventoried moths and butterflies in the southern Willamette Valley for the Nature Conservancy (Coburg Ridge Preserve), Greenbelt Land Trust (various sites near Corvallis) and the Bureau of Land Management (Oak Basin, Coburg Hills). He has also worked with the U.S. Fish and Wildlife Service to document moths at various Pacific Northwest National Wildlife Refuges that include Conboy Lake, Umatilla, Malheur and Klamath Marsh. Other work has been in the Willamette, Deschutes, Ochoco, Rogue River-Siskiyou, Fremont-Winema and Malheur National Forests.

A number of Dana's surveys and studies have been focused on particular butterflies of conservation interest (Taylor's Checkerspot, Fender's Blue, Mardon Skipper, Leona's Little Blue, Johnson's Hairstreak, Silver-bordered Fritillary, Hoary Elfin, and Coastal Greenish Blue). Yet, even when the focus is on a single species, many others are encountered. As such, Dana has always documented the butterflies and moths wherever he goes. This often produces valuable species lists for land managers where they might not otherwise be generated.

Dana has frequently been accompanied in the field by friends Gary Pearson (Springfield, Oregon) and Linda Kappen (Applegate, Oregon). Working closely with Paul Hammond and the Oregon State Arthropod Collection (OSAC), the group has discovered a large number of state and county records for moths, butterflies and a few other insect groups. One important related task is the mounting, labeling and accession into the OSAC of voucher specimens for these studies. Each year Dana also collects and reports the latest butterfly and moth distribution records for Oregon and passes the most important ones on to Jon Shepard for inclusion in the Lepidopterists' Society Season Summary.

In 2019, Dana will continue to document the Lepidoptera biodiversity of Crater Lake National Park, Cascade-Siskiyou National Monument, Malheur National Wildlife Refuge and Steens Mountain, and Zumwalt Prairie Preserve.

Above. Jon Shepard (left) and Paul Hammond. Dana appreciates the collaborative efforts of other lepidopterists because no one person can do it all! Photo by Dana Ross.

Gary Pearson helping with the post-field tasks at the Klamath Marsh National WIldlife Refuge. Photo by Dana Ross.

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Discussion about Lepidoptera Records and Databases

A number of people participated in a general, but necessarily limited, impromptu discussion surrounding efforts to bring together specimen records from various collections into a comprehensive user-friendly form. The discussion also addressed the inclusion of non-specimen records and other types of data in the final result. Non-specimen records would mainly be photographs while other types of data could be something like surveys, or mass collection events where only target species or perhaps a representative sample of the specimens are actually kept.

Note: As indicated, this discussion was fairly general and very limited, by time and by audience questions. It did not discuss things like database design issues, field descriptors and formats, terminology definitions, sharing policy, etc.—all the gritty details that need to be dealt with in order to share database records.

Specimen Records in Institutional Collections

For a lot of the databases that we have had in the past, each observation or record represents a physical specimen (which may now be lost or destroyed). For instance, John Hinchliff oversaw a big effort to pull together all the collection records that he could in order to construct the butterfly atlases for Washington and Oregon. Since the information available for a given specimen is generally well defined—usually limited to the information available on the specimen label—designing a specimen-based database is fairly straightforward.

Specimen-based databases are present all over the place and have been developed by different people at different times with different design approaches and different resources at their disposal (a basic example is a specimen list on an EXCEL spreadsheet). A major focus in the institutional collection community is the creation of standards to allow these distributed and unique databases to share records that can be organized and presented in a meaningful way. To facilitate this sharing, there is an ongoing effort to assign every collection specimen a globally unique identifier—this number often takes the form of a machine-readable bar code.

Specimen-based databases often include the GPS coordinates where the specimen was collected. It is important to remember that the label information, particularly locality information, has evolved over time—some label locations potentially include a very large area, some names are no longer in use or have changed, others have been swallowed up into larger municipalities. The uncertainty associated with GPS coordinates derived from this locality information is necessarily quite variable.

The collection data that OSAC is generating for Lepidoptera for LepNet will ultimately be accessible through the Global Biodiversity Information Facility (GBIF) website. While a lot of people feel GBIF should be the main portal for collection data, other programs can be set up to access the data.

There really isn't a major distinction between regional and global data anymore. Depending on one's purpose, the definition of a region can be quite small (e.g., local park, county) or quite large (e.g., PNW, Nearctic). Regional resources, like PNW Moths, can respond more quickly to changes and can be used to provide region-specific information pertinent to the needs of their users.

Non-specimen Based Records and Other Types of Data

With today's smart phones, anybody can take a reasonable picture and generate data in the field. There are a number of different websites where people can put their data if they want to: general sites such as iNaturalist, and BugGuide, and order, or group specific, sites such as BAMONA. In some cases, people have placed the same (or slightly altered) image on more than one site, not necessarily with exactly the same accompanying information. These repositories have become an important and rapidly expanding source of new data.

The quality of the identifications on photo repositories is variable; in addition, some species cannot be reliably identified from a photograph (this is often a problem when one needs to use a key—characteristics used in the key may not show up in the image). If you want to include these records in a new, well curated database, you need to allocate time to go through these alternative sources, figure out which are useful, figure out which records are useful, and figure out which records are duplicated. Since this process results the creation of multiple records for the same image, you need to link the record in your new database to that in the original.

Alison Center noted that North American Butterfly Association (NABA) has their own online database for the 4th of July butterfly counts—all the counts from Canada, the United States and Mexico. Jon Shepard has been trying to get the Lepidopterists' Society to put the Season Summary online for a number of years but indicated that there is a chance that

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they may drop Summary altogether. He regards the Summary as a useful way to present all this data every year, all in one place. In both of these cases, some records may be supported, in whole or in part, by specimens or photographs, while others may not.

Including non-specimen based records and other types of data increases the complexity of a database design considerably beyond that of a specimen-only database. It also increases the possibility that a given specimen could be represented in more than one record.

Ancillary Information

Specimen records in institutional collections generally have a very limited amount of information associated with them—the information on the accompanying collection label. Other information that may have been written down in the collectors' notebooks or field writings is often no longer available, or only available in a much abbreviated form (such as publications). If available, such information could be used to resolve problems with some locality information.

Ann Potter indicated that a lot of records nowadays are photographs and these come with various archival source documents—peoples' emails, their description of where they were, what happened that day, any number of things. She has a massive collection of such source documents, as did John Hinchliff. This material can be important when the taxonomy changes because you might have to go back to a photograph rather than a specimen to decide how it fits in. She indicated that, while the material can be digitized, it probably also needs to exist somewhere as an actual physical document.

For digital photographs, some ancillary information is automatically entered in the image's metadata fields. (Current models of some high end cameras automatically include GPS coordinates.)

Some information can be entered manually but it is time consuming to enter and the current field descriptors aren't necessarily appropriate for biology (most of this information ends up in the comments). The information available through the metadata is evolving, but it is not necessarily the same, or in the same format, for the different camera brands or models. Some websites and software strip this information out.

Nowadays, many cameras have a video capability allowing the user to generate behavioral information. The information accompanying these files seems less developed than that available for single digital images.

Negative Records

David McCorkle expressed an interest in the absence of records—negative records. For example, places where things used to be but aren't anymore, or species that are no longer found or occur now in much reduced numbers.

But what does a negative record mean? Do people continue to collect/report common species or species known to them? A number of records on online sites come from incidental observations. Reports depend on the motivation and interest of the collector/observer. How many times are you going to report the same species?

Ann Potter indicated that you need some sort of protocol to establish a negative record. However, it should be possible to scan the database and flag species where a problem might exist so people could be on the lookout and would report their findings. Many cases would probably be the result of incomplete reporting.

Errors and Multiple Records

It takes a lot of time (and in some cases considerable expertise) to eliminate identification errors in the databases of various collections.

When a user requests records on a species through a portal such as GBIF, he or she receives records gleaned from a number of databases. As the number of databases with different data types grows, the potential for including multiple records that reference the same specimen or observation event increases. For instance: a collection specimen may have been recorded (in photographs, videos, 3D images, survey counts, etc.) one or more times before or after collection; the specimen and any other observations could all potentially become the source of database records. Since these records may be created at different times by different people, they may or may not be explicitly linked by their providers. Some records with the same, or similar, information may actually apply to different individuals.

Depending on the user's needs, it may be necessary to take the possibility of multiple records into account. The recognition of multiple records is straight forward with physical specimens (each specimen should have a unique identifier). With other forms of recording, the notes of the data provider(s) can help identify some, but not necessarily all, of these cases.

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Long Term Commitment

It is a challenge to keep any database information up-to-date. Nowadays, more records and information are being generated in various and more widely separated places. Much of that information is photographic—there are far more photographers than collectors, and it is far easier to generate lots of photographic data than lots of collection data. It is important that this non-specimen information be archived in some way so that it remains available for future users. It is also important that the specimens themselves, being irreproducible, be provided with some sort of archival backup.

It is also a challenge to keep the software used in the process up-to-date. For a database or a website to be useful, you need to maintain it—database retrieval programs change, databases programs change, database definitions change, web browsers change, web addresses change, the code for building web pages changes, new databases get added, etc.

There was general agreement that there should be a formal center or a small number of centers that were funded on a long-term basis to keep the database up-to-date and the database products useful. At the moment, OSAC and WWU are such centers and active cumulative databasing, particularly for Lepidoptera in the PNW, is ongoing. But how will that effort change, as funding and other considerations come into play.

Conclusions

The process of bringing together the different sources of information into a useable form is currently and will continue to be a challenge.

The possibility of having a meeting of the people interested in helping in one way or another was mentioned.

Specimen Digitization Efforts at the Oregon State Arthropod Collection (OSAC)

Chris Marshall

I'm writing this brief summary of the specimen digitization efforts at the OSAC as a companion note to the above discussion that took place at the Northwest Lepidopterists' Workshop regarding databasing. I was not present during that informal discussion but wanted to briefly note that the OSAC has been, and is currently, involved in several large projects that require coordinated efforts to capture and share specimen records and observations.

As many are aware, a large part of our North American Lepidoptera has been recently digitized and shared online as part of the NSF funded LepNet grant. In addition to these, we have also shared a large number of Pacific Northwest Hemiptera records and are currently working on a funded project to generate and share Pacific Northwest bee records as part of the Oregon Bee Atlas.

As a result of these efforts, we have firsthand experience with some (not all) of the challenges associated with large multi-user specimen digitization projects, including data structure design (e.g., what fields to include), data formatting choices (e.g., date vs text vs integer, etc.) and data entry issues, especially if data are entered by multiple people. In addition to these, because the OSAC shares our specimen data online, we've worked to better ensure that credit (attribution) for the people who generate this valuable data are properly recorded and that proper credit is shared with the dataset when it is made publicly available via larger data aggregators (such as GBIF, etc.) in such a way that the end-user has easy access to the original 'source' of the record.

It is not the intention of this note to provide answers for these issues here, but rather to express an interest in working with the Northwest Lepidopterists in this important endeavor. Towards that end, I plan to present at next fall's workshop, a brief overview of how digital specimen and observational records are captured, archived, and shared at the OSAC. In so doing, I hope to share some of our successes as well as point out some areas we would have done differently in review. I think doing so would serve two purposes: first, it might help the Northwest Lepidopterists avoid some of the pitfalls we fell into, and secondly, it might help align our efforts so the OSAC and the Northwest Lepidopterists' datasets can benefit from each other's efforts easily.

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Dave Specht—Texas Butterfly Festival 2017

Dave and Carol shared some images from the Texas Butterfly Festival (<https://www.texasbutterflyfestival.com/>) held in early November 2017. This annual festival is organized by the National Butterfly Center in Mission, Texas (on the Rio Grande River about 70 miles west of Brownsville, Texas).

There are gardens around the center to attract butterflies. There is also a seasonal spring with a grove of hackberry trees that attracts many species. Personnel at the center also sugar for butterflies using a mixture of beer, brown sugar, and rotten bananas in a syrup base. The mixture attracts other insects, particularly beetles, as well.

On this trip, Dave and Carol also visited the Bentsen-Rio Grande Valley State Park, sites in and around the town of Weslaco, the King Family Compound, William Jennings Bryant's winter home, and the Museum of South Texas History. During their stay the maximum daytime temperatures ranged from 86° F to 95° F.

Dave noted that a lot of people plant the native plant Crucita or Blue Mist Flower (*Eupatorium odoratum*, a member of the Asteraceae). Many butterfly species and hummingbirds nectar on its flowers.

Dave and Carol photographed 50 species on their various outings. Among the species shown were: Great Southern White (*Ascia monuste*), Southern Dogface (*Colias cesonia*), Large Orange Sulphur (*Phoebis agarithe*), Ceraunus Blue (*Hemiargus ceraunus*), Red-bordered Metalmark (*Caria ino*), American Snout (*Libytheana carinenta*), Julia Heliconian (*Dryas iulia*), Tropical Leafwing (*Anaea aidea*), Sickle-winged Skipper (*Achlyodes thraso*), White-patched Skipper (*Chiomara asychis*), Tropical Checkered-Skipper (*Pyrgus oileus*), Laviana White-Skipper (*Heliopetes laviana*), and Eufala Skipper (*Lerodea eufala*).

For Dave, one of the highlights was finding the Ruddy Daggerwing (*Marpesia petreus*). He had not seen this species since his early days taking residency training in pathology at Jackson Memorial Hospital in Miami, Florida.

They also photographed some immigrant species from south of the border including: Malachite (*Siproeta stelenes*), Mexican Bluewing (*Myscelia ethusa*), Red Rim (*Biblis hyperia*), Guatemalan Cracker (*Hamadryas guatemalena*), Guava Skipper (*Phocides polybius*), and Mercurial Skipper (*Proteides mercurius*).

There were even a couple species that show up in the Pacific Northwest: Common Buckeye (*Junonia coenia*), and Checkered White (*Pontia protodice*).

David Lee Myers—Butterfly Trips in Southern Oregon and Northern California

David was in the field this past year more often than he could remember in decades. Of the thousands of images he took, David showed about 30 taken in various Oregon and Northern California locations. These included Eight Dollar Mountain, Applegate Valley, Lower Table Rock, the upper Rogue, Lake of the Woods, and the Sisters area, all of which are in Oregon, and the north Warners in California near the Oregon border.

On the Warners trip, he made a nice abstract image of blue wings floating on a mud puddle. What interested him were all the blue scales that had come off and were sparkling in the sun.

On an outing near Sisters, David saw a strange flying shape that landed on bitterbrush. It turned out to be a Bald-faced Hornet (*Dolichovespula maculata*) carrying a Woodland Skipper (*Ochlodes sylvanoides*). Moments after landing, the hornet cut off the skipper's wings and dropped them; it then took the body and ate it like a giant hot dog. David pointed out that the hornet was vibrating as it was eating so even with a pretty good shutter speed most of his pictures were motion blurred.

In one image taken from his front porch in Ashland, a female Propertius Duskywing (*Erynnis propertius*) looked like it was attempting to oviposit on its host plant, *Quercus garryana*. However, it left no egg behind so it may not have been the right leaf. David noted that it was nice to just sit outside, eating, but with a camera at hand.

Two of David's images were chosen as the opening pictures for "Butterflies of the Pacific Northwest," the recently published field guide by Bob Pyle and Caitlin LaBar.

David's background is as an art photographer, not as a biologist. He loves bringing these two together with the help of this group. In his forthcoming book, "Wings in the Light—Wild Butterflies in North America," from Yale University Press, he uses art quality photographs to attract people's attention and build some fascination for butterflies. The images are accompanied by biological and conservation information.

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Tyson Wepprich—Visualizing Butterfly Trends and Phenology

Tyson, a Postdoctoral Fellow working in the Department of Botany and Plant Pathology at Oregon State, received his PhD from North Carolina State University in Raleigh (Wepprich 2017). Tyson is now studying an introduced chrysomelid beetle, *Galerucella* sp., in use here as a biocontrol species for purple loosestrife.

Tyson discussed population trends and life cycle changes exhibited by Ohio butterflies based on the data set from the Ohio Lepidopterists' Long Term Butterfly Monitoring Program (<https://www.thebutterflynetwork.org/program/ohio-lepidopterists-monitoring-network>) from 1996–2014. Some of the butterflies found in Ohio also occur in the Pacific Northwest.

Hallmann et al. (2017) found a dramatic decline in the total biomass of flying insects measured in German protected areas over the long term. Tyson examined the Ohio data to see if it showed a similar result. After some statistical analysis, he determined that there had also been a significant decline in the number of butterflies that you would expect to see now. He hopes to receive the most recent data (2015 and 2016) soon so he can update and publish his work.

A couple of years ago, Van Dyck et al. (2015) published an interesting study based on the Wall Brown (*Pararge megera*), a widely distributed butterfly in Europe. In southern Europe the butterfly can fit 3 generations in, but in northern Europe it can only manage 2. In Belgium, the butterfly was attempting to make a 3rd generation because the area had warmed enough, but the butterfly larvae could not develop sufficiently to successfully overwinter. The authors wondered if the butterfly populations in these areas were declining because of this failure and called this the "lost generation hypothesis."

Ohio is a good state to test this hypothesis. There is a large temperature gradient from the southwest to the northeast with the lake effect. Tyson found 20 species in the Ohio data that showed differences in the number of generations they have—when conditions were right, they had or attempted to have another generation at the end of the year. For example the Pearl Crescent (*Phyciodes tharos*) could have 2 or 3 generations in the north and 3 or maybe even 4 generations in the south. When a species tried an extra generation, Tyson looked at the numbers counted the following year to see if the extra generation was beneficial or not. There was a range in the 20 species, but, in general, species that had an extra generation showed higher numbers of adults the next year. In other words, the butterflies were good at taking advantage of that extra time. On the other hand, the Cabbage White (*Pieris rapae*) and the Meadow Fritillary (*Boloria bellona*) were species that were in long term population decline and seemed to do worse the year after attempting an extra generation; in those species maybe there was a lost generation.

Tyson wanted to see if a butterfly website that he created for Ohio would work here in Oregon and invited people to check the website out (<https://tyson-wepprich.shinyapps.io/0Hbutterfly/>).

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Jim Reed—The Adaptable Ringlet

Jim outlined a butterfly study he conducted over the past 26 years with his high school biology students in the town of Klickitat, Washington, population 350.

Jim wanted his students to do some basic scientific research, and asked his students a simple question: "How did the Ochre or Common Ringlet (*Coenonympha tullia*) become so common? " The research project started in his regular biology class. However, after hearing the students discussing the project, the administration established a class for field studies—in the fall the class concentrated on botany, in the spring the focus shifted to entomology.

Hwy 142 in Klickitat is good Ringlet habitat—rock with pine-oak trees. The Ochre Ringlet is a good research subject because it has a long flight season, from late March at least through late October. Students sampled the population in 2 time periods—the first was in the spring, mostly April and May, and the second was in late summer, mostly late August to early September. In late May – early June the area gets its first 100° F day. Once that occurs the plants just bleach out so by July a lot of the plants will be almost white; the spring and fall environments are quite different.

One early idea was that the butterfly flies so slowly birds just can't catch it, but the students had a hard time testing that.

They eventually settled on the test hypothesis that it was environmental, the butterfly was well camouflaged. In April and May when the foliage is fresh and green, the students thought that the butterflies should have a darker base color and more spotting, with a very distinct, pale medial band; this color pattern should break up the butterfly's appearance and result in differential predation. Later in the season after the plants dried up, the butterflies should be lighter and the band would not be distinct. The students thought that they would be collecting darker individuals in the spring and lighter ones in the fall. Instead they found that the light form was common in both seasons.

When Jim asked them to explain their results, the students decided there was a need for further research. They came up with several new lines of investigation including:

– their result was due to the larval food sources;
– the number of larval instars differed (one or two students did try to rear the larvae);
– their result was due to gender differences.

Interestingly, many students wanted to do DNA studies but that was beyond the scope of what the school could offer.

The project gave the students some insights into basic scientific research and the problems that can arise conducting field studies.

Next Year: Northwest Lepidopterists' Workshop 2019

In 2019 the groups of emphasis will be:

► *Butterflies: Euphydryas* (checkerspots), *Oeneis* (arctics) and *Erebia* (alpines)

► *Moths:* Geometridae

Acknowledgements

I would like to extend my sincere thanks to all the presenters for their comments, corrections, and changes to the summaries. I especially thank Chris Marshall, Merrill Peterson, Ann Potter and Jon Shepard for their comments on the Lepidoptera records and databasing section and Chris Marshall for his contribution on OSAC's efforts in this regard. I want to thank Dana Ross for the summary of his own presentation. I know all the input improved the accuracy and usefulness of the material.

Thank you all very much. *Ron Lyons*

Northwest Lepidopterists' Workshop 2018 (cont.)

Ron Lyons

Northwest Lepidopterists' Workshop 2018—Participants Photo Key

1 Sheba
2 Andrea Peters
3 Gary Peters
4 David Lee Myers
5 Carol Specht
6 Ron Sleeter
7 Dave Specht
8 David McCorkle
9 Rik Littlefield
10 Alison Center
11 Dave McNeese
12 Jon Shepard
13 Marquetta Mitchell
14 Jennifer Tiehm
15 Lars Crabo
16 Bev Koch
17 Mackenzie McNeese
18 Dan Thackaberry
19 Paul Hammond
20 Dorothy Campbell
21 Anne Poopatanapong
22 Steve Van Kampen
23 Ann Potter
24 Trevor McNeese
25 Matthew Campbell
26 Pat Campbell
27 Steve Kohler
28 Jim Dillman
29 Cynthia Dillman
30 Robin Cushman
31 Jim Reed
32 John Davis
33 Steve Northway
34 Hunter McNeese
35 Jonathan Pelham
36 Joseph Smith
37 Mike Raschko
38 Celeste Searles Mazzacano
39 Caitlin LaBar
40 Lori Humphreys
41 Terry Stoddard
42 Gary Pearson
43 Linda Kappen
44 Arthur Dunn
45 Bob Pyle
46 Dana Ross
47 Emma Van Campen
48 Tyson Wepprich
49 Jim Anderson
50 Bill Neill
51 Sue Anderson
52 Don Severns
53 Ron Lyons
54 Merrill Peterson