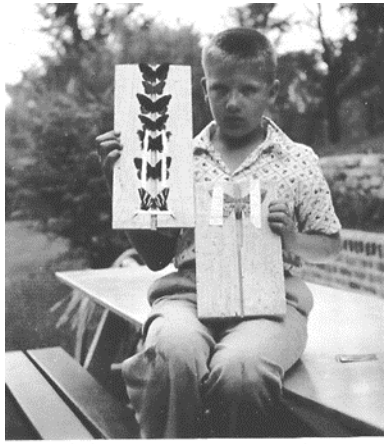
The Lepidopterists' Society
68th Annual Meeting
Davis, California
July 9 – 12, 2019

University of California at Davis
Begun 1908 – University Farm
1959 – Designated as University of California at Davis General Campus
2019 – 39,000 students enrolled
2007 to 2011 – Dept. of Entomology ranked #1 in the United States

Dr. Lynn Kimsey – Director of the Bohart Museum of Entomology at U.C. Davis.

Lynn Kimsey – 5 years old



Michael Collins, early and late instars

The Lepidopterists' Society
Annual Meeting 2019
Davis, California and the Bohart Museum of Entomology
July 9 – 12, 2019

Local Arrangements and Organizing Committee:
Jeff Smith, Michael Collins, Kelly Richers, Dr. Lynn Kimsey

Meeting Chairperson – Jeff Smith

Meeting Logo and T-shirts – Jeff Smith, Dr. Fran Keller

Program – Michael Collins, Jeff Smith, Kelly Richers

Tuesday Night Reception – Bohart Museum of Entomology -
Sponsored by BioQuip Products.

Thursday Night Barbecue – Tommy J's, Davis, CA

Friday Night Banquet – Odd Fellows Hall staff
Banquet Music – Marc Epstein and group

Bohart Museum Staff:
Dr. Lynn Kimsey – Museum Director
Dr. Steve Heydon – Collections Manager
Tabatha Yang – Outreach Events Coordinator
Jeff Smith – Curator of Lepidoptera
John De Benedictis – Lepidoptera specialist

Karl Jordan Award – Presenter Jackie Miller

In Memorium - Presenter Kelly Richers

Student Awards – presented by Brian Scholtens, Jackie Miller

Door Prizes – presented by Brian Scholtens – donors include
BioQuip Products, Michael Collins, Jeff Smith, Kelly Richers
and many more

Sponsors and Vendors – BioQuip Products

Session Moderators:
Melanie Lalonde
Chris Halsh
Ana Paula Caravalho
Ryan St Laurent, Kyhl Austin
Tom Valet
Deborah Mathews Lott
Sara Troup

Jerry Powell
and
Kelly Richers
In a rare
daytime photo

Welcome to Davis, California and the Bohart Museum of Entomology.

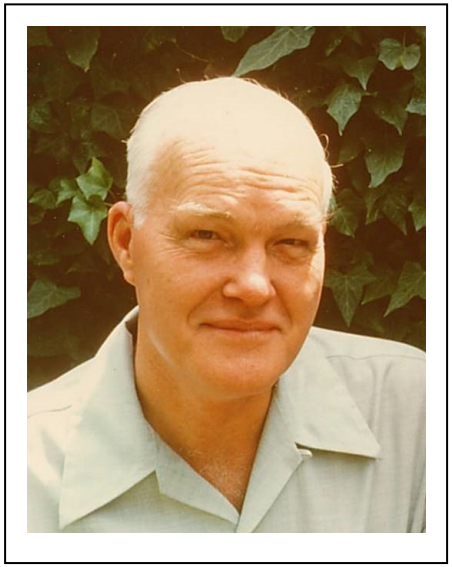
The City of Davis is named for farmer Jerome Davis, who farmed in the area in the 1860's. Yolo County continues to be a major agricultural area, with almonds, rice, and vineyards dominating, but also many other nut and fruit crops. The University Farm opened in 1908 and was re-designated as the University of California at Davis in 1959, with enrollment now approaching 40,000 students.

Davis lies 15 miles west of the state capitol of Sacramento and 75 miles east of San Francisco on Interstate 80, in the middle of the Central Valley of California. Summer temperatures average 90 degrees with many days over 100, but nights often cooled by the "Delta Breeze" flowing to the east from the Pacific Ocean. Average rainfall is 20 inches per year with the normal summer dry season between May and October when no rainfall occurs. Water from Sierra Nevada snow packs sustains cities and agriculture to the east and west, with numerous reservoirs and lakes storing the water.

Local places of interest include the extensive Arboretum on the U.C. Davis campus, near the Bohart Museum, Old Town Sacramento to the east, the many Napa Valley vineyards 1 hour to the west, museums in Sacramento such as the Railroad Museum, Sutter's Fort Historic Site, and Crocker Art Museum.

California boasts around 200 species of butterflies with a great many named subspecies. Diversity of all Lepidoptera is extremely high due to the many different habitats, from alpine to desert, grasslands to coastal, mixed hardwood forests to redwood and pine forests. The State Insect for California is the California Dogface Butterfly – *Zerene eurydice* – a species that occurs throughout California but in no other state.

The Bohart Museum of Entomology is currently the 7th largest insect research collection in North America, with holdings of nearly 8 million specimens. The Lepidoptera collection is nearing 500,000 specimens. The museum is named for Dr. Richard Bohart, a wasp specialist who began his teaching career at UCD in 1946, and started the collection shortly after that. It is the home of the California Insect Survey with major holdings of mosquitoes, tardigrades, and wasps and bees. The Lepidoptera collection is worldwide in scope with major numbers of specimens from northern Mexico.



Dr. Richard M. Bohart
Founding Director of the
Bohart Museum of Entomology

Meeting Schedule summarized:

Tuesday – July 9:

9 AM to 4 PM – Executive Board meeting, conference room near Bohart Museum, U.C. Davis
All day – Registration in Bohart Museum
6 PM to 9 PM – Reception for all in Bohart Museum, refreshments and beverages provided
Shuttle or carpools provided

Wednesday – July 10:

7 AM to 12 Noon – Registration continues at the Odd Fellow Hall, downtown Davis
Pick up Program and other materials
9 AM – Opening Remarks
9:20 to 11 AM – Student Presentations
11:20 AM to 2:20 PM – Mini-symposium on iNaturalist
12 Noon to 1:40 PM – lunch on your own – many restaurants surrounding the Odd Fellows Hall
1:40 PM to 4:20 PM – iNaturalist symposium and other speakers
Evening – dinner on your own

Thursday – July 11:

7 AM – Registration continues if needed at Odd Fellows Hall
9 AM to 11:20 AM – Contributed papers at Odd Fellows Hall – Upper Hall

Thursday July 11 – continued:

11:20 AM to 12 Noon – Poster Presentations in Lower Hall of OFH, Authors book signing in Lower Hall
12 Noon to 1:40 PM – lunch on your own
1:30 PM to 3:30 PM – shuttles or carpools to Bohart Museum – view collection and displays
6:00 PM to 9:00 PM – barbecue at Central Park in Davis - 1 block walk from Odd Fellows Hall and hotels

GROUP PHOTO

Friday July 12:

8 AM – continued registration if needed at Odd Fellows Hall
9 AM to 12:00 Noon – Contributed papers at Odd Fellows Hall – Upper Hall
12 Noon – Group Photo

5:30 PM to 6:00 PM – Reception in Odd Fellows Hall, Upper Hall – No-host bar available
6:00 PM to 9:30 PM – Banquet
Prizes and Awards
In Memorium montage and presentation
Out-going President Address
Door Prizes

DETAILED SCHEDULE OF EVENTS

Wednesday July 10

8:00 – 12:00	Late Registration	Lower Hall, Odd Fellows
	Coffee and snacks	Upper Hall, Odd Fellows
9:00	Opening remarks	Upper Hall, Odd Fellows

9:20 – 11:00 Student Presentations

9:20 – 9:40. **Ana Paula S. Caravalho & Akito Y. Kawahara**. The association of sexual arms race and diversification in Acraeini butterflies.

9:40 – 10:00. **Ryan A. St. Laurent, Alessandro Guisti** & **Akito Y. Kawahara**. *Zaphanta*, the sister group to all other sack-bearer moths.

10:00 – 10:20. **Kyhl A. Austin & Jason J. Dombroskie**. Systematics and biogeography of Caribbean Archipini (Lepidoptera: Tortricidae).

10:20 - 10:40 Break

10:40 – 11:00. **Melanie Lalonde & Jeffrey Marcus**. Hybrid zones and cryptic species revealed in the *Junonia* butterflies of the American Southwest and Mexico.

11:00 – 11:20. **Caitlin LaBar**. On the adventures of rearing Hemileuca hera (Saturniidae).

11:20 – 2:20 Mini Symposium: iNaturalist for Lepidopterists.

11:20 – 12:00. **Ken-ichi Ueda**. iNaturalist for Lepidopterists.

12:00 – 01:40 Lunch Break

1:40 – 2:00. **Marc E. Epstein**. How iNaturalist is contributing to our knowledge of species and life histories of Limacodidae (Zygaenoidea).

2:00 – 2:20. **Ivonne Garzón-Orduña**. Checklist of Limacodidae and related families of Mexico based on collections and citizen science.

2:20 – 2:40. **Jan Metlevski**. On the taxonomy of genera *Protorthodes* McDunnough, 1943 & *Trichopolia* Grote, 1883 (Noctuidae, Noctuinae, Eriopygini).

2:40 – 3:00. Break

3:00 – 3:20. **David. L. Wagner, Kevin L. Keegan & David L. Wikle**. Phylogeny and Biosystematics of the Grotellinae and Metoponiinae (Lepidoptera: Noctuidae).

3:20 – 3:40. **Richard S. Peigler**. Chemical Ecology of *Eupackardia calleta* (Saturniidae) in Texas.

3:40 – 4:00. **Jacqueline Y. Miller & Deborah L. Matthews.** Deception, thievery, mutualism in the orchid-insect world.

4:00 – 4:20. **David Lee Myers**. New book "Wings in the Light: Wild Butterflies in North America" from Yale University Press, 2019.

4:20 – 4:40. **Michael C Singer and Camille Parmesan**
Climate-change resilience in a climate-sensitive butterfly, Edith's checkerspot

Thursday July 11

8:00 – 12:00	Late Registration	Lower Hall, Odd Fellows
	Coffee and snacks	Upper Hall, Odd Fellows

0900 – 1200 Contributed Papers

9:00 – 9:20**. Alvin Ludke & Lisa Couper**. Ecology of the Genus *Adela* (Adelidae) in Central California.

9:20 – 9:40. **Jeff Smith**. A collecting expedition to Belize and building the database of Belize Lepidoptera.

9:40 – 10:00. **Ivonne Garzón-Orduña & Andrew V.Z. Brower**. Patterns of eyespot evolution in the Neotropical butterfly genus Eunica (Lepidoptera: Nymphalidae).

10:00 – 10:20 **Nick V. Grishin, Jing Zhang, Qian Cong, Jinhui Shen**. Taxogenomics of butterflies.

10:20 – 10:40 Break

10:40 – 11:00. **Mary Ellen Hannibal.** Speak Butterfly: Tracing Vladimir Nabokov's 1941 Cross-Country Trip.

11:00 – 11:20. **Robert M. Pyle**. Lepidoptera in Literature: A Reading.

11:20 – 12:00 Book Signing Lower Hall, Odd Fellows
Poster Presentations & Discussion

12:00 – 1:40 Lunch

1:30 – 3:30 Bohart Museum – View Displays, Examine Collection.
Shuttle from Odd Fellows,
Or carpooling encouraged

6:00 – 9:00 BBQ - Central Park in Davis at corner of 3rd and C streets, under Pavilion cover. 1 block north of Odd Fellows Hall.

GROUP PHOTO

Friday July 12

8:00 – 12:00	Late Registration	Lower Hall, Odd Fellows
	Coffee and snacks	Upper Hall, Odd Fellows
9:00 – 12:00	Contributed Papers	Upper Hall, Odd Fellows

9:00 – 9:20. **Paul Opler & Nick. V. Grishin**. Endemic butterflies of the Californian Region, present and projected.

9:20 – 9:40. **Dan Rubinoff, Julian Dupuis, Kendall. H. Osborne, Scott M. Geib**. Genomics of the Endangered El Segundo Blue suggest surprising evolutionary relationships with conservation implications.

9:40 – 10:00. **Don Miller**. Title: Effects of Oil Palm Development on the Butterfly Fauna of Papua New Guinea.

10:00 – 10:20. **Ranger Steve Mueller**. Lepidoptera of the Greater Bryce Canyon Ecosystem Utah.

10:20 – 10:40 Break

10:40 – 11:00. **Tyson Wepprich**, **Jeffrey R. Adrion, Leslie Ries, Jerome Wiedmann, Nick M. Haddad.** Butterfly abundance declines over 20 years of systematic monitoring in Ohio, USA.

11:00 – 11:20**. Matthew L**. **Forister**. Butterflies and the big drought overturn expectations along an elevational gradient.

11:20 – 11:40. **Chris Halsh & Arthur Shapiro**. The special and temporal story of the expanding gulf fritillary.

11:40 – 12:00. **Michael C. Singer and Camille Parmesan**. Climate-change resilience in a climate-sensitive butterfly, Edith's checkerspot.

11:40 End of Formal Papers

5:30 – 6:00 Reception - Open Bar, no-host - Upper Hall, Odd Fellows

6:00 – 9:30 approx. Banquet
Prizes and Awards
In Memorium montage
Out-going President's Address
Door Prizes

Abstracts: Student and Contributed Papers

Wednesday July 10

(Moderator: **Melanie Lalonde**) Student Papers

9:20 – 9:40

The association of sexual arms race and diversification in Acraeini butterflies.

Ana Paula S. Caravalho & Akito Y. Kawahara.
3215 Hull Road, Powell Hall, Gainesville, FL 32611; Department of Entomology and Nematology, University of Florida; apsdecarvalho@gmail.com.
Co-author: Akito Y. Kawahara, 3215 Hull Road, Powell Hall, Gainesville, FL 32611, Florida Museum of Natural History, University of Florida.

Species diversity varies drastically among different groups of life, and the disparity from group to group has long fascinated biologists. The underlying reasons for differences in diversification rates are not obvious. Sexual selection has been considered to be an important force driving speciation, especially when associated with sexually antagonistic coevolution. It has been suggested that the evolution of mating plugs in butterflies is a result of conflict between male and female reproductive interests, triggering coevolution of plugging (male) and anti-plugging (female) adaptations. We analyzed how these plugs could be associated with shifts in diversification rates in Acraeini using Bayesian Analysis of Macroevolutionary Mixtures (BAMM), in a robust phylogenetic reconstruction of the tribe. We have found no shifts in diversification associated with this group, which contradicts the findings of several previous studies that concluded that sexual conflict is associated with shifts in diversification rates.

9:40 – 10:00

Zaphanta, the sister group to all other sack-bearer moths.

Ryan A. St. Laurent, Alessandro Guisti & Akito Y. Kawahara.
University of Florida, Biology Department & Florida Museum of Natural History, 3215 Hull Road, Gainesville FL, 32611, thesaint913@gmail.com . Co-author: Alessandro Giusti, Department of Biology, University of Florida, Gainesville, FL, 32611, USA; Natural History Museum, London, SW7 5BD, UK

Ongoing phylogenomic efforts implemented to better understand the evolution of the mostly Neotropical sack-bearer moths (Mimallonidae) have consistently revealed that *Zaphanta*, a genus of tiny yellow Mimallonids, is sister to the remainder of the family. Long considered monotypic or bitypic, *Zaphanta* have not been the focus of any systematic treatment. These moths are found throughout Central and South America, and detailed examination of several disparate, as well as sympatric, populations of *Zaphanta* have revealed numerous undescribed species. We re-describe *Z. infantilis* and *Z. fraternal* and describe the females of both of these for the first time. An additional nine new species are described and figured from the Amazon, the Cerrado, and the Atlantic Forest. The new taxa present incredibly varied genitalia morphology but are externally homogenous in coloration and patterning. The previously unknown diversity of *Zaphanta* prompts questions about the biogeographic history and ancestral host plant associations of all Mimallonidae.

10:00 – 10:20
Systematics and biogeography of Caribbean Archipini (Lepidoptera: Tortricidae).

Kyhl A. Austin & Jason J. Dombroskie.
Cornell University, Comstock Hall, Department of Entomology, Ithaca, NY, USA, 14853-2601
Co-author(s) Jason J. Dombroskie, Cornell University, Comstock Hall, Department of Entomology, Ithaca, NY, USA, 14853-2601

The Caribbean region provides an excellent realm in which to study biogeography because of its high levels of insular endemism and topographic complexity. The
biogeography of several other insect taxa has been investigated in depth, but none to date have focused on microlepidoptera. Though less diverse than other groups, the Archipini provide an excellent avenue to study biogeography because of their strong
association with high-elevation montane habitats. Almost all species in the Greater Antilles are highly restricted in their distribution. We will present new species and combinations, proposed routes of colonization, and a unique sexual coupling mechanism.

10:20 – 10:40 Break

(Moderator: **Chris Halsch**)

10:40 – 11:00
Hybrid zones and cryptic species revealed in the *Junonia* butterflies of the American Southwest and Mexico.
Melanie Lalonde & Jeffrey Marcus.
Department of Biological Sciences, University of Manitoba, Winnipeg, Manitoba, R3T 2N2 University of Manitoba, mlalonm@myumanitoba.ca; Jeffrey Marcus: Department of Biological Sciences, University of Manitoba, Winnipeg, Manitoba, R3T 2N2

The American Southwest and Northern Mexico has high endemic biodiversity caused by Pleistocene glaciations and the subsequent dispersal of species from glacial refuges within this region. The New World *Junonia* are a recently diverged group of butterflies that sheltered in these glacial refuges during periods of glacial advancement. Using phenotypic and genotypic information from preserved specimens in museum collections, we have reconstructed the plausible historic movements, and the contemporary geographic distributions of five *Junonia* taxa (*J. coenia*, *J. coenia grisea*, *J. litoralis*, *J. nigrosuffusa*, and *J. zonalis*) as well as evidence of hybridization and cryptic species from specimens found in the American Southwest and Northern Mexico. Two morphologically similar taxa, *J. coenia* and *J. coenia grisea*, were found to have differences in morphology, life history traits, nuclear wingless sequences data, and district mitochondrial haplotypes suggesting that they are a cryptic species pair, with *J. grisea* elevated to full species status.

11:00 – 11:20
On the adventures of rearing *Hemileuca hera* (Saturniidae).
Caitlin LaBar.
Northwest Butterflies, Kelso, WA

A cluster of first instar *Hemileuca hera* larvae were found in Kittitas County, Washington in April 2019. Employing a variety of tactics, I attempted to rear this notoriously difficult species. Further complicating matters, they were cage-reared on the "wet side" of the state instead of in their dry shrub-steppe home. I discuss what worked, what didn't, and the extraordinary lengths a person will go to in order to ensure the survival of her caterpillars!

11:20 – 2:20 Mini Symposium: iNaturalist for Lepidopterists

11:20 – 12:00.
iNaturalist for Lepidopterists.
Scott Loarie.
Co-director, iNaturalist; Fellow, National Geographic Society; Fellow, California Academy of Sciences. loarie@gmail.com

Inaturalist is a global online social network of naturalists who share photos of wild organisms for anyone to identify. It can be a valuable tool for anyone studying biodiversity, but particularly in diverse groups like Lepidoptera. I'll present ways iNat can provide distribution, life history, and phenological information, and I'll discuss some of its limitations.

12:00 – 1:40 Lunch Break

(Moderator: **Anna Paula Caravalho**)

1:40 – 2:00
How iNaturalist is contributing to our knowledge of species and life histories of Limacodidae (Zygaenoidea).
Marc E. Epstein.
Plant Pest Diagnostics Branch, California Dept. of Food & Agriculture, 3294 Meadowview Road, Sacramento, CA 95832. mepstein@cdfa.ca.gov

Coupled with collection-based research, collecting, and collaboration on rearing over the past 35 years, the iNaturalist community is helping further my knowledge of Limacodidae in significant ways. This talk will provide several in depth examples.

2:00 – 2:20.
Checklist of Limacodidae and related families of Mexico based on collections and citizen science.
Ivonne Garzón-Orduña.
National Insect Collection (CNIN), Nacional Autonomous University of Mexico (UNAM) México City, México;
Marc Epstein: Plant Pest Diagnostics Branch, California Department of Food and Agriculture, Sacramento, California 95832

We provide a list of species of Limacodidae and closely related families (Megalopygidae, Dalceridae, Zygaenidae and Aididae) built from collection data and from observations made by the general public and identified by one of us and other taxonomists in iNaturalist. We will report the total number of species and observations reached through this portal by the end of June of 2019, as well as the total number of species of Limacodidae documented for Mexico after incorporating records obtained from museum collections. Through this exercise we found new records for Mexico and a couple of surprising absences. Interesting cases of geographical variation in caterpillars of the genus *Acharia* and the possible sighting of the caterpillar of *Monolecua longifascia* will be presented.

2:20 – 4:00 Contributed Papers

2:20 – 2:40
On the taxonomy of genera *Protorthodes* McDunnough, 1943 & *Trichopolia* Grote, 1883 (Noctuidae, Noctuinae, Eriopygini).
Jan Metlevski.
236 Waters Hall, Department of Entomology, Kansas State University, Manhattan, KS 66506

Genus *Protorthodes* McDunnough, 1943 reviewed. Morphology of *Protorthodes antennata* (Barnes & McDunnough, 1912) studied and compared to *Trichopolia dentatella* Grote, 1883. Based on morphology of male and female genitalia, male antennae and wing pattern showed that *Protorthodes antennata* and *Trichopolia dentatella* are congeneric. A taxonomic problem appears since these two species have different generic names. Possible ways to solve the problem proposed.

2:40 – 3:00. Break

(Moderator: **Ryan St Laurent)**

3:00 – 3:20.
Phylogeny and Biosystematics of the Grotellinae and Metoponiinae (Lepidoptera: Noctuidae).
David. L. Wagner, Kevin L. Keegan & David L. Wikle.

Department of Ecology and Evolutionary Biology, University of Connecticut, Storrs, Connecticut 06269
Kevin L. Keegan: Department of Ecology and Evolutionary Biology, University of Connecticut, Storrs, Connecticut 06269;
David L. Wikle, 1021 Roanoke Road, San Marino, CA 91108-2412.

Former concepts of the North American Amphipyrinae were recently found to be highly polyphyletic. What previous noctuid classifications relegated to the Amphipyrinae included no less than nine different subfamily-level lineages (Keegan et al. 2018).

Here we examine phylogenetic relationships among two of these: Grotellinae and Metoponiinae. Special emphasis is placed on the Grotellinae. We present a species-level phylogeny for Nearctic grotellines, characterize their larvae, review their hostplant associations, and examine other aspects of their biosystematics. One message that will be underscored is how different the rates of phenotypic evolution can be between the larval and adults stages of Lepidoptera.

3:20 – 3:40.
Chemical Ecology of *Eupackardia calleta* (Saturniidae) in Texas.
Richard S. Peigler.
Dept. of Biology, Univ. of Incarnate Word, 4301 Broadway St., San Antonio TX 78209

Biogenic compounds were found in larvae and adults of *Eupackardia calleta* using a mass spectrometer. Various compounds were identified in the first-instar larvae before feeding, hemolymph of mature larvae, glandular secretions of mature larvae, and adult moths. The compounds included hydroquinone, trehalose, 3,5-dimethylphenol, dopamine, 3,4-dihydroxyphenylalanine, norepinephrine, and 2-(dimethylamino)ethylacetate, the last five of which were identified in the leaves of the hostplant (*Leucophyllum frutescens*). These compounds were found to impart protection from ants, and probably protect from birds and mammals. The diurnal moths are believed to be Batesian (or Müllerian?) mimics of *Battus philenor* (Papilionidae).

. 3:40 – 4:00.
New book "Wings in the Light: Wild Butterflies in North America" from Yale University Press, 2019.
David Lee Meyers.
681 Nepenthe Ashland Or 97520

The mission of "Wings in the Light" is to first attract and reward readers' attention with photographs from life, in habitat, of wild butterflies. Photographs include damaged and worn butterflies as well as fresh ones. There's taxonomic information and basic biology to build interest, even fascination. An emphasis is on engaging butterflies near one's home, including on public lands. Monarch migration story included. A chapter shows where to look for butterflies. Passages give a human experience orientation to conservation philosophy. The goal is to build appreciation and engagement.

4:00 – 4:20
Deception, thievery, mutualism in the orchid-insect world.
Jacquline Y. Miller & Deborah L. Matthews
McGuire Center for Lepidoptera and Biodiversity, Florida Museum of Natural History, University of Florida, P. O. Box 112710, Gainesville, FL, -2710. jmiller@flmnh.ufl.edu
Co-author: as above.

The plant family, Orchidaceae, is geographically distributed on six continents and amazingly diverse including about one fourth of the world's plant species. Insects, including Lepidoptera, have countless associations and interactions with these plants ranging from larval herbivory, the unexpected nectar thief, and the obligate pollinator. Some classic examples of these interactions as well as more recently discovered examples will be discussed.

Thursday July 11

(Moderator: Kyhl Austin)

9:00 – 9:20
Ecology of the Genus *Adela* (Adelidae) in Central California.
Alvin Ludke & Lisa Couper.
8711 Blythe Ave, Orangevale, CA 95662; Lisa Couper: 4610 Grazing Hill Rd Shingle Springs Rd. CA 95682

Generalizations of the distribution, phenology and oviposition-al substrates for the common, widespread and easily collect-ed but little studied genus *Adela* in central California will be presented. These aspects will be discussed individually for each of the eight described species known from California. Means for identifying the species will be presented. Photos of ovipositional behavior will be presented for seven of the eight described species, some on multiple substrates. Evidence, including a photo of ovipositional behavior, for the existence of an undescribed species will be presented. Ovipositional substrate specialization will be discussed as relates to generic generalizations and species distinctions. Comparative mating behavior will be discussed as far as is known. Photos of pairs in copula will be presented for at least four species.

9:20 – 9:40.
Collecting and Data-basing the Lepidoptera of Belize.
Jeff Smith.
Bohart Museum of Entomology, Univ. of California at Davis, Davis, CA bug-man@starstream.net
Dr. Fran Keller – Folsom Community College, Folsom, CA,
David Wyatt – Sacramento City College, Sacramento, CA

Since 2005 annual trips have been made to Belize for collect-ing and tropical studies. At least half of these were made em-phasizing collecting of arthropods, with all

Lepidoptera deposited in the Bohart Museum of Entomology. Sites sampled include savannah and primary rainforest, with most visits in the Maya Mountains of south-central Belize, with stays from 8 to 14 days during both dry and wet seasons. Records of species, including beetles, are being maintained and the ultimate goal is to build an entomology collection within the country of Belize.

9:40 – 10:00.

Patterns of eyespot evolution in the Neotropical butterfly genus *Eunica* (Lepidoptera: Nymphalidae).

Ivonne Garzón-Orduña & Andrew V.Z. Brower.
National Insect Collection (CNIN), National Autonomous University of Mexico (UNAM) Mexico City, Mexico.
Andrew V.Z. Brower: National Identification Services (NIS), USDA APHIS PPQ Plant Health Programs, Riverdale, MD, USA

Eyespots are the most conspicuous color element of butterflies' wing pattern. Efforts to understand processes involved in the formation of eyespots have been driven mainly by evo-devo approaches. However, patterns of change inferred from phylogenies are also critical in informing hypotheses about the underlying molecular mechanisms behind the formation and/or disappearance of eyespots. We present a phylogenetic hypothesis for *Eunica,* whose species feature startling variation of eyespots on their ventral hind wings. Species of *Eunica* are prominent members of neotropical butterfly communities in a variety of habitats, from tropical semi-deciduous forest in Central America to montane rainforests in South America. COI and four nuclear gene fragments were used in combination with 70 morphological characters from adults to generate a topology under equal weights parsimony. Though the phylogenetic signal provided by eyespots is limited, our tree offers some support for a reduction in the number of eyespots as species diverged.

10:00 – 10:20
Taxogenomics of butterflies.
Nick V. Grishin, Jing Zhang, Qian Cong, Jinhui Shen.
University of Texas, Southwestern and HHMI, 5323 Harry Hines Blvd., Dallas, TX, USA, 75390-9050.
Jing Zhang, Qian Cong, Jinhui Shen, the same affiliation.

Capitalizing on the recent advances in next generation sequencing technology, we obtained genomic sequences of over 10000 butterfly specimens to address a number of problems mostly dealing with taxonomy and nomenclature. These specimens range from freshly collected to Cramer types. Several examples of adjustment to butterfly classification resulting from this work will be discussed. Focusing on the family Hesperiidae, we found many examples of possibly mimetic convergence in wing patterns that obscured phylogenetic relationships. Conversely, we found some close relatives with very different appearance. We conclude that it is easier for taxonomists to correctly place similar-looking (but distantly related) species in different groups, than to bring different-looking (but closely related) species together in one group. An updated classification of Hesperiidae will be presented with the emphasis on North American fauna.

10:20 – 10:40 Break

(Moderator: **Tom Velat**)

10:40 – 11:00
Speak Butterfly: Tracing Vladimir Nabokov's 1941 Cross-Country Trip.
Mary Ellen Hannibal.
2834 Divisadero St., San Francisco CA 94123

A few years ago insect curator Suzanne Rab-Green found an unclassified cigar box in a storage closet at the American Museum of Natural History. Marked "Nabokov 1941" it contained specimens he collected traveling from New York to Palo Alto in May 1941. The AMNH has kept the butterflies together to better tell a story of species distribution and to provoke thinking about change over time. I'm an environmental journalist and author, re-tracing Nabokov's journey right now and collecting not specimens but Naturalist observations of butterflies. My talk will cover what I've found and not found, and start making some connections between Nabokov's lepidoptery and his aesthetic convictions. I'm in the process of writing a book about all this.

11:00 – 11:20.
Lepidoptera in Literature: A Reading.
Robert M. Pyle.
369 Loop Road, Gray's River, Washington 98621. tlpyle@willapabay.org .

Fiction mirrors real life, sometimes more clearly and honestly than other kinds of prose can do. From time to time, an author has sought to infuse his or her imaginative story with factual material drawn from the real lives of butterflies and moths. Vladimir Nabokov, the best known of such writers, was not the only one. In this brief reading I will share several examples, concluding with a selection from my own novel, Magdalena Mountain (Counterpoint Press, 2018). In this book I have attempted to intertwine the lifeways of *Erebia magdalena* with those of my human characters, including a number of lepidopterists, both real and imagined. Through the power of story, we can hope to reach people who do not read scientific papers, and perhaps convince them of the value of Lepidoptera.

11:20 – 12:00 Book Signing
Lower Hall, Odd Fellows
Poster Presentation & Discussion

12:00 – 1:40 Lunch

1:30 – 3:30 Bohart Museum – View Displays,
Examine Collection.
Shuttle from Odd Fellows,
Carpooling encouraged

6:00 – 9:00 BBQ - Central Park in Davis at corner of 3rd and C streets, under Pavilion cover. 1 block north of Odd Fellows Hall.

Friday July 12

9:00 – 11:40 Contributed Papers

(Moderator: **Deborah Mathews Lott**)

9:00 – 9:20
Endemic butterflies of the Californian Region, present and projected.
Paul Opler & Nick. V. Grishin.
C.P. Gillette Museum of Arthropod Diversity, Department of Bioagricultural Sciences, Colorado State University, Fort Collins, CO 80523-1177; paulopler@comcast.net
Nick V. Grishin ;, Southwestern Institute of Biomedical Research, University of Texas, Dallas, TX 75229-3015.

The Californian region is known for its biological uniqueness, not for its absolute species richness. The most recent listing of

Californian butterflies by J. Emmel, T. Emmel, and S. Mattoon (1998) comprises 269 species, 29 of which are erroneous or one-time strays. The authors list 40 species known only from the Californian region [California, southern Oregon, western Nevada, and northern Baja California] for an endemism level of 16.7% which is only surpassed by Hawaii's 100% endemism of its native butterfly fauna (2 of 2 species). We compiled a listing of 23 additional species which have been described or elevated since 1998 or are suggested as candidate species-level taxa based on their distributions, morphology, and/or genetics. Nineteen would be additions to the state list and the corrected Californian endemism rate of 21.4% [56/259] is similar to the endemism rate for native plants but much lower than for amphibians. Pointing out additional species-level taxa of Californian butterflies may lead to their enhanced appreciation and conservation.

9:20 – 9:40

Genomics of the Endangered El Segundo Blue suggest surprising evolutionary relationships with conservation implications.

Dan Rubinoff, Julian Dupuis, Kendall. H. Osborne, Scott M. Geib.

Department of Plant and Environmental Protection Science, University of Hawai'i at Mānoa, 3050 Maile Way, 310 Gilmore Hall, Honolulu, HI 96822, USA. Rubinoff@hawaii.edu

Julian R. Dupuis (1), Kendall H. Osborne (3), Scott M. Geib (2).

(1) Department of Plant and Environmental Protection Science, University of Hawai'i at Mānoa, 3050 Maile Way, 310 Gilmore Hall, Honolulu, HI 96822, USA.

(2) U.S. Department of Agriculture-Agricultural Research Service, Daniel K. Inouye U.S. Pacific Basin Agricultural Research Center, Hilo, HI 96720, USA.

(3) Osborne Biological Consulting, 6675 Avenue Juan Diaz, Riverside, CA 92509.

The El Segundo Blue butterfly (ESBB), usually but not always *Euphilotes battoidies allyni,* was one of the first insects listed

under the Endangered Species Act. Associated with *Eriogonum parvifolium* restricted mainly to coastal sand dunes in Los Angeles County, California, it has been largely extirpated by coastal development. About ten years ago another population, identified as ESBB, was discovered to the north at Vandenberg Air Force Base, apparently dramatically increasing the range of the subspecies; but genetic evidence for the identification was limited to mtDNA barcodes and morphology. Using high density genome wide SNPs (1,882-54,000) from across the genome and additional mtDNA sequence data, we constructed phylogenetic and population-level relationships using 260 specimens of ESBB and related taxa ranging across southern California. Our results are unexpected and suggest long-term isolation of the ESBB and more complex relationships between ecology and systematics--with significant conservation implications for the species.

9:40 – 10:00.. Title: Effects of Oil Palm Development on the Butterfly Fauna of Papua New Guinea.

Don Miller.
Department of Biological Sciences, California State University, Chico CA

Currently the world's most important source of vegetable oil, the oil palm (*Elaeis guineensis*) is cultivated widely in the tropics: its expansion poses a threat to remaining rain forests. I surveyed the butterfly fauna of oil palm plantations and adjacent primary rain forest in New Britain, Papua New Guinea, between 2007—2016. Methods included modified Pollard transects using visual identifications and netting voucher specimens, as well as hanging bait traps with fermented fruit. A comparison of diversity metrics between oil palm and rain forest revealed striking differences, with many species limited to primary forest, although a minority occurred solely in plantations. Thus the butterfly fauna of the rain forest consisted mostly of endemic taxa, whereas by contrast those butterflies in the plantations tended to be widely distributed and associated with weedy, disturbed habitats.

10:00 – 10:20
Lepidoptera of the Greater Bryce Canyon Ecosystem Utah.
Ranger Steve Mueller.
Ody Brook Nature Sanctuary, 13010 Northland Drive, Cedar Springs, MI 49319 odybrooknaturesanctuary@gmail.com
Research Associate at Colorado Plateau Museum of Arthropod Biodiversity Northern Arizona University.

Vouchered Lepidoptera from the Greater Bryce Canyon Ecosystem Utah are reviewed. One new species has been described. Research provides resource management baseline data for Bryce Canyon National Park and surrounding Dixie National Forest in Utah. In 1975, few species listings were found in a literature or discovered in museum collection searches to document regional occurrence. Identification verifications have been secured for most species by specialists. A Greater Bryce Canyon Ecosystem Checklist has been prepared. For easiest lepidopterists access, specimens have been deposited in Bemidji State University MN, Canadian National Collection Ottawa Canada, Carnegie Museum PA, Gillette Museum Colorado State University CO, Michigan State University, Milwaukee Public Museum WI, Monte Bean Museum Brigham Young University UT, and Smithsonian National Museum Washington DC, with Bryce Canyon National Park specimens deposited at the NPS repository at Colorado Plateau Museum of Arthropod Biodiversity Northern Arizona University. Protocol overview is presented.

10:20 – 10:40 Break

(Moderator: **Sara Troup**)

10:40 – 11:00
Butterfly abundance declines over 20 years of systematic monitoring in Ohio, USA.
Tyson Wepprich, **Jeffrey R. Adrion, Leslie Ries, Jerome Wiedmann, Nick M. Haddad.**
2082 Cordley Hall, Department of Botany and Plant Pathology, Oregon State University, Corvallis, OR 97331; Tyson.wepprich@gmail.com ; Jeffrey R. Adrion (2), Leslie Ries (3), Jerome Wiedmann (4), Nick M. Haddad (5).
2. Institute of Ecology and Evolution, University of Oregon, Eugene, Oregon.
3. Department of Biology, Georgetown University, Washington, D.C.;
4. The Ohio Lepidopterists, Columbus, Ohio,
5. Department of Integrative Biology and W.K. Kellogg Biological Station, Michigan State University, Hickory Corners, Michigan.

We estimate the rate of change in total butterfly abundance and the population trends for 81 species using 21 years of systematic monitoring across Ohio, USA. Total abundance is declining at 2% per year, resulting in a cumulative 33% reduction in butterfly abundance. Three times as many species have negative population trends compared to positive trends. These results mirror those documented in long-term European monitoring. Multiple environmental changes such as climate change, habitat degradation, and agricultural practices may contribute to these declines and shift the makeup of the butterfly community. Our analysis of life-history traits associated with population trends shows an impact of climate change, as species with northern distributions and fewer annual generations declined more rapidly. These results from an extensive systematic monitoring program demonstrate an ongoing defaunation that on an annual scale might be imperceptible, but cumulatively has reduced butterfly numbers by a third over 20 years.

11:00 – 11:20
Butterflies and the big drought overturn expectations along an elevational gradient.
Matthew L. Forister.
Biology Department, University of Nevada, Reno; forister@gmail.com

The impacts of extreme weather events are under-studied relative to shifts in average conditions. We used long-term data from ten sites along an elevational gradient in Northern California to investigate faunal response to the mega-drought of 2011-2015. Contrary to the hypothesis that topographic complexity should buffer montane populations against climatic swings, we see declines in observed richness during the drought years associated mainly with increasing temperatures. In contrast, low elevation populations were productive during the drought, which we hypothesize was a consequence of early emergence and multi-voltinism leading to higher densities. Results will be discussed in the light of the last few years of post-drought behavior.

11:20 – 11:40
The special and temporal story of the expanding gulf fritillary.
Chris Halsh & Arthur Shapiro.
Biology Department, University of Nevada, Reno.
Co-author: Dept. of Evolution and Ecology and Center for Population Biology, University of California, Davis, Davis, CA 95616.

The changing climate is altering the distributions of species across the world, resulting in winners and losers in the Anthropocene. In this study, we focus on *Agraulis vanillae*, the gulf fritillary, a butterfly that has expanded its range in the past one hundred years in the western United States. Using time series analysis and species distribution modeling, we investigate the current factors limiting the distribution of *A. vanillae* and predict future shifts under different warming scenarios.

Agraulis vanillae is strongly limited by the distribution of its host plant, however overwintering populations are also limited by winter minimum temperatures. This distribution is predicted to expand as rising temperatures influence the butterfly directly, possibly through reduced overwintering mortality, and indirectly through increasing host plant distribution. These results provide an example of insights gained from combining spatial habitat modeling with intensive temporal modeling to understand the distribution of organisms under ever-changing conditions.

11:40 – 12:00
Climate-change resilience in a climate-sensitive butterfly, Edith's checkerspot.
Michael C. Singer and Camille Parmesan.
Biological and Marine Sciences, Univ. Plymouth, UK; Dept. Geological Sciences, Univ. Texas, Austin.

In the 1970s, Singer observed natural extinctions of several populations of Edith's checkerspot in a 2-year drought. In 1996, Parmesan showed that the average location of an extant Edith's checkerspot population had shifted significantly polewards and upwards between museum records and the early 1990's, as expected under warming climate. Also in the 1990s, an unseasonable frost in June killed hosts and extirpated a set of *E. editha* populations feeding on *Collinsia torreyi*, but left butterflies in adjacent *Pedicularis*-feeding patches unaffected. These observations suggest that the species might be particularly vulnerable to changing climate. But this would be wrong! *E. editha's* extensive ecotypic variation in adult size, host preference and geotaxis, along with its ability to rapidly evolve adaptation to new habitats, predicts high resilience of the species to warming climate. Although several sub-species are already suffering, *E. editha* as a species has a good chance of outlasting human civilization.

11:40 End of Formal Papers
Posters - Lower Hall, Odd Fellows Lodge

Quantifying Moth Community Response to Fire in a California Chaparral System.

Andrew Overton
400 W. 1st Street Chico, CA, 95929. CSU, Chico

Anthropogenic change has led to an increase in global wildfire intensity in many areas of the world, and global climate models predict this trend to continue. Plant succession after fire is well documented, but there is a need to further study how animals respond to these changes in plant communities. In terrestrial habitats, lepidopterans (i.e. moths and butterflies) are studied as bioindicators of ecosystem health based on four criteria: (i) their well-defined taxonomy, (ii) the relative ease of surveying them, (iii) their wide distribution and host-plant specificity, and (iv) the concordance of lepidopteran diversity with that of other taxonomic groups. Further, the order Lepidoptera contains more plant-feeding species than any other taxa in North America. I am testing the hypothesis that changes in moth communities parallel those in plant communities following fire. To test this, I am utilizing ten 15W UV night collecting traps to collect moths on a 24-hectare (59 acre) area of chaparral affected by a 2017 wildfire and two reference sites on the Tuscan Formation at the Big Chico Creek Ecological Preserve. Preliminary data suggests a difference in species abundance and species richness between the sites.

Oviposition patterns and parasitism of the bog buckmoth (Saturniidae: *Hemileuca*), a rare inhabitant of New York peatlands.

Karen Sime.
Department of Biological Sciences, 392 Shineman Hall, SUNY Oswego, NY 13126

The bog buckmoth, known from ten fens around the Great Lakes, appears to be in decline, with several New York populations having disappeared in recent years. Our goals were to characterize the oviposition preferences of bog buckmoth with respect to plant choice and microhabitat, and to examine the impact of an egg parasitoid. The moths do not oviposit on Menyanthes, the larval food plant, but we found that they have distinct preferences, using sweet gale at one site and sedges and ferns at another. Parasitism averaged 25-30% regardless of buckmoth population density, suggesting that it contributes significantly to mortality but is not density dependent. There were no consistent relationships between parasitism and the height of eggs, cluster size, or plant species, but at one site, parasitized eggs were closer to Menyanthes than were non-parasitized eggs, suggesting a trade-off between susceptibility to parasitoids and distance to food plant.

Mating plug evolution in Acraeini butterflies (Nymphalidae).

Shannon Summers.
1000 SW 62nd Blvd Apt 1212, Wildlife Ecology and Conservation, Gainesville, FL 32607
Sarah E. Y. Troup.
505 SW 2nd Ave Apt 3202, Department of Biology, Gainesville, FL, 32601
Ana P. S. Carvalho

3215 Hull Road, Department of Entomology and Nematology, University of Florida, Gainesville, FL, 32611.

Akito Y. Kawahara
3215 Hull Road, Florida Museum of Natural History, University of Florida, Gainesville, FL, 32611.

The nymphalid tribe Acraeini is composed of about 300 species and have an interesting sexual behavior. Males produce mating plugs (sphragis) and transfer them to the female after the transferal of the spermatophore to prevent female remating. This trait is widespread in Acraeini (around 60% of the tribe are known sphragis-bearers) and these mating plugs have been proposed to be a tool for species-level identification. We aimed to investigate how many times the sphragis has evolved throughout the evolutionary history of Acraeini, using the most robustly supported and densely sampled phylogenetic study of the group thus far, in which molecular data is available for 53% of the tribe. Using a Bayesian framework, we have found that the sphragis has evolved only once in the tribe, but has been lost multiple times.

The host plant associations in the genus *Acraea* (Nymphalidae).

Sarah E. Y. Troup.
505 SW 2nd Ave Apt 3202, Department of Biology, Gainesville, FL, 32601
Shannon Summers.
1000 SW 62nd Blvd Apt 1212, Wildlife Ecology and Conservation, Gainesville, FL 32607.
Ana P. S. Carvalho.
3215 Hull Road, Department of Entomology and Nematology, University of Florida, Gainesville, FL, 32611
Akito Y. Kawahara.
3215 Hull Road, Florida Museum of Natural History, University of Florida, Gainesville, FL, 32611

The genus *Acraea* is composed of 287 species and is distributed in Africa, Southeast Asia, Oceania, and the Americas south of the United States. The relationship of

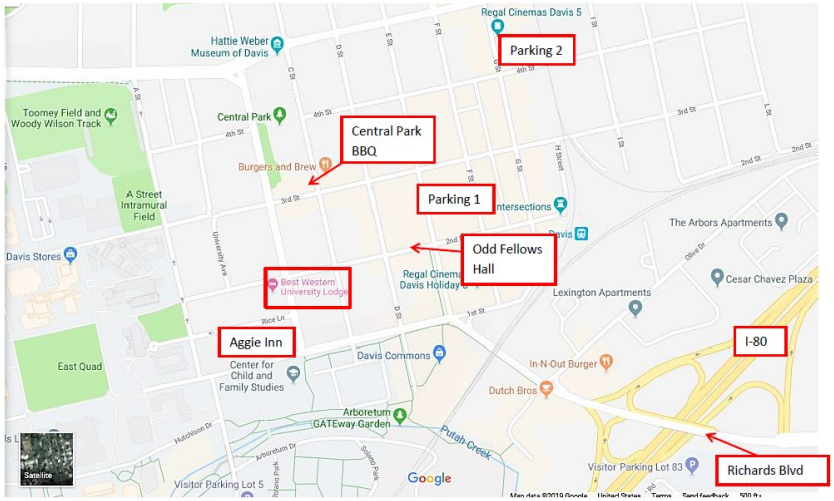
Acraea with their hostplants seems to be somewhat associated with their geographic distribution, as New World *Acraea* apparently only feed on plants of the order Asterales. In the present study, we perform an ancestral state reconstruction of host plant associations in the genus *Acraea*. We performed this analysis in Mesquite, using a Maximum Likelihood tree (IQ-TREE) generated using Anchored Hybrid Enrichment derived sequences and data available on GenBank. Trait data was collected from several literature sources. We confirmed dubious records using the Natural History Museum, London Lepidoptera host database 'HOST'. We have found that Malpighiales are likely to be the ancestral feeding condition of *Acraea,* and that there were two subsequent major shifts of host plant associations in *Acraea*.

Population Size in Response to Rainfall Intensity in the Baltimore Checkerspot Butterfly (*Euphydryas phaeton* Drury).

Tom Velat.
Forest Preserve District of DuPage County, 3 S. 580 Naperville Rd., Wheaton, IL. 60187 tvelat@dupageforest.org

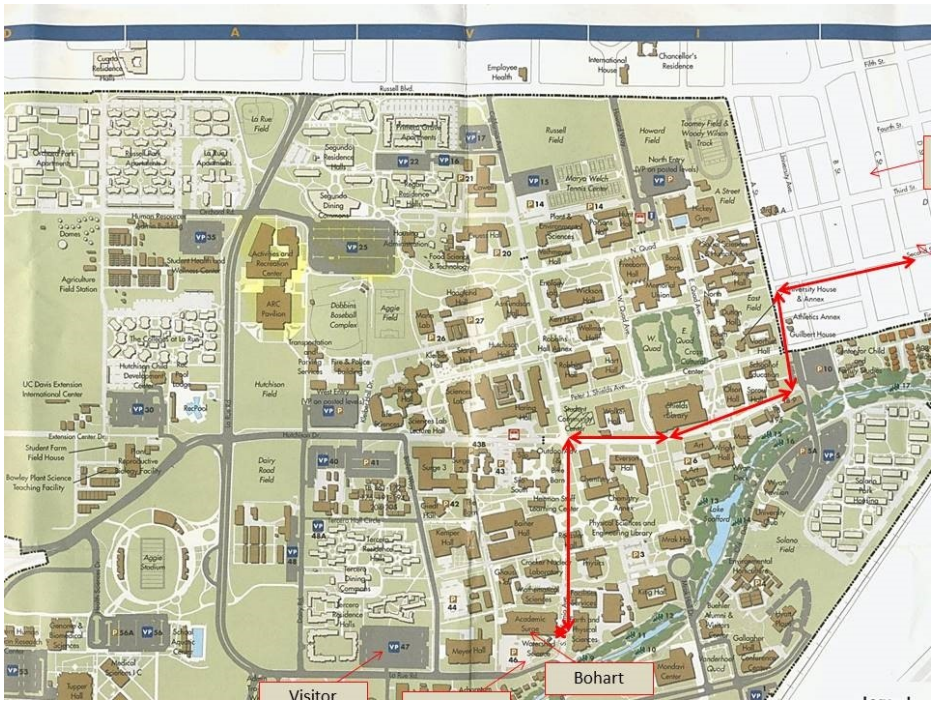
Increases in rainfall intensity in the U.S. over the past 50 years have been linked to greater water-holding capacity in the atmosphere due in part to climate change (Min et. al 2012). I examined the effects of rainfall intensity on population size of Baltimore Checkerspots using mark-recapture data from 2010 - 2017. I calculated rainfall intensity using hourly rainfall data from Midwest Regional Climate Center and a field-deployed rain gauge. I applied the POPAN extension in Program MARK to analyze mark-recapture data and explore differences in monthly rainfall intensity compared to population metrics. Both spring rainfall intensity and total spring rainfall showed negative correlations with population size during the same season. I recommend further study of rainfall intensity as a metric to guide management decisions for this species in the Midwestern U.S.

NOTES:



Odd Fellows Hall – 2nd between C & D
Parking 2 - 4th and G St. - $5 all day
Parking 1 – F between 2nd/3rd - $10 all day

Best Western Plus Palm Court – 3rd and D
Aggie Inn – 1st & B

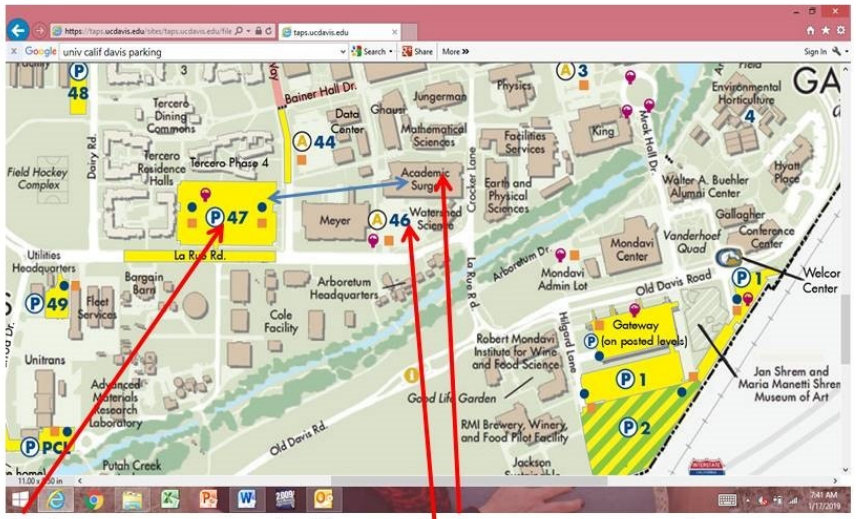


MAPS:

Page 40: Downtown Davis to the Bohart Museum, University of California, Davis

Page 41: Top Map, parking on the campus

Bottom Map, Freeway exits to Davis



Parking Lot 47 – visitors, $10/day, kiosk at lot entrance, accepts Visa and MasterCard – no cash
Pay required 7 AM to 5 PM weekdays

Bohart Museum – Academic Surge Bldg, 1st floor, room 1124
530-752-0493
Parking Lot 46 – with valid permit only 7 AM to 5 PM, Mon. – Fri.

Hwy 113 from Woodland and Sacramento Airport

I-80 east to Sacramento, west to San Francisco

"U.C. Davis" exit – north on Old Davis Rd, left at roundabout, Academic Surge straight ahead

Northern California Collecting Opportunities

California experiences the normal summer “drought” with no rainfall at all from mid-May to mid-October. This results in a lack of butterfly presence throughout the Central Valley, where Davis is located, as all vegetation dries. Butterflies and moths continue to be found in numbers only in the surrounding mountains – the Sierra Nevada range to the east and the Coast Ranges to the west. Potential sites tend to be a minimum of a 2-hour drive from Davis.

Factors that may limit northern California collecting in 2019 include:

- Record snow levels at all Sierra Nevada passes may last well into the summer
- Major wildfires in numerous locations destroyed widespread forest areas
- The Central Valley dries out with our normal summer “drought” from June to October, limiting potential collecting of butterflies
- Nearly all potential sites will be 1.5 to 3 hours from Davis, CA.

The best possibilities include lower to mid-level (up to 6,000 feet) sites in the Sierra Nevada, and Coast Ranges north of San Francisco. Here are suggested places to collect.

Sierra Nevada:

- Carson Pass – Highway 88 – north of the highway (Meiss Pass, Little Round Top), south of the Pass (Frog Lake, Winnemucca Lake, Round Top). Hike moderately strenuous. From Davis 2.5 hours.

Sonora Pass – normally excellent collecting at the pass as well as either side. Walking on east side of Pass moderately strenuous, hiking to west of Pass strenuous. Pass is right at 10,000 feet elevation. Prizes include *Oeneis chryxus stanislaus*, *Oeneis chryxus ivallda, Lycaena phlaeas shields, Chlosyne whitneyi, Neominois ridingsii pallidus*, numerous *Speyeria, Euphydryas.* From Davis 3.5 hours.

Yuba Pass – Highway 49 north of Auburn (I-80 from Davis to Auburn). Classic spots include Gold Lake and surrounding Lakes Basin, several miles east of Sierra City. Checkerspots (*editha*, *chalcedona, palla, hoffmanni*) and Fritillaries (*callippe, hydaspe*, *zerene, californica, mormonia, coronis, cybele, egleis*) numerous, many Lycaenids including *Callophrys johnsoni* and *spinetorum*. From Davis 3 hours.

Grouse Ridge Summit – Nevada County, north of Yuba Pass off Interstate 80. Fantastic alpine landscapes, many lakes, easily walkable. From Davis 1.5 hours.

Feather River Canyon – Hiway 70 between Oroville and Quincy. Easy walking. Prizes include *Oeneis nevadensis*. From Davis 1.5 hours.

Coast Ranges to the west of Davis:

Mendocino Pass, Mendocino National Forest – hiway 162 / FH7 from Grindstone Lookout to Round Valley. 2 hours west of willows off I-5. Forests of mixed hardwoods, pine, redwood. From Davis 3.5 hours. Prizes include *Oeneis nevadensis iduna*, several species of *Speyeria*, numerous Lycaenidae

68th Annual Meeting of
The Lepidopterists' Society

BOHART
Museum of Entomology
Davis, California
2019

Jeff Smith – Several years ago at age 9 and today