

Special Thanks to:



For sponsoring our Tuesday Evening Reception!
Drop by and see their booth in Room Summit C

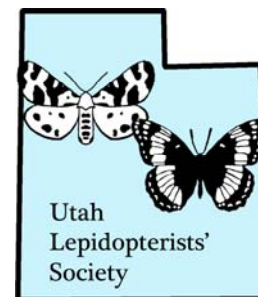


63rd Annual Meeting of The Lepidopterists' Society Park City, Utah • July 16-19, 2014 The Yarrow Resort Hotel and Conference Center



Uniting Amateurs and Professionals

Photo Courtesy John Crossley



Utah Butterfly Field Trips



Welcome to *Utah*!

The Utah Lepidopterists' Society and Utah Butterfly Field Trips welcomes you to Park City, Utah, for the 63rd Annual Meeting of The Lepidopterists' Society! We hope you enjoy your visit and can check out our diverse scenery and great mix of butterflies and moths.

Utah is home to 1,398 different species of moths (Joel M. Johnson checklist) and 248 different taxa of butterflies that fly in a variety of life zones from the Mojave Desert in Washington County and Basin and Range Province through the Colorado Plateau in the central part of our state to the Arctic Alpine habitat of the Uinta Mountains.

For a complete listing of all Utah butterflies (down to subspecies), along with general locations, GPS coordinates, life stage of availability, and distance from the Yarrow Hotel, please visit <http://bit.ly/1sWtTi7>. The JMJ checklist of Utah Moths, along with introduction, can be found at <http://bit.ly/1xbb6BQ>.

We really hope you enjoy the meeting and your stay!

Todd L. Stout--Meeting Chair



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Meeting Sponsors

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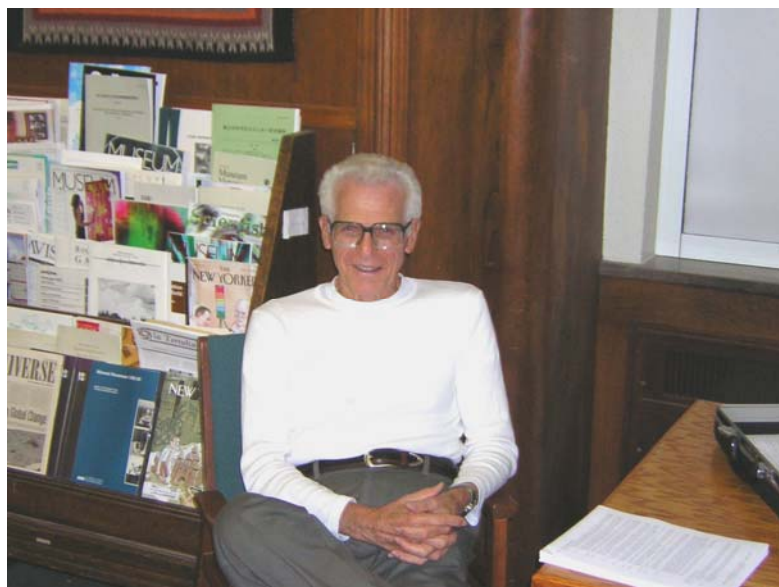


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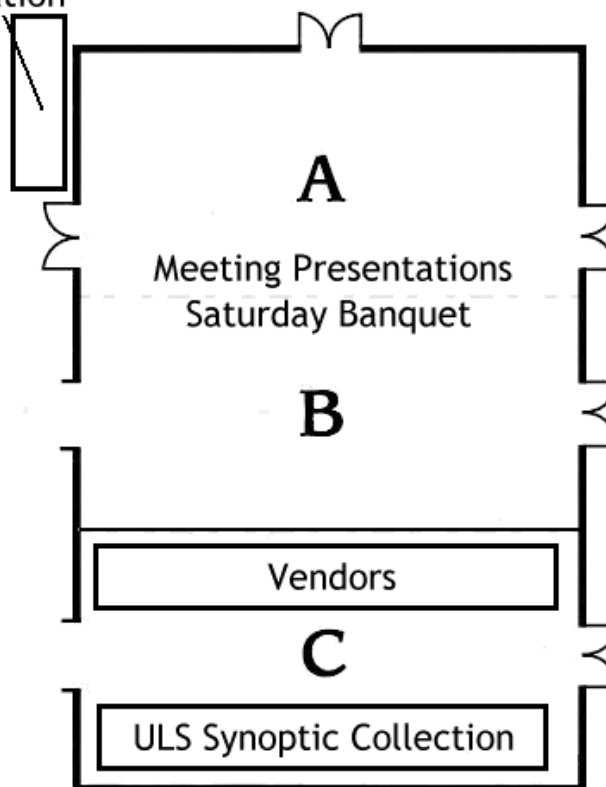
Utah Lepidopterists' Society Founder COL. Clyde F. Gillette



Lobby

SUMMIT BALLROOM

Registration
Area



Program and Local Arrangements

Meeting Chair, Local Arrangements, and Program: Todd Stout

Organizing Committee:
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Todd Gilligan
John Richards
Wayne Whaley
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Student Awards:

Charlie Covell

Door Prizes:

Charlie Covell

Meeting Photographers:

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Schedule Overview

Sunday, July 13, 2014

5:00 A.M. Collectors' Field Trip to Chipeta Lake (Lobby)
9:00 A.M. Photographers' Field Trip to Guardsman Pass (Lobby)

Monday, July 14, 2014

8:00 A.M. Collectors' Field Trip to Murdock Mountain (Lobby)
9:00 A.M. Photographers' Field Trip to Jordanelle Wetlands (Lobby)
8:00 P.M. Blacklighting Field Trip to Guardsman Pass (Lobby)

Tuesday, July 15, 2014

8:00 A.M. Collectors' Field Trip to Bountiful Peak (Lobby)
8:00 A.M. Photographers' Field Trip to Murdock Mountain (Lobby)
9:00 A.M. Executive Committee Mtg in Mountain View Room
1:00 P.M. to 4:00 P.M. Lep Sort Activity at the NHMU*
6:00 P.M. to 8:00 P.M. Welcome Reception in Summit AB
6:00 P.M. to 8:00 P.M. Registration Desk Open (Lobby)

Wednesday, July 16, 2014

8:00 A.M. to 1:00 P.M. Registration Desk Open (Hotel Lobby)
9:00 A.M. to 12:00 Noon Student Papers in Summit AB
12:00 Noon to 1:00 P.M. Lunch
1:00 P.M. to 4:00 P.M. Student/Contributed Papers in Summit AB
6:00 P.M. Blacklighting Field Trip to Payson Canyon (Lobby)

Thursday, July 17, 2014

8:00 A.M. to 1:00 P.M. Registration Desk Open (Hotel Lobby)
9:00 A.M. to 12:00 Noon Contributed Papers in Summit AB
12:00 Noon to 1:00 P.M. Lunch
12:10 P.M. to 1:20 P.M. Membership Comm. Mtg (Summit AB)

1:30 P.M. to 4:00 P.M. Contributed Papers in Summit AB
6:00 P.M. Mark Walker Presentation
6:30 P.M. Informal Show and Tell in Summit AB.

Friday, July 18, 2014

8:00 A.M. to 10:00 A.M. Registration Desk Open (Hotel Lobby)
9:00 A.M. to 12:00 Noon Contributed Papers in Summit AB
12:00 Noon to 1:00 P.M. Lunch
1:00 P.M. to 1:20 P.M. Group Photo Outside Hotel Lobby
1:30 P.M. to 4:10 P.M. Contributed Papers in Summit AB
5:20 P.M. Bus leaves for Barbecue at NHMU in Salt Lake City
6:30 P.M. to 8:30 P.M. Friday Evening Barbecue at NHMU
8:30 P.M. Bus leaves to return to hotel

Saturday, July 19, 2014

9:00 A.M. to 12:00 Noon Utah Lepidoptera Symposium in Summit AB
12:00 Noon to 1:00 P.M. Lunch
1:00 P.M. to 1:30 P.M. Utah Lepidoptera Symposium (Continued)
1:40 to 2:30 P.M. Contributed Papers in Summit AB
3:00 P.M. to 4:00 P.M. Annual Business Meeting
4:10 P.M. to 5:10 P.M. Pacific Slope Meeting in Ivers Room (Upstairs)
6:00 P.M. to 8:00 P.M. Banquet in Summit AB

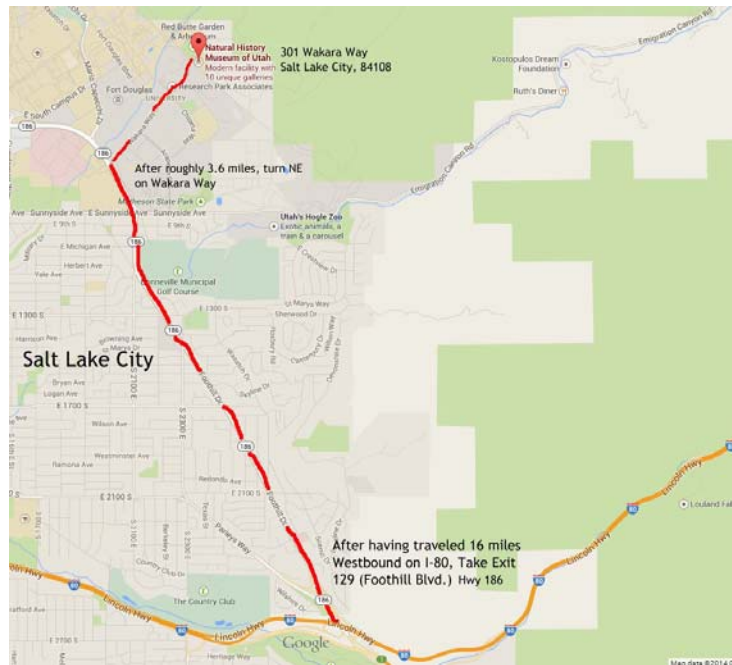
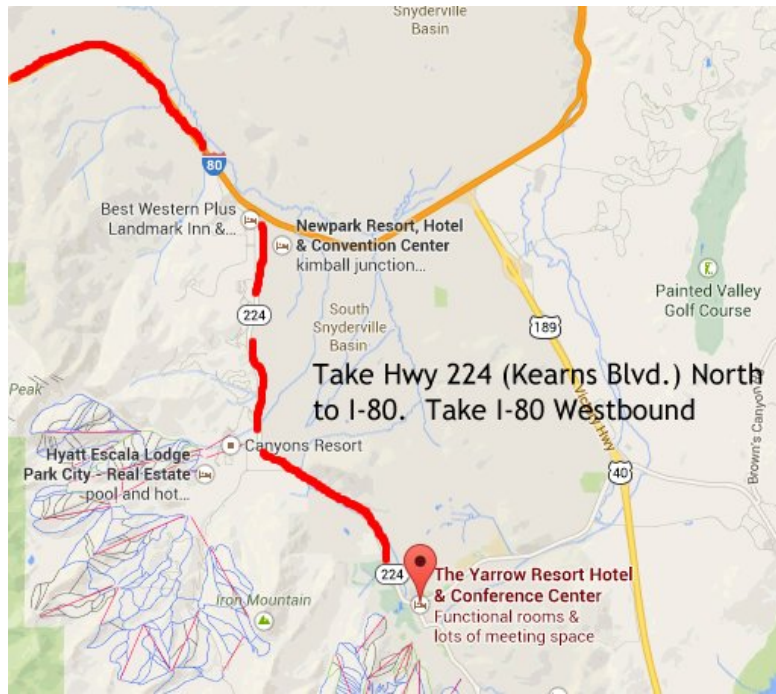
Sunday, July 20, 2014

5:30 A.M. Collectors' Field Trip to Otter Creek/Kooshareem
8:00 A.M. Photographers' Field Trip to Albion Basin

Monday, July 21, 2014

8:00 A.M. Collectors' Field Trip to Deep Creek Canyon

Directions to Friday Evening Barbecue



Schedule of Events

Tuesday, July 15, 2014

9:00 A.M. to 3:00 P.M. Executive Committee Meeting in Mountain View Room at the Yarrow Hotel

1:00 P.M. to 4:00 P.M. Lep Sort Activity at the Natural History Museum of Utah in Salt Lake City. Christy Bills is looking for volunteers to help organize drawers and unit trays. Please contact cbills@nhmu.utah.edu for information.

3:00 P.M. Vendors set up in Summit C. Vendors will be open for business Wednesday and Thursday, from 8AM to 5PM, Friday from 8AM to 6PM, and Saturday from 8AM to 2PM.

6:00 P.M. to 8:00 P.M. Welcome Reception in Summit AB. This event is sponsored by Bioquip. (Pick up free drink ticket at reg. desk.)

6:00 P.M. to 8:00 P.M. Registration Desk Open (Hotel Lobby). For those who would like to register for the meeting during the reception, you can pick up your Welcome Packet at that time.



Wednesday, July 16, 2014

STUDENT PAPERS

8:00 A.M. to 1:00 P.M. Registration Desk Open (Hotel Lobby)

9:00 A.M. to 9:15 A.M. Dale Halbritter "Insights to the allopatry of *Neophasia* (Pieridae)" --Abstract 01

9:20 A.M. to 9:35 A.M. Jasmine James, David James, Tanya James, and Rhiannon James "The Flight, Nectaring and Roosting Behavior of Leona's Little Blue Butterfly (*Philotiella leona*)" --Abstract 02

9:40 A.M. to 9:55 A.M. Rebecca Bennik "Battle of the sexes: Sexual conflict in the lichen tuft moths" --Abstract 03

10:00 A.M. to 10:15 A.M. Jade Badon "The Effects of Anthropogenic Land Use on the Distribution and Diversity of Butterflies in Negros Oriental, Philippines"--Abstract 04

10:15 A.M. to 10:30 A.M. Break

10:30 A.M. to 10:45 A.M. Julian Dupuis "Characterizing hybrids across the *Papilio machaon* group of swallowtail butterflies in North America"--Abstract 05

10:50 A.M. to 11:05 A.M. Erin Campbell "Silverspot Butterfly Species Delimitation"--Abstract 06

11:10 A.M. to 11:25 A.M. Sandra Schachat "Analysis of wing patterning in Micropterigidae: comparing multiple models of lepidopteran wing pattern evolution"--Abstract 07

11:30 A.M. to 11:45 A.M. Vincent Ficarrota "*Phyllocnistis citrella* pheromone traps attract a diversity of non-target species (Lepidoptera: Gracillariidae)"--Abstract 08

11:50 Noon to 1:00 P.M. Lunch

1:00 P.M. to 1:15 P.M. David Plotkin "Evolution of behavior and host preferences of gracillariid leaf miners"--Abstract 09

1:20 P.M. to 1:35 P.M. Minjia Zhong "A framework for characterizing wing shape and size in Lepidoptera using geometric morphometrics"--Abstract 10

1:40 P.M. to 1:55 P.M. Andersonn Prestes " The Hawaiian noctuids (Lepidoptera: Noctuidae): uncovering a unique fauna"--Abstract 11

2:00 P.M. to 2:15 P.M. Christi Jaeger, " Analysis of stain performance on Lepidoptera wings"--Abstract 50

****End of Student Papers****

2:15 P.M. to 2:30 P.M. Break

2:35 P.M. to 3:00 P.M. Diane Alston "Pheromone-Based Strategies for Management of Pestiferous Lepidoptera in Tree Fruit Orchards"--Abstract 12

3:05 P.M. to 3:30 P.M. Steve Cary "Post-Wildfire Butterflies of the Sacramento Mountains of South-Central New Mexico"--Abstract 13

3:35 P.M. to 4:05 P.M. Akito Kawahara "Phylogenomics provides strong evidence for the relationships of butterflies and moths" --Abstract 15

Thursday, July 17, 2014

8:00 A.M. to 1:00 P.M. Registration Desk Open (Hotel Lobby)

9:00 A.M. to 9:30 A.M. Carol Butler "Report on the XIX Annual meeting of the Canada/Mexico/United States Trilateral Committee for Wildlife and Ecosystem Conservation and Management, May 26-30, 2014, Queretaro, Mexico: The monarch butterfly initiative" --Abstract 16

9:35 A.M. to 9:50 A.M. Mark Clark "VHW Submarginal band width measurement using an accurate hand-held portable digital microscope may help identify *Speyeria callippe*"--Abstract 17

9:55 A.M. to 10:10 A.M. Charles V. Covell, Jr. "Three new species of *Idea* Treitschke from the southwest United States and northern Mexico (Geometridae, Sterrhinae)"--Abstract 18

10:15 A.M. to 10:30 A.M. Daniel Rubinoff "Evaluating two threatened butterflies across the Pacific"--Abstract 19

10:35 A.M. to 10:50 A.M. Break

10:50 A.M. to 11:05 A.M. Craig Rudolph "Diana and Great Spangled Fritillaries and prairie restoration in Arkansas"--Abstract 20

11:10 A.M. to 11:40 A.M. David James "Beauty with Benefits: Butterfly Conservation in Washington State, USA Wine Grape Vineyards" -- Abstract 21

11:45 A.M. to 12:00 Noon Thomas Simonsen "Virtual dissections: exploring micro-CT scanning as a method for non-destructive 'dissection' of valuable Lepidoptera material" --Abstract 22

12:00 Noon to 1:00 P.M. Lunch

12:10 Noon to 1:20 P.M. **Membership Committee Meeting** in Summit AB

1:30 P.M. to 2:00 P.M. Todd Gilligan "*Helicoverpa armigera* (Hübner) in the New World: Identification challenges and potential solutions" -- Abstract 23

2:05 P.M. to 2:20 P.M. Eric Metzler "A new species of the genus *Areniscythris* (Scythrididae), a recently discovered iconic species from White Sands National Monument" --Abstract 24

2:25 P.M. to 2:40 P.M. Vazrick Navari "Butterflies in Ancient Egypt" -- Abstract 25

2:45 P.M. to 3:00 P.M. Break

3:05 P.M. to 3:20 P.M. Brian Scholtens "Moth Survey of Congaree National Park" --Abstract 26

3:25 P.M. to 3:40 P.M. Alma Solis "The Pyraloidea collection at the National Museum of Natural History, Washington, DC"--Abstract 27

3:45 P.M. to 4:00 P.M. Giovanni Fagua "Phylogeny and divergence times of *Choristoneura* Lederer, 1859."--Abstract 28

6:00 P.M. Mark Walker, "Mining for Lepidoptera in Central Nevada" --Abstract 51

6:30 P.M. Informal Show and Tell in Summit AB. Bring your Flash Drives and share with us slides, photos, etc.

Did I say mention this is informal? :)

Friday, July 18, 2014

8:00 A.M. to 10:00 A.M. Registration Desk Open (Hotel Lobby)

9:00 A.M. to 9:30 A.M. David James "Incarcerated Citizen Science: Prisoners and Monarch Butterfly Migration Research in the Pacific Northwest"--Abstract 29

9:35 A.M. to 9:50 A.M. James Adams "*Dinumma deponens* (Erebidae: Scoliopteryginae) in the U.S.: the continuing saga" --Abstract 30

9:55 A.M. to 10:10 A.M. Leroy Koehn "Light Bulbs, Ethyl Acetate, Batteries, and Light Traps" --Abstract 31

10:15 A.M. to 10:30 A.M. Jim Reed "Klickidoptera: The Rewards and Challenges of Teaching High School Entomology" --Abstract 32

10:35 A.M. to 10:50 A.M. Break

10:50 A.M. to 11:20 A.M. Felix Sperling "Genotyping-by-sequencing to find adaptive traits in the jack pine budworm (Lepidoptera: Tortricidae)"--Abstract 33

11:25 A.M. to 11:40 A.M. Michael Toliver, "Natural History of Lake Eureka"--Abstract 34

11:45 A.M. to 12:00 Noon Alma Solis "A new species of *Diatraea* from midwestern United States"--Abstract 35

12:00 Noon to 1:00 P.M. Lunch

1:00 P.M. to 1:20 P.M. Group photo in parking lot on the south side parking area adjacent to hotel and Fresh Start Market.

1:30 P.M. to 1:45 P.M. Geoff Martin "iCollections project: the digitisation of the British & Irish Lepidoptera collection at the Natural History Museum, London."--Abstract 36

1:50 P.M. to 2:05 P.M. Alessandro Giusti "The Sphingidae collection and the types of North American Sphingidae at the Natural History Museum (NHM), London"--Abstract 37

2:10 P.M. to 2:25 P.M. Janet Chu "Seven Years' Butterfly Inventorying - Results from Boulder County Open Spaces, Colorado"--Abstract 38

2:30 P.M. to 2:45 P.M. Break

2:50 P.M. to 3:05 P.M. Rik Littlefield "Advances in Focus Stacking (Digital Photography)"--Abstract 39

3:10 P.M. to 3:40 P.M. Stephen Mason "The Lepidoptera Collection at the Academy of Natural Sciences (ANSP) of Drexel University: Don't forget about us!" --Abstract 40

3:40 P.M. to 4:10 P.M. Nick Grishin "COI DNA barcodes: a blessing with a curse"--Abstract 41

5:20 P.M. Bus leaves hotel for the Natural History Museum of Utah for the Friday Evening Barbecue

6:30 P.M. to 8:30 P.M. Friday Evening Barbecue at the Natural History Museum of Utah in Salt Lake City

8:30 P.M. to 8:45 P.M. Bus leaves Museum to return to hotel

Saturday, July 19, 2014

SYMPOSIUM ON UTAH LEPIDOPTERA and LEPIDOPTERISTS

9:00 A.M. to 9:30 A.M. Todd L. Stout "A review of five contact or near contact zones of the southwestern orangetip (*Anthocharis thooosa*) and the northern orangetip (*Anthocharis julia*) in Utah"--Abstract 42

9:35 A.M. to 10:05 A.M. Tony Jones "A Photographic Guide to Checkerspots of Utah"--Abstract 43

10:10 A.M. to 10:40 A.M. Ed Gage "Worm Farming 101--Basic techniques on rearing Butterflies in and outside of Utah"--Abstract 44

10:40 A.M. to 10:55 A.M. Break

11:00 A.M. to 11:30 A.M. Paul A. Opler "Lepidoptera of Grand Staircase - Escalante National Monument, Utah" --Abstract 45

11:35 A.M. to 12:00 Noon Wayne Whaley " Population biogeography of *Papilio indra* and its larval host plants in Utah and Beyond" -- Abstract 46

12:05 P.M. to 1:00 P.M. Lunch

1:00 P.M. to 1:30 P.M. Christy Bills "History of Lepidoptera and Lepidopterists in Utah" --Abstract 47

End of Symposium

1:35 P.M. to 1:50 P.M. Nick Grishin, "Molecules and morphology of Gaint-Skippers" --Abstract 48

1:55 P.M. to 2:10 P.M. Edd Barrows, "Herbivory of *Verbesina alternifolia* by *Phyciodes tharos* (Pearl Crescent, Nymphalidae)" -- Abstract 49

2:15 P.M. to 2:30 P.M. Jerry Powell "Seven years living with light brown apple moth -- current status at Berkeley, CA"--Abstract 14

2:35 P.M. to 2:55 P.M. Break

3:00 P.M. to 4:00 P.M. Business Meeting

4:10 P.M. to 5:10 P.M. Pacific Slope Meeting in Ivers Room (Upstairs)

6:00 P.M. to 9:00 P.M. Saturday Evening Banquet in Summit AB



Natural History Museum of Utah Entomology Collections Manager Christy Bills and 2014 Utah Lepidopterists' Society Vice President Sara Ryndfleisz

Abstracts

001 - Student Paper

Authors: Dale Halbritter and Jaret Daniels

Contact Information: Dale Halbritter (dhalb001@ufl.edu), University of Florida, 520 NW 52nd Terrace, Gainesville, FL, 32607

Presentation Time: Wednesday, July 16th, at 9:00 A.M.

Title: Insights to the allopatry of *Neophasia* (Pieridae)

Abstract: This study investigates the distributions of two allopatric North American butterflies: the pine white, *Neophasia menapia* and the Mexican pine white, *Neophasia terlooii*. Both species come in close proximity to each other in central Arizona. A preliminary phylogenetic analysis resolves most of the *N. terlooii* groups, but the *N. menapia* groups form a polytomy. This suggests dispersal is limited for *N. terlooii* in the isolated mountains of southeastern Arizona. The supercooling points of *N. menapia* and *N. terlooii* eggs were $-30.1^{\circ} \pm 2.2$ C and $-21.8^{\circ} \pm 2.8$ C, respectively. These differences appear to correlate with minimum winter temperature gradients across Arizona. Both species were palatable to birds, indicating they are not likely chemically defended. Mimicry in female *N. terlooii* may be an anti-predator adaptation.

002 - Student Paper

Author: Jasmine James, David James, Tanya James, and Rhiannon James

Contact Information: Jasmine James (david.james@wsu.edu)

Presentation Time: Wednesday, July 16th, at 9:20 A.M.

Title: The Flight, Nectaring and Roosting Behavior of Leona's Little Blue Butterfly. (*Philotiella leona*)

Abstract: The sole known metapopulation of Leona's Little Blue, *Philotiella leona*, in the Antelope Desert of Klamath County, Oregon was surveyed and studied during 2011-2013. Observations were made on adult behavior. The flight period extended from mid-June to mid-

late July or early August (35-47 days). Flight activity was meandering and low to the ground and mostly occurred after midday, as did mating and oviposition. Nectaring was observed on 9 plant species with *Eriogonum umbellatum* most favored. *Philotiella leona* spent much time roosting particularly before 1100 h despite sunshine and ambient temperatures of 10-20 °C. Most roosting occurred on the ground or on bare twigs of low-growing shrubs like *E. umbellatum* and *Purshia tridentata* (Pursh) (Bitterbrush). Ground roosters usually chose warm stones or small rocks in direct sunlight.

003 - Student Paper

Authors: Rebecca Bennik, Dr. Greg Holwell, Dr. Robert Hoare, and Dr. Thomas Buckley

Presentation Time: Wednesday, July 16th, at 9:40 A.M.

Contact Information: Rebecca Bennik (RMBennik@gmail.com), The University of Auckland, 1/29 Edenvale Crescent, Mount Eden Auckland, New Zealand, 1024.

Title: Battle of the sexes: Sexual conflict in the lichen tuft moths

Abstract: Recent comparative and experimental research has proposed sexual selection to be the most likely driver of rapid and divergent evolution of genitalia. One facet of such selection -sexual conflict- may drive genital evolution through opposing selection of male and female reproductive strategies as genital adaptations that allow males a competitive advantage may consequently reduce female fitness leading to an evolutionary arms race via sexually antagonistic co-evolution (SAC). Lichen tuft moths of the genus *Izatha* (Lepidoptera: Oecophoridae) are excellent candidates for exploring sexual conflict driving genital evolution, as some males have sclerotised phallic teeth that cause scarring and deciduous cornuti within the vesica wall which are ejected into the female reproductive tract during mating. Here I present a molecular, morphological and comparative phylogenetic analyses of the genus that provides insight into the evolution of these complex genitalic adaptations and coevolution of key male and female genital structures.

004 - Student Paper

Author: Jade Badon

Presentation Time: Wednesday, July 16th, at 10:00 A.M.

Contact Information: Jade Badon (jadebadon@ufl.edu), McGuire Center for Lepidoptera and Biodiversity, University of Florida, 2777 SW Archer Road, Gainesville, FL 32608

Title: The Effects of Anthropogenic Land Use on the Distribution and Diversity of Butterflies in Negros Oriental, Philippines

Abstract: It is important to have distributional records and diversity statuses for future butterfly conservation plans and assessments especially in Negros Oriental, Philippines. I did my survey and research for four months in the province documenting and gathering data on butterfly distribution. The results showed that generalist species dominated the altered landscapes while the specialist and territorial species were isolated in fragmented forested habitats along watershed areas. The result also showed significant difference on the diversity when the 16 areas were compared. The data can be used for future analysis on lepidopteran population biology especially those species that are in isolations.

005 - Student Paper

Authors: Julian Dupuis and Felix A. H. Sperling

Presentation Time: Wednesday, July 16th, at 10:30 A.M.

Contact Information: Julian Dupuis (jrdupuis@ualberta.ca), University of Alberta, 10948 70 Avenue, Edmonton, AB, CANADA T6H2G6

Title: Characterizing hybrids across the *Papilio machaon* group of swallowtail butterflies in North America

Abstract: The reticulate nature of hybridization violates the traditional assumption of tree-like evolution in phylogenetics. Despite this, hybrid systems offer unique opportunities to study the nature of species boundaries. Here we characterize phylogenetic relationships between members of the *Papilio machaon* species complex of swallowtail butterflies. Hybridization is common in this group, and

several recognized species and subspecies across North America are thought to be of hybrid origin. We focus on these hybrid lineages, and characterize them using mitochondrial and nuclear DNA sequences, microsatellite markers, and genome-wide single nucleotide polymorphisms generated with genotyping-by-sequencing. These data provide unprecedented resolution of the relationships in the *P. machaon* complex, and demonstrate the importance of hybridization in generating biodiversity.

006 Student Paper

Authors: Erin Campbell, Julian Dupuis (jrdupuis@ualberta.ca), and Felix Sperling (felix.sperling@ualberta.ca)

Presentation Time: Wednesday, July 16th, at 10:50 A.M.

Contact Information: Erin Campbell (eocampbe@ualberta.ca), University of Alberta, 602-9916 113 St NW, Edmonton, Alberta, CANADA, T5K 2N3

Title: Silverspot Butterfly Species Delimitation

Abstract: This study presents the first molecular look at the Alberta representatives of the butterfly genus *Speyeria* using the mitochondrial COI barcode region, and is also the first to employ Next-Gen genomic sequencing, SNP discovery and analysis, to this genus as a whole. Both mitochondrial DNA and genomic SNPs were used, and compared, in phylogeny reconstruction, and several morphological characters were scored and then mapped to the genetic clusters in an attempt to test the efficacy of these characters for use in field identification. These data were then used to address the placement of *Speyeria* within the Eurasian genus *Argynnis*, the delimitation of Alberta species, and a clarification of the relationships within the *S. atlantis*/*S. hesperis* complex.

007 Student Paper

Authors: Sandra Schachat and Richard Lee Brown

Presentation Time: Wednesday, July 16th, at 11:10 A.M.

Contact Information: Sandra Schachat (schachatsr@si.edu), Mississippi State University | Smithsonian Institution, Mississippi Entomological Museum, Mississippi State, Mississippi

Title: Analysis of wing patterning in Micropterigidae: comparing multiple models of lepidopteran wing pattern evolution

Abstract: Multiple models have been proposed to explain the relationship between wing venation and wing pattern in Lepidoptera, and some of these have also been hypothesized to apply to insects in other orders. However, these models, though developed for Microlepidoptera, have not yet been tested on the most basal moth families. Lemche's model (1935, 1937) relates fascia (transverse stripes) to the points where veins fork within the wing, whereas Brown and Powell's model (1991; modified by Baixeras in 2002) relates fascia to the points where veins meet the costa of the wing. The family Micropterigidae contains a genus, *Micropterix*, in which wing pattern varies considerably between species, but wing venation does not. The relationship between venation and fascia in *Micropterix* largely conforms to the Brown/Powell/Baixeras model. The groundplan visible in *Micropterix* provides a framework to analyze the wing patterns of additional micropterigid genera, and other basal Microlepidoptera, in future studies.

008 Student Paper

Authors: Vincent M. Ficarotta, Qianju Jia, Moneen Jones, Philip Stansly, Pilar Vanaclocha, and Akito Y. Kawahara

Presentation Time: Wednesday, July 16th, at 11:30 A.M.

Contact Information: Vincent Ficarotta (vficarotta@gmail.com), University of Florida, 614 SW 4th St, Gainesville, FL, 32601

Title: *Phyllocnistis citrella* pheromone traps attract a diversity of non-target species (Lepidoptera: Gracillariidae)

Abstract: The citrus leaf miner, *Phyllocnistis citrella*, is an exotic pest of citrus in Florida that is often monitored with pheromone lures. The commonly used lure, made from a 3:1 blend of (Z,Z,E)-7,11,13-hexadecatrienal and (Z,Z)-7,11-hexadecadienal (IT203 ISCA lure - Citrella), was designed to solely attract *P. citrella*. However, DNA barcoding of specimens taken from pheromone traps from four Florida localities indicates that additional species of *Phyllocnistis* are attracted to the lure. Approximately 12% of the barcoded *Phyllocnistis* specimens were identified as species other than *P. citrella*. While conducting this research, it was observed that leaf miner specimens stored in ethanol tended to yield higher quality DNA than specimens stored dry, corroborating prior results on DNA preservation of microlepidoptera.

009 Student Paper

Authors: David Plotkin and Akito Y. Kawahara (kawahara@flmnh.ufl.edu)

Presentation Time: Wednesday, July 16th, at 1:00 P.M.

Contact Information: David Plotkin (dplotkin@ufl.edu), University of Florida, McGuire Center for Lepidoptera and Biodiversity, 614 SW 4th St, Gainesville, FL, 32601

Title: Evolution of behavior and host preferences of gracillariid leaf miners

Abstract: Gracillariid leaf mining moths constitute a diverse family with nearly 2000 described species. The full extent of its diversity and evolutionary history is still unknown. Over a dozen eudicot families have been traditionally associated as hosts for gracillariids, and the leaf mining larvae have evolved multiple behaviors to avoid parasitism while feeding. In order to determine the evolutionary history of leaf miner behavior, an updated phylogeny was created by incorporating anchored hybrid enrichment (AHE) data (over 500 genes) from select gracillariid taxa into ML and Bayesian analyses. Behavioral character data were obtained from the literature and subsequently mapped onto the phylogeny. Results indicate that larval feeding behaviors are relatively conserved whereas host preferences

have undergone numerous shifts, with multiple instances of gracillariid species in different lineages independently evolving preferences for the same host family.

010 Student Paper

Presentation Time: Wednesday, July 16th, at 1:20 P.M.

Authors: Minjia Zhong, Geena Hill (geena.hill4@gmail.com) Juan Pablo Gomez (jugomez@ufl.edu) David Plotkins (plotkindelta@gmail.com) Jesse Barber (jessebarber@boisestate.edu) Akito Kawahara (kawahara@flmnh.ufl.edu)

Contact Information: Minjia Zhong (dplotkin@ufl.edu), University of Florida, McGuire Center for Lepidoptera and Biodiversity, 614 SW 4th St, Gainesville, FL, 32601

Title: A framework for characterizing wing shape and size in Lepidoptera using geometric morphometrics

Abstract: Geometric morphometrics is an effective tool for quantifying complex shapes of biological structures. During the past few decades, technological advances in software development have allowed geometric morphometrics to become increasingly more relevant to studies related to Lepidoptera. However, standards for these methods are often lacking, and researchers must learn the steps for quantification on their own. We provide a simple method from digitization to Principal Components Analysis and demonstrate how geometric morphometrics can be readily applied. We focus on the variation in hindwing shape in Saturniidae, a family of moths with some of the greatest variability in wing shape and size. We examine 75 species from 4 subfamilies and 8 tribes, each which group into one of five distinct clusters based on PCA results.

011 - Student Paper

Authors: Andersonn Prestes, and Daniel Rubinoff, (rubinoff@hawaii.edu)

Presentation Time: Wednesday, July 16th, at 1:40 P.M.

Contact Information: Andersonn Prestes (aprestes@hawaii.edu), University of Hawaii, 3050 Maile Way, Honolulu, HI, 92320

Title: The Hawaiian noctuids (Lepidoptera: Noctuidae): uncovering a unique fauna

Abstract: Noctuidae is the largest family of Lepidoptera on earth. The noctuid fauna of the Hawaiian archipelago is rich and unique, yet poorly known. Through an integrative approach, based mainly on multilocus molecular phylogenies, morphology and biogeography data, we review several unrelated lineages of endemic noctuids across the archipelago. *Haliophyle* is the most poorly known group, and we discovered at least seven new species. *Agrotis* has few new species with probably low dispersal abilities and restricted to extreme habitats. Many species have not been collected in sporadic surveys carried out in the past 10 years; therefore, they are in need of detailed study to determine their conservation status. The combined approach, using different lines of evidence in the assessment of biodiversity, proved to be very effective, and might be used in other rich but poorly known faunas.

012 -

Authors: Diane Alston and Marion Murray (marion.murray@usu.edu)

Presentation Time: Wednesday, July 16th, at 2:35 P.M.

Contact Information: Diane Alston (diane.alston@usu.edu), Utah State University, 5305 Old Main Hill, Department of Biology Logan, UT, 84322

Title: Pheromone-Based Strategies for Management of Pestiferous Lepidoptera in Tree Fruit Orchards

Abstract: Use of synthetic mimics of natural sex pheromones of pestiferous Lepidoptera has become a keystone strategy in tree fruit pest management around the world. Lowering population densities of codling moth, peach twig borer, greater peachtree borer, and other moth species with pheromone-based mating disruption has supported the surge in reduced-risk and organic-based pest management tactics in tree fruit orchards over the last 20-30 years. Tree fruit lepidopteran biology and ecology, and successes and challenges in pheromone-based strategies will be discussed.

013 -

Author: Steve Cary

Presentation Time: Wednesday, July 16th, at 3:05 P.M.

Contact Information: Steve Cary (sjcary@earthlink.net), 202 Solana Drive, Santa Fe, NM 87501

Title: Survey of tortricid moths and sawflies residing in managed and unmanaged tree fruit orchards

Abstract: The Scott Able Fire burned 16,000 acres of ponderosa pine and mixed conifer forest in the Sacramento Mountains of south-central New Mexico in May 2000. From June 2001 through September 2005, butterflies in the post-wildfire landscape were monitored monthly during warm seasons. Butterfly abundance exhibited no major differences between burned and unburned areas. Ten habitat generalist species occurred more frequently in burned areas while 16 woodland butterflies occurred less frequently in burned areas. Reflecting that compositional shift from a diverse late seral woodland assemblage to a less diverse early seral assemblage, butterfly species richness was slightly reduced at heavily burned sites compared to unburned sites. A small group of fire climax species is an important component of the local butterfly fauna.

014 -

Author: Jerry Powell

Presentation Time: Saturday, July 19th, at 2:15 P.M.

Contact Information: Jerry Powell (powellj@berkeley.edu), U. California Berkeley, 1101 VLSB, 4780, Berkeley, CA 94720

Title: Seven years living with light brown apple moth--current status at Berkeley, CA

Abstract: Light brown apple moth (LBAM), *Epiphyas postvittana*, a native of Australia, was discovered in North America at Berkeley, CA, in July 2006. From initial pheromone trapping, it was obvious, but not to the USDA, that eradication is impossible. I monitored adult LBAM at blacklight in Berkeley 277-323 nights annually. Its numbers rose slowly in 2007-08, enormously in 2009-20, and reached a stable

presence of ca. 62-66% of dampling dates during the past 4 years. Numbers of individuals declined from 5.1 to 2.7/sample date. Resident parasitoids may be contributing to suppression of LBAM. *Argyrotaenia franciscana*, a similar archipine tortricid (polyphagous, flying year around) also is attracted to my blacklight; its presence was low (23-20% of sample dates) for 20+ years preceding arrival of LBAM, then rose from 17-18% in 2007-08 and 25-39% through 2009-2013, inexplicably the reverse if there had been competitive displacement.

015

Authors: Akito Kawahara and Jesse W. Breinholt

Presentation Time: Wednesday, July 16th, at 3:35 P.M.

Contact Information: Akito Kawahara (kawahara@flmnh.ufl.edu), University of Florida, Florida Museum of Natural History, McGuire Center for Lepidoptera and Biodiversity, 3215 Hull Road, Powell Hall, Gainesville, FL, 32611.

Title: Phylogenomics provides strong evidence for the relationships of butterflies and moths

Abstract: Butterflies and moths constitute some of the most popular and charismatic insects. Lepidoptera include ~160,000 described species, many of which are important model organisms. Previous studies on the evolution of Lepidoptera did not confidently place butterflies, and many relationships among superfamilies in the megadiverse clade *Ditrysia* remain largely uncertain. We generated a molecular dataset with 46 taxa, combining 33 new transcriptomes with 13 available genomes, transcriptomes and ESTs. Using HaMStR with a Lepidoptera specific core-ortholog set of single copy loci, we identified 2,696 genes for inclusion into the phylogenomic analysis. Nucleotides and amino acids of the all-gene, all-taxon dataset yielded nearly identical, well-supported trees. Monophyly of butterflies (Papilionoidea) was strongly supported, and the group included skippers (Hesperiidae) and the enigmatic butterfly-moths (Hedylidae). Butterflies were placed sister to the remaining obtectomeran Lepidoptera, and the latter was grouped with $\geq 87\%$ bootstrap support. Establishing confident relationships among the four most diverse

macroheteroceran superfamilies was previously challenging, but we recovered 100% bootstrap support for the following relationships: ((Geometroidea, Noctuoidea), (Bombycoidea, Lasiocampoidea)). We present the first robust tree of Lepidoptera that strongly contradicts historical placement of butterflies, and provide an evolutionary framework for genomic, developmental, and ecological studies on this diverse insect order.

016

Author: Carol A. Butler

Presentation Time: Thursday, July 17th, at 9:00 A.M.

Contact Information: Carol A. Butler (cabutler1@verizon.net), American Museum of Natural History, 60 West 13th Street #2F, New York, NY, 10011

Title: Report on the XIX Annual meeting of the Canada/Mexico/United States Trilateral Committee for Wildlife and Ecosystem Conservation and Management, May 26-30, 2014, Queretaro, Mexico: The monarch butterfly initiative

Abstract: Report on the XIX Annual meeting of the Canada/Mexico/United States Trilateral Committee for Wildlife and Ecosystem Conservation and Management, May 26-30, 2014, Queretaro, Mexico: The monarch butterfly initiative. This meeting reviews and plans international projects for species of common concern, ecosystem conservation, migratory, birds, and law enforcement. Follow-up on the monarch initiative that was proposed to the leaders of the three countries in February, 2014 was added to the agenda. Relevant presentations and recommendations will be discussed.

017

Author: Mark Clark

Presentation Time: Thursday, July 17th, at 9:35 A.M.

Contact Information: Mark Clark (clarkmark@rocketmail.com), 1134 Orchard Rd., Lafayette, CA, 94549

Title: VHW Submarginal band width measurement using an accurate hand-held portable digital microscope may help identify *Speyeria callippe*

Abstract: Historically, phenotypic characters other than color have not been easily used to separate the members of the *Speyeria callippe* group of six western fritillaries. Using a portable smart phone mounted digital microscope, measurements of the VHW submarginal band width (between the silver or white spots) at cell M3 were made on 157 specimens from all six callippe-group species. ANOVA of the species' SMB width showed strongly unequal species means ($F=57.8$; $p=2.4 \times 10^{-33}$). Post-ANOVA multiple comparison testing strongly suggested that *Speyeria callippe* SMB width is significantly smaller than the other members of the group ($p < 0.00015$). Intra-species and inter-species comparisons where sex could be determined showed no significant differences in submarginal band width due to gender. A VHW submarginal band width of < 0.2 cm at M3 may be strong evidence that a western fritillary is *S. callippe*. Finally, measurements "in-the-net" using the Bodelin-smartphone system are possible, presenting another method of field identification in this difficult taxonomic group.

018

Author: Charles V. Covell, Jr.

Presentation Time: Thursday, July 17th, at 9:55 A.M.

Contact Information: Charles V. Covell, Jr. (covell@louisville.edu), McGuire Center for Lepidoptera & Biodiversity, 207 NE 9th Ave., Gainesville, FL, 32601-4378.

Title: Three new species of *Idaea* Treitschke from the southwest United States and northern Mexico (Geometridae, Sterrhinae)

Abstract: During revisionary studies of the North American Geometridae (Sterrhinae) three interesting new species of *Idaea* Treitschke were discovered, two of which are siblings of familiar western North American species. Characteristics and geographic information are given for each species.

019

Authors: Daniel Rubinoff, William Haines, and Akito Kawahara

Presentation Time: Thursday, July 17th, at 10:15 A.M.

Contact Information: Daniel Rubinoff (rubinoff@hawaii.edu), University of Hawaii, 310 Gilmore Hall, 3050 Maile Way, Dept. of PEPS Honolulu, HI, 96822.

Title: Evaluating two threatened butterflies across the Pacific

Abstract: There are few endemic butterflies in volcanic archipelagoes, but they are important and unique components of island biodiversity. The Kamehameha butterfly (*Vanessa tamehameha*) is one of only two endemic Hawaiian butterflies. Museum records and recent fieldwork suggest that it has suffered extensive declines in range and abundance over the past 20 years. The Mariana Eight-spot butterfly (*Hypolimnas octocula marianensis*) is endemic to the Mariana Archipelago, and is a candidate for listing under the USFWS ESA for some of the same reasons. We have begun population assessments of both species to determine the current status of both species across their ranges and surmise likely reasons for their decline. Results suggest that some basic management actions could be instrumental in assisting in the recovery of both species.

020

Authors: Craig Rudolph, William H. Baltosser, Josh B. Pierce, Richard R. Schaefer, J. Howard Williamson, Virginia R. Baltosser, and James Childress

Presentation Time: Thursday, July 17th, at 10:50 A.M.

Contact Information: Craig Rudolph (crudolph01@fs.fed.us), Southern Research Station, 506 Hayter Street, Nacogdoches, TX, 75965.

Title: Diana and Great Spangled Fritillaries and prairie restoration in Arkansas

Abstract: Diana and Great Spangled Fritillaries are present on restored prairies in central Arkansas. We applied insight gained from research in the Ouachita Mountains to address management questions relating

to fire regimes, fragmentation, small population size, and nectar/host plant availability. Data on population size, movement patterns, nectar resources, and host plant (*Viola*) distribution suggest that these *Speyeria* Fritillary populations are demographically viable in the current landscape. Several management actions to insure that this remains the case are suggested. Extensive use of prescribed fire should be continued to benefit both prairie restoration and improve habitat for *Speyeria*. Burn size should be optimized to allow prairie restoration to proceed efficiently while maintaining *Speyeria* meta-population structure. Finally, maintenance of ecotones to provide quality nectar resources should be implemented.

021

Authors: David James, Lorraine Seymour, Gerry Lauby, and Katie Buckley

Presentation Time: Thursday, July 17th, at 11:10 A.M.

Contact Information: David James (david_james@wsu.edu), Washington State University, IAREC, 24106 North Bunn Road, Prosser, WA, 99350.

Title: Beauty with Benefits: Butterfly Conservation in Washington State, USA Wine Grape Vineyards

Abstract: The butterfly fauna of central Washington is characterized by shrub-steppe specialists. However, this ecosystem is threatened due to agricultural development resulting in loss of habitat. Viticulture has transitioned to a sustainable, low pesticide-input enterprise in this region. Current research is focused on restoration of shrub-steppe habitat and native plants to enhance beneficial arthropod populations for pest control. Habitat-restored vineyards in addition to having greater populations of beneficial arthropods, also host an average of 4.8 butterfly species compared to 2.8 in conventional vineyards. Many of the flowering native perennials that attract and sustain biological control agents, are also larval hosts and/or nectar sources for shrub-steppe butterflies. Washington State grapegrowers are being encouraged to cultivate native plants with the twin aims of enhancing pest management and butterfly conservation.

022

Authors: Thomas Simonsen and Ian Kitching

Presentation Time: Thursday, July 17th, at 11:45 A.M.

Contact Information: Thomas Simonsen (t.simonsen@nhm.ac.uk), The Natural History Museum, Cromwell Road, London, UK, SW7 5BD.

Title: Virtual dissections: exploring micro-CT scanning as a method for non-destructive ‘dissection’ of valuable Lepidoptera material

Abstract: Morphological studies and documentation of characters are of singular importance in Lepidoptera taxonomy and systematics despite the increasing popularity and importance over the past decade of molecular methods such as DNA barcoding. In particular, genitalia dissections of type material are often crucial in revisionary taxonomic studies. However, type material is not always readily available as the institutions holding the material may be reluctant to send it on loan, and even more reluctant to allow such material to be dissected. Here we demonstrate how a standard micro-CT scanner in conjunction with freely available can be used to carry out highly detailed, non-destructive virtual dissections of Lepidoptera male genitalia. Furthermore, we propose a workflow by which data can be shared for analysis by workers across the world.

023

Authors: Todd Gilligan, Luke R. Tembrock (luke.country@yahoo.com); and Steven C. Passoa (Steven.C.Passoa@aphis.usda.gov)

Presentation Time: Thursday, July 17th, at 1:30 P.M.

Contact Information: Todd Gilligan (tgilliga@gmail.com), USDA-APHIS-PPQ-S&T, Identification Technology Program, 2301 Research Boulevard, Suite 108, Fort Collins, CO, 80526.

Title: *Helicoverpa armigera* (Hübner) in the New World: Identification challenges and potential solutions

Abstract: In early 2013, the Old World bollworm, *Helicoverpa armigera* (Hübner), was discovered in Brazil. This species has been described as “world’s worst agricultural insect pest,” and this is the first

record of its establishment in the New World. Larvae of *Helicoverpa* are the second most commonly intercepted taxa at U.S. ports of entry, and identification to species poses a significant problem because there are no consistent morphological characters that can be used to separate *H. armigera* larvae from those of the corn earworm (*H. zea*), which is extremely common throughout North America and ranges into Central and South America. Here we provide an overview of *H. armigera* larval morphology and detail initial testing to determine if it is possible to develop a real-time PCR (qPCR) assay to accurately and rapidly identify *H. armigera* larvae using molecular data.

024

Authors: Eric Metzler and David C. Lightfoot

Presentation Time: Thursday, July 17th, at 2:05 P.M.

Contact Information: Eric Metzler (metzler@msu.edu), Michigan State University P.O. Box 45, Alamogordo, NM, 88311.

Title: A new species of the genus *Areniscythis* (Scythrididae), a recently discovered iconic species from White Sands National Monument

Abstract: A small corner of White Sands National Monument, Otero County, New Mexico, is home to the largest concentration of endemic species of moths in North America. An iconic new species of Scythrididae is described from a series of specimens that were found active during the daytime on open bare sand of the white gypsum dunes at the Monument. Adults and genitalia of the male and female are illustrated, and the bionomy of the species is briefly discussed.

025

Authors: Vazrick Navari and Linda Evans (Linda.Evans@mq.edu.au)

Presentation Time: Thursday, July 17th, at 2:25 P.M.

Contact Information: Vazrick Navari (nvazrick@yahoo.com), 6 Stable Way, Ottawa, Ontario, Canada, K2M1A6.

Title: Butterflies in Ancient Egypt

Abstract: A review of depictions of butterflies in tomb scenes and other artifacts from pre-dynastic Egypt (3000 BCE) to the fall of the last kingdom (100 BCE) reveals a wide spectrum of stylistic changes over time.

026

Authors: Brian Scholtens, Joe Culin (jculin@exchange.clemson.edu); John Snyder (john.snyder@furman.edu) and Tom Smith (SmiTCB777@aol.com)

Presentation Time: Thursday, July 17th, at 3:05 P.M.

Contact Information: Brian Scholtens (scholtensb@cofc.edu), College of Charleston, 58 Coming St., Rm 214, Charleston, SC, 29424

Title: Moth Survey of Congaree National Park

Abstract: From October 2009 to September 2010, we sampled moths in Congaree NP one weekend per month. Each month we placed traps, ran a light sheet, and, during the winter months used bait to attract moths. We recorded individual data on about 11,000 moths including over 1000 species. For the Macrolepidoptera groups (those with the best sampling coverage), we averaged about 240 species per month from April through September, with slight peaks in species diversity in June and September. Microlepidoptera show the same trend, but our summer sampling of these groups was less intensive. Our species totals are comparable to those from the Dominick collection at the Wedge Plantation. We recorded 173 state records.

027 -

Author: Alma Solis

Presentation Time: Thursday, July 17th, at 3:25 P.M.

Contact Information: Alma Solis (alma.solis@ars.usda.gov), Systematic Entomology Lab., USDA, National Museum of Natural History, E-517, MRC 168, 10th & Constitution, Washington, DC 20013-7012

Title: The Pyraloidea collection at the National Museum of Natural History, Washington, DC

Abstract: Pyraloid moths are one of the largest groups of Lepidoptera and the Pyraloidea collection at the National Museum of Natural History, Smithsonian Institution, is one of the largest in the world. Many are pests to many crops and stored products, so the collection has been extensively supported by the US Department of Agriculture since the late 1800s. In 2005 it was counted and found to have over 350,000 specimens in the main collection, 2000 type specimens, 170,000 dissection slides, and 739 vial-filled jars of larvae and pupae. Since the 1980's Alma Solis, the curator, has maintained and upgraded the collection with volunteers, contractors and pyraloid specialists. A move in 2001, to more space and better cabinetry, greatly facilitated the ability to continue this effort. Now several projects are underway to digitize and mine the data associated with the specimens.

028

Authors: Giovanni Fagua and Felix Sperling
felix.sperling@ualberta.ca

Presentation Time: Thursday, July 17th, at 3:45 P.M.

Contact Information: Giovanni Fagua (faguagon@ualberta.ca), University of Alberta, 9947 Saskatchewan Drive, Apartment 1501 Edmonton, Alberta, CANADA, T6E 4R3

Title: Phylogeny and divergence times of *Choristoneura* Lederer, 1859

Abstract: *Choristoneura* is a genus of mainly Northern Hemisphere tortricid moths that is known for its pest species. Substantial research on the systematics, genomics and ecological characterization of the North American coniferophagous species, the spruce budworm complex, provides strong incentive to delimit its species and conduct a revision of the genus. Here, we posed two questions: 1) is *Choristoneura* a monophyletic genus?; and, within the genus, 2) what are the divergence times of the American coniferophagous species of *Choristoneura*? Data sets of DNA sequences for the COI gene were analyzed using maximum parsimony, maximum likelihood, and Bayesian phylogenetic analysis. Additionally, a coalescent analysis

based on mitochondrial sequences was performed to estimated times of divergence within the spruce budworm complex.

029

Authors: David James, Lorraine Seymour, and Tamara Russell

Presentation Time: Friday, July 18th, at 9:00 A.M.

Contact Information: David James (david_james@wsu.edu), Washington State University, IAREC, 24106 North Bunn Road, Prosser, WA, 99350.

Title: Incarcerated Citizen Science: Prisoners and Monarch Butterfly Migration Research in the Pacific Northwest

Abstract: Monarch butterfly migration in the Pacific Northwest (PNW) is poorly understood compared to the eastern US. Advances in our knowledge of PNW migration are hindered by small populations of monarchs and people to provide observations and to conduct tagging. In 2012 and 2013 we recruited inmates at Washington State Penitentiary to rear, tag and release monarchs derived from wild PNW populations. The exceptional rearing skills of these incarcerated citizens resulted in > 4000 tagged monarchs to date. A 0.5 % recovery rate was obtained in 2012 and provided evidence for migration to coastal California and circumstantial evidence for migration to Mexico. Mental health benefits to prisoners involved in the monarch migration program have been exceptional, providing positive outcomes for individuals and the Penitentiary.

030

Authors: James K. Adams and Peter Van Zandt

Presentation Time: Friday, July 18th, at 9:35 A.M.

Contact Information: James K. Adams (jadams@daltonstate.edu), Dalton State College, 346 Sunset Drive SE, Calhoun, GA, 30701.

Title: *Dinumma deponens* (Erebidae: Scoliopteryginae) in the U.S.: the continuing saga

Abstract: *Dinumma deponens* was first discovered in the U.S. in June of 2012, in very northern Georgia. In July of that same year a

specimen was also taken in the Birmingham, Alabama area. Since that time, it has been taken in five states total (Georgia, Alabama, Tennessee, North and South Carolina), and in virtually every warm month in the southeast (February, and April through September). The larvae of this moth feed on *Albizia* (*Mimosa*) and the moth may therefore spread through much of the southeast. Here we report on the records so far and comment on the possible number of broods.

031

Author: Leroy Koehn

Presentation Time: Friday, July 18th, at 9:55 A.M.

Contact Information: Leroy Koehn (Leptraps@aol.com), 3000 Fairway Court, Georgetown, KY, 40324.

Title: Light Bulbs, Ethyl Acetate, Batteries, and Light Traps

Abstract: Light Traps: When to change light bulbs, how to handle Ethyl Acetate, managing and charging batteries and maintaining your light traps. And how to do it while traveling.

032

Author: Jim Reed

Presentation Time: Friday, July 18th, at 10:15 A.M.

Contact Information: Jim Reed (jrrstud@gmail.com), Klickitat High School, P.O. Box 166, Klickitat, WA, 98628.

Title: Klickidoptera: The Rewards and Challenges of Teaching High School Entomology

Abstract: We all agree that we need to see more lepidopterists both amateur and professional out in the field, especially young people. At Klickitat High School, in tiny Klickitat, WA, I have been teaching HS Entomology classes for the last six years. It has been challenging yet very rewarding and certainly educational for the instructor! In this 15 minute presentation, I will outline some of the procedures we use to run a successful program that is unique (at least in our area) and has been a source of pride for our school and community.

033

Authors: Felix Sperling, Heather Leibel, and Bryan Brunet

Presentation Time: Friday, July 18th, at 10:50 A.M.

Contact Information: Felix Sperling (felix.sperling@ualberta.ca), University of Alberta, Department of Biological Sciences, Edmonton, Alberta, CANADA, T6G 2E9

Title: Genotyping-by-sequencing to find adaptive traits in the jack pine budworm (Lepidoptera: Tortricidae)

Abstract: The jack pine budworm (*Choristoneura pinus*) defoliates jack pine trees in Canada and is a member of the destructive spruce budworm complex. We searched for genetic characters that reliably distinguish the jack pine budworm from related species, using a genotyping-by-sequencing method that sampled about a hundredth of their 500 million base pair genome. We characterized over 100,000 single nucleotide polymorphisms (SNPs), almost 1000 of which were fixed with an allele found only in jack pine budworm. We have some idea of what genes 278 of these SNPs might be part of. The exciting new world of genomics has given us a window into the adaptive soul of these moths, and now we are trying to understand what this deluge of information is telling us.

034

Author: Michael Toliver

Presentation Time: Friday, July 18th, at 11:25 A.M.

Contact Information: Michael Toliver (miketol@eureka.edu), Eureka College, 300 E. College, Dept. of Biology, Eureka, IL, 61530

Title: Natural History of Lake Eureka

Abstract: In 1999, Peg Toliver and I developed the Natural History of Lake Eureka web site

(<http://ww1.eureka.edu/emp/toliver/Natural%20History/index.html>)

with sponsorship from the Illinois Department of Natural Resources, the City of Eureka, the Eureka Public Library and Eureka College. The purpose of the site was to encourage local residents to value our local resources. The response has been mixed; the City put a frisbee golf

course through the middle of the forest, but local and national users have consistently come to the site to obtain information on critters they've observed. Perhaps the internet can encourage the outernet.

035

Author: Alma Solis

Presentation Time: Friday, July 18th, at 11:45 A.M.

Contact Information: Alma Solis (alma.solis@ars.usda.gov), Systematic Entomology Lab., USDA, National Museum of Natural History, E-517, MRC 168, 10th & Constitution, Washington, DC 20013-7012

Title: A new species of *Diatraea* from midwestern United States

Abstract: *Diatraea* species are grass borers that are distributed in the Western Hemisphere. They feed on major crops such as sugarcane, sorghum, corn, rice, and minor grasses that are being investigated for conservation and biofuel potential such as gama grass. Identification of adult *Diatraea* specimens is notoriously difficult, i.e. they all look alike, and the genitalia must be dissected. Morphological and molecular characters support a cryptic, new species, previously thought to be *D. crambidoides* (Grote), feeding on eastern gama grass.

036

Author: Geoff Martin

Presentation Time: Friday, July 18th, at 1:30 P.M.

Contact Information: Geoff Martin (g.martin@nhm.ac.uk), The Natural History Museum, Cromwell Road, LONDON, UK, SW7 5BD

Title: iCollections project: the digitisation of the British & Irish Lepidoptera collection at the Natural History Museum, London

Abstract: The Natural History Museum, London is committed to digitising 20 million specimens by 2019. The British and Irish collection of Lepidoptera contains around 500,000 specimens spanning 200 years of collecting. This collection was chosen as a pilot project for the digitisation of the museum's collections. The project started in January 2013 and is expected to take three years to

complete. The talk will go through the digitisation process highlighting the many issues and show the results so far including research and curation benefits. The unlocking of these data will be of enormous benefit to those interested in the British and Irish Lepidoptera, will be accessible to all on the museum's data portal (late 2014) and will set the standard for future museum digitisation projects.

from the midwestern United States.

037

Author: Alessandro Giusti

Presentation Time: Friday, July 18th, at 1:50 P.M.

Contact Information: Alessandro Giusti (a.giusti@nhm.ac.uk), The Natural History Museum, Cromwell Road, LONDON, UK, SW7 5BD

Title: The Sphingidae collection and the types of North American Sphingidae at the Natural History Museum (NHM), London

Abstract: The NHM collection of Sphingidae presently holds 113000 pinned specimens making it one of the most important collections of this moth family in the world. Before August 2008 the NHM's collection of Sphingidae contained ca. 60000 pinned specimens. Then, the NHM was able to acquire one of the largest private collections of Sphingidae, the Jean-Marie Cadiou collection. The Cadiou collection, which contains a total of 53000 pinned specimens, has provided modern material that was lacking in our collection. This talk will give a brief overview of both the original NHM and the Cadiou sphingid collections, explaining how the current re-housing of this important collection is taking place. Furthermore, I will also present some of the type specimens of North American sphingids housed in the NHM's collection.

038

Author: Janet Chu

Presentation Time: Friday, July 18th, at 2:15 P.M.

Contact Information: Janet Chu (chuhouse@hotmail.com), Colorado State University, 964 Ravenwood Road, Boulder, CO, 80303

Title: Seven Years' Butterfly Inventorying - Results from Boulder County Open Spaces, Colorado

Abstract: There has been considerable collecting of butterflies historically in Boulder County, and a few recent studies, however, there had been no survey of the butterfly species on the present Open Space lands. This study proceeded to inventory the species within seven varying habitats. The unit of measure in our study is the number of Individual Butterflies per Research Hour recorded in the field (I/RH). In five areas the average number of Individual Butterflies per Research Hour (I/RH) was lower in 2013, when compared with the seven year period. The seven-year average was 36 I/RH. The higher averages of I/RH were measured during 2007, 2008, 2009, and 2012; lower in 2010, 2011 and 2013.

039

Author: Rik Littlefield

Presentation Time: Friday, July 18th, at 2:50 P.M.

Contact Information: Ric Littlefield (support@zerenesystems.com), Zerene Systems, 629 Cherrywood Loop, Richland, WA, 99354

Title: Advances in Focus Stacking (Digital Photography)

Abstract: Focus stacking is a digital photography technique that allows making sharp images with large depth of field even with very small subjects. Focus stacking has been practical using personal equipment for the last 10 years or so, but the range of possibilities continues to expand as new products and methods are developed. This talk will review an assortment of tools that have become available in the last few years, including wireless camera control, microscope objectives used as closeup lenses, and several methods for automated shooting.

040

Authors: Stephen Mason and Jon K Gelhaus (Gelhaus@ansp.org)

Presentation Time: Friday, July 18th, at 3:10 P.M.

Contact Information: Stephen Mason (Mason@ansp.org), Academy of Natural Sciences, 1900 Benjamin Franklin Parkway, Philadelphia, PA, 19103

Title: The Lepidoptera Collection at the Academy of Natural Sciences (ANSP) of Drexel University: Don't forget about us!

Abstract: The Entomology Collection at the Academy of Natural Sciences includes several million insect specimens and over 110,000 species. During the last three years, a species level inventory, funded by the Institute of Museums and Library Services (IMLS), has created a master index of all species in the collection now searchable online: <http://symbiont.ansp.org/entomology>. Through this project, we have been able to document the 120,000 curated Lepidoptera specimens, including some of the oldest North American Lepidoptera (early 19th century) in the Type and Titian Ramsey Peale collections, the substantial microlepidoptera collections of Annette Braun, James Brackenridge Clemens, and Emlen Darlington, and current research collections such as from Mongolia. The process of the IMLS project along with further results for the Lepidoptera will be presented.

041

Authors: Nick Grishin and Qian Cong, congqian1986@gmail.com

Presentation Time: Friday, July 18th, at 3:40 P.M.

Contact Information: Nick Grishin (grishin@chop.swmed.edu), HHMI / UT Southwestern, 5323 Harry Hines Blvd., Dallas, TX, 75390-9050

Title: COI DNA barcodes: a blessing with a curse

Abstract: The 654-base-pair mitochondrial DNA sequence of the C-terminal region of the cytochrome c oxidase subunit 1 (COI) gene, termed "DNA barcode", is a genetic marker useful for species identification and discovery. A growing database of DNA barcodes currently includes 150,000 animal species. DNA barcodes may suggest

undescribed cryptic species, which could be difficult to identify without DNA sequences. Several examples of barcodes in butterflies being very instructive of species boundaries and flawlessly correlating with morphological evidence will be discussed. However, in some cases, naive analysis of COI data may lead to erroneous conclusions due to a number of factors. Suggestions to avoid such pitfalls will be given.

042

Authors: Todd L. Stout and Nick Grishin

Presentation Time: Saturday, July 19th, at 9:00 A.M.

Contact Information: Todd L. Stout (todd@raisingbutterflies.org), Utah Lepidopterists' Society, 1456 North General Drive, Salt Lake City, Utah 84116

Title: A review of five contact or near contact zones of the southwestern orangetip (*Anthocharis thoosa*) and the northern orangetip (*Anthocharis julia*) in Utah

Abstract: Although the general distribution, adult morphology, habitat, larval coloration, pupal cone shape, and barcodes of *Anthocharis julia* and *Anthocharis thoosa* differ throughout their respective North American ranges (including Utah), there are narrow zones of contact or near contact within the state in the Raft River Range (Box Elder County), Wasatch Range (Juab County), Stansbury Range (Tooele County), Huntington Canyon (Emery County), and Book Cliffs region (Carbon County) where there is some degree of gene exchange between these two species.

043

Author: Tony Jones

Presentation Time: Saturday, July 19th, at 9:35 A.M.

Contact Information: Tony Jones (tgj@icw.com), Utah Lepidopterists' Society, 817 North Fox Hunter Drive, Farmington, Utah, 84025

Title: A Photographic Guide to Checkerspots of Utah

Abstract: Utah has a nice variety of Checkerspots within its borders. Checkerspots of the genera *Chlosyne*, *Euphydryas*, and *Poladryas* can be difficult to identify in the field and especially hard when only a photo is present. Photography adds an additional element of difficulty because there is a lack of size comparison and the angle of the photo can hide diagnostic field marks. This presentation shows some of the key field marks of Checkerspots in Utah from a photographic perspective. Finding key identification marks in your photos for both adults and immatures can help identify them down to the subspecies level. We will explore each taxa and review key identification tips as well as enjoy the great beauty of Checkerspots in Utah. In addition, we will review the life history of Utah's Checkerspots as well as tips on when and where to find them.

044

Authors: Ed Gage and Randy Gage

Presentation Time: Saturday, July 19th, at 10:10 A.M.

Contact Information: Ed Gage (edvgage@wildblue.net), Natural History Museum of Utah, P.O Box 742, Tooele, UT, 84074

Title: Worm Farming 101--Basic Techniques on Rearing Butterflies in and outside of Utah

Abstract: This is a discussion of how to raise butterflies and moths. It includes finding the species and enticing the female to lay eggs. Then, once the eggs are obtained in nature or getting the female to lay them, what next? A step by step procedure of just one way the process can be completed with a series of illustrations and a lot of luck. This discussion focuses on many hard to get species and hopefully will help others to obtain the best specimens possible for their collection and further research.

045

Authors: Paul A. Opler and Dave Wikle

Presentation Time: Saturday, July 19th, at 11:00 A.M.

Contact Information: Paul A. Opler (paulopler@comcast.net), C.P. Gillette Museum, P.O. Box 2227, Loveland, CO, 80539.

Title: Lepidoptera of Grand Staircase - Escalante National Monument, Utah

Abstract: This national monument includes some of the last lands to be settled in the West and includes some of the more rugged beautiful elements found in western national parklands. A survey of the Lepidoptera of the Grand Staircase - Escalante National Monument by the authors has been underway since 2012. In 2000-2001, many Lepidoptera were collected as part of a larger insect survey by students at Brigham Young University. The Lep fauna is estimated at slightly in excess of 1000 species based on a tentative list of 70 butterfly species. The fauna is representative of that for the Colorado Plateau but includes elements from the Mojave Desert region, northern Arizona species, intermountain west, and a few introduced.

046

Author: Wayne Whaley

Presentation Time: Saturday, July 19th, at 11:35 A.M.

Contact Information: Wayne Whaley (wwhaley@uvu.edu), Utah Valley University, 800 West University Parkway, Orem, Utah, 84058

Title: Population biogeography of *Papilio indra* and its larval host plants in Utah and Beyond

Abstract: *Papilio indra*, a species that is generally considered a desert adapted organism, inhabits a broad region of Utah and western North America from the warm southwestern regions to the cool atmosphere of montane habitats of northwestern U.S., including very limited distribution in extreme southern British Columbia, Canada. This presentation will illustrate its larval host plants along with their distributions by state. Different habitat types will be illustrated. All of the currently described subspecies will be presented along with their presently known ranges.

047

Authors: Christy Bills and Col. Clyde F. Gillette

Presentation Time: Saturday, July 19th, at 1:00 P.M.

Contact Information: Christy Bills (cbills@nhmu.utah.edu), Natural History Museum of Utah, 301 Wakara Way, Salt Lake City, UT 84108.

Title: History of Lepidoptera and Lepidopterists in Utah

Abstract: Utah has a rich history of lepidopterists who have contributed towards the science in our state. This presentation will review the contributions of John W. Sugden, G. Wesley Browning, Thomas U. Spalding as well as significant contributions of COL. Clyde F. Gillette, Jacque A. Wolfe, Joel M. Johnson, and current lepidopterists who have made an impact on the study and science of lepidoptera in Utah.

048

Authors: Nick Grishin, Qian Cong, Dominika Borek, and Zbyszek Otwinowski

Presentation Time: Saturday, July 19th, at 1:35 P.M.

Contact Information: Nick Grishin (grishin@chop.swmed.edu), HHMI / UT Southwestern, 5323 Harry Hines Blvd., Dallas, TX, 75390-9050

Title: Molecules and morphology of Giant-Skippers

Abstract: Giant-skipper (Hesperiidae, Megathymini) are a highly specialized group of Grass-Skipper (Hesperiinae) confined solely to the North American continent, from Canada to Costa Rica. Their unusual butterfly lifestyles (root and stem borers and leaf-miners as caterpillars, not feeding as adults) and appearance (*Castnia*-like, large size, small head) offer many biological, ecological, and evolutionary puzzles. All this information is encoded in 400 million letters of their DNA. Preliminary analysis of correlation between morphology, localities, and DNA sequences will be discussed and questions posed for future research.

049

Author: Edd Barrows

Presentation Time: Saturday, July 19th, at 1:55 P.M.

Contact Information: Edd Barrows (barrowse@georgetown.edu), Georgetown University, Department of Biology, Center for the Environment, Box 571229, Washington, D.C., 20057-1229

Title: Herbivory of *Verbesina alternifolia* by *Phyciodes tharos* (Pearl Crescent, Nymphalidae)

Abstract: *Phyciodes tharos*, a small, ornate butterfly, occurs in North America from Canada through Mexico, where it can be abundant in parts of its range. Reported larval food plants of this butterfly include many species of asters and *Verbesina helianthoides* (Asteraceae). This study reports that *P. tharos* larvae also consume *Verbesina alternifolia* leaves. A group of 51 larvae occurred on a patch of *V. alternifolia* in Maryland, USA, in August 2012. I collected the larvae and caged them with ad libitum fresh *V. alternifolia* leaves. Forty-six of the larvae developed into 20 normal-looking, adult females and 26 such adult males, a sex ratio that did not significantly differ from 1:1. The other five *P. tharos* died as either larvae or pupae. Shoots of *V. alternifolia* with marked *P. tharos* leaf damage produced new leaves and flowered in September 2012. At least five other insect species, including *Celastris neglecta* (Summer Azure, Lycaenidae), also consumed *V. alternifolia* in the study site. Although I examined this focal patch of *V. alternifolia* from 1993–2014, I found *P. tharos* feeding on its leaves only in 2012.

050

Author: Christi Jaeger

Presentation Time: Wednesday, July 16th, at 2:00 P.M.

Contact Information: Christi Jaeger (christi@ualberta.ca), Mississippi Entomological Museum, 100 Old Highway 12, Clay Lyle Entomology Building, Starkville, MS, 39762

Title: Analysis of stain performance on Lepidoptera wings

Abstract: A well-stained dissection is invaluable when preserving Lepidoptera genitalia or whole body mounts. Any specimen which considerable time and labor has been expended is worth preparing in such a manner that it retains utility beyond a few months or years. A perfect dissection can easily be ruined if it isn't visible due to improper staining. Understanding basic histological techniques is essential for the display of insect tissue; mounting media turns colour as it ages, staining can fade, and an over-stained sample can distort what we see. I explored the effectiveness of several commonly used stains, including Eosin Y, Acid Fuchsin, Orange G, Chlorazol Black, Safranin, Mercurochrome, and Rose Bengal. Additionally, amount of time required for staining was investigated. Ultimately, preliminary results showed that acidified Eosin Y and Mercurochrome were most effective and stained in the least amount of time, 30 minutes.

051

Author: Mark Walker

Contact Information: Mark Walker (mwalker@ureason.com)

Title: Mining for Lepidoptera in Central Nevada

Abstract: After a long and quiet winter, the valleys, peaks, and high deserts of the Great Basin begin warming, triggering an awakening of life and activity that, except for the persistent prospector, can easily go unnoticed. Most visitors of the Great Basin region find a straight highway and high tail it to the nearest watering hole (or casino). Unfortunately, such visitors will miss the real treasures of the Great Basin. Recently, the author enjoyed a two day Memorial Day Weekend adventure exploring old mining towns and studying the butterflies of the Toiyabe Range of Nevada's Toiyabe National Forest. The trip included an unexpected explosion of *Euphydryas*, along with an assortment of other fine Great Basin Lepidopteran gems.

052 Saturday Banquet

Author: Andrew Warren

Contact Information: Andrew Warren (hesperioidea@yahoo.com)
McGuire Center for Lepidoptera and Biodiversity, Florida Museum of Natural History, University of Florida, PO Box 112710, Gainesville, FL, 32611-2710

Title: Online Mentorship and the 21st Century Lepidopterist

Abstract: Challenges to the science of lepidopterology in the 21st Century are identified and discussed, considering how methods of communication and dissemination of information have changed in the digital age. Our community and science can benefit from these challenges, but will have to invest more resources into outreach and mentorship than in the past. Lepidopterists are encouraged to expand their mentorship activities to include social media, in order to tap into the huge reservoir of butterfly, moth, and nature lovers, eager to learn about and contribute to science, especially the younger generations.

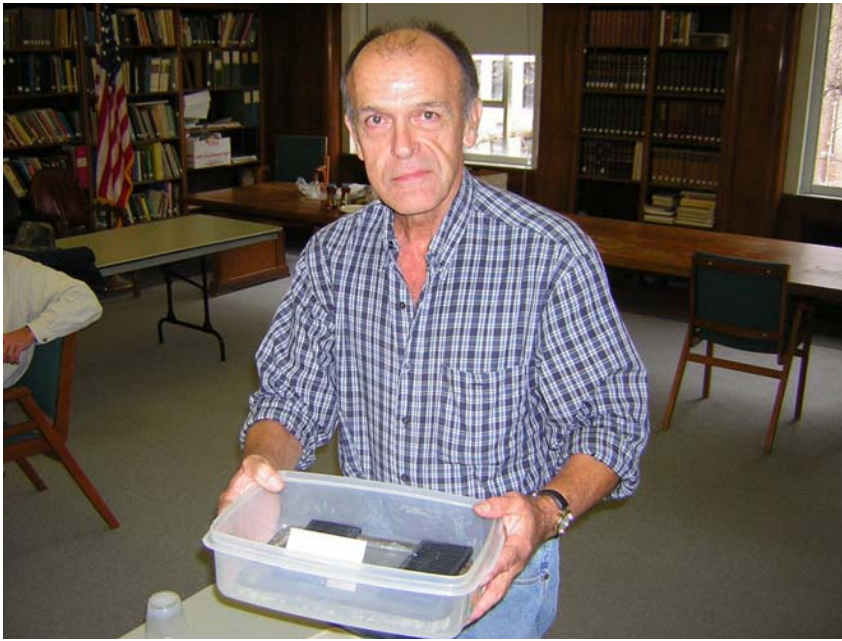
053 Saturday Banquet

Author: Todd Gilligan

Contact Information: Todd Gilligan (tgilliga@gmail.com), Colorado State University, Bioagricultural Sciences and Pest Management, 1177 Campus Delivery, Fort Collins, CO, 80523-1177

Title: Lepidopterology in a Globalized World

Abstract: Globalization, or the increased interaction and integration of nations around the world, has dramatically changed the manner in which we study Lepidoptera. The driving forces behind this process, such as new information technologies and international trade, allow us to further the cause of the Society; however, at the same time globalization creates significant environmental problems that threaten butterfly and moth diversity worldwide. Various aspects of globalization are discussed in relation to Lepidoptera, with special emphasis on the impacts of introduced species and ways in which amateurs and professionals worldwide can work together to benefit lepidopterology.



Utah Lepidopterists' Society Member Jacques A. Wolfe



Utah Moth Specialist Joel M. Johnson

Posters

054 Poster

Authors: Leslie Ries (lries@sesync.org), Thomas Naberhaus (butterflies.moths@gmail.com), Karen Oberhauser (oberh001@umn.edu), Doug Taron (dtaron@naturemuseum.org), Kyle Bibby (kbibby@naturecenter.org), Nathan Brockman (mantisnb@iastate.edu), Jutta Burger (jburger@irconservancy.org), Jaret Daniels (jcdnls@ufl.edu), Kelly Lotts (butterflies.moths@gmail.com), Steve McGaffin (smcgaffin@knoxville-zoo.org), Lea Morgan (lmorgan@mos.org), Greg Newman (newmang@nrel.colostate.edu), Matt Scott (mscott@redshift-tech.com), Jim Springer (springer@naba.org), Maxim Larrivee (maxim.larrivee@ville.montreal.qc.ca), Regina Rochefort (regina_rochefort@nps.gov), Arthur Shapiro (theochila@gmail.com), Ashley Wick (awick@naturecenter.org), Tad Yankowski (tad.yankoski@mobot.org)

Contact Information: Leslie Ries (lries@sesync.org), National Socio-environmental Synthesis Center, 1 Park Place, Annapolis, MD, 21401

Title: The North American Butterfly Monitoring Network: New systems for data management, access, and visualization

Abstract: Citizen scientists throughout North America perform thousands of surveys each year, yet these programs remain little known and the data have been underutilized both for local management or large-scale analysis. Despite this, the growth of these programs over the past five years has been astounding. The North American Butterfly Monitoring Network (www.nab-net.org) has recently formed to promote and support data management, access, and analysis of butterfly monitoring data. We present a broad overview of butterfly monitoring efforts, including currently-available online tools. We then present two new efforts that will greatly expand data access and visualization. The first is a platform for the North American Butterfly Association's multiple monitoring programs and the other is a data platform (PollardBase) for a consortium of regional (transect-based) monitoring programs.

055 - Poster

Authors: Md Kawsar Khan

Contact Information: Md Kawsar Khan (bmbkawsar@gmail.com)

Title: Butterfly species diversity, relative abundance and status of Tilagor Eco- Park, Sylhet, Bangladesh

Abstract: Butterflies are potent pollinators and ecological indicators of forest health. In current research, diversity, distribution and relative abundance of the butterfly fauna was carried out in Tilagor Eco-Prk, Sylhet, Bangladesh. A total of 54 species of butterflies belonging to the eight families were recorded in the study site during March 2014 to May 2014. Nymphalidae (25.9%) and Lycaenidae (25.9%) were the predominant species containing families of the study area followed by Hesperidae (14.8%), Papilionidae (11.11%), Pieridae (9.25%), Danaidae (5.5%), Satyridae (5.5%) and Riodinidae (1.8%). Among the recorded species *Arhopala centaurus* was the most abundant followed by *Junonia atlites*, *Junonia lemonias* and *Junonia hierta*. This is the first approach to annotate the butterfly diversity in this area and future exploration will be continued to update the check list.

056 - Poster

Authors: William Hanes, Daniel Rubinoff, and Cynthia King

Contact Information: William Hanes (whaines@hawaii.edu), University of Hawaii, 310 Gilmore Hall, 3050 Maile Way, Honolulu, HI, 96822

Title: The Pulelehua Project: Enlisting citizen scientists to map distributions of the Kamehameha Butterfly in Hawaii

Abstract: The Kamehameha butterfly (Nymphalidae: *Vanessa tameamea*) is one of only two butterflies native to Hawaii. Although it occurs across the main Hawaiian Islands, its range has contracted. The Pulelehua Project, funded by the Hawaii Department of Land and Natural Resources, is a “citizen science” effort to map Kamehameha butterfly populations, supplementing our own surveys. We created a website to which observers can upload photos of butterflies or immature stages and associated data. Observations will be used to map of suitable habitat using environmental niche modeling, to identify

areas where the butterfly may occur or where reintroductions are most likely to succeed. We are also studying genetic connectivity among populations on different islands and mountain ranges, which will help direct conservation efforts.

057 - Poster

Authors: Thomas Simonsen, Tristan Lowe, Russell Garwood, Robert Bradley, Philip J. Withers. All from University of Manchester, UK

Contact Information: Thomas Simonsen (t.simonsen@nhm.ac.uk), The Natural History Museum, Cromwell Road, London, UK, SW7 5BD

Title: Micro-CT as a tool for real-time studies of Lepidoptera metamorphosis

Abstract: Studies into the morphological and anatomical nature of insect metamorphosis have traditionally relied almost entirely on dissections and histological sections of a few model organisms such as *Calliphora* (blowflies), *Drosophila* (fruitflies), and for Lepidoptera, *Manduca sexta* (tobacco hornworm). Though highly detailed, such studies are very time consuming, they do not readily allow for broad scale comparisons across taxa, and it is difficult to extract quantitative data from the results. Here we explore how micro-CT scanning can be used to examine and document *Vanessa cardui* (painted lady butterfly) throughout metamorphosis. We demonstrate how the results can be used to document and pinpoint key changes, as well as provide new insights into Lepidoptera metamorphosis, and allow for quantitative measurements of trachea and gut volumes.

058 - Student Poster

Authors: Kirsten Isabel Verster and Keith Willmott, kwillmott@flmnh.ufl.edu

Contact Information: Kirsten Isabel Verster (kverster@ufl.edu), Florida Museum of Natural History, 8442 SW 102 Ct., Miami, FL, 33173

Title: Defining species limits in a confusing genus of colorful, abundant Neotropical butterflies

Abstract: The species diversity of many butterflies remains poorly known, particularly in the Neotropics. *Tegosa* is a genus of small orange butterfly species which are highly abundant throughout Central and South America. A previous revision by Higgins (1981) attempted to define species limits, but the phylogenetic relationships among species remain confused. We used morphological, geographical and molecular sequence data to investigate species limits in *Tegosa*. Four revisions to the existing classifications have been suggested by our data. First, *T. pastazena*, formerly considered to be a distinct species, appears to be a subspecies of *T. anieta*. Second, *T. tissoides* shows a distinct dimorphism in females that may function in mimicry. Third, in western Ecuador *T. anieta* are split into three distinct groups corresponding to different climatic conditions. Lastly, in Bolivia, two taxa formerly considered to be subspecies of other widespread species actually appear to be distinct species.

059 - Poster

Authors: Deborah Matthews, Jacqueline Y. Miller, Roger W. Portell, James K. Toomey and Terry A. Lott; 1McGuire Center for Lepidoptera and Biodiversity, Florida Museum of Natural History, University of Florida, P.O. Box 112710, Gainesville, FL 32611 USA; Dickinson Hall, Florida Museum of Natural History, University of Florida, P. O. Box 117800, Gainesville, FL 32611 USA

Contact Information: Deborah Matthews (mothnut@hotmail.com) and Jacqueline Y. Miller (jmiller@flmnh.ufl.edu): McGuire Center for Lepidoptera and Biodiversity, Florida Museum of Natural History, University of Florida, P.O. Box 112710, Gainesville, FL 32611 USA. Roger W. Portell, James K. Toomey, and Terry A. Lott: Dickinson Hall, Florida Museum of Natural History, University of Florida, P. O. Box 117800, Gainesville, FL 32611 USA

Title: Preliminary Observations of Moth Diversity at the Guantanamo Bay Naval Base, Cuba

Abstract: An inventory of the lepidopteran fauna of the Guantanamo Bay Naval Base has thus far included two sampling periods, 18-25 January 2012 and 3-10 October 2013. The naval base covers a 120 km² area in an arid region of southeastern Cuba. Sampling included

habitats on the windward side of the bay, the most distant sites within 10 km of each other. Moths were collected at a sheet illuminated by two 160 watt self-ballasted mercury vapor bulbs set up at a different site each night (per trip). In addition, limited samples were acquired nightly at high intensity lights at a recreation facility. Up to about 20 individuals were collected representing each morphospecies per night. We present an update on inventory progress and results including species richness by family, overall species accumulation for the base, and a comparison of the various habitats sampled.

060 - Student Poster

Authors: Michelle Gionti, Peter Houlihan (phoulihan@ufl.edu), David Plotkin (dplotkin@ufl.edu), Akito Kawahara (kawahara@flmnh.ufl.edu)

Contact Information: Michelle Gionti (mgionti4@ufl.edu) University of Florida, McGuire Center for Lepidoptera and Biodiversity, Gainesville, Florida, 32611

Title: Proboscis variation between distant populations of a long-tongued hawkmoth

Abstract: Hawkmoths exhibit an incredible diversity of tongue lengths, with some species having proboscides that are over a foot in length. It is suspected that a hawkmoth's proboscis length varies depending on its environment, because different habitats may be home to host flowers with different corolla lengths. As a preliminary study, we examined whether long proboscides are associated with particular distributions by comparing the tongue lengths of populations of the tobacco hornworm (*Manduca sexta*). Variation was assessed 1) between populations across latitudinal gradients, and 2) between sexes. Our results indicate that there is a significant difference in proboscis length between northern and southern populations of *Manduca sexta*, and that proboscis length is not sexually dimorphic.

061 - Student Poster

Authors: Chris Tenney, Khuram Zaman (k_zaman@u.pacific.edu), and Ryan Hill (rhill@pacific.edu)

Contact Information: Chris Tenney (tennneyx2@mac.com) UOP Stockton, 138 Del Mesa Carmel, Carmel, CA 93923

Title: Population biology of *Speyeria adiastrae clemencei*

Abstract: *Speyeria adiastrae* is a declining species endemic to the southern California Coast Range. To gain a better understanding of its population biology, we conducted three seasons of weekly counts and two seasons of mark recapture (MR) on a population of *Speyeria adiastrae clemencei* in Monterey County. The population declined during the study period, associated with decreasing rainfall. MR estimates very strongly correlated with weekly counts. We observed differences in habitat use between the sexes, with males showing no preference for ridge or meadow sites, whereas females preferred meadow sites containing *Viola* host plants. Analysis of survival and dispersal indicated this species is relatively short-lived with low dispersal ability, two traits associated with its life history that have important implications for re-colonization dynamics and population structure.

062 - Poster/Presentation Vendor Area

Authors: Kathleen Prudic, Maxim Larrivée (maxim.larrivee@ville.montreal.qc.ca) and Kent McFarland (kpmcfarland@gmail.com)

Contact Information: Kathleen Prudic (klprudic@gmail.com) Oregon State University, 2859 NW Lincoln Avenue, Corvallis, OR 97330

Title: You've See it? Why not E it? Tutorial of eButterfly's online checklist and photo storage website

Abstract: A real-time, online checklist and photo storage program, eButterfly, is providing a novel system for the butterfly community to report, organize and share information about butterflies in North America. Launched in 2011 and with 2000 participants and growing, eButterfly is a rich data source for basic information on butterfly abundance, distribution and phenology at a variety of spatial and

temporal scales across North America. Here I will provide a tutorial on how to enter your data, find localities, share your findings with friends and explore the aggregate data of all eButterfly participants.

063 - Student Poster

Authors: Francesca V. Ponce, Jesse W. Breinholt, Thomas Hossie, Jesse R. Barber, Daniel Janzen, Winnie Hallwachs, and Akito Y. Kawahara

Contact Information: Francesca V. Ponce (francescavponce@ufl.edu) Florida Museum of Natural History, 3215 Hull Road, Powell Hall, Gainesville, FL, 32611

Title: Molecular phylogeny, phylogeography, and anti-predatory eyespot evolution in *Eumorpha* caterpillars (Lepidoptera: Sphingidae)

Abstract: Many animals possess conspicuous external circular markings, or “eyespot”. Eyespots typically function to startle or otherwise deter predators, and are thought to have evolved primarily in response to natural selection. However, surprisingly few studies have examined how eyespots have evolved. We study the evolution of the posterior larval eyespot in the charismatic New World hawkmoth genus *Eumorpha*. While *Eumorpha* has a range of posterior larval eyespot shapes and sizes, little is known of how this trait has changed over time because phylogenetic relationships and phylogeography of the genus remains unknown. In this study, we sampled 59 individuals from 23 *Eumorpha* species, and sequenced four genes (CAD, EF-1 α , Wingless and CO1), totaling 3,789 base pairs. Maximum likelihood and Bayesian phylogenetic methods produced largely congruent trees, many relationships of which had robust branch support. Our analyses reveal that *Eumorpha* had an ancestor with a posterior larval eyespot and that the eyespot was subsequently lost in at least three lineages. *Eumorpha* appears to have originated in South America and shifted its distribution northward to Central and North America. We found little correlation between the presence or absence of the larval eyespot and geographic distribution, which might indicate that *Eumorpha* larvae have found alternate adaptations that are equally effective against visual predators.



2013 Utah Bug Club Students Ethan and Presly

Online Information About Utah Lepidoptera

Utah Butterflies GPS Spreadsheet <http://bit.ly/1sWtTi7>

Survey of Utah Moth Species <http://bit.ly/1xbb6BQ>

Utah Butterfly Basics <http://bit.ly/15AcG3b>

Utah Lepidopterists' Society <http://www.utahlepsociety.org>

Utah Bug Club <http://bit.ly/1pQscR9>

Tony Jones Utah Butterfly Photography <http://tginature.com>

Nicky Davis Wild Utah Butterflies and Moths <http://bit.ly/1rQvFk3>

Meeting Field Trip Information <http://bit.ly/1lKG9B6>



Utah Lepidopterists' Society member Nicky Davis

FIELD CHECKLIST OF THE BUTTERFLIES OF UTAH



Tony G. Jones and Todd L. Stout (Update January, 2014)

ABUNDANCE CODE

C = Common in appropriate habitat and season

U = Uncommon. Found but not common in appropriate habitat and season

R = Rare. Found infrequently in appropriate habitat and season

X = Local. Localized in host plant specific areas in appropriate season

I = Irregular. May not be found every year in appropriate habitat and season and/or may be a stray/transient

HABITAT CODE

A = Arctic/Alpine

G = Great Basin and Range

D = Mojave Desert (Washington County)

M = Mountain canyons and foothills

H = Mountain hilltops

P = Colorado Plateau (Canyon Country)

V = Valley floors, riparian and wet meadows

PAPILIONIDAE

___ <i>Battus philenor philenor</i> (Pipevine swallowtail)	_____ I, D
___ <i>Papilio bairdi</i> (Baird's swallowtail)	_____ U, G P
___ <i>Papilio coloro</i> (Desert swallowtail)	_____ U, D
___ <i>Papilio zelicaon nitra</i> (Anise swallowtail)	_____ C, M
___ <i>Papilio indra indra</i> (Indra swallowtail)	_____ XU, H
___ <i>Papilio indra minori</i> (Mesa Rim Cliff swallowtail)	_____ XR, P
___ <i>Papilio indra calcicola</i> (Navajo Sandstone swallowtail)	_____ XR, D
___ <i>Papilio indra</i> West Desert seg. (West Desert Indra swallowtail)	XU, G
___ <i>Papilio eurymedon</i> (Pale swallowtail)	_____ C, M
___ <i>Papilio multicaudata pusillus</i> (Two-tailed swallowtail)	_____ C, M V
___ <i>Papilio multicaudata multicaudata</i> (Two-tailed swallowtail)	___ U, D G
___ <i>Papilio rutulus rutulus</i> (Western Tiger swallowtail)	_____ C, V M
___ <i>Parnassius smintheus sayii</i> (Rocky Mountain parnassian)	_____ XC, H
___ <i>Parnassius clodius menetriesi</i> (Clodius parnassian)	_____ C, M

PIERIDAE

___ <i>Pontia beckeri</i> (Becker's white)	_____ C, G P V
___ <i>Pontia sisymbri sisymbri</i> (Spring white)	_____ C, M
___ <i>Pontia sisymbri flavitincta</i> (Spring white)	_____ C, M
___ <i>Pontia sisymbri nigravenosa</i> (Dark Veined Spring white)	_____ C, G
___ <i>Pontia protodice</i> (Checkered white)	_____ C, M V
___ <i>Pontia occidentalis occidentalis</i> (Western white)	_____ C, H A V
___ <i>Pieris marginalis pallidissima</i> (Margined Mustard white)	_____ U, M
___ <i>Pieris rapae</i> (Cabbage white)	_____ C, V
___ <i>Neophasia menapia menapia</i> (Pine white)	_____ XC, G P
___ <i>Euchloe ausonides coloradensis</i> (Large marble)	_____ C, M V
___ <i>Euchloe hyantis lotta</i> (Desert marble)	_____ C, G P
___ <i>Anthocharis cethura pima</i> (Desert orangetip)	_____ XC, D
___ <i>Anthocharis julia browningi</i> (Northern orangetip)	_____ C, M
___ <i>Anthocharis julia sulfuris</i> (Northern orangetip)	_____ C, M
___ <i>Anthocharis thoosa thoosa</i> (Southwestern orangetip)	_____ C, G P
___ <i>Colias philodice eriphyle</i> (Clouded sulphur)	_____ C, V M
___ <i>Colias eurytheme</i> (Orange sulphur)	_____ C, V
___ <i>Colias occidentalis pseudochristina</i> (Western sulphur)	_____ XU, M
___ <i>Colias alexandra alexandra</i> (Queen Alexandra's sulphur)	_____ XC, M

___ <i>Colias alexandra edwardsi</i> (Queen Alexandra's sulphur)	U, G P
___ <i>Colias meadi meadi</i> (Mead's sulphur)	XC, A
___ <i>Colias scudderi</i> (Scudder's sulphur)	U, A
___ <i>Zerene cesonia</i> (Southern dogface)	I, P D
___ <i>Anteos clorinde nivifera</i> (White-angled sulphur)	I
___ <i>Phoebis sennae marcellina</i> (Cloudless sulphur)	I
___ <i>Eurema nicippe</i> (Sleepy orange)	I D
___ <i>Eurema mexicana</i> (Mexican yellow)	I
___ <i>Nathalis iole</i> (Dainty sulphur)	R, V G

LYCAENIDAE

___ <i>Lycaena arota schellbachii</i> (Tailed copper)	U, M V
___ <i>Lycaena phlaeas</i> ssp. (American copper)	R, H
___ <i>Lycaena cupreus cupreus</i> (Lustrous copper)	XU, M
___ <i>Lycaena cupreus snowi</i> (Snow's Lustrous copper)	XR, A
___ <i>Lycaena editha montana</i> (Edith's copper)	U, M
___ <i>Lycaena hyllus</i> (Bronze copper)	XC, V
___ <i>Lycaena heteronea heteronea</i> (Blue copper)	C, M
___ <i>Lycaena rubidus sirius</i> (Ruddy copper)	C, M H
___ <i>Lycaena helloides</i> (Purplish copper)	C, M V
___ <i>Lycaena dorcas</i> (Dorcas copper)	R, M
___ <i>Lycaena nivalis browni</i> (Lilac-bordered copper)	C, M
___ <i>Hypaurotis crysalus citima</i> (Colorado hairstreak)	C, M
___ <i>Atlides halesus corcorani</i> (Great Purple hairstreak)	U, G
___ <i>Satyrium titus immaculosis</i> (Coral hairstreak)	U, M
___ <i>Satyrium behri behri</i> (Behr's hairstreak)	C, M P
___ <i>Satyrium semiluna semiluna</i> (Sagebrush Sooty hairstreak)	U, M
___ <i>Satyrium californica wapiti</i> (California hairstreak)	XR, M
___ <i>Satyrium sylvinus putnami</i> (Sylvan hairstreak)	XC, M V
___ <i>Satyrium saepium provo</i> (Hedgerow hairstreak)	U, M
___ <i>Callophrys affinis affinis</i> (Western Green hairstreak)	C, H
___ <i>Callophrys affinis apama</i> (Western Green hairstreak)	XR, P
___ <i>Callophrys sheridani neoperplexa</i> (Sheridan's hairstreak)	XU, M
___ <i>Callophrys sheridani comstocki</i> (Desert Gr. hairstreak)	XR, D
___ <i>Callophrys sheridani paradoxa</i> (Desert Gr. hairstreak)	XR, P
___ <i>Incisalia augustinus annetteae</i> (Brown elfin)	XC, M
___ <i>Incisalia fotis fotis</i> (Desert elfin)	XC, M G D

___ <i>Incisalia polios obscurus</i> (Hoary elfin)	XU, M
___ <i>Incisalia eryphon eryphon</i> (Western Pine elfin)	C, M
___ <i>Mitoura spinetorum spinetorum</i> (Thicket hairstreak)	U, M P
___ <i>Mitoura siva siva</i> (Juniper hairstreak)	U, P
___ <i>Mitoura siva chalcosiva</i> (Juniper hairstreak)	C, G P
___ <i>Strymon melinus franki</i> (Gray hairstreak)	C, M V
___ <i>Ministrymon leda</i> (Leda ministreak)	I, D
___ <i>Brephidium exile</i> (Western Pygmy blue)	I, V D
___ <i>Leptotes marina</i> (Marine blue)	U, V M
___ <i>Hemiargus ceraunus gyas</i> (Ceraunus blue)	XR, D
___ <i>Hemiargus isola alce</i> (Reakirt's blue)	R, V M
___ <i>Everes amyntula</i> (Western-tailed blue)	C, M
___ <i>Celastrina echo echo</i> (Spring azure)	C, M P
___ <i>Euphilotes ellisi ellisi</i> (Ellis's Dotted blue)	XC, P
___ <i>Euphilotes bernardino martini</i> (Bernardino Dotted blue)	I
___ <i>Euphilotes mojave virginensis</i> (Mojave Dotted blue)	XR, P
___ <i>Euphilotes ancilla ancilla</i> (Rocky Mountain Dotted blue)	C, M H
___ <i>Euphilotes stanfordorum</i> (Stanford's blue)	XU, G P
___ <i>Euphilotes pallescens pallescens</i> (Pallid Dotted blue)	XC, G
___ <i>Euphilotes pallescens emmeli</i> (Pallid Dotted blue)	XU, P
___ <i>Euphilotes spaldingi spaldingi</i> (Spalding's Dotted blue)	XC, M
___ <i>Glaucopsyche piasus daunia</i> (Arrowhead blue)	U, M H
___ <i>Glaucopsyche lygdamus oro</i> (Silvery blue)	C, M H
___ <i>Plebejus melissa melissa</i> (Melissa blue)	U, V
___ <i>Plebejus melissa annetta</i> (Melissa blue)	C, M H
___ <i>Plebejus saepiolus saepiolus</i> (Greenish blue)	C, M H
___ <i>Plebejus saepiolus gertschi</i> (Greenish blue)	XC, P H
___ <i>Plebejus icarioides lycea</i> (Boisduval's blue)	C, M
___ <i>Plebejus shasta minnehaha</i> (Shasta blue)	XR, H
___ <i>Plebejus lupini lutzi</i> (Lupine blue)	C, H
___ <i>Plebejus acmon</i> ssp. (Acmon blue)	XR, G
___ <i>Plebejus glandon rustica</i> (Arctic blue)	C, A

RIODINIDAE

___ <i>Calephelis nemesis</i> (Fatal metalmark)	I, D
___ <i>Apodemia mormo autumnalis</i> (Mormon metalmark)	C, D
___ <i>Apodemia mormo parva</i> (Mormon metalmark)	C, M P

___ *Apodemia palmeri palmeri* (Palmer's metalmark)_____I, D

NYMPHALIDAE

___ *Libytheana carineta larvata* (American snout)_____I, D

___ *Euptoieta claudia* (Variegated fritillary)_____U, P

___ *Speyeria cybele letona* (Great Spangled fritillary)_____C, M

___ *Speyeria cybele charlotte* (Great Spangled fritillary)_____XU, P

___ *Speyeria nokomis nokomis* (Nokomis fritillary)_____XU, V

___ *Speyeria nokomis apacheana* (Nokomis fritillary)_____XU, V

___ *Speyeria edwardsi* (Edward's fritillary)_____R, A

___ *Speyeria coronis snyderi* (Coronis fritillary)_____C, M

___ *Speyeria zerene platina* (Zerene fritillary)_____C, M

___ *Speyeria callippe harmonia* (Callippe fritillary)_____C, M

___ *Speyeria egleis utahensis* (Great Basin fritillary)_____C, M

___ *Speyeria egleis* Stansbury Mts. segregate (Great Basin fritillary)U, G

___ *Speyeria hesperis wasatchia* (Northwestern fritillary)_____C, M

___ *Speyeria hesperis chitone* (Northwestern fritillary)_____XC, D P

___ *Speyeria hesperis* Stansbury Mts. seg. (Northwestern fritillary)C, G

___ *Speyeria hydaspe sakantula* (Hydaspe fritillary)_____U, H

___ *Speyeria mormonia mormonia* (Mormon fritillary)_____R, G H

___ *Speyeria mormonia eurynome* (Mormon fritillary)_____C, H

___ *Boloria selene tollandensis* (Silver-bordered fritillary)_____XC, V

___ *Boloria kriemhild* (Relict fritillary)_____XU, M

___ *Boloria freija browni* (Freija fritillary)_____XC, A

___ *Boloria chariclea helena* (Arctic fritillary)_____XC, A

___ *Poladryas arachne arachne* (Arachne checkerspot)_____U, P

___ *Poladryas arachne expedita* (Arachne checkerspot)_____U, G

___ *Thessalia fulvia pariaensis* (Fulvia checkerspot)_____XR, P

___ *Thessalia leanira alma* (Leanira checkerspot)_____U, G P

___ *Thessalia leanira flavodorsalis* (Leanira checkerspot)_____R, P

___ *Chlosyne lacinia crocale* (Bordered patch)_____C, D

___ *Chlosyne gorgone carlota* (Gorgone checkerspot)_____I

___ *Chlosyne palla flavula* (Northern checkerspot)_____C, M

___ *Chlosyne damoetas damoetas* (Rock-slide checkerspot)_____XC, A

___ *Chlosyne acastus acastus* (Sagebrush checkerspot)_____U, G

___ *Chlosyne acastus neumogeni* (Desert checkerspot)_____U, D

___ *Phyciodes tharos riocolorado* (Pearl crescent)_____XR, P

___ *Phyciodes cocyta cocyta* (Northern crescent)_____C, M

___ *Phyciodes batesii anasazi* (Tawny crescent)_____XR, P

___ *Phyciodes pulchellus camillus* (Field crescent)_____C, V M

___ *Phyciodes pallida barnesi* (Pale crescent)_____U, P

___ *Phyciodes mylitta mylitta* (Thistle crescent)_____C, V M

___ *Euphydryas anicia maria* (Variable checkerspot)_____XU, M

___ *Euphydryas anicia wheeleri* (Variable checkerspot)_____U, G

___ *Euphydryas anicia wecoet* (Variable checkerspot)_____U, P

___ *Euphydryas anicia hermosa* (Variable checkerspot)_____U, D

___ *Euphydryas anicia alena* (Variable checkerspot)_____C, A M

___ *Euphydryas editha lehmani* (Edith's checkerspot)_____XC, P

___ *Euphydryas colon nevadensis* (Colon checkerspot)_____U, M

___ *Polygonia satyrus satyrus* (Satyr comma)_____C, M

___ *Polygonia gracilis zephyrus* (Hoary comma)_____C, M

___ *Polygonia oreas nigrozephyrus* (Gray comma)_____I, M

___ *Polygonia faunus hylas* (Green comma)_____C, M

___ *Nymphalis antiopa* (Mourning cloak)_____U, M V

___ *Nymphalis l-album watsoni* (Compton tortoiseshell)_____I, M

___ *Nymphalis californica* (California tortoiseshell)_____U, M

___ *Nymphalis milberti subpallida* (Milbert's tortoiseshell)_____C, V H

___ *Vanessa virginiensis virginiensis* (Virginia lady)_____I, V M

___ *Vanessa cardui* (Painted lady)_____C, V M

___ *Vanessa carye annabella* (West Coast lady)_____U, V M

___ *Vanessa atalanta rubria* (Red admiral)_____U, V H

___ *Junonia coenia grisea* (Common buckeye)_____U, D V

___ *Limenitis archippus lahontani* (Great Basin viceroy)_____U, V

___ *Limenitis archippus obsoleta* (Arizona viceroy)_____XR, D

___ *Limenitis astyanax arizonensis* (Arizona purple)_____I, D

___ *Limenitis weidemeyeri weidemeyeri* (Weidemeyer's admiral)_____U, P

___ *Limenitis weidemeyeri latifascia* (Weidemeyer's admiral)_____C, M

___ *Limenitis weidemeyeri angustifascia* (Weidemeyer's admiral)_____R, P

___ *Adelpha eulalia* (Arizona sister)_____C, M D P

DANAIDAE

___ *Danaus plexippus* (monarch)_____C, V M

___ *Danaus gilippus thersippus* (queen)_____R, D V

SATYRIDAE

___ <i>Cyllopsis pertepida dorothea</i> (Canyonland satyr)	XR, M P
___ <i>Coenonympha ochracea pseudobrenda</i> (Common ringlet)	C, M H
___ <i>Coenonympha ampelos elko</i> (Common ringlet)	XR, V
___ <i>Cercyonis pegala utahensis</i> (Common wood nymph)	XR, V
___ <i>Cercyonis pegala paludum</i> (Common wood nymph)	U, V
___ <i>Cercyonis pegala</i> Otter Creek seg. (Common wood nymph)	XC, V
___ <i>Cercyonis meadi meadi</i> (Mead's wood nymph)	U, P
___ <i>Cercyonis sthenele masoni</i> (Great Basin wood nymph)	U, M
___ <i>Cercyonis oetus charon</i> (Small wood nymph)	U, M H P
___ <i>Erebia magdalena magdalena</i> (Magdalena alpine)	XC, A
___ <i>Erebia callias callias</i> (Colorado alpine)	XC, A
___ <i>Erebia epipsodea epipsodea</i> (Common alpine)	XC, P
___ <i>Neominois ridingsi stretchii</i> (Riding's satyr)	XC, P
___ <i>Neominois ridingsi coloalbiterra</i> (Riding's satyr)	XR, P
___ <i>Neominois wyomingo</i> (Wyoming satyr)	XR, M
___ <i>Oeneis chryxus chryxus</i> (Chryxus arctic)	U, M H
___ <i>Oeneis jutta reducta</i> (Jutta arctic)	XR, A
___ <i>Oeneis uhleri</i> Southwest Utah segregate (Uhler's arctic)	XU, A
___ <i>Oeneis bore edwardsi</i> (White-veined arctic)	U, A
___ <i>Oeneis melissa beani</i> (Melissa arctic)	XU, A

HESPERIIDAE

___ <i>Epargyreus clarus profugus</i> (Silver-spotted skipper)	R, D
___ <i>Polygonus leo arizonensis</i> (Hammock skipper)	I
___ <i>Thorybes pylades</i> South Rocky Mt. seg. (Northern cloudywing)	C, M
___ <i>Thorybes mexicana nevada</i> (Mexican cloudywing)	U, H
___ <i>Erynnis icelus</i> (Dreamy duskywing)	U, M
___ <i>Erynnis brizo burgessi</i> (Sleepy duskywing)	C, D P
___ <i>Erynnis telemachus</i> (Rocky Mountain duskywing)	C, M P
___ <i>Erynnis meridianus meridianus</i> (Meridian duskywing)	U, D
___ <i>Erynnis horatius</i> (Horace's duskywing)	R, P
___ <i>Erynnis pacuvius pacuvius</i> (White-fringed duskywing)	U, P
___ <i>Erynnis pacuvius lilius</i> (Pacuvius duskywing)	U, M
___ <i>Erynnis funeralis</i> (Funereal duskywing)	I, D
___ <i>Erynnis afranius</i> (Afranius duskywing)	C, M
___ <i>Erynnis persius fredericki</i> (Persius duskywing)	XU, H

___ <i>Pyrgus centaureae loki</i> (Grizzled skipper)	XU, A
___ <i>Pyrgus ruralis ruralis</i> (Two-banded Checkered skipper)	C, M H
___ <i>Pyrgus xanthus</i> (Mountain skipper)	U, P
___ <i>Pyrgus scriptura apertorum</i> (Small Checkered skipper)	U, G D
___ <i>Pyrgus communis communis</i> (Com. Checkered skipper)	C, M D P G
___ <i>Pyrgus albescens</i> (White Checkered skipper)	R, D
___ <i>Heliopetes ericetorum</i> (Great White skipper)	U, D P G
___ <i>Pholisora catullus</i> (Common sootywing)	C, G P M
___ <i>Hesperopsis libya libya</i> (Mojave sootywing)	U, D
___ <i>Hesperopsis libya confertiblanca</i> (Mesa Rim sootywing)	U, P
___ <i>Hesperopsis alpheus oricus</i> (Saltbush sootywing)	U, P
___ <i>Hesperopsis graciellae</i> (Macneill's sootywing)	I, D
___ <i>Piruna pirus</i> (Russet skipperling)	C, M
___ <i>Oarisma garita garita</i> (Garita skipperling)	C, V M
___ <i>Thymelicus lineola lineola</i> (European skipper)	C, V
___ <i>Copaeodes aurantiaca</i> (Orange skipperling)	U, P D
___ <i>Hylephila phyleus phyleus</i> (Fiery skipper)	R, D
___ <i>Hesperia uncas lasus</i> (Uncas skipper)	C, P
___ <i>Hesperia juba</i> (Juba skipper)	C, M V
___ <i>Hesperia colorado harpalus</i> (Western Branded skipper)	C, G
___ <i>Hesperia colorado idaho</i> (Western Branded skipper)	C, P
___ <i>Hesperia pahaska martini</i> (Pahaska skipper)	XU, P
___ <i>Hesperia nevada nevada</i> (Nevada skipper)	XU, P
___ <i>Polites sabuleti alkaliensis</i> (Sandhill skipper)	C, G V M
___ <i>Polites sabuleti chusca</i> (Mojave Sandhill skipper)	XU, D
___ <i>Polites draco</i> (Draco skipper)	U, A M
___ <i>Polites themistocles</i> Utah segregate (Tawny-edged skipper)	XU, M P
___ <i>Polites sonora utahensis</i> (Sonora skipper)	XU, V
___ <i>Atalopedes campestris campestris</i> (sachem)	I, P D
___ <i>Ochlodes sylvanoides omnigena</i> (Woodland skipper)	C, M
___ <i>Ochlodes yuma yuma</i> (Yuma skipper)	R, D
___ <i>Ochlodes yuma scudderi</i> (Yuma skipper)	XR, V
___ <i>Poanes taxiles</i> (Taxiles skipper)	XU, V
___ <i>Euphyes vestris kiowah</i> (Dun skipper)	I, P
___ <i>Amblyscirtes aenus aenus</i> (Bronze Roadside skipper)	U, D
___ <i>Amblyscirtes vialis</i> (Common Roadside skipper)	XU, M
___ <i>Lerodea eufala</i> (Eufala skipper)	I, P

___ *Calpododes ethlius* (Brazilian skipper) _____ I
 ___ *Atrytonopsis vierecki* (Viereck's skipper) _____ R, P
 ___ *Agathymus alliae paiute* (Mojave Giant skipper) _____ XR, D
 ___ *Megathymus yuccae navajo* (Yucca Giant skipper) _____ XU, P G
 ___ *Megathymus streckeri streckeri* (Strecker's Giant skipper) _____ XU, P

NOTES _____

This checklist contains 248 species and subspecies approved by the
 Utah Lepidopterists' Society.
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