Volume 60, Number 1 Spring 2018

NEWS OF THE LEPIDOPTERISTS' SOCIETY

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NEWS OF THE LEPIDOPTERISTS' SOCIETY

Volume 60, Number 1
Spring 2018

The **News of The Lepidopterists' Society** (ISSN 0091-1348) is published quarterly by The Lepidopterists' Society, c/o Chris Grinter, The California Academy of Sciences, 55 Music Concourse Drive, San Francisco, CA 94118, and includes one or two supplements each year. The **Season Summary** is published every year as Supplement S1 and is mailed with issue 1 of the News. In even numbered years a complete **Membership Directory** is published as Supplement S2 and is mailed with issue 4 of that volume of the News. Please see the inside back cover for instructions regarding subscriptions, submissions to, and deadline dates for, the News.

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Front Cover:

Graphium evemon, Perak, Cameron Highlands, Malaysia, Feb. 27, 1986 (photo by George Krizek). See related article on next page.

Butterflies of the Cameron Highlands, Malaysia

George O. Krizek[1] and Steve Fratello[2]

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Our colleague George Krizek has in recent years been sharing with us a number of photo essays from various locales, articles that combine his dual passion for butterflies and butterfly photography. In this latest installment, he presents photos he took many years ago when visiting peninsular Malaysia's Cameron Highlands, Feb. 25 - March 7, 1986.

Though a number of hill and montane species are represented, e. g. *Heliophorus epicles tweediei* Eliot and *Lethe verma robinsoni* Pendlebury, the majority are lowland species which reflects the lower and mid-elevation faunas of the Cameron Highlands locales that George visited. The highest reaches of the Cameron Highlands exceed 5,000 ft.; in the upper elevational forests above 4,000 ft. are Malay Peninsula specialties such as *Delias belladonna malayana* Pendlebury (restricted to these highlands above 5,000 ft.) and *Kaniska canace perakana* (Distant), among others (Eliot et al. 1978). It is unfortunate that George was unable to visit and photograph butterflies in the uppermost elevations of these highlands.

Some basic systematic and ecological information pertaining to a good number of taxa photographed by George can be found in my articles concerning lepidoptera, predominantly butterflies of Taman Negera NP, peninsular Malaysia's preeminent tropical rainforest park: News of the Lepidopterists' Society Vol. 50, No. 2, Summer 2008, Vol. 50 Nos. 3,4, Autumn, Winter 2008,Vol. 51, No. 1, Spring 2009 and Vol. 51, No. 2, Summer 2009. The ultimate source for this information is the superb "The Butterflies of the Malay Peninsula", 3rd Edition (Eliot et al.) (I am not familiar with the 4th and final edition which includes plates by Bernard D'Abrera and must certainly be an improvement on an already splendid work). Bernard d'Abrera's own 3 Oriental Region volumes contain magnificent color photos of this fauna (unfortunately minus the majority of the following Lycaenids: Miletinae and *Lycaenopsis* blues) photographed from the peerless British Museum of Natural History collection. Another excellent resource for the region is the "Butterflies of Borneo" 2 volume series; I am only familiar with Volume 2, which includes 2 parts, the first Lycaenidae, the second Hesperiidae. Both are a systematic and pictorial account of the fauna with excellent plates, the Lycaenid volume including all Miletinae and *Lycaenopsis* blues. The great majority of Neomalayan (Malay Peninsula, Sumatra and Borneo) butterfly species are found in all 3 regions (often as different races); even though different races might be involved, the "Butterflies of Borneo" Vol. 2, No. 1 (the one I am most familiar with) is an outstanding resource for the Malay Penisula's Lycaenid fauna.

The great majority of identifications, excluding the Lycaenids, were made by George. If there are any identification corrections to be made, or experts who might know the few unidentified Hesperiids, please contact George. Enjoy George's beautiful photos of a spectacular tropical butterfly fauna! --Steve Fratello

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Eliot, J. & Kawazoe, A. 1983. Blue butterflies of the *Lycaenopsis* group. London: British Museum (Natural History).

Maruyama, K. & Otsuka, K. 1991. Butterflies of Borneo, Vol. 2, No. 1, Hesperiidae & Addendum of Vol. 1. Tokyo: Tobishima Corporation.

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Papilio demoleus, Penang, Mar. 7; *Pachliopta aristolochiae*, Perak, Mar. 1

Trogonoptera brookiana, Perak, Feb. 27

Graphium sarpedon, Perak, Feb. 27

Chilsa paradoxa, Perak, Feb. 26

Papilio helenus, Perak, Feb. 27

Lamproptera meges, Perak, Feb. 28

Paranticopsis ramaceus, Perak, Feb. 27

Graphium agetes, Perak, Feb. 27

Troides helena, Perak, Feb. 26

Appias species: *A. libythea*, Perak, Feb. 28; *A. lyncida*, Perak, Feb. 27; *A. nero*, Perak, Mar. 1

Cepora nadina, Perak, Feb. 27

Delias hyparete, Penang, Mar. 5

Remplana jangala, Penang, Mar. 6; *Arhopala similis*, Perak, Mar. 1; *Arhapala* species, Penang, Mar. 6

Heliophorus epicles (upperside [Perak, Mar. 1] and underside [Penang, Feb. 25]); *Spindesis lohita*, Penang, Mar. 7

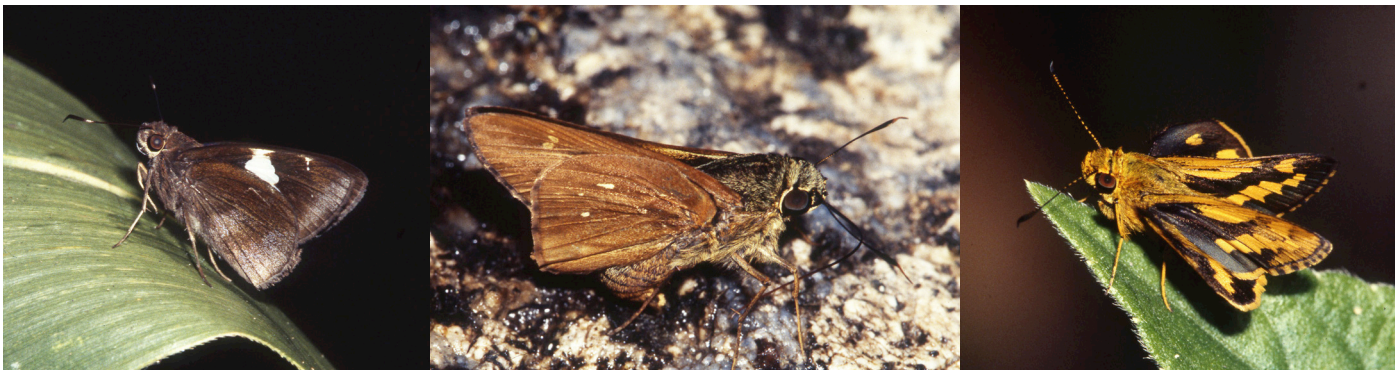
Zeltus amasa, Perak, Feb. 27; *Drupadia ravindra*, Perak, Feb. 27

Dacalana species, Penang, Mar. 7; *Caleta roxus*, Perak, Feb. 27; *Jamides* species, Perak, Feb. 27

Acytolepis puspa, Perak, Feb. 27; *Neopithecops zalmora*, Penang, Mar. 6; *Catochrysops panormus*, Perak, Feb. 28

Prosotas dubiosa, Perak, Feb. 26; *Anthene emolus*, Perak, Feb. 27; *Abisara neophron*, Penang, Feb. 25

Pseudocoladenia dan, Perak, Feb. 27; *Iambrix salsala*, Penang, Mar. 7; *Odontoptiulum pygela*, Perak, Feb. 27



Hesperiine species, Penang, Feb. 25; *Hesperiine* species, Perak, Feb. 27; *Potanthus rectifasciata*, Perak, Mar. 1

Idea hypermnestra, Penang, Mar. 5

Danaus melanippus, Penang, Mar. 7

Doleschallia bisaltide, underside & upperside, Perak, Feb. 27

Polyura athamas, Perak, Feb. 27; *Charaxes bernardus*, Perak, Feb. 27

Cethosia biblis, Perak, Mar. 1; *Cyrestis maphalis*, Perak, Feb. 27

Amathusia binghami, Perak, Feb. 27; *Melanocyma faunula,* upperside (Feb. 27) & underside (Feb. 26), Penang

Orsotriaena medus, Penang, Mar. 7; *Lethe verma*, Penang, Feb. 25

Terinos terpander, Perak, Feb. 28; *Paduca fasciata*, Perak, Feb. 28

Precis almana, Penang, Mar. 7; *Pantoporia* or *Lasippa* species, Perak, Feb. 27

Euthalia monina, Penang, Mar. 4; *Tanaecia julii* (male), Penang, Feb. 25; *Tanaecia* species, (female), Perak, Feb. 26

Dichorragia nesimachus, Perak, Feb. 27; *Lexias dirtea* (male), Perak, Mar. 1; *Lexias pardalis*, (female), Perak, Feb. 27

Athyma nefte (male), Penang, Mar. 7; *Neptis duryodana nesia*, Penang, Mar. 6; *Neptis* hylas, Penang, Mar. 7

Hypolimnas bolina, Perak, Mar. 1

Moduza procris, Penang, Mar. 7

Membership Updates

Chris Grinter

Includes ALL CHANGES received by 9 February 2018. Direct corrections and additions to Chris Grinter, **cgrinter@gmail.com.**

New Members: *Members who have recently joined the Society, e-mail addresses in parentheses. All U.S.A. unless noted otherwise. (red. by req. = redacted by request)*

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The Marketplace

IMPORTANT NOTICE to ADVERTISERS: If the number following your ad is "594" then you must renew your ad before the next issue if you wish to keep it in the Marketplace!

Equipment

FOR SALE: Light Traps: 12 VDC or 120 VAC with 18 inch vanes (15 & 32 Watt) and 24 inch (40 Watt). Rigid vanes of Stainless Steel, Aluminum, or Plexiglass. Rain Drains and beetle screens to protect specimens from damage.

Collecting Light: Fluorescent UV 15, 32 & 40 Watt. Units are designed with the ballast enclosed in a weather tight plastic enclosure. Mercury Vapor: 160 & 250 Watt self ballast mercury vapor with medium base mounts. 250 & 500 Watt self ballast mercury vapor with mogul base mounts. Light weight and ideal for trips out of the country.

Bait Traps: 15 inch diameter and 36 inches in height with a rain cloth top, green Lumite plastic woven screen, and supported with 3/16 inch steel rings. A plywood platform is suspended with eye bolts and S hooks. Flat bottom has a 3/16 inch thick plastic bottom that will not warp or crack. Bait container is held in place by a retainer.

Drawers: Leptraps now offers Cornell/California Academy storage drawers. Drawers are made of Douglas Fir, hardboard bottom and glass top. Finished in clear satin gloss varnish. A single card holder with pull or two card holder with a knob pull. Foam pinning bottom is available.

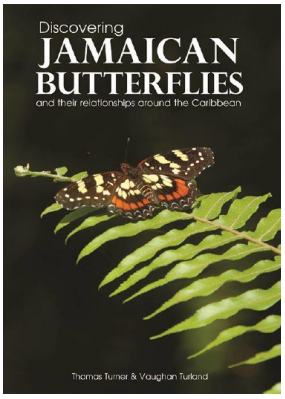
Price does not include shipping. If purchasing 20+ drawers, and you live within 350 miles from Georgetown, KY, I will meet you half way for delivery. Mastercard/Visa, Pay Pal, checks accepted.

For more information visit: **www.leptraps.com**, or contact Leroy C. Koehn, Leptraps LLC, 3000 Fairway Court, Georgetown, KY 40324-9454: Tel: 502-542-7091. 594

Books/Periodicals

Discovering Jamaican Butterflies and their Relationships around the Caribbean
by Thomas Turner and Vaughan Turland

$147.50 512 pages hardcover, ISBN: 9780692877067, 1021 illustrations. www.jamaicanbutterfliesmoths.com



Discovering Jamaican Butterflies is a comprehensive, richly illustrated, account of all of Jamaica's 137 butterflies including new discoveries. The **Relationships** between Jamaican butterflies and their closest relatives around the Caribbean are analyzed and the routes over which colonization of the island's butterflies must have occurred are explored in a chapter on **Origins**. Over 100 life histories are described, usually with color photographs of immature stages and living adults. Other chapters include a brief history of collecting in Jamaica, the preferred **Habitats** and distribution of each species, with a chapter devoted to the **Conservation** of Jamaica's most endangered species.

The aim of the Marketplace in the **News of the Lepidopterists' Society** is to be consistent with the goals of the Society: "to promote the science of lepidopterology...to facilitate the exchange of specimens and ideas by both the professional and the amateur in the field,..." Therefore, the Editor will print notices which are deemed to meet the above criteria, without quoting prices, except for those of publications or lists.

We now accept ads from any credible source, in line with the New Advertising Statement at the top of this page. **All advertisements are accepted, in writing, for two (2) issues unless a single issue is specifically requested.** All ads contain a code in the lower right corner (eg. 564, 571) which denotes the volume and number of the **News** in which the ad first appeared. **Renew it Now!**

Note: All advertisements must be renewed before the deadline of the third issue following initial placement to remain in place.

Advertisements should be under 100 words in length, or **they may be returned for editing.** Some leeway may be allowed at the editor's discretion. Ads for Lepidoptera or plants must include full latin binomials for all taxa listed in your advertisement.

The Lepidopterists' Society and the Editor take no responsibility whatsoever for the integrity and legality of any advertiser or advertisement. Disputes arising from such notices must be resolved by the parties involved, outside of the structure of The Lepidopterists' Society. Aggrieved members may request information from the Secretary regarding steps which they may take in the event of alleged unsatisfactory business transactions. A member may be expelled from the Society, given adequate indication of dishonest activity.

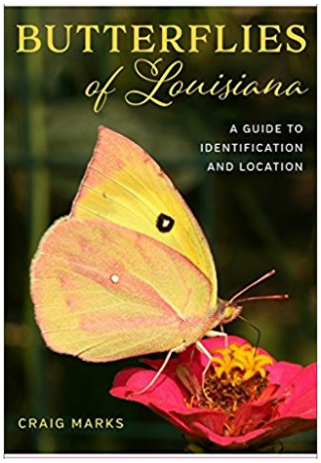
Buyers, sellers, and traders are advised to contact state department of agriculture and/or ppqaphis, Hyattsville, Maryland, regarding US Department of Agriculture or other permits required for transport of live insects or plants. Buyers are responsible for being aware that many countries have laws restricting the possession, collection, import, and export of some insect and plant species. Plant Traders: Check with USDA and local agencies for permits to transport plants. Shipping of agricultural weeds across borders is often restricted.

No mention may be made in any advertisement in the **News** of any species on any federal threatened or endangered species list. For species listed under CITES, advertisers must provide a copy of the export permit from the country of origin to buyers. **Buyers must beware and be aware.**

Butterflies of Lousiana

by Craig Marks

$45.00 paperback, 472 pages, 470 color photos, 149 maps, 978-0-8071-6870-7, March 2018



Butterflies abound in every region of the Bayou State, and with this authoritative resource in hand, both the experienced and novice butterfly watcher can identify a frequent backyard visitor or pinpoint the haunts of a particular species. With a long flight season stretching from late February to early November, Louisiana offers an abundance of opportunities to observe the 154 native species of butterflies, whose habitats range from coastal prairies to swampland to northern piney woods.

Craig Marks provides a wealth of information about each species' physical appearance, behavior, and location based on numerous documented sightings around the state. A replete resource tailored specifically to Louisiana, the guide also features:

- Multiple color photos of each species
- Parish distribution map for each species
- Identification keys
- Tips on butterfly watching and gardening
- Life cycle basics
- Best natural areas in the state for seeing butterflies
- Explanation of official butterfly counts
- Appendix of other possible species in Louisiana
- Appendix of common and scientific names of host plants
- Glossary of scientific terms

Craig Marks is a member of the Lepidopterist Society, the Southern Lepidopterist Society, and the North American Butterfly Association, and the author of many articles on butterflies.

Visit LSU Press online at **www.lsupress.org** to order this book. Enter promo code 04TWENTY at checkout to receive a 20 % discount. 603

Free back issues! Assorted back issues of the News and Journal are available for free. Please contact Chris Grinter (**cgrinter@gmail.com**) for a list of available issues going back to 1954. Please take as many as you like, as those not claimed will be recycled soon. Include $4 postage for quantities under 20, $8 for up to 40, and so on; in other words, $4 per 20 items. International orders will be shipped and billed when we know the actual postage.

The Wedge Foundation Announces Low Remaining Numbers of the Following Fascicles!

Due to excellent sales of the Moths of America North of Mexico series, there are some fascicles (volumes) which are nearing the stage of not being available. Below are those which have fewer than 200 remaining! If you are missing these volumes you may want to order them now!

Volume	Remaining	Cost
6.1 Cosmopterigidae	131	$48.00
6.2 Oecophoridae	79	$70.00
13.1A Pyralidae, Scopariinae	31	$22.00
13.1B Pyralidae Odontiinae	68	$22.00
13.2A Pyralidae Pyraustinae	73	$38.00
13.2B Pyralidae Pyraustinae	135	$38.00
18.1 Geometridae Geometrinae	181	$55.00
22.2 Lymantriidae	47	$48.00

Shipping within the United States is $5.00 per volume.Fascicles may be ordered from: The Wedge Foundation, Kelly Richers, 9417 Carvalho Court, Bakersfield, CA 93311; **OR** Entomological Reprint Specialists, 2985 E. Manzanita Ridge Pl., Tucson, AZ 85718-7342, U.S.A.; **OR** Bioquip Products, 2321 Gladwick Street, Rancho Dominguez, CA 90220

Orders for the United Kingdom: Pemberley Natural History Books, 18 Bathurst Walk, IVER, SL0 9AZ, UNITED KINGDOM.

Orders for the rest of Europe: Antiquariat Goecke & Evers, Inh. Erich Bauer, Sportplatzweg 5, 75210 Keltern, GERMANY indefinite

Butterflies of Venezuela by Andrew Neild. Condition: NEW, in original packaging. Volume 1 -- Nymphalidae Limenitidinae, Apaturinae, Charaxinae -- $100 plus shipping from Washington DC. Volume II -- Nymphalidae Acraeinae, Libytheinae, Nymphalinae -- $145 plus shipping. Both volumes together $230. One copy available. Please write to Bob Robbins at **marulosada33@gmail.com**. 602

Research

Wanted: An adult specimen, either sex, of *Lophocampa roseata* for chemical analysis of the red wing pigment. Observations, photos, specimens of larvae and adults of the Spotted Tussock Moth, *Lophocampa maculata*, and *Lophocampa roseata* from all areas of North America, recent or old data. Records from Alaska and northern Canada, the desert SW, southern Appalachians and Pacific Coast are especially needed to define range. Records of early or late season observations are particularly valuable. All larval and adult photographs are useful, especially if they show unusual patterns of coloration. Specimens are desired for future genetic analysis. Contact Ken Strothkamp, Portland State University (**kstrot2@pdx.edu**). 604

Marketplace *continued on pg. 23*

A checkered history: reconsidering the subspecific status of *Chlosyne gorgone* (Nymphalidae) in the southeast and beyond

John Calhoun

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Research Associate, McGuire Ctr. for Lep Research and Biodiversity, FL Museum of Natural History, Gainesville, FL

The gorgone checkerspot, *Chlosyne gorgone* (Hübner), is primarily a species of the Great Plains. Eastward, it tends to occur in localized, ephemeral populations. Two subspecies are currently recognized. For many years, *C. g. gorgone* was treated as the eastern subspecies, while *C. g. carlota* (Reakirt) was thought to occur westward (Forbes 1945). It was not clear, however, where one ended and the other began. Klots (1951) limited *C. g. gorgone* to eastern Georgia, with "intergrades" toward *C. g. carlota* in northern (inland) Georgia. Bauer (1975) followed suit, considering *C. g. gorgone* to be an "odd coastal subspecies in eastern Georgia." Forbes (1960) stated that the "type race was from Burke Co., in southern Georgia," not realizing that Burke County is located in east-central Georgia. The type locality of *Eresia carlota* (=*C. g. carlota*) was originally given as "Rocky Mountains, Colorado Territory" (Reakirt 1866), but Brown (1974) attempted to relocate it to "Cedar Hill, Jefferson County, Missouri." More recently, Calhoun (2011a) proposed that the type locality of *carlota* should be "the Front Range foothills of Jefferson County, Colorado, west of Denver."

Gatrelle (1998) announced that in 1993 he had discovered *C. g. gorgone* in Orangeburg County, South Carolina, which led to his "rediscovery" that same year of this butterfly at its type locality in Burke County, Georgia. Overlooking an earlier published record from Burke County (Beck 1990), Gatrelle declared that *C. gorgone* "had not been seen or collected anywhere in east coastal Georgia or coastal South Carolina since its description in 1810." After reviewing the morphology and biology of these populations, Gatrelle (1998) consigned *C. g. gorgone* to a very small area within the upper coastal plain of east-central Georgia and west-central South Carolina, making it one of the rarest butterflies in North America. However, several aspects of Gatrelle's (1998) study are misleading. Although he stated that "the range of subspecies *carlota* extends into at least the upper piedmont of Georgia and South Carolina," it is unclear how many specimens he examined from that region. He merely remarked that "a number" of specimens had been collected in "upland" Georgia and South Carolina, and he ignored specimens from all other areas of the southeast. Unfortunately, Gatrelle's (2003) follow-up paper offered no additional clarification. Without elaboration, Gatrelle (2001) also identified a population of *C. gorgone* within the mountains of North Carolina as possibly "an undescribed relict subspecies."

After examining specimens from across North America, Kons (2000) concluded that "there is no evidence of morphological discontinuity or even clinal variation between different parts of the range of *C. gorgone*, and consequently there is no basis for recognizing subspecies on morphological grounds, regardless of one's subspecies concept." Kons, however, lacked sufficient comparative material of *C. g. gorgone* as defined by Gatrelle (1998). Schweitzer et al. (2011) questioned Gatrelle's (1998) subspecies treatment and suggested that "A more critical analysis of specimens from Georgia and the Carolinas would be very useful."

With that purpose in mind, I examined over 1200 specimens and photographs of *C. gorgone* from every portion of its range, including several hundred from the southeastern states of Alabama, Arkansas, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, South Carolina, Tennessee, "Virginia," and West Virginia. Most of the specimens that I consulted are deposited at the McGuire Center for Lepidoptera and Biodiversity (Florida Museum of Natural History, Gainesville; MGCL). Others are at the Field Museum of Natural History (Chicago, Illinois: FMNH), Museum of Comparative Zoology (Harvard Univ., Cambridge, Massachusetts; MCZ), National Museum of Natural History (Smithsonian Institution, Washington, D.C.; NMNH), Natural History Museum, London (London, U.K.; NHMUK), Peabody Museum of Natural History (Yale Univ., New Haven, Connecticut; PMNH), Tall Timbers Research Station (Tallahassee, Florida), and the University of Georgia (Athens, Georgia; UGA). Some are deposited in private collections, including my own.

The southeastern specimens that I examined included 141 supposed *C. g. carlota* from Georgia (101 males and 34 females from 13 counties in the Piedmont and mountains) and South Carolina (4 males and 2 females from two counties in the mountains), as well as 98 wild-caught and reared specimens (49 males, 49 females) of purported *C. g. gorgone* from three localities in the upper coastal plain of eastern Georgia and western South Carolina. I also reviewed the biological information presented by Gatrelle (1998, 2003). Based on my findings, the criteria used by Gatrelle and others to separate *C. g. gorgone* and *C. g. carlota* are untenable.

Historical summary. In his three-volume book *Sammlung Exotischer Schmetterlinge* [Collection of Exotic

Fig. 1. Figures of Dryas gorgone from Plate [41] of Hübner (1806-[1838]) (NMNH), which represent the original description of this nominal taxon (1, dorsal; 2, ventral).

Butterflies], Hübner (1806-[1838], Pl. [41]) published a hand-colored illustration of a butterfly that he called *Dryas gorgone* (Fig. 1). The four figures on this plate probably portray the dorsal and ventral aspects of two specimens. Unbeknownst to Hübner, however, these figures actually depict the male and female of two different species. While the name *Dryas gorgone* was long ago associated with the figured male (Scudder 1875), the female represents *Phyciodes phaon* (W. H. Edwards). Because no text accompanied this plate, the figures of the male butterfly serve as an indication (i.e. original description) of *Dryas gorgone*, but it was not until the 1970s that usage of this name stabilized for the butterfly that we now recognize as *Chlosyne gorgone*.

Some authors (e.g. Klots 1951, Miller & Brown 1981) believed that Hübner's figured specimen of *C. gorgone* came from eastern or coastal Georgia, implying a connection to the English artist-naturalist John Abbot (1751-c.1840), who collected and illustrated many species of Lepidoptera during his 64 years in Georgia. Scudder (1869, 1872) mentioned Burke County, Georgia, in association with one of Abbot's drawings of *C. gorgone* (Calhoun 2003a), which explains why Forbes (1960) stated that "the type race is from Burke Co., in southern Georgia." Hübner's figures appear to portray a dark phenotype, suggesting that populations in eastern Georgia are unusually dusky (and therefore "odd"); a popular assumption that clearly influenced Gatrelle (1998).

Harris (1972) and Gatrelle (1998) claimed that Hübner's figures of *Dryas gorgone* were derived from one of John Abbot's drawings. This notion, repeated in several of Gatrelle's publications, is unfounded. As part of my ongoing studies of Abbot's entomological contributions, I have conducted detailed comparisons between his artwork and Hübner's published illustrations of North American butterflies. Their artistic styles fundamentally differed, and Hübner's figures of *Dryas gorgone* do not resemble any of Abbot's many renderings of *C. gorgone*. The origin of these claims can possibly be traced to 32 small drawings by Carl Geyer (1796-1841), who later assisted Hübner with the publication of *Sammlung Exotischer Schmetterlinge* and continued to issue parts after Hübner's death. The drawings (NHMUK) portray figures of Lepidoptera that Geyer copied from published plates in Smith and Abbot (1797). All are marked "Abb." (Abbot) and include the number of the published plate. Only three portray butterflies, derived from Plates 14, 16, and 24 of Smith and Abbot (1797). It does not appear that any of these duplicate illustrations by Geyer were ever published. Hübner undoubtedly drew and engraved his figures of *Dryas gorgone* from an actual specimen.

Due to the rarity of *C. gorgone* in the east, John Abbot was possibly the only source of early specimens of this species. Megerle (1804) auctioned butterflies from Georgia, which he called "*Papilio Gorgonia*," based on a name proposed by Franz A. Zeigler, a museum curator in Vienna, Austria (Clark 1941, Harris [1950]). In 1810, Hübner adapted this name for his plate of *Dryas gorgone*. It is therefore conceivable that Hübner's figured specimen of *C. gorgone* can be traced back to Megerle's sale and, in turn, to Abbot. The fate of this specimen is unknown (Calhoun 2003a), but there is evidence that Hübner removed the wings from the specimens that he illustrated and pasted them into scrapbook-like volumes, which are now missing (Hemming 1937).

Fig. 2. Drawing of *C. gorgone* by John Abbot, c. 1792 (© The Natural History Museum, London).

Abbot's earliest known drawing of *C. gorgone* (Fig. 2) was probably completed around 1792 (Calhoun 2005). He copied the adult figures in this drawing for an illustration that portrayed the life history of this species (Fig. 3), which he rendered between 1804 and 1810. His notes for this drawing mentioned that he found this butterfly in Burke County, Georgia (Calhoun 2003a). In turn, Abbot duplicated this life history composition, and its accompanying notes, for many years (Calhoun 2003a, 2007b). Consequently, the specimens that he collected in Burke County were the subjects of all his illustrations of this species, including the poorly-rendered figures on which Boisduval and Le Conte (1829-[1837]) based their original description of *Melitaea ismeria* (Calhoun 2003a, 2004, 2005). Abbot lived in Burke County from 1776 to 1806, when he moved to Savannah, Chatham County, Georgia. In a later version of his notes, he also remarked that the butterfly "is not in the lower parts of the

Fig. 3. Life history drawing of *C. gorgone* by John Abbot, c. 1804-1810 (© The Natural History Museum, London).

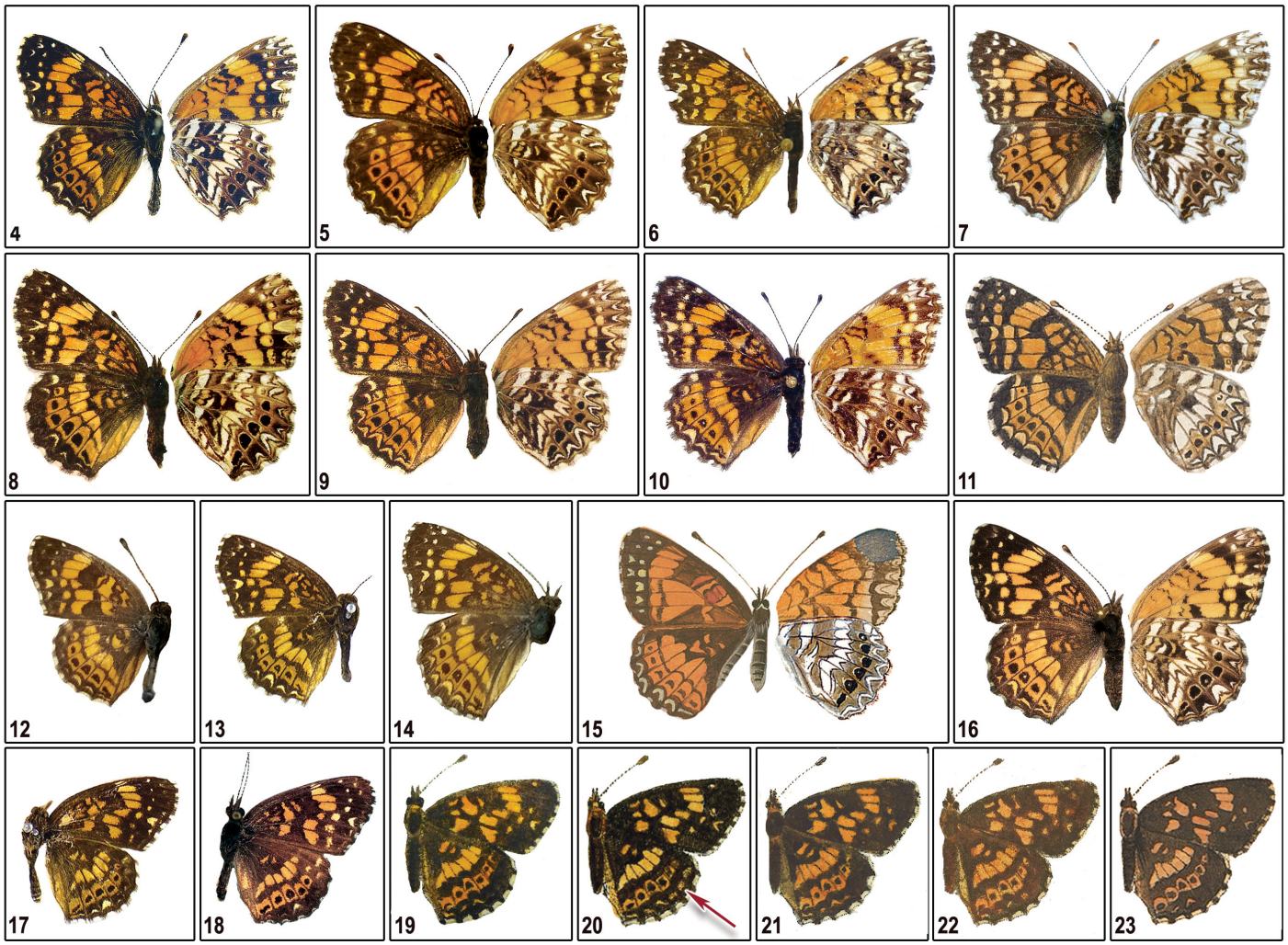
Country," referring to southern Georgia. This implies that Abbot never found *C. gorgone* outside of Burke County. Screven County, Georgia, which is often mistakenly associated with all of Abbot's activities, was established in 1793 from parts of Burke and Effingham counties. This predates Abbot's earliest known written observations of *C. gorgone*, thus his allusions to Burke County probably refer to it as it exists today.

At least four old specimens of *C. gorgone* from Georgia were possibly collected by Abbot: two males and a female at the Macleay Museum (Univ. of Sydney, Australia; MAMU) (Figs. 12, 14), and a male at NHMUK (Fig. 13). All of these specimens may have come from the collection of Dru Drury, which was auctioned in 1805. A damaged male *C. gorgone* at the Zoologische Institut und Zoologisches Museum (Universität von Hamburg, Germany; ZMUH) may also have come from Abbot, as its label mentions "Georgia" and the name "Francillon." Although the London jeweler and natural history dealer John Francillon (1744-1816) sold many of Abbot's insects and drawings to European naturalists, other notations on this specimen's label imply that it was collected later during the nineteenth century.

A female *C. gorgone*, probably collected by Abbot, is illustrated without a name in "Jones' Icones" (vol. 3, Pl. 81) (Fig. 15). This specimen was reportedly from the collection of Dru Drury (1725-1804), a London silversmith who received numerous insects from Abbot. Beginning around 1783, William Jones (1745-1818), an English wine merchant and naturalist, rendered life-sized watercolor illustrations of Lepidoptera that were contained in notable collections around London, including that of Drury. These drawings, long ago nicknamed "Jones' Icones," are currently bound into six volumes at the Hope Library of Entomology (Oxford Univ. Museum of Natural History, Oxford, UK; OUMNH). Unfortunately, Jones washed portions of his ventral figure of *C. gorgone* with a varnish, which has become discolored over time. I digitally restored the ventral hindwing to its probable coloration (Fig. 15), but the patch of varnish on the apical portion of the ventral forewing completely obscures the markings beneath.

To fix the type locality of *Dryas gorgone*, Gatrelle (1998) designated a neotype (Fig. 4) using a specimen of *C. gorgone* from Burke County, Georgia. This specimen, donated in 1998 to the former Allyn Museum of Entomology (AME), is now missing; it was last seen in 2002. Gatrelle did not publish a detailed type locality for *D. gorgone*, but the neotype was labeled "River Rd at Hancock Landing Rd.," which is in northeastern Burke County, near the community of Hancock Landing, just west of the Savannah River. Only a short distance from Abbot's former home, this area is located within the Sand Hills ecoregion, which forms the boundary between the upper coastal plain and Piedmont physiographic regions. A population of this butterfly, not far from the town of North, Orangeburg County, South Carolina, was also identified by Gatrelle (1998) as representing *C. g. gorgone*. It is located within the Atlantic Southern Loam Plains ecoregion, just south of the Sand Hills. Gatrelle (1998, 2003) therefore limited the range of *C. g. gorgone* to the upper coastal plain of east-central Georgia and west-central South Carolina. In addition, Nick M. Haddad collected *C. gorgone* in the Sand Hills ecoregion of Aiken County, South Carolina, which lies adjacent to both Burke County (to the southwest) and Orangeburg County (to the southeast). He collected nine specimens in an area across the Savannah River from Burke County on 13-22 April 1995 and 24 April 1996 (UGA). By Gatrelle's (1998) definition, these would also represent *C. g. gorgone*.

After his death, the bulk of Ronald R. Gatrelle's Lepidoptera collection was purchased by C. Howard Grisham. Based on photos and information kindly provided by Grisham, Gatrelle's collection contained seven mounted specimens of *C. gorgone* from the type locality in Burke County, Georgia (Figs. 5, 6): six males, dated 27 and 29 April 1993; and one female, dated 21 April 1994. Gatrelle collected the male neotype of *Dryas gorgone* in Burke County on 27 April 1993 (Fig. 4). Another female (Fig. 7), collected in Burke County by Gatrelle on 29 April 1993, was given to Jeffrey R. Slotten and later figured by Schweitzer et al. (2011). I collected a pair (male and female) in the same area on 26



Figs. 4-23. Specimens and illustrations of *C. gorgone*. Dorsal (left) and ventral (right) unless otherwise noted (some images are reversed to show undamaged wings). **4,** male, neotype of *Dryas gorgone,* 27.iv.1993, Burke Co., GA, leg. R. R. Gatrelle (specimen missing; image from AME, 2002); **5,** female, 21.iv.1994, Burke Co., GA, leg. R. R. Gatrelle (C. H. Grisham coll.); **6,** male, 29.iv.1993, Burke Co., GA, leg. R. R. Gatrelle (C. H. Grisham coll.); **7,** female, 29.iv.1993, Burke Co., GA, leg. R. R. Gatrelle (J. R. Slotten coll.); **8,** female, 8.v.2017, Hardin Co., KY, leg. L. D. Gibson (Gibson coll.); **9,** female, 8.v.2017, Hardin Co., KY, leg. L. D. Gibson (Gibson coll.); **10,** female, 26.iv.2003, Burke Co., GA, leg. J. V. Calhoun (Calhoun coll.); **11,** drawing of female by J. Abbot, c. 1792 (NHMUK)* (reconfigured to resemble mounted specimen); **12,** male, no date, "Georgia," poss. leg. J. Abbot (MAMU); **13,** male, no date, "Georgia," poss. leg. J. Abbot* (NHMUK); **14**, female, no date, "Georgia," poss. leg. J. Abbot (MAMU); **15,** drawing of female by W. Jones ("Jones' Icones"), c. 1785, prob. leg. J. Abbot (reconfigured to resemble mounted specimen, with ventral hindwing color restored) (OUMNH); **16,** female, ex. ovum, emerged 28.v.1996, Orangeburg County, SC, leg. R. W. Boscoe (MGCL); **17,** male (dorsal), [1843], "Ohio," [leg. D. Dyson] (NHMUK)*; **18,** male (dorsal), 17.v.1958, Old Fort Mtn. St. Pk., Murray Co., GA, leg. L. Harris, Jr. (MGCL). **19-23,** dorsal figure (right side) from Pl. [41] from Hübner (1806-[1838]): **19,** pattern plate (NHMUK)*; **20,** WU (arrow denotes row of submarginal hindwing spots); **21,** NMW; **22,** NMNH; **23,** AMNH. (*© The Natural History Museum, London.)

April 2003 (Fig. 10). I know of no other specimens from the type locality. Contrary to Gatrelle's (1998) claim, the first person to rediscover this species in Burke County was Chris Adams, who photographed it in 1989 at the same locality where Gatrelle found it four years later (Beck 1990b, C. Adams via D. M. Wright pers. comm.).

I am not aware of any records of *C. gorgone* from Burke County, Georgia, since 2003, though the species probably still occurs there. The locality in Orangeburg County, South Carolina, was altered by development and no adults were observed there about five years ago (J. R. Slotten pers. comm.). The species was locally common in a small area of western Aiken County, South Carolina, during the mid-1990s, but the current status of that population is unknown (N. M. Haddad pers. comm., M. A. Vukovich pers. comm.).

Eastern distribution of *C. gorgone*. Subsequent to Abbot, the first known record of *C. gorgone* from east of the Mississippi River is a single male from Ohio (probably near Cincinnati), collected by David Dyson in 1843 (Calhoun 2003b, 2011b) (Fig. 17). It has not been seen in Ohio since, but it may still occur there (Iftner et al.

1992). Once considered rare in Illinois, *C. gorgone* greatly increased in abundance between the 1960s and 1980s. It has since declined, but is still found in the northern parts of the state (Jeffords et al. 2014). There are many records of the species from Wisconsin, especially the western counties, where it is still locally common (Reese 2017). Farther east, there are a few reports from Michigan, where it has not been found since 1958 (Nielsen 1999). It was first recorded in Indiana during the 1960s (Masters & Masters 1969), but there have been no reports in recent years (Belth 2013). The only records in Pennsylvania and New York are from 1906 and 1970, respectively (Shapiro 1974, Monroe and Wright 2017). In Ontario, Canada, it was unknown between the 1890s and 1996, when it was recorded at 13 localities in the eastern portion of the province (Catling & Layberry 1998), possibly the result of recent expansion from the west. Southward, a small number of records are known from West Virginia, all during the late nineteenth century (Edwards 1894, Allen 1997, FMNH). It was first documented in Kentucky in 1874 (Covell 1999, FMNH, MCZ); after many years with no reports it was rediscovered in 2017 (L. D. Gibson pers. comm.; Figs. 8, 9). This butterfly was first recorded in Tennessee during the 1990s, and it was still present in 2016 (Venable 2014, B. Haley pers. comm.). Originally reported from Mississippi during the early 1950s, there are a handful of additional records into the mid-1990s (Mather & Mather, R. Patterson pers. comm.). The earliest known Alabama specimens are from 1934 (PMNH). There are several additional records from the 1940s and 1950s, but none since (Ogard & Bright 2010, MGCL, NMNH, PMNH). In North Carolina it was first found in 2001, but few adults have been observed at known localities in the western mountains, and there are no reports after 2006 (LeGrand & Howard 2017). (A record mapped by Metzler et al. (2005) within the eastern mountains of North Carolina appears to be in error.) It was first recorded in the Piedmont of South Carolina in 1987 (Beck 1988), where it was locally common during the late 1980s and early 1990s (C. N. Watson, Jr. pers. comm.). Although Harris (1972) listed no Georgia records of *C. gorgone* before 1942, the first confirmed record (subsequent to Abbot) is a single specimen from the Piedmont, southwest of Atlanta, dated 1935 (NMNH). The origin of an older specimen at ZMUH, with the notation "Georgia" on its label, is unknown. The species was still known to occur in northern Georgia in 2011 (Ogard & Bright 2011a, 2011b).

Chlosyne gorgone was also reported from Virginia on the basis of an old specimen with incomplete data (Hall 1928-1930, Clark & Clark 1951, Higgins 1960). This specimen was recently found at NHMUK. A dark male similar to that figured by Hübner (1806-1838), it bears a handwritten label reading "Virginia / H. Strecker," indicating that it came from the American lepidopterist F. H. Herman Strecker (1836-1901). It was donated to the museum in 1915 by the English entomologist Frederick D. Godman (1834-1919), and the handwritten label is in his script. This specimen is presumably the reason why Strecker (1878) listed Virginia within the range of this species, implying that it was collected prior to 1878. This locality is dubious, as no other records from Virginia are known (H. Pavulaan pers. comm.). Furthermore, Strecker's collection at FMNH includes a single undated male *C. gorgone* labeled "W. Virginia," thus there is the possibility that other specimens so labeled were interpreted as having come from western Virginia (West Virginia was split from Virginia in 1861). Strecker's correspondence (FMNH) reveals that he sent North American butterflies to Godman between 1878 and 1890, but the original source of the "Virginia" specimen is unknown. In addition, a male *C. gorgone* labeled "USA: Maine / Barnesville / June 1902" is deposited at NMNH. Its printed label is of modern origin, and there is no such town in Maine. This record probably applies to Barnesville, Clay County, Minnesota, where this species is known to occur (Opler 1995).

Habitats of *C. gorgone* within the upper coastal plain of eastern Georgia and western South Carolina are considerably disturbed. The butterflies have been found mostly along weedy roadsides in association with food plants and nectar sources (Fig. 24). Abbot possibly encountered them in similar situations. He lamented in 1818 that the countryside was "being more cleared and settled, and the woods being burnt every spring for the benefit of their cattle" (Calhoun 2007a). In the east, *C. gorgone* probably originally occupied prairie remnants, forest openings, thin woods, and early successional habitats in the wake of fires. The relative scarcity of open habitats eastward (as opposed to the Great Plains) possibly restricted the widespread establishment of this species.

Fig. 24. Habitat of *C. gorgone* in Burke County, GA, 26.iv.2003 (J. V. Calhoun).

Wing morphology. Published definitions of *C. g. gorgone* and *C. g. carlota* have differed, mostly because there was little agreement on the distributions of these alleged subspecies. Undoubtedly based on Hübner's figures, Klots (1951) stated that the ventral hindwing of the nominotypical subspecies "lacks the prominent deep, arrowhead-like, outer lines and lunules of *carlota*." Brown et al. (1955) remarked that "The markings along the margins of the wings on the underside are whitish dots on *gorgone* and whitish bars on *carlota*." Quoting the lepidopterist Cyril F. dos Passos, Mather and Mather (1958) remarked that *C. g. carlota* is "much duller on the upper side." Harris (1972) noted that the "dark submarginal border on the lower side of the hindwing extends through the apex on *C. g. gorgone*, whereas on *C. g. carlota*, the apical area of the lower side of the hindwing is light." Gatrelle (1998) more specifically characterized *C. g. gorgone* as darker, with no white pupil in the "submarginal" (=postmedian) hindwing black spot in cell M3, and with restricted "marginal" (=submarginal) white chevrons on the ventral hindwing. Gatrelle (1998) argued that "These differences alone are enough to validate subspecific status." Gatrelle (2003) subsequently added that *C. g. gorgone* has a very dark ventral hindwing, and confessed that females of this subspecies frequently have a full row of white submarginal chevrons on the ventral hindwing, whereas males rarely display this feature. Gatrelle (2003) also amended his previous statement about the absence of the white pupil in cell M3 of the nominotypical subspecies, observing that "males rarely and females seldom have" this spot ventrally. Gatrelle's concept of *C. g. gorgone* was pushing closer to that of *C. g. carlota*, blurring the line between these subspecies as he perceived them.

My own analysis reveals that these characters are unreliable in separating the two putative subspecies. Although some populations of *C. gorgone* favor slightly more dusky or fulvous phenotypes (probably due to elevational effects, microclimatic influences, and other factors), wing morphology is tremendously variable. The dark phenotype figured by Hübner (1806-[1838]) is not limited to the upper coastal plain as implied by Gatrelle (1998) and others. Such adults are routinely produced throughout the species' range (Figs. 17, 18). The darkness of the ventral hindwing is not constant anywhere and can vary depending upon the freshness of the living individual or age of the specimen. In all populations, the white submarginal chevrons on the ventral hindwing of males are usually less pronounced than in females, and they less often display a full row. The presence or absence of a white pupil within the black postmedian spot in cell M3 of the hindwing is also variable in all populations, though it appears to be more prevalent within the central Great Plains. I found that the frequency of adults that possess this trait is the same (about 40%) in populations of alleged *C. g. carlota* in the Piedmont and Mountains of Georgia and South Carolina, as it is in supposed *C. g. gorgone* of the upper coastal plain (Figs. 7, 10, 16). The pupils vary in size from a few scales to a prominent dot, and it is more often expressed ventrally. The female that I collected in Burke County, Georgia, bears a pupil in cell M3, as well as a trace pupil in adjacent cell CuA1 (Fig. 10). The female specimen illustrated in "Jones' Icones" (Fig. 15), which likely also came from Burke County, similarly exhibits two pupils. Gatrelle (2003) noted that males of *C. g. gorgone* do not possess pupils dorsally, yet two specimens that I examined have trace dorsal pupils. Two males and one female that were possibly collected by Abbot (Figs. 12-14), as well as Abbot's illustrated female (Fig. 11), express this character to varying degrees, both above and below. Males usually lack dorsal pupils range-wide, not just in the upper coastal plain.

Opler and Krizek (1984) and Allen (1997) mentioned a "large pale form" of *C. gorgone*, which they attributed to Georgia, Alabama and South Carolina. Klots (1951) discussed this form under the name *Melitaea ismeria*, based on specimens collected in Georgia by Lucien Harris, Jr. (see Harris 1972), which is the source of all these references. Gatrelle (1998, fig.6) figured a female of this phenotype as an example of eastern *C. g. carlota*, apparently to emphasize his claim that adults of *C. g. gorgone* are much darker. These exceptionally fulvous forms are not limited to the southeast, nor are they typical anywhere.

The butterflies figured in Abbot's drawings (Figs. 2, 3, 11) were collected in Burke County, Georgia, yet they agree with Gatrelle's (1998, 2003) definition of *C. g. carlota*. This misled Calhoun (2004, 2005) to suggest that Abbot's figures portray *C. g. carlota*. However, a female that Gatrelle collected at the type locality of *C. g. gorgone* in Burke County (Fig. 7) is strikingly similar to Abbot's illustrated female (Fig. 11). The female figured in "Jones' Icones" (Fig. 15), probably also collected by Abbot, portrays a similar phenotype. Many specimens from the upper coastal plain of eastern Georgia and western South Carolina (Figs. 6, 7, 16), including my own from Burke County (Fig. 10), violate Gatrelle's concept of *C. g. gorgone*.

Despite Gatrelle's (1998) assertion that "*gorgone gorgone* varies slightly, but consistently, from *gorgone carlota* in phenotype," I was unable to discern any stable morphological features that warrant the segregation of upper coastal plain ("Sand Hills") populations from others in the southeast. Even adults from central Kentucky closely resemble those from Burke County, Georgia (Figs. 5, 7, 8, 9). In turn, I could not reliably separate southeastern specimens from those in other parts of the species' range. Mather and Mather (1958) also failed to detect consistent differences between distant populations. As observed by Kons (2000), there is no evident discontinuity or clinal variation from one region to another.

Hübner's figures. It is obvious that Gatrelle (1998) derived his images of Hübner's figures from Brown (1974). The files of F. Martin Brown (MGCL archives) reveal that he received a photograph of Hübner's plate in 1963 from

Frederick H. Rindge of the American Museum of Natural History (New York, New York; AMNH). I obtained a digital scan of the AMNH plate (Figs. 1) and compared it with prints of the plate at the Cullman Library (NMNH), the Naturhistorisches Museum (Vienna, Austria; NMW), and the Thomas Rare Book Library (Wittenberg Univ., Springfield, Ohio; WU) (Figs. 20-22). I then compared these prints against the original pattern plate (NHMUK) (Fig. 19), which was created by Hübner as a guideline for coloring the published plates of *Sammlung Exotischer Schmetterlinge*. Among these prints, the darkest is that at AMNH (Fig. 23), which was cited by Gatrelle as an example of typical *C. g. gorgone*. The most intriguing print is at WU, within a copy of Hübner's book that was owned by the American lepidopterist Cyril F. dos Passos. The dorsal figure (Fig. 20) is most like the pattern plate in coloration, except that it displays a complete row of pale submarginal spots on the hindwing, similar to two males of *C. gorgone* that Gatrelle collected in Burke County, Georgia (Fig. 6), as well as a male specimen Abbot repeatedly figured (Fig. 2). These spots are also partially visible on the published print at NMNH (Fig. 22). These markings were possibly present on the original specimen, but were not included on the pattern plate, nor most of the published prints.

Hübner produced thousands of plates for his publications. To keep up with this staggering output, he possibly employed colorists (such as art students) to assist in this process, which would explain the variation between prints. Because the 491 plates of Hübner's *Sammlung Exotischer Schmetterlinge* were issued over a period of many years, it is also possible that new copies of earlier plates were issued for late subscribers who desired a complete set of all the illustrations as published. This was possibly continued by Geyer after Hübner's death. Although this was not an uncommon practice among serialized publications of the nineteenth century, it often affected the consistency of the prints, which were sometimes colored years apart by different people (Calhoun 2006, 2017). The publication of such books was rather chaotic and not nearly as straightforward as generally believed.

Biology. Gatrelle (1998) considered differences in biology, specifically the number of broods, "to be the strongest reason to consider *gorgone* as a distinct subspecies." He argued that the populations he studied in Burke County, Georgia, and Orangeburg County, South Carolina, are "strongly univoltine," while other eastern populations are thought to be bivoltine or multivoltine. This includes populations in the Piedmont and mountains of Georgia, where adults have been recorded from late March to September. Gatrelle (1998, 2003) observed that adults of coastal populations emerge in mid to late April and are entirely absent by mid-May, with no flights later in the season. It is well known that *C. gorgone* overwinter as diapausing larvae, and Gatrelle (1998) maintained that in populations of the upper coastal plain it is "virtually impossible to keep larvae from entering diapause," thus they do not produce additional broods.

To support this claim, Gatrelle divulged the location of the population in Orangeburg County, South Carolina, to Richard Boscoe of Pennsylvania, who is very skilled at rearing North American butterflies. Boscoe visited the locality on 28 April 1995 and found egg masses on the hostplant, *Helianthus divaricatus* L., from which he obtained many adults (R. W. Boscoe pers. comm.). Gatrelle (2003) later announced that "Boscoe only obtained adults by allowing diapause [of the larvae] and adults emerged the next spring," citing his personal communication with Boscoe. While this claim would offer persuasive evidence that Gatrelle's single-brood hypothesis was correct, it is patently untrue.

Boscoe reared at least 97 adults of *C. gorgone* from eggs found on 28 April 1995 in Orangeburg County, South Carolina. Of these, no fewer than 18 emerged the same year; nearly twenty percent of the total. The larvae were allowed to develop normally and were not subjected to any special rearing techniques (R. W. Boscoe pers. comm.). Ten males emerged 31 May-7 June 1995, and seven females emerged 4-6 June 1995. Of particular interest, one male emerged on 20 September 1995. These specimens are deposited at MGCL and in Boscoe's personal collection. One of the females that emerged in 1995 (MGCL) was figured by Monroe and Wright (2017). (The male figured in this book was also reared by Boscoe, but the reported emergence date should be 22 May 1996.) These results support John Abbot's rearing notes, which indicate that a larva from Burke County pupated on 17 May and the adult eclosed on 26 May. Even Gatrelle reported that two larvae that he reared from the Orangeburg County locality developed into adults during the same year, emerging on 7 and 9 June (Gatrelle 1998, 2003). He downplayed their significance, however, and noted that the adults were malformed and aberrant. His rearing methods (which included exposing the larvae to harsh, continuous light, and prodding them to remain "awake") possibly altered their natural development. Also, larvae require fresh food plant and will not continue to develop if cut leaves begin to dry (R. W. Boscoe pers. comm.). This may explain why Gatrelle's own rearing efforts, as well as those of Thomas J. Allen, resulted only in diapausing or dead larvae. To explain his observations, Gatrelle (2003) concluded that Abbot must have confused his rearing data with that of *Chlosyne nycteis* (Doubleday), but I have found no proof that Abbot ever encountered that species in Georgia.

Although Gatrelle (1998) believed that univoltine populations of *C. gorgone* are restricted to the upper coastal plain, other populations in Georgia and the Carolinas seem to exhibit a similar phenology. Gatrelle (2001) found *C. gorgone* to be locally well established in the extreme western mountains of Clay County, North Carolina, where he recorded adults 5-18 May 2001. He surveyed the area on multiple occasions between 4 May and 2 October of that year, yet he failed to find any adults after 18 May. This perceived discrepancy possibly convinced Gatrelle (2001) that the Clay County population may represent an

undescribed subspecies. To date, there are no records of *C. gorgone* in North Carolina later than 27 May (LeGrand & Howard 2017).

The latest confirmed record of *C. gorgone* in South Carolina is 16 June (B. G. Scholtens pers. comm., C. N. Watson, Jr. pers. comm.). Although Charles N. Watson, Jr., repeatedly collected at the same localities in Oconee and Pickens counties of northern South Carolina during July-September from 1987 to 1991, he did not encounter the species later than 16 June. A date of 25 June 1988, reported by Gatrelle (1998) for a specimen collected by Watson in Oconee County, South Carolina, is in error. Although Gatrelle's handwritten label is dated "June 25, 1988" (C. H. Grisham pers. comm.), the specimen was actually collected on 25 April 1988 (C. N. Watson, Jr. pers. comm.). The earliest record of *C. gorgone* in South Carolina, outside the upper coastal plain, is 22 April (B. G. Scholtens pers. comm.). There is one credible sight record of a single worn adult on 14 October 2005, in Jasper County, near the Savannah River in southern South Carolina (Scholtens 2006, D. M. Forsythe pers. comm.).

Harris (1972) listed eight records in Georgia later than May, representing only 25 percent of all those he reported. All but 23 of the 141 "inland" Georgia specimens that I examined are dated mid-April-late May. The remaining specimens, dated 8 June-27 August, represent only 16 percent of the total. Recent published records from Georgia are from April-early June, with one from 23 March (Adams 2003, 2004; Scholtens 2004, 2011; Ogard & Bright 2011a, 2011b).

Records of *C. gorgone* from Alabama, Kentucky, Louisiana, Mississippi, and Tennessee are mostly from April-June. Published reports from Alabama are from late April-late May and "late spring" (Chermock 1951, 1953; Baggett 1983, Beck 1990a). The 13 Alabama specimens that I examined are dated 24 April-25 June, with fewer after early May (MGCL, NMNH, PMNH). A couple of additional Alabama specimens in the collection of C. H. Grisham are from April. Kentucky records are dated 2-30 May, with a questionable report from 29 June (Covell 1999, MCZ). At least 50 adults were recently observed in Kentucky on 8 May, but none were seen at the same locality in late June or late July (L. D. Gibson pers. comm.). Louisiana records extend from March to mid-October (Lambremont 1954, Lambremont & Ross 1965), but the 28 specimens deposited at MGCL are dated 13 April-28 May, and individuals were recently photographed on 30 May (BugGuide 2017). In Mississippi, this species has been recorded from April to early May (Mather & Mather 1958, R. Patterson pers. comm.). Nine Mississippi specimens that I examined, from the collection of R. Patterson, are dated 13 April-9 May. Tennessee records are mostly from late April to early June, with some from late June and early July (Venable 2014, B. Haley pers. comm.). It was recorded in West Virginia from early May to mid-July (Edwards 1897 Allen 1997). Arkansas records are primarily April-July (Spencer 2006).

Although the range of confirmed dates of *C. gorgone* in the southeast gives the impression that up to three broods are produced in some areas, records later than June are scattered and typically involve a relatively small number of individuals. This strongly suggests that southeastern populations are predominantly univoltine, with adults flying from late March to early June, depending upon locality and seasonal conditions. This appears to be followed by a staggered, partial second brood, with some adults emerging from late May to September or early October. A portion of the larvae develop directly without diapausing. Some of the pupae resulting from those larvae evidently delay their development for weeks or months, producing adults later in the season. Other larvae may break diapause and complete their development during the same season. In addition to Boscoe's rearing results, a partial second brood is suggested by the observations of Ogard and Bright (2011a), who found adults at a locality in northern Georgia on 19 April. By late May, they observed that some third instar larvae were diapausing within the dried, lower leaves of their *Helianthus* food plants, while older larvae continued to feed. Returning to the same locality on 6 June, they found a handful of adults on the wing (Ogard & Bright 2011b). Even Harris (1972), who documented records of *C. gorgone* as late as September, suspected that only two broods are produced in Georgia.

Gatrelle (1998) argued that populations located within the dry, upper coastal plain ("Sand Hills") habitats of eastern Georgia and western South Carolina are probably forced into univoltinism by a lack of nectar sources later in the season. On the other hand, such a paucity of flowers would also make it very difficult to find the few adults of a partial second brood, as they would probably disperse in search of nectar resources. Obviously, more research is required to confirm the biology of these populations.

Summary. I examined specimens of *C. gorgone* from numerous localities across its range, and found that the various morphological characters that Gatrelle (1998, 2003) and others used to differentiate *C. g. gorgone* and *C. g. carlota* are unreliable. Available evidence challenges Gatrelle's (1998, 2003) assertion that populations within the upper coastal plain of eastern Georgia and western South Carolina ("Sand Hills") have a different biology than other southeastern populations (West Virginia and Kentucky, south to Georgia, and west to Arkansas and Louisiana). Although populations of *C. gorgone* in the "Sand Hills" of Georgia and South Carolina are localized and vulnerable, they do not appear to merit taxonomic segregation. The lectotype of *Eresia carlota*, which was collected along the Colorado Front Range, represents an elevational phenotype (Calhoun 2011a). This name should probably be restricted to populations along the eastern slope of the Rocky Mountains, perhaps as nothing more than a form. Genetic studies are needed to better understand the relationships between populations of *C. gorgone* across its extensive range.

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Marketplace ads -- Research

Continued from p. 13

WANTED: Specimens needed of *Carmenta ithacae* for DNA analysis and museum specimens (image attached). Will cover postage and will compensate collector ten dollars per specimen for up to 12 individuals. Please contact: William Taft at **billandgussie@earthlink.net** for more information or any questions. (see back page for image of *Carmenta ithacae*) 604

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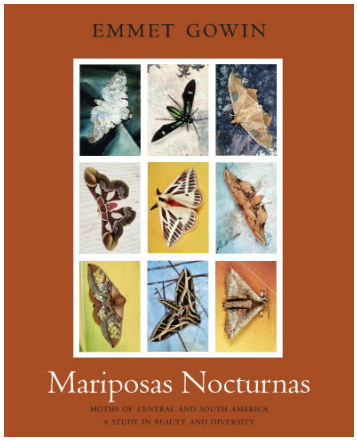
Book Reviews

Mariposas Nocturnas; Moths of Central and South America, A Study in Beauty and Diversity, by Emmit Gowin. Princeton University Press, 2017. $49.95. 143 pgs.



I greatly enjoyed David Fischer's striking and colorful photos of the moths of Fraser's Hill, Malaysia, that were presented in a recent three-part series in the *News of the Lepidopterists' Society*. If that series interested you or if you have any interest in moths, you should take a look at Emmet Gowin's *Mariposas Nocturnas*.

Mariposas Nocturnas presents a huge selection of startlingly beautiful images of moths from Central and South America, arranged on each page in a grid of 25 images- a total of more than one thousand species from Bolivia, Brazil, Ecuador, French Guiana, and Panama. Each facing page lists the common and scientific name of each specimen, and there is an alphabetical list of species names at the end of the book that is linked to each photo. The moths, almost all of them alive, are posed on interesting backgrounds that enhance the images and enrich the grids. First Gowin photographed the moths on fragments of painted wood and pieces of faded silk flowers; later he carried with him into the field scanned and printed copies of works of art to use as backgrounds.

Gowin is an emeritus professor of photography at Princeton University whose photos are in collections around the world. When I met him at the Pace Gallery in New York where images from this book were on exhibit it was clear that he had been captivated by these moths and had become an "enthralled amateur", a term he uses in the book to describe another enthusiast but that fits him as well. In the book he describes the thrill of raising *Citheronia regalis* moths from eggs that he watched the mother lay, and he shares several compelling stories about his experiences in the field. He photographed the moths over 15 years, working with scientists and field biologists at the Smithsonian Tropical Research Institute in Panama, the Organization for Tropical Studies in Costa Rica, and at other research centers in the field.

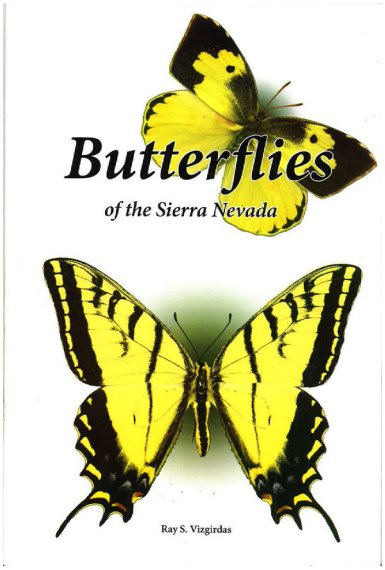
This book is a scientifically valuable work of art that is a magnificent tribute to the diversity, beauty, and complexity of the tropics.

Carol A. Butler, 60 West 13th Street, New York, NY 10011, **cabutler1@outlook.com**

Mist Forest, Chiriqui, Panama, 2008

Plate 31

THIS ONLY LOOKS LIKE A BOOK ABOUT SIERRA NEVADA BUTTERFLIES



Note that the upper butterfly is a male *Zerene caesonia,* which does not occur in the Sierra Nevada--the same image Vizgirdas uses to illustrate his write-up of *Z. eurydice,* which does.

More than a decade ago a University press sent me a book proposal for review—a proposal for a field guide to the butterflies of the Sierra Nevada. Lord knows, we could use one. The University of California Press contracted for one a long time ago, but nothing ever happened. I would write one myself, except virtually all of my Sierran experience has been from Yosemite north. Anyway, I found the prospect of such a book exhilarating. Then I read the proposal. It was ghastly—god-awful—and I told the press in question in as many words that if it actually published it, it would be an object of ridicule for a generation. The author's name was completely unfamiliar to me. That's no big deal: I don't know everybody who has Sierran butterfly savvy. The manuscript gave no internal evidence that the author had any Sierran experience whatsoever. Indeed, to the contrary: it covered a variety of Rocky Mountain species that do not occur in the Sierra – as if the author had used a Rocky Mountain reference (presumably Ferris and Brown's *Butterflies of the Rocky Mountain States*) and just lifted content bodily from it. And it missed species that were actually in the Sierra. The MS was rejected. I thought that was the end of it . . . It wasn't.

I just discovered that the author completely reworked it – he actually read some stuff about Sierran butterflies this time, including some stuff by me – and got it published under the title "Butterflies of the Sierra Nevada," not as a free-standing book, but as two numbers of a journal that no Lepidopterist ever reads: the *San Bernardino Museum Association Quarterly,* vol.54 (2007). (It's for sale at their Museum store—perhaps nowhere else.) No, you've never seen it cited by anyone, and that's basically a good thing. The MS I reviewed got a grade of F. The new, revised, published version gets a D from me. That isn't good enough for anyone to actually use it. Don't.

The author is Ray S. Vizgirdas. He has also published a Sierran botany book, *Wild Plants of the Sierra Nevada* (with his wife, Edna M. Rey-Vizgirdas; University of Nevada Press, 2006). It gives capsule descriptions of selected plants, along with a few line drawings by Mrs. Vizgirdas (which are useless for identification; there are no color or black-and-white photographic or art plates), "keys" for identification which are not keys, and information on both indigenous and contemporary uses, taken from other sources. There appears to be nothing original in the book, and given the rich array of *useful* Sierran botanical resources, it is not obvious why Nevada published it. But back to his butterfly monograph…

Vizgirdas gives very generic treatments of species. He rarely gives any indication of abundance or geographic distribution—one might gather that nearly everything occurs over the entire range. For example, *Euphyes vestris* does indeed occur in wet areas – but *only in the far northern Sierra, north of Nevada County*. The Arctic Skipper, *Carterocephalus palaemon,* and the Great Arctic, *Oeneis nevadensis,* similarly restricted to a handful of known colonies from Nevada and Sierra County (respectively) north, similarly are presented as if distributed the length of the range. The treatment of *Copaeodes aurantiaca* makes it sound like it's found everywhere in "grasslands, fields and washes," when it barely if at all enters the Sierra in the far south. Lapsing back into Rockies mode, Vizgirdas describes the distribution of Ridings' Satyr, *Neominois ridingsii,* as "short-grass prairie, intermountain areas, and grasslands with some areas of bare soil." (It's found in subalpine and alpine steppe in the Sierra.) Get the idea?

But it gets worse. According to Vizgirdas, the Viceroy (*Limenitis archippus*) occurs in the Sierra. It doesn't. Neither does *Colias occidentalis,* which has been repeatedly – and erroneously – claimed from the Sierra. But *Colias alexandra* does occur on the east slope, but it's not included. According to Vizgirdas, the Old World Swallowtail, *Papilio machaon,* occurs in "widely differing habitats," but is most commonly seen in large numbers hilltopping. And *Lycaena cupreus* occurs only in such remote alpine environments that it would be "a well-earned prize when seen or collected." (It's common as low as 5000' on meadows in the northern Sierra…) There are "lowland forms" of *Lycaena phlaeas* that occur in "waste places, pastures and old fields." Yes, in Connecticut! And so on.

As for the photographic illustrations: the one thing to be said for them is that they're in color. Beyond that: the male *Lycaena nivalis* is a female *L. editha.* The "Checkered White" (*Pontia protodice*) is a female Western White *(P. occidentalis*). The underside photo of the "Spring White" is indeed *Pontia sisymbrii,* but the upperside is another male *P. occidentalis.* Of the five species of *Erynnis* illustrated, three are definitely and one more probably misidentified. Vizgirdas' "Sleepy Duskywing" (*E. brizo*) is *E. funeralis* (white fringe and all); his *E. pacuvius* actually is *E. brizo;* and his *E. funeralis* appears to be *E. propertius.* He uses the *same photograph* for both *Hesperia juba* and *"H. comma colorado."* Actually, I don't believe the specimen illustrated is either of them. And of course he doesn't mention, let alone illustrate, the extreme phenotypic differences between

east- and west-slope members of the *"comma* complex." Remarkably, all his larger fritillaries are correctly identified, except for his *"Speyeria mormonia."* Those are *S. hydaspe* – not an easy mistake, but Vizgirdas made it.

Do you think this can serve as either a monograph or a field guide?

If there's anyone out there who wants a page-by-page errata sheet for the whole book, just contact me. But it would be best to just let it moulder in its well-deserved obscurity, along with that other monstrosity, *The Fauna and Flora of Solano County,* by Wilmere J. Neitzel (which I flagged in a previous article evocatively called "False Faunas"). No, I didn't make up that name. If you want to get a copy of Vizgirdas just as a curiosity, it can be ordered for $19 from the Museum Store, San Bernardino County Museum, 2024 Orange Tree Lane, Redlands, CA 92374. Just don't *use* it.

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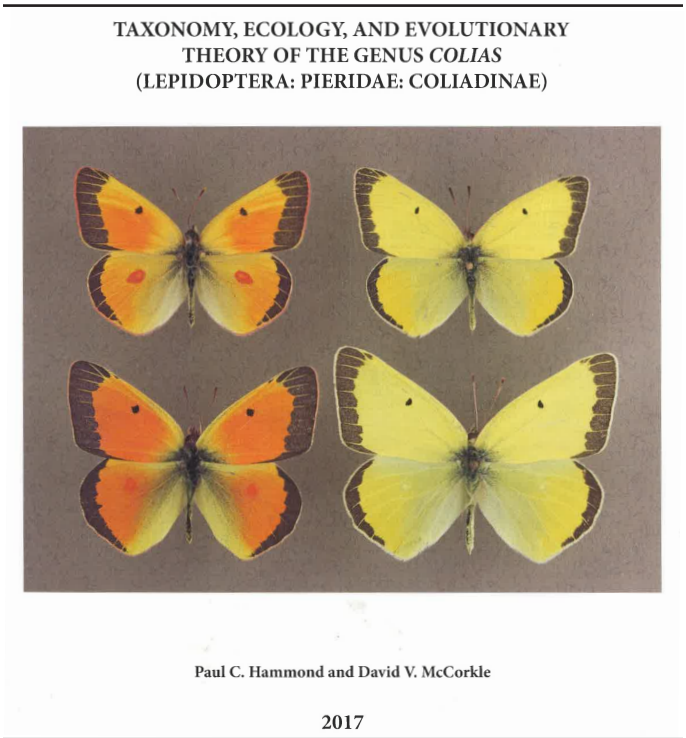
Taxonomy, Ecology, and Evolutionary Theory of the Genus Colias (Lepidoptera: Pieridae: Coliadinae) by Paul C. Hammond and David V. McCorkle. 2017. Published by the authors. 265 pp. 12 color plates. (Available from Hammond for $50 + $3.50 postage: **<copablepharon@gmail.com>**.) ISBN 978-0-692-83890-7.



"What can be asserted without evidence can be dismissed without evidence."—Christopher Hitchens

Evolutionary biologists are regularly accused of telling "just-so stories." There is certainly some truth to the charge. The invention of phylogeny as a basis for classification opened the door to an orgy of speculation. Phylogenetic trees proliferated in the 19th and early 20th centuries, with each author's interpretation of ancestor-descendant relationships – unencumbered by data or scientific rigor – leading to constant taxonomic instability. In those days the biologist's intuition and/or imagination was all that was needed to erect a new phylogeny. Of course, all those phylogenies can be treated retrospectively as hypotheses subject to potential falsification; but since the objective and logical basis for them was usually inexplicit, how would one define a critical test? It has been suggested that, overall, the impact of Darwinism on taxonomy was unfortunate insofar as it greatly increased the instability of both classification and nomenclature.

Nowadays we are past all that, right? Nowadays we have the rigorous logic of cladistics and the inestimable value of molecular genomics to assure that whatever phylogenetic hypotheses we put forward are as well-supported as possible – and subject to explicit falsification. Right?

Then how do we explain this book?

It isn't as if the authors are unaware of the philosophical and methodological advances made by evolutionary biology in recent decades. They are aware of them, and they cite some of them. *They just don't believe the results from them.* Instead, they retreat into the classical mode of the pre-modern taxonomist/evolutionist: *the truth is what I say it is because I really know my critters.* (I should declare up front that the major molecular phylogeny of Pieridae by Braby, Vila and Pierce (2006) that puts *Kricogonia* and *Nathalis* basal to all Coliadines doesn't make sense to me either. I am not claiming molecular cladistics is always right—only that it provides an explicit basis for trying to infer how and why it may have gone wrong.)

There is no better animal genus than *Colias* to try one's soul—or to disabuse one of any latent creationist sympathies. It's all evolution, baby. The boundaries of taxa are infamously ill-defined; the scope of variation—genetic, polyphenic, geographic – is vast; reticulate evolution has often been postulated (but almost never tested rigorously). Almost everyone who has tried to work on the evolutionary biology of *Colias* thinks the genus is involved in adaptive radiation and speciation even as we speak—thinks that, but only rarely has anyone even begun to test it. Circumstantial evidence suggests that much of this is very recent: Quaternary, and largely Holocene (within the last 15,000 years or so). This is true in both high latitudes of the northern hemisphere and in the High Andes and altiplano, where a bewildering array of nominal forms exist.

Hammond and McCorkle think they have the answers. They are seat-of-the-pants answers in that "because I say so" tradition that William Bateson parodied in the introductory sentences of *Materials for the Study of Variation* in 1894. This book gives us not only "theoretical"

phylogenetic trees for *Colias,* but for the Coliadinae in general, and for the butterflies in general (deriving them from "Protosaturniidae" with the Parnassiini basal to all other butterflies). The *Colias* trees derive every living species from another living species. In Chapter 2 they hypothesize a Pangean origin for butterflies, taking extant families back to the Permian (yes, I said the Permian). Of course the fossil record of butterflies reaches back only to the beginning of the Tertiary (as they admit), but "absence of evidence is not evidence of absence" and they need that vast ocean of time to accommodate their phylogenetic scenarios. Needless to say, they stand alone in these positions, as discussed below. They trace *extant species-groups of Colias back to the mid-Triassic,* some 220 million years ago. They place the Andean radiation within the *nastes* species-group and attribute it to the breakup of Pangaea at the end of the Triassic, 200 million years ago. Never mind the time-line for the elevation of the Andes or the facts of the Great American Interchange, when the important *Colias* hosts *Astragalus* and *Lupinus* entered South America. Having placed the origins of species-groups in deep time, however, they do acknowledge that a great deal seems to have been happening lately.

I will not try to falsify their scenarios in a book review. All I can do is recount what most other people who have thought about this think, and assert that they have a good case. While I would very much like to be "in on" the resolution of *Colias* phylogeny and historical biogeography, that is a job for someone at the beginning, not near the end of his/her career—it might be a lifetime job. It is even possible that Hammond and McCorkle are right about modern butterflies flitting about in those Mesozoic forests, trying to avoid being gobbled or stomped on by dinosaurs. If it's science, it should be falsifiable in principle. Right?

Yes, it is possible that Hammond and McCorkle have it right, and everyone else has it wrong. But extraordinary claims require extraordinary evidence, and they offer *no* evidence. For the benefit of readers unfamiliar with the contemporary consensus on the time-line of Lepidopteran evolution, a very brief recap is necessary. The most comprehensive phylogeny for the order based on molecular-genetic data is by Wahlberg et al. (2013) (there has been some relatively minor subsequent tinkering). Hammond and McCorkle do not cite it. Sohn, Labandeira and Davis (2015) review all known Lepidopteran fossils and discuss discrepancies between estimated molecular and paleontological divergence dates (molecular are almost always older). Hammond and McCorkle do not cite it either. For our purposes, the important things to know are that the origin of the *order Lepidoptera* is placed in the late Triassic to early Jurassic, circa 190 MYA—later than Hammond and McCorkle think extant species-groups of *Colias* were around; the origin of glossate Leps (i.e., equipped with a proboscis) is estimated at 160 MYA; the oldest fossil butterflies (Papilionoidea) date from about 105MYA (of course, the origin of butterflies themselves has to be older than the oldest fossils, but by well over 100MY?!), the oldest Bombycoid moths are even "younger" at about 85MYA; and there is absolutely no support for derivation of the butterflies from a hypothetical "protosaturniid" ancestor. What we have from Hammond and McCorkle is a mirror image of the creationist claim that everything happened in the scope of a few thousand years. Both the Hammond-McCorkle and creationist timelines can only be accepted on faith, because there is no evidence for them. Declare your faith and take your choice!

The largest part of this book consists of descriptions of new subspecies—lots of them—and redescriptions of older ones. The question of whether subspecies are "real" or useful, and the extent to which they represent species in the making, remains open and subject to vigorous debate—all the more so when endangered-species law affords them coordinate status with nominal species from a protection standpoint. We discuss it for a week in my systematics class but do not attempt to reach a consensus.

The authors talk a fair bit about evolutionary theory and the nature of speciation. They have been strongly influenced by the "revolutionary" propaganda of Gould, Eldredge, and their allies in paleobiology who treated speciation as essentially instantaneous and essentially synonymous with morphological change. It has been pointed out often that paleobiologists have little choice in this, because the only data they have are morphological. Molecular genetics, starting with enzyme electrophoresis and graduating to evolutionary genomics, provided an alternative basis for inferring reproductive isolation. "Barcoding" began with the Hesperiid genus *Astraptes,* and butterfly systematists are faced with the difficult problem of whether the apparent cryptic species being found left and right through such methods are "real" and worthy of taxonomic recognition. I think Hammond and McCorkle's concept of speciation will not stand the test of time. They rely heavily on phenotypic traits. They acknowledge the reality of parallel or convergent evolution but don't seem very worried about it.

The true nature and relationships of the enigmatic *Colias* (or *Protocolias*) *ponteni=imperialis* is left unresolved here. For some of us, it is a critical issue in Coliadine phylogeny. Hammond and McCorkle think that the high-Andean endemic *C. flaveola* is unusual, presumably because the sexes look alike and are both nominally white. Actually, the males are pale yellow (and so are some of the females), and the thing is pretty unambiguously part of the *weberbaueri-blameyi*-blah blah complex that would provide a wonderful Ph.D. thesis for someone willing to employ state-of-the-art methods instead of waving his or her arms around. I don't take Ph.D. students of my own any more, but if you want to try to work these guys out, I'd love to serve on your thesis committee!

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Mixed signals and odd couplings: is "bandwidth" a limiting factor in pheromone communication?

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In November of 2017 I received within a week reports, via the 'spreading board telegraph', of very rare events: two separate sightings of an apparent chemical attraction by an ovipositing female *Hemileuca eglanterina* (Saturniidae) for male nymphalid butterflies (*Speyeria hesperis dodgei* (Fig. 1) and *Euphydryas chalcedona* (Fig. 2)), and – from a separate source – an interspecific mating between a female *Hemileuca nuttalli* and a male *H. eglanterina* (Fig. 3,4). The obvious question raised by the nymphalid – saturniid interaction is: *What was the chemical attractant and what explanation in evolution could account for its association with such distant families?* In the case of the *eglanterina* ♂ X *nuttalli* ♀ pairing, the surprise was not that cross attraction had occurred, but that the female was a *nuttalli*. Field observations (Collins & Tuskes 1979) and molecular work (see review: McElfresh & Millar 2016) had apparently established that the inter-attraction was always asymmetrical with only *eglanterina* females occasionally "calling in" *nuttalli* males.

Such odd couplings and mixed signals are rare in nature but not unknown. Caged females of the Old World *Saturnia pyri* will attract wild *Antheraea polyphemus* males (Bryant 1980, Collins 2004). Kettlewell (1946) asserts that certain tiger moths will attract members of other genera: *Epicallia (Arctia) villica* (Cream Spot) and *Parasemia plantaginis*; *Phragmatobia fulginosa* (Ruby Tiger) and *Panaxia (Callimorpha) dominula* (Scarlet Tiger); and *Arctia caja and Spilosoma lutea*. Recent chemical analysis has shown other examples of arctiine genera sharing pheromones (Cardé & Millar 2009). Extensive interspecific hybridization widely occurs among the arctiine genus *Grammia* (Schmidt 2009).

Fig. 1. Two male *Speyeria hesperis dodgei* seemingly attracted to chemical (pheromone?) released by ovipositing female *Hemileuca eglanterina* (Saturniidae), July 21, 2017. Approx. 4:15 PM. OREGON Lane Co. Grasshopper Meadows, Diamond Peak Wilderness, s Willamette Pass. Image from a video, by Tanya Harvey.

Fig. 2. Male *Euphydryas chalcedona colon* (?) seemingly attracted to a chemical (pheromone?) released by an ovipositing female *Hemileuca eglanterina*. OREGON Douglas Co., Umpqua National Forest, Lookout Mt., approx. 8 km s Steamboat. June 30, 2007. Photo by Tanya Harvey.

Certain orb-weaving spiders have long been known to call in and prey on male saturniids; examples are widely separated geographically and involve two saturniid subfamilies (Rogers 2014, Stowe 1986, Tuskes et al. 1996, A. Warren pers. comm.). Apparently the spiders are able to synthesize a moth pheromone or its close analog. Males of the sphingid *Amphion floridensis* have been observed attracted to newly vacated cocoons of *Antheraea polyphemus*. (Tuskes et al. 1996). Just after eclosion these cocoons have a distinctive odor of roasted almond.

One could dismiss all examples of cross attraction between distant or unrelated Lepidoptera taxa on the basis of convergent evolution. On the other hand, it is fascinating to consider that there might be important constraints in the evolution of pheromone diversity, thereby increasing the odds of evolving such chemical similarity. Before considering in detail the recent events involving *Hemileuca* I would like to explore this larger topic.

Fig. 3. Mating pair of male *Hemileuca eglanterina* and female *H. nuttalli*. CA Nevada Co. Prosser Cr. Reservoir, n Donner Pass, Aug. 3, 2017, 02:00 PM. Photo by Sarah Hochensmith, courtesy of Will Richardson, Executive Director, Tahoe Institute for Natural Science.

Fig. 4. Enlarged image of mating *Hemileuca* (see above).

A telecommunication engineer, upon taking up a study of moths, would conclude, from his or her perspective, that evolution has partitioned the chemical spectrum of pheromones in such a way that both promotes conspecific mate recognition and also reduces the likelihood of interspecific mating. In fact, there are analogies between telecommunication systems compared to the biochemical and behavioral aspects of pheromone-mediated reproduction in Lepidoptera. These analogies are interesting and instructive and warrant a brief overview.

Modern digital communication for both numerical data and voice uses square wave pulses representing binary coding of letters and numbers (PCM or "pulse code modulation"). Data or voice messages can be labeled and given a unique address, broken into segments, routed through a network by various pathways by use of digital, computer-controlled switches, and finally reassembled in the original sequence and format at the designated receiver. In this manner gaps in transmission are reduced and traffic flow through the network is optimized. This process of digital or pulse modulation at the transmitter, and de-modulation at the receiver, is accomplished by a MODulator-DEModulator or MODEM. The entire process is referred to as TDM or Time Division Multiplex. Another method to divide up bandwidth assigns users to specific narrow bands of frequency called FDM or Frequency Division Multiplex. Both schemes are used in modern cell phone communication. Because the electromagnetic spectrum is finite in range, and because of huge consumer demands for modern telecommunication, bandwidth has become a precious commodity.

As email messages swirl around the internet they are given a certain degree of privacy due to their unique addresses and other security notation. Theoretically, only genuine recipients should be able to retrieve emails specifically addressed to them. In a like manner, moth pheromones join countless other chemical volatiles carried on the wind, but males of a given species perceive and react to only a very narrow taxonomic range of these structurally encoded chemical messages. **Have the vast number of moth species placed demands on the spectrum of structural variation, 'bandwidth', in pheromone molecules?**

Moth pheromones are composed of three chemical classes: alcohols, aldehydes, acetates of about 5-20 carbon atoms in length. Females release pheromones from a special epithelial gland at the tip of the abdomen producing a plume which in most cases is a bouquet or blend of components differing in stereochemistry (right- vs left-handed), various functional groups, and in the presence/absence or position of double bonds.

Pheromones can be classed into four major types (Löfstedt et al. 2016). Type I pheromones are found in 75% of all moth species, and are synthesized *de novo*. Type II pheromones are found in 15% of moth species, and are synthesized from precursors present in the larval diet. Other types differ in structure and in synthetic pathway, and are confined to a very few moth families. The distribution of the various types maps closely on the phylogeny of moths, with a general association of type with superfamily, and

with detailed differences associated with family and genus (Löfstedt et al. 2016). Interestingly, the newly recognized Erebidae, within Noctuoidea, has been found to uniquely use a Type II pheromone, while other Noctuoidea all possess the Type I structure.

Typically, congeners share a similar blend of related pheromones, and species specificity is achieved by the presence or absence of certain key pheromones and by the precise ratio of specific pheromones within the mixture (Allison & Cardé 2016, Birch 1974, Smadja & Butlin 2009).

Many authors (e.g. Cardé 1987, Wilson 1975) have pointed out that the maximum length of the carbon chain is constrained by volatility requirements – longer carbon chains would lack the necessary volatility to form extensive air-borne plumes - and by a minimum length so as to provide enough information content as the basis for specificity. Another possible constraint on pheromone diversity might be the seemingly conservative limitation on the number of biosynthetic pathways; 90% of all moth species share only two basic molecular types of pheromones.

Do these physical and biochemical restraints on the complexity of the pheromone molecule constitute a kind of 'bandwidth' limitation? Could this be the reason we see examples of odd inter-attraction, as between *Hemileuca* and *Euphydryas* or *Speyeria*? Allison & Cardé (2016) argue that even within the few classes or types of pheromones, the combinations and permutations of structural variables – the three chemical classes, the position or presence of double bonds, various functional groups, and optical isomers – can theoretically produce a greater number of species-specific pheromones than there would be numbers of moth species in a given biological community. The evolution of pheromone diversity is not due to major shifts in synthetic pathways, but to the dramatic effect of single mutations in affecting details of a given pathway, and thereby altering the structure of the pheromone molecule (Leary et al. 2012, Smadja & Butlin 2009). In a consensus phylogeny Löfstedt et al. (2016) depict the Papilionoidea as arising about 125 mya compared to the origin of the Bombycoidea at about 80 mya. The Papilionoidea have completely lost the long distance, female-produced pheromone system, so widely shared by moth superfamilies. Male- and female-released courtship pheromones in butterflies are produced by special structures, unrelated to pheromone glands in moths (Löfstedt et al. 2016). No reasonable argument can be made for a resemblance of a female courtship attractant in nymphalids to a long distance pheromone in saturniids on the basis of a shared ancestry.

The male antenna is populated by an array of receptor sites called sensilla which bind in a lock-and-key manner to specific pheromone molecules, triggering an impulse from an associated neuron. In an analogy to the modem in telecommunications, the male moth's brain integrates and processes these signals from the antennae and only when the proper density and species-specific mix of pheromones is detected will it stimulate the moth to fly and search for the female.

This highly integrated system would seem to oppose the process of speciation. Any mutation in a biosynthetic pathway, leading to a novel pheromone molecule, would have to be simultaneously accompanied by a compatible change in the genes controlling sensilla structure and function – an unlikely event. A possible solution to this conceptual dilemma is the 'asymmetric tracking model' (Phelan 1992, see Collins 2004 for a brief summary), in which the male antennae accumulates a range of receptor sites such that he risks mating with a female of another species. Since males typically mate more than once, and since sperm are metabolically inexpensive and not often limited in quantity, he suffers minimal loss of Darwinian fitness by occasionally mating heterospecifically. The female, depending on the species, may typically mate only once, and developing ova is metabolically expensive. Mutations that dramatically alter pheromone structure will be strongly selected against. Thus, males are more likely to 'track' mutations in pheromone chemistry than females are able to alter pheromone chemistry to tract changes in sensilla specificity.

The *eglanterina* X *nuttalli* incident.

Moth breeders have found that generally a female saturniid from one part of an extensive range can attract conspecific males from a far distant region (Collins & Weast 1961). The inference is that the pheromone is uniform across the distribution. The genus *Hemileuca* seems to be an exception. *Hemileuca eglanterina* is probably the most cosmopolitan species in the genus in terms of range of plant communities it inhabits (Tuskes et al. 1996). Its geographic distribution encompasses all populations of *H. nuttalli*, primarily in mountain meadows and sagebrush scrub. McElfresh and Millar (2016) worked out the pheromone chemistry of these two species and found that geographic variation in pheromones was correlated with the degree of sympatry between the two. The pheromone mix in *eglanterina* was more similar to that of *nuttalli* in allopatry, and was more divergent in areas of close sympatry. This pattern seems to represent a case of reproductive character displacement, i.e. the reinforcement of an isolating mechanism that in any way reduces the likelihood of hybridization in areas of sympatry, but with relaxed selection in areas where the two taxa are allopatric. Since *nuttalli* is nowhere allopatric, the character displacement is restricted to variation in the chemistry of the pheromone blend in *eglanterina*, and female *nuttalli* have never before been seen to attract a male of *eglanterina.* Perhaps the answer to the puzzle is that the male antennae in *eglanterina* in this region of the Cascades contain sensilla sensitive to the pheromone of *nuttalli*. This interpretation follows the logic of the 'asymmetrical tracking' model.

As reported to me by Will Richardson, Sarah Hochensmith on August 3, 2017 was leading a small group of youngsters

on a field trip north of Donner Pass CA (see legend Fig. 3) when at 2PM they came upon the mating *Hemileuca*. The pair was understandably left undisturbed. This location is within a known area of sympatry for the two species, but does lie near the western limit of *H. nuttalli*, which is primarily a Great Basin species.

Concerning the *Speyeria* – *Hemileuca* interaction, Tanya Harvey writes (edited for brevity):

"I'd been chasing fritillaries all day. [July 21, 2017]. They seemed to be especially numerous. I caught a glimpse of a large spot of golden brown and thought perhaps it was more fritillaries mating. Instead, it turned out to be a sheep moth (*Hemileuca eglanterina*) laying eggs and being harassed by lusty fritillaries [*Speyeria hesperis dodgei*]. There were tons of fritillaries out that day, but I only saw 1 or 2 on the moth at one time. I watched her from 4:18 to 4:30pm, at which point the frits had left and she climbed up the grass and flew away, having laid 10 rows of eggs. I'd seen this once before, years ago when Sabine Dutoit and I had been at the top of Lookout Mountain in the North Umpqua. In that case, it was an orangey checkerspot [*Euphydryas chalcedona colon*] who seemed to think the sheep moth was a supersized butterfly. I shared our experience with butterfly expert Robert Michael Pyle, who said he'd never heard of such a thing."

[See original link in website entitled "Mountain Plants of the Western Cascades"; some pers. comm. incorporated in above -- **http://westerncascades.com/2017/08/20/unusual-sightings-at-grasshopper-meadows/**]

All who have viewed these photos agree that the butterflies were responding to some kind of chemical attractant, released or associated with the *Hemileuca* female, and that this attractant, probably the moth's natural pheromone, resembled a nymphalid, female-released attractant. Another possibility was that the chemical was somehow linked to the newly-deposited egg ring. Other important factors were probably the observed high density of *Speyeria* and *Euphydryas*, and the fact that the moth may have somewhat resembled the color and size of the butterfly species in question.

Tanya Harvey noticed, as did others, that in both cases the female *eglanterina* was ovipositing on a non-host plant. (The most likely hosts in this area are snow berry (*Symphoricarpus* sp.), bitterbrush (*Purshia tridentata*), and bitter cherry (*Prunus emarginata*)). Perhaps this is a clue to unusual circumstances that might have promoted the interaction. The female *eglanterina* might have eclosed, mated, and oviposited all in the same place, which would have allowed a faint remnant of the pheromone to remain associated with the female. Responding first visually to the moth, the nymphalid males were then attracted to the pheromone, which by chance closely resembles the female-released courtship attractant in these butterflies.

The interaction between *Speyeria* and *Hemileuca* raises some interesting questions regarding mating biology in *Speyeria*. Opler (1999) lists 14 western taxa and remarks that many of these are remarkably similar and difficult even for experts to distinguish in the field. In spite of their similarity, the various species maintain integrity in sympatry (McHugh et al. 2013), although post-mating isolation is weak in many combinations of lab hybridization (Hammond et al. 2013). Effective reproductive isolation depends on the action of male- and female-released courtship pheromones (Hammond pers. comm., Hammond et al. 2013), which has never been carefully studied. Boppré (1984) reviews studies of the morphology of attractant-releasing androconia on the wings of related European *Argynnis paphia*, and their role in courtship. In this species, and perhaps similarly in *Speyeria* as well, there is a stereotyped aerial courtship, a ground courtship with exchange of male and female attractants, followed by mating. The physiology of these systems has been studied in detail in the Old World *Bicyclus*, including the association of given male attractants with specific patterns and structures on the wings (Bacquet et al. 2015). Geographical variation in these chemicals in *Bicyclus* reflects a pattern consistent with reproductive character displacement (Bacquet et al. 2015). The known chemistry of *Hemileuca* pheromones (McElfresh & Millar 2016) would be a useful guide for investigating the biochemistry of mating biology in the western *Speyeria* and *Euphydryas*.

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Lep Soc Statement on Diversity, Inclusion, Harassment, and Safety

This is available at any time, should you need to know at: **https://www.lepsoc.org/content/statement-diversity**

Announcements:

The Southern Lepidopterists' Society invites you to join

The Southern Lepidopterists' Society (SLS) was established in 1978 to promote the enjoyment and understanding of butterflies and moths in the southeastern United States. As always, we are seeking to broaden our membership. Regular membership is $30.00. Student and other membership categories are also available. With the membership you will receive four issues of the SLS NEWS. Our editor J. Barry Lombardini packs each issue with beautiful color photos and must-read articles. SLS conveniently holds its annual meeting, in Sept. or Oct., almost always with the Association for Tropical Lepidoptera. The SLS web page (http://southernlepsoc.org/) has more information about our group, how to become a member, archives of SLS NEWS issues, meetings and more.

Please write to me, Marc C. Minno, Membership Coordinator, at **marc.minno@gmail.com** if you have any questions. Dues may be sent to Jeffrey R. Slotten, Treasurer, 5421 NW 68th Lane, Gainesville, FL 32653.

Society of Kentucky Lepidopterists

The Society of Kentucky Lepidopterists is open to anyone with an interest in the Lepidoptera of the great state of Kentucky. Annual dues are $15.00 for the hard copy of the news; $12.00 for electronic copies only. The society typically schedules three+ field trips yearly. Contact Loran Gibson, 859-384-0083 or **1stkymothman@gmail.com,** to learn more. The **Spring Field Trip** has been set for the weekend of April 13-15 in southeastern KY, with the "base of operations" being the Red Roof Inn in Whitley City. There will be a block of rooms reserved for the event. Call 606-376-3780 to reserve a room, and mention the Society of Kentucky Lepidopterists or Loran Gibson.

The annual meeting is held each year in November, at the University of Kentucky, Lexington. Dates are not yet set for 2018.

To join the Society of Kentucky Lepidopterists, send dues to: Les Ferge, 7119 Hubbard Ave., Middleton, WI 53562.

PayPal is the easy way to send money to the Society

For those wishing to send/donate money to the Society; purchase Society publications, t-shirts, and back issues; or to pay late fees, PayPal is a convenient way to do so. The process is simple: sign on to www.PayPal.com, and navigate to "Send Money", and use this recipient e-mail address: **kerichers@wuesd.org**; follow the instructions to complete the transaction, and be sure to enter information in the box provided to explain why the money is being sent to the Society. Thanks!

The Association for Tropical Lepidoptera

Please consider joining the ATL, which was founded in 1989 to promote the study and conservation of Lepidoptera worldwide, with focus on tropical fauna. Anyone may join. We publish a color-illustrated scientific journal, Tropical Lepidoptera Research, twice yearly (along with a newsletter), and convene for an annual meeting usually in September. Recent meetings have been joint gatherings with the Southern Lepidopterists Society at the McGuire Center for Lepidoptera & Biodiversity in Gainesville. FL. Dues are $95 per year for regular members in the USA ($80 for new members), and $50 for students. Regular memberships outside the USA are $125 yearly. See the troplep.org website for further information and a sample journal. Send dues to ATL Secretary-Treasurer, PO Box 141210, Gainesville, FL 32614-1210 USA. We hope you will join us in sharing studies on the fascinating world of tropical butterflies and moths.

Northeast Natural History Conference

https://www.eaglehill.us/NENHC_2018/NENHC2018.shtml

Students, professors, researchers, conservationists, and naturalists will convene in Burlington, Vermont, April 13-15, for the 2018 Northeast Natural History Conference. With presentations, workshops, field trips, and exhibits,the conference is a premier annual event in field biology and natural history across the NE U.S. and adjacent Canada.

Currently there are a proposed sessions on:

Moths (Lepidoptera) as Environmental Indicators
Butterfly Conservation and Ecology in the Northeast

The conference, to be held at the Sheraton Burlington Hotel, is always a great opportunity for biologists and naturalists to share results, progress, and new ideas about their work. Students are especially welcome. General conference registration will open soon. Student volunteer opportunities available - earn registration fees and attend for free!

We are now seeking session moderators, presenters, and workshop and field trip leaders. Topics span a range of terrestrial, marine, or freshwater work in field biology and natural history:
• Call for moderators and sessions: **https://www.eaglehill.us/NENHC_2018/callforsessions.shtml**
• Call for presentations (abstracts): **https://www.eaglehill.us/NENHC_2018/callforabstracts.shtml**
• Call for field trips and workshops: **https://www.eaglehill.us/NENHC_2018/callforworkshops.shtml**

Oral and poster presentations will be Saturday and Sunday, April 14 and 15. Field trips and workshops will be on Friday, April 13.

Results of the 2018 Election

Secretary:	Todd Gilligan	356 (12 "No" votes)
Treasurer:	Kelly Richers	357 (11 "No" votes)
Vice-Presidents:	Michael Braby (Australia)	262
	Konrad Fielder (Austria)	210
	Vazrick Nazari (Canada)	268
	Richard Peigler (USA) -- First VP	280
Executive Council Members-At-Large:	Jason Dombroskie	271
	Lance A. Durden	239
	Geoff Martin	251
	Todd Stout	257

Richard Peigler garnered the most votes of the Canadian and USA candidates, so he becomes the First Vice-President and will therefore take on the presidential role should the need arise (Constitution: Article IV, section 1; Article VI, section 2). Three hundred and sixty-eight members voted in this election.

Respectfully submitted, Dr. Michael Toliver, Secretary.

Bryant Mather [Travel] Award

The Awards Committee is now accepting applications from Society Members for the 2018 Bryant Mather Award(s) for travel to the Lepidopterists' Society meeting at Carleton University, Ottawa, Ontario, Canada, July 11-15, 2018. **We would like to award two or three stipends to partially cover meeting-related expenses.** Applicants are to be judged on need for the award (i.e., lack of sufficient resources to travel to the meeting without the award) and acceptance of their proposed presentations. Applicants can include any member wanting to attend and present at the meeting (the award is not limited to students).

Please submit a brief (500 words maximum) application summarizing your need for the award, together with a detailed budget and proposed title of your presentation/poster to president Brian Scholtens at **scholtensb@cofc.edu** by April 30, 2018. Winners will be selected by the Awards Committee and notified by May 15, 2018. Recipients will be reimbursed by the Treasurer after the meeting.

Season Summary will be delivered with summer issue of the News; still looking for images for the covers

The Season Summary will be delivered with the summer issue of the News. As such, I am still looking for photos for the covers of the Season Summary. Please send these to James K. Adams (**jadams@daltonstate.edu**). Photos can be of live or spread specimens, but **MUST** be of a species that will actually be reported in the Season Summary for this year.

Seventh Annual (Inter)National Moth Week - July 21-29, 2018

This Year's Event Spotlights Geometrid Moths (Geometridae)

The seventh annual (Inter)National Moth Week is being held July 21-29 around the world. National Moth Week is a global event and during the past six years there have been thousands of participating locations in all 50 states and more than 70 countries. National Moth Week encourages "moth-ers" of all ages and abilities to learn about, observe, and document moths in their backyards, parks, and neighborhoods. The event is open to anyone, anywhere around the world. Surveys, moth-watching and educational events have been held throughout Europe, Asia, Africa, South, Central, and North America.

National Moth Week recognizes that late July may not be ideal for mothing everywhere around the world and also encourages events and participation at any other time that will be productive. Simply register those dates and locations on the website (**nationalmothweek.org**) and we will be sure to spotlight them as well.

National Moth Week (NMW) shines a much-needed spotlight on moths and their ecological importance as well as their incredible biodiversity. Through partnerships with major online biological data depositories such as BAMONA, Project Noah, BugGuide, Encyclopedia of Life, Discover Life, Biodiversity Bhutan, DiversityIndia, Moth Photographers Group, LepiMap – Atlas of African Lepidoptera, and iNaturalist, National Moth Week encourages participants to record moth distribution, submit data and photographs and to provide information on other aspects of their life cycles and habitats.

Participants have submitted more than 10,000 moth records and held thousands of moth nights in backyards, inner cities and some of the most remote places on Earth. Many of these were attended by the public and by families and children that have never been exposed to moths or Lepidoptera survey methods.

National Moth Week 2018 is designated "The Year of the Geometrid Moth" to encourage participants to look for and learn about these fascinating moths.

National Moth Week is always interested in partnering with organizations and can spotlight events through our website, Facebook and social media. For more information about National Moth Week and to register a location at any time of the year please visit nationalmothweek.org. To contact us about the event, please reach out to Dave Moskowitz, co-founder of National Moth Week, @ dmoskowitz @ecolsciences.com.

Last Issue of the Journal of Research on the Lepidoptera -- R.I.P.

I tried to extend the closing of the JRL to volume 50, as this would have been a cleaner number. No such luck, events kept closing in, so here we are at 49 and the end of the line. When Bill Hovanitz developed the idea for the Journal of Research on the Lepidoptera, and established the Lepdoptera Research foundation, Inc to institutionalize the effort in 1962, the future was very different from today. Bill envisioned an open academic platform for good works for understanding ecology and systematics of the Lepidoptera. His timing followed the beginnings of "New Systematics" and "Evolutionary Biology" as real hot items for study and research a couple of decades earlier by the great evolutionary biologists Theodosius Dobzhanski, Ernst Mayr, George Simpson, Sewell Wright and others. Butterflies and moths served well as metaphors and experimental subjects across natural history biology. These insects were charismatic but also structurally highly suited for certain specialties as population ecology and behavior.

Interest in all of nature politically peaked as well, concerns for the environment were worldwide and youth took interest in higher education especially concerned with biodiversity and promoting conservation. Although all groups of living organisms commanded scholastic attention, work with Lepidoptera enjoyed outsized attention. Appropriate Journals covering most fields metastasized. The world of academic publishing burgeoned by providing means of evaluating articles by review processes so comparative ratings became de rigueur and competitive styles established to parallel socio economic criteria of the developed world. Science publishing become big business. Robert Maxwell seduced scientists to develop "Big Science" with his publications model.

Systematics and related academic fields reached their zenith in the latter half of the 20th century. Genetic molecular biology was born and rapidly became the hard science base because of it's apparent value to provide applications for improving human life. Not to be ignored by all this was the sudden rearing of the ugly head of monetization. Monetization changed everything, for the western capitalistic academic world at least, with its profound relationships still sinking in. The commons and private property were churned together with increasingly hostile social class attitudes set in motion. Most societies reached for a life style never before seen, and in the reaching brought on what may well be irreversible environmental damage. Our beloved Lepidoptera are declining almost everywhere, in lockstep with most other plants and animals. Whether any of this is reversible remains to be seen. In the meantime we humans are feeling many pressures.

Comforting delusion maintains most people. Coming back to the city after apple picking excursion to the countryside a few weeks ago, I suddenly noticed the windshield effect

on our car. The many bless the clean glass and absence of annoying bugs. Hello?

So extinctions are now a characteristic of the publishing system as well. I am not as angry about terminating the JRL as for realizing the environment that supported it is disappearing. Citizen scientists burgeon in special arenas (Monarchs), but the intellectual generalists and particularly kids at natural history meetings are clearly on the way out. Facebook and Instagram now provide the dopamine that swallows our goals of sweeter times.

We cannot thank Konrad Fiedler sufficiently for the effort he devoted to preserve and expand the idea of the JRL. In spite of his exemplary work, we were unable to reach a viable contributor base. He implemented strong review policies and attempts at soliciting manuscripts. Nancy Vannucci was able to support him in processing papers rapidly and professionally. All in spite of providing the services without charge. Both gave far above the call of duty. Nancy worked on the JRL for over ten years. She learned a great deal and contributed much to the entire process of producing the Journal as well as managing reviews, etc. Nancy became highly proficient in language including editorial comment, on top of which she managed all the logistics. She was a great resource and cannot be thanked enough.

All that is left to say now is: So long JRL, sorry but we are leaving the building. -- Rudi Mattoni

Cover, last issue of The Journal of Research on the Lepidoptera

The Lepidoptera Course, 7-17 August 2018

The 2018 Lepidoptera Course will take place at the Southwestern Research Station (SWRS) in the Chiricahua Mountains of SE Arizona (2 ½ hour drive from Tucson). With its extensive series of Sky-Island mountain ranges, SE Arizona has the highest Lepidoptera diversity in the USA. With low desert scrub oak and mixed oak-pine woodland, lush riparian, juniper, Douglas fir, and mountain meadow habitats all within a 40-minute drive from the station, the SWRS is an ideal location from which to sample this diversity (of both habitats and species).

The focus of the Lep Course is to train graduate students, post-docs, faculty, and serious citizen-scientists in the classification and identification of adult Lepidoptera and their larvae. Topics to be covered include an extensive introduction to adult and larval morphology with a focus on taxonomically important traits, extensive field work on both adults and larvae, collecting and curatorial techniques, genitalic dissection and preparation, larval classification, and general issues in Lepidoptera systematics, ecology, and evolution.

At present, the projected staff include John Brown (Smithsonian), Richard Brown (Mississippi State), Jennifer Bundy (University of Arizona), Chris Grinter (The California Academy of Sciences), Sangmi Lee (Arizona State), Ray Nagle (University of Arizona), and Bruce Walsh (University of Arizona).

Details and an application form can be found online at http://research.amnh.org/swrs/education/lepidoptera-course. Deadline for applications are 1 July 2018. For further inquiries please e-mail Bruce Walsh at jbwalsh@u.arizona.edu, or Michele Lanan at mlanan@amnh.org

Societas Europaea Lepidopterologica

REGISTRATION IS NOW OPEN!

Combined Annual Meeting of The Lepidopterists' Society and Societas Europaea Lepidopterologica

Carleton University
Ottawa, Ontario, Canada
11-15 July 2018

Registration and abstract submission is now open for the 67th Annual Meeting of The Lepidopterists' Society, to be held **July 11-14, 2018** as a combined meeting with Societas Europaea lepidopterologica (SEL) at Carleton University in Ottawa.

For more information, to register and submit abstracts, please visit: **https://www.lepsoc.org/content/annual-meeting**

International travel support is available for LepSoc and SEL members upon application (Bryant Mather Award; see link above). If you are interested to participate in the **Third North American Microlepidopterists' meeting (July 10)**, you can also visit the link above to register and submit abstracts.

Questions? email lepsoc2018@gmail.org.

L'INSCRIPTION EST MAINTENANT OUVERTE!

Réunion annuelle combinée de la Société des Lépidoptéristes et de la Societas Europaea Lepidopterologica

Université Carleton
Ottawa, Ontario, Canada
11-15 juillet 2018

L'inscription et la soumission des résumés sont maintenant ouvertes pour la 67ème réunion annuelle de la Société des lépidoptères, qui se tiendra du 11-14 juillet 2018 en tant que réunion conjointe avec Societas Europaea lepidopterologica (SEL) à l'Université Carleton à Ottawa.

Pour plus d'information, pour l'inscription et la soumission de résumés, s'il vous plaît visitez: **https://www.lepsoc.org/ content/annual-meeting**

Le service de soutien pour les déplacements internationaux est disponible pour les membres de LepSoc et SEL sur demande (Prix Bryant Mather; voir le lien ci-dessus). Si vous souhaitez participer à la troisième réunion des microlepidoptéristes nord-américains (le 10 juillet), vous pouvez également visiter le lien ci-dessus pour vous inscrire et soumettre vos résumés.

Des questions? Envoyez-nous un courriel à **lepsoc2018@gmail.org.**

Fall 2017 observations of *Rekoa marius* and *Michaelus ira* in the LRGV using *Tecoma stans* (Bignoniaceae)

Bill Beck

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My wife Jane and I had two different weeks in the LRGV and made observations of (two species of) hairstreaks utilizing mature plantings of *Tecoma stans (*Bignoniaceae*)* around and in the Bentsen Palms and Retana Village area in Mission TX; a week in mid-October and then again in early November 2017.

Figure 1: *Rekoa marius* on *Tecoma stans*

The two species, *Rekoa marius* and *Michaelus ira*, are using *T. stans* as a host plant, but adult butterfly behaviors observed and caterpillar utilization of the flower reproductive parts are interestingly different. So though in the same area, and using the same host, they were for the most part non-competitors! (The family Bignoniaceae is a documented larval host for both species.)

Figure 2: Perched *Rekoa marius* male

In our first week there were only *R. marius* observed, in many local spots, and larger clumps of the plant seemed to be more attractive.

The *R. marius* males could be found holding perching sites directly on the top of the *Tecoma* shrubs….not on other plants. This could be seen occasionally most of the day, but more prevalent in the late afternoon. Males were seen using the *T. stans* flowers (cut by bees) for nectar by mid day or later.

The R. marius females would start actively moving and ovipositing around 10am directly on the tip of *T. stans* flower racemes, inserting an egg between buds, on only the very young buds. After laying one egg, the butterfly would pause, and then leave. This activity would seem to wane by late afternoon when it was common to find the females nectaring, using may different flowers including the *T. stans* bee-cut corollas.

Figure 3: Ovipositing *Rekoa marius* female

Several *R. marius* eggs were collected and two were successfully raised thru to adult butterflies, a male and a female (Oct 8 to eclose Nov 8). *R. marius* caterpillars ate voraciously and almost continuously (except when changing to the next instar), and showed little effort to hide (other than cryptic coloration). And while we have seen no larvae yet, Monteiro (1) documents ant interactions for *R. marius* caterpillars.

In November both *M. ira* and *R. marius* were observed. The first *M. ira* (Nov. 2, 2017) sighting was only the 4th recorded observation in the U.S. However in just days *M.*

Figure 4: Nectaring *Rekoa marius*

Figure 5: *Rekoa marius* final instar larva

ira was locally relatively common, with sightings of up to 10 a day. (There were many immediate local sightings during the Texas Butterfly Festival; one was reported at Starr County Falcon Lake SP: Linda Cooper.)

Female *M. ira* would be usually seen about the same time of day as *R. marius* females, in about the same locations.

Figure 6: *Michaelus ira* female ovipositing

However *M. ira* would start searching for oviposition locations at the top end of flower racemes, but would then walk down the stems well into the shrub, perhaps 12-20". An egg could be laid occasionally at the top bud area, like *R. marius*, but egg laying usually occured lower down the branch and was most often in a crevice between an offshoot and main stem.

While *R. marius* caterpillars appear to mainly use flower buds from an external position, *M. ira* caterpillars have a (documented) quite unique behavior of finding and burrowing into un-opened flower corollas, AND sealing the entry opening with silk.

Figure 7. Top: *Michaelus ira* 1st Instar; Middle: *M. ira* mid-instar entering corolla; Bottom: *M. ira* final istar exiting flower corolla

(We did collect three eggs, and are attempting life cycle photos. We have observed the corolla entry hole and silk sealing action.) (This is reminiscent of silver banded hairstreaks on balloon vine!) They appear to prefer to eat the more mature flower reproductive parts only from the INSIDE (See Bachtold (2)). Amazing! In this reference article it is postulated that this is an evolved defensive mechanisms for the young caterpillar against ants!

Figure 8: *Michaelus ira* Perched Male

Also noticeably different was male *M. ira* mating behavior, compared to *R. marius*. Male *M. ira* could be seen showing up to perch in trees in classic tree topping behavior. This was ONLY very late in the day, 500-530 pm until sundown. From one to several could be present. We saw the majority of this behavior on (Texas) Wild Olive trees (*Cordia boissieri*), though a few perch on other trees. The males would not be at the treetops, but on the lower third of the tree, and always in the sunshine. Mating would occur in the tree, and one mated pair was seen. The joined pair stayed into the night, and though un-joined, they were on the same leaf the next morning at 6am.

During this time we only saw *M. ira* nectaring on bee-cut *Tecoma stans* flowers.

Figure 11: *Michaelus ira* Joined Pair

Male *R. marius* are typically noticeably smaller and darker in color than their females. However the male *M. ira* we saw are typically larger than their females, and though the males maybe be slightly browner, and the females slightly paler and a touch gray, they were much more similar in appearance than were the *R. marius*.

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2) Bachtold A. Alves-Silva E. 2012 Behavioral strategy of a lycaenid (Lepidoptera) caterpillar against aggressive ants in a Brazilian savanna. Acta Ethologica DOI: 10.1007/s10211-012-0140-2.

Figure 12: *Michaelus* ira nectaring on *Tecoma*

Book Review -- Hammond/McCorkle

Continued from p. 27

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ARTHUR M. SHAPIRO, *Center for Population Biology, University of California, Davis, Davis, CA 95616.* **amshapiro@ucdavis.edu**

Conservation Matters: Contributions from the Conservation Committee

The rise and fall of a checkerspot population

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In practice, butterfly habitat restoration is often grounded in the so-called "Field of Dreams" hypothesis: if you build it (the habitat), they will come. In its simplest form, the assumption is that the physical environment sets the template for establishment of butterfly food, specifically, host plants that provide food for larvae and nectar plants that feed adults. The next assumption is that butterfly populations should be able to establish and grow to a relatively constant population size, which would be the carrying capacity determined by the available food resources. Sustaining butterfly populations at a particular site is often an explicit or at least implied goal of local habitat restoration projects.

Although sustaining populations is a goal, we know that many butterfly populations fluctuate widely in abundance. Theoretical ecologists have known for a century or so that feedbacks among individuals or populations of interacting species can cause abundance to cycle up and down, even in the absence of variation in the external environment. Nonetheless, it is difficult not to believe that, if a beloved butterfly population drops dramatically in abundance, something must have gone wrong. Two of the most extreme anecdotes I have encountered illustrating this assumption are a case in which a crash in a Taylor's checkerspot population by more than an order of magnitude (e.g., from ~15,000 to ~150 individuals in a few years) was attributed to handling during a mark-recapture study, and a case in which a Baltimore checkerspot restoration site was effectively abandoned because the population initially grew to thousands of butterflies, then dropped to about 10 individuals and persisted as a small population for several years. It is certainly true that poor handling and bad environmental conditions can cause populations to crash (though, if you do the math, dropping by two orders of magnitude in a few years would imply extreme effects of handling – on the order of decreasing daily survival to about 20% of that in unhandled butterflies!). Alternatively, it may also be that fluctuations in abundance of local populations are part of checkerspot biology, and that we should not expect or aim to maintain large populations continuously in the same place.

The theory behind "natural" population fluctuations comes from the notion that conditions deteriorate as a population grows. In its simplest form, theories predict that populations grow under conditions when numbers are low and the ratio of resources to individuals is high. If the maximum annual growth rate of a population is low, the population will grow until abundance exactly matches resource availability, and the population persists at the environmental carrying capacity. However, populations with high maximum growth rates may overshoot carrying capacity. In other words, individuals may consume so many resources that the environment does not recover in time for many of their offspring to survive. Extensions of these ideas include the possibility that populations build up larger predator, parasite or pathogen loads as they grow, and then crash when the negative effects of these consumers become too high. In these cases, natural cycles may serve the positive role of causing their populations to decline and perhaps go locally extinct as the butterfly population declines. Paradoxically, if we were able to control consumers just enough to maintain high local populations in these cases in the near term, we might cause them to slowly go extinct in the long term. Lepidopterists who work with pest species are familiar with boom-bust dynamics of pest populations. The surprise is that these same phenomena can occur in butterfly species that we want to conserve and protect.

My interest in boom-bust dynamics of checkerspot populations arose from field work with a Baltimore checkerspot population at a natural area in east-central Massachusetts (Figure 1; see Brown & Crone 2016 *Cons Bio* 30:103-112).

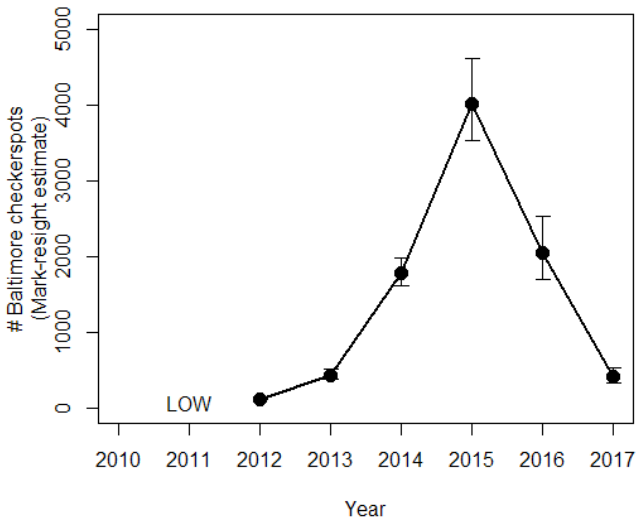

Figure 1. Population dynamics of Baltimore checkerspot butterflies at the Williams Property in Harvard, MA. Although we did not collect mark-recapture data in 2011, we visited it several times during flight season, and also surveyed caterpillar aggregations in late summer. 2011 numbers seemed similar to 2012.

Baltimore checkerspots are not a species of conservation concern in Massachusetts. However, they are a species of conservation concern in other parts of their range. We also chose to study them as surrogates for other listed checkerspot species, for which managers were concerned about possible negative effects of intensive study (see, e.g., Himes-Boor 2018 *Ecological Applications* (in press)). From 2012-2015, the population more than tripled in size each year, from ~100 butterflies in 2012 to ~4000 in 2015. Obviously, this kind of population growth could not continue indefinitely. In 2016, the population dropped to half of its 2015 maximum, and in 2017, it decreased to a quarter of the 2015 size, down to ~400 butterflies. Looking at the graph in hindsight, it is easy to imagine a cyclic population that will rebound again to high density in time. However, in the absence of this fairly rigorous monitoring, it would be tempting to attribute the declines during the past two years to something external to the population itself, such as the very dry conditions that occurred during the growing season of 2016, or perhaps even negative effects of long-term study, depending on one's personal biases.

The phenomenon of Baltimore checkerspot crashes due to overcrowding has also been noted in passing in two previous studies: In her dissertation research on Baltimore checkerspot parasitism in northern Virginia, Nancy Stamp (1984 *Oecologia* 63:275-280) experienced a year in which so many post-diapause checkerspot caterpillars emerged in spring that they defoliated the host plant, white turtlehead, and there were extremely few plants left for these caterpillars to oviposit on as adults, and so the population crashed. Deane Bowers and Annie Schmitt (2013 *Journal of the Lepidopterists' Society* 67:227-229) observed Baltimore checkerspot butterflies ovipositing on inappropriate plants (in this case, milkweeds) in Rhode Island in a year when post-diapause caterpillars had consumed most of the available host plants. Although some caterpillars hatched from eggs laid on milkweeds, there was no evidence that any of these survived. In both cases, the crashes occurred because the populations had grown too quickly, not too slowly (at least not until the moment of the crash). Anecdotally, I have also heard reports of large Baltimore checkerspot populations building up high parasite loads (from local lepidopterist Don Adams), though these patterns have not been rigorously quantified.

With only one population at one site, we cannot really know why there are fewer Baltimore checkerspots now than in 2015. Therefore, the purpose of this essay is not to convince you that our population is crashing due to overcrowding. Rather, I want to raise the possibility of intrinsic boom-bust dynamics, and consider their consequences. One implication is that we should expect populations to boom and bust, and that, at least for Baltimore checkerspots, maintaining stable populations might be an unrealistic conservation goal. In fact, if conditions deteriorate due to high consumption of food resources, or build-up of consumer populations, then crashes might be necessary to allow conditions to recover at a local site. Another implication is that multiple sites might be needed to sustain Baltimore checkerspot populations. The notion of metapopulation dynamics has been around for a long time in conservation biology, but it is often associated with ephemeral habitat patches, or connected networks of small habitat patches. For species that are not pests, metapopulation dynamics are less often thought of in the context of intrinsically cyclical butterfly populations.

One final question is whether boom-bust dynamics might be common in checkerspots in general, or butterflies in general. This question might seem surprising to ecologists who are familiar with eruptive or cyclical population dynamics in other species. Perhaps the answer is, obviously, yes. In my experience working with butterflies, however, I have never heard an on-the-ground manager respond to a population crash by saying, "Maybe it's just part of cyclical [or eruptive] population dynamics." The typical response is that some particular set of external conditions, such as temperature or precipitation or management at just the wrong time, were poor. For example, checkerspot species are known for their dramatic fluctuations in population size. These fluctuations have usually been attributed to changes in management, environmental conditions, or suitability of different host plants in different years. Most other butterfly species I have worked with vary a lot in population size, but not as dramatically as checkerspots. Taken at face value, these observations suggest that population cycles are typically rare in butterflies, and that the Baltimore checkerspot, if indeed it is a naturally cyclical species, would be an unusual exception.

Of course, in the vast majority of instances when we observe apparent eruptions followed by declines of butterfly populations, we don't really know the cause. It may be easier for such events to be attributed to accidental mis-management, or poor environmental conditions, and harder to conclude that boom-bust dynamics are unavoidable, at least from the public-relations perspective of local habitat restoration projects. Similarly, it would be wrong to attribute all population declines or failed reintroduction efforts to intrinsic "natural" causes, when there could be important extrinsic factors that need to be managed. The rise and fall of my checkerspot population was a surprise to me, even though I have spent at least as much of my career studying cycles in plant populations as I have spent studying butterfly conservation. In retrospect, I wonder how many other butterfly population cycles we miss simply because we are not looking for them.

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Translations of two original descriptions of *Hyalophora euryalus* Bdv. (Saturniidae) and the legacy of errors behind the common misspelling of the species name

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Jean B. A. D. de Boisduval and Pierre J. M. Lorquin, both self-taught naturalists, were adventurous, energetic Frenchmen who explored California during the rugged Gold Rush era, and added significantly to our knowledge of its natural heritage. The two were close friends with an informal agreement in which specimens collected by Lorquin were formally described by Boisduval, for example Lorquin's admiral (*Limenitis lorquini* Bdv). This was during a period of transition, in the mid-19th century, when the early European domination of the study of North American Lepidoptera (North American collectors sold material to European lepidopterists) gave way to the study of our fauna by notable Americans such as William H. Edwards, Samuel H. Scudder, F. H. Herman Strecker, and others (Leach 2013). Lorquin first discovered the California silk moth, *Hyalophora euryalus*, a congener of the familiar cecropia moth, but the moth was named and described somewhat later by Boisduval. The final acceptance of the true, proper name for the moth was delayed, not because of its French authorship, but through several improbable errors and missteps over nearly a century.

Here are translations of two relevant descriptions by Boisduval:

Boisduval, J.B.A. 1855. Bulletin Entomologique I trimester. Societe Entomologique de France. 3:25-32.

> "Such are, among others *Saturnia euryalus*, a relative of the North American *cecrop(i)a,* but much smaller and with distinctive primary eyespots and long lunules [HW discal spots] that cross the median band."

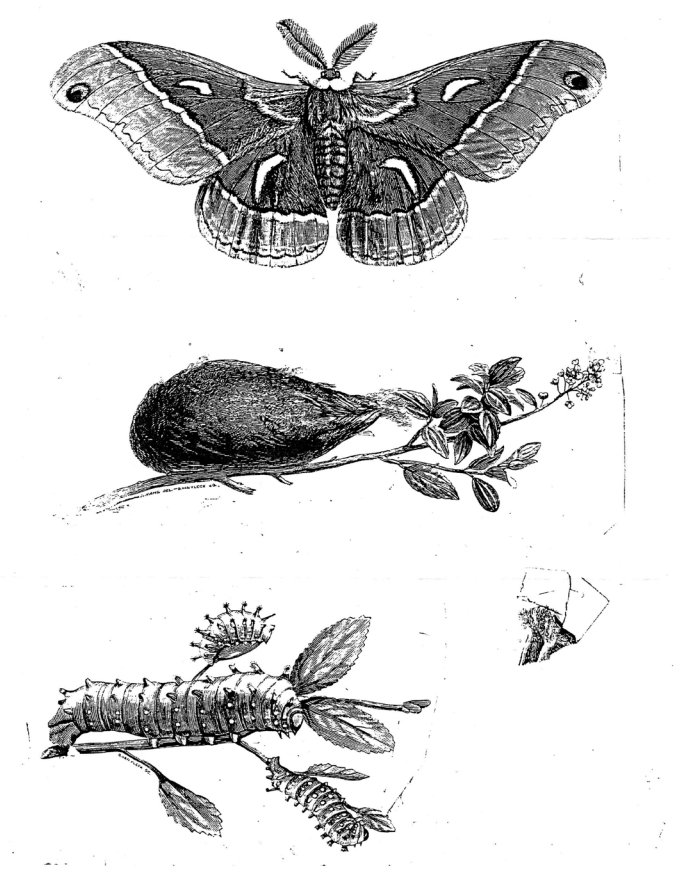
And:

Boisduval. J.B.A.1869. Voyage de deconvertes de L' Astrolabe 1832. Part One Lépidoptéres. Lépidoptéres de al Californie. Ann. Ent. Soc. Belgique 12:37-94; p. 83.
Genre SATURNIA

109. **Saturnia ceanothi**, Beer. [Behr]

Alae rubro-castaneae, fascia communi alba, lunulaque media elongate albido-lutescente. [Wings chestnut-red, head generally white, median lunules (discal spots) elongated white-clay yellow.]

Illustration accompanying original description by Boisduval (1855).



> "We have mentioned this species (Bulletin of the Entomological Society of France, year 1855) under the name of *Euryalus,* but we have learned that it had already been described for some time now by our colleague Dr. Beer [Behr] under the name *Ceanothi* which has remained.
>
> This beautiful Saturnine, first discovered by Monsieur Lorquin, and which had not been described until we learned of it from this entomologist, due to a reluctance we have always had for isolated and offhand descriptions, which for one reason or another has a certain relationship with *Cecropia*, but which is smaller and less colorful."

The misspelling of 'Behr' as "Beer" is curious. Boisduval knew Hans Hermann Behr, a German immigrant and

amateur naturalist who also frequented the California Academy of Sciences in San Francisco. Perhaps the mistake was a Freudian slip, but more likely was due to a miss-reading at the printers of Boisduval's notoriously obscure handwriting (John Calhoun, pers. comm.).

Boisduval was unaware that his use of the species name "*euryalus"* had publication precedence over Behr's "*ceanothi"* when Behr read his original description (as "*ceanothi*") at the meeting of the California Academy of Sciences in 1855. By an unfortunate oversight, when the minutes of the meeting were published a line of type containing "*ceanothi"* was omitted with the result that "rubra", as a Latin adjective, came to be interpreted as a seemingly very appropriate species name (McDunnough 1921). Sweadner (1937) was among the first to widely propagate the correct species name, but misfortune struck again when he reproduced the first description given above from Boisduval, but misspelled *euryalus* as "*euryalis"*, and did so also throughout his monograph. The name "rubra" is used in Holland (1903), and continued in Collins & Weast (1961). The correct spelling of *euryalus* is used by Packard (1914) (as a synonym of "*rubra*"), and used as the correct species name by Ferguson (1972), Lemaire (1978), Tuskes et al. (1996), d' Abrera (1998) and Powell & Opler (2009), yet unfortunately the "-is" spelling is still commonly seen in the general literature and in on-line articles.

Thanks to Patricia Hamilton for translating the rather arcane, 19th century scientific French text. Thanks also to John Calhoun for sharing his detailed knowledge of the historical literature.

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Membership Updates

Continued from p. 11

Address changes (continued)

Clay A. Nichols: 921 NE 23rd St., Oklahoma City, OK 73105 (clayanichols@gmail.com)
Harry Pavulaan: 606 Hunton Place NE, Leesburg, VA 20176 (Harrypav@hotmail.com)
Prof. Orley R. Taylor: Monarch Watch, 2021 Constant Ave., Lawrence, KS 66047 (chip@ku.edu)

Corrections

Patricia R. Moran-Hodge (misspelled as Morgan-Hodge): P.O. Box 734, Eastsound, WA 98245

Nyridela xanthocera (Walker [Erebidae: Arctiinae] -- USA record from Texas

Monica Krancevic **mmk77566@gmail.com**

Heather Pickard, a resident of Ottawa, Ontario, Canada, was on holiday in the Lower Rio Grande Valley of Texas when she photographed a day-flying Lepidopteran nectaring on *Chromolaena odorata*.

Dr. James Adams and Edward Knudson IDed the image as *Nyridela xanthocera*, a moth well-known from Costa Rica through Mexico, but never before recorded in the U.S.

Her sighting on November 29, 2017,occurred at the Valley Nature Center, Weslaco, Hidalgo County, Texas, USA (26.1589944N, 97.9973981W, ±20m).

Metamorphosis

edited by Chris Grinter

Robert Francis Commagère, 73, left this world with the sunrise on Aug. 22, after a 16-month battle with pancreatic cancer. He was a life member of the Lepidopterists' Society and joined in 1970. Known as "Robin" to his family and friends he died in his home in the Brentwood area of Los Angeles, surrounded by his family.

The only child of Maridel Francis (of Spokane, Wash.,) and Robert Anthony Commagère (of New Orleans) he was born in Los Angeles on Aug. 13, 1944, a product of romantic war-time love and a subsequent happy home. In 1958 his family moved from Encino, where he attended both Hesby Street School and Birmingham Junior High School, to Laguna Beach where he attended Laguna Beach High School. He graduated with the class of 1962, who are having their 55th reunion this weekend, which Commagère was excited to attend. He also attended Orange Coast College and finally USC Film School where he studied cinematography.

Commagère, however, diverted his path to follow his love of classical music and launched Genesis Records Inc. in 1969, which gave a voice to many neglected Romantic composers including Hermann Goetz, Antonin Dvorak, and Julius Schulhoff, ultimately releasing over 70 LPs. Early issues featured Los Angeles-based virtuosos Adrian Ruiz, Gerald Robbins, and Jakob Gimpel, but the catalogue expanded steadily to include an impressive array of piano solo, chamber and concerto works, many of them premiere recordings. The label also joined the '70s ragtime revival, issuing pioneering recordings of lesser-known American ragtime composers Joseph Lamb, Joseph Scott, along with those of novelty composer Zez Confrey.

He also collected and housed what is probably the largest collection of classical sheet music in the United States known as the Commagère Music Collection.

Yet what made Commagère unique was his insatiable curiosity and infectious enthusiasm for everything from pugilism to entomology, Mexican Ranchera music to California native plants, cinema to astronomy, photography to track and field, and what he sometimes felt was his life's work—genealogy, and later genetic genealogy. Among other lines, he traced his family line back to the 11th Century.

Never a passive observer, he devoured all his disparate interests with an intense alacrity. His family will miss seeing him busy at the computer, excitedly comparing centimorgans while he blasted the works of Charles-Valentin Alkan, or taking long walks on the shores of Laguna Beach as he photographed the most poetic minutiae that only he could see. He was never seen without his camera, and there was no sunset too redundant or rock too mundane to immortalize.

His passion for music will be carried on by his children in their own musical endeavors, but his enthusiasm, knowledge, kindness, and immeasurable love will forever leave a gaping hole. He is survived by his beloved wife of 44 years, Ramira; their children Kerstin, Anton, Carla, Juliette and Robert; their spouses/significant others Hans Hagen, Joachim Cooder and Sasha Speilberg; and his grandchildren Hana, Lyric, Paloma, and another grandson on the way.

He was laid to rest in Corona del Mar at the Pacific View Memorial Park on Aug. 27.

(Originally Published in the Laguna Beach Indy, 21 Sep 2017)

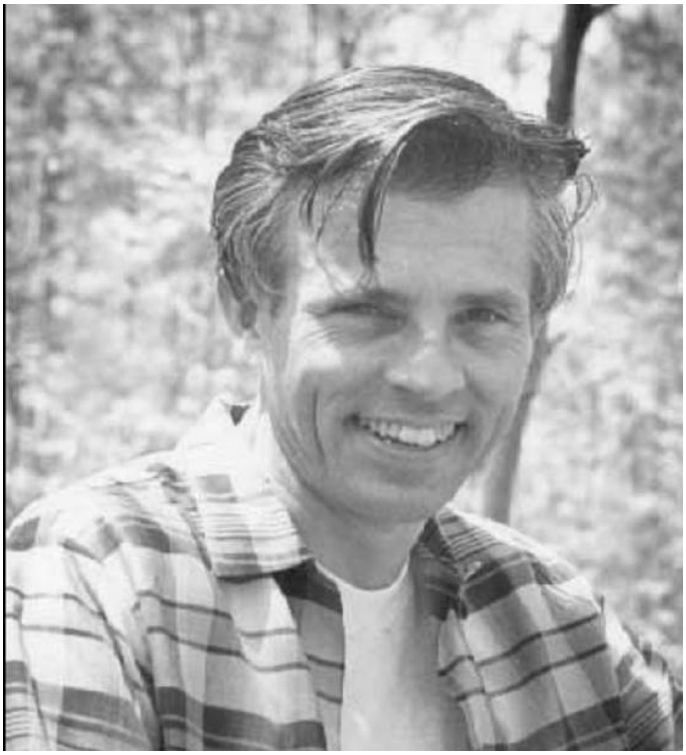
Douglas L. Houck, 76, of Canton, Ohio, died August 21, 2017, at his home. Douglas was a life member of the Lepidopterists' Society and joined in 2007. He was born October 7, 1940, son of the late Gordon L. Houck and Gladys B. Houck. He was the founder and former CEO of DLH Industries, Inc., Canton, Ohio. A Navy Veteran, he was a missile tracker on the Atlantic Missile Range at Ascension Island. His philanthropy work has helped many organizations and individuals. He attended Cuyahoga Falls High School class of 1958, Cuyahoga Falls, Ohio. In addition to his parents, he is preceded in death by brother, Vernon K. Houck, VP of DLH Industries, Inc.

He is survived by sisters, Carol R. (Don) Thursby, Cambridge, Ohio and Gay L. Houck, Huron, Ohio. He is also survived by seven nieces and nephews: Juli Jacobs, Sherry (Damon) Voros, Timothy Filing Jr., Chylece (Jim) Head,

Greg Houch, Jason (Collene) Shupe, Jamie Shupe. Also surviving are special friends, neighbors, and pal, Tippy. The family would also like to thank Crossroads Hospice and Home Instead for their care and professionalism.

Reed Funeral Home NORTH CANTON Chapel handled the cremation. Interment at Greenlawn Memorial Park, Akron, Ohio. The family has requested that any memorial contributions be made to the Douglas L. Houck Foundation at Stark Community foundation.

(Originally Published in The Repository on Sept. 2, 2017)



Ronald William Hodges, 83, died at his home in Eugene, Oregon, on Sunday, December 10, 2017. He was preceded in death by his wife, Elaine Rita Snyder Hodges, after 39 years of marriage.

Ron was born on August 7, 1934, in Lansing, MI, an only child to parents Elma and Lester Hodges, and became interested in Lepidoptera at age six upon finding a freshly emerged Luna moth in the backyard of his Michigan home. He stated his intent to update Holland's "Moth Book" as a ninth grader. He received his BS degree in 1956 and his MS degree in 1957 from Michigan State University, where he was strongly influenced by Roland Fischer. He went to Cornell University to work with John Franclemont. During this period he did extensive field work in New York, North Carolina, Florida, Arizona, and Ecuador. He became deeply interested in the microlepidoptera, particularly the Gelechioidea, and was awarded a PhD degree in 1961. He received a National Science Foundation Postdoctoral Fellowship and commenced to work on genera of Gelechiidae. This project was interrupted when he accepted a position with the Systematic Entomology Laboratory at the U.S. Department of Agriculture, Agricultural Research Service located in the Smithsonian National Museum of Natural History, Washington, D.C. He had several roles in the Laboratory, including laboratory chief. He stepped down from this position to continue field and laboratory research on gelechioid moths. At the Smithsonian, he met Elaine, a scientific illustrator, and they married in 1967; Ron adopted her two sons, Steven and Larry.

He was a member of the American Association for the Advancement of Science, American Association for Zoological Nomenclature (president 1993-95), American Entomological Society, Entomological Society of America, Entomological Society of Canada, Entomological Society of Ontario, Entomological Society of Washington (honorary member, 1999), Michigan Entomological Society, the Lepidoptera Research Foundation, the Lepidopterists' Society (president 1975-76), Maryland Entomological Society (president 1973-74), Ohio Lepidopterists, Northwest Lepidoptera Society, Sigma Xi, and Societas Europaea Lepidopterologica. He received the Thomas Say Award from the Entomological Society of America for his editorial oversight of Moths of North America in 1990, the Karl Jordan Medal from the Lepidopterists' Society for research on gelechioid moths in 1997, and he was elected an honorary member of the Entomological Society of Washington in 1999.

Ron was active until retirement in the Washington Biologists' Field Club since being elected in 1963. He was president from 1976 to 1979 and participated on various committees and work and field days. He was for many years the lead cook in the kitchen. In 1997, Ron and Elaine retired to Eugene, Oregon, where he continued to work on moths (an illustrated, annotated key to genera of North American Gelechiidae) and, until 2011, to edit and publish /The Moths of America North of Mexico/. Gardening with a highly diverse array of plants and developing and maintaining a collection of mainly pleurothallidine orchids also have interested him in retirement. In his spare time, Ron gardened a highly diverse array of plants, enjoyed classical music and paired gourmet meals and wonderful wines.

Survivors include Steven and Susan Hodges of Santa Barbara, California, and Lawrence Hodges of Germantown, Maryland; two grandchildren; two great-grandchildren; his cousin Ann Haseltine of Ishpeming, MI; and Elaine's siblings and their families. Ron will be remembered for his big heart and generosity. He loved to share his garden, food, wine, music passions with his many friends and family. Sensitive to every dangling participle, "can I?" and "may I?" were distinguished, as were the salad and dinner forks. He is missed."

(Obituary courtesy of the Hodges family)

Cracking the life history of Noel McFarland

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Note: This article was written, read by Noel, and submitted to James Adams in mid-January. Lamentably, Noel did not get to see the article in print with the images contributed by his friends and colleagues. Noel passed peacefully on 21 January, not long after Dienie and their daughter Audra took him up to his homestead of 32 years in Ash Canyon. I submit this text largely unchanged except for verb tense--a formal obituary will follow in Journal of the Lepidopterists' Society.

Noel McFarland (Figs. 1, 2) was a renowned western North American lepidopterist, who for decades was the most knowledgeable person on the life histories of western moths, particularly those of southern California and Arizona. He served as a conduit for much of the combined unwritten collecting and life history knowledge of Californian lepidopterists who were active in the first half of the 20th century (e.g., John Adams Comstock, Chris Henne, Charlie Hill, Lloyd Martin, and Frank Sala) and passed much of this collective knowledge to myriad students and colleagues for decades. If one needed to find the early stages of anything or puzzle out a hostplant, Noel was the person to call. And, if he didn't know, he was the single best person to help augur the unknown based on his extensive knowledge of biogeography, botany, soils, moth phenologies, and the early stages and life histories of related species.

Noel's major contributions to those of our Society or otherwise with an interest in Lepidoptera were not so much through his publications or direct involvement with the Lepidopterists' Society but as a mentor, knowledge nexus, director of a one-man biological station, and source of specimens (or livestock). By way of measure: in Powell and Opler's (2009) book on the Moths of Western North America, Noel is cited 116 times—mostly for life history information that he had worked out in southern California, western Oregon, or on his property in Ash Canyon in southeastern Arizona.

From 1979-2011, his five-acre parcel at the mouth of Ash Canyon was famous as one of the most productive destinations a lepidopterist could hope to find. Most nights Noel ran 3-6 blacklight stations, offered free camping or a bunk bed, and had desk space for visitors to his lab (Figs. 3, 4). It was nearly impossible to visit without leaving with a bounty of specimens and newly acquired knowledge of moths.

Noel was a modern incarnate of Jean Henri Fabre, preferring to collect in his yard or nearby canyons, almost to the exclusion of collecting elsewhere. When one lives in southeastern Arizona, just a few miles north of the Mexican border, new US records, new (undescribed) species, and new life histories are there for discovery, just beyond the back door. His plate was always full: daily servicing of his rearing lots, microscopy, photography, and meticulous note taking--there was little point in wasting valuable time commuting to another site given how much was left to do in Ash Canyon. Being a classic naturalist, his biological interests were broad and often diverted to reptiles, succulents and native plants, Neuroptera, Hemiptera

Figs. 1, 2. Noel McFarland. 1. Noel and Dienie McFarland at Infestation 2013--a yearly celebration of all things arthropodological hosted by Pat Sullivan and Lisa Lee at their home up Ramsey Canyon—a storied, if not legendary collecting destination for entomologists of all varieties. 2. Noel and Robert Behrstock rummaging for pupae of *Datana eileena* (Notodontidae), reared from manzanita in his yard. Prior to the collection shown here and subsequent barcoding, *D. eileena* had been regarded to be a synonym of *D. perspicua*, a sumac feeder.

Figs. 3, 4. McFarland's Ash Canyon property. 3. Noel's laboratory and collection room; it even had a small room with bunks for visitors. Herein one would find his collection of meticulously spread and labeled moths—many of which were reared, as well as sundry mundane objects, humorously labeled with entomological precision: with date, price, purchase location…often ended with his signature cartoon of a geometrid larva. 4. Noel ran as many as seven lights a night, including the *special*, lighting station below his home, around which wrapped a 40-foot-long parabolic screen that Noel swore by. If you loved moths, Noel's property was moth Mecca, a destination not to be missed through the months of the monsoon.

(especially mirid and tingid bugs). He developed an intense interest in breeding doves from all over the world: Cape, Mountain Witch, Greenwing, and Australian Crested Doves. For 14 years his primary passion was breeding the spectacular Danphe Pheasant, the national bird of Nepal. Peacock Pheasants were another favorite, and were kept for decades.

Noel grew up in the foothills of the Santa Monica Mountains, just north of Beverly Hills. He developed a passion for rearing caterpillars from a very early age—and held that interest, some eight decades later. Books provided his portal into lepidopterology. As a child, he was greatly influenced by Holland's (1903) *The Moth Book*, and spent many hours, turning its pages. Allan's (1947) *Moth Hunter's Gossip* also was read from cover to cover more than once. His interest in life history work was much fueled by Eliot and Soule's (1902) *Caterpillars and Their Moths*. His father and later two high school teachers—one of whom very much encouraged his initial studies of botany—were quite supportive of his entomological pursuits.

Noel had several mentors from the rich community of lepidopterists who were active in Los Angeles through his teenage years and early twenties: John Adams Comstock, Charlie Hill, Lloyd Martin, and various attendees of the Lorquin Society. Lloyd Martin, the Lepidoptera curator at the Los Angeles County Museum of Natural History, was especially influential and formative in Noel's entomological growth. Lloyd would stop whatever he was doing to put names on the moths that Noel had reared or collected at lights from his backyard. Edmund C. Jaeger, a professor of biology at Riverside Junior College, was one of his most influential teachers when Noel was in his early twenties. Noel accompanied Jaeger on many desert field trips, in 1962 and 1963, to areas in and around Palm Springs. His closest field companion and friend was Chris Henne. The two (Little Wormie and Big Wormie) spent hundreds of hours in the field collecting and rearing caterpillars together, becoming especially close through the last years of Henne's life. Ron Leuschner and Noel met when Noel was young—they maintained a close association for more than fifty years.

Noel's legacy contributions are his book on Australian geometrid life histories and Seven Backyards website. *Portraits of South Australian Geometrid Moths* is Noel's (1988) opus, a large-format book, lavishly imbued with excellent black and white photographs of all four life stages. Noel's macrophotographic skills, especially of eggs and other small structures, are outstanding. The core of the book is its 72 detailed life histories for geometrids that Noel found near Adelaide while employed as an Assistant Curator of Insects at the South Australian Museum (1965-1970). Each species, set off as its own chapter, receives one to three pages of text and numerous larger-than life images—the accounts are rich in Noel's personal observations, and not infrequently, infused with rearing tips, ecological and evolutionary musings, and other content of general interest. It is far more than a taxonomic work—perceptive behavioral observations are salted through all accounts. There are various introductory sections, essays, four appendices, and a bonus section that offer a wealth of knowledge on rearing techniques, larval and adult behavior, resting postures of larvae and adults, a section on food plant use, insect macrophotography, and more—text of relevance for any lepidopterist interested in immature stages and natural history. The idiosyncratic nature of the indexing, format, codifications, embedded notes, and leavening of literary quotes are amply reflective of Noel's personality, dislikes and loves, and independent thinking with regard to publication.

In 2006, McFarland and Larry Prevett (Computing for Science & Education Institute, Bisbee, AZ) started working on his Seven-Backyards website <http://www.sevenbackyards.org/> to share findings on the moth faunas of the properties where Noel collected over the course of his life. The website is an eclectic collection of faunal lists, phenological and life history data, habitat photos, digitized reproductions of some of Noel's publications, biographical information, essays and commentary, and more. It is rich in historical information (e.g., habitat imagery) that will be valuable to future lepidopterists interested in faunal change—especially important will be records for Ash Canyon before the Monument Fire. Noel spent 32 years on the same 5-acre parcel, running blacklights on most evenings, and rearing caterpillars and working out life histories by day. The website is a treasure trove for previously unpublished hostplant associations and seasonal phenology for moths. The site cannot be searched for specific taxa and other kernels of interest, so it takes a bit of time to navigate--and as such, some of McFarland's most scientifically important content may be overlooked by Google and other search engines.

Winds shifted abruptly on the morning of June 14th, 2011, pushing the massive Monument Fire, which for days had been burning at the south end of the Huachucas Mountains, northeast into Ash Canyon. Heat from the blaze assisted a wind that drove the fire down the canyon at more than 60 miles an hour. When the mandatory evacuation orders came, Noel and Dienie had less than 30 minutes to pack up and get away. By mid-afternoon they would lose all four structures on their property: their trailer home, the studio, and Adobe lab. His pet pheasants. The flames turned to ash more than 40 drawers of his most-prized insects; the voucher adults for many of the species he had reared since coming to the canyon in 1979; a large mirid and tingid (both Hemiptera) collection (with their documented host associations); and his hispine chrysomelid beetle collection. Gone was his irreplaceable collection of preserved caterpillars. And, catastrophically, years of meticulous notes on the life histories of all the species he had raised in Arizona, correspondence files, and most of his photographic images were incinerated. Noel's days of collecting, note-taking, and insect macrophotography ended that day. He started curtailing contact with other biologists; instead he poured his energies into his Seven Backyards website, his daughter Audra's family, and reading.

Noel was generous with specimens and his extensive knowledge of life histories. His colleagues remunerated with many patronyms. His discovery in spring 1958 of *Sandia mcfarlandi*, a gorgeous hairstreak just outside of Albuquerque, New Mexico, in La Cueva Canyon as an undergrad at the University of New Mexico, made quite a splash. The find was excitedly recognized and described as new by Paul Ehrlich and Harry Clench within a year of Noel's discovery. In 2003, the handsome green hairstreak was selected as the State Butterfly of New Mexico. It is notable that McFarland's patronyms derive from four different insect orders: Coleoptera, Diptera, Hemiptera, and Lepidoptera—a testimony to both the depth and breadth of his knowledge of natural history and further reflection of Noel's deep-seated alignment to the writings of Jean Henri Fabre.

Figs. 5-8. *Callophrys mcfarlandi* (P. Ehrlich and Clench) and *Nemoria arizonaria* (Grote) (Geometridae). 5. Adult male *C. mcfarlandi* perched on territory. 6. *Nolina*-feeding last instar attended by ant (both images courtesy Bob Barber). 7. Flower (catkin)-feeding last instar *N. arizonaria* collected from emory oak. 8. Last instar *N. arizonaria* reared on emory oak leaves. The two morphs, differing in coloration, texture, and behavior, are inducible. Larvae fed low tannin diets tend to resemble and feed on flowers; while full sibs fed on tannin-rich foliage are less rugose and colored in earth tones.

One of Noel's most significant discoveries was the phenomenon of phenotypic plasticity in *Nemoria* (emerald) caterpillars (Geometridae). Noel documented that spring generation larvae of *Nemoria arizonaria* mimicked oak catkins, their preferred larval food resource, in both phenotype and behavior (Fig, 7), but that their second-generation offspring—that had no recourse except to feed on foliage—mimicked twigs in phenotype (Fig. 8). It was an extraordinarily tangible example of the old saw that "You are what you eat." Eric Greene (1989) would later work out pieces of the molecular underpinnings, pegging tannins (phenolics) in the larval diet as the trigger that launches the developmental cascade (genes) responsible for the remarkable lifestyle differences. The *Nemoria arizonaria* story appeared on the cover of Science magazine and was used by Douglas Futuyma to illustrate the phenomenon of phenotypic plasticity in several editions of his evolution textbooks.

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Is a rose by another name a moth?

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What's in a name? that which we call a rose
By any other name would smell as sweet.

Romeo and Juliet, Shakespeare

I admit to a bias against the Internet as a definitive source of information. Search engines and Wikipedia are wonderfully convenient, but for deep-reading research in a favorite comfortable chair, a book – especially original material -- has no substitute. I think I speak for many in this, and would hope it is not entirely a generational bias.

The saturniids are lucky to have largely escaped being tagged with common names. (For a wry treatment of this issue, see Lutz 1948, pp. 156-157.) When I began seeing on the internet *Hemileuca eglanterina* referred to as the "Elegant Sheep Moth", I bristled just like their caterpillar. This is careless writing and lazy document checking. There are two problems with this common name.

First, "E-G –" ain't "E-L –". Boisduval (1852) wrote at the end of his original description: "Ce bel insecte a été élevé de chenilles trouvées sur les Eglantiers, rosiers sauvages, sur les bords du San-Joachim." Or, "This beautiful insect has been raised from caterpillars found on the Eglantiers, wild roses, near the banks of the San Joaquin." Ferguson (1971, p. 148) excerpts this passage in his discussion of the type locality.

For a definition I quote The Century Dictionary: an encyclopedic lexicon of the English language. 1914. Vol II. Century. NY: **eglantine** n. [Early mod. E.; first in the 16th century, F. eglantine.] 1. The sweetbriar, *Rosa rubiginosa* and *R. eglanteria*.

The irony of the species name is that not only are roses one of many larval hosts, but the adult moth, while highly variable, almost always has a few patches of rose pink on the forewing, and sometimes is entirely rose-pink, yellow, and orange. Yet, this color association is nowhere in Boisduval's description. I would like to think it was in the 'back of his mind'.

The second objection concerns the comparison to sheep. "Sheep Moth" was coined by Holland (Packard 1912, pp. 132-133), who wrote: "They are characteristic of the country of the sage-brush, and the ranges of the western sheep-herder" (Holland 1920, p. 93). Anyone familiar with the destruction caused by herds of grazing, dull-witted sheep would agree that the moniker slights this beautiful saturniid.

I prefer not to suggest a substitute common name; most moth collectors just use "eglanterina". Probably the pinnacle of common names for saturniids was "Hickory Horned Devil". Let's leave it at that.

Thanks to Will Richardson (Ex. Dir. Tahoe Institute of Natural Science) for an interesting exchange on these topics. Thanks also to Pat Hamilton for her careful translation.

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1. Electronically transmitted file and graphics — in some acceptable format — via e-mail. Graphics/figures should be at least 1200 x 1500 pixels/inch^2 for interior use, 1800 x 2100 for covers.

2. Article (and graphics) on disk or thumb drive in any of the popular formats/platforms. Indicate what format(s) your disk/article/graphics are in, and call or email if in doubt. The InDesign software can handle most common word processing software and numerous photo/graphics software. Media will be returned on request.

3. Color and B+W graphics; should be high quality images suitable for scanning. Original artwork/maps should be line drawings in pen and ink or good, clean photocopies. Color originals are preferred.

4. Typed copy, double-spaced suitable for scanning and optical character recognition.

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Material for Vol. 59 and 60 must reach the Editor by the following dates:

	Issue	Date Due
60	2 Summer	May 10, 2018
	3 Fall	Aug. 15, 2018
	4 Winter	Nov. 15, 2018
61	1 Spring	Feb. 15, 2019

Be aware that issues may ALREADY BE FULL by the deadlines, and so articles received by a deadline may have to go in a future issue.

Reports for Supplement S1, the Season Summary, must reach the respective Zone Coordinator (see most recent Season Summary for your Zone) by Dec. 15. See inside back cover (facing page) for Zone Coordinator information.

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Plate 19 from Mariposas Nocturnas by Emmit Gowin (see review of this book on page 24)

Feralia februalis, CALIFORNIA: Riverside Co.,Dripping Springs Campground entrance, 10 mi E of I-15 along Hwy. 79, 33º 27' 53" N, 116º 58' 18" W, 1560' March 12-13, 2009, at lights, with Dave Wikle (photo by James Adams); this moth should be out now for people in southern California!

Papilio polytes, Penang, Cameron Highlands, Malaysia, March 6, 1986 (photo by George Krizek; see related article, pg. 3)

Lamproptera meges, Perak, Cameron Highlands, Malaysia, Feb. 27, 1986 (photo by George Krizek; see related article, pg 3).

Carmenta ithacae, Kokomo, Indiana June 18, 2011 (Photo by Kelly Fiegle; see Research Request, pg. 23)