

# Inside:

Life cycle of Hebomoia glaucippe boholensis

**Conserving rare butter**flies in Michigan

**Butterflies of NE India** 

Additions, deletions and corrections to the KY list of Lepidoptera

Ghost moth larvae from Isla de Chiloé, Chile

Monarchs in trouble in the western U.S.

Native seed distribution program for golf courses

Membership Updates, Metamorphosis, Book Reviews, Announcements (lots), Marketplace

... and more!





Volume 63, Number 1 Spring 2021

The Lepidopterists' Society is a non-profit educational and scientific organization. The object of the Society, which was formed in May 1947 and formally constituted in December 1950, is "to promote internationally the science of lepidopterology in all its branches; to further the scientifically sound and progressive study of Lepidoptera, to issue periodicals and other publications on Lepidoptera; to facilitate the exchange of specimens and ideas by both the professional worker and the amateur in the field; to compile and distribute information to other organizations and individuals for purposes of education and conservation and appreciation of Lepidoptera; and to secure cooperation in all measures" directed towards these aims. (Article II, Constitution of The Lepidopterists' Society.)

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# Contents

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Conservation Matters Conserving rare butterflies in Michigan	
David Pavlik.	3
Observations on ghost moth larvae from Isla de Chiloé, Chile	
(Lepidoptera: Hepialidae)	
John R. Grehan and Matías E. Gargiulo.	6
Announcements:	9
Most MONA fascicles now free as PDFs; Lep Soc Meeting 2021 now	
virtual; Wedge Entomological Research Foundation Student Award;	
Pay Pal; Season Summary records on SCAN; Southern Lep Soc; Soc of	
Kentucky Leps; Assoc for Tropical Leps; Categories of Financial suppo	$\mathbf{rt}$
for Wedge Foundation; Mix Family Award for Contributions to Lepi-	
doptera; GBIF Young Researchers award winner; Journal of Lep Soc	
page charges reduced; Lep Soc diversity, inclusion, harrassment, and	
safety statement; Lep Soc Collecting Statement; Election results	
Life history notes on the orange-tip butterfly ( <i>Hebomoia glaucippe</i>	
boholensis) from Bohol Island, Philippines (Lepidoptera: Pieridae)	
Jade Aster T. Badon and Cristy Burlace.	13
Digital Collecting Butterflies of NE India: Sikkim - West Bengal - Assa	m
Bill Berthet.	14
Book Reviews	21
Additions, deletions, and corrections to the Kentucky list of Lepidopte	ra
Loran D. Gibson, Charles V. Covell, Jr., and Ellis L. Laudermilk	24
Membership Updates.	
Chris Grinter	33
From the Editor's Desk	33
Conservation Matters What's going on with Monarchs in the Wes	t?
A conservation conundrum	
Cheryl B. Schultz and Elizabeth E. Crone	34
Metamorphosis.	36
Bill Shepherd (by Paul Johnson); George Krizek (by Paul Opler)	
The Marketplace.	38
Entranced by <i>Actias luna</i> – a bifid discovery	
Tor Hansen	40
First pheromone collection of the rare Synanthedon richardsi (Sesiidae)	
William H. Taft, Jr.	45
Evaluation of a continental native seed distribution program for	
golf courses, 2020	
Marcus Gray	46
Membership, Dues Rates, Change of Address, Mailing List, Missed or	
Defective Issues, Submission Guidelines and Deadlines.	50
Executive Council/Season Summary Zone Coordinators.	51
Issue Date: February 19, 2021 ISSN 0091-13	48

Editor: James K. Adams

#### **Front Cover:**

Eastern Courtier, *Sephisa chandra*, India, state of Assam, road to Ultapani, April 18, 2013. Upperside: Km 22 along road, underside: western edge of Manas Biosphere.

# <u>Conservation Matters: Contributions from the Conservation Committee</u> Conserving rare butterflies in Michigan

#### David Pavlik

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You may have read about the current population declines of many species of insects, a so-called insect apocalypse. While the extent of insect declines is still being studied, it has been well established that populations of many beneficial pollinators, including butterflies, are decreasing in Europe and North America. Butterfly species that were once common are becoming harder to find and some rare butterflies are on the verge of being lost forever. Michigan has many rare butterflies that researchers are striving to conserve, but others that also deserve attention are declining, across the state, a few of these at an alarming rate. In order to save rare butterflies in Michigan and elsewhere, we must first understand why they are disappearing.

Often it can be difficult to determine why a species is declining, while other times the causes are abundantly clear. Take Michigan's prairie butterflies as an example. It is estimated that the extent of prairie and savanna habitat in Michigan once covered 2.2 million acres or more. At present, it is estimated that less than 1% of these habitats remain in Michigan due to conversion of land to farming, development, and interruption of natural disturbance regimes. Not surprisingly, the fauna that depends on these communities have been trending downward in step. For example, the Regal Fritillary (Speyeria idalia), once found in the lower half of Michigan in prairie and other open landscapes, has been extirpated from the state. The Karner Blue (Lycaeides melissa samuelis), listed as federally endangered, is another butterfly that has been lost from much of its historic range. Its host plant, Lupinus



Karner Blue (Lycaeides melissa samuelis)

perennis, thrives in frequently disturbed prairies, former glacial lake beds, open savannas, barrens dunes, and other sandy habitats. Modification of historical disturbance regimes in these communities, especially fire, along with landscape-level habitat changes have resulted in Michigan nearly losing another of its native prairie butterflies. Fortunately, conservation partners from around the Great Lakes have been able to increase the abundance and number of Karner populations in the state through habitat restoration, management, and captive rearing and breeding. Thanks to the hard work by these individuals and organizations, this butterfly can be abundant in good years and is one of the iconic butterfly conservation success stories in Michigan—see also Gifford et al. (2020) in the previous issue of the Newsletter about management successes in and around Albany, New York, the colony chosen by Vladimir Nabokov as the type locality.

Prairie fens--wetlands with alkaline soils and marl--are another rare habitat in Michigan. Several uncommon plants and animals live in these specialized habitats, and much like upland prairies and savannas, these habitats have been vanishing from Michigan at a startling rate. Prairie fens have complex water structures that have been disrupted by the installation of drainage ditches and nutrient runoff affecting the groundwater table that is necessary for these areas to persist. Additionally, in the absence of natural disturbance regimes like fire, encroachment from woody vegetation and invasive plants (i.e. Common Buckthorn and Eurasian Phragmites) has greatly reduced the size of the remaining prairie fens in the state. Butterflies commonly inhabiting these areas include Baltimore Checkerspot (Euphydryas phaeton), Dorcas Copper (Lycaena dorcas), and various grass- and sedgeeating skippers. Swamp Metalmark (Calephelis muticum), once common in prairie fens around the state, has not been seen in many years, despite extensive searching by conservation groups and butterfly hobbyists. While it is possible this butterfly still exists in Michigan, the loss of the Swamp Metalmark is another example of the effects that widespread habitat destruction can have on a oncecommon species.

Many conservation partners around the Midwest and Canada are diligently working to ensure the same fate does not befall the Poweshiek Skipperling (*Oarisma poweshiek*). This critically endangered butterfly, now only found in one or two locations in Michigan and one location in Manitoba, also inhabits prairie fens. This species was

News of The Lepidopterists' Society



Poweshiek Skipperling (Oarisma poweshiek)

once so abundant in the Midwest that avid butterfly collectors would pay it no attention. Now, researchers are lucky to see more than a few in a full day of surveys at known sites. What is most concerning about this species' decline is how quickly populations have disappeared. While it is clear that the loss of habitat has resulted in declines, other factors are likely contributing, which conservation biologists are working to uncover.

Over the past 10 years, Poweshiek Skipperling populations have vanished from areas of seemingly suitable habitat. Researchers hypothesize that the widespread use of neonicotinoid insecticides, confirmed to be present in fens where the skipperling was once found, could have caused populations to disappear. Additionally, the Poweshiek Skipperling overwinters as a caterpillar, fully exposed to the harsh winter elements found in the Midwest. The caterpillars depend on the high humidity and mild temperatures found underneath the snowpack, which acts as an insulator, to survive. With climate change, this snowpack is much less reliable, and we now see frequent freeze and thaw cycles over the course of a winter. If caterpillars have no snowpack to act as a buffer against the elements during periods of extreme cold, this could have negative impacts on remnant populations.



Mitchell's Satyr (Neonympha mitchellii mitchellii)



Release of Poweshiek Skipperlings into natural habitat

To assist in the recovery of the Poweshiek Skipperling, conservation biologists are raising caterpillars in captivity, greatly increasing their chance of survival, so that they can be released back into extant populations once they become butterflies. These researchers have recently had several major breakthroughs in captive rearing and breeding, giving renewed hope for the potential recovery of one of the rarest butterflies in Michigan, and in the world.

Another Michigan prairie fen specialist and federally endangered butterfly that has declined throughout the state is Mitchell's Satyr (*Neonympha mitchellii mitchellii*). Like other species mentioned above, Mitchell's Satyr has seen its habitat disappear due to changes in hydrology, encroachment from woody and invasive vegetation, and habitat loss. Fortunately, there are still several healthy populations in the state. Conservation-minded organizations are working together to restore habitat by removing woody vegetation and rearing caterpillars in captivity that can eventually be released back into the wild as adult butterflies.

While the Karner Blue, Poweshiek Skipperling, and Mitchell's Satyr are the iconic rare butterflies in Michigan, there are other species deserving of attention that are "flying" under the radar. One such butterfly that we should be concerned about is the Early Hairstreak (Erora *laeta*). This species spends most of its life in the canopy of American beech (Fagus grandifolia) trees. The larvae eat mature beech tree nuts and possibly leaves. Adults spend most of their time in the canopy, descending only to find nectar before returning to the overstory. For these reasons, the Early Hairstreak is very rarely observed, making the tracking of population trajectories difficult. It is possible this species is, or was, common in Michigan, but rarely observed. It is also possible this species is disappearing from Michigan, and the rest of the United States, without us even knowing. Beech bark disease, caused by a sapfeeding insect and a fungus, was discovered in Michigan in the year 2000. The insect and fungus work together to kill healthy beech trees. Older beech trees are especially susceptible to the disease. This is a problem for the Early Hairstreak because the caterpillars have a preference for beech nuts, which are only found in significant quantities on trees that are 40 years or older. It is conceivable that the loss of habitat, especially mature beech tree stands in Michigan, has resulted in Early Hairstreak population declines as we have seen with so many other butterflies, yet this complex species-host interaction remains unstudied.

These are just a few examples of how rare butterflies in Michigan have been affected by changes in climate and land use, invasive species, and modification of natural disturbance regimes. Two other Michigan butterflies that have disappeared or are disappearing include the Ottoe Skipper (*Hesperia ottoe*), once found in native Michigan prairies, and the Grizzled Skipper (*Pyrgus centaureae wyandot*), once found in open barrens, that may already be lost from these environments.

Why should we care about these rare butterflies, or butterflies in general? In addition to being among the most attractive terrestrial invertebrates and ambassadors for invertebrate conservation efforts, butterflies act as indicator species, alerting us to underlying environmental issues that are affecting species in these habitats, not just butterflies. When we lose a butterfly from these areas, they signal that we may be losing the functional integrity of the systems where they live. These butterflies give us an early warning of what is happening, and that conservation actions may be needed.

Fortunately, there are many ways you can help conserve rare butterflies. One way you can help is by participating in annual butterfly counts or assisting butterfly monitoring networks in your area. Data collected during these volunteer counts help scientists better understand how butterfly populations are changing over time and allow us to identify population declines before it is too late. Many states have monitoring networks that are looking for volunteers, including the Michigan Butterfly Monitoring Network, and the Ohio Lepidopterists Monitoring Network. See if your state has a monitoring program and get involved to help conserve rare (and common) butterflies! If one currently does not exist in your state, starting a butterfly monitoring network would be immensely beneficial. As more states start similar programs, we will have a clearer idea of how butterflies are responding to local, as well as national, challenges and how we might help the species and ecosystems in greatest need.



Rock strewn creekbed in western Sikkim state of India that Bill Berthet investigated for butterflies. See related article, pg. 14.

# Observations on ghost moth larvae from Isla Grande de Chiloé, Chile (Lepidoptera: Hepialidae)

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The larval stages and biology are well known for only a small proportion of the c. 700 known species of Hepialidae. Larvae are secluded feeders living within a silk-lined web or tunnel on the ground surface, in the soil, or within the woody tissues of host plants. Most species are probably subterranean dwellers where they feed on roots or the leaves of surface vegetation or decaying leaf debris. Some species are root or stem borers that feed on callus tissue at wound sites and a few species feed on woody tissues of shrubs or small trees. A few species are also known to feed on dead leaf litter within forests throughout development or live within sphagnum moss. The early stages of many species are known to feed on fungi or fungal infested plant tissues before transitioning to live plant hosts (Grehan 1989, Dugdale 1994, Grehan & Ralston 2018).

The larval stages of Central and South American Hepialidae are regionally among the least documented for both morphology and biology. Callus-feeding stem borers are known for the 'phassine' genera of Mexico and Central America and the 'cibyrine' group ranging between southern Mexico and Argentina (Mielke *et al.* 2020). But this group is absent west of the Andes south of Ecuador where 11 other genera occur along the Andes between the Ecuador and Tierra del Fuego (Nielsen & Robinson 1983, Grehan & Rawlins 2016, Grehan & Mielke 2018). In the absence of any report of stem feeding species in this region it is probable that all species live on or within the ground.

For southern South America, Nielsen & Robinson (1983) noted that apart from the larval stages of *Dalaca*, nothing was known about the biology of the southern hepialid fauna. The exception for *Dalaca* is the result of some species such as *D. chiliensis* and *D. pallens* being pests of natural and artificial grasslands. Larvae inhabit tunnels in the soil and feed on the foliage of grasses and herbs by cutting the leaf base so that the brown color of the dead leaves contrasts with the surrounding green of uninjured plants (Cisternas 1987, 1989; González 1989). Larvae of these species are also known to feed on the stem just above the root collar where they remove the bark and outer tissues of herbaceous and shrubby plants such as raspberry (Cisternas 2000) and cranberry (Cisternas 2013).

Details on the biology of other southern Andean species remains elusive. Nielsen & Robinson (1983 fig. 24) did illustrate a *Dalaca* larva found under a fallen log, but provided no details about feeding. Here we present some further observations of hepialid larvae associated with fallen and decaying logs by MEG. We are unable at this time to identify the species, but the records provide some detail on the precise location of the larvae and evidence for the consumption of decaying wood tissues as well as live plants in the diet.

Five larvae were found within or under the dead and decaying logs of fallen trees within intact and disturbed forests on the island of Chiloé (Fig. 1).



**Fig. 1.** Field records of ghost moth larvae on Isla Grande de Chiloé (insect). Red circle – area of observations.

Larva 1 (Fig. 2a): Beneath the bark on top of a fallen tree about one meter from the ground (Fig. 3a). Body length of about 8 cm suggests the larva is near its final instar. The larva was surrounded by moist, actively decaying wood.

Larva 2 (Fig. 2b) and Larva 3 (Fig. 2c): Each found in moist muddy soil under a dead log.



**Lavra 4** (Fig. 2d): Under a dead log at soil surface and surrounded by decaying wood. The decaying log was located in a semi-open area with following logging (Fig. 3b).

Larva 5 (Fig. 2e): Within soft decaying wood of a log within an area of logged forest (Fig. 3c).

The location of at least two larvae (larva 1, larva 5) inhabiting decaying wood tissue, and larva 1 under bark at the top of a decaying log, demonstrates that at least

Fig. 2a. Larva No. 1 under bark on upper surface of dead log. Location: 42°29'38.34"S, 73°51'41.56"W (see also https://www.inaturalist. org/observations/63597731). Fig. 2b. Larva No. 2 found under log, in muddy soil. Location: 42°29'16.38"S, 73°51'52.33"W (see also https:// www.inaturalist.org/observations/37671308). Fig. 2c. Larva No. 3 found in wet soil under Location: 42°20'22.20"S, decaying log. 73°46'54.06"W (see also https://www.inaturalist. org/observations/62450986). Fig. 2d. Larva No. 4 under dead log at soil surface. Location: 42°29'6.88"S, 73°52'12.31"W (see also https:// www.inaturalist.org/observations/65762430). Fig. 2e. Larva No. 5 within dead log. Silk lining of the tunnel visible around the posterior abdomen. Location 42°29'6.88"S, 73°52'12.31"W. All photos by Matías Gargiulo.

some species of southern South American Hepialidae are inhabitants of dead, decaying wood rather than just being associated with dead logs that provide shelter for soil inhabiting species as may be the case for larvae Nos. 2, 3, and 4. Dead decaying wood of fallen trees has not previously been confirmed as a habitat for larval Hepialidae, other than as a temporary stage for fungal feeding early instars of *Aenetus virescens* where older instars transition to the stems of live trees and shrubs (Grehan 1989).

In the absence of rearing to adult, the species or even genus of these larvae cannot be determined. However at least three species appear to be involved as indicated by differences in the extent of the prothoracic sensory pits which can be diagnostic for different species of Hepialidae (Dugdale 1994). These 'pits' comprise an area of microtrichia around the base of each seta SD1 and SD2, as a microtrichiated area enclosing both SD1 and SD2, or both setae being enclosed along with D2 (Grehan & Rawlins 2003). In the larvae observed here, larva 1 is distinct from the other specimens in having a separate microtriciated base for SD1 and SD2 respectively (Fig. 4a). In the other four larvae, SD1 and SD2 share a common microtrichiated bed.

There are also differences in body color that are suggestive of species differences. Larva 2 (Fig. 2b) and larva 3 (Fig. 2c) both have a pale to medium grey body with darker pinnacula, but lateral areas of larva 3 also have yellowish grey highlights and the microtrichiated region between SD1and SD2 appears to be considerably narrowed. Larva 4 and 5 each have a pale greyish white body and reddish brown prothorax and share the same microtrichiated field enclosing SD1 and SD2 (Figs. 4d, e). We therefore conclude



Fig. 3a. Location of larva 1a under bark of fallen log. Fig. 3b. Location of larva 2d under log in area following logging. Fig. 3c. General location of larva 2e in habitat following logging. All photos by Matías Gargiulo.

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that larva 4 and larva 5 are probably of the same or closely related species.

The current observations do not unequivocally demonstrate specialist consumption of decaying wood by these species, even for those specimens found tunneling within the dead wood. Many of the fecal pellets surrounding larva 4 (Fig. 2d), which was at the interface between dead wood and soil, show a combination of reddish brown and bright green tissues. This combination may indicate the consumption of live plant tissues along with decaying wood. Future rearing of larvae is highly desirable to fully identify the host plant tissues for these decaying-wood inhibiting larvae, and to confirm species identification by rearing to adult.

#### Acknowledgments

We are grateful to Paul Hutchinson (Welshpool, Western Australia) for comments on the manuscript. Matías Gargiulo also thanks his sons Bastián and Martín who played a large part in the main findings in the field, and without whom it would not have been possible to complete this contribution to the published work on hepialids in South America.

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# Most MONA Fascicles Now Available as Freely Downloadable PDFs!



The Wedge Entomological Research Foundation (WERF) recently completed a project to make digitally available all published *Moths of America North of Mexico* as PDFs with full text search capability, and is pleased to offer these for download on its website at:

#### http://wedgefoundation.org/publications\_paypal.asp

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Fascicles published prior to 2015 were physically scanned since "born digital" high resolution copies were unavailable; those fascicles are free. Born digital PDFs were available for the four most recently published fascicles (9.4 *Eucosma*, 2015; 9.5 *Pelochrista*, 2017; 22.1A Notodontidae, 2018; 25.4 Noctuidae, 2020). These four PDFs can be purchased and downloaded at a sliding discount compared to the corresponding print versions, based on the number of years since publication. For additional information please contact WERF's Managing Director, Kelly Richers (kerichers@wuesd. org).

# <u>Announcements</u>: 2021 Annual Meeting to be Virtual

The annual meeting of the Lepidopterists' Society for 2021 is going to be held virtually. Details have NOT been finalized, so be looking for further announcements on the website and in the June issue of the News. It was with some regret that we made this decision, but considering where the general public is in terms of the pandemic, we felt it was still not safe to hold a large in-person meeting. We are still hoping to hold the 2022 meeting at Western Carolina University in Culowhee, North Carolina. Stay tuned.

# Wedge Entomological Research Foundation Student Award

The Wedge Entomological Research Foundation (WERF) was founded to promote the study of insects, their evolution and diversity, and in particular to research and publish information on the moths of North America. WERF's flagship publication is the Moths of America North of Mexico (MONA) series, now in its 50th year, of which many fascicles are available for free in PDF form at http:// wedgefoundation.org/publications\_paypal.asp. The Foundation has recently initiated an award program for students. This Student award is \$1,000 per year, and can be used for expenses related to the study and conservation of moths, butterflies, and related insects (e.g., travel to meetings, field station room/board, biosystematics research costs, etc.). High school, undergraduate, and graduate students are eligible. WERF is especially committed to supporting underserved groups. A one page (500 word) project description with an indication of how the funds will be used must be submitted by 1 February. This first year the due date is 15 May 2021. The application should be accompanied by a resume or curriculum vitae, and a letter of recommendation from the student's major professor or academic advisor. Preference will be given to proposals that focus on Lepidoptera. Completion of a 350-word summary of project findings, with one to two appropriate images, is required by 31 December of the award year. Support from WERF should be acknowledged in relevant presentations, publications, web products and similar deliverables.

# PayPal -- the easy way to send \$ 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. 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!

# Searching The Lepidopterists' Society Season Summary on SCAN

Brian Scholtens and Jeff Pippen

The Season Summary coordinators, Brian Scholtens and Jeff Pippen, want to thank everyone who made our first effort at producing the Season Summary a success. We particularly thank all the Zone Coordinators, who put up with lots of instructions about how to format and submit records, and who all successfully sent records so that we could produce the summary.

Part of what we are now doing as a society is contributing all our Season Summary records to SCAN (Symbiota Collections of Arthropods Network), a larger effort to assemble and make available occurrence records of insects and other arthropods to the greater scientific community and the public in general. Each year we now upload all of the submitted Season Summary records to this site. In addition, several years of back records are also hosted here, and we hope to continue adding past years as that is possible.

Now that our Season Summary is available online, we thought it best to provide a simple set of instructions about how to use the SCAN database to search our available records. This process is easy, but not immediately obvious when you start exploring the site. To get started you can go directly to the SCAN site using the link below, or you can access the site through the Lepidopterists' Society webpage using the link under Season Summary. Then just follow the set of instructions below to access, search and download any data from the Season Summary. The first two instructions set up the search feature to search only the Lepidopterists' Society records. If you would like to include other databases, you can select them in addition to our database. Have fun and explore a bit. There are lots of interesting datasets on the site, including quite a few from major and minor collections as well as some important personal collections. Have fun exploring our data and those in the other databases.

- 1) Go to: https://scan-bugs.org/portal/collections/ index.php
- 2) Click on Select/Deselect All to deselect all databases
- 3) Scroll to near the bottom of the list and select
- Lepidopterists' Society Season Summary
- 4) Go back to the top and click on Search
- 5) Choose whatever criteria you would like and tell to complete search
- 6) Records will be displayed
- 7) Click on the icon in the upper right if you would like to download records
- Click on appropriate choices this will download comma separated or tab separated data, which can be compressed or not
- 9) Click Download Data

# 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 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. 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 69<sup>th</sup> 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. The annual meeting is held each year in November, at the University of Kentucky, Lexington. Jason Dombroskie will be this year's featured speaker. In addition, there will be a fall field meeting held in Georgia over the Labor Day weekend. Be looking for a report in the next SKL Newsletter. Follow the Society's facebook page (https://www.facebook.com/societykentuckylep/) for announcements of this and other field trips.

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

# 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, though that may change with the recent move to Spring for the SLS meeting in 2019, with whom we typically share a meeting. 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.

## The Wedge Entomological Research Foundation Revises Categories of Financial Support

In 1989 the Wedge Entomological Research Foundation (WERF) created the financial contributor category of Patron to recognize persons and organizations donating \$2,000 in support of the Foundation's publication efforts, The Moths of North America series of monographs. Each Patron is recognized in every publication of the Foundation. Currently, there are eleven patrons.

The WERF is updating its categories of financial support. Until the year 2021, any person or organization desiring to become a Patron can pledge \$2,000 to be paid in full or in three annual installments (to be paid in full by 31 December 2021). Beginning in January 2021 the Foundation will introduce new categories of financial support; Platinum = \$10,000, Gold = \$5,000, and Silver = \$2,500. For all three levels of support, payments can be made in full or in three annual installments. Beginning in January 2021, the category of Patron will be closed, and all Patrons will be designated as Founding Patrons.

Founding Patrons, and contributors at the Platinum, Gold, or Silver level will be recognized in all future publications of the Wedge Entomological Research Foundation.

Please contact Kelly Richers, **krichers@wuesd.org**, for further information. Thank you for your continued support.

## Mix Family Award for Contributions in Lepidoptera

In honor of Nancy, John, Lin, and Joe Mix, the Lepidopterists' Society is pleased to announce the establishment of the "Mix Family Award for Contributions in Lepidoptera." This award will be used to honor an amateur lepidopterist (someone not professionally employed as an entomologist) who has contributed the most to the field of Lepidoptera in the view of the Awards Committee. Outstanding shortterm or long-term accomplishments will be considered, and may include contributions to outreach and education, collaboration with colleagues, novel research and discoveries, building an accessible research collection, or leadership within the Society. Nominations are allowed from any member of the Lepidopterists' Society and the nominee must also be a member of the Society in good standing.

This annual award is funded by a very generous monetary donation from Steve Mix that is designated specifically for this award. Award recipients will receive a check for \$1,000 and a plaque that will be presented at the banquet at the Annual Meeting of the Lepidopterists' Society. The award will be presented to a single recipient, and any person who receives the award is not eligible to be nominated again for at least 5 years. It is estimated that the initial donation will be sufficient to sustain this award for at least 20 years. In the event that the award fund is reduced to the point where the award cannot be sustained, the Executive Council will determine if the award will continue.

# Award winner addresses data bias while assessing trends in boreal butterfly diversity



Vaughn Shirey, a Ph.D student at Georgetown University, is one of two winners of the 2020 **GBIF** Young Researchers Awards. An expert jury has recognized Shirey, who was nominated by the GBIF United States delegation, for their effort to address data bias while modelling the long-term impacts of climate and land-use change on a wellknown group of organisms in poorly sampled regions: the butterflies (Papilionoidea) that inhabit the boreal forests of North America and northern Europe.

Disparities in the availability of biodiversity data across space and time present challenges for modelling, measuring and mitigating threats like climate and land-use change. With the world's boreal forests now facing rapid warming and widespread land conversion, sparsity of data from these high-latitude environments only increases the difficulty and urgency of such challenges.

Combining butterfly data available through GBIF with trait data extracted from literature, Shirey's research both examines a group of organisms particularly sensitive to global change and provides a model for using data with known gaps and biases to analyse high-priority conservation areas. The results synthesize a macroscale study of butterfly richness and composition trends in North American and European boreal forests between 1940 and 2019. "GBIF-mediated data serves here as the backbone for making inferences about butterfly communities in a time of global change," said Shirey. "The 'pseudo-sampling' technique I apply, alongside accounting for observer behaviors, can help develop best practices for using sparse, opportunistic occurrence records to understand biodiversity dynamics."

"Vaughn is a tremendously creative and independent thinker who has charted their own path since arriving at our lab, so this award is truly well-deserved," said Leslie Ries, Associate Professor of of Biology at Georgetown University. "With their combination of data science skills, passion for serving the community and commitment to highlatitude field work in a vast and logistically challenging ecoregion, Vaughn has all the qualities of a leader for the next generation of ecologists." "I had the opportunity to supervise and work with Vaughn during their stay in Helsinki under a Fullbright Fellowship," said Pedro Cardoso, curator of arachnids, millipedes and terrestrial molluscs at Luomus, the Finnish Museum of Natural History. "They already had a number of ideas on how to best use GBIF data and overcome their limitations, and I never ceased being impressed by their work capacity. Seeing Vaughn going this far this fast is not really a surprise, but still makes me so happy to see their work recognized with such an important award!"

"I am both impressed with Vaughn's existing record and their potential for transformational approaches to the use of GBIF data," said Rob Guralnick, curator of Biodiversity of Informatics at the Florida Museum of Natural History and University of Florida Research Foundation Professor. "Vaughn has already established themself as a nextgeneration leader in eco- and biodiversity informatics, especially given their focus on integrating machinelearning approaches into knowledge synthesis and citizen science-based work."

Shirey is the second U.S. national to win the award, after Kate Ingenloff (2018), the first from Georgetown, and the third nominated by the U.S. delegation to GBIF, following Ingenloff and Andrés Lira-Noriega, a Mexican researcher then studying in the United States, who received an award in 2010, the award's inaugural year.

Shirey shares the award with Ángel Luis Robles of Mexico. The pair will both receive a €5,000 prize and recognition at the upcoming GBIF Governing Board meeting.

#### About the Award

Since its inception in 2010, the annual GBIF Young Researchers Award has sought to promote and encourage innovation in biodiversity-related research using data shared through the GBIF network.



*Oeneis polixenes* in Kluane National Park, Yukon Territory Canada - Summer 2019. Photo by Vaughn Shirey.

(Additional announcements continued on page 39)

# Life history notes on the orange-tip butterfly (*Hebomoia glaucippe boholensis*) from Bohol Island, Philippines (Pieridae: Lepidoptera)

Jade Aster T. Badon<sup>1</sup> and Cristy Burlace<sup>2</sup>

<sup>1</sup>Biology Dept., Silliman University, Dumaguete City, Philippines 6200 & The Philippine Lepidoptera Butterflies and Moths, Inc. **jadetbadon@su.edu.ph** <sup>2</sup>Habitat Bohol, Bilar, Bohol, Philippines **cristyhabitatbohol@gmail.com** 

**Key words:** *Hebomoia*, life history, Bohol, Philippines

The genus Hebomoia was described by Hübner in 1819 from the type specimen of *Papilio glaucippe* Linnaeus. The species has seven subspecies in the Philippines (Treadaway & Schroeder 2012): ssp. philippensis Wallace 1863 (H. g. reducta Fruhstorfer 1907, H. g. aishines Fruhstorfer 1911, and H. g. mindorensis Fruhstorfer 1911 are synonyms) occurs in Catanduanes, Lubang, Luzon, Marinduque, Mindoro, and Polillo; ssp. boholensis Fruhstorfer 1911 (H. g. cebuensis Okano & Okano 1994 syn.) occurs in Bohol, Cebu, Masbate, Negros, Panay, Siquijor, and Ticao; ssp. cuvonicola Fruhstorfer 1907 occurs in Cuvo; ssp. erinna Fruhstorfer 1910 occurs in Babuyan and Batanes; ssp. iliaca Fruhstorfer 1911 occurs in Basilan, Biliran, Camiguin de Mindanao, Dinagat, Jolo, Mindanao, Panaon, and Samar; ssp. palawensis Fruhstorfer 1907 occurs in Balabac, Dumaran, and Palawan; and ssp. lindae Treadaway & Schroeder 2008 occurs in Bongao, Sanga Sanga, Sitangkai, Sibutu, and Tawi Tawi. This paper provides life history notes of Hebomoia glaucippe boholensis from Bohol, Philippines.

#### Hebomoia glaucippe boholensis Fruhstorfer 1911

The illustrated larva was found in a private butterfly garden in Bilar (a poblacion), Bohol, Philippines. The larva (possibly last instar) was green, with bluish to tiny black protrusions (Figs. 1-2). The lateral section has yellow to orange globular markings with two conspicuous dark orange and two bluish globular markings near the head (which also has a narrow white band on the lateral section). The pre-pupa (Fig. 3) was pale green with reduced body protrusions and the lateral section has white and dark yellow globular markings. The early pupa (Figs. 4-5) is pale green with black markings. After a few days it became darker yellow green with an orange patch (Fig. 6) on the apical region of the developing wings. An adult male (Fig. 7) and female (Fig. 8) are illustrated.

**Habitat**: The caterpillar was found in a garden at 300 m elevation with dense vegetation.

**Hostplants**: The caterpillar was found feeding on *Capparis* sp. (Capparidaceae) (Figs. 9-10). According to

Igarashi and Fukuda (1997), this species feeds on *Crateva* religiosa, *Crateva magna*, *Capparis moonii*, *Capparis* sepiaria, *Capparis acutifolia*, *Capparis lanceolaris*, and *Capparis pumila* (all in the plant family Capparidaceae).

#### References

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- Treadaway, C.G. & Schroeder, H.G. 2012. Revised checklist of the butterflies of the Philippine islands (Lepidoptera: Rhopalocera). Nachrichten des Entomologischen Vereins Apollo S20: 1-64.
- Tsukada, E. (Ed), Yata, O., & Morishita, K. 1985. Butterflies of the South East Asian Islands. Vol. 2: Pieridae & Danaidae. Plapac, Tokyo. 623 pp.

All photos by Cristy Burlace. Figures 1-8 are on the back of the News, pg. 52.



Figures 9-10. The hostplant, Capparis sp. (Capparidaceae).

# **Digital Collecting: Butterflies of NE India: Sikkim -**West Bengal - Assam

#### **Bill Berthet**

12885 Julington Road, Jacksonville, FL 32258



This article is based on a butterfly photography holiday from April 5-26, 2013. The trip was organized by Adrian Hoskins, and our butterfly guide was Arjan Basu Roy.

Adrenalin was gushing through my brain as I boarded a United Airlines plane for the 14 plus hour flight from Newark to New Delhi, where I joined up with 5 Brits at the airport for a very early morning breakfast. We left Delhi at 10:40am on a Jet Airways flight to Bagdogra, West Bengal India. Picking up our vans at the airport we transferred to Chilapata Jungle Camp in West Bengal, which was complete with a butterfly lab created by Nature Mates.

At the Jungle Camp, the bungalows are on stilts. While having dinner that evening we were entertained by a powerful thunderstorm with the most impressive lightning display I have ever witnessed. Later that evening while lying on the bed I looked up to see hundreds of bright yellowish green astronomical images stuck to the ceiling that phosphoresce after turning the light off, reminding me of the black light posters on the walls in my college dorm room in 1969. I found it difficult to sleep that night as a family of Owls living near the bathroom walls were mak-

bergems@comcast.net

ing noises all night long.

Our group spent several days at Chilapata Reserve Forest, which forms an elephant corridor between Jaldaphara National Park and Buxa Tiger Reserve, which used to be home to rhinoceroses.

Following a muddy narrow trail along a creek I was greeted by Cheritra freja as it bobbed up and down along the trail with very long straight multiple tails. I also encountered the colorfully marked, rarely observed Arhopala perimuta and Heliophorus epicles, showing off its bright red wing margins.

Walking along a dry riverbed filled with recent elephant foot prints and bread loaf size dung, we spotted Horaga onyx, Arphopla centaurus, and Flos asoka. Entering an insect and vegetation choked closed canopy, we observed one brightly yellow colored *Delias descombesi* standing out against the dark background. Some of the swallowtails included Graphium sarpedon, and G. doson along with the Common Map butterfly, Cyrestis thyodamas.



The Chilapata Reserve Forest marker and the Butterfly Lab.

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Out next stop was Buxa Tiger Reserve, where we were surprised that parts of the forest had been burned. Walking the road Nigel (one of the Brits) had the tiny *Catapaecilma elegans* landing on his arm.

Later our group came across a bridge where workers were making and pouring concrete that was attracting various

species of butterflies. What a blast it was, as butterflies were fluttering around everywhere! *Castalius rosimon* was among them, joined by a very fresh open wing Papilio demoleus.

I split from the group, and found a <sup>1</sup>/<sub>4</sub> mile wide dry riverbed. I encountered a nice *Papilio paris* along the way.



I headed back to find a car and driver, and then followed the dry riverbed for around 6 miles to finally find water. As I got out of the car a dog approached, and I made the mistake of giving it one of my snacks. The dog did not want to leave my side for much of the afternoon! I observed hundreds of white and yellow butterflies puddling in one small area, but the dog kept running into the pile and flushing them. Finally, I was able to rid myself of the dog. I found a funky shaped, shaky trail/bridge made out of bamboo (see page 44) snaking around huge boulders. The bamboo bridge/trail was there to direct people on a narrow path up a mountain with a small Buddhist temple on top. On the other side of the huge boulders it was like entering heaven, with a beautiful waterfall (see page 44) flowing into a pool of crystal clear blue water. The only butterfly observed here, however, was *Kallima inachus*.



Bill, dog and a cloud of white butterflies.

The 6 member international group set off to the small, around 100km long x 70km wide, almost totally mountainous, Indian State of Sikkim, bordered by Nepal, China, Bhutan, and West Bengal. The elevation ranges from 280m to 8,586m, including Kanchenjunga, also known as K3, third highest mountain in the world. Around 700 species of butterflies reside here. The biodiversity is a mix between Palaearctic and Oriental regions.





At the border crossing, we had to apply for inner line permits to enter the state. That took around 2 hours to complete. Driving on the left side on a narrow, curvy, mountainous, 2 lane road, we arrived late in the afternoon to The Bliss Village Resort for the night.

The next morning we saw young men breaking rocks with а sledge hammer to make concrete at a bridge crossing that is attracting butterflies. This area produced Papilio bianor, the rarely

seen *Parasarpa dudu, Udaspes folus*, and *Cepora nadina*. We are surprised to see even elderly men and woman sitting down breaking small rocks with a hammer on the side of the road. We arrived at our first destination, Barsey Jungle Camp, close to the Barsey Rhododendron Sanctuary, with a spectacular multicolored Rhododendron forest when in bloom. Heading N.E in Western Sikkim after breakfast the vans passed by a very large concrete boat on the side of the road. Such a boat seemed very odd, and I would like to know the history around this watercraft. The ultimate destination today is the Water Garden at Heepul that is a large and very uneven, quickly descending rock-filled stream bordered by lush vegetation. This habitat kept us busy most of the day. You had to work really hard and carefully in this potentially dangerous area to photograph butterflies boulder-hopping down the stream.

There was a flat area at the bottom below the bridge that had a difficult to navigate zig-zag trail to reach a moist sandy bank. This bank was attracting several species of butterflies that we did not observe above. The days' clicks included *Graphium cloanthus*, *Graphium glycerion*, *Atrophaneura polyeuctes*, and *Polyura athamas*. Happy with the day's results, we stopped at a very friendly home-



Left: Grass Demon (Udaspes folus). Top Row: Common Peacock (Papilio bianor), Glassy Bluebottle (Graphium cloanthus), Spectacled Swordtail (G. glycerion). Bottom Row: White Commodore (Parasarpa dudu; upper-/ undersides), Lesser Gull (Cepora nadina).



Volume 63, Number 1

#### News of The Lepidopterists' Society



Common Windmill (Atrophaneura polyeuctes; underside and upperside) and Common Nawab (Polyura athamas).

stay for the night run by grandma, grandpa, daughter, and grand-daughter. Getting from the road to their homestay took us over 30 minutes of huffing and puffing, hiking up a nearly vertical trail. The young locals could carry over 100 pounds of our luggage at a time, up this trail without breaking a sweat!

While driving the next day we found a relatively flat area next to a rainbow trout hatchery with flowering vegetation. I decided to boulder hop up a very steep moss covered almost dry creek (see page 5) looking for something different. One of the target species for this trip to Sikkim was *Papilio krishna*, but, unfortunately, none were observed.

Arjan arranged for a fried trout lunch that really hit the spot.

There were not too many bugs that day but we did get *Papilio polyctor ganesa, Papilio helenus*, the legally protected *Orthomiella pontis pontis, Chiliara kina*, and *Colias fieldii*. Overall the weather was cooler and rainier than normal, keeping the butterfly observations low.

That night we stayed at the swanky Hotel Red Palace in Yuksom, and were given brightly colored silk prayer flags upon arrival.

In the morning we drove out to a large helipad outside of town, bordered by forest on one side and house gardens on the other. Not much was happening but did score the rare and striking *Auzakia danava* mineralizing next to a stream (1770m) in the rain, along with *Papilio helenus*, *Celaenorrhinus leucocera*, and *Belenois aurota*.





Commodore (Auzakia danava).

After staying at the Hotel Red Palace another night we drove to Siliguri to catch the antique looking Rajdhani Express train. It was jam packed with people heading to Kokrajhar, where we transferred to a Forest Bungalow in the Ultapani area in the far Western part of Manas Biosphere Reserve in Assam. Driving for 22km on a very muddy narrow two lane road led us to the forest bungalow. In the late afternoon we passed a bridge construction area teeming with butterflies. The next day looked very promising. That evening we shared a very good dinner. That was followed by a presentation by a local expert on the flora and fauna of the area. Driving in parts of India can be dangerous, hectic and tension filled. On one occasion our driver and a person from another car got out of their cars cursing at each other because one would not yield the right of way. In addition, there is the wildlife. You can pass by monkeys to elephants (see back cover) and everything in between.

In the morning we walked along the mud filled road photographing several butterflies along the way. After lunch we drove several miles to the concrete bridge project. We spent hours clicking away to our hearts delight. The challenge was having six die-hard butterfly photographers all in one small area. Goodies for the day were *Sephisa chandra* (see front cover), *Tanaecia lepidea, Charaxes kahruba*, and a very skittish female *Charaxes bernardus*.

Early the next morning Tony and I took our coffee with us while walking the road. Coming back we tried to enter a fenced in area. A male Peacock (see back cover) flew down from a large tree blocking us from passing through the gate. Tony tried to shoo the Peacock aside, but the bird started to jump up and down, trying to strike Tony with clawed feet. Finally a local came by and removed this agitated bird.

Our group spent the next day on a trail bordering a small stream where a local showed us how to use a net to catch small fish. We then went back to the bridge area. Some of that day's haul included the rarely photographed fe-



**Top Row:** Grey Count (*Tanaecia lepidea*), Dark Archduke (*Lexias dirtea khasiana*). **Bottom Row**: Variegated Rajah (*Charaxes kahruba*), Variable Tawny Rajah (*Charaxes bernardus*).

male of Lexias dirtea khasiana, Graphium antiphates, and Papilio clytia.

Around 6:15 am the next morning we encountered the very striking, and not common, Bibasis sena, before driving to our last stop Florican Cottage, located just outside Manas National Park in Assam. This huge area has both pristine savannah and forested habitats. This area, as with others, required skilled drivers to shuttle you along a narrow, muddy road with water-filled potholes for miles between the entrance and ending at Mathanguri along Manus River. the



Fivebar Swordtail (Graphium antiphates; underside and upperside).

Sometimes the river is filled with Water Buffalos. The country of Bhutan is just on the other side of the river.

Two armed guards were with us at all times as we photographed butterflies. Elephants were roaming nearby. I even got to ride one. Riding an elephant through the savannah I was amazed at all the birds and animals around the mud holes, hidden by the tall grass. Seems they were not bothered by the elephant being around them.

We ended this photographic holiday with clicks of a *Bindahara phocides* female and *Spalgis epeus*, whose carnivorous caterpillars feed on scale insects and mealy-bugs.

The last click was of a phantom-looking moth in the family Thyrididae, *Herdonia hainanensis*.

The last evening was spent sitting on lawn chairs watching six women and seven men who walked several miles to perform their local dances. We had an additional 150 or so specators who joined us to watch the performance.

**Top Row:** Orange-Tailed Awl (*Bibasis sena*), Apefly (*Spalgis epeus*), Common Mime (*Papilio clytia*). **Bottom Row:** Plane (*Bindahara phocides*), Mealy bugs (larvae of *Spalgis epeus* feed on these), *Herdonia hainanensis*.



# **Book Reviews**

**THE DISAPPEARANCE OF BUTTERFLIES**. 2021. Josef H. Reichholf. Polity Press, Cambridge, U.K. and Medford, MA, x + 2276 pp., 43 full color figures. English translation of "Schmetterlinge: Warum sie verschwinden und was das für uns bedeutet" Carl Hanser Verlag GmbH & Co. KG, Münich (2018) in German by Gwen Clayton. ISBN -11: 978-1-5095-3979-6.



The book is basically in two equally divided parts – the first on the biodiversity of Lepidoptera in southern Germany and the second on the decline and disappearance of Lepidoptera in southern Germany.

The English title is unfortunate because author Josef Richholf uses 'Schmetterlinge' to include both butterflies ('Tagfalter') and moths ('Nachtfalter'). The

English title gives the impression to the American reader that this going to be a book about the decline and disappearance of butterflies due to "Global climate change." This is actually far from the actual case in this instance, because Dr. Reichholf is primarily concerned with the decline of moths he has monitored in the environs of Munich, Bavaria where he carried out his doctoral research in 1970, and subsequent light trap monitoring in the region. His main observations and concerns are with the German psyche to make every possible square meter of arable land productive of some crop that benefits the local economy and life-style. In the case of the area around

Munich this means growing field corn (maise) for animal feed or biofuels as close to roadways as possible leaving no unused space for other plants including Lepidopteran host-plants and nectar sources.

His section on diversity is based on his observations of both butterflies and moths around Munich and environs since the late 1960's until 2017. It includes sections on whites (*Pieris* species),



Josef H. Reichholf

migratory species, and nettle feeding butterflies as well as other notable butterflies and moths. He makes many observations and compares these with content in the comprehensive 'Die Schmetterlinge Baden-Würtemburgs' edited by Günter Ebert (1993, Staatlichen Museum fur Naturkinde Karlsruhe, Ulmer, Stuttgart).

The last section of the book on the disappearance of butterflies and moths is based on his years of butterfly transects and discontinuous years of moth trapping by 15watt u.v in Munich and environs in Bavaria. In both kinds of efforts his data shows declining trends, but are not associated with climate change. Dr. Reichholf attributes the declines to changes in land management primarily to land clearing and the excessive use of chemical fertilizers and pesticides on crop monocultures. I have personally witnessed many Lepidoptera-depauperate areas of fields and conifer plantations in Bavaria in contrast with the diverse meadows and wetlands of the alps that are quite some distance from Munich in southern Germany.

Paul A. Opler, Department of Agricultural Biology, Colorado State University, Fort Collins, CO 80522-1177

NOTONDOTIDAE of the INDONESIAN ARCHIPEL-AGO (Lepidoptera): Volume 1. July 2020. Alexander Schintlmeister. Brill. Leiden, The Netherlands. ISBN 10: 9004354247 / ISBN 13: 9789004354241. \$175.00 and up from many retailers worldwide.



Just as the Wedge Entomological Research Foundation (WERF) is completing its series to revise the Notodontidae of North America (Miller et al. 2018, Miller et al. scheduled for 2021), Alexander Schintlmeister continues his studies to document the Notodontidae of the world. Schintlmeister (2020) is the most recent in his continuing series (e.g. Schintlmeister 1992, 1996, 2008, 2013, 2016; Schintlmeis-

ter & Lai 2001; Schintlmeister & Pinratana 2007; Schintlmeister & Witt 2015) to list, catalogue, and illustrate the world's Notodontidae. This newest book is stated by the publisher to be "The first comprehensive work on oriental Notodontidae (Lepidoptera) outside mainland Asia. In addition to the Indonesian territory, the investigated area includes Borneo Island, the Malayan Peninsula, entire New Guinea with adjacent islands and the Solomon Islands. All species are illustrated in both sexes with a total number of 1,272 specimens on 51 color plates. Genitalia photos of both sexes as well as detailed distribution maps are provided for each species. The book deals in the first volume with 298 species and contains descriptions of 99 new notodontid taxa. A second volume will treat the remaining 160 species and include also a comprehensive biogeographic analysis."

Like most of his other works, this book is richly illustrated with color photos of moths. The illustrations include: the color illustrations of adults; black-and-white distribution maps with elevations indicated by shading; a generalized habitus of a notodontid adult moth; and figures of morphology for male and female genital structures including 8<sup>th</sup> tergites and sternites using examples from the book. Blackand-white figures detail important collecting localities.

The distribution maps in the text employ a variety of shapes including circles, squares, triangles, and stars to denote specific localities for the several species. The shapes are both solid and open on the many maps, thus avoiding confusion.

This is a revisionary work with an updated checklist showing synonymies. The text follows the systematic order of the checklist. The species accounts include the following: name and year of description with author, location of holotype, taxonomic history, taxonomic notes, bionomics, and distribution. The descriptions of new species include the specimens in the type series, other specimens examined, etymology, diagnosis including description, bionomics, and distribution. The description is a combination of diagnosis and descriptive characters. Telegraphic writing is generally not employed, rather the descriptive characters incorporate the diagnosis with comparisons to other species. There are no keys; I like keys because they help me understand the specific characters the author used to distinguish closely similar spaces.

Like most people examining a new book, I turned to the color illustrations to satisfy myself; they are crisp and well done. The colors are brilliant, even for the mostly brown and gray moths.

Important parts of the book are in the very beginning: a chapter on the family Notodontidae; Methodological Notes; Material and Its Collectors; Morphological Terms; and Abbreviations. I found the page entitled Methodological Notes, which I suggest should be read first, to be particularly important to understanding the book, the research utilized to write the book, and its layout. These few especially important paragraphs, and the paragraphs taken together provide considerable insight for the presentation of data in the text.

The page titled "The Family Notodontidae" defines the family with distinguishing morphological characters. Larval host plant preferences for the subfamilies are given, when known, along with the caveat from the book, "For most Oriental notodontids, however, the larvae and their host plants are still unknown." Both the color and black and white illustrations are sharp, and details are easy to see. Neither the illustrations of adult specimens nor genital illustrations are crowded together on the plates. The color plates of adult moths incorporate the name of the species, it's sex, and the locality is adjacent to each illustration. This added feature obviates the need to flip through pages for details. Unobtrusive black lines are used to point out important discriminative features for some taxa. The adults are illustrated at 110%.

I especially like the glossy paper for the black and white illustrations of genitalia thus making the details easy to examine. The tergite and sternite of the 8<sup>th</sup> abdominal segments are illustrated adjacent to the genital figures. The name of each species, its locality, and the slide number are placed adjacent to each genital illustration. Enlargements of the inverted vesicae are occasionally used to show variations within a species or to highlight differences between similar species such as in the genus *Syntypistis*. Unobtrusive black lines are used to point out important discriminative features for some taxa. Scale bars are provided on each plate showing genitalia. The contrast between sclerotized regions and membranous regions could be greater, especially for the vesicae.



The Notodontidae are frequently noted for some of their remarkable larvae. I hoped to find color photographs of token caterpillars; none are presented. The sections entitled bionomics usually mentions the elevations where the adults were collected; habitats are generally not mentioned; larval host plants are rarely included because they are unknown.

The part of the book I would consider to be the abstract is at the back of the book in the pages delineating Taxonomic Changes, Newly Described Taxa, New Synonymies, New Combinations, Status Changes, and Lectotype Designations. The References are few and apparently limited to the literature for the original description of the animal taxa in the book.

The quality of the book's construction equals the contents. The pages are Smythe sewn and hard bound with a rounded back allowing the book to easily lie flat when open. The grain of the glossy paper runs from top to bottom allowing the paper to bend easily rather than fighting the user. Laminated paper covers the boards, a type of binding called casewrap, a durable binding found in many popular books including books on cookery and children's books. The book has colorful covers and the spine clearly identifies the book.

I highly recommend this book for anyone interested in the family Notodontidae. The book deserves further recommendation for its quality of construction and illustrations. For anyone interested in the family Notodontidae on a worldwide basis, this book is a required addition to their library. I own Schintlmeister's other books on Notodontidae, and this volume is most welcome.

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# Additions, deletions and corrections to the Kentucky list of Lepidoptera

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# ABSTRACT

The authors remove nine taxa in five families from the Kentucky list of Lepidoptera in line with recent exclusions and synonymy. The total number of specific names on the list is reduced by six due to discoveries of redundantly reported names in some previous publications. Seventy-eight species in twenty-four families are added to the list by way of recent discoveries from the field, and availability of new names through publications of descriptions of new species. Additions are in families: Opostegidae (1), Tineidae (2), Bucculatricidae (2), Gracillariidae (3), Glyphipterigidae (1), Argyresthiidae (1), Autostichidae (3), Depressariidae (1), Cosmopterigidae (1), Gelechiidae (7), Elachistidae (1), Coleophoridae (1), Blastobasidae (1), Momphidae (1), Schreckensteiniidae (1), Epermeniidae (1), Choreutidae (1), Tortricidae (25), Sesiidae (1), Pyralidae (2), Crambidae (5), Notodontidae (1), Erebidae (5), Nolidae (2), Noctuidae (8).

# INTRODUCTION

Lepidopterists in Kentucky continued to be active in the field after publication of the last update of the Kentucky List of Lepidoptera in 2016 (Gibson et al, 2016). Sampling activities along the summit of Big Black Mountain in Harlan County continued to produce many more new species. Collected samples in a nice prairie habitat in Hardin County also brought in some new moths. Raymond Little, working at lights around his home in McCreary County, had much success at finding new microlepidoptera species. James Adams discovered new species in the same county. More new species were found in the Ballard Wildlife Management Area where Gerald Burnett works. Relocation of a collection of Kentucky Cochylini (Tortricidae) among the holdings of The Ohio State University Collection was responsible for adding many new members of that group. Thanks to Steven Passoa for finding those specimens!

Scrutiny of previously published updates to the Kentucky List of Lepidoptera including Covell (1999), Covell, et al (2000), Gibson and Covell (2006) and Gibson, et al (2016) revealed synonymies and redundantly reported names that need to be addressed. Two names previously on the Kentucky list are "excluded" in the Pohl, et al (2016) checklist. These names are listed in the deletions and corrections sections below. The number of names removed due to synonymies and exclusions equals nine. The list is ellislaudermilk@yahoo.com



Caloptilia serotinella

reduced by six due to redundantly reported species names. The number of species currently attributed to the Commonwealth now stands at 2642.

Numbers preceding generic names and taxonomic arrangement in this list below follow Pohl et al (2016), also known as the P3 checklist.

# ADDITIONS

## Family OPOSTEGIDAE

#### 160109 Pseudopostega cretea (Meyrick, 1920)

McCreary Co., Raymond Little residence, Mine 18 Road, N 36.660152 W 84.496239, Strunk, KY. 8 August 2017. Collected and determined by Raymond Little.

#### Family TINEIDAE

## 300166 Tricophaga tapetzella (Linnaeus, 1758)

McCreary Co., Raymond Little residence, Mine 18 Road, N 36.660152 W 84.496239, Strunk, KY. 22 May 2020. Collected and determined by Raymond Little.

#### 300204 Scardia amurensis Zagulajev, 1965

Harlan Co., Big Black Mtn. above 3650' elev. in BL trap, 1 July 2016. Collected by Loran Gibson and Ellis Laudermilk, determined by James Adams. Many older specimens of KY *Scardia* that were initially determined as *S. anatomella* (Grote, 1881) are also *S. amurensis*. It is currently unclear if both species occur in KY.

#### Family BUCCULATRICIDAE

#### 330002 *Bucculatrix solidaginiella* Braun, 1963

Harlan Co., Big Black Mtn. above 3750' elev. in black light (BL) trap, 12 July 2017. Collected by Loran Gibson and Ellis Laudermilk, determined by Terry Harrison.

#### 330092 *Bucculatrix ainsliella* Murtfeldt, 1905

Harlan Co., Big Black Mtn. above 3750' elev. in BL trap, 9 May 2016. Collected by Loran Gibson and

Ellis Laudermilk, determined by Terry Harrison.

#### Family GRACILLARIIDAE

#### 330159 Caloptilia serotinella (Ely, 1910)

Harlan Co., Big Black Mtn. above 3650' elev. in BL traps, 1 July 2016 (determined by Don Davis), 15 March 2016 (determined by Terry Harrison), 14 June 2017 (determined by Loran Gibson), all collected by Loran Gibson and Ellis Laudermilk.

#### 330219 Acrocercops pnosmodiella (Busck, 1902)

Hardin Co., near intersection of Joe Prather Road and Wooldridge Ferry Road in BL trap, 23 June 2017. Collected and determined by Loran Gibson, determination confirmed by Jim Vargo.

#### 330320 Phyllonorycter propinquinella (Braun, 1908)

Harlan Co., Big Black Mtn. above 3700' elev. in BL trap, 19 April 2016. Collected by Loran Gibson and Ellis Laudermilk, determined by Terry Harrison.

#### Family GLYPHIPTERIGIDAE

#### 360135 Acrolepiopsis heppneri Gaedike, 1984

McCreary Co., Raymond Little residence, Mine 18 Road, N 36.660152 W 84.496239, Strunk, KY. 11 June 2017. Collected and determined by Raymond Little, determination confirmed by Terry Harrison.

#### Family ARGYRESTHIIDAE

#### 360163 Argyresthia goedartella (Linnaeus, 1758)

Harlan Co., Big Black Mtn. above 3700' elev. in BL trap, 12 July 2017. Collected by Loran Gibson and Ellis Laudermilk, determined by Jim Vargo.

#### Family AUTOSTICHIDAE

#### 420002 Oegoconia novimundi (Busck, 1915)

McCreary Co., Raymond Little residence, Mine 18 Road, N 36.660152 W 84.496239, Strunk, KY, 5 August 2017. Collected and determined by Raymond Little.



420007 Spinitibia hodgesi Lee and Brown 2010

Hardin Co., near intersection of Joe Prather Road and Wooldridge Ferry Road in BL trap, 24 June 2017. Collected by Loran Gibson and Ellis Laudermilk, determined by Terry Harrison. Ballard Co., Ballard Wildlife Management Area (WMA), 18 July 2017. Collected by Loran Gibson and Gerald Burnett, determined by Terry Harrison.

#### 420021 Glyphidocera lactiflosella (Chambers, 1878)

McCreary Co., Raymond Little residence, Mine 18 Road, N 36.660152 W 84.496239, Strunk, KY, 14 July 2017. Collected and determined by Raymond Little.

#### Family DEPRESSARIIDAE

#### 420091 Agonopterix canadensis (Busck, 1902)

McCreary Co., Raymond Little residence, Mine 18 Road, N 36.660152 W 84.496239, Strunk, KY, 12 August 2017. Collected and determined by Raymond Little.

#### Family COSMOPTERIGIDAE

#### 420361 Cosmopterix dapifera Hodges, 1962

McCreary Co., Raymond Little residence, Mine 18 Road, N 36.660152 W 84.496239, Strunk, KY, 2 July 2018. Collected and determined by Raymond Little, determination confirmed by Terry Harrison.

#### Family GELECHIIDAE

#### 420466 Battaristis concinnusella (Chambers, 1875)

McCreary Co., Raymond Little residence, Mine 18 Road, N 36.660152 W 84.496239, Strunk, KY, 18 September 2017. Collected and determined by Raymond Little, determination confirmed by Terry Harrison.

#### 420477 Anacampsis fragariella Busck, 1904

Hardin Co., Joe Prather Road and Wooldridge Ferry Road, BL trap, 23 June 2017. Collected by Loran Gibson and Ellis Laudermilk, determined by Loran Gibson. Owen Co., James Rich WMA, in BL trap, 15 June 2020. Collected and determined by Loran Gibson.

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Polyhymno luteostrigella

#### 420594 Polyhymno luteostrigella Chambers, 1874

Hardin Co., near intersection of Joe Prather Road and Wooldridge Ferry Road, BL trap, 23 June 2017. Collected and determined by Loran Gibson, determination confirmed by Jim Vargo.

#### 420687 Bryotropha branella (Busck, 1908)

Harlan Co., Big Black Mtn. above 3750' elev. in BL trap, 14 June 2017. Collected by Loran Gibson and Ellis Laudermilk, determined by Loran Gibson.

#### $420755\ Since\ chambersi\ Lee\ 2012$

Harlan Co., Big Black Mtn. above 3700' elev. in BL trap, 15 March 2016. Collected by Loran Gibson and Ellis Laudermilk, determined by Sangmi Lee.

#### 421337 Caryocolum cassella (Walker, 1864)

Letcher Co., Big Black Mtn., 2 June 1935. Reared by Annette Braun. Reported by Huemer (1988) (research provided by Terry Harrison). Harlan Co., Big Black Mtn. above 3650'elev., BL trap, 1 July 2016. Collected by Loran Gibson and Ellis Laudermilk, determined by Terry Harrison.

#### Family ELACHISTIDAE

#### 421408 Elachista albicapitella Engle, 1907

Harlan Co., Big Black Mtn. above 3750' elev. in BL trap, 14 June 2017. Collected by Loran Gibson and Ellis Laudermilk, determined by Terry Harrison.

#### Family COLEOPHORIDAE

#### 421652 Coleophora deauratella Lienig and Zeller, 1846

Harlan Co., Big Black Mtn. above 3750' elev. in BL trap, 15 March 2016. Collected by Loran Gibson and Ellis Laudermilk, determined by Terry Harrison.

#### Family BLASTOBASIDAE

421743 *Holcocera chalcofrontella* Clemens, 1863 Harlan Co., Big Black Mtn. above 3750' elev. in BL trap, 14 June 2017. Collected by Loran Gibson and Ellis Laudermilk, determined by David Adamski.

#### Family MOMPHIDAE

420552 Dichomeris

purpureofusca

(Walsingham,

**McCreary** 

residence, Mine 18

Road, N 36.660152

Strunk, KY, 27 May 2019. Collected by

Raymond Little, determined by Hugh

McGuiness. A very

southern record!

Co.,

Little

84.496239,

1882)

W

Raymond

421852 Mompha stellella Busck, 1906

Ballard Co., Ballard WMA, 18 July 2017. Collected by Loran Gibson and Gerald Burnett, determined by Terry Harrison.

#### Family SCHRECKENSTEINIIDAE

#### 500001 Schreckensteinia erythriella (Clemens, 1860)

McCreary Co., Raymond Little residence, Mine 18 Road, N 36.660152 W 84.496239, Strunk, KY, 25 September 2019, 27 October 2019. Photographed twice by Raymond Little. Photos determined by Jason Dombroskie. Specimens not collected.

#### Family EPERMENIIDAE

#### 520006 Epermenia albapunctella Busck 1908

McCreary Co., Raymond Little residence, Mine 18 Road, N 36.660152 W 84.496239, Strunk, KY, 20 February 2018. Collected and determined by Raymond Little, determination confirmed by Terry Harrison.

#### Family CHOREUTIDAE

#### 580027 Choreutis pariana (Clerck, 1759)

McCreary Co., Raymond Little residence, Mine 18 Road, N 36.660152 W 84.496239, Strunk, KY, 3 September 2017. Collected and determined by Raymond Little, determination confirmed by Jason Dombroskie.

#### Family TORTRICIDAE

#### 620056 Acleris nigrolinea (Robinson, 1869)

Harlan Co., Big Black Mtn. above 3750' elev. in BL trap, 15 March 2016. Collected by Loran Gibson and Ellis Laudermilk, determined by Jason Dombroskie. McCreary Co., Raymond Little residence, Mine 18 Road, N 36.660152 W 84.496239, Strunk, KY, one at sheet light, 10 March 2019. Collected and determined by Raymond Little.

#### 620092 Aethes atomosana (Busck, 1907)

McCracken Co., Paducah, Littleville Zip Track site, U.S. Rts 60 and 62, 9 September 2006. Collected and determined by Loran Gibson, determination confirmed by Jim Vargo.

#### 620104 Aethes matheri Sabourin and Miller, 2002

Boone Co., Big Bone Lick State Park, 25 June 1980. Collected and determined by Loran Gibson, determination confirmed by Michael Sabourin.

#### 620109 Aethes patricia Metzler, 1999

Larue Co., high quality prairie preserve habi-

tat, 24 August 2005. Collected and determined by Loran Gibson. Christian Co., Fort Campbell Army Base, in BL trap, 20 August 2012. Collected and determined by Loran Gibson.

#### 620112 Aethes razowskii Sabourin and Miller, 2002

Boone Co., Big Bone Lick State Park, 4 June 1981. Collected and determined by Loran Gibson, determination confirmed by Michael Sabourin.

#### 620115 Aethes sexdentata Sabourin and Miller, 2002

Calloway Co., north side Grubbs Road, west side of Blood River, in BL trap, 16 June 2007. Collected and determined by Loran Gibson, determination confirmed by Michael Sabourin.

#### 620119 Aethes terriae Sabourin and Miller, 2002

Owsley Co., east side of CR 1411, .85 mi. north of SR 30, 4 June 1994. one female collected and determined by Loran Gibson; determination confirmed by Michael Sabourin.

#### 620137 Aethes ringsi (Metzler, 1999)

Laurel Co., Daniel Boone National Forest, Rockcastle Rec. Area, ridgetop southwest of Ned Branch, at sheet light on 28 July 1992. Collected and determined by Loran Gibson. McCreary Co., Daniel Boone National Forest, powerline cut east of Ridge Road (aka Lucky S Road) south of SR 700 west of Whitley City, in BL trap, 14 June 2018. Collected and determined by Loran Gibson. Harlan Co., Big Black Mtn. above 3650' elev., in BL trap on 2 August 2016. Collected by Loran Gibson and Ellis Laudermilk, determined by Loran Gibson. 620197 Rolandylis fusca Pogue, 2001

Campbell Co., A. J. Jolly County Park, at sheet light on 15 July 1982. Collected by Loran Gibson, determined by M. G. Pogue.

#### 620210 Thyraylia hollandana (Kearfott, 1907)

Harlan Co., Big Black Mtn. above 3700' elev. in BL trap, 2 September 2015. Collected and determined by Loran Gibson.

#### 620211 Thyraylia nana (Haworth, 1811)

Harlan Co., Big Black Mtn., above 3800' elev. in BL trap, 24 May 2016. Collected by Loran Gibson and Ellis Laudermilk, determined by Loran Gibson.

#### 620227 Eulia ministrana (Linnaeus, 1758)

Harlan Co., Big Black Mtn., above 3800' elev. in BL trap, 24 May 2016. Collected by Loran Gibson and Ellis Laudermilk, determined by James Adams.

#### 620257 Argyrotaenia hodgesi Heppner, 1989

Graves Co., Terrapin Creek State Nature Preserve (2nd parcel), 2 Sept 2000. Collected by Loran Gibson and Ellis Laudermilk, determined by Jason Dombroskie.

#### 620302 Choristoneura conflictana (Walker, 1863)

Jefferson Co., Valley Station, 19 June 197? (year illegible), collected by Siegfried Scholz, determined by Jason Dombroskie. Specimen in University of Louisville collection at University of Kentucky, Lexington, KY.

620370 Adoxophyes negundana (McDunnough, 1923)

Hickman Co., east side of Rt. 239 along Bayou



Top: Aethes atomosana, A. sexdentata. Bottom: Eulia ministrana, Adoxophyes negundana

du Chien, 31 September 1993. Collected and determined by Loran Gibson. Also collected along Ohio River in Pendleton, Gallatin and Campbell Counties in May and July.

#### 620420 Cenopis ferreana (Busck, 1915)

McCrearv Co.. Daniel Boone National Forest, powerline cut east of Ridge Road (aka Lucky S Road) south of SR 700 west of Whitley City, in BL trap 14 June Collected and 2018.determined by Loran Gibson. determination confirmed by Jason Dombroskie. This name validates the entry under Hodges et al. (1983)

#### News of The Lepidopterists' Society

checklist number 3720.1 in Covell (1999, p. 60) as an undescribed species.

#### 620426 Cenopis saracana Kearfott, 1907

Christian Co., Pennyrile State Forest, 20 June 1980. Collected and determined by Loran Gibson. Also collected by Loran Gibson from Edmonson, Hopkins, Laurel and McCreary Counties.

#### 620435 Platynota semiustana Walsingham, 1884

Hopkins Co., Lat. 37.169483, Lon. 87.499183, 12 August 2020. Collected, photographed, and determined by Eric Williams.

#### 620614 Olethreutes trinitana (McDunnough, 1931)

Harlan Co., Big Black Mtn., above 3800' elev. in BL trap, 24 May 2016. Collected by Loran Gibson and Ellis Laudermilk, determined by Loran Gibson.

#### 620642 Ancylis subaequana (Zeller, 1875)

Harlan Co., Big Black Mtn., above 3800' elev. in BL trap, 24 May 2016. Collected by Loran Gibson and Ellis Laudermilk, determined by Loran Gibson.

#### 620646 Anyclis discigerana (Walker, 1863)

Harlan Co., Big Black Mtn., above 3700' elev. in BL trap, 9 May 2016. Collected by Loran Gibson and Ellis Laudermilk, determined by Loran Gibson.

#### 620704 Rhyacionia adana Heinrich, 1923

McCreary Co., Raymond Little residence, Mine

18 Road, N 36.660152 W 84.496239, Strunk, KY, 20 and 21 March 2018. Collected and determined by Raymond Little, determination confirmed from male genitalia by JoAnne Russo.

#### 620707 Rhyacionia granti Miller, 1985

McCreary Co., Raymond Little residence, Mine 18 Road, N 36.660152 W 84.496239, Strunk, KY, 20 March 2018. Collected and determined by Raymond Little, determination confirmed from male genitalia by JoAnne Russo.

#### 620970.1 Pelochrista kimballi Wright and Gilligan, 2017

Christian Co., Pennyrile State Forest, 14 August 1987. Bullitt Co., south side of Rt. 480, 6.9 miles east of Rt. 61, 23 June 1989. Bullitt Co., Pine Creek Forest, 22 July 1989. Boone Co., Big Bone Lick State Park, 25 August 1989. All collected by Loran Gibson. All are paratypes determined and described by Donald Wright in Wright and Gilligan (2017).

#### 621079 Epiblema glenni Wright, 2002

Boone Co., Big Bone Lick State Park, 17 July 1989, 26 July 1989, 27 July 1989 (three males). Rowan Co., east side of Rt. 1274, 2 miles west of Rt. 519, 18 August 1995 (four males). Nelson Co., Bernheim Forest, Bean House area, 14 August 2010 (two males). Laurel Co., powerline cut west side of Marsh Branch Road, 25 July 1997. All collected by Loran Gibson, all determined by Donald Wright. The Laurel County specimen is designated as a paratype in Wright (2002).

#### 621308 Grapholita prunivora (Walsh, 1868)

Harlan Co., Big Black Mtn., above 3750' elev. in BL trap, 2 August 2016. Collected by Loran Gibson and Ellis Laudermilk, determined by Loran Gibson, determination confirmed by John Brown.





Top: Platynota semiustana (image by Eric Williams), Olethreutes trinitana, Ancylis subaequana. Bottom: Ancylis discigerana, Pelochrista kimballi.

#### Family SESIIDAE

#### 640174 Alcathoe carolinensis Engelhardt, 1925

McCracken Co., Paducah, 31 August 2013. Collected by William R. Black Jr., determined by Charles V. Covell Jr. Specimen is currently in McGuire Center Collection, Gainesville, FL.

#### Family PYRALIDAE

#### 800092 Hypsopygia binodulalis (Zeller, 1872)

Hardin Co., glades on north side of Rt. 313 west of Wooldridge Ferry Road, 24 June 2017. Collected by Loran Gibson. McCreary Co., Daniel Boone National Forest, powerline cut east side of Ridge Road (aka Lucky S Road) south of State Route 700, west of Whitley City. McCreary Co., Raymond Little residence, Mine 18 Road, N 36.660152 W 84.496239, Strunk, KY, 25 September 2019. Collected by Raymond Little. All were determined by Brian Scholtens.

#### 800349 Sciota rubrisparsella (Ragonot, 1887)

Ballard Co., Ballard WMA, 18 July 2017, one in BL trap. Collected by Loran Gibson and Gerald Burnett, determined by Loran Gibson.

#### Family CRAMBIDAE

#### 800815 Argyria lacteella (Fabricius, 1794)

Ballard Co., Ballard WMA, 18 July 2017, one in BL trap. Collected by Loran Gibson and Gerald Burnett, determined by Loran Gibson. About a half dozen individuals were in light traps with *Urola nivalis, Argyria critica* and *A. auratella*!

#### 800869 Fissicrambus hemiochrellus (Zeller, 1877)

Hardin Co., near intersection of Joe Prather Road and Wooldridge Ferry Road, 23 June 2017, Collected and determined by Loran Gibson, determination confirmed by Brian Scholtens.

#### 800888 Neodactria zeellus (Fernald, 1885)

Harlan Co., Big Black Mtn., above 3650' elev. in BL trap, 1 July 2016. Collected by Loran Gibson and Ellis Laudermilk, determined by Brian Scholtens.

801283 *Loxostegopsis merrickalis* (Barnes and McDunnough, 1918)

McCreary Co., Raymond Little residence, Mine 18 Road, N 36.660152 W 84.496239, Strunk, KY, 22 August 2017. Collected by Raymond Little, determined by Jason Dombroskie.

801463 Sitochroa palealis ([Denis and Schiffermüller], 1775)

Oldham Co., Horner Bird Sanctuary, 9 July 2011. Collected diurnally by Charles V. Covell Jr. Determined by Loran Gibson. Harlan Co., Big Black Mtn., above 3650' elev. in BL traps, 1 July and 2 August 2016. Collected by Loran Gibson and Ellis Laudermilk, determined by Loran Gibson.





Top: Epiblema glenni. Second: Grapholita prunivora. Third: Sciota rubrisparsella. Fourth: Fissicrambus hemiochrellus. Bottom: Sitochroa palealis.





Top: Peridea bordeloni. Second: Haploa reversa. Bottom: Apamea sordens.

#### Family NOTODONTIDAE

#### 930050.1 Peridea bordeloni Miller, 2018

Harlan Co., Kingdom Come State Park, 6 July 1977. Collected and determined by Loran Gibson, determination confirmed by Hugh McGuinness. Harlan Co., Big Black Mountain summit, 12 August 2015, Collected by Loran Gibson and Ellis Laudermilk. Determined by Hugh McGuinness. A photo taken on Pine Mountain in Harlan County by Shelby Fulton also appears to be this species according to Hugh McGuinness.

#### Family EREBIDAE

930227.1 Crambidia xanthocorpa Lewis, 2014 Harlan Co., Kingdom Come State Park, 9 August 1980. Owsley Co., east side of CR 1411, .85 mile north of SR 30, 24 Julyi 1982. Owsley Co., Caney Fork Creek near Stay, 16 August 1986. All collected and determined by Loran Gibson. McCreary Co., Big South Fork National Rec. Area, 22 July 2017. Collected by Raymond Little, determined by Larry McDaniel. This species has been confused with *C. cephalica* (Grote and Robinson, 1870) in the past. It is currently unclear if both species occur in Kentucky.

#### 930343 Haploa reversa (Stretch, 1885)

Laurel Co., Daniel Boone National Forest, powerline cut west side of Marsh Branch Road, 27 June 1997. Collected and determined by Loran Gibson.

#### 930470 Idia majoralis (Smith, 1895)

McCreary Co., Daniel Boone National Forest, powerline cut east of Ridge Road (aka Lucky S Road), south of SR 700 and west of Whitley City, in BL trap 14 June 2018. Collected by James Adams, Raymond Little, and Loran Gibson, determined by James Adams.

#### 930610.5 Rusicada privata (Walker, 1865)

McCreary Co., Raymond Little residence, Mine 18 Road, N 36.660152 W 84.496239, Strunk, KY, 14 August 2015. Collected and determined by Raymond Little.

#### 930960 Gondysia telma (Sullivan, 2010)

Ballard Co., Ballard WMA, sand field, 18 August 2016. Collected and determined by Gerald Burnett.

#### Family NOLIDAE

#### 931136 Nola clethrae Dyar, 1899

McCreary Co., Hwy. 742 at Roaring Paunch Creek, 13 April 2018. Collected by Raymond Little, determined by James Adams.

#### 931153 Baileya ellessyoo Brou, 2004

McCreary Co., Daniel Boone National Forest, along SR 700, three miles southwest of Whitley City, 13 April 2018. Collected and determined by James Adams.

#### Family NOCTUIDAE

#### 932234 Elaphria alapallida Pogue and Sullivan, 2003

Owsley Co., east side CR 411, .85 mile north of SR 30, 26 May 1979. Collected and determined by Loran Gibson. Harlan Co., Big Black Mtn. above 4000' elev., 14 July 1979. Collected and determined by Loran Gibson, determination confirmed by Donald Lafontaine. Meade Co., Otter Creek Park, 20 June 1981. Collected and determined by Loran Gibson. Harlan Co., Big Black Mtn. above 3800' elev., 9 May 2016. Collected and determined Loran Gibson.

#### 932298 Apamea wikeri Quinter and Lafontaine, 2009

Carlisle Co., Sandy Branch, five miles southwest of Bardwell, 18 June 1999. Three females collected by Eric Quinter, James Wiker, and William R. Black Jr. These were included as paratypes in Mikkola *et al*, 2009. Meade Co., Otter Creek Park, 20 June 1981. Collected by Richard Henderson, designated as paratype in Mikkola *et al* (2009).

#### 932314 Apamea sordens (Hufnagel, 1766)

Harlan Co., Big Black Mtn. above 3700' elev, in BL trap, 5 June 2018. Collected by Loran Gibson and Ellis Laudermilk, determined by James Adams and Donald Lafontaine.

#### 932361 Protapamea louisae Quinter, 2009

McCracken Co., Boatwright Farm, old Mayfield Creek, 0.9 miles west of Clinton Road (Hwy. 339). Reared by Eric Quinter on *Arundinaria gigantea*; one female emerged 3 June 2000. Designated as paratype in Mikkola *et al.* (2009).

#### 932483 Papaipema harrisii (Grote, 1881)

Big Black Mtn. summit road, in BL traps, many collected on 2 September 2015 and 21 September 2016. Collected by Loran Gibson and Ellis Laudermilk, determined by Donald Lafontaine. Additional specimens were collected and reared by Tony McBride and determined as *"Papaipema harrisii* group". Apparently, DNA comparison is not definitive in separating some *Papaipema* species, including this one. This taxon is provisionally included in the KY list pending further taxonomic clarification.

#### 932552 Lithophane viridipallens Grote, 1877

McCreary Co., Daniel Boone National Forest, along SR 700, three miles southwest of Whitley City, 13 April 2018. Collected and determined by James Adams.

#### 933089 Homorthodes lindseyi (Benjamin, 1922)

Lafontaine and Schmidt (2010) elevated this from a subspecies of H. furfurata (Grote) to full species. Kentucky's records are currently mixed between the two. The following are records of H. lindseyi: Owsley Co., 3 miles NE of Booneville, 10 May 1980. Collected by Loran Gibson, determined by C.V. Covell. Meade Co., Otter Creek Park, 17 August 1984. Collected and determined by Loran Gibson. There are, no doubt, many other records of this from KY.

#### 933537 Cerastis fishii (Grote, 1878)

McCreary Co., Daniel Boone National Forest, along SR 700, three miles southwest of Whitley City, 13 April 2018. Collected and determined by James Adams.

#### DELETIONS

#### Family GRACILLARIIDAE

330278 *Phyllanorycter malimalifoliella* (Braun, 1908) is a synonym of *P. cratagella* (Clemens, 1859) and is removed from the Kentucky List.



Top: Papaipema harrisii. Second: Lithophane viridipallens (photo by James Adams). Bottom: Cerastis fishii.

#### Family COLEOPHORIDAE

421646 *Coleophora aenusella* Chambers, 1878 is a synonym of *C. mayrella* (Hübner, [1813]) and is removed from the Kentucky List.

#### Family TORTRICIDAE

620390 Sparganothis belfrageana (Zeller, 1875) is a synonym of S. sulfureana (Clemens, 1860) and is removed from the Kentucky List.

620434 *Platynota scotiana* (McDunnough, 1961) is a synonym of *P. exasperatana* (Zeller, 1875) and is removed from the Kentucky List.

80094 Herculia infimbrialis (Dyar, 1910) is a synonym of H. olinalis (Guenée, 1854) and is removed from the Kentucky List.

800649E *Phycitodes albatella* (Ragonot, 1887) is excluded per Pohl et al (2016).

#### Family EREBIDAE

930449.5E *Antichloris viridis* Druce, 1884 is excluded per Pohl et al (2016).

930500 Zanclognatha ochreipennis (Grote, 1872) is a synonym of Z. jacchusalis (Walker, 1859) and is removed from the Kentucky List.

930848 *Catocala titania* Dodge, 1900 is a synonym of *C. alabamae* Grote, 1875 and is removed from the Kentucky List.

#### CORRECTIONS

#### Family TINEIDAE

300125 *Homosetia argentinotella* (Chambers, 1876) was first reported in Covell (1999) and was reported a second time in Gibson, et al (2016).

#### Family PYRALIDAE

800383 *Actrix nyssaecolella* (Dyar, 1904) was first reported in Covell (1999), but was reported again in Gibson and Covell (2006).

#### Family CRAMBIDAE

800817 *Argyria nummulalis* Hübner, 1818 was originally reported in Covell (1999) but was reported again in Gibson and Covell (2006).

800906 *Parapediasia decorellus* (Zincken, 1821) was first reported in Covell, et al (2000). The same species was included again in Gibson and Covell (2006).

#### Family NOCTUIDAE

932206 *Pseudeustrotia indeterminata* (Barnes and McDunnough, 1918) was first reported as *Lithacodia indeterminata* Barnes and McDunnough, 1918 in Covell (1999). The same species was reported again in Gibson, et al (2016) under the current genus.

932699 *Platypolia mactata* (Guenée, 1852) was first reported in Covell, et al (2000) as *Oligia mactata* (Guenée, 1852). It was reported again in Gibson, et al (2016) under the current genus.

## ACKNOWLEDGEMENTS

We are grateful to many who provided data on their captures of Kentucky moths. We are especially thankful to James Adams, Gerald Burnett and Raymond Little. For helping with difficult determinations, we want to extend our thanks to: James Adams, David Adamski, Gerald Burnett, Don Davis, Jason Dombroskie, Terry Harrison, J. D. Lafontaine, Sangmi Lee, Larry McDaniel, Hugh McGuinness, Michael Pogue, JoAnne Russo, Michael Sabourin, Brian Scholtens, Jim Vargo, and Donald Wright.

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All photos by Loran Gibson unless otherwise specified.

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# **Membership Updates**

Chris Grinter

Includes ALL CHANGES received by February 17, 2021. 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. = address redacted by request)

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I am entering my tenth year as editor of the News, and this is my 39th issue. I started in the middle of 2011 (fall and winter issues that year). It does not seem that it could possibly have been ten years, and yet here we are.

It has been thoroughly enjoyable, and putting together an issue is like putting together a big puzzle, for your viewing pleasure. I have made a few small mistakes along the way, but try to fix them in subsequent issues with "Corrections".

None of this would have been, or continue to be, possible without your contributions. Thanks to all of you who have provided articles for publication. The quality is usually exceptional, and you keep them coming. Here's to a year where we get ahead of the pandemic and back out in the field! I hope to get a chance to see some of you soon!

# <u>Conservation Matters: Contributions from the Conservation Committee</u> What's going on with Monarchs in the West? A conservation conundrum

Cheryl B. Schultz<sup>1</sup> and Elizabeth E. Crone<sup>2</sup>

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Academic debates have focused on what is causing declines in monarch numbers - with recognition that there are interacting threats from pesticides and habitat loss in the breeding grounds, loss of overwintering habitat and the relentless influence of a changing climate. While the decline in overwintering numbers is possibly slowing down in the eastern monarch, migratory monarchs in the West are crashing. Although far fewer in number than their eastern relatives, the breeding range of western monarch covers a third of its North American range. Western monarchs numbered in the tens of millions fifty years ago. They experienced a long-term decline to a few hundred thousand by a decade ago. But then in 2018 the numbers dropped from two hundred thousand to thirty thousand, stayed at about this number in 2019, and this year, in winter 2020, numbers dropped again - to a startling count of just 1,914 monarchs across hundreds of historic overwintering sites in coastal California.

But, wait. At the same time as the numbers in the overwintering sites have dropped to a breathtaking low, we are hearing reports that people in San Francisco and Santa Cruz are seeing monarchs in their backyards every day. They seem to be everywhere. "How can the monarch be going extinct if I see one almost every day while out for a morning walk?" Many are puzzling over this unusual turn of events.

The first puzzle is, how many monarchs are in the West this winter? To answer this question, one needs to recognize that there are two groups of monarchs – the migratory monarchs wintering in the coastal groves and resident (non-migratory) monarchs in urban gardens. Although the migratory monarch butterflies are regularly surveyed, the resident monarchs are not. This winter, one of us (Elizabeth Crone) surveyed monarchs in urban gardens near Berkeley by walking neighborhoods, counting flying monarchs, and noting caterpillars and milkweeds easily seen from sidewalks. Scaling up from these surveys to the number of miles of residential streets, we estimate 12,000 resident monarchs in urban gardens north of Santa Barbara this winter. That's 6x more than the number counted in the overwintering sites. It's also likely that, when there were millions of monarchs in California's coastal overwintering sites, there were  $\sim 20$ -200 million monarchs across the interior West at the peak of the summer breeding. From these numbers, we know that there are orders of magnitude fewer monarchs today than there were in the past, even though there are more than one would estimate from the overwintering counts alone.

A second puzzle is, why are there so many monarchs in urban gardens this year? We don't really know. However, as interest in monarchs has swelled, urban gardeners have planted milkweeds – and the easiest milkweed to purchase and maintain is tropical milkweed. This non-native plant is notorious because, while it is easy to grow, its biology is distinct from native milkweeds. It grows year-round rather than dying back in the winter. In the past, there used to be very little milkweed – native or non-native – in coastal California north of Santa Barbara. While monarchs were abundant in the winter in coastal woodland groves, they were almost absent from coastal California in the summer. Now western monarchs seem to be increasing in abundance as year-round residents of urban gardens.

Third, can the urban resident monarchs replenish the monarch population across the West? For a few reasons, probably not. If migratory monarchs are absorbed into the urban gardens with year-round milkweed, they may lose their ability to respond to environmental cues to induce migration. In addition, there is a protozoan parasite that harms monarchs, *Ophryocystis elektroscirrha* (OE). OE builds up on milkweed plants that grow year-round but cannot persist when milkweed drops its leaves for the winter. As a result, 75% of monarchs in urban gardens are infected with OE while less than 10% of the migratory individuals are infected. OE-infected monarchs lay only a fraction of the eggs laid by healthy females. As a result, resident monarchs do not have the reproductive capacity to build up high enough numbers to fill the interior West.

What next? From a research perspective, there are a few important unknowns. A top priority is to understand the interaction between resident and migratory monarchs. Are



migratory monarchs absorbed into urban gardens, either during fall or spring migration? Do infected monarchs in urban gardens spread the OE infection from urban gardens into the wild population? Another priority is to understand the net effect of tropical milkweed. Is it harmful because it harbors disease? Or is it helpful because it provides food resources when little else exists? Many conservationists fall on the side of assuming tropical milkweed is mostly harmful. However, even though it is not native, we do not know if the costs of tropical milkweed outweigh the potential benefits given the rapid shift in the state of the system from mostly migratory to mostly resident. And, even if OE transmission from tropical milkweed were the cause of decline, encouraging its removal would not necessarily reverse the decline. We might just lose the resident population, as well as the migratory one. These knowledge gaps limit our ability to make clear, science-based recommendations for urban gardeners with tropical milkweed in coastal California.

However, in a time of crisis, "do more research" is not an adequate response. Fortunately, there are some actions that we know will help western monarchs, as well as native butterflies and pollinators. In the immediate future, it will help to plant native milkweeds that flower in early spring, especially in natural areas near (~5-50 miles from) overwintering sites, where the first generation of migrating monarchs can reach them. Enhancing milkweed and nectar in other parts of the migratory breeding range will also be important over the long-term. In addition, most monarch overwintering sites are not currently protected and warrant immediate protection--the migration will never recover if there are no overwintering sites. At the same time, we can minimize or even eliminate use of pesticides in gardens and in natural areas. Finally, we can help monarchs and many native pollinators by landscaping with wildflowers, rather than turf grass or some of the non-vegetated landscaping choices that have become popular in the West in response to recent drought.

The good news is that monarch butterflies are resilient. They have persisted in many environments over millennia. While the migratory phenomena in western monarch is currently at a watershed moment, under the right conditions, monarchs have a tremendous capacity for population growth and recovery. As we write this, the U.S. Congress is considering the MONARCH Act which includes >\$60 million to help recover western monarch. If you are concerned about conservation of western monarch, consider voicing support for this or similar legislation. Because monarch butterflies are resilient, it gives us a window of time to act, both by increasing knowledge and by actions that we know will help this iconic butterfly.

[Editor's Note: This article was a last-minute submission by the Conservation Committee, and was considered urgent enough to include in this newsletter. So, you get a two for one from the Committee in this issue.]



Figure 1. A) Overwintering clusters of western monarch in January 2020. Santa Cruz, CA (Photo Credit: Cheryl Schultz. B) Monarch caterpillar in a garden with tropical milkweed in November 2020. Berkeley, CA (Photo Credit: Elizabeth Crone). C) Monarch adult in a garden with tropical milkweed in March 2020. Santa Cruz, CA (Photo Credit Alan Strassberg).



# Metamorphosis

#### Remembering Bill Shepard -- By Paul G. Johnson

On November 18, 2020 we lost a great friend of butterflies and a wonderful human being, with the passing of Bill Shepard. I met Bill eighteen years ago when I led a butterfly walk at Pinnacles National Park for the San Francisco Bay Area Chapter of the North American Butterfly Association (NABA). It was his first visit to Pinnacles, which he would later enthusiastically refer to as "My favorite place on the planet!" He returned many times for butterfly counts, and for celebrations of birthdays and wedding anniversaries with his wife, Ginger.

Bill helped with eleven NABA butterfly counts at Pinnacles, during which his count parties recorded a total of more than 4,000 butterflies. In all, Bill participated in sixtyseven NABA butterfly counts across Northern California. For two decades he also helped with the Western Monarch Thanksgiving Count, surveying several East Bay overwintering sites and discovering a new site at Berkeley Aquatic Park. Bill was a member of the Lepidopterists' Society since 2002 and he also supported butterfly conservation through NABA, Xerces Society, and Nature in the City.



Bill (left) and Liam O'Brien at the South Lake Tahoe Butterfly Count, 2016. (Photo courtesy Liam O'Brien.)

Several years ago at the annual Mid-winter Gathering of Northern California Lepidopterists, Bill enlightened the group with a presentation about his work with overwintering Monarch butterflies. And at the 2019 Gathering, he shared a story about how a conversation with an entomologist neighbor likely contributed to the development of the Entomologist Barbie doll.

As a middle school history teacher, Bill found a creative way to foster future generations of butterfly enthusiasts. He arrived at the science class "disguised" as a naturalist with hat, field guide, binoculars, a note pad, and his butterfly net. All the students received a copy of his selfpublished guide complete with photos, facts, and ID tips for 16 common local butterfly species.

I always appreciated Bill's enthusiasm and dedication to butterflies and their conservation, and I enjoyed his company on many butterfly counts and butterfly walks. Bill and I shared the same favorite butterfly species, the Mourning Cloak.

Bill often carpooled to butterfly counts with Liam O'Brien. When Liam heard of Bill's passing, he said: "I can't imagine a butterfly season without him. For the last few decades his boyish enthusiasm kicked off every season for me. He got excited about each butterfly like he'd never seen it before, and it was genuine. Was there ever a person who loved butterflies more?"

Stu Weiss shared this: "I'm a three-decade long Monarch researcher and conservationist. I met Bill only in 2017, and was blown away by his dedication and passion for natural history, and especially by his detailed knowledge of where and when Monarchs used Albany Hill and other East Bay sites. His tour of the hill guided my data collection and interpretation. I'm saddened by his passing, he still had so much to offer to us and the butterflies in this age of Monarch population crashes which has shocked everyone."



Bill with Mia Monroe at the Monarch overwintering site on Albany Hill, 2018. (Photo by Ginger Morris.)

When Bill was diagnosed with stage IV cancer, he was given "a couple years." But he lived more than twice that long, with much of his time spent outdoors with butterflies. This June, despite failing health, he rallied his strength for one last butterfly count in Berkeley, where he and Ginger recorded eighteen species.

Bill devoted so much of his time and energy toward sustaining butterflies and their habitats. It's no secret that butterflies in turn sustained Bill and his passion for life.



Bill (front left) with the Pacific Slope contingent at the 2019 national Lepidopterists' Society meeting in Davis, CA. (Photo by Evi Buckner-Opler.)

#### George O. Krizek (1932-2021)

George was born April, 1932 in Prague. He grew up there and completed his education in Europe. He was a medical professional with two doctorates from Charles University in Prague and the University of Vienna in Austria. George had a life-long love of nature and butterflies. George, his wife Blanka, and daughter Monika, fled the communist regime in Czechoslovakia and moved to the United States in 1968. He completed his medical residency in New York City with specialties in psychiatry and neurology. Dr. Krizek worked for many years in Washington, D.C. and Maryland as a practicing psychiatrist.

George was very active in the field collecting and photographing butterflies and moths in the United States and in many countries in Europe and other parts of the World. I met George at a small dinner in Washington, D.C. where George showed many of his excellent slides of eastern U.S. butterflies taken in nature. At the end of the slide show, our host Dr. Joseph Zeligs said 'wouldn't it be nice if someone wrote a butterfly book to go with George's slides.' After that I agreed to write that book which turned out to be 'Butterflies East of the Great Plains' by myself and George which was published by Johns Hopkins University Press in 1984. This was the first book on butterflies of a large U.S. region to be illustrated primarily with color photos of butterflies taken in nature. Later, photos of typical eastern butterfly habitats, which had been published in our book in black and white were republished in color in Holarctic Lepidoptera (Krizek and Opler, 2003). George had a variety of Lepidoptera interests and published on a variety of subjects. He also published other scientific papers in several medical journals.

I fondly remember field expeditions with George to the Dismal Swamp in southeastern Virginia, Costa Rica, and several localities in the greater Washington, D.C. area.



George Krizek, admiring a butterfly on his finger.

Dr. Krizek is survived by Blanka, his wife of 61 years, daughter Monika, her husband Glenn Griffis and two grandchildren, all of Washington, D.C. I thank his family for providing the nice photo of George.

#### Dr. Krizek's Lepidoptera publications:

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[Written by Paul A. Opler, Loveland, Colorado]

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

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.

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tact Leroy C. Koehn, Leptraps LLC, 126 Greenbriar Drive, Aurora, OH 44202; Tel: 502-542-7091, e-mail: leptraps@ aol.com. indefinite

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# Publications, Books

New publication: Chaetotaxy of First-Stage Butterfly Larvae, with Improved Homologies and Nomenclature for Lepidoptera Setae and Sensilla. James A. Scott. Papilio (New Series) #32:67 p. Includes 61 setal maps and a key to nearly all the major taxa of butterflies. Free pdf now at https://hdl.handle.net/10217/212226 And all 32 issues of Papilio (New Series) are free in pdf at https//dspace.library.colostate.edu (which goes to Mountainscholar.org), then select Colorado State University, Fort Collins, then search for Papilio (New Series). 624

**For Sale:** Lepidoptera and entomology books for sale. Eric Metzler is selling some books related to Lepidoptera and entomology bibliography. These are duplicates from my personal library. For a copy of the list, please send an email to: ehmetzler@metzler.app, or a S.A.S.E. #10 business envelope to: PO Box 45, Alamogordo NM 88311-0045. I will reply first come, first served." 624

**For Sale:** Available for the cost of shipping. Lepidopterists Journals from 1974 to near present. Contact: Ranger Steve (Mueller), Ody Brook Nature Sanctuary, 13010 Northland Dr., Cedar Springs, MI 49319-8433; phone: 616-696-1753. **Odybrook@chartermi.net** 624

### Research

Eric Metzler is looking for any persons who collected moths in the Ouachita Mountains or knows of moths collected in the Ouachita Mountains, a mountain range in western Arkansas and southeastern Oklahoma. Together with the Ozark Plateaus, the Ouachitas form the U.S. Interior Highlands. The highest natural point is Mount Magazine, in Arkansas, at 2,753 feet. If you can help with information about moths collected in the Ouachita Mountains please contact Eric Metzler at: ehmetzler@metzler.app or PO Box 45, Alamogordo NM 88311-0045. Thank you. 624

# Announcements

Continued from p. 12

# Journal of the Lep Soc page charges reduced

Due to the ongoing financial hardship created by the COVID-19 pandemic, The Journal of the Lepidopterists' Society will be dropping pages charges for members to \$25 USD per page. This policy will remain in effect for the duration of Fiscal Year 2021 (July 1, 2020 – June 30, 2021) and will be revisited at the annual meeting of The Lepidopterists' Society in June 2021. If you are an author and/or a member that has a paper already in layout, or has a paper that has been accepted but not-yet-published, the Editor will automatically update your page charge assessment to reflect this shift in policy. Questions regarding this new approach to reducing financial burden for members should be sent to the Editor directly at **KSummerville@drake.edu**.

## 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

## Lep Soc Statement on Collecting

The Lepidopterists' stance on collecting is discussed fully in The Lepidopterists' Society Statement on Collecting Lepidoptera. This is available online at: https://www. lepsoc.org/content/statement-collecting

# Lepidopterists' Society Election Results

Here are the 2021-2012 election results. Terms will start upon completion of the 2021 virtual Lep Soc meeting. We also want to let the membership know that we are aware of the delay in arrival of ballots due to inconsistent delivery of mail by the USPS. As such, we extended the date by which we would accept ballots by a month to Feb. 15. We apologize if anyone was left out of the process due to the mail delay. Elected officers indicated by "\*".

President:	Votes
Jean-Francois Landry	215*
Vice President:	
Maria Heikkilä	175*
Erik Van Nieukerken	169*
Carol Butler	157*
Dubi Benyamini	137
<u>Member-at-Large</u> :	
Kyhl Austin	169*
F. Matthew Blaine	166*
Pete Van Zandt	163*
John Beck	161

Congratulations to the new officers!



*Laringa castelnaui* (Nymphalidae, Biblidinae) - "The Blue Dandy", Betong, Tala, Thailand, August 2020. Photo by Antonio Giudici.

#### Tor Hansen

P.O. Box 775, North Truro, MA 02652

Reared Actias luna male.

Actias luna has kept me entranced for years, and I am pleased to announce a project in mate selection yielded a phenotypic variation. Just what compelled me to follow up my curiosity in breeding biology of the stunning apple green longtail, came about after a study of metamorphosis in *Hyalophora cecropia*. During preceding years of rearing luna larvae to spin cocoons and get intact emerging adult moths, I had no expectation of the appearance of this bifid aberration in which the distal tips of the long tails subdivide into two distinct lobes. In fact this change in morphology is likely an unusual mutation, certainly appearing in less than one percent of individuals.



Actias luna male, with bifid tail, obvious on left side.

#### torhansen46@gmail.com

How this aberration came to light is indeed fascinating. As a young boy browsing through books illustrated with artistic renderings and showy photos, luna moths captured my admiration. It felt like mother nature had triumphed par excellence in evolving such a stunning creature. Luna larvae are vivid green bio-gems studded with pink/red tubercles, and a leaf-like yellow mid-rib that camouflages the larva (fig. 4). They riveted my attention and soon had me determined to find some living moths. So named for its uncanny glow like soft moonlight, luna spurred me along with other Saturniids, the giant silk moths, to pursue hobbies and a career as an entomologist. As a youngster, repeated visits to the American Museum in New York advanced my studies and later highlighted a greater interest in the miraculous function of pheromone attraction.



Actias luna: eggs, first instar and last instar larvae.

Growing up in Englewood New Jersey in the mid 1950s, I searched vacant weedy lots and woodland edges where patches of deciduous wilderness still existed among the encroaching urbanization. Englewood stretched out westward from the upper reaches of the palisades, a lengthy volcanic sill flanking the Hudson River complete with old growth of assorted birches, tall sweet gum and tulip trees, various oaks, hornbeams, cherry, spicebush, sassafras & viburnum. One day after playing with best friend Johny Osborne, we took a break from our obsession with electric trains to explore Ozzie's extensive back yard where the unraked ground yielded a yell from Ozzie, "Tor, I found a Luna Moth". Sure enough its discovery was enough to set me on a local inspection of the surroundings where lunas inhabit the unlandscaped wild frontier. In early Disney days when Fess Parker played Davy Crockett, imagine

Volume 63, Number 1



George Russell turning to Davy saying, "Davy, I found this here Luna Moth!"

Fast forward to the creation of Flat Rock Brook, a nature center in the 1970s. This 150 acres of sloping old growth woodland was purchased and preserved by caring aware citizens. By then I had graduated from the University of Arizona with a major in zoology, and was motivated to conserve and replenish vanishing species and diminishing habitats. Wanting to champion the increase of luna moths at Flat Rock, I reared numerous caterpillars that took readily to sweet gum. I showed the growth and metamorphic changes to students and parents who loved to see the molting transformations, as well as moths eclosing from their cocoons and spreading their wings.









Volume 63, Number 1



The completion of the expansion of the wings; male in first image, female in last two, continued from previous page.

Recognized for my artistic skills, experience in diorama building by affiliation with American Museum New York, FRB commissioned me to design a wall diorama, a stylish exhibit of the amazing biological diversity still at large in meadow and palisade sylvan edges. Display cases donated to Flat Rock Brook contained mirrored back walls, ideal for my assembly of all major orders of insects flourishing (or then missing from the wilds). With relaxing fluids, & trained in the art of preparing specimens, I made a display of insects that lasted for years to come, and no doubt inspired many a student of nature. Among the hymenoptera were large Megarhyssa species of ichneumon wasps, capable of drilling into bark with exceptional long wire-like ovipositors, and adept at arresting horntail wasp larvae within. Many moths such as *Catocala* underwings, effective pollinators like the sphingids or hawkmoths, and, of course, Actias luna were included. Supplemented with my small photos of assorted habitats within the preserve, the showcase was designed to highlight the enjoyment in walking the trails, and to dramatize the special features representing why Flat Rock Brook needed preservation.

Most of these giant silk moths reproduce by the female exuding a steady stream of perfumed macro-molecules that are effective in attracting even distant males, driven to follow the drifting trail to the source, and couple with female so to fertilize her preformed eggs. I am still astounded to behold the pairing of moths that overcome an inborn handicap of loss of digestive tract; these moths cannot as adults ingest nor digest any food nor sip nectar at flowers like butterflies can. And yet they can survive by fast mating brought about by pheromone detection.

Through my affiliation with nature studies, and sensitivity developed in teaching, I was chosen to become my aging mother Eleanor's health home aid, and for 2 years I so

served her needs and cooked her meals. Luckily Flat Rock Brook's woods were only one half a mile away, so I could walk the trails after hours, and pursue my breeding studies. I decided to construct some make-shift cages, a cardboard box or glass terrarium fronted with window screen and a window cut open for males to have easy access to the calling female placed within. That summer (1996) I carried one moth in a cage up to a rocky outcrop called the quarry, where I placed it on top a ledge and waited for the first suitors to fly in well after dusk. A second cage with another female moth was placed beside the black or river birches, well within the sweet gum woodland, near the brook with the flat basalt smooth rocky bottom that gave the brook it's name. As the babbling brook spilled over and cascaded a meandering course down to the meadowlands and Passaic River, I waited a while with flashlight in hand, so to witness the mating ritual. With the second Luna female in a cage at the foot of a river birch where earlier I had found an enclosed cocoon, I returned several times that night but to no avail, since no males were aflutter.

A short walk up to the quarry put me at the first caged female Luna, and before long, a swift male Luna appeared, flew to the cage area, but did not enter. Perhaps confused by the unfamiliar cage, or by strange human chemicals in the air, it flew down to the low grasses covering the ledge, where it proceeded to flit and drop its long tails into the grasses, flitting slowing, repeating the tails swishing the grass as if were testing where the pheromone trail would lead it. About 20 seconds later it flew to the cage, but then flew off into the woods. Soon another male Luna flew over to the cage, and then a second male moth arrived, and by the time it may have located the female the first male flew through the open window and quickly mated with the calling female. At last I had witnessed the mating where no city lights could distract the males. Only one male mated

![](_page_42_Picture_2.jpeg)

Mating Courtship Flight Path of wild male & to a calling female & Luna moth & Actias Iuna

An approximation of the flight path of males attracted to the female in the cage

with the female, and the second male moth did not enter the cage. Monogamous mating is here the case, and hardly a fully developed ritual. But the males did display a crazy eight or infinity sign in flight pattern before the one moth entered the cage. The perfumed pheromone trail was borne

on a gentle breeze that likely did enable the male lunas to circumnavigate until the pheromone source could be confirmed. I collected the caged couple and drove home.

That mating pair did not include the bifid male. That same night at 11:20PM, I had walked back to the other cage set in the birches and noticed a large wild male mating with the caged female moth. Not suspecting anything unusual about them, once home I placed them close to the open garage, and then looked closely to find the male with double lobed tails, with both long tails bearing the bifid trait. The placid moths remained coupled most of the day. Near evening I separated them, and placed the female inside a paper shopping bag. Before midnight she had laid enough eggs to keep, and I let her go to repopulate her progeny

![](_page_42_Picture_8.jpeg)

![](_page_42_Picture_9.jpeg)

in the wild. Over the next month I reared five caterpillars to moths, but none of these five showed any bifid trait.

As to the genetic and evolutionary significance of the bifid trait, it may simply be one of those rare mutant alleles that shows up from time to time. Given the spectrum of mutation in drosophila fruit flies, this trait may be indeed a mutation, resulting in an aberrant specimen. But where do we look to describe its true place in the genome? Is it a single mutant allele? Or could it require multiple alleles? Gene sequencing may hold some answers, but more serious research may open the window as to how the bifid trait becomes expressed in the moth's external morphology. Picture a kite flying high in the sky and stabilized by it's dragging tail. Will DNA extracted from the deceased bifid be able to clarify and elucidate this fascinating trait?

> One noteworthy caveat involves Graellsia isabellae, the Spanish Moon moth, a distant European relative within the same family (Saturniidae). When I purchased ten live cocoons through the Lep Soc News marketplace, little did I know that the pupae may stay in diapause through two winters, quite a long time in dormancy. When some of my cocoons did not eclose after first winter, I recalled someone telling me not to discard them. Sure enough, after their second winter in cocoons some moths emerged intact. Don't discard your luna cocoons that do not eclose after first winter. I wonder does this prolonged diapause span other genera of long-tailed Saturniids?

The bifid phenotype is quite different from another mutant phenotype called a mosaic gynandromorph, in

#### News of The Lepidopterists' Society

![](_page_43_Picture_2.jpeg)

Actias sinensis female and male, with a mosaic gynandromorph offspring.

which both male and female characteristics are expressed in offspring, in wing scale pattern and color. Photo is courtesy of the late Charles Remington PhD, Peabody Museum.

None of this may have happened if I had not tended to maintaining mother Eleanor's health, and she was much the incentive of my pursuit of using art to serve science. And more inspiration came from cinematographer Campbell Norsgaard, who pioneered early cinema of insect metamorphosis. Sophomore biology instructor Casper Hill at Dwight Morrow High School, allowed me to complete his class over the summer, during which I illustrated in colored pencil all instars of larval black swallowtail. And more recently before he died none other than that silver haired daddy of mine Leonard Hansen who urged me to finish & publish our book "Butterflies Across Cape Cod". Today Flat Rock Brook in Englewood is a thriving nature center dedicated to education, preservation, and replenishing biological diversity! Browse the internet to find amazing research in pheromone molecular structure, and new knowledge on Saturniids that can only increase the wonder in their evolutionary biology. Lunas bring

about a feeling of amazement, lingering serenity, a model for prayer and meditation like a god's eye, and a living example of serendipity.

![](_page_43_Picture_8.jpeg)

Left: Bill Berthet on bamboo bridge in Buxa Reserve, India snaking through huge boulders. Right: Waterfalls with pool of blue water after the bamboo bridge. April 9, 2013. See related article, pg. 14.

Please follow Tor's nature column "Berkshire Wild" at www.iberkshires.com"

![](_page_43_Picture_11.jpeg)

Fig. 1. *Synanthedon richardsi*. Top: spread specimen; bottom: laterodorsal view. Note the extra long anal tuft and the faint mark on the antennae.

# First pheromone collection of the rare Synanthedon richardsi (Sesiidae)

William H. Taft, Jr.

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I have been on a 30-year investigative quest to fill informational gaps previous investigators of North American Sesiidae (Engelhardt, 1946 and Eichlin & Duckworth, 1988) were unable to provide (e.g. food plant, pheromone, life history and range).

In the Summer, 2019 issue of the News of the Lepidopterists' Society I published the article "Recent observations on rarely encountered sesiid borer-Synanthedon richardsi". This article outlined recent observations and possible food plants associated with Synanthedon richardsi (Figures 1 & 2), a little known and rarely collected sesiid moth species almost unknown to North American entomological museums. Even the availability of commercially available sesiid synthetic pheromones in the last 35 years has been of little aid in finding more adult specimens. A recent search for this species using the Symbiota Collections of Arthropods Network (SCAN) indicates only one reported specimen from the Great Smoky Mountains National Park from August, 1941 (A.J. Cook Research Collection -Michigan State University).\*

I identified an image on the bugguide.net website of a female *Synanthedon richardsi* moth taken on June 29, 2019 by Gary Campbell on his property located near the Borough of Coopersburg, Pennsylvania. As a result of this sighting, I planned a short collecting trip to the area for late June during the 2020 field season and was fortunate enough to contact Gary and Karen Campbell and visit their home. Mr. Campbell is a professional landscaper who uses primarily native plant species and his property was exemplary of his planting skills. Some large Blackhaw viburnum (*Viburnum prunifolium*), a shrub that is a suspected larval food plant of *Synanthedon richardsi*, was found behind the house within deer-proof fencing.

During my visit, Gary agreed to deploy 3 pheromone traps with various unique chemical blends late June and through July, 2020. My short collecting trip yielded just 4 species of sesiids including Synanthedon exitiosa, Synanthedon pictipes, Synanthedon rubrofascia, and ..... In spite of the limited collecting results, I did receive a parcel containing additional sesiid specimens Gary Campbell collected on his property. In one of the vials there were a dozen male specimens of Synanthedon richardsi. The lure that attracted our target species was the European Hornet Moth (Sesia apiformis) purchased from Pherobank in the Netherlands. It's key pheromone components are 3Z,13Z-18:OH and 2E,13Z-18:Al\*\* in a ratio of ratio 2:3 (W. Francke et al, 2004). These are the first *Synanthedon richardsi* ever collected using a synthetic compound and evidence mounts that Blackhaw viburnum is probably one of moth's foodplants.

#### Acknowledgements

Many thanks to the Campbell's and other citizen scientists that have helped me collect clearwing moths from around the United States and Canada.

\*The network of North American Museum database for Sesiidae is incomplete.

\*\* (Al) means an aldehyde group which is rather unique in Sesiidae.

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![](_page_44_Picture_20.jpeg)

Fig. 2. Underside view of S. richardsi. The key feature is the 4 white segments on the ventral side of the abdomen.

# Evaluation of a continental native seed distribution program for golf courses, 2020

#### Marcus Gray

Audubon International & Fairleigh Dickinson University, 12 Airport Road, Huguenot, NY 12746 marcus@auduboninternational.org

![](_page_45_Picture_5.jpeg)

Clubhouse signs for "Monarchs in the Rough"

In recent years, many companies and other entities have undertaken promotional seed distribution programs intended to benefit pollinators. However, information pertaining to the actual planting and subsequent success of plants is lacking for these native seed distribution efforts. There is a dearth of quantifiable metrics that demonstrate plant growth or what response the intended target species group (i.e., bees or butterflies) have had as a result of any new habitat which is created. The assumption by many is that seed packets or larger quantities are planted and properly cared for to ensure germination and husbandry of the plants through to successful establishment. Furthermore, few (if any) activities have focused on long-term maintenance of sites to ensure continued benefit if it exists in the first place. Another novel aspect of this work is bringing the golf sector into pollinator conservation in a coordinated way which has the personnel and financial resources required to manage a site into the future.

Monarchs In The Rough (MITR) was initiated in 2017 through a partnership between Audubon International and the Environmental Defense Fund. Over time, additional sponsors and grant funding was attained to scale conservation efforts up to the landscape then continental level. A pilot project was undertaken with 14 golf courses in California to plant milkweed in 0.40 ha (1-acre) plots. It was decided that more diverse plantings would benefit monarchs and other butterflies, so the seed mix grew to encompass native, regionally-appropriate plants such as wildflowers and grasses. Other programs have received considerable criticism for not ensuring the correct seed is used in the right place (Fears, 2017). To avoid similar issues and develop the best conservation plantings possible, we worked with multiple vendors

including Pinelands Nursery in New Jersey and Minnesota Native Landscapes which are part of a continent-wide grower network that could source local ecotype seed across North America. In summer 2019, a survey was sent to participants to gain insight into planting completion and subsequent plant growth and to learn from practitioners on-the-ground about ways in which the model might be improved. While the program has expanded to 568 golf courses committing 792 acres (October 2019) to pollinator management, at the time the survey was sent, there were 514 properties involved, with 700 acres enrolled. The survey received completed responses back from 173 respondents which represented approximately 32% of participating golf courses at that time. The initiative has since grown to 752 golf properties and 1,070 acres involved which surpassed the goal of 1,000 acres (December 2020).

An exciting aspect of working with golf courses is that they have the means to scale a project up on their own once an idea takes hold. We found that 40% of respondents indicated that they had already planted additional areas beyond the initial support from MITR. 59% said they intended to expand their plantings moving forward while 34% were unsure. This provides an education and outreach opportunity to assuage supposed reservations managers of a particular property may have about increasing land dedicated to wildlife. More than half (57%) of survey takers were willing to provide photographs and a written description of their work. Items like this are critical to demonstrate peer to peer influence and foster adoption more widely among Golf Course Superintendents. The public relations benefits of such exposure are important to managers.

![](_page_45_Picture_11.jpeg)

Work day, Sterling Hills Course, California

Survey details came from 29 US states & 1 Canadian province and were distributed across a wide array of landscape conditions coast to coast. The expectation is that planting success would be dependent on variables like rainfall or other factors such as deer browsing pressure. However, the diversity of localities represented in completed surveys provided evidence that any such failure was limited to a particular property rather than an issue at the regional level despite significant flooding in the Midwest, hurricane activity in the Southeast and drought in other areas.

Since patches are relatively new, it was expected that the number and size of individual plants would increase as the stand became established. Some courses (17%) had not yet received seed due to joining in the weeks prior to the survey going out. Conversely, 83% had received their seed shipment at the time the survey was conducted. Others (30%) were still preparing their sites and had not yet planted but were waiting for Fall 2019 for seeding. Of those that had planted, 51% opted for a Spring sowing while only 19% seeded in the Fall. Accordingly, 62% of respondents say they artificially stratified milkweed seeds prior to planting.

Site preparation is critical for native forb plantings. Competition with cool season grasses and introduced warm season grasses can cause a wildflower planting to fail. Competition for light, nutrients and space all contribute to decline in vigor in stands of native plants that evolved with periodic disturbance (Daniels 2019). It is fully expected that MITR plantings will require reinvigoration through soil scarification, prescribed fire, grazing or other means 4-5 years out from inception. This coincides with the peak of expansion of plants at establishment and the ephemeral peak condition must be maintained in the way like those in agricultural landscapes. In the survey, it was found that 19% cleared the site with Glyphosate which was less than expected anecdotally. Thirty golf courses (22%) removed acreage from existing, intensively-managed turf grasses. This method has benefits including multiple years of preemergent herbicide applications and other treatments which favor growth of native plants in the substrate once the introduced sod is removed. Converting areas back to native plants reduces not only chemical inputs but watering required once established, reduced staff time and fuel

![](_page_46_Picture_5.jpeg)

Mature Milkweed with Monarchs

related to mowing frequency. In addition to the habitat aspects, native grasses and forbs improve water infiltration, buffering against stormwater runoff, and enhance water quality. Fifty-three (40%) Superintendents noted that they used other establishment methods such as mowing plants down to the ground, prescribed fire followed by root raking, scalping vegetation with mowers followed by scarification of the ground with hand tools, tilling (1-2 times), aerovating into existing turf, interseeding into native grass stands, and broadcast seeding bare spots on a site. Others opted for growing out plugs in flats with the seed provided to install started plants.

Ninety-three (93) golf courses estimated the number of milkweed stems per acre in this study. 41% saw up to 49

plants per plot, 32% experienced plots with 50-99 milkweed stems. Ten (11%) golf properties said their patches contained 100-149 stems with 15 (16%) reporting over 150 milkweed stems per acre. Through the survey, it was discovered that 15% of courses reported submitting plant or butterfly observations to environmental groups. Golf courses are now poised to contribute to monitoring efforts with (105) seeing 30 named butterfly species in addition to Monarchs and listing

![](_page_46_Picture_10.jpeg)

Site Preparation

Volume 63, Number 1

![](_page_47_Picture_2.jpeg)

Leslie Park Golf Course, Michigan

"Skippers" as a group. Twenty-two survey takers told us about comments they received regarding the project. They covered topics including primarily positive ones complimenting the conservation commitment and Members being encouraged to start their own butterfly gardens to some experiencing mixed reviews, some too early to tell. Multiple courses have received press in the form of television appearances and articles written about their effort to provide habitat for butterflies. Seventy-four of those surveyed had comments about MITR that ranged from those having germination issues to those that plan to expand on their own in the future. One course requested that more diverse milkweed varieties be made available which we take to heart as additional types become commercially viable and affordable. Five survey respondents mentioned seed germination problems specifically, however some of these perceived failures may be remedied by allowing enough time for individual plants to mature given one report of being dissatisfied until the year after planting and being "much more pleased" with growth. Also, the milk-

weed seeding rate (1/2 lb.)per acre) is such that it is anticipated to yield 10-15 plants per acre (approximately 30 stems), similar to the initial plug distribution from Monarch Watch and Monarch Joint Venture Guidelines, which are expected to spread and produce seed becoming an optimum 200 stems per acre (Monarch Joint Venture 2019 and Monarch Watch 2019). Superintendents desired information on the monarch life cycle, better identification

![](_page_47_Picture_6.jpeg)

Tame Prairie

of seed mix contents from vendors, better promotion of the MITR program, to be provided with more signs or discounts on additional seed purchases to expand, details on the types of complementary plants that should be used, and a guide to Best Management Practices for site preparation and planting by region. One course requested the option for expedited shipping which is likely a response to the internal processes related to order handling and distribution falling in line with appropriate planting times.

Seven total participants out of 173 completed surveys had issues and at least two were weather-related. At the time the survey was conducted, thirty-six sites had not yet been planted which yielded a rate of 5% of plantings being unsuccessful as counted

in the survey results. If the rate of failure is multiplied by the total number (620) of golf courses enrolled at the time, it means 31 acres did not work out. However, we know that the 620 golf courses equate to 720 acres paid for through MITR rather than it being a straight 1:1 relationship, golf course to acreage. The survey provided details which made us aware of 160 additional acres planted by golf courses above our financial support of their own volition plus some unknown amount we influenced through outreach beyond our ability to measure impact. Given the survey results and success rate of installations, we expect 8 acres out of the additional 160 planted to fail. The remainder (152 acres) more than compensates for the problems identified by survey questions. The total area known to be committed to pollinator plots through MITR now stands at 1,070 acres (433 ha) for the life of the initiative and is expected to increase per our current grant deliverables. Golf courses in the MITR program average 1.42 acres dedicated for butterfly stewardship per property. Due to travel restrictions related to Covid-19, plans are underway to ground-truth

![](_page_48_Picture_2.jpeg)

University of Missouri Course: left -- year 1; right -- several years of maturation.

data reported in the survey during the 2021 growing season by cooperating with existing monitoring frameworks of the Monarch Joint Venture and other citizen science initiatives that document plant metrics, larval occurrence and adult butterfly use on 40 golf courses.

We conclude that golf course seed distribution programs are a valid means by which habitat projects for monarchs and other pollinators can be successfully implemented. The high rate of necessary husbandry (seed stratification), appropriate site preparation, confirmed planting effort and summary of results are unequaled at the continental scale in North America. Golf course budgets are critical for implementation and sustainability of conservation programs like MITR. This network of reserves is intended to serve as demonstration sites, however once established will produce significant numbers of butterflies in their own right (more than 7,000 monarchs annually from 1,000 acres (Thogmartin et al. 2017). Great potential exists for golf properties to serve not only as restoration venues but as ideal monitoring sites to provide data to Citizen Science research. As plots mature and the concept continues to spread, additional golf courses will undertake the MITR initiative and early adopters will increase their work while promoting butterfly conservation to others, on and off the golf course.

#### Acknowledgements

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The Lepidopterists' Society is open to membership for anyone interested in any aspect of lepidopterology. The only criterion for membership is that you appreciate butterflies and/or moths! To become a member, please send full dues for the current year, together with your current mailing address and a note about your particular areas of interest in Lepidoptera, to:

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Submissions are always welcome! Preference is given to articles written for a non-technical but knowledgable audience, illustrated and succinct (under 1,000 words, but will take larger). Please submit in one of the following formats (in order of preference):

1. Electronically transmitted file and graphics — in some acceptable format — via e-mail. Graphics/figures should be at least 1200 x 1500 pixels/inch<sup>2</sup> 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.

# Submission Deadlines

Material for upcoming volumes must reach the Editor by the dates below:

Issue		Issue	Date Due
63	$\frac{2}{3}$	Summer Fall	May 12, 2021 August 15, 2021
	4	Winter	November 15, 2021
64	1	Spring	February 12, 2022

Be aware that issues may ALREADY BE FULL by the deadlines, and so articles received close to a deadline may have to go into 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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