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NEWS OF THE LEPIDOPTERISTS' SOCIETY

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Inside:

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Contents

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Front Cover:

Eumorpha labruscae, larva, collected October 8, 2020 as an egg in Pinellas Co., FL. By J. Tuttle. Being reared in Suffolk Co., MA, on *Ludwigia peruviana*. Image on October 25, 2020 by Teá Kesting-Handly.

Dos Passos' Hairstreak life cycle (*Callophrys dospassosi*): a photo essay

Bill Beck

15660 N. Roadrunner Ridge Lane, Tucson, AZ 85739 **billbeck001@gmail.com**

Dos Passos' Hairstreak, Sonora, Mexico (blue dorsal)

Mated pair of *C. dospassosi*

Introduction:

Though it seems ages ago, it was September 2018 that I had a chance to travel in Sonora Mexico (Route 16 east from Hermosillo) with a good family friend, Johnny Ochoa. This was lucky for me for loads of reasons: Johnny speaks fluent Spanish (I do not), he has family that lives and ranches in Sonora, and he is experienced travelling there too. This ecoregion of Sonora, and timing of early September, is key to a "hairstreak heaven" by all accounts of those who have gone, now including me!

We saw many butterflies new to us, but especially exciting were big new hairstreaks. One in particular, *Callophrys dospassosi*, was one we had hoped to find, and we did!

C. dospassosi were found (very locally) along the highway on nectar sources near juniper. They were at different locations at 5000-6000 feet in elevation in pine/oak/juniper ecosystems. The prime nectar on our trip was seep willow (*Baccharis salicifolia*). We saw both male and female hairstreaks. A couple of females were "introduced" to a juniper branch from a nearby tree and in short order they deposited eggs, which we watched and photographed.

Route 16, into the wilds of southeastern Sonora

Rearing:

Seven days after oviposition, the eggs began to hatch and the larvae immediately began eating the host juniper. (Photos below try to follow the first hatched larva.) From egg to eclosed first adult was 56 days.

Though we didn't follow instars closely (no head capsules, etc), we watched the length of the larvae change in steps and believe there were at least 5 or 6 instars. This is unusual for most hairstreaks, which typically have four, but Ballmer and Pratt showed 5-7 instars were the norm for the *Callophrys/Mitoura* group (*johnsoni, loki, nelsoni, siva, spinetorum, thornei*) (2). Each *dospassosi* instar lasted about 4 days. (In the photos look closely at the length of a juniper "leaf" compared to the length of the caterpillar for an idea of how quickly size changed!)

While the early instars bore into the lower, wider part of a leaf, by third instar the larvae consumed new growth twigs from the tip down. The entire twig tip would be enclosed by the larvae's hood while eating.

Discussion:

Callophrys dospassosi (incl. ssp. *searsi*) is a hairstreak butterfly Harry K. Clench worked to describe just before his death in 1979. Though his work was in draft, the

Clockwise from left: New eggs; 1st instar newly hatched; 1st instar boring into leaf base – Day 4; 2nd instar casting skin – Day 7.

Left to right: 3rd instar – Compare size to egg casing at this point– Day 9; 3rd instar – Consuming the twig end. – Day 11; 4th instar – Day 17

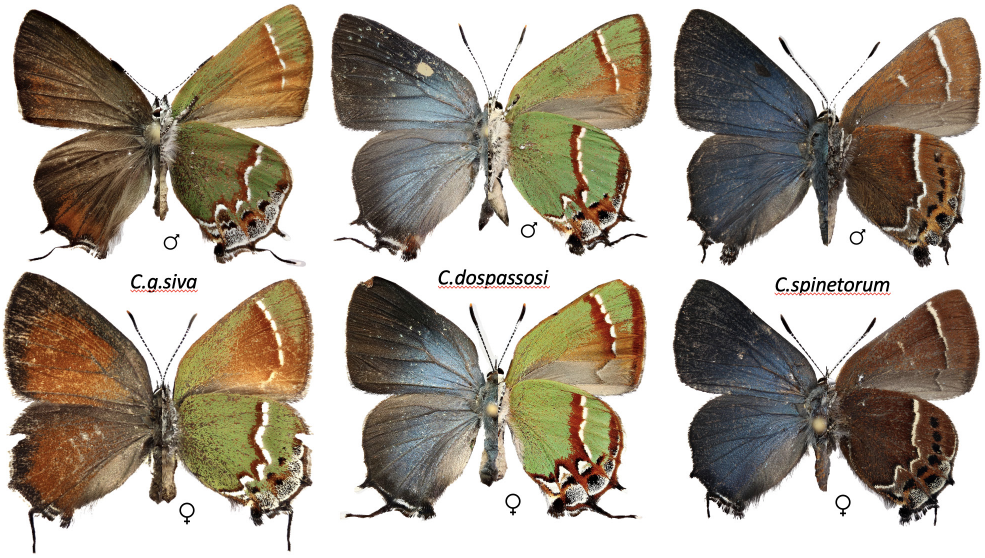
Left top: early last instar – Day 23; Above: late last instar – Day 26; Left: color changes from last instar, pre-pupa, pupa – Day 31; Bottom row, left to right: first eclosed adult from pupa, wings folded, blue on top – Day 56; adult expanding wings; underside moist (rust colored, not green yet); adult expanding wings; adult with wings expanded

manuscript, type specimens and descriptions of this butterfly and several other hairstreaks were gathered and published (Lee D. Miller and Jacqueline Y. Miller). Harry Clench stated "…a number of new *Callophrys* have come to hand, from a variety of sources and from localities ranging from the United States to Guatemala. Several new species in the subgenus occupy a pivotal position in the genus ..." The Type specimen was collected "recently" in 1963. (5)

Of particular interest for *dospassosi* Clench stated in his remarks; "This new species strikingly combines attributes of the well-known, exceedingly different looking *Mitoura*: its upper side is almost indistinquishably [sic] like that of *spinetorum*, while the underside is similar to that of *siva*." He compares *dospassosi* in detail to these two species, and I include here a plate from Clench (the article figures male and female genitalia as well).

Range maps of these three species show that they are likely sympatric in Mexico (Fig 1-1, page 21 (8)). On our trip we did see *siva* along Route 16 too, but not at the same locations we saw *dospassosi*. However Jim Brock confirmed that (Doug Danforth) had seen *siva* and *dospassosi* at the exact same location, "…Mesa Grande a few miles NW of Yecora along the old road to San Nicolas" (pers comm.). (Clench noted the type specimen collection dates for *C. d.*

Plate 1: Clench's Comparison Species: *C.g.siva* vs *C. dospassosi* vs *C. spinetorum*



dospassosi as Jan, Feb, Mar, and Sept; and July, Aug and Sept for *C. d. searsi*. Also Doug Danforth's picture of a *dospassosi* (BOA) was March, while our sightings were September; *C. dospassosi* is certainly multivoltine.) Wow, this certainly tosses up a challenge for pinning the *dospassosi* taxonomy in a phylogeny chart!

In the intervening 40 years from that paper (yes, 40!) a lot has been studied, science has progressed, and our knowledge grows. Today we know that *dospassosi* is from a lineage of hairstreaks which include *spinetorum* and *siva* as Clench used in his review. *Dospassosi's* ancestor probably branched from this *Callophrys* lineage after the *spinetorum/johnsoni* branch, but probably before *hesseli* separated from the final *gryneus* "radiating" group of hairstreaks.

There are many interesting and applicable works on these hairstreaks. (See reference list; parts briefly summarized here in order of the date of publication):

- Downey and Allyn described and pictured eggs of Lycaenidae, including individual pictures of *C. gryneus siva* and *C. hesseli* eggs. (6)
- Ballmer and Pratt tabulated last instar larval characteristics for many Lycaenidae. This included data for both *siva (Mitoura* species*)* and *spinetorum*. Last instar larval characteristics for these two species have differences noted (page 41). (2)
- Ballmer and Pratt built on the 1988 work, and proposed a new genus *Loranthomitoura,* separating *spinetorum* (also *estela, guatemalena, millerorum*, *johnsoni)* from *Mitoura*, based on traits and character differences of these (mistletoe hosted) butterflies; compared to the remaining "*Mitoura*", the Cuppressaceae eaters. Page 40 Figure 3 shows larval (chaetotaxy) differences between (C) *Loranthomitoura* (*spinetorum*) and (D) "a composite of *Mitoura* ssp.". (3)
- Robbins lists *C. dospassosi* in *Callophrys*; Genus *Callophrys* (Billberg 1920), # 400. (This work returned *Mitoura* and *Loranthomitoura* into the precedent genus *Callophrys*.) (10)
- Quental clarified Neoptropical *Eumaeini* generic relationships and showed "relative time" separation of *Cyanophrys* from *Callophrys*, and also *C. gryneus* from *C. spinetorum* (Figure 15). (9)
- Ballmer, Pratt and Wright used allozyme-based methodology for building a phylogeny of the North American *Callophrys.* It shows the *gryneus* group lineage (*gryneus/loki/muiri/siva/nelsoni*) nested together after the lineage branch of *hesseli*, and both after the split of *spinetorum/johnsoni* (Figure 2). (4)
- Dave Wagner facilitated work for *C. dospassosi,* using DNA extracted from a larval specimen. A BOLD TaxonID Tree (COI Species Database Tree) was developed using *Callophrys* genus. This tree showed *dospassosi* separated earlier and outside the nesting of all later *gryneus* entities (*gryneus*, *mansfieldi*, *chalcosiva*, *sweadneri*, *muiri*, *nelsoni*).
- And recently Zhang et al. used large butterfly genome assemblies to build phylogenies. This shows a relationship (*muiri/loki*) nested with *gryneus*, earlier *hesseli* split off, and earlier still was the *johnsoni/spinetorum* limb. (Nuclear genome tree; (2020 media-2)). (11)

Dos Passos' Host Juniper Surpise

Mentioned at the beginning, *dospassosi* females oviposited readily on a juniper tree branch from a tree immediate to the seep willow they were nectaring on. Well, VERY lucky for me John Lane has an insatiable interest in everything juniper and everything juniper hairstreak!

Studying hairstreak egg/larval photos, John noticed that the juniper itself looked peculiar and somewhat different in his eyes. He believed it might not be *J. deppeana* (Alligator juniper) as I assumed. John investigated "fore-with" and contacted an expert on junipers (Robert P. Adams) who confirmed that the tree was *Juniperus blancoi var. mucronate;* a rather rare Mexican endemic (Pers comm.). The unique leaf tip formation in this juniper species sets it apart from all others, the "mucronate" tip. (1)(7) Imagine: a seemingly uncommon hairstreak and a rare juniper tree. A correlation or a coincidence? Well lets abracadabra with the internet!?!

Juniperus blancoi

The quickest way to take a peek at known locations for *dospassosi* is to click on Scan-bugs.org link (link at the end of this article). It will show you a map of Mexico with specific locations to give to you a high level snap-shot of the *dospassosi* range. The encompassing area is right down the "back-bone" of Mexico's main mountain ranges. Next try another click on the link to the EOL website (see eol.org link below) hosted by the National Museum of Natural History, connecting to *Juniperus blancoi*. You get another map showing juniper specimen locations. Lastly click on the link to the EPA website for eco-regions of North America. You can select for "level-III" eco-regions, and you'll see that the locations (for the butterfly and juniper tree locations) fall into "13.2.1 Sierra Madre Occidental with Conifer, Oak, and Mixed Forests"; "13.3.1 Sierra Madre Oriental with Conifer, Oak, and Mixed Forests" and perhaps "13.5.2 Sierras of Guerrero and Oaxaca with Conifer, Oak, and Mixed Forests". When you overlay these charts, (butterfly and of the tree), they VERY closely align. Correlation or coincidence? Well, I speculate correlation, as I KNOW *dospassosi* use *J. blancoi* on Route 16! Haha!

By the way, the host branch lasted for some time as larval food. However "supply" ran low, and some larvae were switched to *J. deppeana* and some to *J. arizonica*. All larvae completed their cycle on these three junipers. Apparently it is not unusual for larvae to be less picky with their food than are the adults with their ovipositing.

Ending Thoughts:

Download James Akers Pence's 2005 doctoral thesis "Conservation Biology of *Mitoura gryneus sweadneri* (Lepidoptera: Lycaenidae)" from link (8). This work has very exceptional *C. g. sweadneri* and *C. g. gryneus* lifecycle photos you can compare to *dospassosi* above. Also link to "Alabama's Butterflies" where Sara Bright has wonderful lifecycle egg thru adult photos for Hessel's hairstreak! (See url below).

PS: Why do we do this? Enlightenment! There are still discoveries to make and mysteries to solve! Lets go! Thanks for help, discussion and guidance from Robert P. Adams, Jim Brock, Fred Heath, John Lane, Doug Mullins, Johnny Ochoa, Robert Robbins, and Dave Wagner.

References

(1) Adams, R.P. 2014. Junipers of the World: The genus *Juniperus*, 4th Edition, Trafford Publishing. Bloomington, IN.
(2) Ballmer G.R., Pratt G.F. 1988. A Survey of the Last Instar Larvae of the LYCAENIDAE (lepidoptera) of California. Journal of Research on the Lepidoptera. 27(1): 1-81.
(3) Ballmer G.R., Pratt G.F. 1992. *Loranthomitoura*, A New Genus of Eumaeini (Lepidoptera: LYCAENIDAE: THECLINAE). Tropical Lepidoptera. 3(1) pg 37-46.
(4) Ballmer G.R., Pratt G.F., Wright D.M. 2011. Allozyme-Based Phylogeny of North American *Callophrys* (s. l.) (LYCAENIDAE). Journal of the Lepidopterists' Society, 65(4):205-222.
(5) Clench HK. 1981. New *Callophrys* (LYCAENIDAE) From North and Middle America. Bulletin of the Allyn Museum Number 64. Florida State Museum, University of Florida, Gainesville, FL.
(6) Downey J.C., Allyn A.C. 1984. Chorionic Sculpturing in Eggs of LYCAENIDAE. Part II. Bulletin of the Allyn Museum Number 84. Florida State Museum, University of Florida, Gainesville, FL.
(7) Mastretta-Yanes, A., Wegier, A., Vázquez-Lobo, A. *et al.* (2012) Distinctiveness, rarity and conservation in a subtropical highland conifer. *Conserv Genet* **13,** 211–222. https://doi.org/10.1007/s10592-011-0277-y
(8) Pence J.A., 2005. "Conservation Biology of *Mitoura gryneus sweadneri* (Lepidoptera: LYCAENIDAE)". University of Florida. **https://ufdc.ufl.edu/UFE0013112/00001/pdf**
(9) Quental T.B. 2008. Systematics, Sexual Selection and Evolution of Secondary Sexual Characters in Neotropical Eumaeini Butterflies (Lepidoptera: LYCAENIDAE). PhD Dissertation to Department of Organismic and Evolutionary Biology, Harvard University, Cambridge, Massachusetts.
(10) Robbins R.K. 2004. Introduction to the checklist of Eumaeini (LYCAENIDAE), Lamas, G. (Ed.), Checklist: Part 4A. *Hesperioidea -- Papilionoidea*. In: Heppner, J. B. (Ed.), Atlas of Neotropical Lepidoptera. Volume 5A. Gainesville. Ass. for Trop. Lepid. Scientific Publishers.
(11) Zhang, J., Cong, Q., Shen, J., Opler, P. A. & Grishin, N. V. 2019. Genomics of a complete butterfly continent. BioRxiv **https://doi.org/10.1101/829887**

Additional Internet hairstreak reference urls.

https://www.butterfliesofamerica.com/callophrys_d_dospassosi.htm
http://www.nic.funet.fi/pub/sci/bio/life/insecta/lepidoptera/ditrysia/papilionoidea/lycaenidae/theclinae/callophrys/index.html
https://v3.boldsystems.org/index.php/Taxbrowser_Taxonpage?taxid=906034
https://scan-bugs.org/portal/map/googlemap.php?maptype=taxa&taxon=139330&clid=0
https://eol.org/pages/1061662
https://www.epa.gov/eco-research/ecoregions-north-america
https://alabama.butterflyatlas.usf.edu/species/details/29/hessels-hairstreak

Conservation Matters: Contributions from the Conservation Committee

Recovery of the Karner Blue (*Plebejus samuelis*) in the Albany Pine Bush Preserve, Albany, NY

Neil A. Gifford, Conservation Director[1], Steven P. Campbell, Conservation Biologist and Amanda M. Dillon, Field Ecologist and Entomologist

Albany Pine Bush Preserve commission, 195 New Karner Road, Albany, NY 12205 [1]**ngifford@albanypinebush.org**

Recovery is the goal for all species listed as threatened or endangered with extinction, but to date no Lepidoptera have been removed from the federal endangered species list (**https://ecos.fws.gov/ecp/report/species-delisted**) due to recovery. The task is often complicated by incomplete knowledge of a species' ecology, ongoing and emerging threats, and limited financial and logistical resources necessary to protect and restore degraded ecosystems (Tear 1995). Examples of successfully pulling a species, or even individual populations of a listed species, back from the brink of extinction are therefore something to herald and study. The successful recovery of the Karner blue (*Plebejus samuelis*) at the Albany Pine Bush Preserve in eastern NY, is one such example. Like a small blue phoenix, its literal rise from the ashes is a remarkable story of renewed ecological vitality that offers inspiration for similar successes of other rare Lepidoptera.

The Karner blue is a small (22–24 mm), non-migratory butterfly of oak savannas in the upper Midwest and pine barrens in the northeastern United States (Fig. 1). The caterpillars feed exclusively on the leaves of wild blue lupine (*Lupinus perennis*), a shade-intolerant perennial wildflower. The species' annual cycle spans two generations or broods. The first emerges in May/June to mate and lay eggs during their short (< 7 days) life span; the second brood emerges in July to mate and lay eggs that overwinter until the following spring (Schweitzer et al. 2011). Karner blues persist within a given landscape as metapopulations (i.e., groups of connected subpopulations) in which individuals occupy or abandon patches of habitat as their suitability changes following disturbance. Wildland fire, grazing, and dry soil conditions historically maintained Karner blue habitat (USFWS 2003).

Figure 1, top: An adult male Karner blue and its only known larval food source, wild lupine (*Lupinus perennis*); bottom: habitat in the Albany Pine Bush Preserve, Albany NY.

The decline of the Karner blue typifies the plight of many 20th century wildlife populations and was a symptom of declining ecosystem health. The loss, fragmentation, and degradation of the oak savanna and pine barrens ecosystems resulted in a 99% decline in Karner blue abundance and distribution since the 1970s (USFWS 2003). Due to its rapid decline in New York, the New York State Department of Environmental Conservation (NYSDEC) listed the Karner blue as endangered in 1977. As the species continued to decline across its range, the United States Fish and Wildlife Service (USWFS) listed it as endangered in 1992. As part of

the federal Karner blue recovery plan (USFWS 2003), the USFWS established 13 recovery units in six states, one of which is the Glacial Lake Albany (GLA) recovery unit in eastern NY. Within GLA, there are four state recovery areas that each support remnant Karner blue metapopulations: Saratoga Sandplains, Saratoga West, Queensbury, and the Albany Pine Bush. Whereas the USFWS requires the restoration of viable metapopulations in three of the state recovery areas for the species to be delisted, the NYSDEC recommends viable metapopulations in all four areas of the state for delisting.

The Albany Pine Bush Preserve is an urban preserve sandwiched between the cities of Albany and Schenectady, NY that protects a 1,400-ha remnant of a northeastern interior pine barrens; it is also the type locality for the Karner blue (Fig. 2). This ecosystem once encompassed more than 10,000 ha (Barnes 2003). Paralleling patterns in the species' range-wide habitat decline, the barrens here suffered significant loss, fragmentation, and degradation from human development, fire suppression, and invasive species (APBPC 2017). The resulting contemporary landscape includes a mix of remnant barrens and non-barrens ecological communities. Remnant barrens communities include the globally rare pitch pine-scrub oak barrens, pitch pine-oak forests, and successional northern sandplain grasslands (NYNHP 2020).

Given the loss and deterioration of the barrens, recovery of the Karner blue in the Albany Pine Bush has depended on the acquisition and restoration of degraded barrens, the establishment of suitable Karner blue habitat within the barrens, and the reintroduction of key ecological processes, especially wildland fire. To this end, preserve managers worked with state and federal recovery teams and academic partners to define suitable Karner blue habitat, implement ecosystem management strategies, and conduct monitoring to gauge progress (APBPC 2017).

Suitable Karner blue habitat requires ≥ 2,000 lupine stems per ha, ≥ 4 species of adult nectar plants per brood, and 5–30 percent tree and shrub cover (USFWS 2003, APBPC 2017). At the time of its listing in 1992, there were fewer than a dozen sites, supporting < 6 ha of suitable habitat in the Albany Pine Bush. To meet recovery criteria here we needed at least 130 ha of suitable habitat distributed across five or more subpopulations (APBPC 2017). Restoring the barrens to achieve this goal involved thinning 990 ha of native and non-native forest and mowing and thinning 148 ha of scrub oak thickets. Depending on site conditions, we applied dormant- or growing-season prescribed fire alone and in combination with these other techniques on 550 ha. Finally, we seeded lupine and other locally derived native plants across 280 ha of the preserve. We continue to employ these methods as we expand ecosystem restoration and Karner blue habitat to additional areas of the preserve.

Restoring habitat was only the first stage of Karner blue recovery. Karner blues still needed to colonize newly restored sites in sufficient number to establish viable subpopulations - a highly improbable task for a low-vagility and short-lived butterfly in a landscape fragmented by barriers of pavement and forest. We accelerated the colonization of restored habitat through a captive rearing and release program in collaboration with the New Hampshire Fish and Game Department. During each year of the program (2008-2015), we provided them 20 presumed-gravid, first brood females from the preserve and other nearby sites; they returned pupae to us that we cared for until adults eclosed and could be released. Over this time, we released 7,868 Karner blue butterflies at 27 sites. These

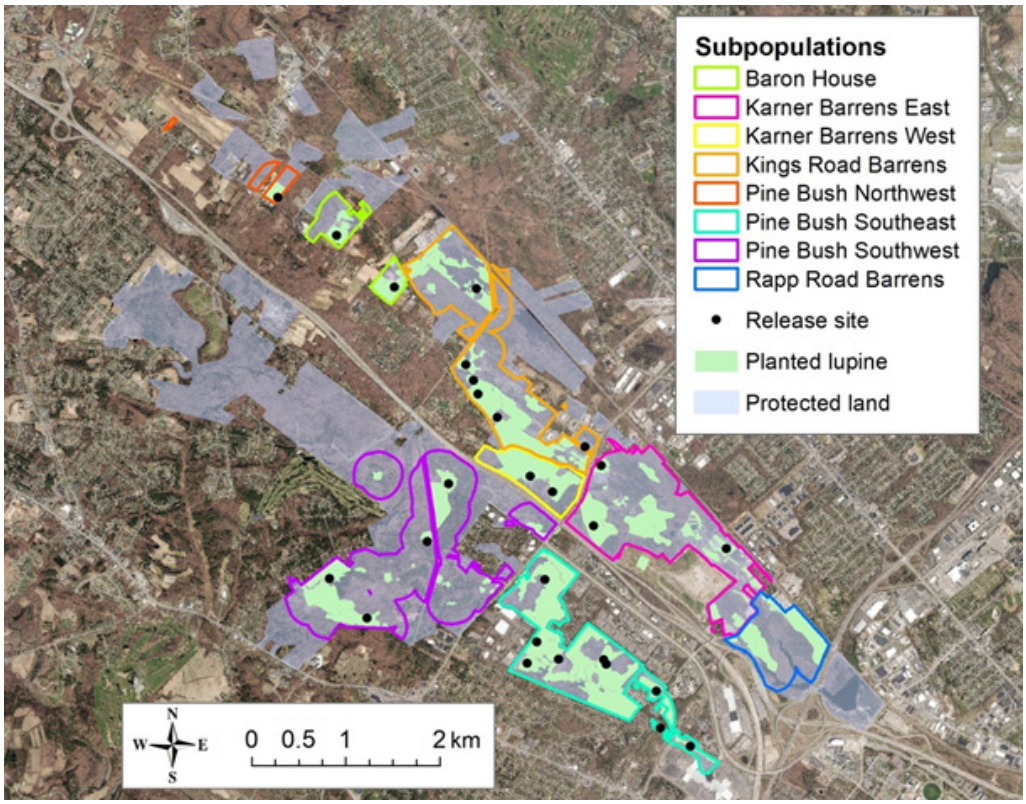


Figure 2. Areas in the Albany Pine Bush Preserve planted with lupine and other native species between 1995 and 2019. Hundreds of butterflies were released in restored areas between 2008 and 2015. Karner blue habitat patches are grouped into subpopulations based on their proximity (< 200 m) to each other and their location relative to geographic barriers such as roads.

efforts facilitated the colonization of nearly all areas of lupine planted across the preserve (Fig. 2). We suspended accelerated colonization in 2015, when it appeared that butterflies were established in numerous sections of the preserve and colonizing new sites on their own.

From 1992 to 2006 we used butterfly counts along meandering transects as an index of population size and change. In 2007, we began using distance sampling in conjunction with insect population curves to produce rigorous estimates of brood size (i.e., the cumulative number of butterflies that emerge within a brood). The resulting estimates can be compared to federal and state recovery criteria. In years when there are enough observations, we also estimate brood sizes of individual subpopulations (Fig. 2).

The results of our efforts exceeded expectations (Fig. 3). Prior to 2007, we suspected population size to be only several hundred butterflies in the best years. Brood sizes grew consistently between 2007 and 2015, with the first brood increasing from an estimated 700 to 14,600 butterflies and the second brood increasing from an estimated 850 to 18,700 butterflies. First and second brood sizes fluctuated around 6,000 and 12,000 butterflies respectively between 2015 and 2019, before increasing sharply to 46,100 butterflies during the 2020 second brood. Over this time, we have also increased the distribution of the butterfly from one to eight subpopulations. The most recent survey year documents the eighth consecutive year that the metapopulation exceeded the recovery threshold established by USFWS and NYSDEC for the Albany Pine Bush recovery area, i.e., 3,000 adults in either the first or the second brood (Fig. 3). Similarly, brood sizes have exceeded the target we set (7,640 adults) to ensure that the number of butterflies in the preserve remains above regulatory minimums in the worst years. Additionally, annual brood size estimates are conservative since they only apply to the small portions of the restored areas that we surveyed. For example, in 2020 we surveyed 13% of the 280 ha known to contain Karner blues (Fig. 2) in the preserve.

Observed trends are likely a result of a complex combination of biotic and abiotic factors. First, the amount of vegetation in successional stages that are most favorable for the Karner blue varies annually. Habitat quality at any given site is in constant flux as conditions transition from relatively low quality immediately after management, to high quality after 1–3 years of regeneration, and then again to lower quality as sites become overgrown (Fig. 4). Second, seasonal weather differentially affects Karner blue life stages (survival, growth, and fecundity) which determine the magnitude of between-brood changes and ultimately the sizes of each brood (Bristow 2017; Fig. 3). The interplay between biotic and abiotic factors appears to have been particularly important in 2020. Through ecosystem restoration we provided suitable habitat such that when the weather was favorable the metapopulation was able to increase rapidly.

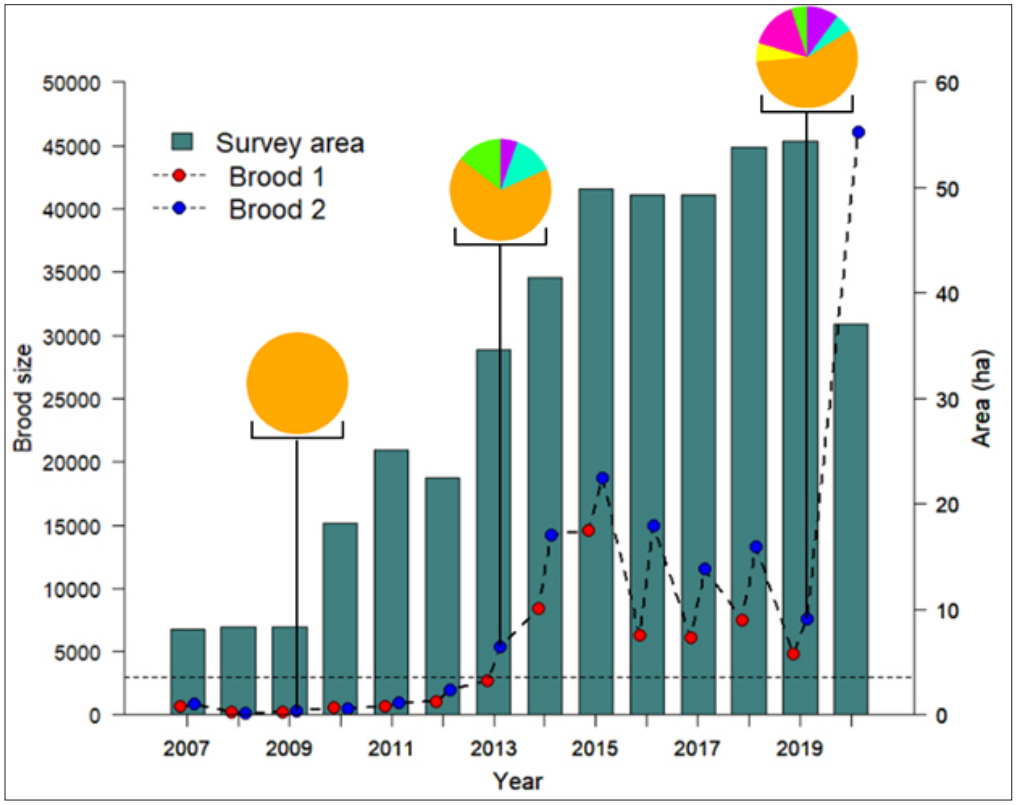


Figure 3. Brood size estimates of adult Karner blues in the Albany Pine Bush Preserve and the relative contributions of subpopulations to a subset of second broods, 2007-2020. Dashed horizontal line represents the state and federal recovery criteria (i.e., 3000 butterflies in the first or second brood). Colors in subpopulation pie charts correspond to those in Fig 2.

The recovery of the Karner blue in the Albany Pine Bush Preserve has been inspiring. It is surreal to walk through acres of dense lupine in high-quality barrens and see hundreds of endangered butterflies, when only a decade ago much of the area was overgrown and the butterflies dangerously close to extirpation. The recovery has also been instructive. Monitoring Karner blues has helped us understand that the understory of "high-quality" pitch pine-scrub oak barrens is not characterized by thickets of scrub oak, but rather by an open grassy shrubland, where scrub oaks, New Jersey tea (*Ceanothus americana*), heaths (*Vaccinium*, *Gaylusacia*, and *Kalmia*), and other dwarf shrubs are distributed among a matrix of prairie grasses (*Andropogon* and *Sorghastrum*) and

Figure 4. Patches of lupine remain unburned following a growing-season prescribed fire in the Albany Pine Bush Preserve. Such patches serve as refugia for Karner blues as the vegetation in the surrounding areas regrows.

wildflowers (*Lupinus*, *Lespedeza*, *Monarda*, *Asclepias*, *Viola*, and *Lillium*); and that these conditions have proven favorable to other rare plants and animals, among them nine Lepidoptera, including the frosted elfin (*Callophyrus irus*), mottled duskywing (*Erynnis martialis*), and inland barrens buckmoth (*Hemileuca maia maia*). We have improved our knowledge of how to combine pyric, mechanical, and chemical tools to achieve desired effects. Experience has taught us how growing season prescribed fires can produce mosaics, frequently burning around lupine patches, which serve as effective refugia for Karner blues within burn units (Fig. 4). We have witnessed how fire diversifies the phenology, quantity and quality of lupine, with obvious benefits for Karner blues. Lupine experiencing fire in the growing season resprouts, flowers, and persists until a killing frost, while unburned mature lupine plants senesce in mid-summer. Working with our partners in New Hampshire, we also learned that feeding Karner blue larvae lupine from burned sites can increase fecundity.

We have also come to appreciate that education and outreach is essential to implementing highly visible and somewhat controversial management techniques in an urban preserve. We share information with tens of thousands of preserve neighbors annually by mail, on our website (**www.albanypinebush.org**), on portable roadside billboards, on social media (Facebook, Twitter and YouTube), and through television, radio and print news. We also engage people in guided and self-guided recreation, education, and volunteer opportunities. Cornell University's Center for Conservation Social Sciences found that doing so has helped us build an informed public that is not only less likely to oppose our work but also willing to support its continuation (Naiman et al. 2018).

Although the Karner blue metapopulation at the Albany Pine Bush Preserve has exceeded all regulatory recovery criteria, its stability and long-term future remains uncertain. Invasive species and climate change will continue to challenge our conservation successes. We will therefore need to continue to enlarge and diversify the metapopulation by protecting and managing additional lands. Monitoring will also continue to be critical to evaluating how population size compares to recovery criteria and to investigating how biotic and abiotic factors affect metapopulation dynamics. In the near term, we can relate changes in metapopulation size to changes in habitat (e.g., management and succession) and weather. Understanding the influence of these factors will help us ensure that metapopulation size remains above the minimum recovery thresholds. In the long-term, we can also begin to examine the effects of climate change on important aspects of the species' phenology and use this information to adapt our management as the species advances toward viability in the 12 other recovery units across its historic range. Delisting the species appears more possible than ever before.

Literature Cited:

Albany Pine Bush Preserve Commission [APBPC]. 2017. 2017 Management plan update for the Albany Pine Bush Preserve. Albany, NY. 80 pp.

Barnes, J.K. 2003. Natural History of the Albany Pine Bush: Albany and Schenectady Counties, NY. NY State Museum Bulletin no. 502, Albany, NY. 245 pp.

Bristow, L.V. 2017. Effects of warming on the endangered Karner blue butterfly: an exploration of the sensitivity of life stages and traits. M.S. Thesis. University of Notre Dame, Notre Dame, IN. 144 pp.

Naiman, S., S Allred, N. Gifford, E. Kinal, and C. Buckler. 2018. Understanding Support for Actively Managed Protected Areas: The Case of the Albany Pine Bush Reserve. Cornell University. CCSS Series No 18-2.

New York Natural Heritage Program. 2020. Online conservation guide for *Pitch pine-scrub oak barrens*. Available from:https://guides.nynhp.org/pitch-pine-scrub-oak-barrens/. Accessed October 7, 2020.

Schweitzer, D.F., M.C. Minno and D. L. Wagner. 2011. Rare, Declining and Poorly Known Butterflies and Moths (Lepidoptera) of Forests and Woodlands in the Eastern United States. USDA Forest Service, Washington DC. 517 pp.

Tear T.H., Scott J.M., Hayward P.H. and B. Griffith.1995. Recovery plans and the Endangered Species Act: are criticisms supported by data? Conservation Biology 9:182–195

U.S. Fish and Wildlife Service. 2003. Final Recovery Plan for the Karner Blue Butterfly (*Lycaeides melissa samuelis*). U.S. Fish and Wildlife Service, Fort Snelling, Minnesota. 273 pp.

The Marketplace

IMPORTANT NOTICE to ADVERTISERS: If the number following your ad is "623" then you must renew your ad before the next issue if you wish to keep it in the Marketplace!

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

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

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

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

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

Publications, Books

Southern Lepidopterists' Society Special Issue

The *Southern Lepidopterists' Society* has recently published a separate Supplement to its Volume 42, summer issue of *News* titled "Louisiana's Avery Island and its Enigmatic Butterflies," authored by Gary Noel Ross. The special issue contains 95 pages including 201 photographs. (NOTE: Avery Island is an ancient coastal salt dome that is renowned worldwide as home to Tabasco Brand pepper sauce, Jungle Gardens, and Bird City -- the latter being the nation's first successful attempt at conserving large wading birds such as egrets and herons.) Copies of this illustrated and easy-to-read work can be secured for the price of $27.00/copy (including shipping). Make check payable to Gary Noel Ross and mail to 6095 Stratford Ave., Baton Rouge, LA. 70808. Electronic correspondence can be addressed to: **GNRoss40@yahoo.com**. 623

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

I am very interested in North American Cossidae, especially from the southwestern region: California, Utah, Texas, Arizona, etc. I am especially interested in: *Fania, Toronia, Hamilcara*, and *Pomeria* (=*Inguromorpha*). Any specimens you can send are very important to me for DNA investigations. I offer in exchange butterflies and moths from Russia, Kazakhstan, Tajikistan, and Mongolia. You can contact me directly at yakovlevcossidae@gmail.com or through Eric H. Metzler, erichmetzler@tds.net Thank you. Dr. Roman V. Yakovlev, docent of Ecology Department, Altai State University, Lenina 61, Barnaul, RUS-656049, Russia. 623

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. 183

Joan Mosenthal DeWind Award

The Xerces Society is now accepting applications for two awards for research into Lepidoptera conservation.

Joan Mosenthal DeWind was a pioneering member of the Xerces Society. A psychiatric social worker by profession, she was also an avid butterfly gardener and an accomplished amateur lepidopterist. Her contributions of time, organizational expertise, and financial support were essential to the early growth and success of the Xerces Society, and helped found a robust organization that has continued to expand in the decades since and become a conservation leader. In Joan's memory, Bill DeWind established this student research endowment fund. Award amounts are determined annually, but are a minimum of $3,750 each.

Submission Requirements: The DeWind Awards are given to students who are engaged in studies and research leading to a university degree related to Lepidoptera conservation and who intend to continue to work in this field. All proposals must be written by the student researcher. Proposed research should have a clear connection to Lepidoptera conservation and must be completed within one year from receiving funds. Applicants may be graduate or undergraduate students; however, please note that all but one awardee, to date, have been pursuing graduate research. Applications from countries outside the United States will be considered but must be written in English and international applicant work cannot involve work in the United States.

Submission Deadline: The submission deadline is Sunday, January 3, 2021, at 11:59 PM PST. Award winners will be announced by March 31, 2021, with initial awards payments sent out by June 2021. All proposals must be submitted by email to **dewind@xerces.org**. For more information, go to **https://xerces.org/dewind**.

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Searching for Cincta: a fascination with a hauntingly beautiful desert dweller

Michael M. Collins

Associate, Invertebrate Zoology, Carnegie Museum of Natural History, Pittsburgh, PA
215 Prospect St., Nevada City, CA 95959 **michaelmerlecollins@comcast.net**

The wild silk moth *Rothschildia cincta,* with its deep chocolate brown wings and transparent eye spots, has long been a personal quest. Common in Mexico, in the U.S. it was thought to be confined to the remote Baboquivari Mts. of southern Arizona. In the winter of 1964 I collected cocoons in Brown Canyon on the eastern side of the mountain range, but sent them off to another collector before their hatching. Returning in December 1979, I searched and searched the canyon without reward. Only in the 1980s did I first raise the moth from eggs sent by Arizona contacts. Shown above, the original wooden sign to the canyon, found face down on the ground by the gate in 1979. The cocoon is from the 1964 trip; live male reared in 2019 by Mike Wilson, from California Gulch, near Ruby, Santa Cruz Co., AZ.

Background and Beginnings

At age 10 one doesn't ponder the origin of their childhood fascinations. I grew up surrounded by fields, woods and ponds and they naturally became my boyhood world. Before I began rearing wild silk moths I was a dedicated tropical fish fancier, collected the odd snake for a pet, and kept salamanders and tree frogs in a terrarium. I am confident that the 1953 Disney film *The Living Desert*[1] was the

1 *The Living Desert* won an Oscar for Best Documentary, as well as awards at the Cannes and Berlin Film Festivals, and a special award at the Golden Globes. Both the music and narration anthropomorphized several scenes, but this did not detract from their drama. The javelina-bob cat chase sequence alone warrants renting or buying this film online.

The distant Baboquivari Mts., viewed from the Sonora Desert Museum, west of Tucson. Early in my quest this mountain range seemed remote and mysterious, as seen here.

vector that pointed me in a new direction, a path that eventually led me to write this essay on the boldly patterned, chocolate-colored moth, a mysterious beauty even among the elegant competition of luna and cecropia.

The desert world in that film seemed exotic and wonderful and inspired my Dad and me to take a camping trip in February 1954 to Organ Pipe Cactus National Monument, bordering Mexico, and to explore the mountains surrounding Tucson. I became enchanted by the Sonoran Desert and have returned many times to nourish that enduring child-like curiosity.

In 1956 I read an ad in Nature Magazine offering cocoons of *Rothschildia forbesi* (Benjamin, 1934) and *Eupackardia calleta* (Westwood, 1853) silk moths for sale, from the semitropical fauna of the Gulf Coast of Texas. Compared to their promethea moth relative in the Midwest, these were new and foreign species to me, and barely mentioned in Holland's Moth Book. This was the beginning of a life-long friendship with Bob Weast, beginning with trading livestock, sharing experiences in collecting and rearing caterpillars, and was the genesis, after his move to nearby Des Moines (professor of music, Drake University), of our field guide to the silk moths.

Although trained as a musician, Bob had a sophisticated perspective of species in nature. He saw the silk moth species we studied as populations held together by pheromone attraction, each sharing an array of life history adaptations, and beating the odds of survival through their reproductive potential. Two chapters in our little green book reflected this view of nature: **Population Dynamics** and **Breeding Flights**. I owe much to Bob for shaping my special interest in speciation and evolutionary ecology.

In about 1959 Bob sent me eggs of *Rothschildia lebeau forbesi* (hereafter *forbesi*). I raised the caterpillars on wild black cherry. They looked nothing like the familiar Midwestern species, but were bright green with contrasting white and black stripes. They grew fat and eventually spun bizarre gourd-shaped cocoons, not sensibly wrapped in a leaf as *promethea* do. When the moths hatched they rested with their wings spread open, rather than closed over their backs as in the familiar *promethea* and *cecropia*, so that lilac-pink shadings stood in bold contrast to the dark brown background. Most unusual of all were the large clear "windows", discal spots lacking any scales. I was hooked. Bob was familiar with *forbesi*, a backyard moth when he lived in Corpus Christi, but the Arizona relative *R. cincta* (Tepper, 1883) (= *jorulla*) was fascinating to us because almost nothing was published about its life history. I wondered how this moth could exist in the unforgiving Sonoran Desert environment. I hadn't heard as yet the word 'monsoon' applied to desert country, nor had I yet seen the lush growth these rains bring forth in late summer.

The Search for cincta, learning its natural history

The earliest records of *cincta* in Arizona appear to be from the Baboquivari Mountains of Pima Co., about 50 miles southwest of Tucson. For example, in the University of Arizona collection is a male taken at light in Brown Canyon, August 4, 1961, by Floyd Werner. This record postdates the writing and publication of *Wild Silk Moths of the United States* (Collins & Weast, 1961), and I believe the records from the Baboquivaries mentioned in that publication derive from personal discussion between Weast, a resident of Tucson in the early 1950s, and local collectors such as Killian Roever (big game hunter and cocoon collector) and lepidopterist Lloyd Martin (subsequently associated with the Los Angeles County Museum).

The original description of *Rothschildia jorulla* (=*cincta* in taxonomic revision) by Tepper (1883) states only: "Cocoons of this moth were found in Southern Arizona by Mr. Robert Driver". John Calhoun (pers. comm.) generously researched this history and discovered that Driver worked in the silver mines of Oro Blanco (Sta. Cruz Co.) in the time period of 1880 -1882, although we don't know the details of his association with Tepper. Oro Blanco is therefore most likely the type locality for *cincta* and is about 10 miles west of Ruby, now both ghost towns, in the vicinity of the Atacosa Mts. South of Ruby is California Gulch, the current favorite collecting site for *cincta*. Just east of this site is Lake Peña Blanca, a popular black-lighting location for saturniids, and where *cincta* is occasionally taken. Driver was also the source for cocoons of *Eupackardia calleta*, which Tepper subsequently described by the synonym of *Platysamia polyommata.*

In August, 1959 I travelled to Arizona with cocoons and live females of *forbesi* which, on a hunch, I tied[2] out near Ruby. By the whimsy of nature they failed to attract any *cincta* males. By all rights I should have collected the species here, and came so close to enriching the discussion of *cincta* (then as *jorulla*) and illustrating it in Collins & Weast (1961). During this trip I visited the University of Arizona Entomology Department to quiz the resident Lepidopterist and to inspect specimens in the collection. I don't remember his name, but recall that the professor's eyebrows raised when this brash, young lad informed him that the *Rothschildia* in the collection from Arizona were misidentified as *forbesi*. I responded to his skepticism by saying: "Here, I have some live *forbesi* right here in this shoe box!" I hope those donated *forbesi* are still in the collection for comparison to their local relatives.

In December 1964, my Dad and I again travelled to Arizona and drove to Brown Canyon in search of *cincta*. I found about 40 cocoons, about 9 alive. Charles Mason in the Botany Department at U of A identified the host shrub

2 Unmated female saturniids can be carefully tethered with a soft string. They tend to not fly until mated so that the mating pair can be recovered at sunrise, to avoid bird predation.

as *Coursetia glandulosa* Asa Gray from leaves and stems I brought in. I have since seen *Eysenhardtia polystachya* (Ortega) DC. (Kidney-wood) in herbaria and in the wild and this plant also seems a close match. (Both these plants belong to the subfamily Papilionoideae of the pea family, Fabaceae.) The true identity of the Brown Canyon host still needs to be resolved. *R. cincta* typically spins on or very near the host, and with so many cocoons I am certain the mystery shrub is a true host. I gave the cocoons to Weast who sent a few to Claude Lemaire in France and I never saw a moth from them. The male figured in Lemaire (1978; Fig. 9-1) is one of these.

Comstock and Vazquez (1963) are probably the first to record *Jatropha* L. (Euphorbiaceae) as a host of *cincta*, from the vicinity of Puerto Vallarta, Mexico, and this host record is cited by Ferguson (1972). Following the Ferguson (1971, 1972) fascicles on the Saturniidae, a cadre of wild silk moth enthusiasts collected and reared many species, and published several previously unknown life histories. Notable among these authors are Mike Smith, Paul Tuskes, and Jim Tuttle, aided by the field work and rearing experiences of Chris Conlan, Ken Hansen, Bruce Griffin, Doug Mullins, and Mike Wilson, some of whom collected *cincta* from *Jatropha* in Mexico. Ken Hansen found larvae of *cincta* on *Jatropha* on Kitt Peak Rd. in the Baboquivari Mts.; this we subsequently determined to be *J. cardiophylla* (Torr.) Müll.Arg.

A third hostplant of *cincta* was added to the literature in 2000, hopbush (*Dodonaea viscosa* Jacq.) in the soapberry family, Sapindaceae. On butterfly collecting trips to California Gulch, south of Ruby in Santa Cruz Co. AZ, Jim Brock had noticed cocoons of *cincta* on this shrub, and reported this to Jim Tuttle, who subsequently found 4th and 5th instar larvae of *cincta* on hopbush in Peña Blanca canyon, 23-29 August, 2000. Tuttle and others have since routinely found cocoons and larvae on hopbush in California Gulch.

We now find *cincta* using as larval hosts shrubs in three very distinctive families: Sapindaceae with hopbush as an evergreen, dense shrub with simple, dark green leaves containing toxic saponin (which makes a soapy solution once used by native peoples); limberbush in the Euphorbiaceae, an open shrub with long, whip-like branches, drought deciduous, with heart-shaped leaves that contain a sap that turns red on drying (giving the Mexican name *Sangre de Drago* or Dragon's Blood); and a legume, tentatively *Coursetia glandulosa* (or perhaps the similar and closely related *Eysenhardtia polystachya*), a deciduous, thorn-less shrub with singly pinnate leaves. Extreme polyphagy is also seen in the closely related *R. lebeau* (Janzen 1982, 2003). One host, *Xanthozylum* (Rutaceae) is fed upon by *lebeau* at the extremes of the moth's distribution, in coastal Texas (knudsen & Bordelon 2004) and in a dry seasonal forest in Costa Rica (Janzen 1982).

Given the fact that all three potential hosts may grow together, presumably the female *cincta* possess the ability to chemically identify and oviposit on all three, the larvae can metabolize their respective phytochemicals, and the larval phenotype is adaptive against this diverse background of foliage types. Collins and Wagner (2014) and Collins and Weast (1961) suggest that the bold vertical stripes may disrupt the outline of the caterpillar.

Are Rothschildia cincta and lebeau forbesi truly allopatric in the U.S.?

The publications by Ferguson, cited above, refer to two volumes on Saturniidae as part of a series entitled "The Moths of North America North of Mexico". When the second volume appeared, those of us familiar with the native wild silk moths were surprised to see the acceptance of an old and questionable record for *cincta* (as *jorulla*) from the Esperanza Ranch near Brownsville, Texas, and in the midst of *forbesi* country. This record seems dubious for several reasons: (1) no other confirmed record exists of *cincta* anywhere in Texas (Knudson & Bordelon 2004), (2) the overall distribution of *cincta* is centered in central and western Mexico, (3) given the weak reproductive isolation between the species, one could expect hybridization in the wild should the two co-occur, (4) the Esperanza Ranch specimens look exactly like a larger subspecies found in Mexico. There was an additional record of a single *R. orizaba* (Westwood, 1854) for the same locality, which seems unlikely because this is a Mexican species found at higher elevation, quite different from the low elevation thorn scrub habitat of the Texas Gulf Coast.

These Texas specimens were said to have been collected as cocoons (probably in 1903) by Jacob Doll and given to Berthold Neumoegen, a prominent 19th Century entomologist for whom Doll was a frequent collector. Doll was a respected amateur associated with the Brooklyn Entomological Society, known for his skill as a preparator and collector. In his obituary published by the society (Englehardt 1929) he is characterized as "- - - not concerned with taxonomic details" - - - " nor did he trouble to record in writing his varied experiences and discoveries", relying instead on a "tenacious memory". It seems probable that the specimens in question are mislabeled and were collected in Mexico. This was the conclusion reached by Tuskes, Tuttle & Collins (1996) and by Claude Lemaire (1978) in his impressive earlier treatment of the New World Saturniidae:

> La présence de l'espèce au Texas oriental n 'est pas plausible, étant donné la physionomie général de sa répartition. Les exemplaires qui en ont été cités, sous le nom de *jorulla* et notamment ceux figurés par FERGUSON (1972:221, pl. 17, fig. 2,7 et 9), ont été vraisemblablement acclimatés ou obtenus d'élevage; ils doivent être rapportês

à *R. cincta guerreronis* , sous-espèce du Mexique central et occidental.

The presence of the species in eastern Texas is not plausible, given the general features of its distribution. The specimens that have been cited under the name of jorulla *and notably those figured by FERGUSON (1972) likely have gained (undo) prominence; they appear to be* R. cincta guerreronis*, a subspecies of central and eastern Mexico.*

Eclectic Musings on the Natural History of Rothschildia cincta *as a Desert Moth*:

Suggested topics for future research

(1). To survive in the Sonoran Desert, saturniids such as *Rothschildia cincta* must closely synchronize their life history with the seasonal late summer monsoons. The rains in July and August initiate a season of flowering and growth in the Sonoran Desert, and especially so for the majority of trees and shrubs that serve as host plants for the saturniid fauna. As an example, Limberbush (*Jatropha*) puts out only diminutive leaves in June and does not fully develop foliage until the rains come.

Given the roughly three to four weeks development time from break of diapause to fully formed adult, one can ask does the large moth fauna of southeast Arizona "predict" the beginning of the rainy season in initiating development? How do pupae in cocoons, or in earthen chambers for those species with burrowing larvae, "know" when to initiate adult development? What environmental cues are responded to? Silk moth breeders have found that a synchronized adult emergence often depends on spraying cocoons with water or keeping them in high humidity in a terrarium.

(2). *Rothschildia cincta* uses a wide diversity of plants as larval hosts. How many of these are ancestral, a reflection of a long evolutionary association with the desert? How many are more recent and represent regional adaptations? Among the *Rothschildia* how does the pattern of host plant use compare to the phylogeny of the genus? Both *Jatropha* and *Dodonaea* contain toxic compounds. Are the larvae of *cincta* similarly chemically protected?

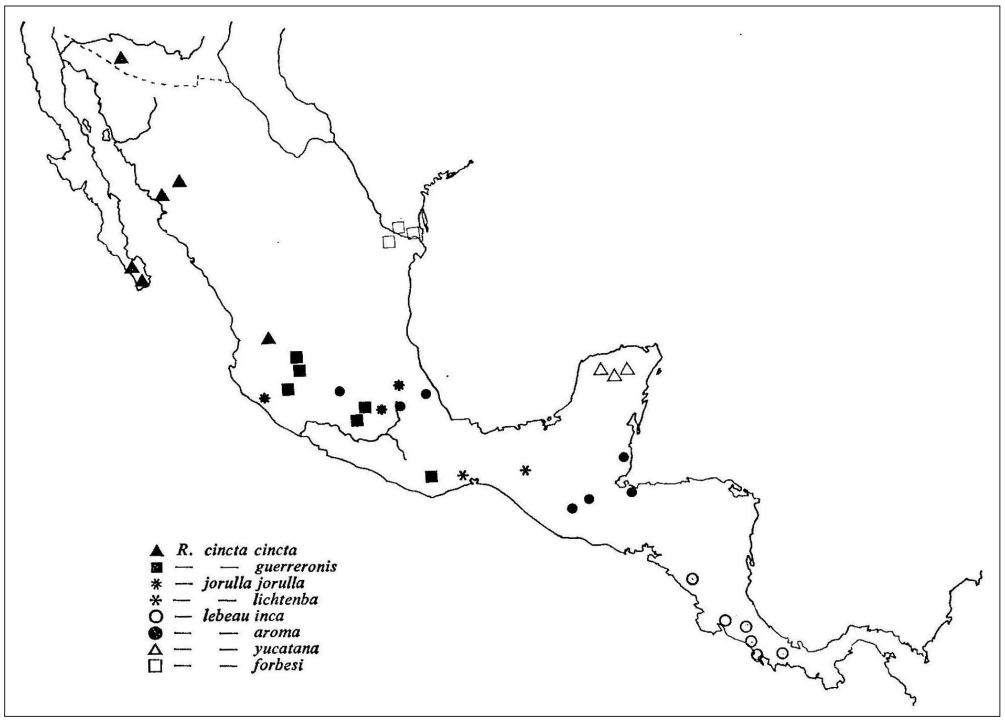
(3). For a creature such as the *cincta* moth the seasonality of the Sonoran Desert confines reproduction and larval growth to a few weeks, and for the rest of the year the animal must remain in its cocoon as a pupa. If we estimate the duration of each stage and express it as days and as a percent of the entire year, we find for the egg stage: 10 days / 2.7%; for the larva: 35 days / 9.6%, for the pupa in the cocoon: 315 days / 86.3%, for the non-feeding adult: 5 days / 1.4%. We see that the cocoon plays a predominant role in the survival of the species; it must protect the pupa from the extremes of the elements for nearly the entire year, through cold rains and occasional freezes in winter, and from the blazing sun in early summer.

This silken structure represents a neatly packaged experiment in biophysics. The light color of the cocoon, the smooth texture of the silk, the compact, rounded shape, and lack of attached leaves or twigs all suggest properties to maximize reflectance (albedo) against the blazing sun. Miniature thermocouples and recording devices could measure the temperature of the cocoon and of the pupa through daily cycles, and compare internal temperatures to that of the immediate environment. What is the maximum temperature a pupa can tolerate and how close does it come to this point in nature?

(4). What is the adaptive significance of the wing pattern, especially those prominent clear spots? Such a question applied to Lepidoptera wing pattern elements in general is extremely difficult to answer experimentally, and has been the topic of much speculation, some of it perceptive and much of it fanciful if not absurd. There are about 45 species of *Rothschildia*, distributed from Arizona to Argentina, most of them tropical and within that realm occupying both dry-deciduous forest as well as humid rain forest. For all this habitat diversity, the wing patterns are remarkably similar with brownish wings and those distinctive clear spots. It seems reasonable that the adaptive significance of the clear spots must be one of a general nature, representing the summation of adaptations over evolutionary time and in a changing biotic environment – what evolutionary biologists call a "general purpose phenotype". Do the clear spots tend to disrupt the perception by a predator of a moth, do they enhance crypsis in some way, or do they resemble vertebrate eyes and startle a potential predator? Perhaps they do some or all these things when viewed over evolutionary time among a variety of species.

(5).The phylogeography of *cincta* and *forbesi* deserves special attention. The distribution map in Lemaire (1978) suggests that the distributions of the two species, as respective subspecies *cincta gerreronis* and *lebeau aroma,* might merge where the Sierra Madre Occidental and Oriental ranges come together in southern Mexico. Two alternative hypothetical patterns are possible; an ancestral form in southern Mexico could have genetically diverged as it spread north and occupied the Occidental and Oriental branches, resulting in the two recognized taxa. The other model would be one of speciation in allopatry and a secondary contact in the south, perhaps with ongoing hybridization. Modern phylogenetic methods could be used to evaluate these or other interpretations.

In a morphology-based phylogeny, Zapata (2009) found that the two currently recognized subspecies, *lebeau lebeau* and *lebeau forbesi* are distinguished as separate species, each closely related to *cincta* in a group containing a few other species. The *orizaba* species group is another member of this same clade. This phylogenetic analysis seems to mirror the geographical distribution: the moths in



Distribution of members of the *cincta – lebeau* species group, from Lemaire (1978). Note the likely sympatry of *cincta guerreronis* and *lebeau aroma* in southern Mexico.

Texas and Arizona represent the northern divergent end points of two separate and extensive north-south branches.

As I finish this essay I am reminded, in abruptly turning from describing a moth's beauty to a dry and detailed proposal for research, of Emerson's chiding remark to his friend Thoreau. He quoted Wordsworth: "We murder to dissect"; 'we can learn all we need to know about nature by merely observing it, and not by subjecting it to the scrutiny of science' (or at least the state of science during the Age of Romanticism).

Imagine that we could somehow place Newton (the genius physicist who used prisms to study the nature of light) and Emerson (the Transcendentalist) side by side watching a thunderstorm subside. As the ensuing rainbow appeared wouldn't each enrich the experience of the other through their special talent in spectra and introspection?

Acknowledgements

In this story of my quest to discover the life history of *Rothschildia cincta*, I gratefully cite the many friends, associates, and others who, over a span of many years, explored, collected, and reared this species. I especially thank Annette Aiello, Jim Brock, Chris Conlan, Ken Hansen, John Rawlins, Paul

Left: Brown Canyon, Baboquivari Mts. Pima Co., AZ, 29 July 1993, with Jim Mouw. I baited a trap with a female *cincta* reared by Bob Weast from Mexican stock. A male *cincta* came in about 0100. This is the only wild adult I have collected! Right: fifth instar *cincta* from Sonora, Mexico. Courtesy C. Conlan.

Dec. 26 2010. Kitt Peak Rd., Baboquivari Mts., Pima Co., AZ. *Rothschildia cincta* cocoon on *Jatropha cardiophylla*. This cocoon had eclosed and has been bleached by the sun; live cocoons are also lightly colored, suggesting a role in thermoregulation.

Left: Hopbush (*Dodonaea viscosa*) (Sapindaceae) at the same location as the cocoon on Limberbush, Kitt Peak Rd., Baboquivari Mts. Pima Co., AZ. This is a host plant for *cincta* in the Baboquivari range, as well as in the Ruby-Oro Blanco region, and probably elsewhere in the range of *cincta* in S.E. Arizona.

"Black Light Charlie" the resident ring-tail cat (*Bassariscus astutus*) near Lake Peña Blanca, Sta. Cruz Co., AZ, a favorite black-lighting spot for large moths, including *Rothschildia cincta*. Flying about the light or at rest on the white sheet, moths are easy pickings for Charlie. I took this photo in darkness with flash, in July 1992 during a collecting trip with Bob Weast. These are quick and agile animals, distantly related to raccoons; most of my slides showed only the tail.

Left: Peña Blanca Canyon, Santa Cruz Co., AZ where Jim Tuttle first found larvae of *Rothschildia cincta* on a new host, hopbush (*Dodonaea viscosa*), growing at the base of the large rock face.

Left: Bob Weast on the outskirts of Harlingen, Cameron Co., Texas, January 2001, pointing out a cocoon of *forbesi* on ash. Right: Cocoon of *forbesi* on lime prickly ash, or Colima (*Zanthoxylum fagara*). Sabal Palm Sanctuary, Cameron Co., Texas

Figures of *Rothschildia lebeau forbesi* from Collins & Weast (1961). Center figure of mature larva shows disruptive effect of intersegmental stripes, resembling stems and twigs.

Tuskes, and Jim Tuttle who shared information or read through early versions of the article. John Calhoun, our noted colleague who has chronicled the history of many early collectors and taxonomists, kindly researched the source of type material for this moth. I thank Pat Hamilton for the translation of the Lemaire quotation. In June of 2020 Mike Wilson unexpectedly sent me a batch of *cincta* cocoons he had reared; the first moth to eclose inspired me to begin this long-contemplated article, which, above all, became an opportunity to pay homage to my old friend Bob Weast.

Citations and General References

Collins, M.M. 2011. Cocoons: Reflections on their unappreciated natural history. News of the Lepidopterists' Society, 53 (2): 39-43.

Collins, M.M. & D. Wagner. 2014. Caterpillars, crypsis and context: interpreting the adaptive significance of larval patterns requires viewing at appropriate distance in natural lighting and against natural background. News of the Lepidopterists' Society, 56:3-9.

Collins, M.M. & R.D. Weast. 1961. The Wild Silk Moths of the United States. 138pp. Published privately.
Comstock, J.A. & L. Vazques. 1963. Estudios de los ciclos biologicos en Lepidopteros Mexicano. 3. II. Heterocera. Annales del Instituto de Biologica [Mexico City] Universidad nacional, 34:1-2; 217-273.
Engelhardt, G.P. 1929. Jacob Doll. Bulletin Brooklyn Entomological Society, 24:104-109.
Epple, A.O. 2012. Plants of Arizona, 2nd ed. Falcon Guides, Rowman & Littlefield, 466 pp.
Ferguson, D.C. 1971. Pp. 1-154, *in* The Moths of North America North of Mexico, Fascicle 20.2A, Bombycoidea (in part) (R.B. Dominick ed.). E.W. Classey Ltd., London.
_____. 1972. Pp. 155-275, *in* The Moths of North America North of Mexico, Fascicle 20.2B, Bombycoidea (in part) (R.B. Dominick ed.). E.W. Classey Ltd., London.
Howse, P. & K. Wolfe. Giant Silkmoths: Colour, Mimicry & Camouflage. Papdakis. Berkshire, UK.
Janzen, D.H. 1985. Guia para la identificacion de mariposas nocturnas de la familia Saturniidae del Parque Nacional Santa Rosa, Guanacaste, Costa Rica. Brenesia, 19/20:255-299.
_____. 2003. How polyphagus are Costa Rican dry forest saturniid caterpillars? Pp. 369-379, *in* Spatio-temporal Dynamics and Resource Use in the Canopy. Basset, Y., V. Novotnyh, S.E. Miller and R.L. Kitching, (eds.). Cambridge University Press, Cambridge.
Knudson, E. & C. Bordelon. 2004. The Illustrated Checklist of the Lepidoptera of the Lower Grand Valley, TX. Vol. 2B: Macro-Moths. Texas Lepidoptera Survey Pub. 9B.
Leach, W. 2013. Butterfly People. Pantheon, N.Y. 388 pp.
Lemaire, C.1978. The Attacidae of America: Attacinae. Ed. C. Lemaire. Neuilly-sur-Seine.
Phillips, S.J. & P.W. Comus (eds.). 2000. A Natural History of the Sonoran Desert. Univ. Calif. Press. Berkeley, CA.

Female *Rothschildia cincta* resting on her cocoon after emergence. Reared from stock from near Ruby, Sta. Cruz Co. Arizona, by Michael Wilson.

Tepper, F. 1883. Description of new moths. Bulletin Brooklyn Entomological Society, 5:65-67.
Tuskes, P.M., J.P. Tuttle, and M.M. Collins. 1996. The Wild Silk Moths of North America. Cornell University Press, Ithaca, New York.
Weast, R.D. 1989. Saturniidae: Ecological and behavioral observations of select Attacini. Privately published, Des Moines, Iowa.
Zapata, A.I. 2009. Sistemática biologia de *Rothschildia* Grote, 1896 (Lepidoptera: Saturniidae) del centro y noroeste de la Argentina. Facultad de ceincias de exactus, fisicas y naturales. Universidad Nacional de Cóordoba, Argentina.

President's Letter

The Lepidopterists' Society, 2019-2021

Alma Solis

2020 will go down as an unusual, difficult year for everyone due to Covid-19. World events have had a great impact on our ability to interact with our fellow lepidopterists and our favorite organisms, butterflies and moths. As the pandemic worsened, the Annual Meeting location at Western Carolina University in Cullowhee, North Carolina, closed. The Officers and the Executive Council made the difficult decision to cancel this year's Annual Meeting in May. Optimistically, it has tentatively been rescheduled for 2021, same place, around the same time. The pandemic affected me personally when I was sent home to telework in late March. All mail at the museum was being held at the shipping office and not distributed; I did not receive my newsletters and journals until late July. I have never been so happy to see my back issues of the Journal of the Lepidopterists' Society and News of the Lepidopterists' Society. Kudos to the editors, Keith Summerville and James Adams! This is truly a volunteer society.

When I became President of the Lepidopterists' Society in 2019, I was reminded that we are a diverse society with lepidopterists of different ages from all over the world from different cultures. We have one amazing thing in common worldwide – we all appreciate butterflies and moths, and the many aspects of their beauty and biology. Over the past 5 years, our society has heavily invested in supporting the next generation of lepidopterists by donating in support of free student memberships. This past year we advertised our society's student memberships on the Entomologists of Color #ENTOPOC website (https://www.entopoc.org/apply.html/). EntoPOC advocates for the removal of barriers for students of color pursuing careers in Entomology. Thanks to members who have donated and Chris Grinter for making this happen! I encourage everyone to read the society's Statement on Diversity, Inclusion, Harassment and Safety (https://www.lepsoc.org/content/statement-diversity).

Our society is composed of those who enjoy working relationships with Lepidoptera either as part of a job or as an avocation. This year our society received a generous contribution from Mr. Stephen M. Mix for the "Mix Family Award for Contributions in Lepidoptera" to be bestowed annually to an amateur lepidopterist -- one not professionally employed as an entomologist -- who has contributed to the field of Lepidoptera. Heartfelt thanks to the Mix Family for their generosity and Kelly Richers for facilitating this contribution! We also partnered with the directors of the film "The Dark Divide" which was supposed

to be shown near the venue of the annual meeting. The film is a visually beautiful film based on the book "Where Bigfoot Walks: Crossing the Dark Divide" by esteemed Lepidopterists' Society member Dr. Robert M. Pyle.

We are very lucky to have an interest in Lepidoptera because, wherever we live, we can go outdoors and see the object of our interest flying about, or at night, look at the wall next to the porch light or set out lights to see and/or collect moths. However, those who travel to their study sites were greatly impacted. My husband, Jason Hall, who works on butterflies, was very disappointed not to be able to go to Ecuador this year, and I was unable to go to Texas to do more fieldwork on aquatic pyraloids (Fig. 1). On the bright side, because we were both at home this year, our butterfly garden received more attention, and it looked better than it has in years. Listen to an NPR interview about us and our butterfly garden (https://www.npr.org/2012/09/23/161645461/rare-specimens-an-unusual-match-up-in-entomology)!

Because I was unable to meet many of you at the Annual Meeting this year, below are some Frequently Asked Questions about me, my work, and my interests. I wish you, your families, and friends a healthy and happy 2021. I hope we can do more "mothing" and "butterflying" when we meet in the beautiful mountains of North Carolina in the summer of 2021.

FAQs

Where do you work and what do you do?

I work for the Systematic Entomology Laboratory (SEL), ARS, USDA, at the National Museum of Natural History in Washington, D.C. (https://www.ars.usda.gov/northeast-area/beltsville-md-barc/beltsville-agricultural-research-center/systematic-entomology-laboratory/) (this site also has links to my research papers and Lepidoptera material databased on the Smithsonian Institution site). As Project Plan Leader for the SEL Lepidoptera unit, which also includes Paul Goldstein (Noctuoidea) and Mark Metz (Gelechioidea), I spent the early part of this year on our 5-year proposed plan that was reviewed by an external panel and approved! I conduct research on pyraloids (Figs. 2, 3), curate the national collection, and identify material intercepted at U.S. ports or sent in by other organizations/persons. We were sent home in late March to telework and it drastically changed how I work. Most of the identification requests started coming in as digitals with images, not as actual specimens, of pyraloid and pterophorid larvae and pupae (I also identify immature carposinids that are frequently confused with pyraloids). One of the most unfortunate effects of the pandemic has been that I am unable to curate the Crambidae, Pyralidae, Pterophoridae, Thyrididae or Hyblaeidae collections. I inherited these from Doug Ferguson (Hodges, 2004), one of my mentors, when I was hired in 1989, and it includes the latter three families because historically they were all placed in the Pyraloidea. I have been attempting to catch up on unfinished projects, particularly on Neotropical pyraloids, that accumulated during the 10 years when I was the SEL Research Leader. Recently, I was invited by a Lithuanian colleague to co-author with his team on Neotropical Nepticulidae and other lepidopteran leaf-mining families; this took me back to my earliest work on Mexican leafmining moths (see below) (Figs. 4-6). And finally, to plug one of my favorite topics, I am editor of the Pyraloid Planet. This is a yearly newsletter for pyraloid enthusiasts, associated with the Pyraloidea taxonomic database, *GlobIZ* (http://www.pyraloidea.org/), where you can read/download the newsletter issues that began in 2006.

How did you become interested in moths?

I grew up in Brownsville, Texas (at the most southern tip on the border with Mexico), and attended the local junior college, Texas Southmost College. The college managed Rancho del Cielo Biological Station in Tamaulipas, Mexico, a cloud forest at about 3500 feet. My first visit to a cloud forest changed my interests forever. I was captivated by the diversity of plants that I had not seen before, such as giant bromeliads, orchids, ferns, and extremely tall trees. I transferred to the University of Texas at Austin, where I received my undergraduate degree in Secondary Science Education, primarily in botany. I then decided to work on my Master's degree with Larry Gilbert (of *Heliconius* butterfly fame) on plant-insect interactions. I wanted to do a research project for my thesis at Rancho del Cielo on pollination, but he suggested I work on leafmining moths and their hostplants (he handed me Paul Opler's work on oak-feeding leaf miners in California to read) (Solis, 1982). The *first major obstacle* was to get permission from Barbara Warburton, founder and director of the biological station, to stay at the station by myself for 2 months. No woman had ever stayed there alone for any length of time, but I was able to convince her over time after answering many questions. After garnering approval, in the spring of 1980 I was dropped off at the station with my gear via 4-wheel drive vehicle; they picked me up two months later. The biological station is accessible only by foot, mule/horse, or 4-wheel drive vehicle. I spent my first two months finding and rearing leafmining moths, mostly Gracillaridae (Figs. 4-6). The following year, I decided to enhance my study by including moths in general, so I planned to start light collecting using a trap and rearing non-leafmining moths. The *second major obstacle* was a lack of electricity; lights were powered with butane. I needed a battery that could last about 2 months that did not need to be charged (a cloud forest has very little sun and this was before portable solar panels). I calculated that a marine battery could support a light trap every other day for almost 2 months. This turned out to be good because I usually spent one whole day searching for food for the caterpillars.

The hardest activity: the marine battery was large and very heavy, and I had to move it over rocky paths and a

Fig. 1. Alma Solis in 2018 collecting moths in Boerne, Texas (photo by Delmar Cain). Fig. 2. Adult, *Scoparia basalis* (Scopariiinae), Maryland, wing length 5-8 mm. Fig. 3. Larva, *Epipaschia superatalis* (Epipaschiinae), poison ivy caterpillar, Maryland. Fig. 4. Rearing laboratory, Rancho del Cielo Biological Station, Mexico. Fig. 5. *Phyllonorycter* sp. pupal case (Gracillaridae), host plant *Acer*, or maple, Rancho del Cielo, Mexico. Fig. 6. *Phyllocnistis* sp. (Gracillaridae) larval mine and pupa on edge of leaf, host plant *Liquidambar*, or sweetgum, Rancho del Cielo, Mexico. Fig. 7. NMNH Lepidopterists circa 1995 (photo by Vichai Malikul) (Left to right back row: D. Adamski, M. Epstein, D. Harvey, M. Pogue, J. Brown, R. Robbins, D. Davis; front row: J. Lewis, D. Ferguson, R. Hodges, J. Burns, A. Solis, V. Malikul).

road using a wheelbarrow. *What I learned*: how to be alone, how to work in a forest at night alone, how to take care of caterpillars, how to pin moths, how to spread leafmining moths, how to safely remove a moth imbedded in my ear canal, and great dexterity with a wheelbarrow. As a side note, I became acquainted with bats at night hunting for food around the sheets and collecting lights, and venomous snakes basking in patches of sun during the day.

What is it like to be a curator of a collection?

I am curator of the Pyraloidea and several other smaller families. It is the largest collection of pyraloids in the world. The Pyraloidea NMNH collection consists of more than 350,000 pinned specimens (almost 3000 type specimens, 135 tall Interior® cabinets), 15,890 slides with dissected moth parts, and an alcohol collection with all life stages, but mostly larvae, in 6243 vials (in 1208 bale jars). When I started curating the collection, I was a PhD student at the University of Maryland at College Park. I was hired by SEL during the last three years of my PhD in pyraloid systematics to learn about immature morphology and identification with Doug Ferguson (Hodges, 2004) and curation of the adult collection with Ron Hodges (Solis, 2018).

Which pyraloid group to start with? There was much discussion between Ron Hodges, Doug Ferguson, who was on my PhD committee, and myself regarding this question, and subsequently I consulted Gene Munroe, one of the few pyraloid experts in the world at the time (Solis 2003, 2008, 2009). He said: "if you can curate the North American Scopariinae, you can curate any other group." I took it on as my first curation challenge. Scopariines are small (5-8 mm wing length), black and white moths whose scales fall off easily (Fig. 2), which can make them impossible to identify externally and often necessitates dissection for identification. I learned a lot about scopariines and curation standards, which would prepare me for a much greater challenge -- the entire Pyraloidea collection. I was hired in 1989 as a Research Scientist with USDA and I prepared a long-term plan for the re-organization and curation of the entire collection. In the beginning, two-thirds of the Pyraloidea collection was unsorted moths. Partial curation of the remainder was done by Hahn Capps (mostly Pyraustinae), Carl Heinrich (mostly Phycitinae), and William Schaus (the rest of the pyraloid collection), and later by Gene Munroe (Pyraustinae) and Jay Shaffer (Pyraustinae/Peoriinae). All the drawers still had cork bottoms, but the NMNH was transitioning to foam-bottom unit trays, which was wonderful for moving specimens rapidly.

The Lepidoptera Pro tem (Latin for "for the time being"), or unsorted material, was huge (almost 300 drawers). In the 1990s, we accumulated all Pro tem drawers and sent them to the Museum Support Center in Maryland for sorting. The moth lepidopterists (Fig. 7) traveled together in a shuttle once a month to spend the day sorting the material mainly to superfamily, which was eventually transported back to the main collection. I spent my first few years culling pyraloids, pterophorids, hyblaeids, and thyridids from the Pro tem and then sorting masses of pyraloid material to subfamily. I was able to hire contractors, with USDA support, to catalog all of the microscope slides (until then only pyraloid or pterophorid slides made by Doug Ferguson were catalogued). This was a herculean, time-intensive, very long-term project that required locating the adult specimens that corresponded to the slide. Note: It was very opportune that Reed Watkins retired to the east coast of the United States and volunteered to curate the Pterophoridae (Silverson & Solis, 2014) because I had so little time for it; the pterophorid collection had more than doubled in size with unsorted material that I had recovered from the Pro tem.

Now. There are currently no unsorted Pyraloidea drawers, with all material directly sorted to subfamily, although there is still Pro Tem at the subfamily level that only more time and dissections can solve. Only the Phycitinae needs major organization and work in the Neotropical and Old World Pro tem (Herb Neunzig sorted most of the Nearctic Pro tem, but more has accumulated since then) to combine the geographical collections.

Recent databasing projects include the Nearctic *Crambus* and the Pyraloidea of Virginia, a recent acquisition, which was barcoded, identified, databased, and uploaded to the web (https://collections.nmnh.si.edu/search/ento/). Another major project was to have each vial of the pyraloid larval collection barcoded and databased, and during this teleworking period I have had greater opportunity to continue proofing it before uploading it to the web. In the summer of 2019, I started working with interns on the Lepidoptera Legacy Project to label material in about 10 cabinets so they can be transferred to the Lepidoptera Pro tem. I hope to continue this project when we can return to the museum.

References

Hodges, R. W. 2004. Alexander Douglas Campbell Ferguson, 1926-2002, Obituary. Proceedings of the Entomological Society of Washington. 106(1): 243-344.

Solis, M. A. 1982. A biogeographical comparison of the moths of *Liquidambar* forests. Master's Thesis. University of Texas at Austin. 73 pp.

Solis, M.A. 2018. Ronald William Hodges, 1934-2017: Eminent lepidopterist and great mentor. Proceedings of the Entomological Society of Washington. 120(2):466-477. **doi:10.4289/0013-8797.120.2.466**. (obituary)

Silverson, N. & M. A. Solis. 2014. Reed Watkins: a passion for plume moths. News of the Lepidopterists' Society. 56: 142-144.

Solis, M. A. 2003. In celebration of Eugene G. Munroe. Tropical Lepidoptera 11(1-2): 1-6.

Solis, M. A. 2008. Eugene Munroe: The Lepidopterist, 1919-2008. Bulletin of the Entomological Society of Canada. 40(3): 139-143. (obituary)

Solis, M. A. 2009. Eugene G. Munroe (September 8, 1919-May 31, 2008). Journal of the Lepidopterists' Society. 63(1): 52-57. (obituary)

How to survive along a tectonic subduction zone: the western Pacific islands ghost moth *Phassodes* Bethune-Baker, 1905 (Lepidoptera: Hepialidae)

John R. Grehan[1] and Carlos G. C. Mielke[2]

[1]Research Associate, McGuire Center, Florida, USA **calabar.john@gmail.com**
[2]Caixa postal 1206, 84.145-000 Carambeí, Paraná, Brazil **cmielke1@uol.com.br**

With rare exception, ghost moths are not among the great diversity of Lepidoptera found on various volcanic islands around the world. Instead, ghost moths are almost entirely restricted to continents, continental islands (that are part of a continent) or major islands and their offshore islands that include or are associated with continental substrates such as New Zealand, New Guinea, Sumatra, Java, the Lesser Sunda, Moluccas, Japan, Philippines, and Taiwan. The principal anomaly is the genus *Phassodes* Bethune-Baker, 1905, formerly represented on some western Pacific islands by a single named species – *Phassodes vitiensis* Rothschild 1895 in the Fijian archipelago (**Fig. 1**). Two further records attributed to this species were later documented by Tams (1935) for American Samoa, and Comstock (1966) for Samoa (then known as Western Samoa). This genus showed no obvious affinities to any of the regional ghost moth fauna in New Caledonia (a single species of *Aenetus* Herrich-Schäffer, 1855) or the diverse range of genera and species from the surrounding landmasses of Australia, New Guinea, and New Zealand (cf. Dugdale 1994, Grehan & Mielke 2018, Simonsen 2018).

Our attention to *Phassodes* began in 2015 when CGCM visited a European insect fair and observed a display with a ghost moth specimen from Guadalcanal in the Solomon Islands. We quickly identified it as a specimen of *Phassodes* by its distinctive wing pattern which was not noticeably different from that of the Fijian *P. vitiensis*. The Solomons specimen was an important discovery as it was the first new geographic record for the genus that was not only 2,000 km from the next nearest locality in Fiji, it was also from a region that had no other previous ghost moth records whatsoever.

Fig. 1. *Phassodes vitiensis*: Naviti Resort, Coral Coast, Fiji (Photo by Kirk Williams & Benny de Groof). From Grehan & Mielke (2020).

We were very interested to determine the species status of the Solomons specimens and with this goal in mind we were able to procure a specimen. But we also needed to make detailed comparisons with other *Phassodes* specimens and in his respect we were fortunate to learn that the Bernice Pierce Bishop Museum in Hawaii had a collection of *Phassodes* from Fiji along with the specimens recorded by Tams (1935) and Comstock (1966) for American Samoa and Samoa respectively. The collection staff was very supportive in agreeing to loan specimens for study and dissection. We also had access to some additional specimens previously loaned to JRG by the United States Natural History Museum and the New Zealand Arthropod collections.

From this combined material the Solomon Islands, Fiji, and Samoa were each represented by male specimens which allowed direct comparison between them. The American Samoa specimen was represented by a single female, but we were able to compare this with genitalic dissections of females from Samoa and Fiji. Consistent differences in the genitalia, supplemented by variations in the antennae and abdominal sclerites, allowed us to conclude that there were four species, each endemic to a different island archipelago (Grehan & Mielke 2020).

The scattered distribution of *Phassodes* between American Samoa and the Solomon Islands was allopatric to all other Hepialidae in the region and we were interested in its biogeographic relationships. For that we needed to have evidence of its probable sister group. Comparison of the *Phassodes* male genitalia with all other ghost moth genera showed that the general shape and structure was most similar to that of *Abantiades* Herrich-Schäffer, 1855

endemic to Australia. This structural similarity was so strong that if one were not aware of a male *Phassodes* dissection being from outside of Australia it could well be mistaken for a form of *Abantiades*. Complimentary to this general similarity there also were at least two uniquely shared features that supported a sister group relationship between the two genera. Both have a unique digitiform lobe in the male genitalia and a laterally inflated intermediate zone of the tergosternal sclerite connecting the first abdominal sternite and tergite (Grehan & Mielke 2020).

The sister group relationship between *Abantiades* and *Phassodes* is geographically represented as a disjunct and allopatric distribution pattern. The presence of animals and plants on Pacific Islands is very often assumed to be the result of chance dispersal from imagined centers of origin in nearby continents or major landmasses. This is the traditional and widespread explanation for Pacific island organisms. The center of origin model for the origin of allopatry has no actual scientific basis, but is a theoretical notion that goes back to Charles Darwin who viewed any alternative as requiring the agency of a miracle. The idea that allopatric distributions are the result of movement sets up an irresolvable dichotomy between attributing both distribution range and divergence to the ability to move. Somehow movement is sufficient to establish allopatry (whether adjacent or disjunct) and yet insufficient to overcome the isolation necessary for divergence (Heads 2012). Because it cannot be directly observed, chance dispersal is sometimes characterized as 'mysterious' or 'miraculous' (Heads 2014b).

A center of origin-chance dispersal explanation for *Phassodes* would require the ancestor to have migrated from Australia only once, and only at the initial divergence of *Abantiades* before it speciated (i.e. *Phassodes* is not nested within *Abantiades* as a derivative of an *Abantiades* sub-clade). After that there would never again be any successful dispersal, even to larger and closer geographic areas such as New Caledonia, New Guinea or New Zealand. An alternative biogeographic model which is applicable to allopatry in general is vicariance of a widespread ancestor. In this model of dispersal, movement is responsible for range establishment and persistence, but not divergence which occurs when local climatic or geological mechanisms disrupt ancestral genetic continuity. For *Phassodes,* this would mean that the common ancestor with *Abantiades* was already present within the current range of each genus. This dual presence does not mean that the ancestral range was exactly the same as the full range of each genus now, only that it encompassed the original distributions of each genus at their initial divergence.

Evidence for a vicariance origin of *Abantiades* and *Phassodes* is provided by a tectonic correlation where *Abantiades* occupies a continental geography while *Phassodes* occupies an oceanic geography associated with the Vitiaz subduction zone (**Fig. 2**). The Solomon and Fiji islands are both part of the now immobilized Vitiaz subduction zone which originated off the eastern Coast of Gondwana about 95 Ma (Heads 2017). Through tectonic extension, the subduction zone moved progressively eastwards into the Pacific basin through a process called 'rollback'. As with subduction zones in genera, the Vitiaz arc would have been paralleled on the overriding plate by a series of volcanic islands or island arcs (i.e. a chain of adjacent or nearby islands) generated by the heating of subducting oceanic crust. There is geological evidence for the presence of large islands or island arcs along the Vitiaz arc which would have provided a continuity of habitats that allowed survival of *Phassodes* as it became isolated from the ancestral range with *Abantiades* **(Fig. 3**).

The long term survival of *Phassodes* was only made possible by the ability or opportunity for these species to transfer between older islands that eventually subsided below sea level, and newer emergent islands **(Fig. 4**). In this sense *Phassodes* is a persistent weed that was able to survive along the Vitiaz subduction zone. The Samoan islands localities are not immediately part of the Vitiaz arc, although they are associated with a tectonic 'tear' or zone of crustal weakness that extends to the terminus of the Vitiaz arc at Fiji. The Samoan islands are also among just the most recent of a series of volcanic islands that have formed and moved westwards until subducted at the Vitiaz arc for at least 20 Ma (older islands having been

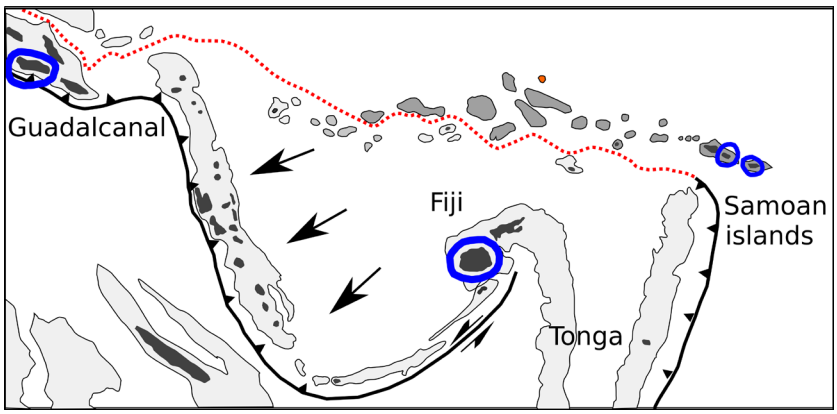


Fig. 2. Distribution map for *Phassodes* (blue outlines) and local tectonics. Thick black lines – major plate boundaries pointing in the direction of subduction beneath over-riding plate with barbs on the over-riding plate; dotted red line – Vitiaz Trench; arrows – direction of expansion of North Fiji Basin; half arrows – direction of plate movement either side of transform fault; Dark grey shading – current islands; pale & intermediate shading – submerged ridges, seamounts, and island slopes (from Grehan & Mielke 2020)

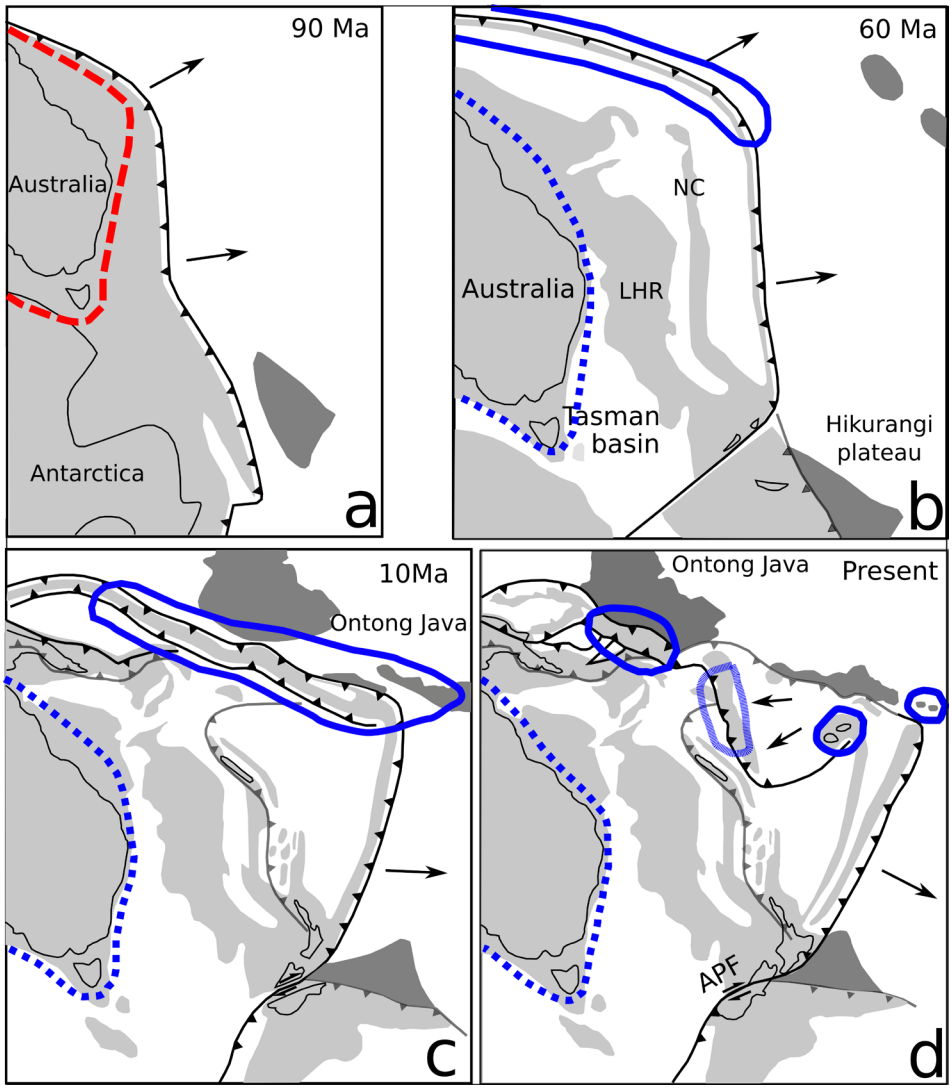


Fig. 3. Conceptual diagram of possible historical relationship between eastwards rollback of East Gondwana subduction zone and vicariance of the *Abantiades*/*Phassodes* ancestor: **(a)** hypothetical range of ancestor, **(b)** initial separation between 90-70 Ma isolating *Phassodes* along subduction zone volcanic islands, **(c)** contiguous island arc distribution of *Phassodes*, including the Samoa hotspot trail, **(d)** tectonic disruption of the Solomons-Tonga island arc displacing the Vanuatu segment to the southwest where it is possible that *Phassodes* may still persist. Red dashed line – hypothetical ancestral range, blue line – *Phassodes* distribution, dotted blue line – *Abantiades* distribution (shown just for the eastern range), pale blue line – potential persistence of *Phassodes* in Vanuatu archipelago (from Grehan & Mielke 2020).

lost to subduction). It is possible that the occupation of a Samoa volcanic system occurred from the inception of the Vitiaz arc.

Movement of organisms within a region, whether between habitat islands or geographic islands, is a normal observable ecological process that allows a species to persist as a metapopulation (a population of populations) more or less *in situ*, even when individual habitats or islands may have a patchy or disjunct distribution, and are ephemeral over

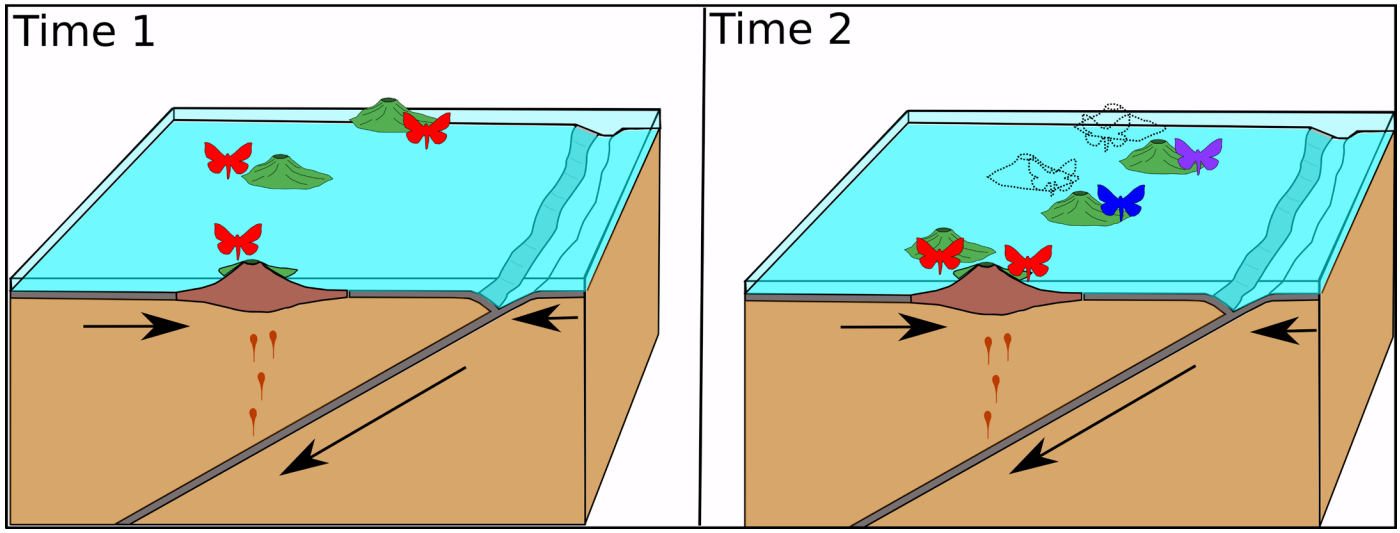


Fig. 4. Conceptual diagram of *Phassodes* as a subduction zone weed at a converging plate margin where the genus is able persist along a plate margin as a series of metapopulations. Initial species populations in Time 1 (red silhouettes) establish new populations in Time 2 (blue and purple silhouettes) by dispersing onto new volcanoes (adjacent or very close) that are sequentially formed along the subduction zone while older islands are eroded or subside (dotted outlines in Time 2). Arrows - direction of plate movement. See Heads (2019) for discussion of the metapopulation concept.

time (Heads 2018, 2019). This type of dispersal may result in habitat (or island) colonization and range expansion, but not differentiation which requires a cessation of ecological dispersal. In this respect, ecological dispersal is different from long-distance dispersal which is a theoretical mode of speciation that is often invoked to explain the origin of allopatric taxa by singular, chance events (Heads 2012).

The 2000 km disjunction of *Phassodes* between Guadalcanal and Fiji could represent extinction within the geographic gap when former island arcs were fragmented by formation of the North Fiji basin. This explanation is also consistent with the existence of the same disjunction in many other animal and plant groups, including taxa of lilies, palms, frogs, stick insects, and beetles (Heads 2014a, Grehan & Mielke 2020). However, it is also possible that the disjunction may be reduced if further populations of *Phassodes* are found in other islands of the Solomon archipelago or in Vanuatu which represents a displaced portion of the original Vitiaz arc.

The Pacific islands survival of *Phassodes* along the Vitiaz arc and the associated Samoa volcanic plume contrasts with absence of this or other Hepialidae on other Pacific oceanic islands. The difference may be due to the presence of more extensive islands and island arcs along the Vitiaz arc than other regional subduction zones or localized intraplate volcanoes of the Pacific. Larger or more frequent island formation along the Vitiaz arc would have provided greater long term continuity of habitats necessary for the survival of ghost moths, particularly larger bodied species that show no evidence of having a broad ecological dispersal capability (Grehan & Mielke 2018). Moths are unable to glide and usually do not maintain active flights beyond a single night. Thus, smaller and more widely separated and intermittent volcanic islands in the Pacific basin would not have supported a sufficient continuity of habitat necessary to allow persistence of a metapopulation in *Phassodes* or any other ghost moths, even if they may have been present there in the past.

For future ghost moth research there is great interest in whether or not *Phassodes* is present in the Bismarck Archipelago and Bougainville adjacent to the Solomon Islands. The apparent absence of ghost moths from the Bismarck Archipelago was noted early by Pagenstecher (1900). Like many other ghost moth species, *Phassodes* is an infrequent visitor to light. This behavior, combined with the relative lack of collecting in these regions, suggests that the range of *Phassodes* could be more extensive than current records imply, although it is more doubtful that *Phassodes* is present in New Guinea which has been more extensively collected and *Abantiades* is also unrecorded. *Phassodes* is also represented by only a single island in each of the Solomon Islands, Fiji, Samoa, and American Samoa archipelagos and so the question remains as to whether the genus is present on other islands, and if so, are they also distinct species.

References

Comstock, J.A. 1966. Lepidoptera of American Samoa with particular reference to biology and ecology. *Pacific Insect Monographs* 2:1-74.

Dugdale, J. 1994. Hepialidae (Insecta: Lepidoptera). *Fauna of New Zealand* 30:1-164.

Grehan, J.R. 2012. Morphological evidence for phylogenetic relationships within the Hepialidae (Lepidoptera: Exoporia). *Bulletin of the Buffalo Museum of Science* 42:33-62.

Grehan, J.R. & Mielke, C.G.C. 2017. Re-characterization of *Gymelloxes* with a re-description of *Gymelloxes terea* from Central America (Lepidoptera: Hepialidae). *Zootaxa* **4663**: 434-440.

Grehan, J.R. & Mielke, C.G.C. 2018. Evolutionary biogeography and tectonic history of the ghost moth families Hepialidae, Mnesarchaeidae, and Palaeosetidae in the Southwest Pacific (Lepidoptera: Exoporia). *Zootaxa* 4415:243-275.

Grehan, J.R. & Mielke, C.G.C. 2020. Taxonomic revision and biogeography of *Phassodes* Bethune-baker, 1905 (Lepidoptera: Hepialidae), ghost moth descendants of a subduction zone weed in the south-west Pacific. *Bishop Museum Occasional Papers* 136:1-37

Heads, M. 2012. *Molecular panbiogeography of the tropics.* Berkeley, University of California Press. 562 pp.

Heads, M. 2014a. *Biogeography of Australasia. A molecular analysis*. Cambridge, Cambridge University Press. 493 pp.

Heads, M. 2014b. Biogeography by revelation: investigating a world shaped by miracles. *Australian Systematic Botany* 27:282-304.

Heads, M. 2017. *Biogeography and evolution in New Zealand*. CRC Press, Boca Raton. 635 pp.

Heads, M. 2018. Metapopulation vicariance explains old endemics on young volcanic islands. *Cladistics* 32:392-212.

Heads, M. 2019. Recent advances in New Caledonian biogeography. *Biological Reviews* 94:957-980.

Pagenstecher, A. 1900. *Die Lepidopterenfauna des Bismark-Archipels*. Zweiter Theil. Die Nachtfalter. E. Nägele, Stuttgart. 451 pp.

Simonsen, T.J. 2018. Splendid ghost moths and their allies. A revision of Australian *Abantiades*,*Oncopera*, *Aenetus* and *Zelotypia*. *Monographs of Australian Lepidoptera* 12:1-312.

Tams, W.H.T. 1935. *Insects of Samoa and Other Samoan Terrestrial Arthropoda: Lepidoptera. Heterocera (exclusive of Geometridae and the Microlepidoptera).* Parts 3–4. Trustees of the British Museum (Natural History) London. 129 pp.

An urban population of saturniid silk moths

Bob Mayer

29 Greenough Ave. Unit 1, Jamaica Plain, MA 02130 **rgmayer38@gmail.com**

In the summer of 2017 I was lucky enough to come upon a Pipeline Swallowtail, *Battus philenor,* laying eggs on an *Aristolochia macrophylla* vine *at* the Arnold Arboretum in Boston, Massachusetts. I sought help in how to manage and rear those eggs through a local Lepidoptera email group and that process led to a relationship with Don Adams, a noted breeder of butterflies and moths in Massachusetts. On a visit to the Arboretum he expressed curiosity about the local Saturniid moth population. Given the significant light and air pollution in this urban setting, and the habit of landowners to rake and clean their yards each fall – disturbing invertebrate cocoons – could it sustain a population of the indigenous Saturniidae? I agreed that with his help (which became very considerable) I would investigate.

The site and setup

The Arnold Arboretum is a 281 acre tree museum founded by Harvard University and given to Boston as a city park in 1882. Harvard maintains the dendrology collection and manages the grounds, including mulching or collecting leaves each fall. Much of the Arboretum is forested but there are grassy areas and perennial meadows, all encircled by the urban landscape. The Arboretum is a major research institution, and I submitted a research proposal to Harvard for my investigation, which was approved.

In October 2017 Don brought me a collection of three species of silk moth cocoons in a hand constructed wire cage: *Hyalophora cecropia, Antheraea polyphemus,* and *Callosamia promethea*. They were over-wintered outdoors near a maintenance garage, exposed to the elements but protected from predators by the wire cage, to help insure eclosure synchrony with the native population if present. In mid May 2018 the cocoons were moved near a calling cage which was also constructed and donated by my mentor, and it was placed on a metal stand in a protected area away from any buildings or lighting. This cage would permit dispersal of female pheromone, allow attracted males to find/enter the 4-½ inch diameter hole, and provide a measure of protection from predation for mating pairs.

The investigation - 2018

On May 29 I discovered the first eclosure, a male Cecropia, but while preparing to mark and release it the moth escaped unmarked. The next day there were three more eclosures – all female – which were kept in the cage, and the door was left open for the night. The following day I discovered a pairing had occurred (see image).

Top: The "calling cage" showing an opened door, after a moth had eclosed within (right corner). Bottom: The male Cecropia on left has much more prominent antennae than the female.

However, because of my careless release of an unmarked male the day before, I couldn't be sure that it was a native male that had responded to the female's pheromone release and paired with her. The Cecropias remained paired all day but as dusk approached they separated; I then marked the male and released him. The female was placed in a paper grocery bag and after about 30 minutes I opened the bag and the female departed. Looking carefully inside the bag I found 20 eggs attached to the paper.

The following day I found another Cecropia pairing in the calling cage (the third female had flown out). This male was unmarked; a native! This female produced another collection of eggs that evening.

It was another ten days before there was another eclosure; this time a female Polyphemus moth. After three nights of not calling in a male she left the cage in the night. Several days later, on June 21, a second Polyphemus female did call in a native male, and she laid several dozen eggs in the paper bag she was held in after mating. At this point native males of both species had responded to sexual pheromones of introduced females.

I was anxiously observing the four Promethea cocoons I had been given earlier by Adams. Regrettably none eclosed. He later brought me 3rd instar Promethea caterpillars from his breeding operation and these were placed on sassafras (*Sassafras albidum)* as host tree at the Arboretum. As the tree collection is labelled, the exact species of each food plant was documented. Cecropia caterpillars were fed on black cherry (*Prunus serotina)* and two species of maple, red maple (*Acer rubrum)* and silver maple (*Acer saccharinum).* Those that were put on cherry grew much better in all cases. Polyphemus larvae were started on northern red oak, (*Quercus rubra).* Two methods were used to contain and feed the specimens. Some caterpillars were placed in five galleon nylon mesh paint strainer bags which were then affixed to living branches on the respective host tree.

The others were kept in screened enclosures in which cuttings of the host plant were maintained in covered vases filled with water. The latter were part of an educational display in the Arboretum Visitors Center and the food plants were replenished almost daily by the Visitor Engagement staff. As the caterpillars grew and advanced into the next instar, they consumed the leaves in the mesh sleeves faster so they needed to be moved to a new branch nearly every other day. And they did indeed grow.

My granddaughter displaying an advanced instar Cecropia caterpillar as only a four year old would do!

By mid July caterpillars of all three species began to spin cocoons, although there were no other eclosures – and therefore matings – of the Promethea moths. We decided to continue the project for a second year, and the existing cocoons were put up for overwintering as was done previously.

The investigation - 2019

In early May 2019 Cecropia moths began to eclose. There had been some below zero winter nights but the cocoons of both Cecropia and Polyphemus species survived and we had numerous eclosures, including several native pairings, of both.

Top: This lovely Polyphemus female is just expanding her wings
Bottom: On June 1st, 2019 I discovered six Cecropia eclosures, including a mating pair, in the calling cage.

There were a number of Promethea eclosures in 2019 as well, including at least one possible native pairing. The uncertainty arose because the coupling occurred outside the calling cage, there had been several male eclosures, and the native origin of the male was unproven.

2020 - An additional, and disrupted, year of investigation

I had several dozen cocoons of three species of Saturniid moths which I carried over through the winter and decided to continue the project for another year, in part to see if I could confirm the presence of wild Promethea moths in Jamaica Plain. In addition Don Adams provided me with some Luna moth cocoons (*Actias luna),* but predicted that wild specimens were unlikely here because Luna cocoons fall from the host tree or are actually spun-up in the leaf cover and therefore are often swept up in fall yard cleanup. I awaited early eclosures when the Coronavirus pandemic gripped the area and the Arnold Arboretum was closed to visitors and all but essential staff. As it was not possible to operate the moth monitoring operation on the grounds, I decided to continue the investigation in my yard in Jamaica Plain. I live less than half a mile from the previous monitoring site in the Arboretum "as the moth flies" and, given that the females of these silk moths are said to attract males from at least 3 miles away, the new arrangement closely approximated the original design.

First 2020 eclosures were of the Luna species; there were several females and as predicted they were unsuccessful in calling in native males. Later in the summer Adams provided a dozen mid-stage Luna caterpillars which were raised on american sweet gum (*Liquidambar styraciflua*) branches until they spun their cocoons in late July. Several of these eclosed in August and the two females resulting were again unsuccessful in calling in a male.

I had much better success in 2020 with the Promethea cocoons. Over the summer there were five females that called in wild males, confirming the presence of this species in urban Boston. This species is unique in that males are diurnal and females nocturnal. They overlap in activity for a few hours in the early evening, allowing my wife and I, dining in the yard, to observe the males coming to the cage and frantically flying around it until they found the cage entrance and the female. Three of these encounters resulted in pairing.

The eggs from these matings were successfully raised on tulip tree *(Liriodendron tulipifera),* some in sleeves in the Arboretum and others on cuttings from Arboretum accessions in my yard.

Results

An investigation of the population of giant silk moths in urban Boston through the technique of pheromone attraction of male moths by captive females was undertaken over a three year period. The results confirmed the existence of wild Cecropia, Polyphemus and Promethea moths in the habitat. In the last season Luna females were not successful in attracting males, suggesting that the Luna moth was not present in the area if eclosure synchrony was correct.

Top: Female (left) and native male Promethea moth. Bottom: Promethea caterpillar

Acknowledgements

Don Adams had the inspiration for this investigation, provided needed equipment for the task and was a constant mentor and guide throughout the three year process. Without him the study would not have occurred; many thanks! Thanks also to the Arnold Arboretum of Harvard University's Keeper of the Living Collections Michael Dosmann and Curatorial Assistant Kathryn Richardson for accepting my Proposal to Access the Arnold Arboretum Living Collections for Scholarly Purposes (Project number 24-2018), and for reviewing a draft of this report. Manager of Visitor Engagement Kate Stonefoot and Visitor Engagement staffers Ana Eder-Mulhane, Catherine Cremin and Regina Mission were responsible for much of the care and feeding of the silk moth caterpillars as well as organizing a display of that aspect of the project, which was viewed by hundreds of visitors during the first two seasons. They also corralled and returned a number of caterpillars that eloped from their cages during the study!

Announcements:
Call for Season Summary Records

The Season Summary database is on the Lepidopterists' Society home page (http://www.flmnh.ufl.edu/lepsoc/). The value of the online database increases as your data gets added each year. Please take the time to consider your 2020 field season and report range extensions, seasonal flight shifts, and life history observations to the appropriate Zone Coordinator. They and their contact information appears on the inside back cover of the "News". The states covered by each zone are in the (most recent) Season Summary. Some Coordinators have changed, so look closely in this issue. Zones 6, 7 and 8 now have new coordinators lined up and you can send your records to them (see inside back cover). Please have your data to the Zone Coordinator(s) no later than **December 31, 2020**.

Most records are important. Reports of the same species from the same location provides a history. However, do not report repeated sightings of common species. Report migratory species, especially the direction of flight and an estimated number of individuals. Again, all of these records may be useful in the future. BE AWARE that some of these types of records will go IN THE DATABASE, but may NOT appear in the printed Season Summary.

Season Summary Spread Sheet and Spread Sheet Instructions

The Season Summary Spread Sheet and Spread Sheet Instructions are available on the Lepidopterists Society Web Site at **http://www.lepsoc.org/season_summary.php.** The Zone Coordinators use the Season Summary Spread Sheet to compile their zone reports. Please follow the instructions carefully and provide as much detail as possible. Send your completed Season Summary Spread Sheet to the Zone Coordinator for each state, province or territory where you collected or photographed the species contained in your report.

Photographs for Front and Back Covers

Please submit photos for the front or back covers of the Season Summary to the editor of the News, James K. Adams (**jadams@daltonstate.edu**). Photos can be of live or spread specimens, but **MUST** be of a species that will actually be reported in the Season Summary for this year.

Brian Scholtens and Jeff Pippens, Co-Chief Coordinators for the Season Summary. (see contact information inside back cover).

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
8) Click on appropriate choices – this will download comma separated or tab separated data, which can be compressed or not
9) Click Download Data

2020 Annual Meeting at Western Carolina University Rescheduled for 2021

The annual meeting of the Lepidopterists' Society has been rescheduled for the 2020 location, Western Carolina University, next year (2021) at the same time of year, during mid-June. Be looking for more information in the coming months. We look forward to hosting you next year.

Brian Scholtens and Jim Costa, meeting coordinators.

The Ron Leuschner Memorial Fund for Research

The 2021 cycle of the Ron Leuschner Memorial Fund for Research on the Lepidoptera is now open for applications. Each year, the Society will fund up to 3(+) grants for up to $500 each to undergraduate or graduate students depending on merit. Applicants must be members of the Lepidopterists' Society. Applications are due January 15, 2021. The application must include submission of the application form, which will be posted later this year to the Lep Soc website at www.lepsoc.org, a brief (500 word maximum) proposal, and a letter of recommendation or support from the student's academic advisor or major professor. Additional information about the research fund or a copy of the application can also be obtained by writing to Dr. Shannon Murphy (see immediately below). Submit all of the above to Shannon Murphy at **Shannon.M.Murphy@du.edu**. Snail mail applications should be sent to Shannon Murphy, Associate Prof., Boettcher West 302, Dept. of Biological Sciences, University of Denver, 2050 E. Iliff Avenue, Denver, Colorado 80208. Successful applicants will be notified by March 15, 2021. The review committee consists of members of the Lepidopterists' Society, including the previous year's successful candidates (who are thus not eligible for a new award in the subsequent year's competition). Award recipients will be expected to produce a short report for the committee at the conclusion of their year of funding, which summarizes the positive impact of the award on their research. Recipients must also acknowledge the Fund's support in any publications arising out of the funded work.

This year the Lepidopterists' Society gave three students awards from the Ron Leuschner Memorial Fund for Research on the Lepidoptera. The three awardees were: 1) Christopher Cosma, a PhD student from the University of California, Riverside for his proposal entitled "Linking plant-plant and plant-pollinator interactions along an elevational gradient", 2) Gabriela Montejo-Kovacevich, a PhD student from University of Cambridge for her proposal entitled "Evolution of toxicity in *Heliconius* butterflies recently introduced to the Cook Islands (New Zealand)" and 3) Yuecheng Zhao, an undergraduate student from Emory University for the proposal entitled "Effects of male body size on the mating behavior of monarch butterflies (*Danaus plexippus*)". Each student received $500 to support their research project.

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**

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 lay-out, 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.**

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!

Co-authors of the book Hawkmoths of Australia (left to right): Maxwell Moulds, James Tuttle and David Lane. The Book won the prestigious 2020 Royal Zoological Society of New South Wales Whitley Award (see page 167).

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 69th 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 short-term 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.

Hawkmoths of Australia wins prestigious award

The Royal Zoological Society of NSW Whitley Awards are an annual celebration of the best of Australasian zoological literature. This year, we are thrilled to announce that *Hawkmoths of Australia* has been awarded the prestigious Whitley Medal in the 2020 Royal Zoological Society of NSW Whitley Awards.

Each year, the Royal Zoological Society of New South Wales presents the Whitley Awards, recognising outstanding publications that help increase our understanding of Australasian wildlife. The awards are named in tribute to Gilbert Whitley, an eminent ichthyologist and

Hawkmoths of Australia is Volume 13 in our long-running Monographs on Australian Lepidoptera series, which profiles the systematics and biology of the vast Australian fauna of moths and butterflies. Illustrated with more than 800 colour photographs, *Hawkmoths of Australia* provides the first full treatment of Australian hawkmoths, and includes many new details on life histories and parasitoids.

Co-authors Maxwell Moulds, James Tuttle and David Lane were delighted about the win: "It is a great honour for us to have received the prestigious Whitley Medal for 2020, especially given the level of competition across the broad range of zoological topics. Hawkmoths have been a special interest to all of us throughout our lives, and the book gave the opportunity to not only document our life experiences with these iconic moths but to add new and exciting discoveries as we went. The project also offered the opportunity for each us to explore Australia, the tropical north, the deserts, and the temperate south, and make many friends along the way.

"Writing this book had its challenges and there are many people to be thanked for helping making it a success, all acknowledged in the book, but the editors are especially thanked. Winning the Whitley Medal has been the 'icing on the cake' for us, humbling, exciting, and giving a feeling of pride and accomplishment."

Instead of the usual ceremony at the Australian Museum, Sydney, the Royal Zoological Society of NSW presented the Whitley Awards in a virtual capacity this year, due to COVID-19 restrictions. You can watch a video of Maxwell, James and David's Whitley Medal acceptance speech on Youtube.

Dr Marianne Horak, editor of the *Monographs on Australian Lepidoptera* series, said of the win: "The Whitley Medal is a wonderful accolade for the three authors for their exceptional dedication that went into producing *Hawkmoths of Australia*, from lifetimes of observation, collecting, rearing and photography to painstaking descriptions of all stages and assemblage of the magnificent plates. It honours a book that will provide inspiration and information for generations of naturalists."

Corrections to the Fall 2020 Issue of the News

There were two issues with the Bill Berthet article on the butterflies of Yunnan and Sichuan Provinces, China (Vol. 62(3): 123-131). The first is my fault. As editor, I have removed questionable comments from articles previously with no issue for the author or reader, but I missed an inappropriate comment in this article. At the bottom of the first column, page 127, Bill mentions a certain "look" he got from some local gals. I don't know if the stress of the year, or just lack of attention made me miss this comment, but I should have removed it. Most of the time I try to do MINIMAL change to content to keep the author's original intent intact. I am certain Bill meant no harm, but that is no excuse. Believe me, I take this issue seriously. Thanks to Justin Mathieu Henault for bringing this to my attention. I WILL do better in the future. I would like to think that since taking over in the middle of 2011 that I have done a pretty decent job of policing content when necessary, especially since I am the only person editing the 50-page Newsletter quarterly. I am aware of perhaps one other time where I may have had unintentional blinders on and allowed something questionable to fall through the cracks. I am only human after all. But this is one I should have taken care of right away. My continued thanks go out to Bill for his multiple contributions to the Digital Collecting column.

As for the second issue, Adam Cotton noticed that the species labelled as *Graphium mandarinus* is actually *G. parus*. Adam goes on to indicate that *mandarinus* has an elongate "8" on the discal band not present in *parus*. Thanks to Adam for noticing this.

(Additional announcements continued on page 161)

Dogface hybrids

William D. Gendron

335 E. Grove Street, Pomona, CA 91767 **speydiana@aol.com**

Twenty years ago, I retired from Engineering and began to collect butterflies in Southern California. I collected in my youth and one of my favorites has always been the California Dogface, *Zerene eurydice*. This butterfly is the State Insect of California since 1972. I'll use "CalDF" to abbreviate it. In 2001, I began to raise CalDF at home, using a six foot square by six foot tall cage, purchased from BioQuip Products and outfitted with six, potted *Amorpha fruticosa* as hostplants. My resident nectar source is potted Lantana. This set-up has worked well now for 20 years; however, none of those plants are still potted now.

Each year, I need only add gravid females to my cage to start the annual rearing project. In good years, the yield has been 200 - 300 adults, sometimes in three generations. The CalDF butterfly over-winters as adult; hence, a trip to the forest, usually in May, is required every year. My goal: catch two females.

In 2019, I had some bad luck. It was a strange year for butterflies in California, owing to late rains and an unusually cold winter. Most species were late to fly by nearly one month. It was not until the last week in May that I had success finding CalDF females. However, something wonderful happened along the way.

On May 13, my colleague, Clark Thompson, and I visited a small and little known colony of CalDF, occurring on forested land near the intersection of Interstate 15 and Calif. State Hiway 138, an area in the Cajon Pass, where high-desert and montane habitats meet. Our first trip there, a week before, was not successful. On that second trip, my luck turned. I collected four individuals, of what I thought must be Southern Dogface, *Zerene cesonia*, flying in sympatry with CalDF. Two of them were clearly female. Talking to myself, I thought "STOP, don't pinch that butterfly." Could I possibly raise the Southern Dogface, which I will abbreviate as "SoDF," in my cage using my CalDF host-plant?

It was worth a try. After a 45 minute drive home, I delivered two, somewhat worn, but healthy looking female SoDF. I also collected CalDF females that day, but they were over-wintered and produced no ova. To my great delight, the SoDF were full of ova, which were deposited over the next 4 weeks. After that day, it took another two and one-half weeks before I would finally collect a gravid CalDF female, which by then were on the wing. I soon had larvae of both species growing in my cage.

Of course, I had hoped, from the very first, that I might be able to cross the species to create hybrids. I knew it was possible. It is common lore in California that these species mix at the extremes of their respective ranges. Field guide authors have written about the fact for almost 100 years. My friend, Dr. Brian Counterman, then at Mississippi State University, had produced over 70 F1 larvae in 2018, only to lose them and all of his breeding stock in an accidental contamination event at his Lab. So, I still didn't know what their hybrids look like, but had my suspicions.

Going back to those field guides, not much has ever been published by any author because not much is known, with certainty, about Dogface hybrids. There are no images to be found via Google.com, and no scholarly papers to document the results of rearing experiments. John Adams Comstock said the most in his 1927 text, Butterflies of California. Speaking of the need to better understand the origin of "highly variable" specimens, found rarely, in Southern California, mainly, the San Bernardino Mountains, Comstock wrote "Here is a problem on which some of our younger entomologists may profitably work." I am 75 years of age, but, clearly, I was too young to answer the call.

Comstock's intuition was correct; however, true F1 hybrids, are rare in Nature and F1 specimens had never been brought to his attention. He was correct in his hypothesis that form "bernardino" males and form "amorphae" females result from hybridization. But, without F1 hybrid specimens in hand, he could only speculate about their origins. It turns out that once the genes are commingled, their F1 hybrid phenotypes are passed-on to subsequent generations. When hybrids mate with their parent species, the back-crossed generations carry the dominant characteristics and field-marks forward in time. After many generations, the hybrid characteristics become diluted, making identification of specimens questionable.

Included here is a photo of the four generations raised, from May through October, 2019. These include F0 broods of CalDF and SoDF and their F1 hydrids, F2 and F3 back-crossed generations. The digital photo is large and may be viewed at higher magnification on the Lep Soc website. The image can be viewed at: **https://www.lepsoc.org/journal/dogface_hybrids.jpg**. See the image caption for the details of the hybrid specimen information.

The broods were large, with the exception of the last, with more than 300 specimens in total. I have four Cornell drawers nearly full. After rearing two generations from May to late July, my host-plants were stripped bare and could not support all of the F1 brood. In desperation, I reached out to my former employer for a favor, namely, use of the Butterfly Pavilion at Rancho Santa Ana Botanic

The arrangement is as follows: Columns 1 and 2: F0, CalDF and F0 SoDF males and females, 5 of each sex. Columns 3 and 4: F1 hybrids - male CalDF crossed with female SoDF, 10 of each sex. Columns 5 and 6: F2 hybrids – a mixture of true F2 and male CalDF crossed with female F1, 10 of each sex. Columns 7 and 8: F3 hybrids - male F2 crossed with female CalDF, 10 of each sex. Image by Clark Thompson.

Garden (RSABG) in Claremont, now known as CalBG, only 3 miles from my home. I could not have completed the F1 generation or produced the F2 and F3 generations at all without that resource. A very large *A. fruticosa* there could have sustained 500 larvae.

In conclusion, I believe this work confirms that Dogface species do hybridize in Nature. I have wild-caught specimens, of both sexes, from multiple locations that exhibit the same phenotypes shown here. This is my first experience with hybridization. It took a lot of discipline and hard work. The experience was exciting because I was not sure if the animals would be viable and what they may look like. Given enough host plant, many more crosses could be accomplished, each with additional variations in color and markings. The world of "Designer Dogface" was opened and laid at my door-step. Unfortunately, I was out of time, out of host-plant and out of energy to do more. I am privileged to have had the opportunity.

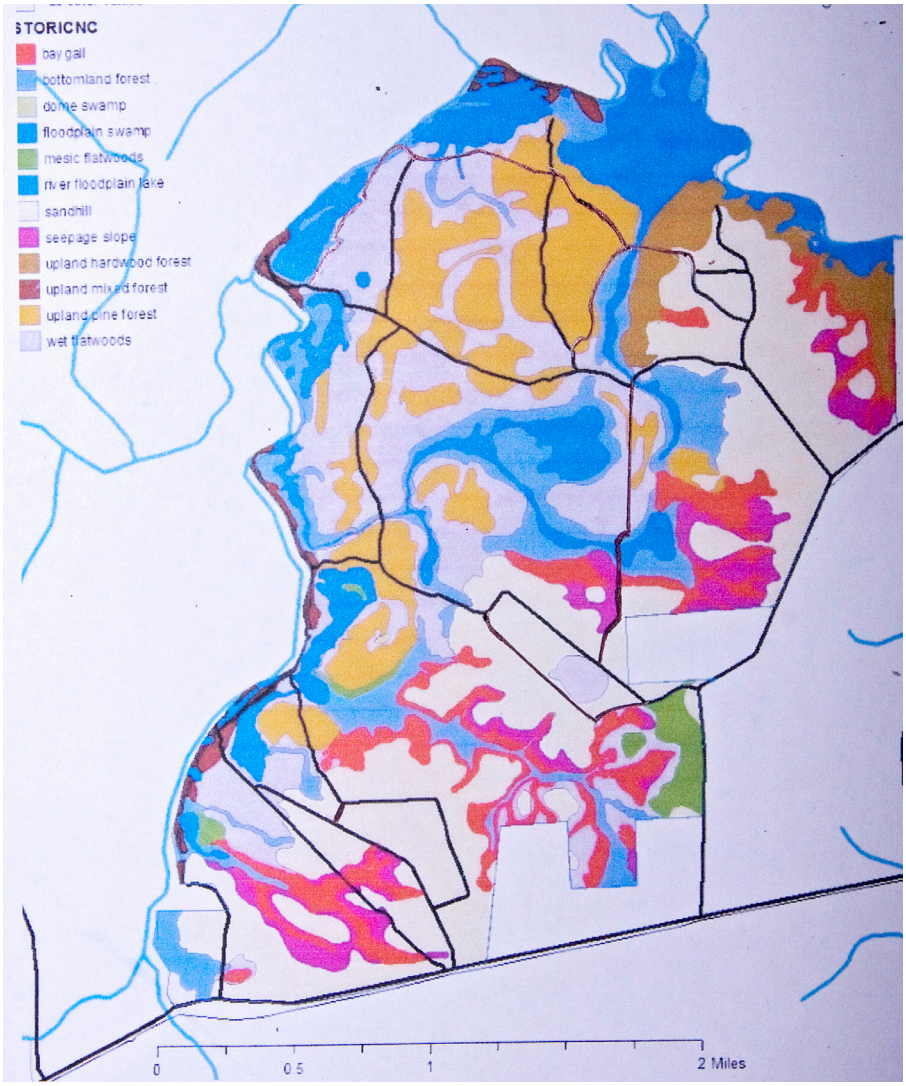
I wish to thank the following for their help and assistance: Clark Thompson, whom I accompanied to the Cajon Pass and for his expertly produced photograph; Brian Counterman for his inspiration and support to during the journey and, David Bryant, Director of Visitor Services at CalBG, for use of the Butterfly Pavilion as a rearing-cage. Thank you, one and all!

Digital Collecting:

Butterflies of Ralph E. Simmons Memorial State Forest, Florida

Bill Berthet

12885 Julington Road, Jacksonville, FL 32258 **bergems@comcast.net**



Ralph E. Simmons Memorial State Forest map, with natural communities indicated. Trails are indicated in black.

Ralph E. Simmons Memorial State Forest in Nassau Co., Florida is only 3,638 acres in size, supporting twelve types of natural communities. These include sand hill, upland forest, wet flat woods, seepage slopes, upland pine forest, a flooded river lake, baygall, and dome swamp. This state forest contains five intermittent drains that flow into the St. Mary's river with around 10 miles of established trails and is part of the Great Florida Birding Trail, with over 125 species of birds documented for the area.

The northern part of the forest borders SE Georgia, and a 6-7 mile section of the 125 mile long St. Mary's River that flows into the Atlantic Ocean in the extreme northeastern corner of Florida, around 36 air miles northwest of downtown Jacksonville.

Just E of RSMSF during Florida's British Period (1763-1783) the small trading hamlet of Mills Ferry was established here on the St. Mary's River. Mills Ferry was first chronicled in the early 1770s by William Bartram. He noted that the Seagrove & Co. trading post existed here where the British King's Road crossed the river connecting Charleston, South Carolina to St. Augustine, Florida. Towering longleaf yellow pines where cut along this section of the St. Mary's River to mast the tall ships of the British Navy.

In 2007, I started working as a volunteer with FNAI (Florida Natural Areas Inventory), FFS (Florida Forestry Service) and others, surveying for critically imperiled, imperiled, and other FNAI tracked butterflies in N.E. Florida. In my "home forest", I have observed and documented 96 species of butterflies, adding an additional 6 more species observed by others, totaling 102 species of butterflies in this "Butterfly Bonanza" forest.

Lethe creola, a new butterfly species for Florida was recently discovered, and presently the only habitat in Florida that supports it is several bottomland forests in Ralph E. Simmons Memorial State Forest. For more information on this butterfly go to: **lepscience.files.wordpress.com/2013/10/l-creola-in-fl.pdf**

Other "goodies" found here include: *Celastrina ladon, Megathymus cofaqui, Erynnis baptisiae, Cupido comyntas, Libytheana carinenta*, *Nymphalis antiopa*, *Poanes yehl* and *Euphyes berryi,* along with a reliable spring and fall brood of *Amblyscirtes alternata & A. aesculapius.*

1) St. Mary's River Habitat at Ralph E. Simmons Memorial State Forest; 2) *Lethe creola*; 3) *Megathymus cofaqui* sequence, with eggs and open tent; 4) *Cupido comyntas*; 5) *Libytheana carinenta*; 6) *Poanes yehl*; 7) *Euphyes berryi*; 8 & 9) *Amblyscirtes alternata*; 10) *Amblyscirtes aesculapius*.

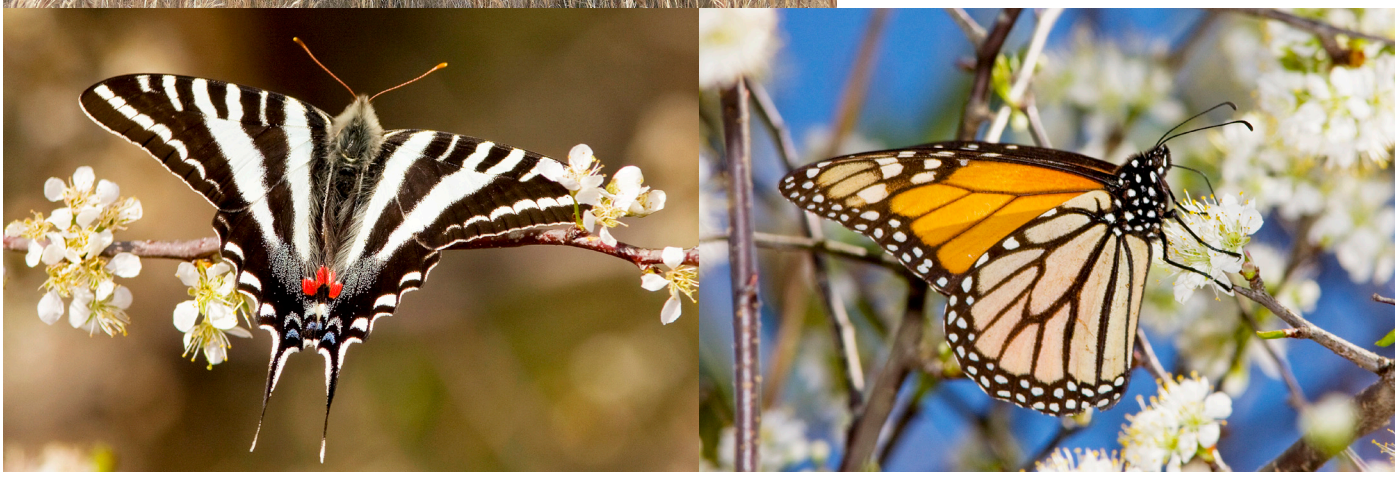
This area is also home to many Gopher Tortoise burrows and Southeastern Pocket Gopher mounds. In 2011, FNAI conducted a survey for gopher tortoises across the property. This survey evaluated approximately 820 acres of suitable habitat. It divided the habitat into three different types: sandhill, pine plantation, and ruderal. The study found multiple size classes of burrows, suggesting multiple age classes present within the forest and evidence of recent reproduction. The study concluded with an estimate of 1,360 active and 607 inactive burrows.

I always look forward each year to the start of the butterfly season in this part of Florida, beginning with the 2 to 3 week period in the month of February for the nectaring opportunities and the showy display of Chickasaw Plum (*Prunus angustifulia)* blossoms. In Chinese culture the five petals of plum blossoms symbolize the "five Blessings" referring to longevity, wealth, health and composure, virtue, and the desire to die a natural death in old age. There is a grove of 21 trees of the plum in this area. The "champion thicket" measures around 38' high, 50' in width, 45' in depth and has 42 trunks! In 2020 only 7 trees were in bloom. Over the years, I have observed 23 species of butterflies in this grove.

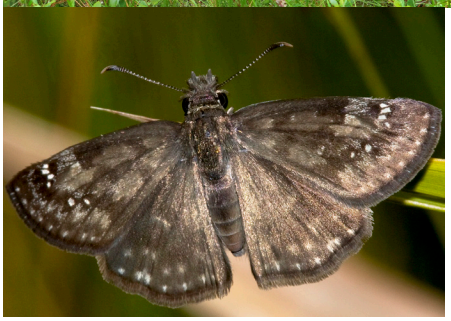
Callophrys (*Incisalia*) *irus arsace.* Upper left: Sundial Lupine with eggs; upper right: larvae with an attendant ant; lower left: pupa; lower right: adult.

We always marvel at the audible hum and buzzing created by European Honey, Carpenter, Mason, and Bumble Bees nectaring, along with the many song birds hidden and camouflaged in the thicket. It's always an entertaining sight watching 3-5 *Eurtyides marcellus* flying together, daisy chaining in various acrobatic formations, then splitting off like a Blue Angels maneuver, or getting a glimpse of a nectaring *Danaus plexippus*, that survived "The Winter" in N.E. Florida.

At Simmons, the bright yellow flowered blooming vine Carolina Jessamine, *Gelsemium sempervirens*, can be observed along fence lines, with large stands coiled in Turkey oaks and other trees and bushes that become nectar magnets to pollinating insects. In March and April I can be found roaming the 55 acre block of upland pine and sandhill habitats looking for ova, larvae, and adults of the FNAI ranked S1 *Callophrys irus arsace* near its palmate shaped leaf host plant Sundial Lupine (*Lupinus perennis*). Nectar sources for this rare butterfly



Top: Chickasaw Plum (Prunus angustifolia). Bottom: *Eurytides marcellus*; *Danaus plexippus*.



Above: Gopherweed, *Baptisia lanceolata,* host plant for *Erynnis baptisiae*; left: adult *Erynnis baptisiae.*

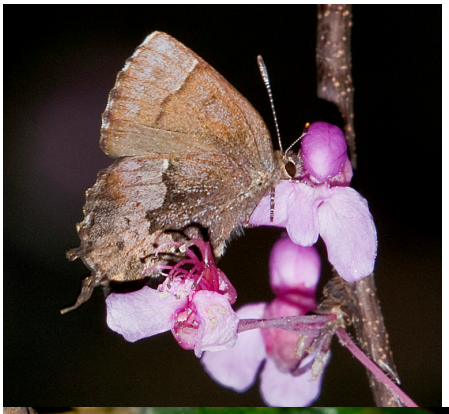
include Sundial Lupine, Shiny Blueberry (*Vaccinium myrsinites*), Dwarf Huckleberry (*Gaylussacia dumosa*), and Hawthorn (*Crataegus* sp.). The last instar larvae are sometimes attended by ants, and are capable of pupating over 1 inch underground.

Another target species in the area is the small, timid, dark, fast flying FNAI S2 *Amblyscirtes alternata* (pg. 187). Talk about frustrating---while you are crawling around trying to get close enough to obtain a good photograph of these little guys, they are saying "see yah later" as they disappear off into the pine forest. The larvae feed on Bearded Skeletongrass (*Gymnopogon ambiguous*).

This area has a large stand of Gopherweed, *Baptisia lanceolata,* which is the host plant for *Erynnis baptisiae*. This plant also attracts many butterflies and other N. E. Florida pollinators to nectar on the bright yellow flowers.

Eastern Redbud (*Cercis canadensis*), Wild Cherry (*Prunus serotina*), and Carolina Willow (*Salix caroliniana*), are also a very important early nectar sources for butterflies, bees, and other N.E. Florida pollinators. During these months (including February) I also visit the slope forest, which has cane breaks of *Arundinaria gigantea* bordering the St. Mary's River near the camping shelter. This Upland hardwood closed-canopy forest, is dominated by deciduous hardwood trees on mesic soils with an understory of Highbush Blueberry (*Vaccinium corymbosum*), overshadowed by Dahoon (*Ilex cassine*) and American Holly (*Ilex opaca*), host trees for *Callophrys henrici margaretae*, that like to nectar on Horse Sugar and (*Gelsemium sempervirens*).

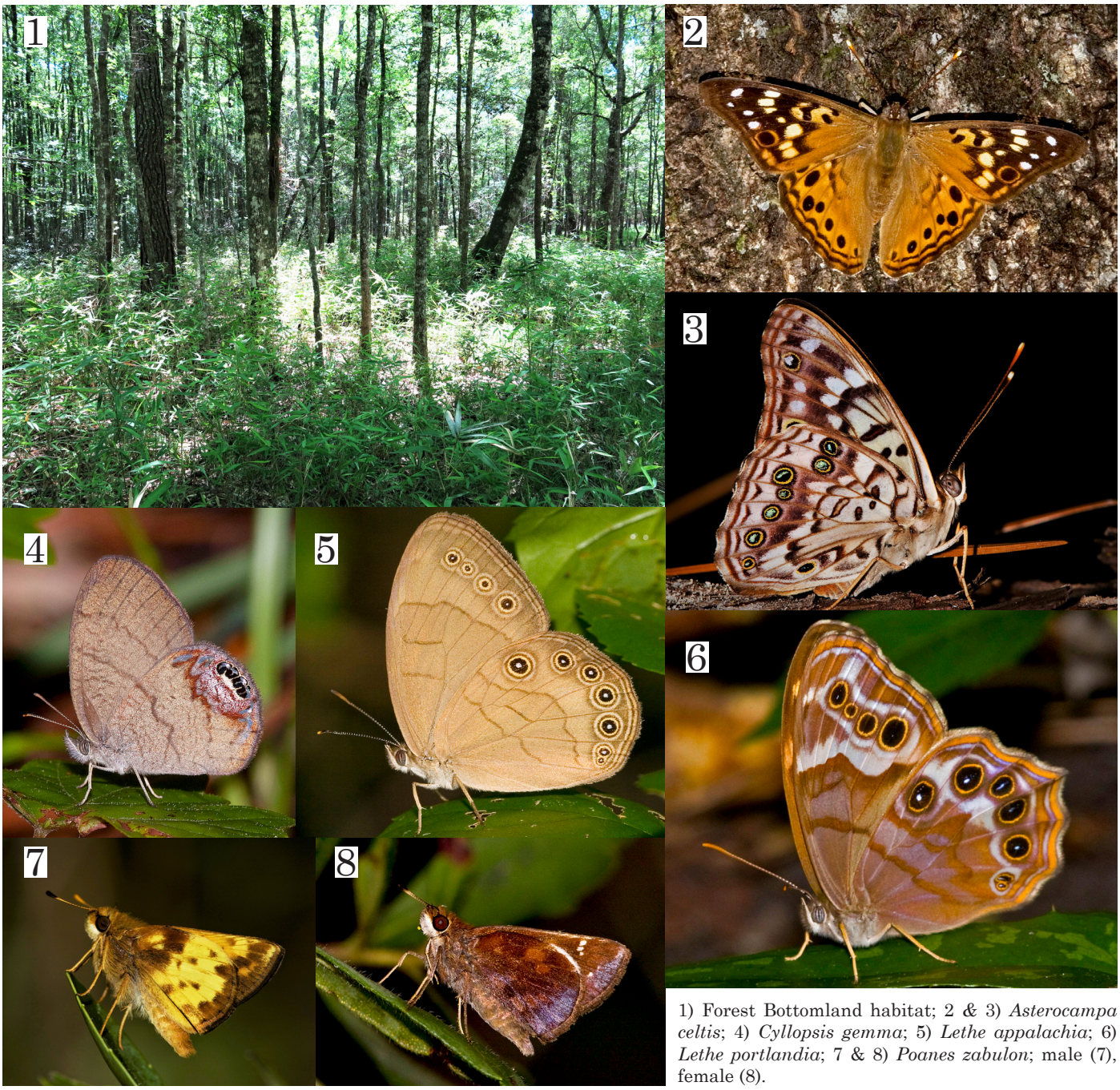
On February 5, 2012 near the cabin shelter, all the stars were aligned that day as I watched 2 *Nymphalis antiopa*



Top: *Callophrys henrici margaretae,* nectaring on Red Bud (*Cercis canadensis*). Middle: Question Mark (*Polygonia interrogationis*). Bottom: *Celastrina neglecta.*

glide down in a zigzag pattern from the canopy of the forest, landing on fresh horse dung. After several stealth like approaches I could not get close enough for a decent picture. I put my Tilley hat on the ground and hid behind some bushes. They would tease me, fluttering around the hat but would not land. Being very patient, I hid behind a tree until one of them landed close enough for a decent shot, then popping out from behind the tree I was finally able to take the "record" shot. I've had numerous more visits for the past 8 years, but no more have been seen.

Exciting observations in March can include *Polygonia interrogationis*, *Celestrina neglecta*, *Cupido comyntas*, and in later months *Libytheana carinenta*.



1) Forest Bottomland habitat; 2 & 3) *Asterocampa celtis*; 4) *Cyllopsis gemma*; 5) *Lethe appalachia*; 6) *Lethe portlandia*; 7 & 8) *Poanes zabulon*; male (7), female (8).

Wearing Tingley rubber boots, thick pants, long sleeve shirt, Tilley wide brim hat, gloves, insect spray, and glasses I can be found skulking around the wet areas of the bottomland forest in April and May, surveying for *Asterocampa celtis* and *A. clyton*, *Lethe creola*, *L. portlandia*, *L. appalachia*, *Cyllopsis gemma*, *Amblyscirtes aesculapius*, *Poanes zabulon* and others. I look for Switchcane, *Arundinaria gigantea*, host plant for the Pearly-eyes and others, and Narrowfruit Horned Beaksedge, *Rhynchospora inundata,* host sedge for *Lethe appalachia*.

This habitat can be hazardous. You have to be aware of Cypress knees, uneven wet terrain, spiny plants and vines, mosquitos, spiders, venomous snakes, humid conditions constantly fogging up your glasses, and ticks. Each trip, after arriving back at the car I shed all my clothes, put them in a plastic bag, and put on a new set of clothes. I always check for ticks and take a shower when I get home.

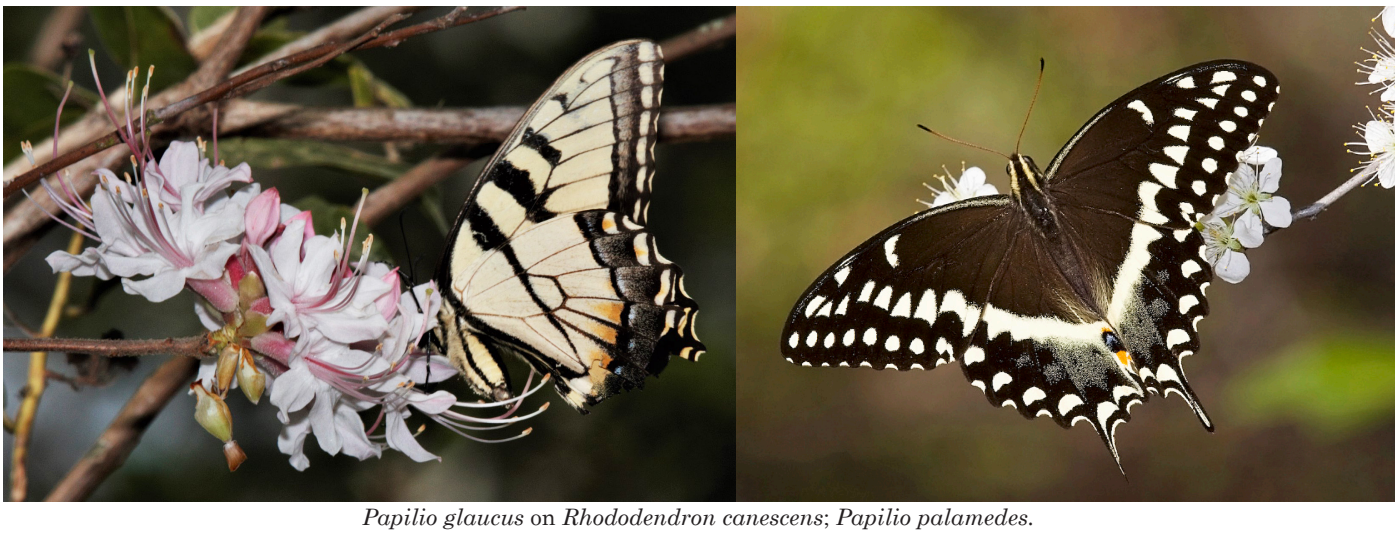
Bottomland forest is a deciduous or mixed deciduous/evergreen, closed-canopy forest on terraces and levees within riverine floodplains and in shallow depressions that may be inundated with water for a portion of the year. The diverse over story is dominated by Red Maple, Sweetgum, Sweetbay, Swamp Tupelo, Yellow Poplar (*Liriodendron tulipifera*) and Loblolly Bay. Other trees which may be found

Top Row: *Satyrium liparops*; Saw Palmetto (*Serenoa repens*) plant in the understory; *Atlides halesus*. Bottom row: *Parrhasius m-album; Satyrium favonius; Calycopis cecrops.*

in this system include Red Cedar (*Juniperus virginiana*), Live Oak (*Quercus virginiana*), Bald Cypress (*Taxodium distichum*) and Cabbage Palm (*Sabal palmetto*). The mid-story consists of scattered trees and shrubs, such as Swamp Cyrilla or Titi (*Cyrilla racemiflora*), Swamp Doghobble (*Leucothoe racemosa*), Dahoon Holly (*Ilex cassine*), Gallberry (*Ilex glabra*), and Fetterbush (*Lyonia lucida*). The ground cover includes ferns, and various grass and sedge species. The outside edges of this community are surrounded by herbaceous grasses.

May is Hairstreak month. I always look for Sparkleberry, Deerberry, Swamp Cyrilla or TiTi, Blackroot, Button Snakeroot or Ratttlesnake Master (the Timucuan Indians used the roots for neuralgia and the leaves for dysentery; chewing the leaves increases saliva flow) Saw Palmetto blooms, Red Cedar, and others. I have been rewarded with *Atlides halesus*, *Satyrium favonius* and *S. liparops*, *Calycopis cecrops*, *Parrhasius m-album*, and *Strymon melinus*. On May 25, 2008, I came across two Saw Palmetto (*Serenoa repens)* plants with over a dozen butterflies fluttering around the numerous white blooms. I grabbed the camera, and within 20 minutes I counted 7 *Satyrium favonius*, 5 *Parrhasius m-album*, and 1 *Satyrium liparops*. Another spectacular event from Mother Nature!

Along the edges of the floodplain swamps and seasonal creeks, the very showy blooms of Flame and Pinxter Azaleas, *Rhododendron austrinum and R.canescens* are seemingly waiting for *Paplio glaucus, P. palamedes, P. troilus* and other pollinators to nectar.



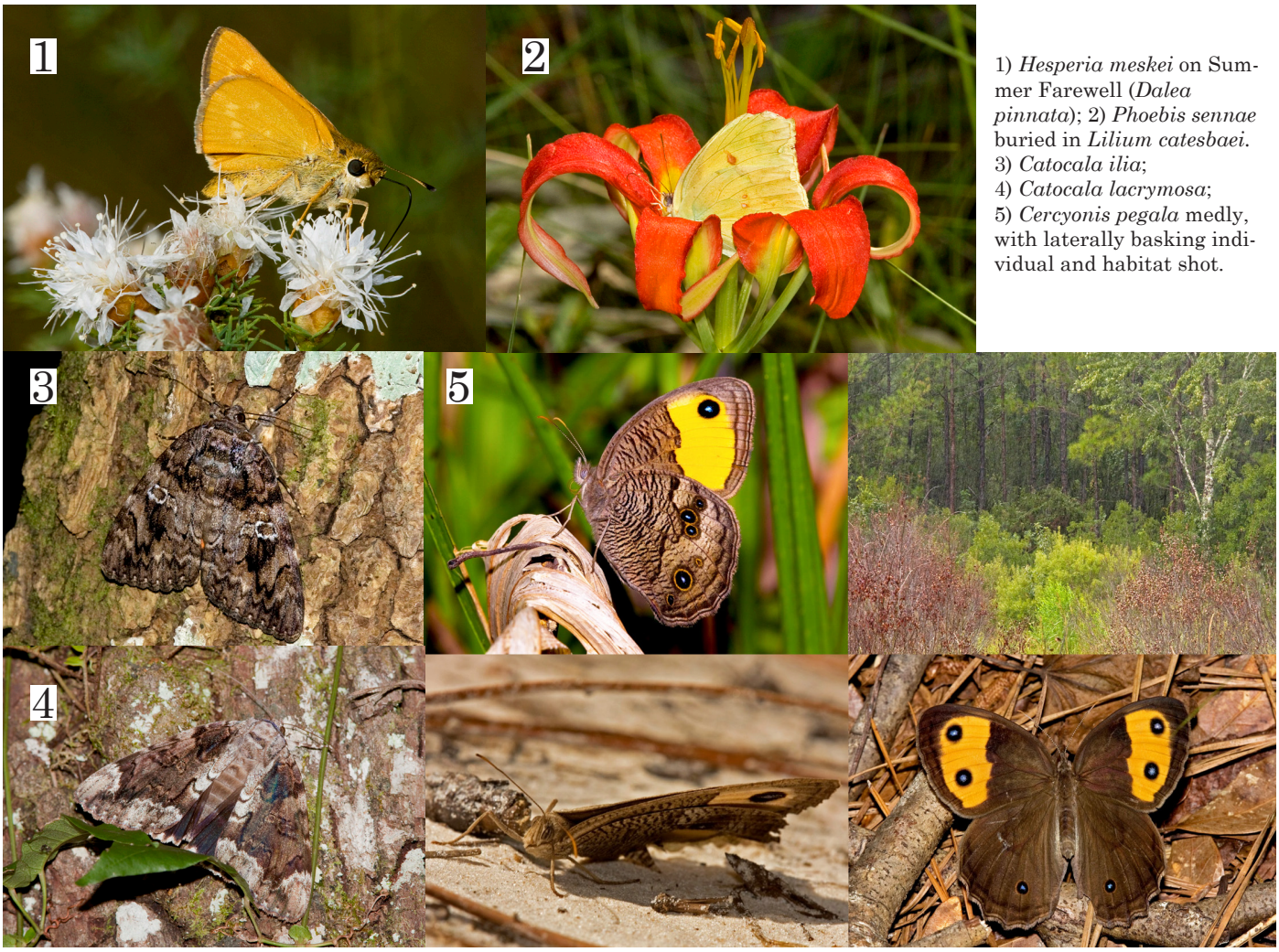
Papilio glaucus on *Rhododendron canescens*; *Papilio palamedes.*

For nectaring skippers we hunt for Kidneyleaf Rosinweed (*Silphium compositum*) hoping for a first brood *Hesperia meskei*. In the Pine Flatwoods area we look for the purple blooms of Buckroot (P*ediomelum canescens*), another premium nectar plant available at this time. Every now and then I observe Underwing Moths camouflaged on the tree bark, sometimes being a challenge to photograph, they do not like camera flash.

June and early July visits are often to the Florida Power and Light Company's 300-foot-wide power line right-of-way traversing the Southwest corner of the forest bordered by the St. Mary's River. We look for a colony of freshly emerged *Cercyonis pegala* evasively hiding in the tall grass. When "kicked up," they usually take a bouncy and erratic flight and dive into thick cover, or fall "lifeless" to the ground around Wax Myrtle, Southern Bayberry (*Myrica cerifera*) bushes. The males emerge up to a week before the females, then die quickly after mating. Females then lay their eggs on Broomsedge Bluestem (*Andropogon virginicus*). In late summer when the caterpillars emerge they go into diapause, to complete their development the next spring. In the middle of September, next to one of the power line towers, *Euphyes berryi* can be observed nectaring on Blazing star (*Liatris* sp.; see number 7, pg. 187) Presently this is the only known spot in Simmons to see this skipper.

This seepage slope habitat is an open, grass-sedge dominated community kept continuously moist by groundwater seepage. It occurs in areas with rolling topography, and is usually bordered by well-drained sand hill or upland pine communities. Seepage slopes are always moist, except during extreme drought, but never flooded. They consist of a diverse and unique herbaceous layer. On the drier slopes, wiregrass is the dominant component. In wetter areas, the herbaceous layer is dominated by several species of beaksedge, switchcane, whitehead bogbutton, sphagnum moss, and netted chain fern.

Also found in this community at RSMSF are Parrot and Hooded pitcher plants (*Sarracenia psittacina* and *S. minor*), Blue-flowered Butterwort (*Pinguicula caerulea*), Pink Sundew (*Drosera capillaris*) and Catesby's (pine) Lily (*Lilium catesbaei*), where you may find *Phoebus sennae*, *Papilio palamedes*, or P. *troilus* burrowed in the throat of this beautiful flower. Endangered FNAI S1 plants Silver Buckthorn (*Sideroxylon alachuense*), Florida Merrybells



1) *Hesperia meskei* on Summer Farewell (*Dalea pinnata*); 2) *Phoebis sennae* buried in *Lilium catesbaei*. 3) *Catocala ilia*; 4) *Catocala lacrymosa*; 5) *Cercyonis pegala* medly, with laterally basking individual and habitat shot.

(*Uvularia floridana*), and Purple Honeycomb-head (*Hartwrightia floridana*) are also found growing in RSMSF along with the occasional observations of Dusky Pygmy Rattlesnakes.

On August 30, 2016 around 11:30 Patrick Leary made a surprising observation, the six continent butterfly a female *Hypolimnas misippus* appeared. Pat was able to take several pictures before the butterfly disappeared into the forest. Widely distributed in the tropics, native to Africa, Asia and Australia, and introduced to the Caribbean islands and northern South America, and occasionally dispersing to the southern USA (Hoskins, 2012). The neotropical range may have been due to transport in slave trading ships (Butterflies and Moths of North America, 2016).

If weather conditions are right you could find *Papilios troilus*, *P. palamedes*, *P. glaucus*, *Eurtyides marcellus*, or *Limenitis arthemis astyanax* imbibing minerals on wet areas along forest roads.

September and Early October can be oozing with butterfly diversity and numbers. A frequent stop I call the "Diodia" trail. This time of year Poor Joe (*Diodia teres*) is in bloom, attracting numerous butterflies (particularly skippers). In one very small area, during the years 2008 to 2015, between the times of 11:00 – 12:15 and the dates of 8-26 to 9-15 I have observed between 1-8 *Amblyscirtes alternata* nectaring on flowers of this plant. This reclusive "Swamp Fox" skipper, flies close to the ground, very briefly stopping to nectar. Further down the trail there is a yearly reliable spot to observe *Amblyscirtes aesculapius* also nectaring on *Diodia* and Fuzzy Bean (*Strophostyles helvola*).

On September 12, 2010 while leading a Florida Native Plant Society Ixia Chapter field trip, a large heavy bodied butterfly zipped by, landing on a Long Leaf Pine tree about 20 feet away. My heart started pounding and adrenaline level was sky high as I quickly approached, camera in hand, firing off 5 shots at a fresh female *Megathymus cofaqui* (see image 3, pg. 187) before she took off in a straight line disappearing into the forest. I have since observed one more adult in this area and routinely find their eggs on Adam's Needle (*Yucca filamentosa*).

Entering the second entrance on Penny Haddock Road I often work both sides of the forest road. During September and October this pine flatwoods area has the greatest diversification and numbers of butterflies in RSMSF, with skippers having the starring role. When conditions are right, the mixture of flowering plants is astounding: *Lachnanthes*, *Carphephorus*, *Liatris*, *Diodia*, *Dalea*, *Vernonia*, *Solidago*, *Elephantopus*, *Pontedaria*, *Verbena*, *Bidens* and others, attract a glorious amount of nectaring butterflies and other N.E. Florida pollinators.

One day I remember well, October 05, 2012, I observed 24 *Hesperia meskei*. 8 were nectaring on Summer Farewell (*Dalea pinnata*) in one small area (see image, previous page). This gave me the opportunity to photograph open and closed-winged males and females, and one being a victim to a green Lynx Spider. Other skippers in this habitat include *Euphyes dion*, *Euphyes arpa*, *Hesperia attalus slossonae*, *Poanes yehl*, *Calpodes ethlius*, *Problema byssus*, *Polites origenes*, and many others (see back page).

Top: *Hypolimnas missippus* (image by Patrick Leary). Middle: *Papilio troilus* (wings open), *P. palamedes,* and *P. glaucus* getting minerals from the moist ground. Bottom: *Limenitis arthemis astyanax,* imbibing fluids from the body of an Eastern Lubber Grasshopper (*Romalea mictoptera*).

At Scott's Landing Road, both sides of the road can be bordered by blooms of *Bidens alba*, Fogfruit (*Phyla nodiflora*) and Brazilian Verbena (*Verbena brasiliensis*), and this is another bonanza of butterfly activity area.

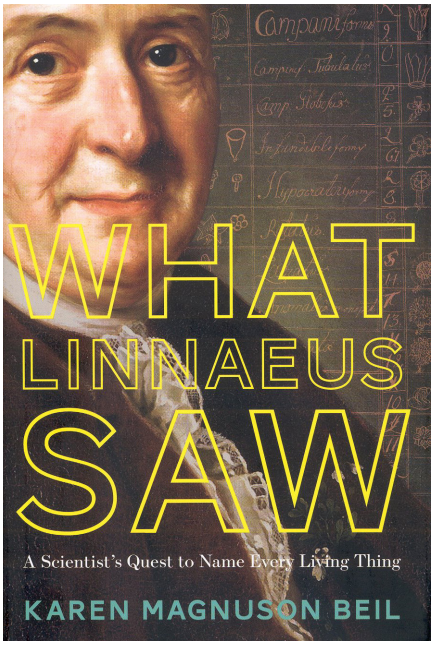
The only known plant disease outbreak on RSMSF at this time is Laurel Wilt (formerly known as Redbay Wilt). The disease is caused by a fungus (*Raffaelea lauricola*) that is introduced into host trees by a non-native insect, the Redbay ambrosia beetle (*Xyleborus glabratus*). This disease primarily attacks Redbay (*Persea borbonia*). Other trees in the *Laurel* family (*Lauraceae*) are also susceptible, including Sassafras (*Sassafras albidum*), Pondspice (*Litsea aestivalis*), and Avocado (*Persea americana*). Numerous red bays on RSMSF exhibit the symptoms of Laurel Wilt. At this time, there are no applicable control methods for the forest setting. *Persea borbonia* is the host tree for *Papilio palamedes*, and, because of that the Laurel Wilt is causing reduced populations of this butterfly.

Over the years of searching for and photographing butterflies in the field around the world, I use the mantras "Today's the Day" and "Hope Springs Eternal" for keeping my motor running strong. I hope you will decide "Today's the Day" and visit some of the wonderful natural areas available to you. You never know what you'll see flying by!

Book Review

WHAT LINNAEUS SAW: a Scientist's Quest to Name Every Living Thing by K. M. Beil

2019. New York: W. W. Norton. 256pp. $21.95.



There are innumerable books about Carl Linnaeus (1707-1778), the famous Swedish naturalist and originator of the binomial system of naming plants and animals, yet this new biographical history by Ms. Beil stands out as one of the most detailed and comprehensive of the lot. Although designed for high school level readers, the book is very readable and informative for all readers. The book includes a useful Linnaean time-line, a bibliography to relevant works on Linnaeus, and an index.

The author retraces the entire life of Linnaeus, even beginning with his early school days in Stenbrohult and Växjö, Sweden – where he already became transfixed with the wonders of nature – to his time at Uppsala University (1727-35), where he studied the sciences and medicine, and later became a professor himself. Linnaeus traveled to Germany and Holland during1735-38, then returned to Sweden to practice medicine, but by 1741 he was appointed a professor at Uppsala University, where he remained until his retirement in 1772. His famous work, *Systema Naturae* (10th ed. 1758), is known to all biologists as the beginning point of valid scientific names in zoology (the botanists use an earlier work from 1753, *Species Plantarum*).

Linnaeus was more a botanist than a zoologist, but we lepidopterists know him most for his naming and organization of the insects, especially the Lepidoptera. We have the well-known *Papilio glaucus* Linnaeus, 1758, besides his generic name *Papilio* Linnaeus, 1758, as well as *Danaus plexippus* (Linnaeus, 1758), and many others. The monarch he named but in his day he included all butterflies in the single genus *Papilio*, so all other butterfly genera were named by others after him. He included almost all micro-moths in the single genus *Tinea*, and likewise only had *Bombyx*, *Geometra* and *Noctua*, for the larger moths. While Linnaeus had about 450 species of Lepidoptera he knew of in 1758, we now have about 165,000 species. I imagine Linnaeus would be astonished to know this number of species exist just among Lepidoptera, not to mention the million or so beetles we know of now, but perhaps not. He was no doubt keenly aware of the potential biodiversity in the world, just by the tidbits he was sent by various people from their travels, especially from the tropics.

Ms. Beil treats her subject very thoroughly, and besides the informative text there are numerous illustrations from Linnaeus' notebooks, his specimens, his surroundings, his travels, and his works. She notes how he interacted with his colleagues, his students, the people he met during his travels, his family, and his cherished students of which many later became renowned as well for their works on classification in zoology and botany.

The book's title well expresses Linnaeus' program to name everything in Europe. Only later when so much came to his attention from America, and the East Indies, and China and India, did the job of naming perhaps overwhelm him a little, although for that he trained his many university students, some of whom also became professors, while others went out into the world to explore and send back specimens.

Anyone wanting to learn more about Linnaeus cannot get a better overview of the subject of this master than by reading this new book by Ms. Beil.

J. B. Heppner, McGuire Center for Lepidoptera & Biodiversity, Florida Museum of Natural History, Univ. of Florida, Gainesville, FL 32611, **jheppner@flmnh.ufl.edu**

Membership Updates

Chris Grinter

Includes ALL CHANGES received by November 12, 2020. 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)*

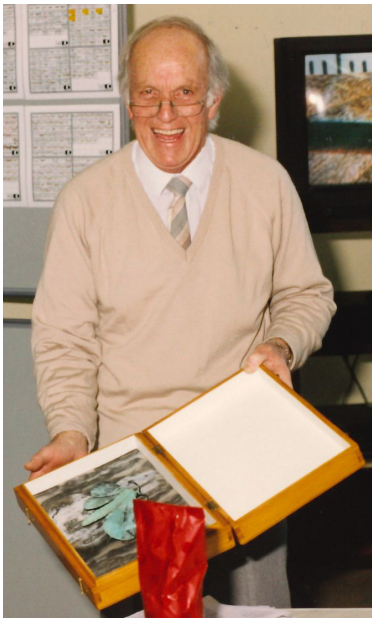
Timothy J. Bates: 5847 Deming Ave, The Villages, FL 32163 (tjbates25@yahoo.com)
Jared Burns: 945 West Circle Dr., Rossville, GA 30741 (jburns9@daltonstate.edu)
Beth Carlson: 1409 Nettle Ln, Haslet, TX 76052 (karen.carlson@carlsonengineeringinc.com)
Shannon Marlow du Plessis: 301 Shade Rd., Wimberley, TX 78676 (shannon.duplessis@gmail.com)
Shelby Fulton: [red. by req.] (shelby.fulton@ky.gov)
José Guerrero: IGUA 4225, Facultad De Ciencias, Universidad De La Republica,11400 Capital Federal, Montevideo, URUGRAY (tesoreri@fcien.edu.uy)
Benjamin Goeble-Thomas: 3805 Cleveland Ave., St. Louis, MO 63110 (littlebenstem@gmail.com)
Mike Gollop: 51 Welker Crescent, Saskatoon, SK S7H 3M3 CANADA (mike.gollop@shaw.ca)
Peter Heles: 628 Westover Dr, Richardson, TX 75080 (peterheles@att.net)
Hillary Jackson: [red. by req.] (hillarygjackson@hotmail.com)
Guo-Fang Jiang: 398 Donghai Ave, Quanzhou, Fujian, 362000 CHINA (370718493@qq.com)
Neeley Keeton: 709 W 6th St., Chickamauga, GA (nkeeton@daltonstate.edu)
Min Jae Kim: [red. by req.] (mkim197@jhu.edu)
Emelia Obodum Kusi: 2032 Threadneedle St., North Chesterfield, VA 23284 (kusie2@vcu.edu)
Annika Lindqvist: 11331 Lanewood Cir, Dallas, TX 75218 (annika_lindqvist@yahoo.com)
Arthur Martella: 23 Schofield Rd, Phoenixville, PA (Artmartella@msn.com)
Bloo Mitchell: 1204 Antioch Drive, Dalton, GA 30721 (bmitchell6@daltonstate.edu)
Christina Brooke Nimmo: 3061 Sedgwick Cir., Loveland, CO 80538 (clapp_33@msn.com)
Darren Otts: 1309 Phillips Drive, Dalton, GA 30720 (dotts@daltonstate.edu)
Vivian A. Peralta Santana: 384 New St., Newark, NJ 07103 (vp383@scarletmail.rutgers.edu)
Donta Tracy: [address redacted by request] (donatracy@hotmail.com)
Rebecca Weiss: [red. by req.] (beccaeweiss@gmail.com)
Peter Woods: 400 Richland Ln., Pittsburgh, PA 15208 (trametes@gmail.com)

Address Changes: *All U.S.A. unless otherwise noted.*

Kyhl Austin: 2620 Nahaku Pl Apt A, Honolulu, HI 96826 (kyhl.austin@gmail.com)
Jade Aster Badon: Biology Department, Silliman University, Hibbard Avenue, Dumaguete City, Negros Oriental 6200 PHILIPPINES (jaabadon@gmail.com)
Michael F. Braby: Division of Ecology and Evolution, Research School of Biology, RN Robertson Building, 46 Sullivans Creek Road, The Australian National University, Acton, ACT 2601 AUSTRALIA (michael.braby@anu.edu.au)
Janet Chu: 350 Ponca Place #233, Boulder, CO 80303 (2chuhouse2@gmail.com)
Julien Delisle: 3 Oasis-des-Carrières, Cantley, Quebec, J8V 0B6 CANADA (julien.delisle@hotmail.com)
Nick DiMarco: 12 Sunset Lane, Patchogue, NY 11772 (nickadimarco@gmail.com)
Andre Victor Lucci Freitas: Departamento de Biologia Animal, Instituto de Biologia, Universidade Estadual de Campinas Rua Monteiro Lobato, 255, Campinas, Sao Paulo, 13083-862, BRAZIL (baku@unicamp.br)
Joann Karges: Lakewood Village, Apt 1112, 5100 Randol Mill Rd., Fort Worth, TX 76112 (joakarges@aol.com)
Jovana Magdalena Jasso Martinez: 572 Anaxagoras Street Apt 4, CDMX, 03020 MEXICO (jovana.jasso@st.ib.unam.mx)
James S. Miller: 236 Montgomery Street, Newburgh, NY 12550 (hairmuler@gmail.com)
Eric H. Metzler: new email: ehmetzler@metzler.app
Steve Nanz: 9 Howard Place, Brooklyn, NY 11215 (steve@stevenanz.com)
Dennis J. Olle: 934 Andres Ave, Coral Gables, FL 33134 (dennisolle@me.com)
Lady Carolina Casas Pinilla: Rua Carlos Von Koseritz, 175, Ap 504, Sao Joao, Porto Alegre, RS, CEP 90540-030, BRAZIL (lccasasp91@hotmail.com)
Richard Priestaf: PO Box 513, Santa Barbara CA 93116
Camilo José Medina Ramirez: Josefa Ortiz de Dominguez Mnz #2, Lote #37, Tierra y Libertad, Naucalpan de Juárez, Edo. Mex, CP:53700 MEXICO (camilo@ciencias.unam.mx)
James Richard Reed: PO Box 166, Klickitat, WA 98628 (jrrstud@gmail.com)
Ken Stead: 16321 Kelly Woods Dr. Apt 186, Fort Myers, FL 33908 (steadken@gmail.com)
Kenneth Strothkamp: 5006 SW Julia Court, Portland, OR 97221 (kstrot2@pdx.edu)
Wagner de Souza Tavares: Asia Pacific Resources International Holdings Ltd. (APRIL), PT Riau Andalan Pulp and Paper (RAPP), Pangkalan Kerinci, Riau, 28300 INDONESIA (wagnermaias@yahoo.com.br)
John P. Walas: 70 Farrand Street, Thunder Bay, Ontario, P7A 3H5 CANADA (johnw@tbaytel.net)
Ian A. Watkinson: 14786 E. 40th Place, Yuma, AZ 85367 (monarchrst@aol.com)
Steven Whitebread: Maispracherstrasse 51, Magden, CH-4312 SWITZERLAND (whitebread@one-name.org)

Metamorphosis

John S. Dugdale (1934—2020)



John died on 4th September 2020 aged 86. He was a towering figure in New Zealand entomology for the last 60 years. He was a well-known and very frequently consulted expert on Lepidoptera, tachinid flies, and cicadas, but his interests and knowledge extended far beyond these groups. He will always hold a unique place in the entomological history of this country and he also made significant contributions on the world stage; the breadth and depth of his expertise and the advances he made in our understanding of the New Zealand Lepidoptera fauna are unlikely to be equaled by any one person in future.

Amongst many significant publications, his annotated Checklist of New Zealand Lepidoptera (Dugdale 1988) was perhaps his outstanding achievement. Based largely on a year of study of the type specimens held in the Natural History Museum in London, this work (published as *Fauna of New Zealand* vol. 14) revolutionized the classification of our butterfly and moth fauna and put it for the first time on a modern footing. All subsequent Lepidoptera work in this country owes a major debt to this catalogue. John also contributed to the *Fauna* series a very detailed and scholarly revision of the ghost moths (Hepialidae) (Dugdale 1994). His revisionary work encompassed many other groups, including Tortricidae, Plutellidae, and Geometridae. He was a fine scientific illustrator, and a copious collector, adding an uncounted number of specimens to what is now NZAC, including at least 50,000 Lepidoptera (probably many more than this). He took a special interest in early stages and also amassed a very comprehensive collection of larvae, whose riches remain to be unraveled by future research.

John's research on NZ cicadas was encouraged by his great friendship with Charles Fleming. They spent many summers roaming the mountains of the South Island together getting into and out of scrapes. John liked to tell people that Charles called him his "pornographer" because he was in charge of studying cicada genitalia. While Charles's major concentration was on the songs, John's was on the ecology and morphological taxonomy. John redescribed the genera of NZ cicadas (Dugdale 1971) and together they produced a large and comprehensive monograph on the genus *Maoricicada* (Dugdale and Fleming 1978). John was a tremendous help to cicada researchers who came after him in providing interesting questions to pursue, details on each field site he had visited, and personal hospitality.

John was an excellent, reliable, and witty correspondent; his letters and e-mails are full of unusual insights and often a delightful and characteristic mildly grumpy stoicism. He remained extremely sharp and retained his huge knowledge to the end of his life. He will live on very long in our memories, and indefinitely in his vast contribution to New Zealand science.

[Written by Robert Hoare & Chris Simon, a full obituary will appear in a future issue of the *New Zealand Entomologist*.]

References

Dugdale, JS. 1988. Lepidoptera— annotated catalogue, and keys to family-group taxa. *Fauna of New Zealand 14*. 262 pp.

Dugdale, JS. 1994. Hepialidae (Insecta: Lepidoptera). *Fauna of New Zealand 30*. 164 pp.

Dugdale, JS. 1972. Genera of New Zealand Cicadidae (Homoptera). *New Zealand Journal of Science 14:* 856–882.

Dugdale, JS, Fleming CA. 1978. New Zealand cicadas of the genus *Maoricicada* (Homoptera:Tibicinidae). *New Zealand Journal of Zoology 5:* 295–340.

Dr Roger Bristow (1939-2020)

Dr Clement Roger Bristow was born in Alfreton in Derbyshire, UK. He completed a BSc in Geology in 1960 in the University of London (Queen Mary College) and immediately after, he continued with his PhD studies in the same university. Roger worked for the British Geological Survey and remained affiliated to it until his last days. The Institute of Geological Sciences, was formed from the merging of the Geological Museum, the British Geological Survey and Overseas Geological Survey in 1965 and it was located then in Exhibition Road in London, now part of the Natural History Museum. During his lunchtime breaks, Roger visited the Lepidoptera collections and he is remembered by former Lepidoptera staff, Phil Ackery and Dick Vane-Wright, as a dedicated researcher and true gentleman.

Roger, as he was known, was always interested in butterflies but because of his job commitments with the Overseas Geological Survey, he travelled with his family to live in Quito in 1974. Whilst he was working on technical

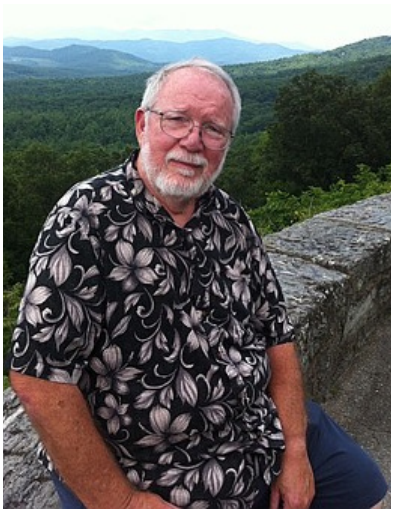
aid training geologists in Ecuador, he started collecting butterflies with his wife with the aim of writing a book about the national fauna. However, the task was colossal because of the huge diversity of species (c. 4,000 sp) and his time living there for 3.5 years was not sufficient, so Roger decided to specialise in the Brassolini, formerly a subfamily but now a tribe of the brush-footed butterfly subfamily Satyrinae, known as the owl butterflies. Roger donated more 2,300 specimens of butterflies collected in Ecuador to the Natural History Museum from 1974 to 1976 and 1981, neatly set and labelled, bringing probably the first butterfly specimens from Ecuador to the Natural History Museum collections including complete coordinates on the labels. As an anecdote, Pam, his wife, remembered this was a result of Roger's frustration when he found in collections specimens labelled with the wrong data.

Roger published over 30 papers and a book during his career, not only about the Geology of England but detailed taxonomic studies in Neotropical butterflies, giving him worldwide recognition as one the experts on this group. His legacy also includes discovering and naming more than 30 new species and subspecies of South American Lepidoptera. Roger visited the collections until last year and his visits were less frequent due to increasing mobility limitations and health issues. Roger passed away peacefully in September. He will be remembered as a fine gentleman, careful collector, pioneer, and great contributor to the study of Neotropical butterflies, mainly in Ecuador.

Roger's memory is survived in Pamela, his lifelong wife and research companion. They had two children Matthew and Harriet.

[Words by Dr Blanca Huertas (with kind contributions of Pam Bristow and Prof. Dick Vane-Wright).]

James K. Ettman (August 18, 1942 - June 26, 2020)



James K. Ettman, 77, of Petit Jean Mountain in Morrilton, Arkansas, passed away on June 26, 2020. Jim is survived by his wife, Ruth Ellen White Ettman, his daughters Elizabeth Giovannini (Peter) and Aimee Mimms (John), and his grandchildren Ashleigh Giovannini, Anna Giovannini and Tyler Mimms. He is preceded in death by his first wife, Sue Ann Schwender Ettman, his parents Julia Curtis Ettman and Irving K. Ettman, and grandson Luke Mimms. He was an elder in the First Presbyterian Church.

Active in the band and student government, Jim graduated from White Station High School in Memphis (1960) and the University of North Carolina, Chapel Hill (1964). Throughout high school and college, he was a Boy Scout ultimately attaining the rank of Eagle Scout. Each summer he attended or worked as a counselor at the Kia Kima Boy Scout camp in Hardy, Arkansas. Years later, Jim worked with other former scouts to revitalize the camp.

Known nationally for his entertaining presentations on nature and local history, he was park interpreter at Pine Mountain State Park in Kentucky and then Petit Jean State Park in Arkansas. Jim was an expert on wildflowers, orchids, insects, butterflies, moths and Indian rock art, writing papers in both Kentucky and Arkansas on wildflowers and orchids. He was one of the first park interpreters ever to use multiple slide projectors simultaneously (as many as 24) to create shows with imagery that danced across the screens to teach others about the natural world around us.

Jim's presentations were filled with his own photography, a skill that led him to his second career. Jim Ettman Productions produced large-scale corporate shows along with video presentations on culture, operations, management training and product sales. He was well known for pushing the limits of technology, and even developing new technology, to create mesmerizing art on the screen.

In his retirement, Jim rededicated himself to his passion of entomology. The culmination of several years of collecting and cataloging, a paper on the moths of Arkansas is the last project he completed. Still to be confirmed by Arkansas Tech University, he may have discovered as many as six previously unknown moths to the state of Arkansas.

A celebration of his life will be held later in the summer. Memorials may be made to a local scouting organization of your choice. (Written by and reprinted with permission from Ruth Ettman and the family)

Dysphania cf. *malayanus* (Dysphaninae), Sri Lanna Nat. Park, Chiang Mai-Thailand, 4 Feb 2020. **www.ThaiButterflies.com**

Membership

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:

Kelly Richers, Treasurer
The Lepidopterists' Society
9417 Carvalho Court
Bakersfield, CA 93311

Dues Rate

Active (regular)	$ 45.00
Affiliate (same address)	10.00
Student	20.00
Sustaining	60.00
(outside U.S., for above add 5$ for Mexico/Canada, and 10$ elsewhere)	
Life	1800.00
Institutional Subscription	60.00
Air Mail Postage, **News**	15.00
($30.00 outside North America)	

Students must send proof of enrollment. Please add $5.00 to your dues if you live in Canada/Mexico, $10.00 for any other country outside the U.S. to cover additional mailing costs. Remittances must be in U.S. dollars, payable to "The Lepidopterists' Society". All members receive the **Journal** and the **News** (each published quarterly). Supplements included in the News are the Membership Directory, published in even-numbered years, and the Season Summary, published annually. Additional information on membership and other aspects of the Society can be obtained from the Secretary (see address inside back cover).

Change of Address?

Please send permanent changes of address, telephone numbers, areas of interest, or e-mail addresses to:

Chris Grinter, Assistant Secretary
The California Academy of Sciences
55 Music Concourse Drive,
San Francisco, CA 94118
cell: 847-767-9688
cgrinter@gmail.com

Our Mailing List?

Contact Chris Grinter for information on mailing list rental.

Missed or Defective Issue?

Requests for missed or defective issues should be directed to Chris Grinter. Please be certain that you've really missed an issue by waiting for a subsequent issue to arrive.

Memoirs

Requests for Memoirs of the Society should be sent to the Publications Manager, Ken Bliss (address opposite).

Submissions of potential new Memoirs should be sent to:

Kelly M. Richers
9417 Carvalho Court
Bakersfield, CA 93311
(661) 665-1993 (home)
kerichers@wuesd.org

Journal of The Lepidopterists' Society

Send inquiries to:

Keith Summerville
(see address opposite)
ksummerville@drake.edu

Book Reviews

Send book reviews or new book release announcments to either of the following (do NOT send new books; authors will be put in contact with reviewers):

James K. Adams
(see address opposite)
jadams@daltonstate.edu

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

WebMaster

Todd Gilligan, Colorado State University, Bioagricultural Sciences and Pest Management, 1177 Campus Delivery, Fort Collins, CO 80523-1177, (970)490-4478
tgilliga@gmail.com

Submission Guidelines for the News

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^2 for interior use, 1800 x 2100 for covers.

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

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

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

Submission Deadlines

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

Issue		Date Due
63 1	Spring	February 12, 2021
2	Summer	May 12, 2021
3	Fall	August 15, 2021
4	Winter	November 15, 2021

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.

Executive Council

President

Alma Solis
Research Entomologist
Systematic Entomology Lab
USDA, Smithsonian Inst.
P.O. Box 37012, National Museum of Natural History
E-517, MRC 168
Washington, D.C. 20013
(202)633-4573
alma.solis@usda.gov

Past President

Brian Scholtens
Biology Dept., College of Charleston, 66 College St.
Charleston, SC 29424-0011
(843)953-8081
scholtensb@cofc.edu

Vice Presidents

Dean Bowers (1st VP)
Dept. of Ecology & Evol. Biology, 334 UCB
University of Colorado
Boulder, CO 80309-0334
(303)492-5530
deane.bowers@colorado.edu

Gregory R. Pohl
Natural Resources Canada
5320-122 st Edmonton AB
Canada T6H3S5.
gpohl@nrcan.gc.ca

Ivonne J. Garzon Orduna
Colección Nacional de Insectos (CNIN),
Universidad Nacional Autónoma de México (UNAM) Cto. Zona Deportiva S/N, C.U., Coyoacán, 04510
Ciudad de México, CDMX
Teléfono: +52 55-5622-9165
ivonne.garzon@ib.unam.mx

Treasurer

Kelly M. Richers
9417 Carvalho Court
Bakersfield, CA 93311
(661) 665-1993 (home)
kerichers@wuesd.org

Secretary

Todd Gilligan
(see Webmaster, opposite)
tgilliga@gmail.com

Assistant Secretary & Assistant Treasurer

Chris Grinter
The California Academy of Sciences, 55 Music Concourse Drive, San Francisco, CA 94118; 847-767-9688
cgrinter@gmail.com

Publications Manager

Kenneth R. Bliss
1321 Huntington Trail
Round Rock, TX 78664
(512)850-1700
krbliss@gmail.com

Editor, Journal of The Lepidopterists' Society

Keith Summerville
Dept. of Environmental Science and Policy, 131 Olin Hall, Drake University
Des Moines, IA 50311-4505
(515)271-2498
ksummerville@drake.edu

Editor, News of The Lepidopterists' Society

James K. Adams
School of Sciences and Math
Dalton State College
650 College Drive, Dalton, GA 30720 (706)272-4427
jadams@daltonstate.edu

Editor, Memoirs of The Lepidopterists' Society

Kelly Richers
(see Treasurer, left)

WebMaster

Todd Gilligan
(see WebMaster opposite)

Members-At-Large

Elizabeth Barnes, Jeffrey Belth, Sangmi Lee, Chuck Harp, Elizabeth Long, Debbie Matthews, Jason Dombroskie, Todd Stout, Geoff Martin

Season Summary Zone Coordinators

Refer to Season Summary for Zone coverage details.

Chief Season Summary Coordinators/Editors

Brian G. Scholtens
Biology Department
College of Charleston
66 College Street
Charleston SC 29424-0001
(843) 637-6224
scholtensb@cofc.edu
AND
Jeff Pippen
101 Forest Oaks Dr.
Durham, NC 27705
jeffpippen9@gmail.com

Zone 1, The Far North:

André Langlois
Yukon, Canada (more info coming)
Andre.Langlois@gov.yk.ca

Zone 2, The Pacific Northwest:

Jon H. Shepard
4925 SW Dakota Ave.
Corvallis, OR 97333
(541) 207-3450
shep.lep@netidea.com

Zone 3, The Southwest:

Ken Davenport
8417 Rosewood Avenue
Bakersfield, CA 93306
(661) 366-3074
kdavenport93306@yahoo.com
with help on moths from Kelly Richers (see Treasurer, this page)

Zone 4, The Rocky Mountains:

Chuck Harp
8834 W. Quarto Ave.
Littleton, CO 80128-4269
(720) 981-5946
cehmoth@aol.com

Zone 5, The Plains:

Michael M. Ellsbury
70855 Highway 8
Fairbury, NE 68352-5565
(402) 805-5456
bugsnrails@gmail.com

Zone 6, Texas:

Stuart Marcus
146 Lone Oak Lane
Liberty, TX 77575
(936) 336-9786
stuart.marcus13@gmail.com

Zone 7, Ontario and Quebec:

Kyle Johnson
5842 Wedgewood Drive
Little Suamico, WI 54141-8613, (920) 639-8390
kejohnson4@wisc.edu

Zone 8, The Midwest:

Eric Olson
2970 N Torreys Peak Dr
Superior, CO 80027
(720) 308-4320
eric@olsonplanet.com

Zone 9, The Southeast:

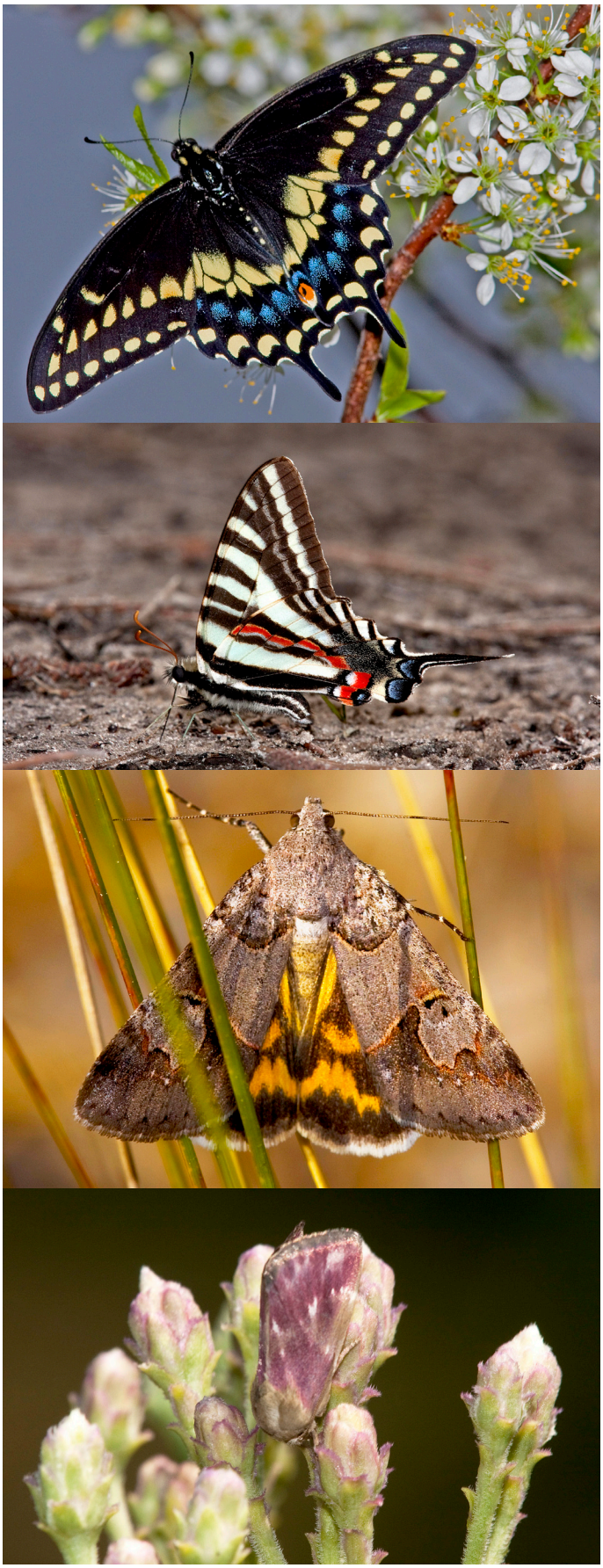
Brian G. Scholtens
Biology Department
College of Charleston
66 College Street
Charleston, SC 29424-0001
(843) 637-6224
scholtensb@cofc.edu

Zone 10, The Northeast:

Mark J. Mello
c/o Lloyd Center,
430 Potomska Rd
Dartsmouth, MA 02748
markmello@lloydcenter.org

Zone 11, Mexico & the Caribbean:

Isabel Vargas Fernandez
Museo de Zoologia,
Facultad de Ciencias,
Univ. Nacional Autonoma Mexico, Apartado Postal 70-399, D.F., Mexico 04510
ivf@ciencias.unam.mx



Above -- top: *Euphyes dion*; middle: *Hesperia attalus slossonae* in *Gelsemium sempervirens*; bottom: Brazilian Skipper (*Calpodes ethlius*). Right -- top: Black Swallowtail (*Papilio polyxenes*); second down: Zebra Swallowtail (*Eurytides marcellus*); third down: *Drasteria graphica*; bottom: *Schinia carmosina* on its foodplant *Carphephorus* sp. Images by Bill Berthet; see related article on page 186.