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NEWS OF THE LEPIDOPTERISTS' SOCIETY

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Argema mimosae, Kenya (Texas A&M University Insect Collection), on basket from Zambia. Photo by Rig Peigler. See associated article on the next page.

Cocoon rattles: an intriguing aspect of lepidopterology

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Use of moth cocoons to make ceremonial rattles is known for many indigenous peoples, but the practice is limited to sub-Saharan Africa and the Americas. Despite the fact there are many large and easily available cocoons in Asia, Australia, Madagascar, and the Maghreb, none of the tribal peoples of these regions make cocoon rattles, and we will probably never know if a tribe of Cro-Magnon people in Europe 15,000 years ago made rattles using cocoons of *Saturnia pyri*. However, examples of cocoon rattles in California (historical), the American Southwest (Sonora, Sinaloa, Chihuahua, Arizona) and the Kalahari Desert (South Africa, Namibia, Botswana) are numerous and varied, always demonstrating cultural diffusion between neighboring tribes.

All the cocoons used for making rattles belong to the Saturniidae and Lasiocampidae.

Mention of cocoon rattles is rare in the literature on Saturniidae (Packard 1914, Essig 1931, Ferguson 1972, Pinhey 1979) and I know of only one mention in literature on sericulture (Schultze 1913: 20) and one on Lasiocampidae (Zolotuhin 2015: 43-44). By contrast, cocoon rattles are described and illustrated in many books and articles dealing with cultural anthropology and ethnography (Kirby 2013, Simonett 2016, van Huis 2019, and citations in Peigler 1994 and Peigler & Oberprieler 2017).

I first became interested in this topic in the 1990s when I worked as a curator of entomology at Denver Museum of Natural History, now Denver Museum of Nature & Science. There were several such rattles in the collection of the Anthropology Department, and I was amazed by the similarity in design and construction between some from southern Africa and others from the American Southwest. Although I have published a few papers on cocoon artifacts, I realize that many members of the Lepidopterists' Society are unaware of these objects, so this article is intended as an introduction and an update. Although I had made good use of the ethnographic and anthropological literature about cocoon rattles, you will see below that I had totally missed reports in the archaeological literature that give evidence of cocoon rattles in Namibia and Argentina dating back thousands of years deep in caves in very dry climates.

In the introductory entomology course that I teach every fall, my students enjoy holding and shaking cocoon rattles when I cover my lesson on cultural entomology. Therefore, over the years I have bought many cocoon rattles from internet sources and donated them (along with wild silk textiles) to entomology programs where they can be used for teaching, outreach, open house tours, display cases, etc. Most recipients of my donations are universities in the Southeast and Western Interior. These artifacts are becoming increasingly difficult to obtain so should be permanently preserved in institutional collections. Cocoon artifacts should not be displayed in the open air but kept in sealed containers such as Cornell drawers that protect them from sunlight, dust, humidity, and arthropod pests. However, in my opinion, at least a few should also be routinely handled and enjoyed by students and visitors.

The people who make and use cocoon rattles always start with empty cocoons, sometimes collected empty in the field, but other times after eating the pupae from the viable cocoons. Entomophagy is another intriguing aspect of cultural entomology (Feng et al. 2016). Chips of ostrich eggshell, tiny pebbles, glass beads, seeds, or gravel are added into the cocoons that are then stitched onto strips of fabric or cords of braided fibers to make ankle rattles or attached to wooden handles to make hand rattles. Cocoon rattles are mainly used in ceremonial dances at weddings, funerals, Easter Week celebrations of the Yaqui, trance dances of the San (=Bushmen), and others. Below is a comprehensive summary of the types of cocoon rattles that exist, along with images of the rattles and the moth species that make the cocoons.

Hand rattles in California and Sonora

The Californian rattles have not been made since the early 20th century, but there are extant examples preserved in museum collections. A selection was figured by Essig (1931: 22). They mainly contained cocoons of *Hyalophora euryalus* (Fig. 1), common in many areas of California (Will et al. 2020: 391-392). It is likely that cocoons of *Hyalophora gloveri* and *Antheraea polyphemus* were also occasionally used, but I am not aware of any extant artifacts to prove it. While working at the Denver Museum of Nature & Science, I had the good fortune to correspond with Craig D. Bates, a curator at the Yosemite Museum and an authority on California's Native People. He made replicas of the rattles, carefully modeled after museum pieces, using the same materials: cocoons, deer sinew, native hemp, specific types of twigs and wood, etc. (Peigler 1994) but had to substitute game bird feathers for those of now protected birds. Craig pulled the inner cocoons (discarded) from the outer cocoons (used to make rattles) through the exit valves with needle-nose pliers but told me that the Native People used sticks tipped with hot tar to do this. His replicas were sold in the

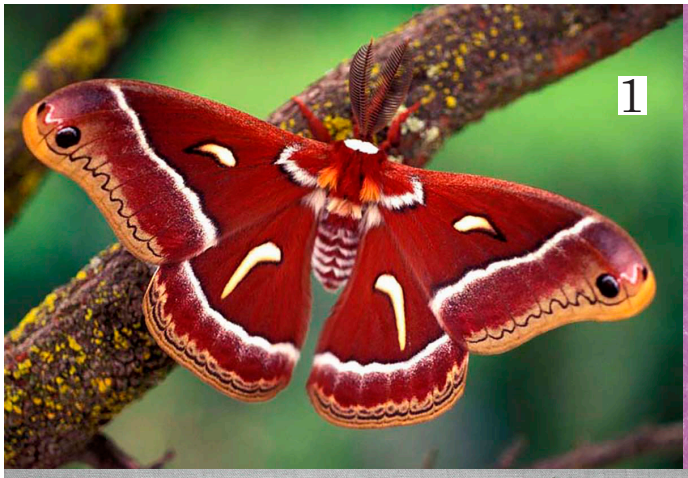


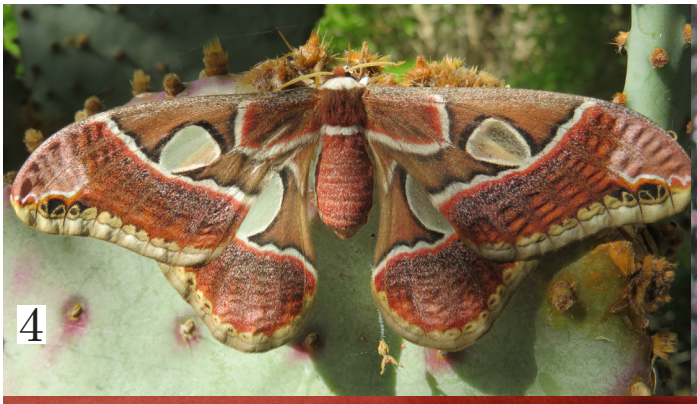
Fig 1. *Hyalophora euryalus,* northern Baja California, photo by Kirby L. Wolfe. **Fig. 2**. Replicas of historical hand rattles made with cocoons of *Hyalophora euryalus* modeled after extant ones from California in museums, made by Craig Bates in 1995. Right & bottom: Pomo tribe, one with handle of tightly bundled goose quills. Left: Yuki tribe, cocoons attached with loops of dogwood twigs. Photo by William G. Alther. (Denver Museum of Nature & Science, catalog numbers AN-1996-14.12; AN-1996-14.14; AN-1996-14.18) **Fig. 3**. Replicas of historical hand rattles made with cocoons of *Hyalophora euryalus* modeled after extant ones from California in museums, made by Carson Bates, a member of the Sierra Miwok tribe. Top: Western Mono tribe, four cocoons containing obsidian flakes, attached with deer sinew to handle of alder wood (Mississippi Entomology Museum). Center: Yosemite Miwok tribe, four cocoons containing gravel from an ant hill, attached with deer sinew and split willow shoots to handle of elderberry wood. Bottom: Central Miwok tribe, one cocoon containing gravel from ant hill, lashed with deer sinew to a twig of willow, painted with red ochre, decorated with goose feathers (both in McGuire Center for Lepidoptera & Biodiversity).

museum shop in Yosemite National Park. At my request he made many for me to purchase, several of which are in the anthropology collection at the Denver Museum of Nature & Science (Fig. 2) and can be viewed on that museum's website under Collections. Craig's son Carson Bates also made some rattles for me (Fig. 3).

According to books on California tribes I found in the museum library and what Craig Bates told me, these rattles were used in some ceremonial dances, but they were primarily made and used by shamans for curing illness, chasing away bad dreams, and to cast spells. Craig told me that some shamans considered cocoon rattles to be too powerful for commoners in the tribe to handle. The traditional homelands of the tribes that made cocoon rattles were all in north-central and central California. The tribes included the Western Mono, Pomo, Yuki, Yokuts, Wintun, Konkow, Maidu, and Miwok. In my original publication (Peigler 1994) I illustrated some historical hand rattles in the Oakland Museum and Smithsonian made by Costanoan, Yokuts, and Wintun tribes. A website for the Pechanga People of the Luiseño tribe in the Temecula Valley of southern California states that they currently make and use cocoon rattles, but I suspect this may be a recent innovation adapted from the historical examples farther north. I sent an email to inquire but got no response. We can assume that use of rattles made from cocoons in California dates back several centuries. Shamanism in the Americas traces its origins to Asia millennia ago, but, as I mentioned above, people in Asia are not known to make cocoon rattles.

There are three hand rattles in the Arizona State Museum made by Seri people in Sonora. One has 21 cocoons of *Rothschildia cincta* (Fig. 4) loosely attached to a wooden handle by cotton thread. The other pair (Fig. 5) is well constructed with cocoons of *Eupackardia calleta* (Fig. 6) and *R. cincta* firmly attached by copper wire onto wooden handles of limberbush (Peigler 1994). This pair was made in October 1973 by a Seri named Jesús Morales in El Desemboque, Sonora. The wood extending above the cocoons is colored with slate blue and brown paints. There are splinters and no patina on the handles, indicating they were newly made when purchased. They were for use in the deer dance, which is of Yaqui origin. Besides these three artifacts, I am not aware of any other handheld cocoon rattles made by Native People in Arizona and Mexico, but there are many examples made with gourds, deer hooves, metal, seed pods, and other materials.

In his classic treatise on North American Saturniidae, Ferguson (1972: 231) wrote in his text for *Eupackardia*



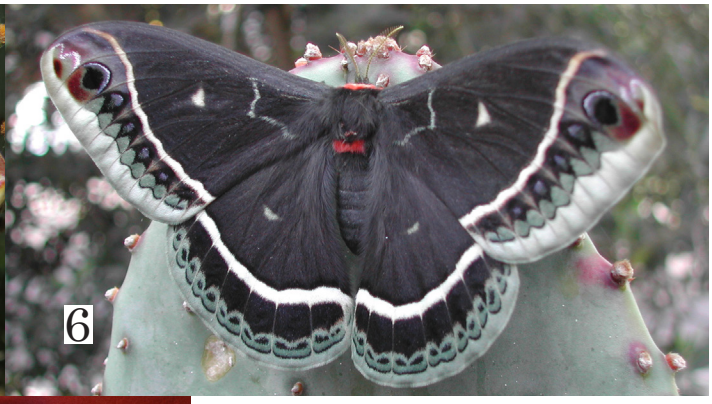


Fig. 4. *Rothschildia cincta*, Santa Cruz Co., Arizona, reared on ailanthus by R. Peigler, photographed on *Opuntia santa-rita*. **Fig. 5**. Hand rattles containing cocoons of *Eupackardia calleta* and *Rothschildia cincta* made by Jesús Morales of the Seri tribe in 1973 in El Desemboque, Sonora. Photo ©Arizona State Museum, The University of Arizona. **Fig. 6**. *Eupackardia calleta*, Arizona, reared from cocoon by R. Peigler.

calleta, "In the collection of the United States National Museum there is preserved one of these cocoons containing small pebbles. This had been used as a rattle by an Indian medicine man in Arizona." When I studied wild silk textiles in the anthropology collections at the Museum Support Center (Suitland, Maryland), I inquired about this rattle, but no record could be found. It was also not in the Saturniidae collection in the same building. Possibly Ferguson saw this artifact on public exhibit in a diorama. In any case, nothing like this is otherwise known from Arizona, as far as I know.

Ferguson (1972: 221-223) called the *Rothschildia* in Arizona by the name *R. jorulla*, but Lemaire (1978, fig. 26, map) demonstrated the true *R. jorulla* is found in southern Mexico. There has been confusion about specimens misidentified as *R. jorulla* or *R. cincta* in the Lower Rio Grande Valley of Texas, ever since Ferguson (1972, pl. 17, figs. 2, 7, 9) figured three specimens from Esperanza Ranch near Brownsville. The solution is deceptively simple: the locality labels on these historical specimens that Ferguson figured are correct, but the moths are actually *R. lebeau* (=*forbesi*), the only *Rothschildia* that occurs in Texas, although the Mexican *R. orizaba* has possibly been collected a century or more ago in the Brownsville area. The name *jorulla* has also been used incorrectly by some authors in the anthropological literature when writing about cocoon rattles.

Ankle rattles in Arizona, Mexico, and Argentina

Several tribes of the American Southwest make cocoon rattles for ceremonial dances, worn wrapped around the ankles of the dancers. Most contain cocoons of *Rothschildia cincta*, but some contain cocoons of *Eupackardia calleta* and the Tarahumara sometimes use cocoons of *Hyalophora gloveri* (Fig. 7) in addition to those of *R. cincta*. The tribes are

Fig. 7. *Hyalophora gloveri*, Butte Co., Idaho, reared by Derek Bridgehouse.

Fig. 8. Ankle rattles made by Yaqui in Arizona with cocoons of *Rothschildia cincta*. A short rattle used by deer dancers (Senckenberg Museum, Frankfurt). The red tassels are only seen in Yaqui rattles. **Fig. 9**. Ankle rattles made by Tarahumara in Chihuahua with cocoons of *Rothschildia cincta*. (University of Nebraska State Museum), shown alongside nesting baskets made with pine needles by Tarahumara.

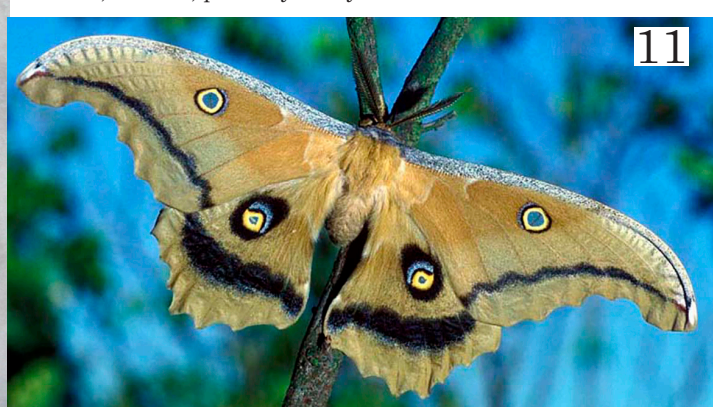
the Mayo (=Yoreme) and Seri (=Comcáac) of Sonora and Sinaloa, the Yaqui (=Yoeme) of Arizona and Sonora, and the Tarahumara (=Rarámuri) of Chihuahua. In the same region the Opata also made cocoon rattles, but that tribe has been extinct for decades, surviving descendants now assimilated into other groups. In the McGuire Center for Lepidoptera & Biodiversity there is a small Opata rattle with cocoons of *R. cincta* collected in 1943 in Sonora, figured by Peigler and Oberprieler (2017). Native People of the Tóhono O'odham (=Papago) and Pima tribes of Arizona and adjacent Mexico also make the same kinds of cocoon rattles. However, Athabaskan tribes in the same region such as Apache and Navajo never made or used cocoon rattles, showing that cultural diffusion can depend more on culture and linguistics than on geography.

Yaqui rattles consist of cocoons with anterior ends cut off and gravel inserted, stitched in pairs along a cord with braided fiber, long strips of buckskin, or coarse string. The pairs signify male and female. Shorter rattles (Fig. 8) that wrap around the ankles only three times are for deer dancers (the venado dance), whereas rattles with hundreds of cocoons extending up halfway or almost to the knees are worn by pascola and chapayeka dancers in the same ceremonies. Tassels of red yarn at each end signify Divine Grace, but only the Yaqui decorate their rattles like this. They also often apply white paint to the cocoon rattles each year to make them look new and last longer. No other tribes paint or embellish their cocoon rattles in any way. The Yaqui live on reservations south of Phoenix and in Tucson or among the general population in southern Arizona, and they maintain cultural ties with other Yaqui groups south of the border.

In summer 2004 I sent a few hundred empty cocoons of *Eupackardia calleta* to a Yaqui pascola dancer named Merced Maldonado in Arizona, because he had been unsuccessful in finding cocoons of *Rothschildia cincta* for years. In October 2004, he drove from Arizona to San Antonio with his wife and sister, and they were guests in my home for four days. We made road trips toward the coast and collected 531 cocoons of *Eupackardia calleta*, of which 43 were viable. Cocoons persist on the hostplants for two or more years after the moths emerge (Louwagie & Peigler 2017). I learned some of the Yaqui beliefs, legends, and customs about the cocoons, rattles, necklaces, etc. from Merced. I assumed that some of what he told me was not published in the anthropological literature, so I took notes and we co-authored a paper (Peigler & Maldonado 2005). I still send empty cocoons of *E. calleta* to Merced every year, because he makes rattles for other dancers and teaches Yaqui culture to young members of the tribe.

Rattles made by the Seri and Mayo are constructed like Yaqui rattles, but I have only seen cocoons of *Rothschildia cincta* in their rattles. By contrast, Tarahumara rattles consist of single rows of cocoons, usually spaced apart, sewn onto long strips of white muslin fabric, but I have seen a few rattles with colorful fabric (Fig. 9). Tarahumara in the famous Copper Canyon also make rattles with cocoons of *Hyalophora gloveri*, alternating inner cocoons with outer cocoons (Fig. 10). One such rattle in the Denver Museum of Nature & Science was purchased in Cusarare Mission, 20 km southeast of Creel, Chihuahua, in October

Fig. 10. Ankle rattles made by Tarahumara in Chihuahua with cocoons of *Hyalophora gloveri* with alternating inner and outer cocoons (Clemson University Arthropod Collection), shown alongside a handwoven Tarahumara sash. **Fig. 11**. *Antheraea montezuma*, Oaxaca, photo by Kirby L. Wolfe.



1993, and contains 30 cocoons (half inner, half outer) of *H. gloveri* and two cocoons of *Antheraea montezuma* (Fig. 11). Helena Simonett (2016) published an extremely detailed account of cocoon rattles used by the Mayo, and her article is easily accessible on the internet. She provides a lot of information pertaining to culture, history, beliefs, spirituality, and customs of those people surrounding cocoon rattles, and gives updates on how their culture is being assaulted by outsiders, globalization, climate change, habitat destruction, and other aspects of unsustainability.

We can easily assume that use of ankle rattles made with *Rothschildia* cocoons in Mexico dates back several centuries, but I recently became aware of physical evidence that it goes back millennia in South America. In the caves of Huachichocana in Jujuy Province of the Argentine Northwest, such rattles were found associated with human burials in excavations dating back 8670 B.P. (before present) and 3400 B.P., and the "present" for these dates was the year 1986. The rattles were preserved because the caves in Jujuy are very dry, and the finds were in deep layers. The archaeologists Alicia Fernández (1986: 377) and Humberto Lagiglia were able to determine that the cocoons were strung together and matched extant cocoons of *Rothschildia*. The two species in that region are *Rothschildia maurus* and *R. schreiteriana* (Fig. 12) (Lemaire 1978, fig. 39, map). These ancient rattles are kept at the Museo Arqueológico Dr. Eduardo Casanova in Tilcara (Fernández 2002) where many Inca relics are displayed. They come from excavations in what archaeologists call the South Andean Culture Area during the Preceramic Period II and Preceramic Period V (Willey 1971).

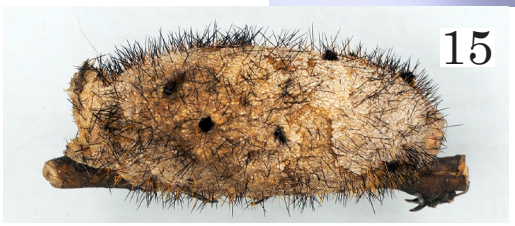
Although cocoon rattles have apparently not been made in Argentina for possibly centuries, in the village of Ancasti, Catamarca Province, women today collect the cocoons of the above two species and handspin the silk to weave scarves and knit shawls (Zapata & Jurado 2018, Cassiau 2020). Fortunately, these activities treat the *Rothschildia* populations as a renewable resource because the viable cocoons are strung outdoors on long wires to allow the moths to emerge and fly free before their cocoons are processed. Ruth Corcuera (2006: 167-169) illustrated two ponchos dating to the early 20th century from the same region preserved in collections that were woven of handspun *Rothschildia* silk.

Ankle rattles in Namibia, Botswana, and South Africa

Today, cocoon rattles are still commonly made by San (=Bushmen), Zulu, and Tswana peoples. The tribes of San make the rattles for men to wear in their trance dances for healing after nightfall. For the Zulu and Tswana, cocoon rattles are worn in dances at various ceremonies like weddings, funerals, festivals, etc., by both men and

Fig. 12. *Rothschildia schreiteriana*, male from Chaco Prov., female from Salta Prov., Argentina, and cocoons. Courtesy of Adriana I. Zapata, Universidad Nacional de Córdoba.

Fig. 13. *Gonometa postica*, pair, Pretoria, South Africa, reared by Rolf Oberprieler (Denver Museum of Nature & Science). **Fig. 14**. *Gonometa rufobrunnea*, pair, Francistown, Botswana (Denver Museum of Nature & Science). 13 & 14 by Rick Wicker. **Fig. 15**. *Gonometa postica*, cocoon showing larval spines to deter predators. Photo by Rolf Oberprieler.



women. In the past 30 years these rattles have been made in large numbers for sale to tourists and to ship to ethnic import shops in Europe and North America. Some rattles consist of cocoons of the saturniid *Argema mimosae* (see front cover), an exquisite moon moth that is common in eastern South Africa, including KwaZulu-Natal, the traditional homeland of the Zulu. The San and Tswana rattles are made from lasiocampid cocoons (*Gonometa* and *Schausinna*), as described below.

There are more than a dozen species of *Gonometa* (Lasiocampidae) in sub-Saharan Africa, but only two southern species have been used in cocoon rattles, namely *Gonometa postica* (Fig. 13) whose larvae eat woody legumes and *Gonometa rufobrunnea* (Fig. 14) whose larvae eat only mopane. The cocoons are very hard due to calcium crystals and the larvae incorporate their stinging spines into their cocoons during construction, resulting in many outward projecting spines (Fig. 15). Obviously, these must be scraped off before the cocoons can be made into rattles. The moths resemble the much smaller American saturniids in the genus *Anisota*, in that the diurnal males mimic wasps, but the nocturnal females resemble dead leaves.

The great majority of San and Tswana rattles contain cocoons of *Gonometa,* which are brown or tan with a rough surface. Since male cocoons are only half the size of female ones, the artisans usually use cocoons of only one sex in each rattle. Sometimes the whole cocoons are used, in which the pupal shell is removed from a lateral slit where the cocoon was attached to a stem and the gravel inserted. In these types of rattles, string or buckskin is threaded through each end, so that each rattle has two parallel cords (Figs. 16, 17). In other cases, ends of cocoons are cut off and the cut end is pressed flat

Fig. 16. Ankle rattles made by San (Bushmen) living along Shashe River, south of Francistown, Botswana, composed of whole female cocoons of *Gonometa rufobrunnea*. **Fig. 17**. Ankle rattles made by San composed of whole cocoons of *Gonometa postica* strung with twisted cords. Left (above): all male cocoons with leather fasterners. Right (above): all female cocoons (Clemson University Arthropod Collection).

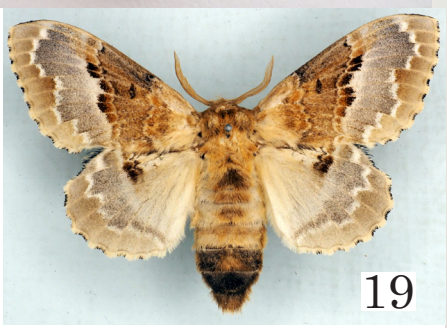


Fig. 18. Ankle rattles made by Tswana women of the Baharutshe tribe, Thamaga, Botswana, composed of cut female cocoons of *Gonometa rufobrunnea* and twisted plastic string (Virginia Tech Insect Collection). **Fig. 19**. *Schausinna regia*, female, Windhoek, Namibia, reared and photographed by Rolf Oberprieler. **Fig. 20**. Ankle rattles made by Bakgatla, Tswana, with cocoons of *Schausinna regia*. Made in Mochudi, Botswana, collected in 1932 by Percival R. Kirby, worn by men for dancing. Photo courtesy of Percy Kirby Musical Instruments Collection, ©South African College of Music. **Fig. 21**. Ankle rattles made by Bakone Pedi in Transvaal, collected by P. R. Kirby, with cocoons of *Gonometa postica*, worn by women in dances. Photo courtesy of Percy Kirby Musical Instruments Collection, ©South African College of Music.

and strung on the cords (Fig. 18), like rattles from Mexico. San rattles usually have whole cocoons, and they are long enough to extend well above the ankles when wrapped around the legs, like rattles of pascola dancers in America.

Rattles of the same type made by the San have also been made of cocoons of *Schausinna regia* (Fig. 19), but the few examples known to me are very old and I doubt this species is still used. The cocoons differ from *Gonometa* by having a linear slit for the moth to emerge, no external spines, a smooth surface, and gray color. There is a rattle in the National Museum of Ethnology (Rijksmuseum voor Volkenkunde) in Leiden, The Netherlands, that the museum acquired in 1894, and another old one in the Clemson University Arthropod Collection figured by Peigler and Oberprieler (2017). The only others known to me are two San rattles in the Percy Kirby Collection of Musical Instruments, University of Cape Town, figured by Kirby (2013), one of which is shown here (Fig. 20).

There is one rattle (Fig. 21) attributed to the Bakone (=Bokoni) Pedi that is constructed *exactly* like some of the American rattles made by Seri, Mayo, and Yaqui, with cut cocoons of *Gonometa postica* stitched in pairs along a cord, each pair touching the next. Obviously, there was no chance of cultural diffusion between America and Africa. I have not seen other rattles from southern Africa like this historical sample, so I doubt they are still made. It was collected by Percival R. Kirby in Transvaal Province, but the Pedi are now denizens of Mpumalanga and Limpopo provinces, carved from the former Transvaal. The specific locality and year were not recorded, but Kirby did state this type was used by women in all kinds of dances. The Pedi (also called Northern Sotho) are a subgroup of Tswana people. Kirby's collection of musical instruments was made in the 1920s and 1930s.

The Zulu make two additional types of rattles using the beautiful silvery cocoons of *Argema mimosae*. In the first type, cocoons are stitched in three rows to a piece of animal fur such as goat or kudu (Fig. 22). This type of rattle was mentioned by Packard (1914: 179). The other type is more commonly made and occasionally available from internet sellers, in which the cocoons are bundled in groups and

Fig. 22. Zulu rattles with cocoons of *Argema mimosae* sewn onto a piece of animal fur (Denver Museum of Nature & Science, cat. no. AN-1996-14.32A-B). Photo by William G. Alther. **Fig. 23**. Zulurattles with cocoons of *Argema mimosae* attached to braided cord. This model is also made by the Swazi tribe. **Fig. 24**. Zulu rattles made in the 1920s of cocoons of *Gonometa postica*, decorated with white glass beads. (Photo ©Denver Museum of Nature & Science. Cat. no. A1311.14A).

attached to braided fiber (Fig. 23). These have also been made by Swazi people (Peigler 1994, Kirby 2013), as well as Zulu (Pinhey 1979: 110).

In the Denver Museum of Nature & Science I saw a pair of ankle rattles made by the Zulu, each rattle consisting of nine *Gonometa postica* cocoons decorated with white glass beads (Fig. 24). They were purchased in South Africa between 1920 and 1924 by Mr. & Mrs. Albert Priest. I have never seen rattles of this type anywhere else, and I doubt they are still being made. One of the pair can be viewed on the museum's website under Collections. I have not seen other rattles with cocoons of *Gonometa* from so far east.

Just as I was unaware of the archaeological literature reporting cocoon rattles in Argentina, I recently learned there is also ancient evidence for them in Namibia. In a cave called Fackeltraeger, Wendt (1972: 35) found cocoons that had been pierced at each end (as with rattles made today) with a fragment of cord threaded through the perforations. This excavation has been dated to 2980 B.P., but again, the "present" of B.P. was in 1972, making these rattles about 3030 years old if the dating was accurate. John Kinahan (2018: fig. 8) shows two cocoons that were excavated from Falls Rock Shelter and were perforated so that they could be strung onto rattles. These are dated to at least 3000 B.C. and look to me more like *Schausinna regia* than *Gonometa*. In the same article, Kinahan (2018: fig. 2) reproduces rock art (petroglyphs) in which two human figures in the White Lady frieze of the Maack Shelter are clearly wearing cocoon rattles around their lower legs. This rock art is at least 2000 years old.

There are other cocoon artifacts made by indigenous peoples that are not rattles. Most are necklaces and pendants, several of which were described and illustrated in my publications cited below. As a specialist on Saturniidae, I continue to be perplexed that I have never seen rattles from southern Africa containing cocoons of *Epiphora bauhiniae* or *E. mythimnia.*

Acknowledgments

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Macaria trilinearia (Grossbeck) in the McGuire Collection

Bob Belmont

Research Associate, McGuire Center for Lepidoptera & Biodiversity, Florida Museum of Natural History, University of Florida, 3215 Hull Road, Gainesville, FL 32611 USA **bbelmont@ufl.edu**

I have recently retired and now work with Charlie Covell at the McGuire Center curating the Geometridae. Among the rarer geometrids of America North of Mexico is a species now thought to be extinct. *Macaria (Speranza) trilinearia* (Grossbeck) supposedly has not been collected or reported since the 1950s. According to Ferguson (2008), this species is known only from Arizona, although Ferguson (2008) also listed two specimens collected in southern Utah. Last year when I moved to Gainesville and started curating the geometrids this species was one of the few geometrids North of Mexico that was not represented in the curated portion of our collection. After weeks of working through our 300+ drawers of unidentified North American geos, I discovered two *trilinearia* specimens, one of each sex. The specimens are illustrated below.

Of the 1450 species of Geometridae in America north of Mexico, the McGuire collection is now 91% complete. If you are interested in helping to complete our collection, please e-mail me for the list of species we still need.

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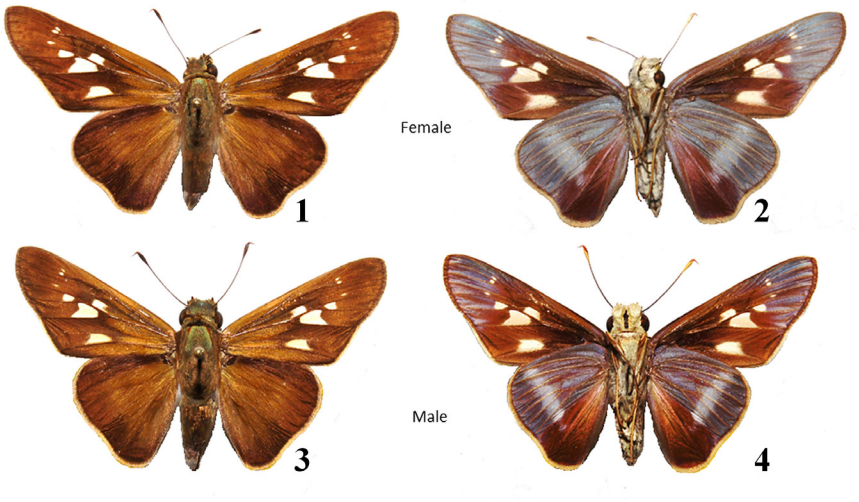
Left: *Macaria trilinearia*, male, collected by O. C. Duffner in Paradise, Arizona, September 1930. Wingspan 31 mm. Right: *Macaria trilinearia*, female, collected by Ron Leuschner at Sierra Ancha Experimental Forest, 40 miles N. of Globe, Gila Co., Arizona June 3-4, 1956. Wingspan 30 mm.

Life history notes on Evans' Skipper, *Panoquina evansi* (Hesperiidae: Hesperiinae)

Richard Boscoe[1] and Berry Nall[2]

[1]150 Ridge Pike A101, Lafayette Hill, PA 19444
[2]PO Box 22, Falcon Heights, TX 78545 **lb@thenalls.net**



Figures 1-4: *Panoquina evansi*, ex ova, ex female collected October 30, 2007, Mission, Hidalgo Co. TX. **1-2** Female emerged December 26, 2007; **3-4** male emerged January 6, 2008.

The skipper *Panoquina evansi* (Figs. 1-4, 13-14 on back cover), named by H. A. Freeman in 1946 Type Locality: Pharr Hidalgo County, Texas (Pelham, 2008), strays periodically into the Lower Rio Grande Valley of Texas from Mexico. Most reports have been from Hidalgo and Cameron Counties, but the skipper has been found as far west as Falcon State Park in Starr County. *P. evansi* has been considered a subspecies of *Panoquina fusina* (Hewitson, 1868), without justification according to Pelham (2008). Tilden (1974) reported collecting *P. evansi* in the LRGV on flowers of *Chromolaena odorata* = *Eupatorium odoratum* (Asteraceae) in October and November 1972. Brock and Kaufman (2003) state the foodplant is unknown. Scott (1986) suggests sugar cane, *Saccharum officinarum* (Poaceae), as a possible host.

The senior author collected a female 30 October 2007 south of Mission, Hidalgo County which oviposited reluctantly in confinement on *Panicum maximum* (Poaceae), a host for *Panoquina ocola* (W. H. Edwards, 1863) and *P. lucas* (Fabricius, 1793). Upon hatching, neonatal larvae wandered about the rearing cage, refusing to eat it and subsequently refusing *Saccharum officinarum*. When offered foliage of *Sabal mexicana* = *Sabal texana* (Arecaceae=Palmae), the larvae immediately moved to the margins of the leaf blades and began to feed; they were ultimately reared to adults. A confined female, again collected by the senior author near Mission 25 October 2020, oviposited readily on leaf blades of *Sabal mexicana*. Three larvae from this female were successfully reared by the junior author on *Washingtonia robusta* (Arecaceae); these are the subjects photographed in this study. The native *Sabal mexicana* may be separated from the ornamental *Washingtonia robusta* palms by its unarmed leaf petioles (Richardson and King, 2011).

DESCRIPTION OF IMMATURE STAGES

Ovum (Fig. 5). White, semi-hemispherical, faintly textured; base with lip.

Neonate (Fig. 6). Body yellow, several long, stiff dark setae near venter. Head dark brown, relatively smooth.

First instar (Fig. 7). As previous, except mid-section of body becoming green as development progresses.

Second instar (Fig. 8). Body translucent green at mid-section, lightening to yellow distally; 4 faint white stripes along dorsum, outer stripes broader than inner. Head bifurcate, cream with 2 broad light brown stripes on each lobe; frons bordered with light brown.

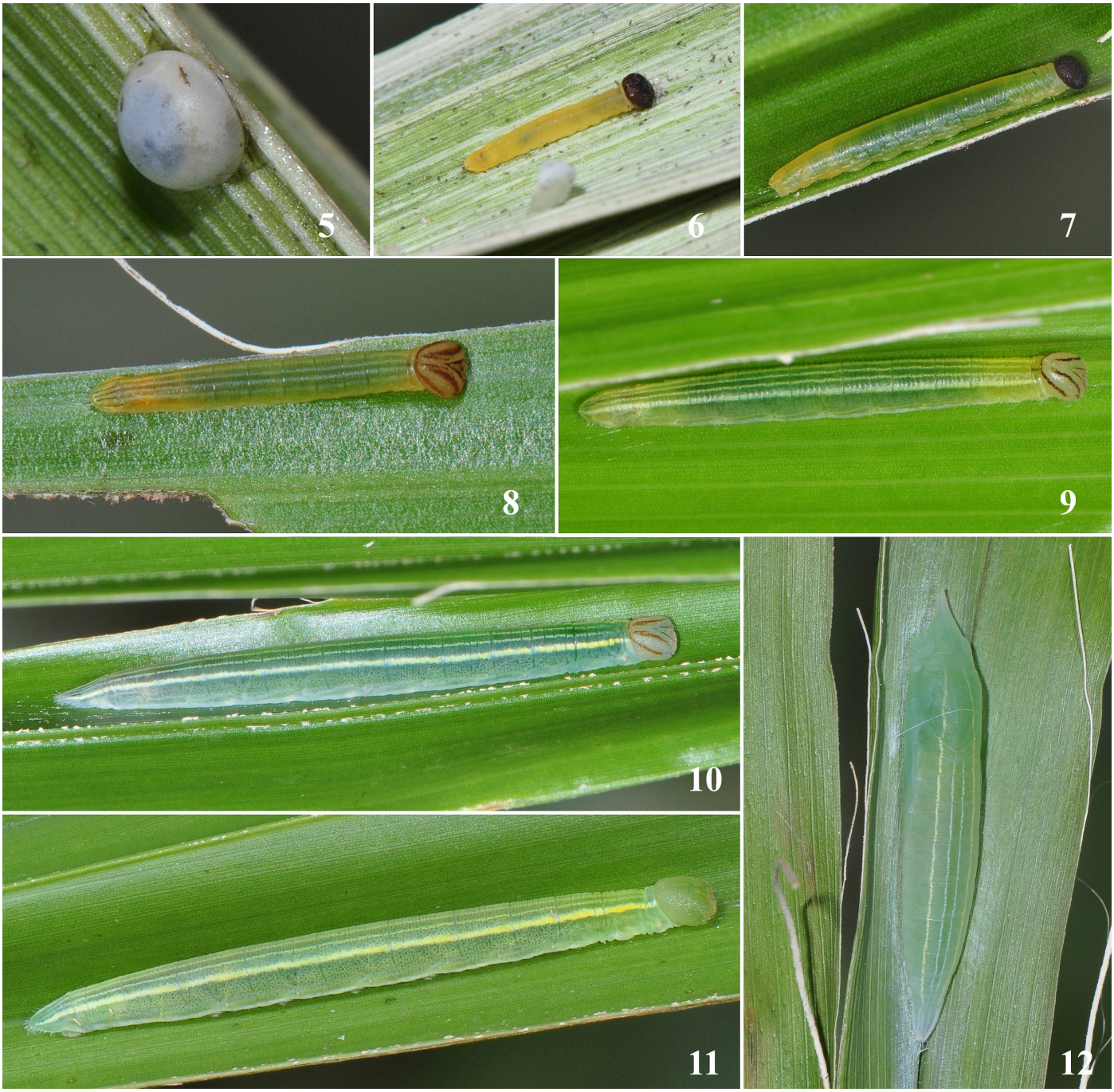
Third instar (Fig. 9). Body as previous instar, but striping stronger; visible veining along, and emanating from, spiracles. Head paler; stripes brown, narrower.

Fourth instar (Fig. 10). Body translucent bluish green; veining stronger; outer dorsal stripes light yellow. Head very pale green with narrow tan stripes.

Fifth instar (Fig. 11). Body gains yellowish overtones; all dorsal stripes yellow. Head pale green with no striping.

Pupa (Fig. 12). Green; 2 white inner stripes and 2 yellow outer stripes. Head to very narrow point.

Larvae reach approximately 5.5 cm in length. They rest on leaf blades without constructing shelters. Molting larvae sew a thick thread across the ribs of the leaf above the head area. The larvae flick their frass a large distance when defecating. Pupation occurs on the leaf blades. The pupa is formed between two leaf ribs, with a single thread sewn across the ribs near the thorax.



Figures 5-12: Immature stages of *P.evansi*. **5** Ovum (developing); **6** neonate; **7** first instar; **8** second instar; **9** third instar; **10** fourth instar; **11** fifth instar; **12** pupa.

ACKNOWLEDGEMENTS

We thank David M. Wright for providing the photographs of the pinned specimens.

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As indicated, see the back cover for Figures 13 and 14.

The Marketplace

IMPORTANT NOTICE to ADVERTISERS: If the number following your ad is "641" then you must renew your ad before the next issue if you wish to keep it in the Marketplace!

Publications, Books

Southeastern Arizona Butterflies, by Rich Bailowitz and Jim Brock, 356 pages.

This guide is an updated sequel to the ground-breaking 1991 guide by the same two authors. This new work treats in depth all 273 species recorded in the region. It features more than 700 excellent color photographs, most of living butterflies photographed in the field. It provides more than 300 regional larval host plant records. Plus, it features color images of common nectar sources, caterpillars and habitats, range maps for all but the most common and widespread species, and an illustrated comparison guide to the difficult-to-identify duskywings.

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Taxonomy, Ecology, and Evolutionary Theory of the Genus *Colias* (Lepidoptera: Pieridae: Coliadinae). Second Edition, 2020 by Paul C. Hammond and David V. McCorkle.

This book has an 8 1/2 inch X 11 inch format with a hard cover, and is 319 pages in length. It includes 10 figures and 16 color plates that illustrate nearly all of the North American taxa including 30 newly described subspecies, plus closely related Eurasian taxa. A detailed discussion is presented of the distribution, habitat, and larval foodplants for each taxon in North America. In addition, the book explores the broader theory of evolution and adaptive radiation using *Colias* butterflies as the model, and presents the new theoretical concepts of genealogy, adaptive radiation waves, and multipartite population gene pools. $110.00. Available from Paul C. Hammond, 2435 E. Applegate St., Philomath, OR 97370. email **copablepharon@gmail.com.** 642

Research

Research Request: I am preparing with Daniel Handfield (also a member) volume 2 of our book on «Les Papillons du Quebec» that will treat the so called Microlepidoptera. We are close to completing the plates. For that purpose, we wish to obtain a few aquatic females of *Acentria ephemerella* (Lepidoptera:Pyralidae) to be able to show the fin-like wings in this species. As such, we need some fresh material.

We have not been able to catch females locally and are asking the membership for help in obtaining specimens. We are willing to purchase specimens, but would, of course, accept donations. Please contact: Louis Handfield at **lscal@netrover.com** 641

WANTED, spring to summer 2022: Live specimens, any stage, of *Leptotes marina*. Preferably from populations using *Plumbago* as the hostplant. Contact Raymond White (**rrweditha@yahoo.com**) to discuss numbers, timing, delivery, & payment. 641

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

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

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

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

Canadian Wildlife Service, Prairie Region, is seeking information about observations of four species: *Melaporphyria immortua* (any obs); and *Notamblyscirtes simius*, *Hesperia pahaska*, and *Amblyscirtes oslari* (any obs from Canada, MT, ND or MN). Data will be used to help identify potential habitats and locations for future Canadian surveys and to assist with determination of Canadian at-risk status. Detailed locations do not have to be shared. Please contact Medea Curteanu, CWS Edmonton, AB; **medea.curteanu@ec.gc.ca** 641

WANTED: Hawkmoths for Research. Hawkmoths can drink liquids with very different viscosities, from water to honey. We seek to understand how this is accomplished. We are requesting hawkmoths (Sphingidae) of any species (non-threatened, non-endangered species only) from Arizona, California, and New Mexico. We request dry adult hawkmoths carefully packaged to avoid broken appendages or damaged wings. We will pay shipping costs. Proboscis images will be posted on our website, and all contributors will be acknowledged.

Contact me, Alex (Alexandre Varaschin Palaoro), to arrange shipping (e-mail): **avarasc@clemson.edu.**

Website: **https://cecas.clemson.edu/kornevlab/** 642

Equipment

WANTED TO BUY: Genitalia vials/stoppers. Formerly BioQuip catalog number 1133A; 4 x 10 mm plastic vials, w/stoppers, in units of 100 vials/stoppers per bag. Please send quantity and price information to: Terry Harrison, **nosirrah@consolidated.net**. 642

Miscellany

Tony Roberts, a continuous Lep. Soc. member since 1956 with a concentration from 1987-2010 on the moth, and in particular the post-glacial microlepidopteran, fauna of immediate coastal Down East Maine, seeks suggestions, inquiries, requests regarding residual lab equipment, reagents, 20th century micro-photographic and drawing paraphernalia, fiberoptics, slides, pins, pith for double-mounts, drawing aids, etc. and, most important, an extensive library of North American books, offprints and copies of North American papers on same, PLUS many scarce Holarctic titles. Kindly contact: Michael A. "Tony" Roberts at maroberts@maineline.net, if interested in any of the above. 641

SPECIAL REQUEST from Ranger Steve Mueller:

Editor's Note: I, and many of you, are friends with Ranger Steve. Do not hestitate to call Steve during this difficult time; he has provided his phone number and I'm sure whatever support you can offer will be appreciated.

I am Ranger Steve (Mueller). Due to multiple myeloma cancer my impending demise weighs heavy on my heart. I am downsizing materials. I am working on surviving year 24 since diagnosis.

I have 75 Cornell drawers ($25 each) and two cabinets ($600 each) with additional display boxes for sale. Most Lepidoptera have been donated to Smithsonian, Carnegie, Michigan State (where the rest will go when I pass), Milwaukee Public, Bemidji State, Gillette at Colorado State, Brigham Young, Colorado Plateau Arthropod Biodiversity at Northern Arizona, and Ottawa Canada National museums.

Journals and newsletters are available for the cost of shipping, or can be picked up. My library is available for examination. Some materials will be held until my passing.

Newsletters, journals, and magazines:

- American Butterflies and Butterfly Gardener from origin.
- The Ohio Lepidopterists Newsletters
- Lep Soc Newsletters
- Great Lakes Entomologists Journals
- Michigan Botanical Club – White Pine Chapter Newsletters
- Michigan Botanical Club Journals (Now Great Lakes Botanist)
- Young Entomologists Society Journals
- Wings - Xerces Society Journal
- Utah Lepidopterists Society Newsletters
- Michigan Audubon Journals (formerly Jack Pine Warbler and most recently became Michigan Birds and
- Natural History).
- Michigan Audubon Jack Pine Newsletter (name changed from journal to newsletter when the new MAS journal was created).
- MONA Fascicles; $999.00 for complete set (not including the three most recently published fascicles); individual fascicles may also be purchased
- Many Entomology books.
- Natural History Library book series (early 1900's) for many taxa.
- How to Know Taxonomic Keys series (mostly entomology – Botany has been distributed)
- Handbook of Nature Study by Anna Comstock.
- Johnson's Natural History Vol 1 & 2.
- The Riverside Natural History – 1884.
- Henry Thoreau Journals – two volume set
- Rickett Wildflowers of US – (Northeastern, Southeastern, and Southwest – 7 Volumes).
- Aldo Leopold's 1933 Game Management Text 1947.
- Vegetation of Wisconsin - John Curtis 1959.
- Plant Ecology Weaver and Clements -1929

Also available are NABA Michigan Butterfly Counts in Excel files (about 17 annually). Summaries are available by email as noted in the NABA reports.

Ranger Steve (Mueller), Ody Brook Nature Sanctuary, 13010 Northland Dr., Cedar Springs, MI 49319-8433 616-696-1753; **Odybrook@chartermi.net**

Metamorphosis

Scot Alan Kelley (Aug. 7, 1960 - Aug. 4, 2021)

Scot Alan Kelley, 60, of Independence, Missouri, passed away on Wednesday, August 4, 2021 at Northcare Hospice House in North Kansas City, Missouri. A Celebration of Life was held on September 25, 2021 from 12:00 - 4:00 pm at First Presbyterian Church, Westminster Hall, 417 W Lexington Ave, Independence, MO 64050.

Scot was born on August 7, 1960 in Kansas City, Missouri, the son of Arthur Raymond and Patricia Ann (Ballew) Kelley. Scot was a lifelong resident of Independence, Missouri, graduating from Truman High School. For the first 17 years of his life, he lived with his family at Drumm Farm where they worked. The farm taught him many lessons and a variety of skills he would carry throughout his life such as raising livestock and gardening. During his time on the farm, he formed life-long friendships with many of the other boys that lived and worked there with him. Some of them would come to be considered family to him.

Scot married the love of his life, Susan Brogdon on November 13, 1982, and to this union they had two children: Stephanie and Stephen. He loved dedicating time to his family, and volunteered as a room mother, leading them to change the title to "room parent". He went on to further his education later in life, receiving a Bachelor's degree in Business Administration from Park University, graduating with Summa cum laude Honors in 2015. He always wanted to continue learning and wouldn't settle for less than his best, and always had an eye for details. Those traits would lend well to his career in auditing.

Scot's true life-long passion was studying and collecting butterflies and moths. He learned from J. Richard Heitzman, a mentor and friend, about collecting, identifying, and pinning insects while in 4-H. He went on to create a museum of Entomology for the butterfly festival at Powell Gardens, where he volunteered much of his time. He also volunteered for Scouts as Scout Master. He followed in his father's footsteps by earning the honor of Eagle Scout, which he later assisted his son in achieving, and his grandson in working towards the same honor. In addition to volunteering at Powell Gardens and with Scouts, Scot participated in the church and taught many outdoor activities. He was a member of the Idalia Society, the Lepidopterist Society, 4-H Club, the First Presbyterian Church of Independence, Boy Scouts, and Cub Scouts.

There are so many things that he enjoyed doing in his free-time. He was a very approachable person who would often drop whatever he was doing if you asked him for help. Scot was a jack-of-all-trades, but if you asked him for help with something he didn't know it became a learning experience for the both of you. Scot was also an extremely creative person. He enjoyed working with wood doing everything from burning and carving to making clocks. He also enjoyed working with leather, crocheting, sewing, and taking pictures. He even made a coloring book for Powell Gardens with his family. Working with him on a project was always a unique experience with his creativity and patience, which touched so many people throughout his life and left lasting gifts.

Scot leaves so much knowledge, inspiration, and passion to those who knew him, because you couldn't help but learn something when you were around him. His legacy will continue every time someone shares what they learned from him with another and for that he will be greatly missed but always remembered.

Scot is preceded in death by his father, Arthur Raymond Kelley. He is survived by his wife of 38 years, Susan; his children: Stephanie (Brandon) Kalthoff of Independence, MO; and Stephen Kelley of Columbia, MO; his grandchildren: Brennan and Micah Kalthoff; his mother, Patricia Ann (Ballew) Kelley, of Independence, MO; his stepmother, Sharon Irene (Smith) Kelley of Independence, MO; and his brother, Glen Kelley, of Independence, MO.

James E. Keeler (1925-2014), an Alabama naturalist and Lepidopterist

The naturalist and lepidopterist, James E. Keeler (1925-2014), was mostly unknown as a lepidopterist, but was long an avid collector of butterflies. His other main interest was birds and their conservation.

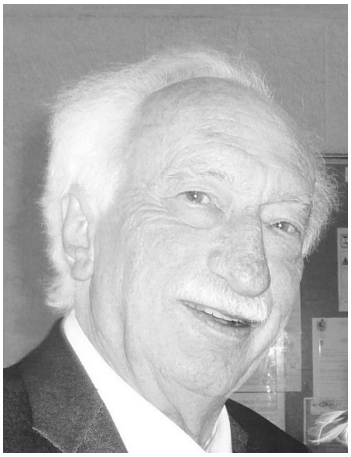
He was born in Kansas in 1925, near Wichita, in the small farming town of Valley Center, but in 1948 moved to Alabama and remained there the rest of his life. He studied at Kansas State University, Manhattan, Kansas, and received a B.S. degree in biological sciences in 1947. He went to Alabama in 1948 to fill a job to study morning doves for the Alabama Department of Natural Resources, first in Auburn and later in Montgomery, and remained with the department throughout his career. After six years as a research biologist, he became chairman of the morning dove program for the entire Southeast. Moving to Montgomery, he later became Director of Wildlife Research division for what then was renamed the Alabama Department of Conservation and Natural Resources. He retired in 1981 and kept his residence in Montgomery. In 1952, he was one of the founders of the Alabama Ornithological Society, in Montgomery. His only lepidoptera society membership was with the Lepidopterists' Society for a few years, from 1986-92.

Besides work on birds, including editing a book on Alabama birds, he made several expeditions for both butterflies and bird studies, including a three-week trip to Yucatan in 1966 and a seven-week trip to Baja California in 1983. As early as 1936, he already began collecting butterflies in his native Kansas. He did not publish anything on butterflies, but did many papers and reports on Alabama birds.

The butterflies he amassed over the years came to 3,702 specimens, all neatly prepared. His butterfly specimens were mostly from Alabama, but also many from his expeditions to Mexico, besides from Kansas and other states. The Keeler Collection was received in 2006, after he called to have them picked up for donation to McGuire Center.

J. B. Heppner, McGuire Center for Lepidoptera and Biodiversity, Florida Museum of Natural History, University of Florida, Gainesville, Florida 32611
jheppner@flmnh.ufl.edu

Louis Bigot (1927 – 2021)



M. le professeur Louis Bigot, the renowned French specialist of the Lepidopteran family Pterophoridae, has passed away in Marseille, France, on the 25th of August (2021) at the age of 94. For our North American fauna, he officialised the name *Oidaematophorus poulini* (Lepidoptera: Pterophoridae) (Bigot 2021), a first publication of the name by Bigot and Jacques Picard (Bigot & Picard 2005) being invalid according to the rules of nomenclature. His collection is housed at the Muséum d'Histoire Naturelle of Marseille, France. He is the author of many papers on Lepidoptera, particularly on the pterophorid fauna of Europe, especially of France.

He will be greatly missed by all his colleagues lepidopterists.

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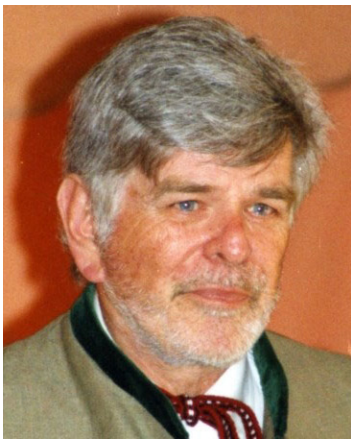
Louis Handfield, **lscal@netrover.com**

Rudolf H. T. Mattoni (Oct. 6, 1927 – Jan. 3, 2022)



On January 9, the **Los Angeles Times** reported the passing of Rudolf H.T. (Rudi) Mattoni in New York City. Longtime editor of *The Journal of Research on the Lepidoptera,* Rudi was born in Venice, CA (Los Angeles) and spent most of his life in the pursuit of knowledge about the lives and distribution of butterflies, especially blues. An Honorary Charter member of the Lepidopterists' Society, Rudi received his undergraduate degree in Entomology from the University of California, Berkeley and a doctorate in population genetics from U.C.L.A.

At the age of 20, he founded BioMetal Associates (later changed to BioQuip Products under different ownership). His company sold equipment and supplies to the entomological community. He also owned and operated several successful agricultural businesses that included habitat restoration. Perhaps most visible during this effort was the restoration of the El Segundo Dunes near the Los Angeles International Airport. Under his direction, the restoration included the rearing and releasing of endangered El Segundo Blue butterflies *(Euphilotes battoides allyni).*

Rudi was also involved in restoring native habitat of the Palos Verdes Blue at the US Navy's San Pedro Defense Fuel Supply Point following its 1994 rediscovery, where it was believed extinct since 1983. The Palos Verdes Blue *(Glaucopsyche lygdamus palosverdesensis)* is native to the Palos Verdes Peninsula in southwest Los Angeles County.

Rudi also described Elvira's Pallid Blue butterfly *(Euphilotes rita elvirae,* 1966), native to the Antelope Valley of the Mojave Desert in Los Angeles County. By the 1980s, he had also published a complete photo listing and distribution chart showing the butterfly fauna of Los Angeles County.

Most recently in his later years, Rudi remained deeply concerned about the continual destruction of natural habitats, the loss of biodiversity and the negative impacts of human-caused climate change. His passing is a significant loss to his entire family, his friends and the scientific community, most notably the Lepidopterists' Society.

A more complete obituary detailing Rudi's life and his accomplishments can be found online at **https://www.legacy.com/us/obituaries/latimes/name/rudolf-mattoni-obituary?id=32177421**

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John Rawlins and ghost moths -- an appreciation

John R. Grehan

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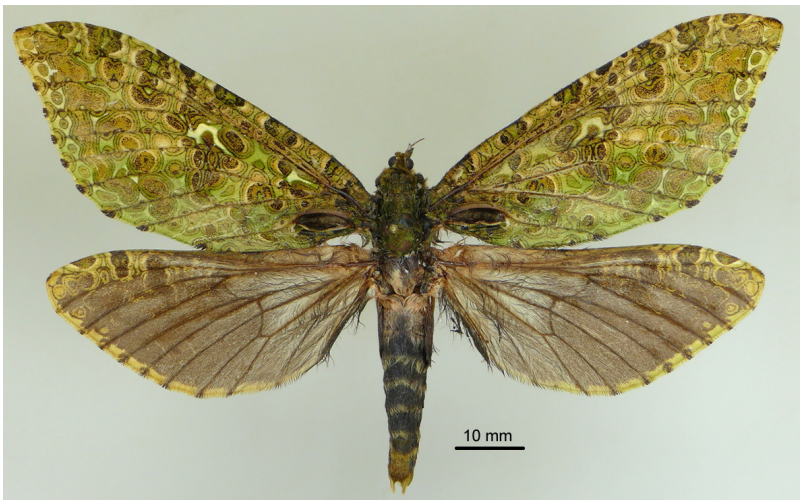
Kindness and generosity are qualities that cannot be understated for John Rawlins. These are the qualities for which I owe John a lifetime debt of gratitude. He was instrumental in helping me to make a course correction in my professional life that otherwise may have been impossible to achieve. From early childhood I was fascinated with insect diversity and became an avid collector. It would seem that I would be destined to work on some aspect of insect taxonomy. But when I started the New Zealand equivalent of grad school, my first exposure to a systematics course left me with the impression of a confused and undisciplined field beset with obscure and arcane rules. I came to the conclusion that systematics was too opaque for my practical research orientation. I guess I wanted science to be as solid as the specimens I collected. So I was left with 'ecology' and focused my graduate thesis on the ecology of an individual ghost moths species (*Aenetus virescens).* But it was not really the best fit, and even then I allowed myself the distraction of extending my studies to comparative biology in other ghost moths species. A compounding problem was making the 'mistake' of adopting panbiogeography, a controversial research program that was an anathema to the scientific establishment in New Zealand and remains the subject of approbation to this day.

As far as I was concerned, the good thing about panbiogeography was its focus on distribution of taxa, the nature of differentiation which is at the heart of systematic theory. But I was stuck. As one prominent Lepidoptera systematist bluntly informed me, no one would support a postdoctoral study in systematics after having degree in ecology. Ten years later, after more or less wandering the intellectual wilderness, John Rawlins would prove otherwise. As in all things, change comes down to circumstances and opportunity that are often effected by more than one individual. In 1997 I was fortunate to be accepted by Ke Chung (KC) Kim at the Pennsylvania State University as an Assistant Curator for the Frost Entomology Museum. KC was not at all fazed by my eccentric background and interest, and my application was enhanced by support from John Rawlins who knew KC very well.

These circumstances fell together in a remarkable way. In 1988 I had arrived in Vermont for contract research on ghost moth impacts on high elevation forest decline. This was followed by my first meeting John when he and Bob Davidson came up from the Carnegie Museum to examine an insect collection at the local university. At that time I was a rather jaded personality, having felt rather battered and bruised by the nature of intolerance towards panbiogeography experienced in New Zealand. And yet even then John somehow saw something of value in me and expressed a willingness to assist me where possible in the future. From that point we remained in periodic contact, and some years later when I made my first effort to work on a systematics project, John willingly provided his knowledge and skills to develop a credible proposal for a Smithsonian program (in collaboration with Don Davis). Even though this effort was unsuccessful, it was an example of how John was willing to expend time and effort on the behalf of someone like me who was out of step in research background and interest.

The Assistant Curator postion afforded a new opportunity to develop skills in taxonomy and systematics to study ghost moths. And this was only possible because John readily agreed to be involved, to provide instruction, and especially his professional credibility that would allow me to borrow specimens from other institutions. Geographically we were also fortunate to be in sufficiently close proximity (three-hour drive) for regular collaboration. And most critically, he made available the Carnegie Museum's research collection of ghost moths. Although this collection was relatively small, there was an entire drawer of specimens of one 'obscure' Central-South American genus (*Druceiella*) comprising only four named species, and therefore potentially manageable as a beginner's project. From there John proceeded to spend many hours with me, going over details of morphological description, how to look for features that may provide species distinctions, and especially details of dissection technique. Through all of this he was ever patient and made an outstanding instructor. To say that I felt blessed would be putting it mildly.

We might have made rapid progress if it were not for the reality that our respective positions also had other demands on our time. And then I had to move to another institution with a different set of employment priorities. But 20 years later the work was finally completed and published (Grehan & Rawlins 2018). We also managed to describe a new genus of Hepialidae for one of the largest and most striking ghost moths ever found in South America (Grehan & Rawlins, 2016). During this time I became increasingly familiar with ghost moth taxonomy and systematics in general, to the point where I would be able to make further progress on my own initiative. Throughout our collaboration, and various other interactions, I came



Viridigigas ciseskii Grehan & Rawlins, 2016 from Peru. Male specimen showing specialized scent glands on the forewings.

to appreciate the wonderful outlook John had on life and on science. He always took a realistic, but ever positive, approach to everything. And he was always generous to me in both his time and his professional knowledge. At one point during my ghost moth work I became sidetracked by an opportunity to describe the larval morphology of a Mexican species (*Phassus*) as I had worked on this aspect in my earlier 'ecological' study in New Zealand. In this effort I was once more amazed by John's focus and sharp intellect as he applied his general knowledge of larval chaeototaxy to an intensive review of every seta and microscopic pit on the beast, and he also provided the skills of the Carnegie Museum's entomological artist (Jane Hyland) to illustrate the morphology. The final result is probably the most comprehensive study of larval morphology of any ghost moth to date (Grehan & Rawlins 2003).

Another critical quality that made our collaboration possible was that he really was someone with an opon mind. Here I was, a radical panbiogeographer (is there any other kind?) with a perspective at odds (other than a handful of like-minded enthusiasts) with just about everyone else (and sufficiently threatening to qualify for overt suppression – see *Systematic Biology* 62: 494–498). John, on the other hand, had a pretty much orthodox education on such matters as biogeography and evolution. One would think this would be a poor foundation for close collaboration. But John was exceptional. He listened to my biogeographic arguments with graciousness, tolerance, and above all, respect. This response included controversies in systematics such as my interest in the morphological evidence for a human-orangutan sister group (Grehan & Schwartz 2009). I think John had a broad fascination with life that was open to the vast range of possibilities for interpretation.

My personal interactions with John described here barely scratch the surface of this remarkable person, and no doubt others will have far more detailed and insightful reminiscences. But the brief annotations I describe here are central for me and my life's work in ghost moth taxonomy. I was pleased to name a new species, *Pfitnzeriella rawlinsi* Grehan & Mielke, 2018, (Grehan & Mielke 2018) as a small token of my gratitude and appreciation for his setting me on course for a taxonomic and systematic project that will hopefully last to the end of my days. I see this effort as one branch of the intellectual growth that John no doubt made possible for many others as well. He will always be a part of my work. Whenever facing difficult or complex situations with people, I try to recall how John would look at such circumstances and how he would respond. In that way he is helping me still. Perhaps his best message for me is the way he would often sign off – 'More moths, more glory!" And so it is.

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John Grehan (left) and John Rawlins (right) working on ghost moth dissection at the Carnegie Museum of Natural History. Probably 1998.

Digital Collecting:

Butterflies of the Atlantic Forest of southeastern Brazil

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This article is based on a butterfly photography holiday from January 22 to February 12, 2015. It was organized by Richard Raby, with Kim Garwood, Tony Hoare and myself as participants. Thanks to Kim for allowing me use parts of her Brazil trip report in the narrative.

This trip summary is presented chronologically in 7 parts: 1. Estrada Fazenda Bananal – Estrada de Limao; 2. Sierra da Bocaina; 3. Upper Itatiaia National Park; 4. Forestal Nacional Passa Quatro-Cachoeira de Ipora waterfalls; 5. Fazenda Boa Esperanca; 6.Campos do Jordao – Pico de Itapeva – Pedra do Bau; and 7. Lower Itatiaia National Park.

The Atlantic Forest is characterized by high biodiversity and endemism that extends along the Atlantic coast of Brazil from Rio Grande do Norte state in the northeast to Rio Grande do Sul state in the south and inland as far south as Paraguay and the small Province of Misiones in Argentina. The ecoregions in this area include: 1. Restinga: a closed canopy forest that grows on stabilized coastal dunes; 2. Open Restinga: savanna-like formations with scattered clumps of small trees and shrubs with an extensive layer of herbs, grasses, and sedges; 3. Seasonal tropical moist Submontane, and Montane lowland forests; 4. Tabuleiro forests found over very moist clay soils; and 5. Tabuleiro savanna's occurring over sandy, faster-draining soils. Both Tabuleiro areas are humid areas that rely on water vapor from the Atlantic Ocean.

Further inland is the Atlantic dry forest forming a transition between the arid Caatinga to the northeast and the Cerrao savannas to the east, with a high abundance of deciduous trees. This area has less diversity than the tropical moist forests. Over 88% has been deforested, threatening many plant and animal species with extinction.

The Atlantic Forest is unusual in that it extends as a true tropical rain forest to latitudes as far as 28°S, nutured by the trade winds producing precipitation throughout the southern winter.

Brazil has around 3300 species of butterflies (Brown, 1996b) with about 2100 species found in the Atlantic Forest. Around 40 percent of its vascular plants and up to 60 percent of its vertebrates are endemic species.

On January 22nd Kim Garwood, along with trip organizer and bird/butterfly guide Richard Raby (a Brit and part time Taxi driver in Cambridge, England) picked up myself and another Brit, Tony Hoare, from the Rio de Janeiro airport. From there, we went to Richard's house in Marica.

Map of locations we visited during this particular trip.

In the early Sixties I remember my mom serving food from a wood and glass tray decorated with butterfly wings that has been in the family for decades. This tray spoke to me as a young boy of places which were unimaginably exotic and impossibly far away. Butterfly-wing art was a popular indigenous art form in Brazil, particularly Rio de Janeiro and other parts of South America from the late 19th to mid-20th century. Morpho butterflies

Butterfly wing trays from Bill Bethet's personal collection.

were farmed extensively for use in these popular art forms, fostered by tourism. These pieces included many other species of butterflies found in the rainforests of the American continent. The hallmark of butterfly-wing artwork is the striking iridescent and luminous blue and green tones of the Morpho's butterfly wings – that diffract and scatter light, making it appear to change colors. Many of these trays and other works of butterfly-wing artwork could be found in a "cabinet of curiosities" in America and Europe.

The process used various colors, shapes, patterns, and sizes of butterfly wings, laid out in intricate patterns on a backing board that used newspaper as a filler when pressed down under glass. The entire piece is set into a dark hardwood tray with lighter-toned inlay. The trays when taken apart could sometimes be dated by viewing the newspaper. With great skill and craftsmanship, the artist created the scene with reverse painted glass depicting various well know sites (Sugar Loaf Mountain – Statue of Christ The Redeemer) in Rio de Janeiro, along with sailboats, birds, animals, checker-chess board designs, flags, maps of countries, Masonic compass and square motifs, along with many other images. Blue Morpho butterfly wings were used to create the iridescent blue and purple water and clouds, with the craftsman framing the scene with either Mahogany or Rosewood surrounded by inlayed Teak marquetry mainly in an Art Deco design.

Monkey Puzzle wood butterfly art table.

The very seldom seen Monkey Puzzle wood from the critically endangered Brazilian Pine (*Araucaria angustifolia*) was used to make butterfly art tables. The Parana Pine is native and found in the states of Minas Gerais, Rio de Janeiro, Sao Paulo, Parana, Santa Catarina and Rio Grande do Sul. The wooden table in the picture features contrasting reddish knots originating from the evenly spaced, horizontal spreading branches that are arranged in whorls around the trunk. This table was created in Rio de Janeiro by Carlos Zipperer Sobr in 1923.

Later that first evening he took us to a German Restaurant where we stuff ourselves with sausage, pork loin, sauerkraut and potatoes while swapping stories.

A fine meal of rich German food.

Above: *Parides ascanius, Narope cyllastros, Dynastor darius.* Right: *D. darius*, upperside.

The next morning after a hardy breakfast, we all piled into Richard's 4-wheel drive, manual transmission, silver colored Jeep, first stopping about a ½ hour away at several very large bushes of blooming Lantana trying to get clicks of the showy, vary rapid flying, Swallowtail *Parides ascanius*. There were no decent clicks taken. Later we walked along a shady trail in an Urban Restinga fragment bordering a lagoon where we rustled up several *ascanius*, with one wanting to be famous that posed for many good clicks. This vulnerable Fluminense Swallowtail is endemic only to the municipalities of Atafona (Sao Joao de Barra) and Itaguai. The adults fly all year, with the larvae feeding on the Pipevine (*Aristolochia macroura*) in its preferred wetlands, near its favorite nectar source *Lantana camera.*

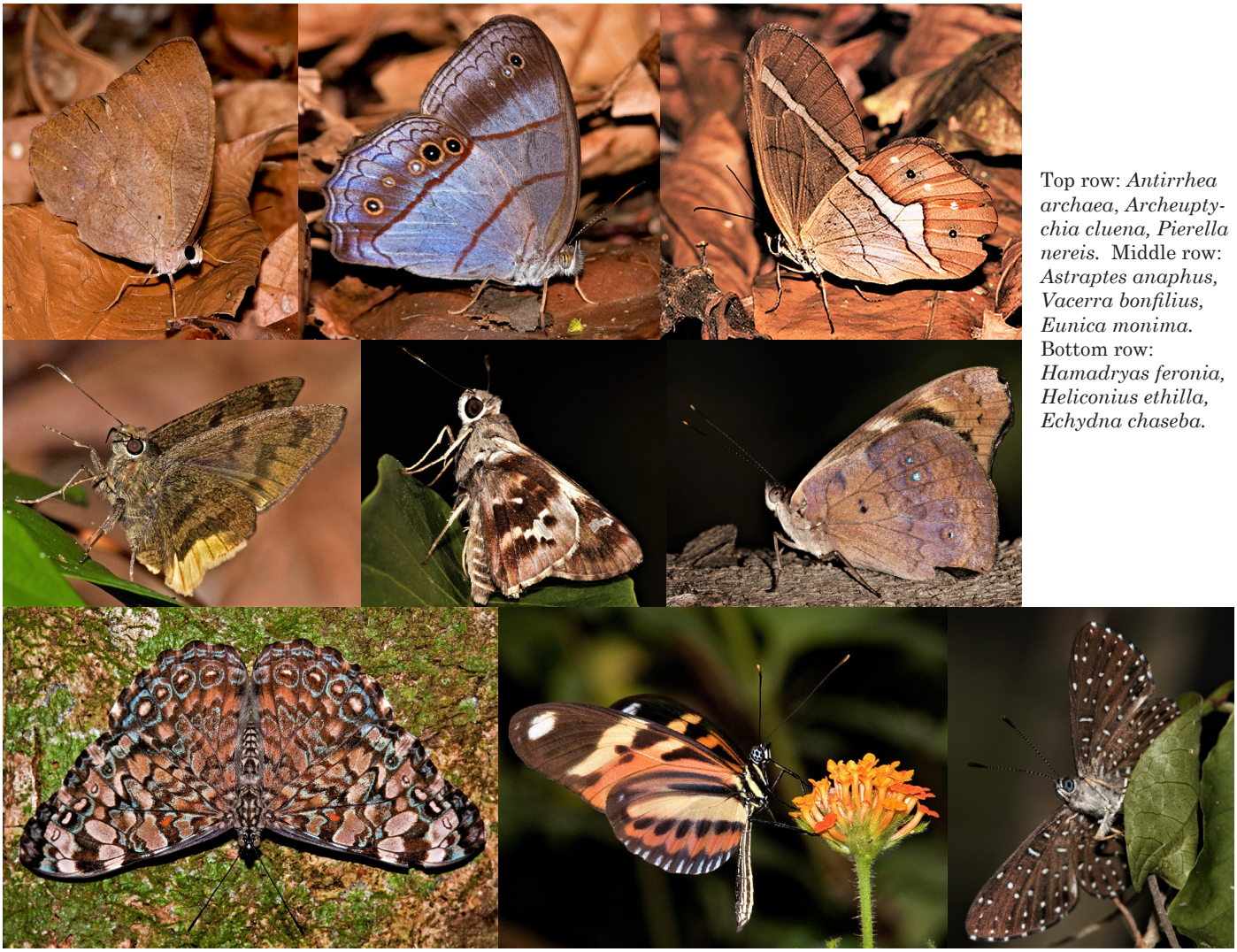
What a great start.

That evening around dusk we drove up to a 320m hang gliding spot, with hundreds of twinkling lights around the bay, looking for the late-evening loving *Dynastor darius*. Along the way, before it got too dark, we spotted a pair of erratic flying *Narope cyllastros* that finally landed for a click.This area is very dry. As it was getting darker, we headed up a partially closed canopy trail observing the lightning fast *D. darius* bolting by us as it zipped up and down the trail, making it impossible to photograph. Richard nets one so we can get both dorsal and ventral shots.

January 24th, while still in the Marica area we drove to the extremely dry areas of Estrada's Fazenda Bananal and de Limao, where we photographed the ground hugging *Antirrhea archaea*, a striking *Heliconius ethilla*, the Yellow-tipped Flasher (*Astraptes anaphus*), Variable Cracker (*Hamadryas feronia*), *Archeuptychia cluena*, and a worn *Pierella nereis.*

Late evening view, overlooking the bay near Marica .

In the morning we headed northwest for the 4 hour drive towards our next ecolodge, Estalagem da Bocaina, located N.E. of Serra da Bocaina National park. It was sunny and hot when we stopped at a small, very dry habitat along the way. Very few butterflies or any other insects were seen, but we did snag a Bonfilius Skipper

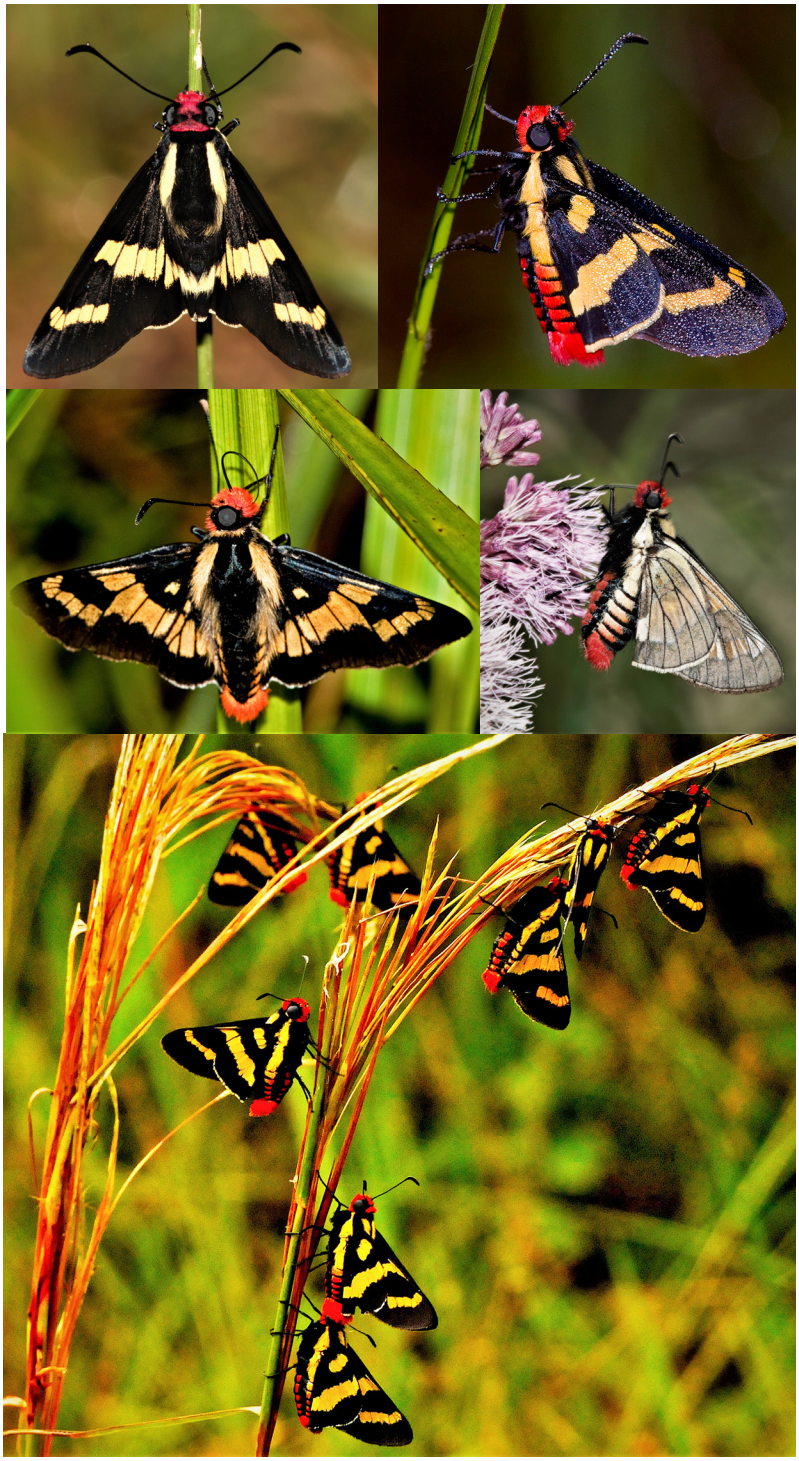


Top row: *Antirrhea archaea*, *Archeuptychia cluena*, *Pierella nereis*. Middle row: *Astraptes anaphus*, *Vacerra bonfilius*, *Eunica monima*. Bottom row: *Hamadryas feronia*, *Heliconius ethilla*, *Echydna chaseba*.

(*Vacerra bonfilius*) the Starry Night Metalmark (*Echydna chaseba*) and the Dingy Purple Wing (*Eunica monima*).

Estalagem da Bocaina has very interesting habitat. Located in a small and narrow, grassy, shrub-filled, relatively flat area, bordered on all four sides by seasonal tropical moist lowland forested mountains with a nearby lake and stream, this area kept us busy for the next 5 days. Weather patterns here were generally bright sunny mornings with clouds building and rain by 1 pm. The accommodations included basic rooms with community toilets and showers. However, nearby was the very good Estalagem da Bocaina Nelsi Restauarant with good family service and homemade meals, with trout being a customer favorite.

The Estalagem da Bocaina area.



Top: *Sarbia damippe*, upper- and undersides. Middle: *Sarbia xanthippe spixii*, upper- and undersides. Bottom: Roosting *S. damippe*, photo by Richard Raby and used by permission.

In the light rain we drove up the track (1200m) and parked near a spot where the Damippe Firetip (*Sarbia damippe*) have roosted in numbers in the past . . . and, hooray, they were there!

There are 8 species of *Sarbia* firetips, a neo-tropical genus in the family Hesperiidae. *Sarbia damippe* roost in numbers from 1 to around 10 that cling to 1-2 foot tall grass/reeds growing in a 50 x 50 foot marshy area in 2 to 5 inches of water, surrounded by 4 to 10 foot high shrubs. The *damippe* typically roost 6 to 18 inches off the ground in this water filled marshy area. This helps to keep some predators at bay, although they can be vulnerable to flying predators.

Some butterflies in this genus are able to rotate their head 90 degrees (see first image, middle row, left) giving them the ability to preen themselves of morning dew, and additional predator protection. In the rain I get clicks of *S. damippe* and later Xanthippe Firetip (*S. xanthippe spixii*).

The next few days we got clicks of the very large, beautiful Sky-blue Hairstreak (*Pseudolycaena damo*), Mangrove Buckeye (*Junonia genoveva*), the striking Vivid Painted Lady (*Vanessa myrinna*), *Mimoides lysithous*, Waiter Daggerwing (*Marpesia zerynthia*), Orange-barred Sulphur (*Phoebis philea*) and the day flying Owl butterfly *Blepolenis batea*.

One afternoon, exhausted from hiking up a steep zig-zagging trail to the top of a forested hill, I found the shy *Pseudodebis ypthima* hiding in a dark area that I can't get in automatic

Top: *Pseudolycaena damo.* Bottom: *Junonia genoveva.*

Top row: *Vanessa myrina*, *Mimoides lysithous* (upper- and undersides). Second row: *Marpesia zerynthia, Blepolenis batea, Pseudodebis ypthima.* Third row: *Morpho portis, Synargis paulistina, Noctuana diurna.* Bottom row: *Memphis mora, Mimoniades versicolor* (upper and undersides).

focus. So using manual focus, I took one shot with a flash, which the butterfly did not like, and it disappeared back into the forest. Backtracking down the trail it started to rain very heavily. Luckily I had my umbrella and popped it open, with a mile walk back to the lodge still in front of me. Other goodies in the area included *Morpho portis*, *Synargis paulistina*, *Memphis mora*, and the cryptic, small tailed, flat winged skipper *Noctuana diurna*. And next to the lodge, I got images of the incredible Versicolor Skipper (*Mimoniades versicolor*).

The next morning we drove 25km back to Bananal then headed up the main Sao Paulo to Rio highway. We continued west for 30-40 minutes, up to Itamonte over a 1,666m pass and down the other side to the country like hotel Pousada Ribeirao do Ouro where we stayed for several days. The owners had a new custom built cooking area. We were served a delicious trout dinner with capers, mushrooms and chopped almonds, plus a tray of veggies.

Today could be exciting driving the Agulhas Negras road (1900m) in upper Itatiaia N.P. looking for the fabulous *Polygrapha suprema* that cruises above the road looking for fox feces to feed on.

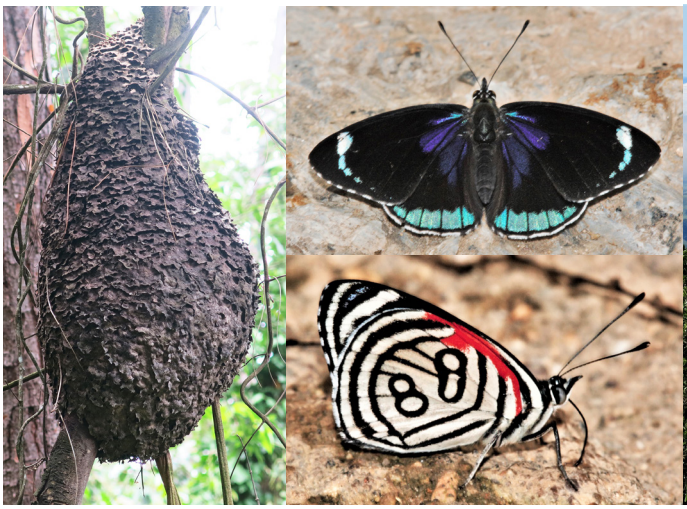
Itatiaia Nat'l Park (pronounced It-ah-she-ah in English, Ee-tah-she-I-ah in Portuguese) is the oldest national park in Brazil, created in 1937 and home to over 350 species of birds. The park is in the Mantiqueira Mountains with altitudes from 540 to 2,791 meters. The park has parts of the municipalities of Itatiana and Resende in Rio de Janeiro state, and Bocaina de Minas and Itamonte in Minas Gerais state. The higher part of the park contains the origins of 12 river basins that supply the Rio Grande, a tributary of the Parana River, and the Paraiba do Sul, the most important river in Rio de Janeiro state. The lower part of the park has lush Atlantic Forest vegetation, and wide rivers with natural pools and waterfalls. The park is surrounded by the Serra da Mantiqueira Environmental Protection area which provides an ecological buffer zone for the park.

We put bait out in several places but not much was flying. Finally we saw a *P. suprema* flying above. We quickly stopped the jeep I sprayed lots of rotten shrimp bait along the road. The butterfly circled around Richard and landed on the bait. Tony and I sneaked up and got dorsal and ventral shots. The adrenalin flow was very high! We drove higher up the road getting clicks of a White-spotted Prepona (*Archaeoprepona amphimachus*), *Pampasatyrus gyrtone*, and the very dark satyr *Praepedaliodes exul* with a white squiggle on the costa.

The next day Richard found a fresh Charybdis Firetip (*Pyrrhopyge charybdis semita*) high up on a bush. He drove his Jeep under the bush and climbed on the hood to get good shots.

The weather turned cloudy, foggy, and cool. We got back to the hotel for a special dinner, with the owners serving 3 kinds of soup -- my favorite was a bean soup with beans and wieners. Later that night the family set up a large screen TV (with beer and snacks) to watch the Seattle Seahawks play The New England Patriots in Superbowl XLIX. You may remember this, but just in case: The Seahawks threatened to score a winning touchdown from New England's 1-yard line, but a pass was intercepted in the final moments by Patriots cornerback Malcom Butler. The Brazilians spent more time on their phones than watching the game, however . . .

Top row: *Polygrapha suprema* (left and center), *Archaeoprepona amphimachus*. Bottom row: *Pampasatyrus gyrtone, Praepedalioides exul, Pyrrhopyge charybdis semita*.



Left: Large wasp nest. Right: *Diaethria candrena.*

Passa Quatro pass.

The next morning, we passed a large wasp nest while driving over Passa Quatro, ending up at the Cachoeira de Ipora waterfalls in Forestal Nacional Passa Quatro. We got ventral and dorsal clicks of a Candrena Eighty-Eight (*Diaethria candrena*) after a 30 minute chase.

On February 3 we departed for one night at Fazenda Boa Esperanca, driving over the Passa Quatro pass from Minas Gerais State to Sao Paulo State, and stopping at the top with spectacular views. At the pousada (1400m) we found the swallowtails *Eurytides bellerophon* and *Heraclides hectorides* mineralizing in the muddy driveway, along with an Ocyalus Skipper (*Mimoniades ocyalus*).

After a leisurely breakfast we headed towards the upscale resort town of Campos do Jordao in Sao Paulo State. It stayed cool and overcast all day, sprinkling at times, so we saw very few butterflies. Finally, we arrived at the Hotel Pousada Vale Verde. Later that afternoon we headed to the fancy looking Churrascaria ou Vivo restaurant Parillia Argentina. There is a large "Rums of the Caribbean" sign near the bar. We ordered Caparinas. While the guys waited for their giant steaks to be cooked, Kim ordered lasagna and a delicious pear and gorgonzola salad. The meat was tender and full of flavor. Kim's lasagna was ok, but, hey, who orders a pasta dish at an Argentinian Steak House!

After lunch Richard, Tony, and myself headed up the road, passing the enormous Hotel Gura, to Pico do Itapeva to find a special satyr. It was very windy, but we got several looks as they sailed by us in the wind.

Above: *Heraclides hectorides.* Above right: *Eurytides bellerophon.* Right: *Mimoniades ocyalus.*

Left: *Pampasatyrus reticulata.* Above: *Pampasatyrus reticulata* habitat. Right: *Nicolaea schausa.*

The next day it was raining, at times quite heavily, so we played tourist. We went shopping then headed to the Alligator place for fondue and pizza . . . which had no pizza so we ended up at a Swiss/German Restaurant. Afterwards, we stopped at a tasty chocolate shop, where we took selfies of us standing in front of a wall of cascading chocolate.

February 6 we drove 45 minutes or so to Pedro do Bau (1780m) looking for *Sarbia* firetips. We had no luck, so we went down into a valley and waded through very tall grasses into a marshy area, where a spectacular orange banded satyr covered with black and creamy colored spots was cruising around. The problem was that you could hardly move among the tall grasses and when you got near this satyr it just disappeared into the grass. It started to rain so the others hiked back up the hill to the jeep. I stayed in the light rain for 15 or 20 minutes more. Thankfully the sun came out and all of a sudden one of the satyrs came to bask on a blade of grass. I got 2 clicks before it bolted by me not to be seen again. Andres Freitas later identified it as *Pampasatyrus reticulata.*

In the afternoon we went back to Pico de Itapeva (1700m). Instead of going up the hill, we slid down the embankment, with shorter grasses and some flowering vegetation, into a marshy area to observe a small brown butterfly (*Nicolaea schausa*) nectaring. Sloshing through the marshy area we get a couple of shots while the tall flowers are swaying back and forth in the wind. Two very special bugs in what ended up an exciting day. It's not always quantity but the quality of bugs that count.

Later that day we took the 3-hour drive to the Hotel Donati for 5 nights in the lower part of Itatiaia National Park.

In between cloudy skies and rainy weather we worked the areas around the waterfalls at Rio Campo Belo, the triangle below Hotel Donati, the waterfalls below Hotel do Ype, and the areas around the Old Simon Hotel, capturing images of a Broad-banded Swallowtail (*Heraclides astyalus*), the bright yellow spotted Blue-frosted Banner (*Catonephele numilia*), Turquoise Emperor (*Doxocopa laurentia*), Blind Eighty-eight (*Haematera pyrame*), the brilliant green *Chalybs chloris*, Argon Skipper (*Argon lota*), Pohl's Skipper (*Phemiades pohli*), and *Levina levina.*

Along the road the bamboo was fruiting and flowering, and we observed the Buffy-fronted Seedeaters eating seeds and calling each other. This is a rare bird found only around seeding bamboo.

Parque Nacional do Itatiaia sign and habitat.

The afternoon before our last day we visited an artist's home/studio just down the road from the old Simon Hotel. The couple who lives there both do amazing art work. He's Australian and she's Brazilian. Check out christianspencer.pro.br.

Our last morning was gorgeous and sunny. We checked out of the hotel and drove directly to the airport in Rio. My flight left at 11 pm. Tony's was delayed and left around 2 am. Kim headed back to Marica with Richard.

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Estalagem Da Bocaina Nelsi, Trip Advisor

Left: *Heraclides astyalus, Doxocopa laurentia.* Center: *Catonephele numilia, Haematera pyrame, Levina levina.* Right: *Chalybs chloris, Argon lota, Phemiades pohli.*

Announcements:

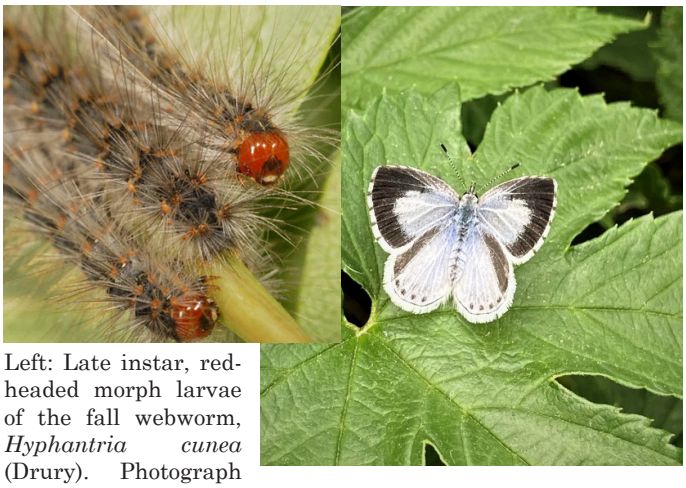
The Ron Leuschner Memorial Research Fund awardees for 2022

The three awardees for this year are Abigail Robinson, Claire Guzinski, and Abbey Swift. Their brief research proposals are as follows:

Abigail Robinson -- Climate change can drive phenological mismatch, which has the potential to disconnect ecological processes from evolutionary responses in Batesian Mimicry complexes where temporal dynamics are crucial for predator learning. To understand the temporal dynamics of learning, I will assess model and mimic phenology across a Batesian model's geographic range.

Claire Guzinski -- Nighttime heatwaves may render insects unable to recover from high daytime temperatures, thus exacerbating the effects of daytime temperature extremes. With funds from the Ron Leuschner award I will investigate how diet quality can mediate the effects of elevated mean temperatures and nighttime heatwaves on an extreme generalist herbivore: the Fall Webworm (*Hyphantria cunea*).

Abbey Swift -- The Hops Azure (*Celastrina humulus*) is a rare butterfly species that often forms a relationship with ants while in its larval stage. Ants provide protection in exchange for nectar secreted by the larvae. My research will determine how environmental factors predict the likelihood that larvae form this ant association and the benefits of the relationship to this endemic butterfly.



Left: Late instar, red-headed morph larvae of the fall webworm, *Hyphantria cunea* (Drury). Photograph by Lyle J. Buss, University of Florida (see Claire Guzinski, above). Right: The Hops Azure (*Celastrina humulus*) on a Wild Hops leaf. Photo by Abbey Swift, taken along Monument Creek in Colorado Springs, Colorado (see Abbey Swift, above).

Lep Course returns! 23 July - 1 August 2022

Please join us at the beautiful Southwestern Research Station for a return to in-person instruction. Details and application available on **www.lepcourse.com**.

Searching The Lepidopterists' Society Season Summary on SCAN

Brian Scholtens and Jeff Pippen

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 provide below 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 it through The Lep Soc 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

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!

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. Be looking for information in the next SKL Newsletter about this year's meeting as virus protocols may require a different format, as it did last year. Also, follow the Society's facebook page (https://www.facebook.com/societykentuckylep/) for announcements of this and potential 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, which may change venues and times year by year as the ATL often shares a venue with the Southern Lepidopterists' Society, as well as The Lepidopterists' Society, for their meetings. 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.

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**

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.

Correction to Winter 2021, pgs. 177 – 179

I (James Adams, the editor) forgot to include some VERY important information in the article "The fire this time: the coast range burning." by Art Shapiro. He provided me with the names of the people who took the images, but I neglected to connect those names with the images when published. Here are the appropriate acknowledgements:

The three images on page 178 labelled "Gates Canyon after the fire" are by Kathy Keatley Garvey on Sept. 25, 2020. The three on page 179 were taken by Stephanie Penn on June 16, 2021.

My apologies to Art, Kathy, and Stephanie!!

Lep Soc Statement on Diversity

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

Observation of seasonal adult "forms" and intermediates of *Ministrymon leda* (W.H. Edwards, 1882)

Bill Beck

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(photos by the author unless otherwise indicated)

Overlapping seasonal forms of *Ministrymon leda*: intermediate nr. Summer form (left) and Winter form (right), photographed October 23, 2021 at the Nogales, AZ airport.

Introduction

I live in Tucson Arizona, where sightings of the butterfly *Ministrymon leda* (Leda) can happen every month of the year (1). With a camera in hand, I've had a chance to take many pictures over some years. These pictures illustrate Leda's seasonal polyphenism, where distinctly different phenotypes are produced by the same genotype. It's quite amazing; and so I thought I'd share some of these pictures! (No matter how it happens…..it is interesting that mother nature can do this!)

The Leda seasonal color shift is dramatic. Early on it was believed that the winter color form was a different hairstreak species from the summer form! There are two "new species" descriptions from W.H. Edwards in 1882, one for (*leda*), now the summer form, and another separate description for (*ines*), now the winter form (2).

This duplicity was not realized for 86 years, until 1968, when correspondence between F. Martin Brown and Kilian Roever discussed and redressed the Leda seasonal forms. It is documented by Brown and Paul Opler in "Transactions of the American Entomological Society" March 1970 96(1): 19-77. (3).

Kilian Roever's input is very inciteful and important to my photos; especially note his word "Intergradation". I include Kilian's quote from Brown's paper here:

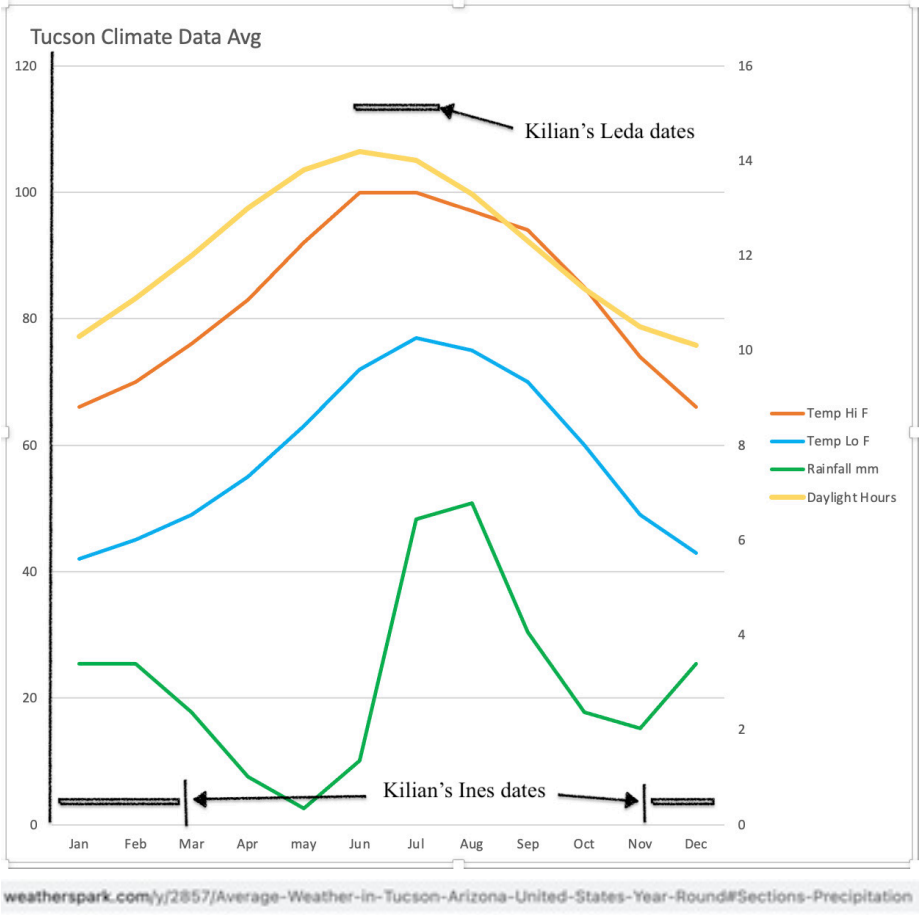


Figure 1: Tucson Climate Data with Seasonal Form Dates

"*Ines* appears to be no more than a cool weather (or short day length) form of *leda*. Intergradation between *leda* and *ines* occurs in both the spring and fall, but is more apparent in late September and early October. General flight periods in southern Arizona appear to be as follows: late March -- early May (*leda* and *ines*); June -- early August (*leda*); and September – early November (*leda* and *ines*). The brood sequence appears to be much more sharply delineated in central Arizona."

I downloaded Tucson climate data (Fig. 1) to show correlation to Kilian's observations: the *leda* dates definitely align with Tucson high temp./long day length and the *ines* with annual low temp./short day length. From the Tucson data, any wet/dry association is less clear to me.

Basic Wing Elements

From Nijhout's wonderful butterfly wing pattern book, he shows that wing color elements are controlled independently ventral/dorsal, in each wing, and in each wing cell bounded by veins. Here I'm using LEDA wing pattern elements (Fig. 2) as defined in Nijhout's diagrams (4).

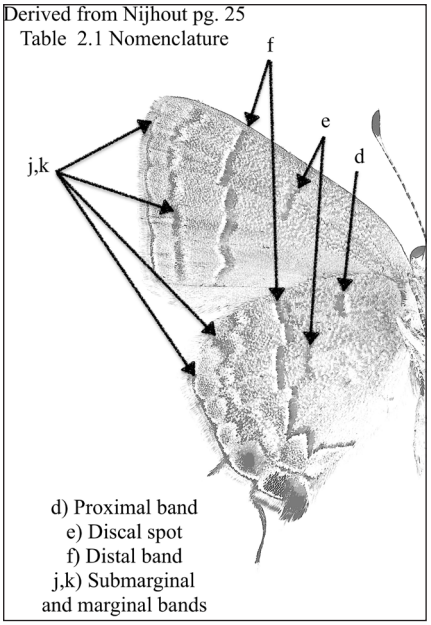


Figure 2: Leda Wing Pattern Elements

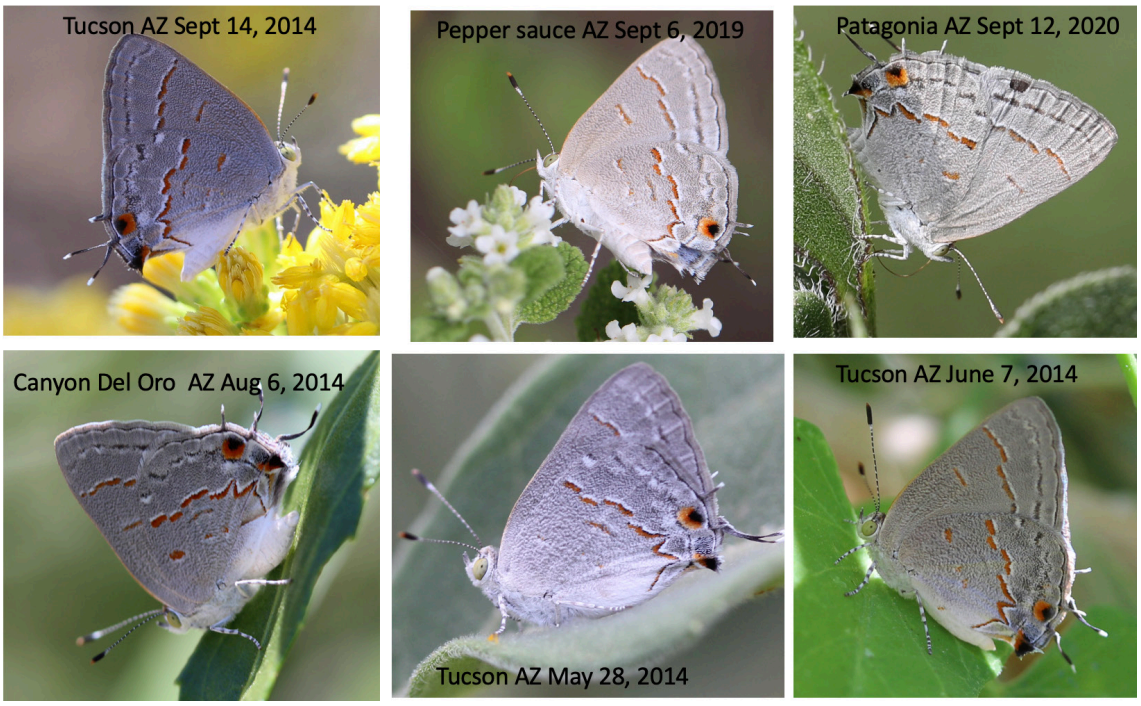


Plate 1: "Summer" form images

Methods

I sorted through my photos of about 230 different wild Leda individuals taken throughout the year around southern Arizona. Using Edwards descriptive work and Kilian's insight I drafted a "criteria set" (see Table 1 below) delineating each of three identifiable groupings: Summer Form, Winter Form, and everything else - Intermediate Form, (Kilian's "Intergradation"). The criteria set was a grouping of the color of characters used in Leda descriptions, characters visible viewing the ventral side (as captured in the photos on plates 1, 2, and 3).

In looking at the three plates, you can clearly see the Leda wing **pattern** stays in place, BUT the **colors** expressed on these elements change!

Table 1: Leda Photo Sorting Criteria

Character		Summer	Winter	Intermediate
1	Eye color observed	Clear green	Dark wheat color	Either
2	Wing base color	Clear light gray	Ash grey color mix	Either
3	d) Proximal band (central symmetry system)	Red, edged with black & white	Black, edged with white	Either or mixed colors
4	e) Discal spot color hindwing and forewing	Red, edged with black & white	Black, edged with white	Either, mixed or separate colors
5	f) Distal band color hindwing and forewing	Red, edged with black & white	Black, edged with white	Either, mixed or separate colors
6	Anal spot and thecla spot	Black and large with red/w orange halo	Overscaled and not visible	Many variations inbetween
7	j,k) Submarginal and marginal band colors	Black and crisp colors	Gray and nr not visible	Many variations inbetween
8	Postmedian area frosted	None	Both areas fore and hind	None, one or both areas
9	Central symmetry system band color	None, same as base color	Heavily darkened	None to almost black

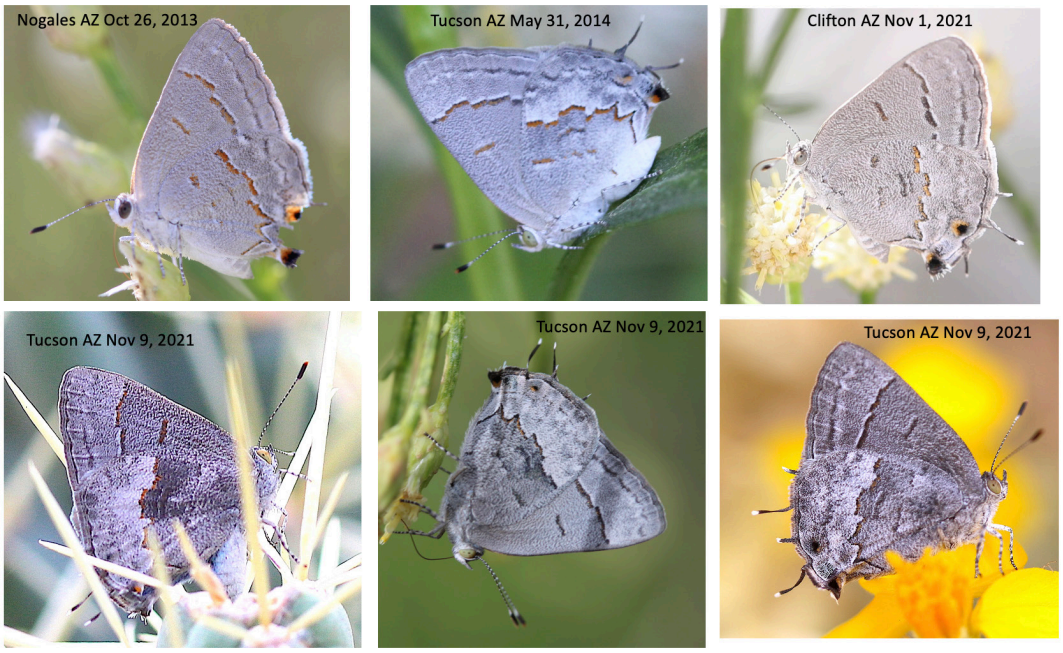


Plate 2: "Intermediate" form images

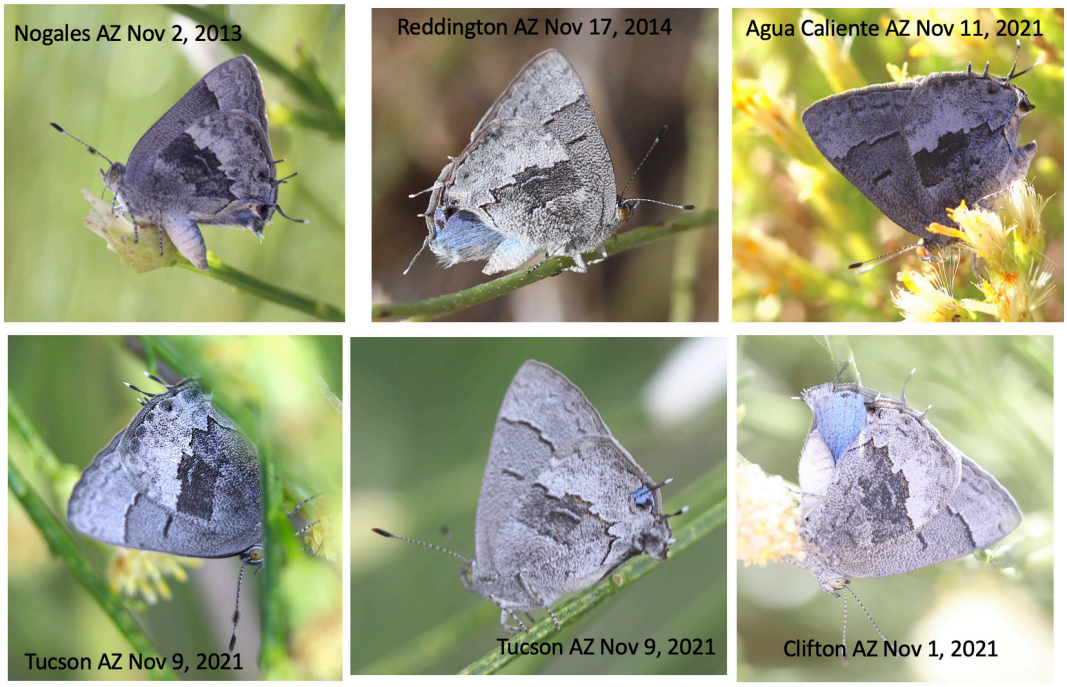


Plate 3: "Winter" form images

Discussion

While there are four *Ministrymon* species known in the US, Leda is the only known breeding resident mini-streak in Arizona, has the largest U.S. range of the mini-streaks, and is often quite common locally (5).

In areas with seasonal change some multi-voltine butterflies have evolved an ability of displaying different colors, patterns, or even forms seemingly for competitive advantage depending on the season. Areas with notable summer to winter/hot to cold changes, or wet to dry shifts provide a driver for physical changes in appearance that are of advantage to the butterfly.

There is good research on seasonal variation in butterflies, including the how's of hormonal biochemistry that make it happen, and thoughts on the whys it might be so. For example, the darkening of the white *Pontia occidentalis* during cooler seasons is for thermoregulation (6), or the change of conspicuous eye spots of tropical satyrine butterflies is to perhaps thwart or deflect predator attack in the active wet season (7).

Interesting research shows that for *Bicyclus anynana* specific developmental temperature thresholds of caterpillar instar and early pupae determines what form the adult pattern will take. This is an African nymphalid which displays two seasonal forms, wet seasonal and dry seasonal phenotypes (sub-tropical Africa). Intermediate developmental temperatures produce intermediate phenotypes which often are the most prevalent form! "The intermediate phenotype… coexist in nature with the WS and DS forms during the seasonal transition and become for weeks the most abundant form as they may represent up to 75% of all individuals". (8). I suspect this example of MANY forms of intermediates is not unlike the situation for Leda.

(My rearing experience (and data with it) is slim, having raised Leda twice, and neither time was the adult color a focus. I did not control nor save data on caterpillar environmental temperature (home living room) for instance. The first effort (female form for eggs unrecorded) resulted in at least one Intermediate form. The second effort

(obtaining eggs from an intermediate form female) resulted in intermediate and at least one summer form. It would suggest that my indoor temperature may be near a threshold perhaps, and that a single brood can apparently have variable pattern color offspring adults.)

Using the nine criteria (I used here) as all separately triggered expressions, and doing the math, calculates 510 possible unique combinations between the Summer and Winter forms for Intermediates! Just imagine!

Conclusions

If one really wants to get to the bottom of this there are plenty of questions and more good work that could be done.

Leda summer and winter forms match Kilian Roever's observations of high and low seasonal temperatures respectively. Seeing that the very dark winter form comes with the lowest temperatures, I would guess that part of the value of Leda's winter form would be associated with thermoregulation, as shown for Western Whites. Also, with the summer form having clear markings and bright colors, this form maybe be a predator survivor tool, as supposed for the eyespots of Buckeyes?

As for butterflies with seasonal forms and shown here for Leda, wild butterflies may not always have a single combined set of pattern element "states". It is more complicated than that. Many separate elements in the pattern can have color variation unto themselves, so that butterflies seen in the field can have a wide multiplicity of variations for intermediate phenotypes in addition to the end game seasonal types. Mother Nature always keeps her options. Fascinating!

References

(1) Southeastern Arizona Butterfly Checklist, **http://seaba.org/sites/default/files/SEABA%20Butterfly%20List%20NABA%20compliant%2012-08-2016.pdf**

(2) Edwards WH. (1882) Description of Species of Butterflies Taken in Arizona by Jacob Doll, 1881. PAPILIO Vol. 2 No. 2, New York Entomological Club: **https://archive.org/details/papilio21882edwa**

(3) Brown FM., Opler PA. (1970) The Types of the Lycaenid Butterflies Described by William Henry Edwards. Part II: Theclinae and Strymoninae. Transations of the American Entomological Society Vol. 96. No. 1 (Mar. 1970), pp 19-77. American Entomological Society, **http://www.jstor.org/stable/25077990**

(4) Nijhout HF. (1991) The development and evolution of butterfly wing patterns. Washington: Smithsonian Institution Press.

(5) Glassberg J. (2013) Ministreaks of the United States and Mexico, including Vicroy's Ministreak, a Newly Described Species. American Butterflies Vol. 21 No 1 Spring.

(6) Kingsolver JG. (1995) Viability Selection on Seasonally Polyphenic Traits: Wing Melanin Pattern in Western White Butterflies. Evolution, 49(5), pp. 932-941. **https://onlinelibrary.wiley.com/doi/epdf/10.1111/j.1558-5646.1995.tb02328.x**

(7) Brakefield PM., French V. (1999) Butterfly wings: the evolution of development of colour patterns. BioEssays 21:391-401 John Wiley & Sons, Inc.: **http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.462.2307&rep=rep1&type=pdf**

(8) Muller D, Elias B., Collard L., Pels C., Holveck M-J. Nieberding CM. (2019) Polyphenism of visual and chemical secondary sexually-selected wing traits in the butterfly *Bicyclus anynana*: How different is the intermediate phenotype? PLoS ONE 14(11): e0225003: **https://doi.org/10.1371/journal.pone.0225003**

Membership Updates

Chris Grinter

Includes ALL CHANGES received by May 9, 2022. 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)*

Greg A. Bingaman: 683 Showers Rd., Muncy, PA 17756 (gbingaman@windstream.net)
Jennifer Dirking: [red. by req.] (EcoGardenista@gmail.com)
Lourdes S. Garcia: 3838 47th St., San Diego, CA 92105 (sharlsg87@gmail.com)
Christa F. Hayes: 2143 Old Shellman Rd NE, Townsend, GA 31331 (christafhayes@icloud.com)
Peter D. Hoell: [red. by req.] (viajero99@yahoo.com)
Matthew Kenne: 709 N Phillips St, Algona, IA 50511 (mkenne@netamumail.com)
William ODonnell: [red. by req.] (william.odonnell2@g.austincc.edu)
Abbey Swift: 9724 Borderpine Way, Colorado Springs, CO 80925 (aswift2@uccs.edu)
Rachel Weavers: 9505 Lingwood Trail, Orlando, FL 32817 (rachelweavers@knights.ucf.edu)
Kimberly L. Woodbury: 101 Atkinson St, Apt 3, Bellows Falls, VT 05101 (Kjwoodbury@gmail.com)

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

William Bernstein: 1011 S Valentia St, Unit 34, Denver, CO 80247 (popojijo@gmail.com)
Junia Carreira: Avenida Olavo Bilac, 333, apartment 113 - km 18, Osasco, São Paulo, 06190-150 BRASIL (juniayoc@gmail.com)
Jeffrey C. Gilbert: 2818 SW County Rd 344, Lake City, FL 32024 (jbugman@comcast.net)
Rea Manderino: 1776 Loughborough Lane, Upperville, VA 20184 (rea.manderino@osgf.org)

Update to sightings of *Heliconius charithonia* and new sightings of *Anartia jatrophae* on the Gulf coast in 2020, 2021 and early 2022

Gary Noel Ross

6095 Stratford Avenue, Baton Rouge, LA 70808 **GNRoss40@yahoo.com**

Introduction

I recently published data to support my theory behind the 2020-2021 above average sightings of the zebra longwing/zebra heliconian (*Heliconius charithonia*) (family Nymphalidae, subfamily Heliconiinae) and the region's above average dutifully named tropical storms and hurricanes (Ross 2021). Because of a delay in publication, I had time to add a postscript to the story: south-central Louisiana was impacted on August 29, 2021 by Hurricane Ida, a Category 4 storm with 150 mph winds that proved catastrophic for a large sector of the Louisiana coastline. Reports of *H. charithonia* escalated. Because I still was within the deadline for submitting my article, I included additional data through October 31. After submitting my story, however, I learned of additional accounts, published either post October 31 or overlooked earlier. All appended data—through March 31, 2022—are reported here.

During my additional research on *H. charithonia*, I learned of several recent records (fall 2021) of a second vagrant/immigrant to the Gulf coast: white peacock (*Anartia jatrophae*) (family Nymphalidae, subfamily Nymphalinae)—a medium size, pallid gray/pink/white ground-hugging species common in peninsular Florida but considered rare farther north or east (see Ross, 2016a, 2016b). All sightings were from southeastern/coastal Mississippi and extreme southeastern/coastal Louisiana.

The majority of these new reports cited here were gleaned from electronic citations posted on the internet (Facebook.com/groups/BRButterflyEnthusiasts/). Several, however, are from hardcopy "Season Summaries" published by the *Lepidopterists' Society* and "Reports of State Coordinators" published in *Southern Lepidopterists' News*. In addition, several citations are attributed to Linda B. Auld (Auld, 2021) and Craig W. Marks (Marks, 2022). Individual investigators are cited in the Acknowledgements.

Data

A. *Heliconius charithonia*

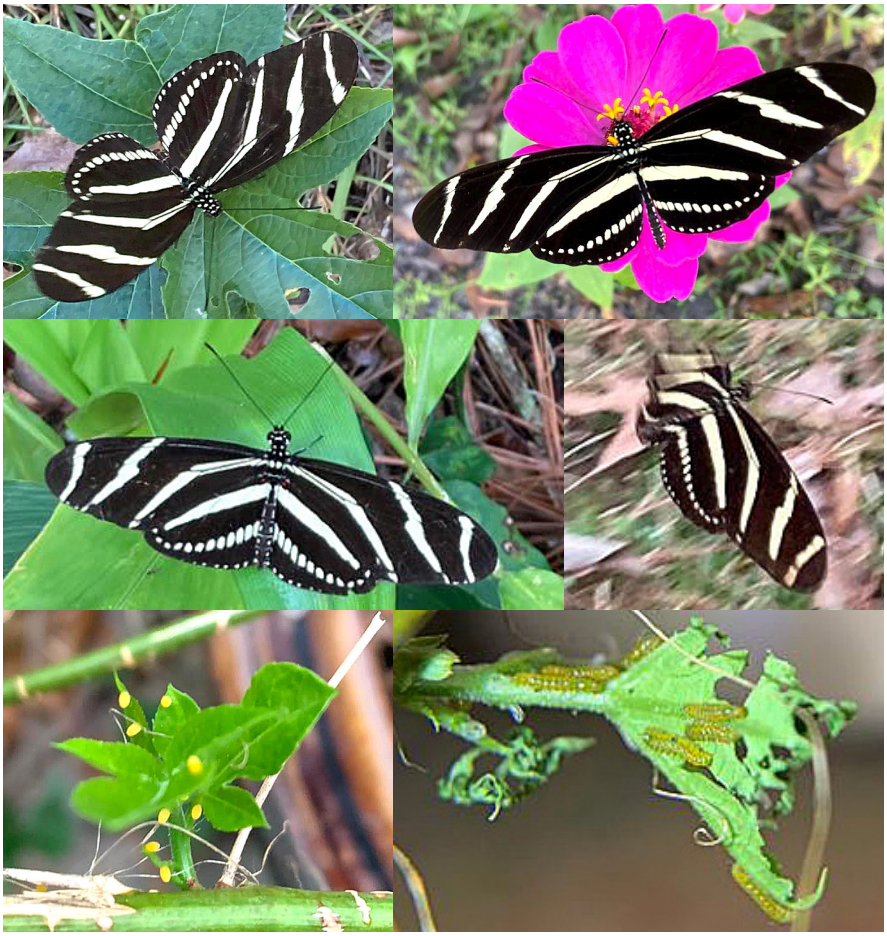
Georgia

Bulloch County (southeast/coastal), Statesboro, December 25, 2021-January 1, 2022, Lance Durden
Burke County (east-central), Sardis, November 5, 2020 (uncommon northward), Malcolm Jenkins
Cherokee County, (northeast), Little River, October 10, 2020, seen once before, Vicki DeLoach
Fulton County, (west-central), Atlanta metro south, November 28, 2020, Doug Hughes

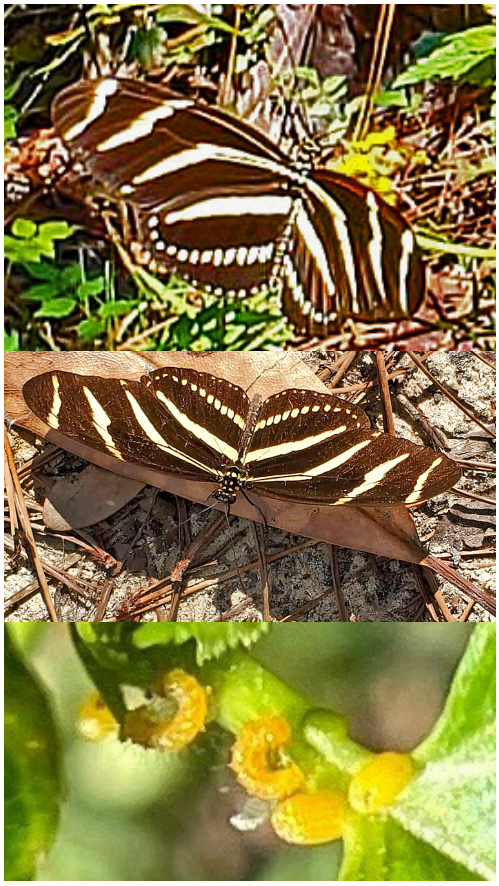
Louisiana

[WEATHER: Slidell: January 2022 experienced 14 nights with freezing or sub-freezing temperatures; the lowest temperature was 20 F; highs topped at 83-84 F. February experienced seven freezing or sub-freezing nights; highs topped at 82-83 F. On March 12, a late-season cold front caused the night temperature to dip to 30 F, and on March 13, the low was 26 F. The minimum low temperature for the 2021-2022 winter season was 20 F on January 23.

As I reported previously (Ross 2021), sightings in southeastern Louisiana between September 2021 and October were uncommonly numerous. That trend continued throughout December and into early January 2022 (Marks 2022) in spite of the passage of two cold fronts that dropped temperatures in the southeastern Louisiana region to slightly below freezing (29-31 degrees F) in early January. Summary of sightings (especially from St. Tammany Parish) include: Bayou Sauvage National Wildlife Refuge, Big Branch National Wildlife Refuge, Covington, Lacombe, Lower East Pearl River Wildlife Management Area, Mandeville, New Orleans, Slidell. The majority of the locales are near the southern LA-MS border at approximately the same latitude as the locales in coastal MS. Several records, however, are from coastal Mississippi, including one from the exact same venue (and exact same lantana plant!) as documented 13 months earlier in 2020. The most outlying sightings are from Orleans Parish (Gentilly section of New Orleans on November 2) and Ascension Parish (Gonzales on December 16)—slightly west/southwest of St. Tammany. Observers frequently reported females depositing clusters of eggs on both native and ornamental species of passionflower vine (*Passiflora* spp.). Most citations included photographs. Eggs and early instar larvae were reported as late as January 6 and 8, 2022. The last reported sighting of an adult was on January 15, 2022, almost two weeks following the regions first freeze. Understandably, several sightings could easily represent long-lived butterflies *not* blown originally into the location, but instead first or second generation offspring from individuals that had initially been relocated.



Top row: *Heliconius charitonia,* Mandeville, LA; left: Trina Ridaught Drury, Nov. 17, 2021; right: Bruce Howard, Nov. 20, 2021. Bottom two rows: *H. charitonia,* Slidell, LA; middle row: Deloris tousinau, Dec. 31, 2021 and Jan. 15, 2022 (in flight); bottom row: Laura Nolan Luquet; eggs (left) and larvae (right) on Jan. 8, 2022.



Top two images: *H. charitonia*, Shearwater Pottery, Ltd., Ocean Springs, MS (nearly exact same location), Ms. Peter Wade Anderson; top: Oct. 1, 2021; middle: Jan. 31, 2022. Bottom: *H. charitonia* larvae, Long Beach, MS, Jennifer Buchannan, Jan. 6, 2022.

Mississippi

[WEATHER: Biloxi: Sub-freezing temperatures in early 2022 on the Gulf Coast were less frequent (six nights at or below freezing in January; highs topped at 76-77 F) than those in Slidell, Louisiana. February experienced only two nights at or below freezing; highs topped at 76-77 F. On the night of March 13, a low temperature of 30 F was recorded. The minimum low temperature for the 2021-2022 winter season was 26 F on January 23.]

In addition to the two sightings ascribed to SHEARWATER POTTERY, LTD. in Ocean Springs (Jackson County)--one on September 11, 2020 and one on October 1, 2021 (Ross 2020)—the following should be added (all locales are within 30 miles of each other). To summarize, the latest cold season report of an adult is January 31, 2022 and of larvae, January 28, 2022 (Pass Christian). Below are the specifics for adults:

Hancock County, Pearlington, September 18, Dinah Maygarden
Harrison County, Pass Christian, October 6, 2021, Emily Taylor
Harrison County, Pass Christian, December 3, 2021, 1 individual, Jennifer Buchanan
Harrison County, Long Beach, December 30, 2021, 1 individual, Jennifer Buchanan
Jackson County, Ocean Springs, January 31, 2022, 1 individual, Peter Wade Anderson

North Carolina

Chatham County (central Piedmont), Pittsboro, October 16, 2021, 1 individual, Jamie Nunnelly

South Carolina

Charleston County (southeast/coastal), Fort Lamar Heritage Preserve: September 2, 2021; Pinckney Park (James Island), September 25, 27, October 19, 29, December 2; Beachwalker Park (Kiawah Island), November 1, 2021, Dennis & Donna Forsythe
Richland County (central), Congaree National Park: October 26, 2021, Marty and Dave Kastner

B. ***Anartia jatrophae***

Louisiana

The white peacock was sighted at the following locations (Marks 2022 and personal communication). All locales are coastal.

Cameron Parish, Willow Island (29,9954879, -92.8437691), Lacassine National Wildlife Refuge, December 4, 2021, 1 individual, Phillip Wallace, Brad Moon, Paul Conover (observed a specimen a few weeks prior)
Cameron Parish, Hackberry Ridge (near community of Hackberry), October 30, 2021, November 21, 2021, small colony, Paul Conover
Jefferson Parish, Grand Isle, December 22, 2021, 1 individual, David Muth
Lafourche Parish, Port Fourchon, October 22, 2021, numerous individuals, Kelly Boutwell Spivey/Phillip Himel
St. Tammany Parish, Bayou Sauvage National Wildlife Refuge, December 12, 2021, 1 individual, David Muth

Ms. Spivey indicated (personal communication) that her son, Phillip Himel, witnessed many individuals of *A. jatrophae* flying about and resting on the large white-painted fuel tanks in the C-Port facility at Port Fourchon (the Port is barely 18 statute miles from Grand Isle). The sighting is particularly noteworthy because it occurred just under eight weeks in the wake of Hurricane Ida, which made landfall at that exact location on August 29. The difference in timing is sufficient to account for one or two generations of breeding if the food plant were available—highly probable because host plants such as *Bacopa rotundifolia* (water-hyssop) and *Phyla nodiflora* (frogfruit) are considered invasive "weeds" in damp soils—even in mowed lawns—throughout most of the low-lying Gulf coast.

The Port Fourchon/Grand Isle records are at the epicenter of the Louisiana sightings. Consider: Bayou Sauvage NWR is approximately 80-90 statute miles to the east, and Cameron Parish is approximately 200 statute miles to the west. All localities were impacted severely by Hurricane Ida.

Anartia jatrophae. Top Row: Port Fourchon, LA, Kellie Boutwell Spivey/Phillip Himel, Oct. 22, 2021; Pass Christian, MS, Janet Gordon, Dec. 3, 2021; Lacassine Nat'l Wildlife Refuge, LA, Phillip Wallace, Brad Moon, and Paul Conover, Dec. 4, 2021. Bottom row: Hackberry Ridge, LA, Paul Conover, Nov. 21 and Oct. 30, 2021.

Mississippi

The sightings below are approximately 100 statute miles northeast of Port Fourchon—landfall for Hurricane Ida on August 29. Also, the records are within the same time period as the records from LA, and within only two to four months subsequent to Hurricane Ida. As with *H. charithonia*, individuals of *A. jatrophae* could easily represent first or even second generations produced by breeding adults relocated following the massive storm. All locales are coastal.

Harrison County, Long Beach, October 26, 2021, 1 individual, Jennifer Buchanan
Harrison County, Pass Christian, November 20, 2021, 1 individual, Craig Marks
Harrison County, Pass Christian, December 3, 2021, 1 individual, Jennifer Buchanan

Discussion/Conclusion

These new data (2020-2022), particularly from southern MS and southeastern LA, are cogent as an explanation for the extraordinary large number of sightings of *H. charithonia,* and to a lesser degree, of *A. jatrophae,* along the Mississippi and Louisiana Gulf coasts during the fall of 2021. Notwithstanding, ecologists agree that these two tropical/semi-tropical species, which are well established in southern and central Florida, are known to disperse periodically northward onto the Atlantic coast and westward along the Gulf coast. I agree. But I find it highly probable that tropical summer/fall cyclones, which often impact the Gulf coast, are a historical part of the population dynamics of both *H. charithonia* and *A. jatrophae*. Furthermore, because host plants for both species are readily available in those nascent habitats distanced from Florida, the butterflies should be able to establish breeding cohorts. That said, what remains to be seen is if these sub-tropical/tropical immigrants can survive the sub-freezing cold periods of early 2022 to pioneer new colonies. But that's another story for another time.

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Monarch butterflies gather pyrrolizidine alkaloids from dead and injured plants: a call for citizen science contributions

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Monarch butterflies (*Danaus plexippus*) are peculiar in having special relationships with two kinds of plants: one with milkweeds (species of *Asclepias*) on which the caterpillars develop and from which they usually obtain cardiac glycosides (CGs; cardenolides), the second with various unrelated plants which provide them with 1,2-dehydropyrrolizidine ester alkaloids (PAs), another large and diverse group of 'toxic' compounds. PAs are gathered by the adult butterflies only, mainly from *dry* or *injured* plant matter, usually independent from feeding behavior and for purposes not related to nutrition, a syndrome that has been coined as "PA-pharmacophagy" (Boppré 1984). Research on monarchs and plants has focused on larval hostplants, CG-based defense, and adult nectar sources—the relationship between monarchs and PA-containing plants, however, has been largely neglected, as Lawson *et al.* (2021) have documented.

Pyrrolizidine alkaloids play important roles in the lives of many organisms (e.g., Boppré 2011). Like CGs, they are natural chemicals (plant secondary metabolites) that are produced by plants of several unrelated families for protection from antagonists (see Boppré & Monzón 2022). Various insects store PAs for their defense; many male clearwing and milkweed butterflies (Ithomiini and Danaini but not *D. plexippus*) as well as tiger and wasp moths (Arctiini) also use odors (pheromones) derived from PAs in their courtship behavior. For humans and livestock PAs pose serious health risks (JECFA 2020).

PA-pharmacophagous Lepidoptera obtain PAs mostly from withering or dead plants, and sometimes from injured ones. In living plants, PAs are concealed within the cell walls and inaccessible to butterflies until a plant becomes dry or injured and cells break open. Also, PAs often occur only in particular parts of the plant (such as roots or seeds) and amounts vary inter- and intraspecifically, even intra-individually, and over time. Since PAs do not provide nourishment, butterflies do not 'feed' on PA-plants in the literal sense but instead 'take up' PAs. Loosely speaking, for adult PA-insects, PA-plants do not represent 'grocery shops' but rather 'pharmacies'. Plants that provide food for larvae and adults can be called primary hostplants, while those that provide PAs we call secondary hostplants.

At first glance, gathering nectar or PAs seems to reflect the same behavior – both kinds of compounds are ingested *via* the proboscis. However, it is two distinct behaviors: different sensory cues are used to locate sources, the ingested substances are treated very differently by the metabolic

Three examples of monarchs (*Danaus plexippus*) with expanded proboscides gathering pyrrolizidine alkaloids from withered inflorescences and withered leaves, respectively, of boneset (*Eupatorium serotinum*) in a garden in Maryland. Photos by Nancy Lawson.

system, and the motivation is different. While monarchs digest nectar and must consume it steadily throughout their lives, they store PAs. Once they have accumulated sufficient, they will not continue searching; this implies that gathering PAs is not a regularly occurring but a temporary, additional activity. Also, it is costly not only because sources of PAs must be actively sought but also because the PAs in dry plant matter have to be dissolved by regurgitating gut content and/or saliva that is sucked up again, a time-consuming and expensive process. At a wound, sometimes, butterflies scratch with their tarsal claws to damage further cells and gain access to more PAs. The amount of alkaloids that can be taken from plants varies greatly; this results in individuals with unique defensive characters. A monarch can live without PAs—but its success in obtaining these chemicals can extend its lifetime and/or increase its biological fitness.

Surprisingly, only a few field records of monarchs and PA-plants are available in the literature, although as long ago as 1955 the celebrated American naturalist William Beebe found *D. plexippus* at withered heliotrope (*Heliotropium indicum*) in Trinidad. However, he had no knowledge of PAs and could not explain the phenomenon. Since then, counterintuitive sightings of monarchs sucking at dry plant matter likely were made occasionally but did not seem to be considered newsworthy. After PAs were recognized as target chemicals for some insects in the mid-1970s, two studies documented that PAs are indeed stored by monarchs. PA-pharmacophagy is without doubt a basic character of monarch butterflies, even though it has been largely ignored (see Lawson *et al*. 2021 for details and references). Perhaps monarchs are less eager to take up PAs than their relatives, but gathering PAs must play an important role in their biology; otherwise they would never do it.

Currently, many questions about monarch PA-pharmacophagy remain, including first and foremost: Which plants serve as natural sources of PAs for monarchs? Do male and female monarchs gather PAs in equal manner or extent, or is there a sex-bias? Do monarchs engage in PA-pharmacophagy obligately or facultatively? Is PA-gathering in monarchs a plastic behavior that only occurs in certain circumstances, and if so, which ones?

The floral nectar of PA-plants usually is devoid of PAs, but some flowers do have these alkaloids in their nectar; they can be thought of as 'supermarkets' where butterflies get food and drugs at the same time. For most nectar foragers, however, PAs are deterrents. Are flowers that contain PAs in their nectar visited preferably or even exclusively by monarchs that primarily seek PAs and not food? Which other insects visit them? Are monarchs found at withering inflorescences, too? Candidate plants for PAs in nectar include some species of *Eupatorium, Conocilium coelestinum*, and *Gymnocoronis spilanthoides*.

Scientific natural history studies are needed to fill the knowledge gaps on PA-pharmacophagy in monarchs, an intrinsic behavior of these iconic butterflies. Sightings of monarchs with expanded proboscides at dead plant parts are of particular relevance. Much of the initial information required will probably come from observations that most likely can be made only by chance, not intentionally or by design.

WE INVITE butterfly lovers, insect enthusiasts, gardeners, bird watchers, and other naturalists, from as many regions of the United States (plus Latin America, Australia, the Pacific and Atlantic islands, and wherever else the monarch is found), to volunteer for our citizen science project "Monarch Rx" (CitSci 2021, Mertz 2021) and contribute observations of monarchs at dry or injured plants on as many occasions and from as many habitats as possible. For sure, members of the Lepidopterists' Society are the most appropriate audience to call for assistance, given their time spent in the field and capacity for conducting systematic studies by baiting with PA-plants. The primary goal is to create a list of plants that are attractive to monarchs due to their PA content. Then the health of visiting butterflies, the frequency of visits, and many further details can be studied quantitatively through PA-baiting.

Keep eyes open for monarchs with uncoiled proboscides at dry or injured plant leaves, stems or exposed roots. Identify the attractive plant, record parts visited (leaves, roots) and their condition (withered, injured), the sex of visiting monarchs, and the time they spent sucking. Was wetting with solvent or scratching observed? Plant determination is sometimes a problem because of ambiguous vernacular names and continuing name changes; however, exact plant ID is crucial because even closely related species may differ significantly in their PAs. Date and place, weather conditions, estimated abundance of monarchs flying in the vicinity at the time of observation, and any remarkable experiences should also be put on record. If possible, record how many days a particular plant remained attractive to monarchs. Fortuitous field observations can be substantiated by testing the attractive plant in other locations.

Information on incidence and level of infection with *Ophryocystis elektroscirrha* ('*Oe*') parasites is much wanted; if time permits, check monarchs found at PA-sources for spores of *Oe* (see Monarch Health 2022). PAs might not only provide protection against predators but also harm *Oe* and regulate infection by them: if female monarchs deposit PAs in their egg shells (like queen butterflies do), first instar larvae will take them up, and PAs might act as medicine against sporozoites of *Oe* in the caterpillars' guts. This hypothesis seems worth refining. Perhaps infected monarchs are more eager to gather PAs than healthy individuals?

A most valuable additional approach is to conduct PA-baiting: take a homemade or commercial butterfly trap traditionally used for monitoring fruit feeding butterflies

Danaus plexippus nigrippus at PA-baits in Panguana, Peru. Upper left: female at a slit twig of *Prestonia* sp. (photo by Phillip Klein); lower left: female and two day-active arctiine moths, *Corematura chrysogastra,* at bag with dry *Heliotropium indicum* (photo by Michael Boppré); right: male at bag with dry *Heliotropium indicum* (photo by Dirk Sichelschmidt).

(e.g., Shuey 1997, DeVries *et al*. 2016) and use uprooted PA-plants as bait. When monarchs are around, baiting with PA-plants is useful for checking if the butterflies are looking for PAs. Of course, baiting records should include the same information listed above for field observations. Trapped specimens can be marked, released and continue to be observed. Note that PA-baits become less attractive over time, PA-content within a given plant may vary and in some cases is highest in the roots, and that humidity is needed for generating volatile PA-derivatives as attractive odors (for practical tips see Boppré & Monzón 2022). Note that a PA-bait may compete with PA-sources occurring naturally in the habitat. The intraspecific as well as intra-individual variation in PA-content of many PA-plants suggests the use of different plants in parallel. Negative records (such as: leaves are not attractive but roots are) can provide valuable information, too. However, in general, documenting non-attraction is challenging, while demonstrating attraction is straightforward.

Studies of other PA-pharmacophagous insects including other species of milkweed butterflies have revealed that they do not have relationships with particular PA-plants but only with the alkaloids as such. Strictly speaking we are not dealing with an insect-plant relationship in the common sense but rather with an insect-chemical relationship: insects have an association with a whole variety of plants in their environment that contain the target chemicals; they can also be lured with some milligrams of pure PAs offered in a dish. Hundreds of PAs are known from hundreds of plant species and many more will be found. A given plant contains a bouquet of several PAs. As such, PAs are not volatile and cannot be detected by Lepidoptera over a distance, but attractive odors are formed when PAs degrade by hydrolysis in a humid environment. Of the many variables influencing attractiveness of PA-plants, currently only some basics are understood (see Boppré & Monzón 2022).

In any case, for the USA we can plausibly assume that many Echiteae (Apocynaceae), Senecioneae, Eupatorieae (Asteraceae, "Compositae"), Heliotropiaceae, Boraginaceae (Boraginales) and Crotalarieae (Fabaceae) including species of the genera *Amsinckia* (fiddlenecks), *Artemisia* (mugwort), *Chromolaena* (Siam weed), *Crotalaria* (rattlebox), *Delairea* (Cape ivy), *Erechtites* (burnweed), *Eupatorium* (thoroughwort), *Eutrochium* (Joe Pye weed), *Gymnocoronis* (Senegal tea), *Hackelia* (stickseed), *Heliotropium* (heliotrope), *Onosmodium* (false gromwell), *Senecio* (ragwort, groundsel), *Symphytum* (comfrey), and *Tournefortia* (soldierbush) are potential sources of PAs for monarchs. Since monarchs use all kinds of habitats with many plant communities in different assemblages, it is important to survey as many habitats as possible.

In many PA-plants, PAs are concentrated mainly in the roots, which are usually inaccessible to butterflies and therefore do not represent frequently used PA-sources in nature. Nevertheless, they can be good bait with which to determine the 'appetite' of monarchs for PAs. Species with highest PA levels in their roots and widespread occurrence include *Symphytum officinale* (common comfrey; a garden herb) and *Erechtites hieraciifolius* (American burnweed, fireweed; a pioneer therophyte).

A peculiar PA-containing plant is Senegal tea (*Gymnocoronis spilanthoides*, see next page), an invasive aquatic species introduced to the USA (USDA 2017). Not only its flowers (Minolli 2019) but also withering roots are very attractive to monarchs (Krauska 2009). It is commercially available as an ornamental for aquaria, it can be cultivated and propagated easily, and its drying roots can be used as bait for monitoring monarchs' relationship to PAs. However, this plant must be handled with great care to avoid release into the natural environment.

In a recent issue of the News, Badon (2021) published striking photographs of "*Euploea* butterflies nectaring *en*

masse". In fact, they are not "nectaring" but rather gathering PAs from drying infructescences of *Heliotropium* plants. We are convinced that similar pictures can be taken with monarchs on PA-plants if one is in the right place at the right time.

Twenty seven monarch butterflies gathering PAs at withering roots of Senegal tea (*Gymnocoronis spilanthoides*) in Missouri. Photo by Tom Krauska.

We are eagerly anticipating the participation of many readers willing to look out for monarchs at dry or injured plants, conduct baiting with PA-plants, or record past sightings on "Monarch Rx" (CitSci 2021), ideally accompanied by photographs. The website provides various resources on background topics and instructions on what to record and report. Comments and questions are most welcome. In due course, we will compile and analyze the data from citizen scientists for a future report that will acknowledge all contributors. At this moment the approach for studying monarchs and PAs is clear and vague at the same time—we are only at the very beginning of elucidating this poorly known and complex facet of monarch biology. With a great number of records, knowledge will grow, research tasks can be formulated more specifically, and eventually it will also be possible to assess whether PA-plants need to be taken into account in conservation efforts for the monarch.

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My blue muse: an essay on nostalgia, disappointment and hope

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"*Color is a power which directly influences the soul.*"
Wassily Kandinsky (1866-1944)—Russian painter and art theorist

Blue is the most beloved color of *Homo sapiens*. And when blue is coupled with luster, then our psyche transcends into the metaphysical. Case in point: Butterfly conservatories. Within glass walls and ceilings, some of the world's most glamorous insects fly amidst flower-laden greenery nurtured by warm, humid air. Visitors invariably articulate a stream of "oohs" and "aahs." The expletives usually are lavished upon a large butterfly that is predominantly shimmery blue in color. The celebrity is known by the moniker "Blue Morpho" or simply, "Morpho." [NOTE: Currently, taxonomists recognize 29 species within the genus *Morpho*; all are endemic to tropical forests throughout the Americas. The 29 species are divided into 126 subspecies and even more forms. The taxon *Morpho* honors *Morpheus*, the ancient Greek God of dreams, and is an epithet for *Aphrodite*, the Greek Goddess of love, lust, beauty, pleasure, passion and procreation. The genus *Morpho* ranges from Mexico through Central American, and then southward into northern, eastern, and central South America. *M. helenor* is the most northern species; it is represented by a total of 30 subspecies. *Morpho helenor montezuma* (originally classified as *M. peleides*) is the most northern taxon, ranging from northeastern Mexico (about 25 miles south of the Tropic of Cancer) southward into Guatemala and Honduras.]

Familial trademarks of *Morpho* include: moderate to large size and a seemingly implausible reflective/metallic hue (technically, iridescence). This uniqueness is created not by pigmentation within wing scales, but by the structure and orientation of each individual scale itself. Whereas most morphos are indeed blue, a few non-rank-and-file members are pearly white, delicate lavender, or burnished copper. All, nevertheless, display a flashy, dazzling brilliance that borders on the flamboyant. Also, most species are reported to be relatively high-flyers. For hobbyists and professionals alike, morphos are usually touted as the "crown jewels" or "Holy Grail" in the world of butterflies. In 1960, however, when I was a sophomore at a local university in New Orleans, such a wonder was only my "stuff of dreams."

That August my world changed. I had recently become friends with a graduate student, Don Sutton. Don was enrolled in Louisiana State University School of Medicine in New Orleans studying the venom of snakes. During a conversation, Don mentioned that on one collecting trip to northeastern Mexico, he had witnessed a large glitzy blue butterfly at *El Salto* ("The Jump"), a massive waterfall located in a forested region not more than 400 miles south of the Texas border, barely 25 miles south of the Tropic of Cancer. [NOTE: Anthropologists designate this region as "La Huasteca" or "Huasteca Potosina" because it is the historic home of the indigenous Huastec people.]

Biogeographers/zoogeographers classify the area as the "Neotropical Realm" because its flora represents the northern limit of the Atlantic Tropical Deciduous Forest (simply, Tropical Forest) with the majority of its fauna reaching their northern-most distribution. In 1986, UNESCO established "El Cielo Biosphere Reserve" near the community of Gómez Farías (1,073 feet or 327 meters), state of Tamaulipas. The site is positioned on the eastern flank of the Sierra Madre de Oriental—the fabled backbone of eastern Mexico. The sanctuary protects the extraordinary diversity of tropical wildlife, including the northern most range of *Morpho helenor montezuma. El Salto* straddles the border between the states of Tamaulipas and San Luis Potosí, and is located approximately 35 miles south of the reserve.

Meanwhile, my younger brother Grant, a recent high school graduate, had recently become the proud owner of a newly premiered *Ford Falcon* S*tation Wagon* (chic black with red interior.) Luckily, Grant shared with Don a penchant for reptiles. Awash with such karma, I concocted a bold plan: To petition my parents to allow me, Grant, and Don to drive the *Falcon* on a three-week expedition into Mexico to collect butterflies and to observe reptiles. For the next two days I agonized. Then the response: "GO!" And with that single word, my first butterfly saga was launched.

August 13, 1960. We drove the 700 miles to the Brownsville (U.S.)-Matamoras (Mex.) border in a single day (thanks to our adrenaline-spiked blood). The next morning we secured car insurance for traveling within Mexico, drove across the unimposing Rio Grande and international bridge, and secured tourist visas for ourselves and the *Falcon*. By noon we were on our way: Mex 101, the major highway south. Agricultural fields of cotton and sorghum flanked the highway. Soon, the croplands were replaced by semi-arid low-rolling hills dominated by scraggy, thorny acacia trees surrounded by clumps of grass and prickly pear (*Opuntia*) cacti. After veering onto Mex 85, we encountered a simple metal roadside sign that was easily translatable: TROPICO DE CANCER. We now were officially in "the Tropics."

The semi-arid land soon segued into verdant hills. Valleys

This highway marker translates as "Tropic of Cancer." This sign is on Mex 85 and represents the official northern limit of "The Neotropics" in North America. Aug. 1981.

were often cultivated with a tall grass-like plant that I recognized as sugarcane. Unlike in Louisiana, the stalks here had matured into fluffy white plumes similar to those of pampas grass (*Cortaderia selloana*), a landscape plant commonly used in the South. Once we passed Mante, the landscape became greener. Citrus orchards, groves of banana and bamboo, and monolithic cabbage palms created a checkerboard vista. Farm houses were augmented with flowering plants—either as border gardens or in porch/window containers (often discarded food tins). All in all, bucolic, idyllic—a proverbial picture postcard.

Field of sugarcane (*Saccharum* sp.), a perennial tall grass (family Poaceae). Sugarcane is the major agricultural crop for the region. Plants are allowed to mature with flower plumes before harvesting. Aug. 1981.

Tropical butterflies (mainly sulphurs, family Pieridae) "puddling" on damp soil in parking arena (floodplain) of El Salto. Aug. 1981.

And butterflies? Yellow, orange, and white sulphurs (family Pieridae) filled the air with their antics, wheeling and reeling about. Virtually every roadside puddle (created by the rain of the previous night) had evolved into a club for butterflies (commonly termed "puddling"). On several occasions, I coerced my brother to pull onto the shoulder of the road so that I could net specimens. Our final highway switch occurred within the small, but busy, community of Antiguo Morelos. There, we veered right (west) onto a smaller highway, Mex 80. Within less than one hour, the Sierra Madre Oriental loomed on the horizon. Majestic, imposing. The road now began a steep, sinuous climb through what had become rocky outcrops dissected with road cuts. Don confided: "I remember this. We're almost there!"

August 17, 1960. My map indicated that the gateway to *El Salto* was the pueblo (municipality) named El Naranjo, "The Orange." (Coordinates: 22°31'19"N, 99°19'31"W, altitude 879 feet or 268 meters.) The community, although sparse, was surrounded by a lush and colorful checkerboard landscape of citrus orchards (hence the name), plots of sugarcane, tracts of tropical forest, and riverine bamboo—all picturesque, quaint. My map further indicated that the area was drained by Río Salto, aka Río Valles, a relatively narrow, serpentine river that originated in the highlands to the west. Approximately six miles north, a narrow dirt road bore a hand-painted sign and arrow: *El Salto*.

The cascade was massive. Turbulent water plunged 230 feet (70 meters) into a lower water course—narrow, shallow, and translucent blue-green. So robust, the falls were partially shrouded in a billowing, cool mist that nurtured a moist mini-ecosystem. Ferns, mosses, liverworts, selaginellas, club mosses, and fungi carpeted everything exposed. Regardless, the river was quite picturesque in its own right. Here and there natural mineral build ups of minerals cordoned off concentric travertine pools that functioned as small catch basins—de facto aquaria. Several pools held caches of small, colorful fish—some of which appeared to be the same as those in my freshwater tropical

El Salto ("The Jump"). The 230-foot cascade straddles the border between the states of San Luis Potosí and Tamaulipas in northeastern Mexico. The falls are bordered by lush forest, classifed as the northern limit of the Atlantic Tropical Deciduous Forest. The iridescent "Blue Morpho" (*Morpho helenor montezuma*), family Nymphalidae, reaches its northern-most distribution here. Below the cascade are turquoise-colored travertine pools. Aug. 1970.

Ponytail palm (*Beaucarnea recurvata*), family Asparagaceae. This was a common component of the region classified as Atlantic Tropical Deciduous Forest. Small specimens are often sold as ornamental houseplants around the globe, causing the species to be listed as "Endangered." Aug. 1981.

fish tank. (A few of the larger pools served as "bath tubs" for us campers.) The river was flanked by stately lacy-needled Montezuma cypress trees (*Taxodium mucronatum*—a relative of the bald cypress (*Taxodium distichum*) native to the southeastern United States. The falls proper were surrounded by a forest of broadleaved trees. The tableau was mysterious, unworldly. My imagination shifted into overdrive: the "Tarzanesque" jungle of the silver screen, the mystical *Xanadu,* and even the Biblical *Garden of Eden*. Could this wood be the enchanted haven of my Blue Muse?

Whereas Grant and Don contented near river's edge, the forest beckoned me. A narrow canopied trail began to the right of the cascade. I entered. Feathery palms and lacey ferns dominated the dark lower layer. Nameless shrubs and trees rose higher, many with rope-like vines (lianas) suspended from their branches. One tree in particular caught my attention: a medium-sized tree exhibiting a red, scaly bark—reminiscent of someone peeling after serious sunburn. (I later learned that the tree is referred to as "gumbo-limbo" and classified as *Bursera simaruba,* native to southern Florida and much of the American tropics.) But the most bizarre component of this botanical bonanza was a larger version of a houseplant in my parents' living room: a ponytail/elephant's foot palm. Here, though, specimens were 8-12 feet tall. Still, they featured their characteristic bulbous base topped with cascading, thin leaves—the "ponytail." (Botanists classify the plant as *Beaucarnea recurvata* in the Asparagaceae family. The odd-ball evergreen is more related to the agaves and yuccas than to a true palm. Once common in rocky/semi-dry forested regions of northeastern Mexico, *B. recurvata* is currently listed as an endangered species due to over-collecting for the international landscape market.)

Only a short distance into my hike, there they were. Four sparks of electric blue materialized seemingly from a tree barely ten feet ahead on the trail. Reflexively, I blurted out: "BLUE MORPHOS!" The opulent foursome grazed my pants as they flew down the light-dappled corridor. Their flight was bouncy, floppy, tantamount to the loping *Pegasus* of lore. I was mesmerized. After regaining my composure, I quickly realized I had not swung my net—no doubt, a victim of high anxiety!

Another view of El Salto Falls from a bit downstream, showing the lush Atlantic Tropical Deciduous Forest surrounding the falls. Aug. 1970.

I approached the tree. Its trunk was straight and smooth, but marred by a three-to-four inch longitudinal gash about waist high. The wound was discharging a glistening liquid that perfumed the air with the pungent aroma of yeast, a telltale sign of fermentation as in making bread or beer. A host of fruit flies, gnats, and tiny bees were buzzing about and alighting on what might be equated to an rancher's "salt lick." My mind quizzed: "Could the butterflies also have been attracted to the aroma?" (I recalled reading about butterflies that feed on liquids other than nectar such as fermenting fruit, sap, feces, blood, urine, perspiration, and even tears.) I drew closer, looking askance around the trunk. To my surprise, a large butterfly was resting in an upright position, its wings closed and vertical. Its visage was *not* blue, however. Instead, the undersurface was awash with chocolate punctuated with large marginal eyespots (ocelli) ringed in gold. I was stymied. "Could this be the underwing guise of a 'Blue Morpho' at rest or when feeding—a type of disguise or deception ascribed as 'camouflage' or 'cryptic coloration'?"

The butterfly launched. YES! In flight the wings displayed the trademark iridescent blue. I wielded my net—this time, reflexively. And in that split second I embraced what I had coveted. My ecstasy was visceral—I dare say, even reverential. I sprinted down the trail yelling: "I just caught a morpho!" Grant and Don quickly joined in my exuberance.

During the three days and two nights at *El Salto*, I learned that the "Blue Morpho" was common along the wooded trail and forest edges near the falls. The butterfly's signature iridescence was visible only in flight, which was in a floppy, zigzag pattern. Then, the flash and dazzle produce an on-again/off-again ("blinking") display that must be confusing to onlookers. During those halcyon days I had time to contemplate this "language" of the morpho. I learned, too, that the butterflies habitually flew near ground level. My conclusion? The so-called dual personality (flaunting in flight/cryptic at rest) coupled with the low, bouncy gait are all defense ploys, evolved to thwart potential hungry mouths (quite effective at distracting butterfly collectors, too.).

During my down time from the forest, I sampled the myriad butterflies in the sunlight of the parking area. My catches included: Papilionidae: *Heraclides thoas*, Pieridae: *Anteos maerula*, *A. chlorinde*, *Ascia monuste, Abaeis boisduvaliana*, *A. mexicana*, *Pyrisitia proterpia*, *Kricogonia lyside*, *Phoebis agarithe*, *P. philea*, *P. sennae*, *Aphrissa statira;* Nymphalidae*: Memphis pithyusa*,

Top: Hand-held male specimen of the "Blue Morpho" (*Morpho helenor montezuma*), the author's "Blue Muse" and the inspiration for this story. Aug. 1981. Bottom: underside of spread specimen from the El Salto area (photo by James K. Adams).

The author's assistants collecting butterflies below the cascade in the parking area (natural floodplain) of Rio Salto. Aug. 1970.

Anaea aidea, *Anartia fatima*, *A. jatrophae*, *Biblis hyperia*, *Danaus gilippus, Dryas iulia*, *Eueides isabella*, *Heliconius charithonia*, *H. erato*, *Dynamine dyonis*, *Eunica monima, Euptoieta hegesia, Hamadryas feronia*, *Marpesia chiron, M. petreus, Mestra amymone*, *Microtia elva, Chlosyne janais, Myscelia ethusa*, *Siproeta stelenes*; and Lycaenidae: *Leptotes marina*. [LAGNIAPPE: Whereas butterflies were undeniably the most colorful creatures of the air, birds came in at a close second. Each evening at dusk, for example, several flocks of colorful and raucous green parakeets (*Psittacara; holochlorus*) flew overhead, presumably, returning to their favorite nocturnal perches. And on our second evening, I glimpsed a pair of large multi-colored military macaws (*Ara militaris*)—documented to reach its northern limit at or near *El Salto*.]

Unfortunately, our itinerary compelled us to leave the paradisiacal *El Salto* on our third day. We continued into the heart of the Sierra Madre, onto Mexico's Central Plateau, and then onto the higher slopes of the nation's juggernauts: Volcán Popocatépetl and Volcán Iztaccihuatl—two snow-capped volcanic peaks topping out above 17,000 feet. At roads end (13,000 feet) on "Popo," we experienced mild altitude sickness due to hypoxia: headaches, nausea, and low energy. Rather than wait out the malaise accompanied by cloudy sky, and nary a butterfly on the wing, we descended the volcano after only a single night of camping. We drove eastward into the more hospitable tropical lowlands of coastal Veracruz. There, the air was once again ablaze with butterflies.

August 29, 1960. After 17 days of travel, we were back in New Orleans, physically exhausted but psychologically rejuvenated. My tally of specimens was 126, representing 79 species, but as I lacked a camera I have no photographs. My two companions observed many reptiles, the most exciting of which was a Mexican vine snake (*Oxybelis aencus*), a thin, spear-headed, brown, and mildly venomous individual seen at the *El Salto* location. By today's standards my numbers are not impressive. As a student beginning to amass a butterfly collection, I was not yet versed in the science behind collecting a series of specimens of any give species. Consequently, I was content with only a sample of each new butterfly I encountered. (Furthermore, insect storage boxes were relatively expensive and difficult to secure.)

Today I am winding down a career that has spanned nine decades of teaching and research in many exotic geographies—and not to be overlooked, two return visits (1970 and 1981) to Mexico's *El Salto*. On both occasions, the "Blue Morpho" was on the wing. Yet, I can affirm unabashedly that my 1960 introduction to the "Blue Morpho" remains my purest sensorial and cherished butterfly memory. My credo and everyday mantra have been honed as:

"The butterfly is the essence of beauty, the paragon of the natural world, and the single creature of Creation that opens the very vaults of Heaven by inspiring us to dream anew."

UPDATE: In 1966, the Federal government of Mexico changed the dynamics of Rio Salto. Engineers erected a hydroelectric plant above the cascade where the elevation was approximately 1,300 feet (400 meters). Named *Planta Hidroelectrica Camilo Arriaga CFE El Salto*, the modern marvel was to supply abundant and inexpensive electricity to local municipalities and agriculture (sugarcane) mills. The military even erected a mall garrison to safeguard the installation. In order to power the turbines, the water above the falls had to be re-routed into gigantic conduits. After powering the turbines, the water was returned to the original river bed about a mile downstream. Of course, absent water, the cascade along with the river immediately downstream, vanished. And as if overnight, one of Mexico's major natural wonders, an aquatic ecosystem, and a prime destination for international biologists, biogeographers, and eco-tourists, vanished. During the summer wet season when the river often rages, the surplus flow was shunted back to the original rock bed. That action reinstated a temporary cascade, albeit reduced. In response, a few vacationers continued to visit.

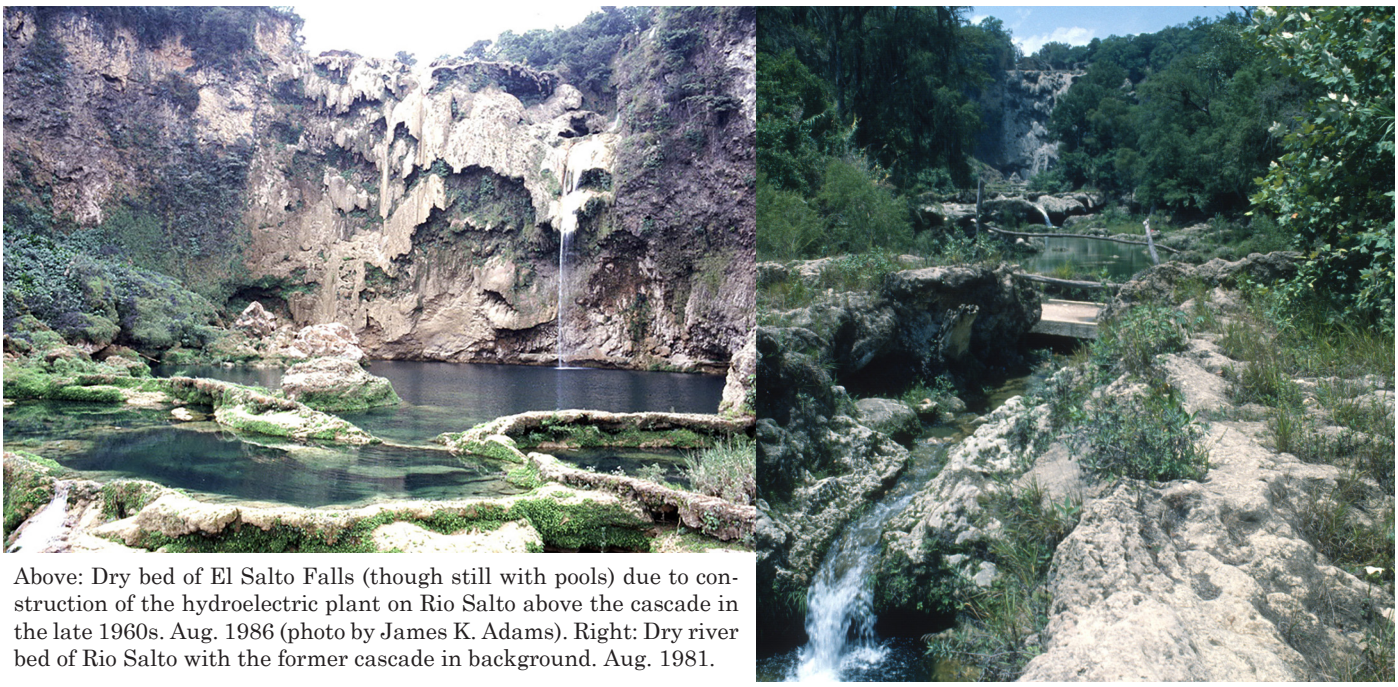
At first glance the new paradigm might be viewed as a cautionary tale. But I have hope. Consider: Technology has advanced exponentially, and public opinion regarding natural resource conservation has changed. For example, since construction of the hydroelectric plant over 55 years ago, new methods for generating energy and transmission have emerged. And in 2018, several governmental

Left: view of the hydroelectric plant complex on Rio Salto above the cascade. The plant generates electrical power for residents and commercial enterprises such as sugarcane mills. Right: section of construction to re-direct Rio Salto into large conduits to feed the hydroelectric plant. Aug. 1981.

departments, the national tourist agency along with several environmental groups, expressed alarm that the hydroelectric plant was destroying one of Mexico's poignant natural and biological resources—as well as an increasing recreational site for both locals and international visitors. The consortium drafted a formal petition requesting that authorities should return Río Salto to its natural course. Perhaps the nexus between the global burgeoning of ecological stewardship and our insights into human well-being (both physical and mental) has re-activated the human conscience. Perhaps when politicians and engineers now design new projects, they will realize that *all factors* must be considered. Simply put, perhaps the "price of power" may sometimes be too great to bear. Perhaps.

Although the future of *El Salto* is uncertain, this I do know: International environmentalists and tourists alike stand firm in positing that *any* effort to restore the cascade to its former all-weather flow would be a poignant gift to humankind. I look forward to the day when impressionable students can be inspired by the grandeur and wonder of Mexico's *El Salto* and my lifelong winged muse, the "Blue Morpho."

POSTSCRIPT: Contemporary young readers might question how a twenty-year-old college student in 1960 managed to capture and preserve fresh specimens while traveling on an extended field trip. Here are the particulars. In my salad days of 1955 (age 15), I opted for my sophomore high school biology project to make a collection of butterflies common to the New Orleans area. In response, my teacher provided me with a catalogue from WARD'S NATURAL SCIENCE ESTABLISHMENT of Rochester, New York—currently, WARD'S SCIENCE. (At the time, the company was the leading purveyor of educational/science supplies to schools and professionals.) I purchased



Above: Dry bed of El Salto Falls (though still with pools) due to construction of the hydroelectric plant on Rio Salto above the cascade in the late 1960s. Aug. 1986 (photo by James K. Adams). Right: Dry river bed of Rio Salto with the former cascade in background. Aug. 1981.

Top: view of Rio Salto in flood above cascade. The brown color is due to massive amount of suspended sediments. Bottom: Rio Salto and El Salto Falls in flood. The entire floodplain/parking arena was inundated. Aug. 1970.

SIDEBAR: My August 1970 visit to *El Salto* proved life threatening. Consider: While asleep in my Chevy "Carry All" parked beside the river below the falls, the river topped its banks—likely the result of heavy thunderstorms during the previous two days. Unbeknownst to me the river's natural flood plain, that is, the entire parking green, was being inundated. I learned of this potential catastrophe only at dawn when I was suddenly awakened by a tapping on one of the vehicle's windows. A handful of local men carrying flashlights had come to warn that I had to move my vehicle *immediately* or else it would be inundated and swept downstream. I peered through the window. TERROR! Muddy floodwater was now lapping at the bottom of the doors. Quickly, I exited. After wading to the partially submerged front wheels, I engaged the four-wheel drive mechanism. Then, with the locals guiding me along what had been a road, I drove the vehicle onto the dry ridge above the flood plain. Gazing down I could see that the floodwater was carrying sizable uprooted trees and assorted vegetation—all potential life-threats to me asleep in my vehicle. By mid morning, the entire parking ground had been transformed into a quasi lake, muddy and two to three feet in depth. Nevertheless, both my vehicle and I were safe—thanks to gracious strangers. By the next day, the river had receded to within its normal banks. Fortunately, in the wake of the flood, I detected no residual vehicular damage.

the company's pamphlet *How To Make An Insect Collection* in addition to recommended supplies such as: student insect net (to replace my hand-crafted net of broomstick, coat hanger, and bridal veil tulle that I had been using since age 13), insect pins, glassine storage envelopes, spreading boards, silica gel, naphthalene (moth balls) and glass-top storage display cases. I reasoned that the school project warranted a more professional approach. In addition, I borrowed from my local library *A Field Guide to the Butterflies of North America, East of the Great Plains* by Alexander B. Klots (1951). The book contained not only images for identification and classification, but insight into biogeography, and the ins and outs of making a butterfly collection. (Incidentally, in 1957 I located a copy of the Klots now iconic publication for sale in a local bookstore; that book accompanied me on all excursions to *El Salto*, and to this day, remains in my library.)

During my 1960 expedition to Mexico, I stored the papered specimens (killed by immediate pinching) in a standard military metal ammo case that I purchased from a downtown army surplus store (simple plastic storage containers were still into the future). Silica gel and naphthalene (moth balls) were added to the ammo box to hasten desiccation and prevent mold. After my return to New Orleans, I rehydrated the specimens in a makeshift relaxing chamber consisting of a large commercial mayonnaise jar (appropriated from a corner deli) that was fitted with a damp paper towel and naphthalene. After pinning, I facilitated drying by positioning the boards atop my parent's refrigerator to take advantage of the excess heat generated by the appliance's motor. Dried specimens were labeled and stored in display cases augmented with naphthalene. Identifications were based on the Seitz and Godman & Salvin tomes (see below) accessed at the Tulane University library. In conclusion, I worked within the system of the time.

All images by Gary Noel Ross except where indicated (all others by James K. Adams).

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Views from further downstream of THE falls on the Salto River. The upper falls (El Salto Falls) are visible in the upper right of both images. The flow is diverted from below the hydroelectric plant back into the river bed above the smaller falls visible in the foreground. Top: image from Aug. 1986, showing the dry surface of El Salto Falls and modest flow in the river. Bottom: this massive flow of water was immediately after Hurricane Gilbert passed over the area in September of 1988. The hydroelectric plant was nearly overwhelmed, and clearly a LOT of the overflow was coming over the upper falls at that time. Photos by James K. Adams.

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An aberrant form of *Arhopala theba* (Lepidoptera: Lycaenidae) from Luzon Island, Philippines

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Key words: *Arhopala, theba,* aberrant, Luzon, Philippines

INTRODUCTION

The endemic butterfly *Arhopala theba* was described by Hewitson in 1863 from specimens collected in Mindoro. This species occurs in Bohol, Camiguin de Luzon, Homonhon, Leyte, Luzon, Marinduque, Mindoro, Mindanao, Negros, Panay, Panaon, and Samar (Treadaway & Schroeder 2012). The paper describes an aberrant form of *Arhopala theba* collected from Atimonan, Rizal, Luzon.

Arhopala theba aberrant form

Adult: The upperside of the male aberrant form still looks similar with the typical form of the male *Arhopala theba*, by having a pale metallic bluish scaling and a darker metallic blue scaling on the apex (occupying half of forewing). The underside of the aberrant form has broader white scaling on the median sections of both wings, while some narrow white lines are absent.
Habitat: Forest.
Hostplant: Currently unknown. According to Igarashi and Fukuda (1997), *Arhopala horsfieldi* feeds on *Lithocarpus macphailii* (Fagaceae), while *Arhopala abseus* feeds on an unknown Fagaceae. Another species, *Arhopala pseudocentaurus,* feeds on *Diplodiscus paniculatus* (Tiliaceae) (Igarashi & Fukuda 2000).

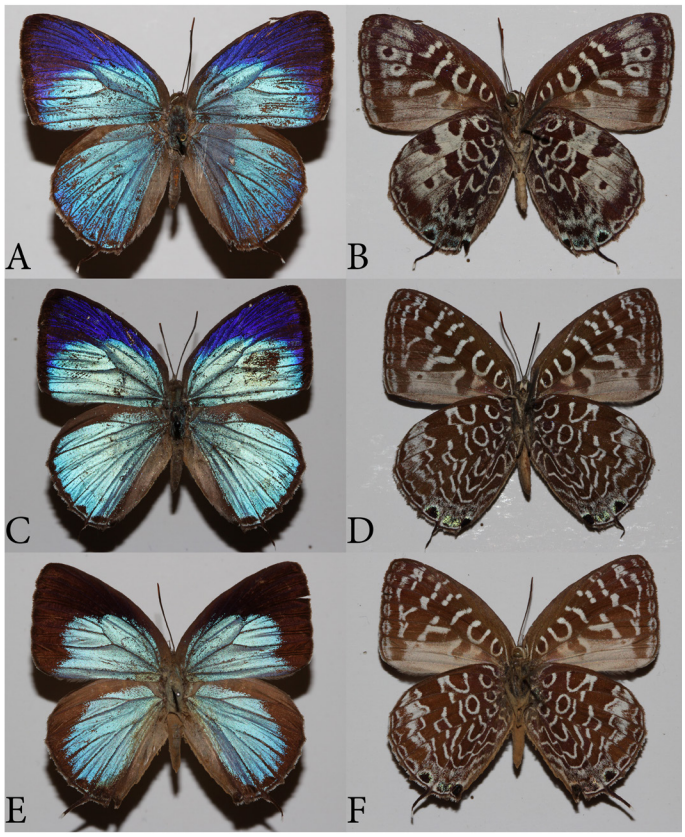

Figure 1. (A) *Arhopala theba* ♂, aberrant form, upperside, Atimonan, 12 Jul 1969, (B) underside, (C) *Arhopala theba* ♂, upperside, Sierra Madre, Quirino, north Luzon, Sept 1989, (D) underside, (E) *Arhopala theba* ♀, upperside, Atimonan, 12 Jul 1969, (F) underside.

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Book Review

Book Review: *Papilionidae of the World* by Makoto Nakane. Published by Roppon-Ashi Entomological Books (Tokyo, Japan), printed by Taita Publishers (Czech Republic). URL: **http://kawamo.co.jp/roppon-ashi/.** 336 pp., ISBN: 978-4-902649-16-1. Language: Japanese (with some English text), price: 25,000 yen.

This is a 336-page systematic book on the swallowtails (Papilionidae) of the world, written mainly in Japanese, but with an English translation of some of its text. The book includes high-quality photographs and short descriptions of 603 species. The book begins with a preface, short section on acknowledgements, table of contents, and three pages of explanatory notes on how the book is organized, and a description of categories on how the book measures traits such as forewing length. There are three distribution maps (each which is a 2-page spread) that follow, that show range maps of *Papilio* (*Achillides*), *Papilio* (*Menelaides*) and Caribbean Papilionidae.

More than 85% of the book is devoted to a systematic section which includes photographs and text on each of the 603 recognized papilionid species. This section is organized phylogenetically by subfamily, starting with Baroniinae; subgenera for most genera are recognized. Each page in this section contains one or two high-quality photos of a pinned specimen(s) beside text that includes the species' Japanese common name, Latin name, forewing length, habitat, altitude, distribution, and other life history information. The "altitude" category does not include a range of elevations, instead it is generalized into altitudinal categories such as "High mountains." The book also lists a "Rarity" category for each species that denotes how rare each sex is, based on a 5-star system (more stars = rare). At least one paragraph (written in Japanese) follows, which includes discussion on taxonomic identification challenges, host plants, etc. Unfortunately for western readers, this text is written only in Japanese. After the systematics section is a 2-page section called "Gynandromorphs of Papilionidae" which includes photographs of 16 specimens of Papilionidae that are either gynandromorphs or aberrant specimens (a few clearly are not gynandromorphs, despite the title of the section). The book ends with a fairly lengthy reference section and an index to names of genera, subgenera, species, and Japanese common names.

This is a beautifully organized book with excellent photographs of swallowtail butterflies. I feel the text falls a bit short in that it does not present a phylogeny of species (or at least the major relationships among genera), and the traits section of each species lacks a separate category on host plants, which I would have liked to see. However, all photographs are excellent, and information such as the "rarity" of species I found useful. I highly recommend this book for anyone that is interested in butterfly systematics.

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Election Results

Here are the election results for 2022-2023. New electees are encouraged (expected?) to attend the Executive Council meeting at this summer's Annual Meeting. Terms start after the meeting. A total of 316 ballots were received.

Vice President:	Votes:
David Bettman (1st VP)	223 √
Ivonne Garzon	190 √
Carol Butler	184 √
Erik J. van Nieukerken	173
Hector A. Vargas	138
Secretary:	
Chris Grinter	293
Member at Large:	
Kevin Keegan	201 √
Hugh McGuinness	182 √
Tea Montagna	168 √
Mayra C. Vidal	120
Sandra Schachat	110
Tanner Matson	108

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($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).

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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:

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Journal of The Lepidopterists' Society

Send inquiries to:

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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):

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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
64	3 Fall	August 15, 2022
	4 Winter	November 15, 2022
65	1 Spring	February 15, 2023
	2 Summer	May 12, 2022

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

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

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Papilio canadensis form "*fletcheri*". Ontario, Peterborough Co., Highway 620 between Apsley & Glen Alda, 8 June 2020 (photo by Hal Donly).

Papilio glaucus (upper-and underside of the same specimen) with a bit of extra black. Georgia, Fannin Co., Cooper Creek Recreational Area, near Sea Creek Falls, August 6, 1998 (photos by James K. Adams).

Figures 13-14: Fresh *Panoquina evansi*. 13 Ventrum; 14 dorsum. See related article by Boscoe and Nall, pg. 72.

Arogos Skippers, *Atrytone arogos*, nectaring from False Dandelion, *Pyrrhopappus* sp., Lexington Wildlife Management Area, Cleveland Co., Oklahoma, June 1, 2020, image by Bryan Reynolds.

Two Arogos Skippers, *Atrytone arogos*, and one Sachem (*Atalopedes campestris*; in back), nectaring from Thistle (*Cirsium* sp.), 15 mi. W of Medicine Lodge, Tumbleweed Rd., Barber Co. KS, July 11, 2021, image by James Adams.