

# NEWS

OF THE

# LEPIDOPTERISTS' SOCIETY



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***... and more!***



# NEWS OF THE LEPIDOPTERISTS' SOCIETY

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

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## Front Cover:

"Zombie Love", "mating" pair of Queens (*Danaus gilippus*) in Glenn Heights, Dallas Co., TX, August 5, 2012 (photo by Dale Clark)



Digital Collecting:**Back to Panama -- the Darien**

Kim Garwood

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Unfortunately I had to miss the first two weeks of Al and John's April Panama trip due to circumstances beyond my control, but I flew into Panama City April 15<sup>th</sup> and caught up with the group for the second half of the trip. This still allowed me to do the Darien part of the trip, which was the main thing I was interested in. The first half was more in the highlands, at Finca Hartmann, and was quite good, from what they told me.

The lowlands seemed to be slow this time. We were at the end of the dry season/beginning of the rainy season. It had been a very hot, dry, and windy previous several months, and this may have negatively impacted the butterflies.

My first day we went to Cerro Jefe, which has been great in the past but not today. Very slow, not much flying, though JD and I did have a suicidal *Ancyluris inca* which attacked us in 'the tunnel'. This is right next to the microwave towers on the top, where you can often find a number of riordinids. The only other species I saw was *Neoxeniades pluviasilva*, which wouldn't pose for any photos, but John MacDonald later caught it.

We left and headed back for the 'rubbish road', which is a new area the guys just discovered last year. It is close to Panama City, right over the bridge of the Americas. You take the first exit, to Veracruz, go about 5-10 minutes and pull off to your left. Folks are apparently using the area

as a trash dump. You can walk in maybe a mile or so, get past the trash heaps and into good scrubby habitat. Lots of birds, lance-tailed mannikins calling and displaying, and some good butterflies. The best, to me, was *Arawacus dumenilii*, which I had never seen before. Unfortunately I couldn't get a live shot, though the collectors got several specimens. They look very moth like when they fly, small and pale, fluttering through the dead grasses. I did get some photos of one of my favorite skippers, *Paches loxus*.



Lycaenidae:  
*Arawacus dumenilii*  
(Photo by  
Jerry  
McWilliams)



Hesperiidae: *Paches loxus*



Kim Garwood with *Ancyluris inca* (Riodinidae) on her hat.  
(Photo by Jon D. Turner)

The next morning we left early, 6am, for the 6 hour drive to Yaviza, at the end of the Panamerican Highway. You have to go through several checkpoints, where you need to have permits and passports for everyone in the car. Al had everything in order, but we still had to wait a couple of times; overall it went smoothly. We made it to Yaviza about 12:30pm, where we had to check in to two other offices for permits to proceed, the equivalent of Panama Fish and Game, then the local police. But the Fish and Game office was closed early for Easter, which wasn't until Sunday. So frantic scrambling around town by Al and Luis, our local Indian guide, for the next several hours. Luis finally found the woman at home, cooking dinner, and got her to come

back to the office and type up the needed papers. By that time, 5 hours later, the local police told us we would have to leave by 6 pm, as they wouldn't let boats go on the river after that. A mad last minute dash to the police, where all passports again had to be copied, and we were off with minutes to spare. Why are these things never easy?

For an hour plus we chugged down the Rio Chucunaque to El Real, a small, scruffy river town where we carried everything up from the boats, (including 2 generators, gas, and food for 11 people for a week) loaded two trucks and drove to another police station where we again had to check in. They sure kept track of our every movement. The police even wanted all the details, birthdays, drivers licenses, etc., on the truck drivers. Then we drove for another 45 minutes or so (of course it was pitch black) and got to where the horses were patiently waiting our arrival. We then unloaded the trucks, loaded up the horses, and most of us started through the dark jungle using our headlamps. A quick, forced march through the mud of an hour or so and we finally made it to our home away from home, Rancho Frio.

The next morning we explored our site, which was right on the stream. The location was nice and we saw a number of good birds from our clearing on the stream. Green kingfishers nested nearby, a green and rufous kingfisher was seen a bit back down the trail hidden under the bank, and fasciated tiger herons were found up and down the stream. One day, one of the tiger herons worked the piles of sticks right in front of our clearing. You can tell they had a major flood down this stream, as there were large piles of trunks jammed up in several places. Morphos sailed up and down the stream as well, mostly *M. menelaus amathonte* but a few *M. cypris* came through as well.

Trails head off in several directions, and we had a week to explore. Unfortunately we never found many butterflies. You could slog the trails all morning and only stumble across a few individuals. The best area seemed to be a bit higher up the hill, towards the second camp, Camp Plastico (such a romantic name). John and JD hiked up and camped for a couple of nights, with a string of porters hauling one of our two generators, gas and camping gear. I never made it that far up the hill, as it is fairly steep and about three hours uphill. The camp spot is just a wide spot in the trail, and the good butterfly spot is back down the hill on the other side to about 400 meters, from 700 meters at the camp. So you hiked up, then down, then back up to sleep. Unfortunately for them the generator which they hauled up doesn't work, even though we used it the two previous nights at base camp. When it comes back down, Al figured out it just needed a few ounces of oil. Apparently the guy who carried it up turned it over and the oil all went to the top. So they didn't get to do any moth lighting, which was one of the main purposes for lugging it uphill.

They did get some good butterflies up at Camp Plastico, or at the stream on the other side. John brought back a very



Papilionidae: *Pterourus birchallii* (photos by John MacDonald)



Nymphalidae (Heliconiinae): *Heliconius eleuchia eleusinus*, upperside and underside (photos by John MacDonald)

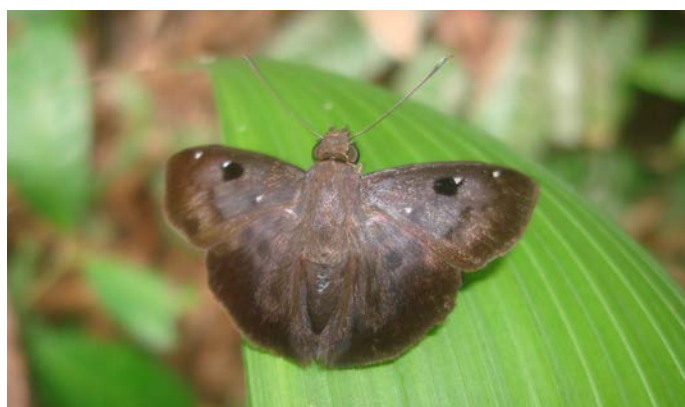


fresh *Pterourus birchallii*, first one any of us had ever seen. John also brought back a new *Heliconius* which may be a new subspecies for Panama, *H. eleuchia eleusinus* from Colombia. That's the exciting thing about this location, you are so close to Colombia who knows what might turn up?

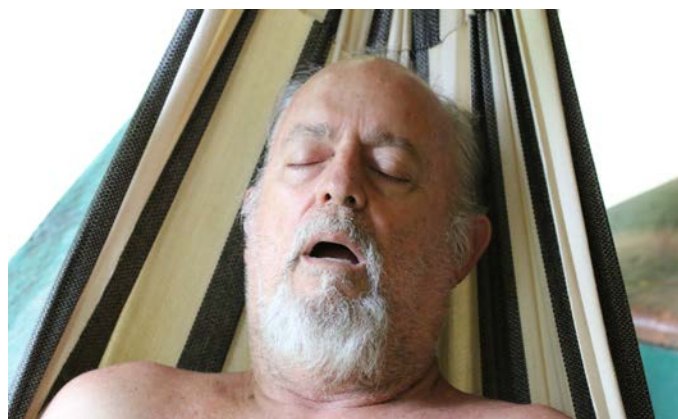
I went up the hill one day to some nice overlooks, where Kevin and I got good shots of *Eracron paulinus*. There is a hilltop about 20-30 minutes up from our base camp that is the place where you can get good cell phone reception. The Indians have even built a simple bench, cross sticks in the ground, and they frequently pop up here to call home. There wasn't any reception down at the Rancho Frio. This hilltop area can be good for butterflies. I found *Callithomia hezia smalli* displaying here one day, and the guys had *Mesosemia ceropia*, which I never found.



The cell phone spot in the jungle



Hesperiidae: *Eracron paulinus*



Al Thurman, hard at work! (Photo by Kevin Painter)



Nymphalidae (Ithomiinae): *Callithomia hezia smalli*

Our accommodations were pretty basic, cinder block buildings with bunk beds, a shower and toilet block where the toilets have to be flushed by bucket. We brought in towels, soap, and sleep sacks, as there weren't any sheets. The guys hauled in fans, as apparently this is a decadent group. Al brought in a floor fan, which we ran frequently

on the hot windless afternoons on the front porch, where we had a couple of hammocks and the main table. Here's a shot of Al Thurman hard at work after nights of moth collecting. We had a generator and are extravagant with our gas. Kevin brought 4 small battery powered fans, which were great for the bunk beds.

I was in one of the 8 person dorm rooms, 4 bunk beds, with 3 of the guys, so we all had a bottom bunk. This worked fine until a large group of Germans showed up, who took all the top bunks. They got up very early each morning, like 4:30am, and made a tremendous amount of noise stomping around, talking, flashing their headlamps everywhere, so we got up too. Why so early? We never figured it out. Fortunately they were only there two nights. We were not sorry to see them leave.

There were beautiful lizards around, lots of dragonflies, and Green and Black poison arrow frogs (*Dendrobates auratus*). One of my favorite lizards was this Yellow-headed Gecko (*Gonatodes albogularis*), very shy and difficult to photograph, but Kevin managed to score with this shot. We wondered if that may explain the low numbers of butterflies, as there were so many predators around. I've rarely seen as many dragonflies as we saw.





Green and Black Poison Arrow Frog (*Dendrobates auratus*)



One of the Emerald Cicadas (*Zamarra* sp.)



Yellow-headed Gecko (*Gonatodes albogularis*,  
photo by Kevin Painter)



Saturniidae: Imperial Moth (*Eacles imperialis* ssp.)

Because there were so few butterflies, we photographed many other things. You can always tell how good the butterflies have been by your ratio of butterfly shots to birds, lizards, flowers, wasps, etc. Here's a shot of a great moth caterpillar (*Gonodonta* species, near *sinaldus*). There were also lots of cicadas, many of which came to the moth light. This was one of my favorites, a beautiful turquoise one (*Zamarra* sp.). There were also lots of moths, many new ones for Al and John who stayed up very late sweeping the sheet. These large Imperial Moths were common; this one was still on the sheet at dawn, not collected. Nice to be at a spot where this was ignored. Some of the guys get good shots of a Neotropical Otter (*Lontra longicaudis*) who comes fishing in the creek one day, right near our camp.



The endangered Neotropical River Otter (*Lontra longicaudis*;  
photo by Mike Baranski)



Erebidae: *Gonodonta* species, near *sinaldus*

We did have some nice hairstreaks. There were lots of *Eumaeus godartii* freshly hatched. John found a clump of pupae, which we kept; they hatched in stages, some on our last day. Dan collected quite a few, some nice *Janthecla*, and one I was sorry to miss, *Arcas gozmanyi*. Here's *Iaspis andersoni*, probably.





Lycaenidae: *Eumaeus godarti*, top: several pupae, bottom: adult.



Lycaenidae: *Iaspsis andersoni*

One night we had very heavy rains, and a few of us who went looking for the harpy eagle just made it back to camp by 5pm when the heavens opened. After several hours of rain, there was a huge hatch of flying ants, which came right to any light. We had to turn off all lights and sit in the dark, waiting for them to clear out. The next morning they were 6" deep at the moth light. Al dumped them in to the stream to feed the fish, causing a frenzy. That same night, after the rain stopped, one of the trees that held up the moth sheet came crashing down suddenly, mak-

ing all of us jump. Fortunately it didn't hit anything, and the moth lamp wasn't damaged. Al ran out and tied it to another tree, and the next morning the guys chopped it up with the chain saw, no problem. There was a nest of baby possums in the tree, and the babies ran all around the clearing. Very sad, as they appeared to be too small to make it on their own. We didn't see any the next morning.

One of my favorite riordinids from the trip was this *Sarota acantus*. I've included a shot taken by Gill Carter at Cana in the Darien back in January, 2013 where she shows the size of the *Sarota* next to a finger, to give you an idea of how really small they are.



Riodinidae: *Sarota acantus* (Top photo: Kim Garwood, Bottom photo: Gill Carter)

All in all, the trip was slow in terms of butterflies photographed, but it was interesting to check out a new place. I had been to Cana 12-15 years ago, when you could fly in, for birding and remembered fabulous forest. Rancho Frio wasn't near as rich in biodiversity; whether we just hit a bad time of the year who knows. The moths were very good. It was lots of fun to be with the group I was with and I had a good time, but I prefer going a bit further south.

(Photos by Kim Garwood, unless otherwise indicated)

# A survey of butterflies found at a reclaimed municipal landfill Superfund site in Saco, Maine (York county)

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The Saco Municipal Landfill Superfund Site is located on Foss Road in Saco, Maine (York Co.). The Superfund Site, owned by the city of Saco, covers approximately 90 acres with four separate landfill areas (Areas 1, 2, 3, and 4) comprising around 33 acres of land. Through the years due to foreclosures, the city added an additional 70 acres for a total area of approximately 160 acres (Recreation and Reuse Plan 1998). The city operated the municipal landfill from the early 1960's to 1988. In 1990, the landfill was declared a Superfund site by the U.S. Environmental Protection Agency (EPA 2006; Owens III 2010).

The distinct landfill areas are separated by Sandy Brook stream which runs across the center of the site from north to south. Landfill Areas 1 and 2 are located on the east side of Sandy Brook while Landfill Area 4 and the smaller, associated Landfill Area 3 are on the west side of the brook. A sketch of the four Landfill Areas prior to restoration and the area of the proposed wildlife enhancement (wetlands) is shown in Appendix A. Between 1976 and 1985, Landfill Areas 1 and 2 were capped followed by the capping of Areas 3 and 4 in 1998. The alternate wetland areas were also created at the same time. The EPA determined that the landfill closure was officially completed in 2000 and long term monitoring of the site is continuing (EPA 2000; EPA 2006; Owens III 2010).

Prior to the official closure of the landfill, the city of Saco prepared a comprehensive Recreation and Reuse Plan (1998) for the site which was later updated (EPA 2006) as shown in Appendix B. Many aspects of the reuse plan, including nature conservation areas and passive recreational uses, have already been implemented. Reuse Area A (Landfill Area 1), located east of Foss Road (paved), now has several large recreational fields, a small meadow and parking lots. In this same Reuse Area, a former borrow pit approximately 2 ½ acre in size, was transformed into a pond with a fishing dock and adjacent picnic table as shown in Fig. 1 (EPA 2006). There is also a small trail (Sandy Brook Trail) off the access road to the pond which connects through the woods back to Foss Road.

Reuse Area B (Landfill Area 2), a large, mounded meadow, located on the west side of Foss Road, is only used for sledding during the winter. The transfer station and composting area are located on the northern side of this Reuse Area near the entrance to the landfill. Reuse Area C (Landfill Areas 3 and 4) is the entire area west of Sandy Brook including large, mowed fields on the west side of the recreated wetlands. As part of the Superfund cleanup, the city of Saco converted the former sand and gravel pit near Landfill 4 into wildlife habitat (Basin) and created a new area of wetlands (10 acres in size) near Sandy Brook (EPA 2006).

Landfill Areas 2, 3 and 4 are bordered by wooded areas comprised of White Pines and a variety of different deciduous trees including various species of oaks, maples and others. At the base of Landfill Area 4 is a large retention basin which fills with water after heavy rainfalls forming a marsh type of meadow surrounded by dirt access roads leading to various portions of the landfill. The recreated wetlands area, adjacent to the retention basin, consists of a few small ponds, some early growth White Pines, and various species of low growth shrubs surrounded by small meadows (Fig. 2).

During the summer of 2013, as volunteers for the Maine Butterfly Survey (MBS) and with permission from the city of Saco and other agencies, we did a survey of butterflies at the reclaimed landfill. We used the Checklist survey method which allowed us to search anywhere within the site and not follow a designated transect path (Royer et al. 1998). We also counted the number of individuals of each species observed on each visit to the landfill.



Figure 1. View of pond area at the reclaimed municipal landfill site in Saco, Maine.





Figure 2. View of the recreated wetlands at the reclaimed municipal landfill site in Saco, Maine.

We surveyed the landfill at roughly two week intervals from May 1 to September 18, 2013. A total of 13 visits were made to the landfill averaging two hours per visit for a total of around 28 hours. Some surveys were interrupted by weather conditions (thunderstorms) requiring us to revisit the landfill at shorter intervals. The majority of the surveys were conducted between 11 A.M. and 2 P.M. on sunny days with temperatures above 70°F (ranged from 60°F on May 15 to 83°F on July 18). All areas of the landfill were surveyed on most visits but we did spend more time in the wetlands and pond area due to the greater abundance and variety of species in those habitats. Since the city hopes to eventually use both of these areas for nature study (EPA 2006), the main goal of the survey was to determine how well the recreated wetlands in Reuse Area C and the area around the reclaimed 2 ½ acre pond located in Reuse Area A serve as habitat for butterflies.

A total of 47 species of butterflies were recorded at the reclaimed landfill during the survey as listed in Table 1. Forty-five species were vouchered (photo or actual specimen) while two species (Common Buckeye and Eyed Brown) were observed at close range but unable to voucher. The scientific names of all species recorded during the survey are shown in Table 1. All vouchered species were confirmed by MBS and are now part of the MBS collection (MDIFW Wildlife Scientific Collection Permit No. 2013-233).

During the 13 visits to the landfill, we also counted the number of butterflies observed for a total of 1,880 individuals (see Table 1). Based on our counts, the Inornate Ringlet was the most abundant species with 725 individuals, followed by the European Skipper (174), Clouded Sulphur (124), Pearl Crescent (109), and Common Wood Nymph (92). On June 20, over 230 Inornate Ringlets were observed and on the same date, we counted 161 European Skippers.

Some of the more unusual species recorded at the landfill included the Bronze Copper, Appalachian Brown, Mulberry Wing Skipper, Pepper and Salt Skipper (Fig. 3), Black Dash Skipper, and Banded Hairstreak. The most significant findings were the Bronze Copper and the Appalachian Brown which are both listed by the state of Maine as species of Special Concern. A single Bronze Copper was observed on June 10 in the basin which was devoid of water due to dry conditions and another individual was seen near the access road in the wetlands on August 22. On August 7, a single Appalachian Brown was found in a glade on the Sandy Brook Trail. Also found on this trail on the same date was one Banded Hairstreak. A single Black Dash Skipper, a species first recorded in Maine in 2009, was found on the edge of the basin on July 12. The Pepper and Salt Skipper (two on June 10) and Mulberry Wing (one on July 18) were found in the small meadow near the picnic table on the edge of the pond.



Figure 3. Pepper and Salt Skipper (*Amblyscirtes hegon*), Saco, Maine, June 10, 2013.

The diversity and abundance of butterflies at a site often depends on the availability of nectaring sources (flowering shrubs and wildflowers). Holl (1995), in her study of reclaimed coal surface-mined sites in Virginia, found that the abundance of nectaring sources was strongly correlated with total butterfly abundance and species richness. All four original landfill areas had few wildflowers since the fields were mowed during the summer to prevent deep rooted plants from penetrating into the liners. The mounds forming Landfill Areas 2, 3 and 4 were mowed at least twice during the summer (June and August) but did show some growth of Red and White Clover and Cow Vetch between mowing, especially along the bottom edges of the landfills adjacent to the access roads. We mainly found common species of butterflies (Inornate Ringlets, European Skippers and Crescents) in these three Landfill Areas. The recreational fields in Landfill Area 1 (Reuse Area A) were mowed at even more frequent intervals turning them into lawn areas for soccer, etc. These fields were almost devoid

of butterflies due to the lack of nectaring sources. The only two areas with infrequent mowing were the wetlands-basin area and the small meadow near the pond (both mowed once in August). These two locations had an abundance of wildflowers including Crown Vetch, Cow Vetch, Red Clover, White Clover, Oxeye Daisies, Black-eyed Susan, Goldenrod, and Queen Anne's Lace. The area around the top edge of the retention basin had extensive growth of Daisy Fleabane and edges of Landfill Areas 2 and 4 had a few thistle plants. The entire landfill contained only a dozen or so common milkweed plants. The species richness was especially high in the recreated wetlands-basin area where we observed 38 different species of butterflies. The area around the pond and Sandy Brook Trail produced 33 species followed by a low count of 22 species in Landfill Areas 1, 2, 3 and 4.

A large portion of the recreated wetlands area is bordered on the southwest by a power transmission line right-of-way maintained by the power company in an early successional state of growth. Power line right-of-ways appear to serve as important habitat for butterflies and may also act as corridors for northward movements of rare, stray species such as the Eastern Tiger Swallowtail, Common Buckeye and Variegated Fritillary, all of which were recorded at the landfill (Gobeil and Gobeil 2014b; Wagner and Metzler 2011). Having a power line right-of-way adjacent to the wetlands increases the total volume of land in early successional growth which benefits butterfly populations.

The wetlands had an unusually high population of Wild Indigo Duskywings with a total count of 31 recorded on August 7. This is the highest concentration of this species we have seen at any site we have surveyed in Maine. We commonly find this species on road verges near bridge crossings over I-95 (Maine Turnpike) where Crown Vetch, a host plant for this species, has been planted to prevent soil erosion. The adjoining power line right-of-way is in close proximity to I-95 and may be acting as a corridor which could account for the high counts of this species at the landfill.

There are few studies dealing specifically with butterfly populations found in reclaimed municipal landfills. At the closed Martin's Farm landfill site near St Osyth, Essex, UK, they created grassland areas to attract butterflies and eventually recorded 18 species of butterflies (Dennis 2010). At another location in the UK, at the reclaimed Dimmer Landfill Site, near Castle Cary, Somerset, an unusual grassland area was constructed with a base of limestone and concrete rubble (Cross 2012). Since 2004, 32 species of butterflies have been recorded including the Small Blue (*Cupido minimus*), Small Heath (*Coenonympha pamphilus*), Dingy Skipper (*Erynnis tages*), and Grizzled Skipper (*Pyrgus malvae*), all of which are listed as UK (BAP) Biodiversity Action Plan priority species. The Carymoor Environmental Trust has been hired to manage this capped landfill to help increase butterfly populations and maximize biodiversity at the site. Tarrant et al. (2013) studied floral resources and pollinating insects at a number of restored

landfills in the East Midlands, UK, and concluded that reclaimed landfills have conservation potential to support a significant diversity of pollinating insect species. Watson and Hack (2000) indicate that due to changes in agricultural practices, there has been a 97% decline in semi-natural grasslands in England and Wales in the 20<sup>th</sup> century and that grassland creation on closed landfill sites provides a good opportunity to benefit declining butterfly species.

Several U.S. cities are in the process of restoring butterfly habitats after closure of their landfills. In Albany, New York, as discussed in the City of Albany Rapp Road Landfill Restoration Planning and Permitting (2009) report, the city is converting the closed Rapp Road landfill into an expanded pine bush savannah-prairie community to help restore populations of the federally endangered Karner Blue butterfly (*Lycaeides melissa samuelis*) and other forms of wildlife.

In Oakland, Maine, Johnny Thomas, the transfer station manager, has been actively involved in trying to create habitat for butterflies at the closed landfill. He recently received permission from the Maine DEP to plant wildflower seeds on two small sites at the landfill. This experiment will determine how deep the roots penetrate into the ground to be sure that they do not disturb the clay cap on the landfill. If this experiment is successful, then the 12 acre landfill may eventually have a cover of wildflowers (Hongoltz-Hetling 2013).

With slight modifications in the frequency and timing of mowing in the basin, wetlands and pond area, the Saco landfill could become one of the few reclaimed, municipal landfills being actively managed for butterflies in the U.S. Studies have shown that a mowing regime of 3-5 years and mowing in late summer tends to benefit butterfly populations (Westover 1994; Valtonen et al. 2006). If the city is interested in managing the landfill for butterflies, access roads around the basin-wetlands area should remain unpaved since these dirt roads often serve as important habitat, especially for some state-listed species of butterflies (Wagner and Metzler 2011; Gobeil and Gobeil 2014b). Adding additional nectaring sources at the landfill would also help. The planting of milkweed plants would be especially important for Monarchs which have shown a sharp decline in the U.S. and Maine during the past few years (Wilson 2013; Gobeil and Gobeil 2014a). Planting more thistle plants would also enhance the habitat for butterflies. Thistle plants were found to be the most important nectar source for butterflies at the reclaimed Martin's Farm landfill in the UK (Davis and Coppeard 1989). With a few minor changes, the landfill could easily be managed for recreational use as well as a nature preserve and an educational resource.

According to the National Solid Wastes Management Association, in the 1970's there were about 20,000 municipal landfills in the U.S. Today, with stricter federal and state regulations, the number of municipal landfills



has been reduced to approximately 1,900. Even though the number of operating municipal landfills is lower now, many of the closed landfills were small in size and have now been replaced by much larger, active landfills (NSWMA 2011). Since many of the currently active landfills will be forced to close in the future, their importance as possible habitat for butterflies and other forms of wildlife becomes even more significant.

Based on the diversity and abundance of butterflies that we found at the reclaimed Saco Municipal Superfund site (47 species including two state-listed species of Special Concern), it appears that restored landfills and especially recreated wetlands can serve as important habitat for butterflies and help to conserve declining butterfly populations.

## Acknowledgements

We especially wish to thank Joseph Hirsch, Director of the Parks & Recreation Department for the city of Saco, for obtaining permission from various agencies to allow us to do the survey at the landfill. We also wish to thank Althea Masterson, Corporate Communications Manager for Woodard & Curran, for granting us permission to use several figures that her company produced as part of the EPA closure of the Saco landfill.

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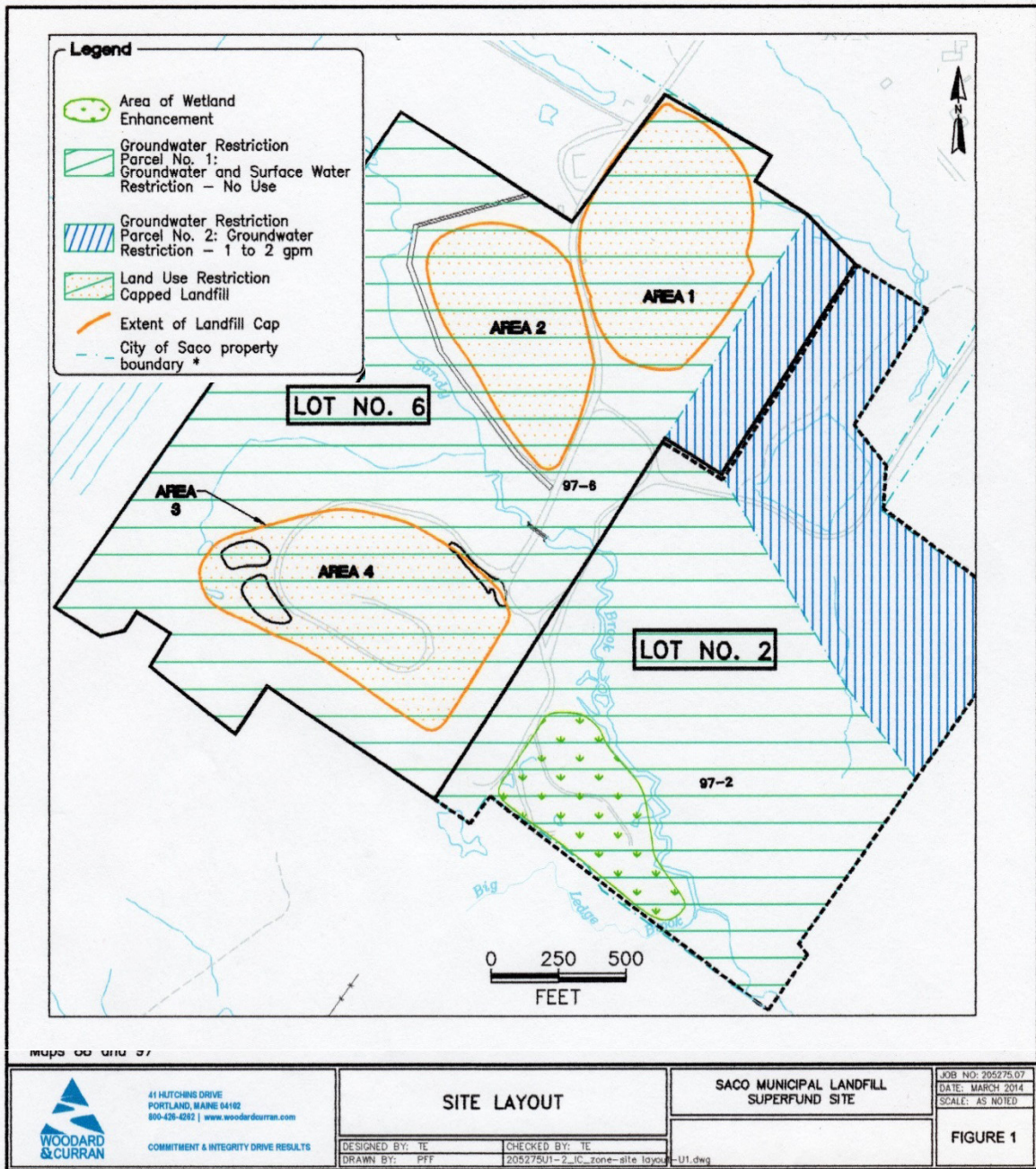
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**Table 1. Species and number of individuals recorded at the Saco Municipal Landfill Superfund Site in Saco, Maine, in 2013. The nomenclature sequence follows deMaynadier et al. (2014).**

Common Name	Scientific Name	No. Indivs. Seen 2013
<b>Family HesperIIDae</b>		
Silver-spotted Skipper	<i>Epargyreus clarus</i> (Cramer)	2
Northern Cloudywing	<i>Thorybes pylades</i> (Scudder)	1
Juvenal's Duskywing	<i>Erynnis juvenalis</i> (Fabricius)	20
Wild Indigo Duskywing	<i>Erynnis baptisiae</i> (Forbes)	78
Least Skipper	<i>Ancyloxypha numitor</i> (Fabricius)	7
European Skipper	<i>Thymelicus lineola</i> (Ochsenheimer)	174
Peck's Skipper	<i>Polites peckius</i> (W. Kirby)	24
Tawny-edged Skipper	<i>Polites themistocles</i> (Latreille)	2
Long Dash Skipper	<i>Polites mystic</i> (W. H. Edwards)	20
Northern Broken Dash	<i>Wallengrenia egeremet</i> (Scudder)	15
Little Glassywing Skipper	<i>Pompeius verna</i> (W. H. Edwards)	6
Hobomok Skipper	<i>Poanes hobomok</i> (Harris)	14
Mulberry Wing Skipper	<i>Poanes massasoit</i> (Scudder)	1
Black Dash Skipper	<i>Euphyes conspicua</i> (W. H. Edw.)	1
Dun Skipper	<i>Euphyes vestris</i> (Boisduval)	34
Pepper & Salt Skipper	<i>Amblyscirtes hegon</i> (Scudder)	2
<b>Family PapilionIDae</b>		
Black Swallowtail	<i>Papilio polyxenes</i> (Fabricius)	21
Eastern Tiger Swallowtail	<i>Papilio glaucus</i> (Linnaeus)	1
Canadian Tiger Swallowtail	<i>Papilio canadensis</i> (Rothschild & Jordan)	13
<b>Family PierIDae</b>		
Cabbage White	<i>Pieris rapae</i> (Linnaeus)	40
Clouded Sulphur	<i>Colias philodice</i> (Godart)	124
Alfalfa Butterfly	<i>Colias eurytheme</i> (Boisduval)	69

<b>Family LycaenIDae</b>		
American Copper	<i>Lycaena phlaeas</i> (Linnaeus)	38
Bronze Copper	<i>Lycaena hyllus</i> (Cramer)	2
Eastern Pine Elfin	<i>Callophrys niphon</i> (Hübner)	6
Banded Hairstreak	<i>Satyrium calanus</i> (Hübner)	1
Eastern Tailed Blue	<i>Cupido comyntas</i> (Godart)	85
Cherry Gall Azure	<i>Celastrina serotina</i> (Pavulaan & Wright)	12
Summer Azure	<i>Celastrina neglecta</i> (W. H. Edw.)	1
Silvery Blue	<i>Glaucopsyche lygdamus</i> (Doubleday)	3
<b>Family NymphalIDae Subfamily Danainae</b>		
Monarch	<i>Danaus plexippus</i> (Linnaeus)	3
<b>Subfamily Heliconiinae</b>		
Variagated Fritillary	<i>Euptoieta claudia</i> (Cramer)	1
Great Spangled Fritillary	<i>Speyeria cybele</i> (Fabricius)	4
Aphrodite Fritillary	<i>Speyeria aphrodite</i> (Fabricius)	2
<b>Subfamily Nymphalinae</b>		
Pearl Crescent	<i>Phyciodes tharos</i> (Drury)	109
Northern Pearl Crescent	<i>Phyciodes cocyta</i> (Cramer)	54
Common Buckeye	<i>Junonia coenia</i> (Hübner)	1
Eastern Comma	<i>Polygonia comma</i> (Harris)	1
Mourning Cloak	<i>Nymphalis antiopa</i> (Linnaeus)	8
American Lady	<i>Vanessa virginiensis</i> (Drury)	9
White Admiral	<i>Limenitis arthemis</i> (Drury)	6
Viceroy	<i>Limenitis archippus</i> (Cramer)	40
<b>Subfamily Satyrinae</b>		
Eyed Brown	<i>Satyrodes eurydice</i> (Linnaeus)	1
Appalachian Brown	<i>Satyrodes appalachia</i> (R. L. Chermock)	1
Little Wood Satyr	<i>Megisto cymela</i> (Cramer)	6
Inornate Ringlet	<i>Coenonympha tullia</i> (Hübner)	725
Common Wood Nymph	<i>Cercyonis pegala</i> (Fabricius)	92
<b>TOTALS</b>	<b>47 Species</b>	<b>1880</b>

**Appendix A -- Sketch showing the four landfill areas at the Saco Municipal Landfill Superfund Site in Saco, Maine, prior to restoration including the proposed area of wetland enhancement. Sketch supplied by Woodard & Curran and used with their permission.**



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**Appendix B -- Sketch of the Conceptual Reuse Plan for the Saco Municipal Landfill Superfund Site in Saco, Maine (EPA 2006). Sketch used with permission from Woodard & Curran.**

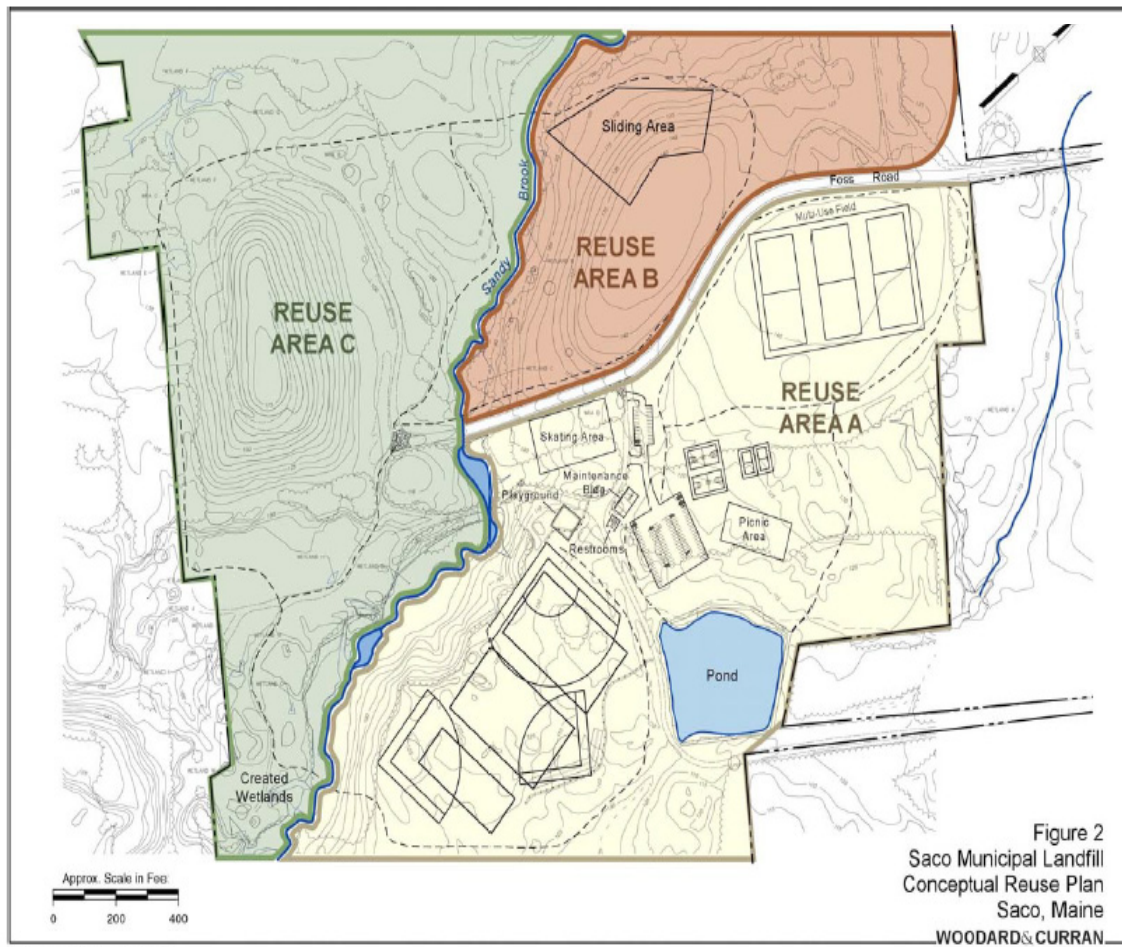


Figure 2  
Saco Municipal Landfill  
Conceptual Reuse Plan  
Saco, Maine  
WOODARD & CURRAN

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# Rediscovery of *Digrammia gilletteata* (Dyar) in Garfield County, Utah

Paul A. Opler

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Dyar (1904) described *Sciagrapha gilletteata* from a single male transferred to him by C.P. Gillette that was simply labelled "Colo." (USNM type 7776). It is likely that Dyar received the specimen from C.P. Gillette during his visit to Colorado A. & M. College, Fort Collins (now Colorado State University) in 1901 (Dyar 1903).

Since its description this moth has been treated primarily as a full species under *Semiothisa gilletteata* (McDunnough, 1938; Ferguson, 1983).

In his treatment of the Macariini Ferguson (2008) treats *gilletteata* as a full species provisionally but states that it may be only a form of the more widespread *Digrammia subminiata* (Packard) from which the first species differs by the lack of black overlay on both the antemedial and postmedial bands and replacement of these bands by ochreous orange or yellow.

Ferguson (2008) gives the distribution of *D. gilletteata* from the Front Range of Colorado south to (Las Vegas) Hot Springs and Jemez Springs, New Mexico. With the exception of Jemez Springs all of the localities are along the eastern edge of the Rocky Mountain Front. Collection dates are cited as from late June until August. The only collection year cited was 1898, and he did state that the species or form had not been collected since its description. In the C.P. Gillette Museum of Arthropod Diversity, Colorado State University, Fort Collins, there are three individuals among our series of *D. subminiata* that match the description of *gilletteata*; all three are labelled Colo with a 4-digit number that refers to numbers in two log books. These numbers are 2233, 2235, and 2252. They have no further data, but may have been collected in Larimer County. We have two large log books that have overlapping series of numbers, and we have never been confident that we have found the correct data for any so-labelled specimens.

In contrast, Ferguson (2008) discusses *D. subminiata* in detail and describes its distribution as widespread in the West and Midwest from the Pacific Coast east to the Great Plains and one or two flights from May to September; most collection dates are in July and August.

Ferguson (2008) did rear a brood of adults obtained from a captive female collected in 1989 near Cimarron, Colfax County, New Mexico. He illustrated and described the larva which feeds on willow (*Salix* spp.); more specifically he felt that the species prefers shrubby species in particular coyote willow (*Salix exigua* Nuttall).

On June 13, 2012, at Calf Creek Recreation Area, in Grand Staircase–Escalante National Monument, Garfield County, Utah a single male *D. gilletteata* (Figure) was captured in an overnight u.v. light trap. This is part of a long-term survey of the Lepidoptera of the monument. This was in a riparian habitat and coyote willow was a common species here. This capture, about 114 years later than the previous record demonstrates that the species or phenotype representing *D. gilletteata* is still extant, and this is the first record for Utah far to the west of the closest location in New Mexico.



Figure. Male *Digrammia gilletteata*, from Calf Creek Rec. Area, Grand Staircase --Escalante National Monument, Garfield Co., Utah, June 13, 2012.

Ferguson's opinion about the specific standing of *D. gilletteata* seems to have changed during the years prior to getting his macariine manuscript ready for publication. Over the last several decades of his life I periodically brought Colorado Geometridae for his examination and determination. In 1992 and 1999 he determined individuals from Rist Canyon, Larimer County, Colorado that are reminiscent of *D. gilletteata* whose forewings were missing antemedial black markings as *D. subminiata*. Further exploration of this area and research may shed light on whether this is a valid species or merely a variant of *D. subminiata*.

## Acknowledgments

I thank Kevin Miller, Monument Biologist who made the study possible. I also thank my wife Evi who accompanied me on this expedition as well as Dave Wikle who has accompanied me on other expeditions to the Monument. Chris Grinter graciously took the superb image of the moth. Marc Epstein graciously provided the reference about Dyar's 1901 visit to Fort Collins.

*Continued on p. 167*



# A specimen of *Parnassius apollo* (Linnaeus), aberration "novarae" Oberthür

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On July 14th I was sampling grid no. UTM 30TVL95, in the Natural Park of Sierra Norte, NW of Guadalajara province, Spain, at an altitude of around 1590-1600 meters (5250 feet). I was checking the range and density of a large colony of *Parnassius apollo escalerae* Rothschild of which I was already aware. Suddenly, a noise on the ground to my right attracted my attention; it was the unmistakable sound, like wrinkling paper, of an Apollo flapping amongst the branches of a dwarf shrub. When I approached in order to check this, I found a female specimen of the aberration "novarae" of *Parnassius apollo*, moving on the ground, flapping without taking wing and stumbling over the grass in her way.

Here I present a couple of photographs of that wonderful specimen.

The aberration "novarae" Oberthür was described in 1891 from Silesia. This form tends to albinism. Its black marks are reduced, and the normally red eyespots on hindwings are black instead. It is an extremely rare form, of which only a few specimens are known.

In this specimen in particular, the big eyespot on her right hindwing is reduced to a half the normal size, its inner rim being blurred, and the small eyespot on that same wing is nonexistent.

I would appreciate any sort of information a fellow specialist could provide about other specimens of this wonderful and rare aberration.



Specimen of *Parnassius apollo* ab. "novarae" on *Sedum acre*, host plant for the caterpillars. Natural Park of Sierra Norte, Guadalajara (Spain) July 14th 2014.



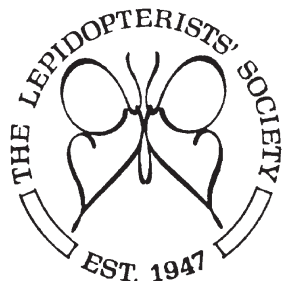
Same specimen in a defensive posture when threatened by the camera, with her wings completely unfolded.

## *Digrammia gilletteata* rediscovered in Utah

Continued from p. 166

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Announcements:**Call for Season Summary Records**

If you have not gotten records of importance to your Zone Coordinators for the Season Summary, and still desire to do so, you must do so IMMEDIATELY. The deadline is/was **December 15, 2014**. For full instructions see Vol. 56: No. 3, page 114. Your Zone Coordinator's contact information is on the inside back cover of each issue of the News.

**Call for Papers - special student research issue of the Journal (Vol 69:3, Fall 2015)**

At this year's annual meeting, the Executive Committee of the Lepidopterists' Society approved using the 3rd issue of Volume 69 (2015 calendar year) to showcase peer-reviewed manuscripts that include undergraduate students as co-authors. The goals of this effort are, in part, to showcase the exceptional work that the "next generation" of Lepidopterists are performing and to expose future scholars of Lepidoptera to our Society's outlet for publication. The same instructions to authors and the same criteria used during our standard peer-review process will apply to articles that appear in the special section, tentatively titled: "Focus on the Future: Research from Emerging Lepidopterists". Should you or a colleague outside the Society that uses Lepidoptera as focal taxa in research wish to submit an article for this special issue please indicate so in the cover letter (or email) that accompanies your manuscript submission. Questions – please email me (keith.summerville@drake.edu or call 515-271-2265).

**Book Reviews now only published in the News of the Lepidopterists' Society**

Please send book reviews or new book releases to the editor of the News: James K. Adams, School of Sciences and Math, Dalton State College, 650 College Drive, Dalton, GA 30720. (706)272-4427; [jadams@daltonstate.edu](mailto:jadams@daltonstate.edu), or Carol A. Butler, 60 West 13th Street, New York, NY 10011, (212)807-0008; [cabutler1@verizon.net](mailto:cabutler1@verizon.net). Do NOT send actual books -- we match up reviewers with authors and have the authors send copy directly to the reviewer.

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**Online access for publications through the Colorado Digital Libraries**

All issues of the Papilio, new series, edited and published by James A. Scott, are now served on-line as pdf's through the Colorado Digital Libraries. They have open access and may be downloaded, viewed, and printed at no cost. They may be found at [http://digitool.library.colostate.edu/R/PLGJX445AYR3L2ATBXKSYXD83E5GSSUHLLS5CMFD9E7KK3B3VJ-01145?func=collection-result&collection\\_id=4527&local\\_base=GEN01-CSU](http://digitool.library.colostate.edu/R/PLGJX445AYR3L2ATBXKSYXD83E5GSSUHLLS5CMFD9E7KK3B3VJ-01145?func=collection-result&collection_id=4527&local_base=GEN01-CSU).

These are listed under the C.P. Gillette Museum of Arthropod Diversity. Most numbers of the Contributions of the C.P. Gillette Museum of Arthropod Diversity are now also served on line as pdf's with open access. We hope to have all of the series served on-line by the end of the calendar year.

Paul A. Opler, Assistant Director, C.P. Gillette Museum

**Brochures**

If anyone is in need of some of the new Membership Brochures to hand out at various functions, please contact Julian P. Donahue ([julian@lepsoc.net](mailto:julian@lepsoc.net)) and he will be glad to help you out.

**Corrections to items in the Fall 2014 News (vol. 56:3)**

I have been notified of a few more omissions of people from the Lep Soc 2014 meeting picture (back cover): Vicki LeFevers, Jean Martin, and Rosemary Seidler. The editor also apologizes for misspelling Caitlin LaBar's name as "Ciatlin".



Nymphalidae: *Melanargia ines*, Asni, High Atlas Mountains, Morocco, July 31, 1986 (Photo by George Krizek; see article page 177)



## Formative Experiences:

### Carol A. Butler

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I have always been a city girl. I was born in the Bronx, New York. My parents had a small power boat to which we escaped on hot summer evenings, and we sailed it on Long Island Sound most weekends. I would probably have become a marine biologist if I had known that it was a field of study. I attended the Bronx High School of Science where there were lots of people interested in biology but only as it related to pre-med study. After college, I traveled to the Caribbean for a vacation and I came across young people who were students living on the islands, studying conch, and enjoying the sun and sea. I remember being shocked-- *How did I not know you could do this!*

Many years later, I got an email from the Center for Traditional Music and Dance asking for volunteers to help at a concert I was planning to attend (Youssou N'Dour, as I recall). I offered to help on the evening of the event, wasn't asked to do much, and they gave me a free ticket. This happened on another occasion as well, and I felt rather overcompensated. When they asked for volunteers on a Sunday morning to help run a Mexican festival in the north end of Central Park to celebrate the monarch butterfly migration, I volunteered knowing that it would be a lot of work.

It was a sunny late summer day, and the park was full of kids, events, costumes, food- it was really hectic. A woman from Connecticut sat inside a mesh tent full of monarch butterflies and larvae, surrounded by excited kids with a million questions about the butterflies. I was fascinated, and I listened for the answers so I could repeat them and help out. At some point the woman in the tent had to take a break, and I offered to sit in the tent in her place. There I was, covered with butterflies, surrounded by kids screaming- "you have a butterfly on you!" I was in heaven. A woman answering questions outside the tent realized I was having a great time, and suggested I volunteer at AMNH to work in their butterfly vivarium. I hadn't even known that it existed.

I went home that night and applied to the Museum online, eventually was interviewed and accepted, and waited impatiently until the end of October for the vivarium to open for the season so I could start my shift. That was in 2004, and you can still find me there every Friday afternoon—except when I skip a week to attend the Lepsoc Annual Meeting.

## SOUTHERN NEW MEXICO RESEARCHER RECEIVES REGIONAL DIRECTOR'S AWARD

### Carlsbad Caverns National Park and White Sands National Monument

National Park Service Press Release

CARLSBAD, NM and ALAMOGORDO, NM - On Sept. 26, National Park Service volunteer researcher Eric Metzler received the National Park Service's (NPS) Intermountain Regional Director's Award for Natural Resource Research. This esteemed honor is in recognition of Mr. Metzler's significant moth research at White Sands National Monument and Carlsbad Caverns National Park. In 2007, Eric undertook a study to survey and identify species of moths at these two national park units. Eric's work exemplifies excellence in advancing and publishing scientific research that furthers the goals of science and natural resource management in the National Park Service.

Metzler received the award because of key accomplishments in the field of research: 1) discovering more than 600 species of moths, 36 of which are new to science, and nearly all of the new species are endemic in the dunes of White Sands; 2) developing a baseline database for moth richness and diversity that helps NPS accomplish the all-taxa inventory goals; 3) providing interpretive materials, seminars and other formal presentations for both local and regional NPS staff; 4) publishing nine scientific papers, and one paper for the general public emphasizing the remarkable endemism of moths at White Sands and 5) volunteering 1600+ hours annually at both parks.

"Eric's scientific contributions inspire stewardship and collaboration in the spirit of protection, preservation, and improvement of the natural resources of White Sands National Monument and Carlsbad Caverns National Park," said NPS Intermountain Regional Director, Sue Masica.

*About the National Park Service, more than 20,000 National Park Service employees care for America's 401 national properties and work with communities across the nation to help preserve local history and create close-to-home recreational opportunities. Learn more at [www.NPS.gov](http://www.NPS.gov)*

Contact: Valerie Gohlke 575-785-3090, Carlsbad Caverns National Park

Contact: Rebecca Burghart, 575-479-6124, White Sands National Monument



# Intergeneric mating attempt: males of *Tegosa claudina* Eschscholtz and a female of *Chlosyne lacinia saundersi* Doubleday (Nymphalidae: Melitaeinae)

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**Abstract.** This work describes observations on a possible harassing courtship behavior of three males of *Tegosa claudina* Eschscholtz towards a *Chlosyne lacinia saundersi* Doubleday female in southeastern Brazil. We recorded the behaviors for 30 minutes using two digital cameras. The males of *T. claudina* harassed the female of *C. l. saundersi* in spite of the presence of more than five females of their own species foraging in inflorescences of *Bidens alba* Linnaeus a few centimeters apart. These records showed that the attraction exerted by the female *C. l. saundersi* upon *Tegosa claudina* males, could be derived from the overall similarity of color patterns in accordance with the mean values of RGB luminance and strong difference in size. Both species are phylogenetically related but belong to distinct tribes that split up approximately 30 million years before present. However, some traits still are not sufficiently differentiated to promote a complete pre-zygotic barrier.

**Key words:** *Bidens alba*; body size; butterfly behavior; pheromones; pre-zygotic barriers; sexual selection; wing displays

## INTRODUCTION

Gene flow between biological species does not usually occur because of pre-and post-mating isolating mechanisms (Futuyma, 2009). In animals, behavioral isolation is considered an obstacle to gene flow between sympatric and syntopic species. Usually, the system for the recognition of a partner is composed of visual, chemical and/or tactile signals. Commonly, females of one species will not respond to signals sent by males of different species and vice-versa (Paterson, 1985). In addition, females may express a preference for males with specific ornamentations within their species (Kemp, 2007).

Pre-zygotic barriers are important, but hybridization between species is relatively common in plants although less common in animals. Evidence suggests that hybridization occurs in at least 25% of plant species and 10% of animal species (Mallet, 2005).

The evolution of interspecific divergence in elaborate courtship displays may have played an important role in speciation of several groups of vertebrates. Divergence in morphological traits such as coloration or ornamentation appears to be important in interspecific diversity in certain groups of vertebrates with pheromones serving as basis for species-specific mating cues (Ptacek, 2000). The reinforcement model of evolution argues that natural selection enhances pre-zygotic isolation between divergent populations or species by selecting against unfit hybrids or costly interspecific matings. Reinforcement is distinguished from other models that consider the formation of reproductive isolation to be a by-product of divergent evolution (Lukhtanov *et al.*, 2005).

Interspecific matings (or attempts to do so) have been documented for a few Lepidoptera species; these events have been infrequently recorded (Table 1). Among these, matings between species of the same genus are most common, and some records on inter-generic mating by Lycaenidae (Lepidoptera), show partners with similar wing patterns (color, shape and size) (Kare and Smetacek, 2010).

During a field survey in March 31, 2009, at the edges of the dirty road in the right bank of the Quilombo river (Santos, SP, Southeastern Brazil, 23°51'25"S and 46°20'55"W) we observed unusual interactions between a teneral female *Chlosyne lacinia saundersi* Doubleday and three males of *Tegosa claudina* Eschscholtz.

In this paper, we have the following objectives: (1) to describe these interactions and, (2) to compare them with standard mating behavior of males of *T. claudina*.

## MATERIALS AND METHODS

We followed the butterflies from 10:50 h to 11:20 h and recorded their behavior using two digital cameras: a Canon EOS 50D (4752 x 3168 pixels resolution), and a Nikon Coolpix L5V1.0 (3072 x 2304 pixels resolution). In the laboratory we used the Exchangeable Image File Format (EXIF) time data (time in hour:minutes:seconds) of each picture to quantify the interactions.



**TABLE 1:** References about inter-generic mating in butterflies and moths, and attempts among individuals of the same sex belonging to different species.

Pairs and References
<i>Papilio xuthus</i> and the <i>P. polyxenes-machaon</i> group (Ae, 1960)
European silkmoths (Saturniidae) (Bryant, 1980)
<i>Fixsenia favonius</i> (Smith) and <i>Calycopis cecrops</i> Fabricius (Lycaenidae) (Calhoun, 1990)
Hybridization between <i>Callosamia</i> and <i>Hyalophora</i> (Saturnidae) (Carr, 1984)
Natural interspecific pairing between <i>Pieris virginianensis</i> and <i>P. napi oleracea</i> (Pieridae) (Chew, 1980)
<i>Callimorpha dominula</i> (Linnaeus) and <i>Tyria jacobaeae</i> (Linnaeus) (Arctiidae) (Clarke <i>et al.</i> , 1996)
<i>Limenitis archippus</i> (Cramer) and male <i>L. arthemis</i> subspecies (Nymphalidae) (Covell-Jr, 1994)
Inter-specific pairing in Lycaenidae (Downey, 1962)
A <i>Limenitis</i> sp. hybrid from Missouri (Elder, 2002)
<i>Plebejus icarioides montis</i> (Boisduval) and <i>Everes amyntula</i> (Boisduval) (Lycaenidae) (Frechin, 1969)
<i>Siproeta epaphus</i> (Latreille) and <i>Anartia amathea</i> (Linnaeus) (Nymphalidae) (Greeney <i>et al.</i> , 2006)
Hybrid between <i>Limenitis arthemis astyanax</i> and <i>L. archippus</i> (Nymphalidae) (Greenfield and Platt, 1974)
Inter-generic mating by Lycaenidae (Kare and Smetacek, 2010)
<i>Limenitis</i> Fabricius (Nymphalidae) (Klots, 1959)
<i>Limenitis arthemis astyanax</i> (= <i>arizonensis</i> W. H. Edwards) and <i>Polygonia interrogationis</i> (Fabricius) (Marcus, 2007)
A hybrid <i>Limenitis</i> (Monroe, 1953)
<i>Limenitis archippus</i> and <i>Limenitis weidemeyeri</i> hybrid (Myrup, 2008)
<i>Callosamia</i> and <i>Samia</i> (Saturniidae) (Peigler, 1978)
<i>Limenitis (Basilarchia) arthemis astyanax</i> and <i>L. archippus</i> (Platt and Maudsley, 1994)
<i>Limenitis archippus</i> and <i>Limenitis</i> sp. (Nymphalidae) (Platt <i>et al.</i> , 1978)
Male <i>Aglais urticae</i> , L, persistently courting a male <i>Brenthis euphrosyne</i> L. (Poulton, 1929)
Hybrid between two <i>Limenitis</i> sp. (Schiefer, 1999; Schiefer, 2000)
<i>Papilio glaucus glaucus</i> and <i>P. eurymedon</i> , <i>P. rutulus</i> , and <i>P. multicaudatus</i> (Papilionidae) (Scriber <i>et al.</i> , 1990)
<i>Mechanitis polymnia</i> (Linnaeus) and <i>M. lysimnia</i> (Fabricius) (Nymphalidae) (Vasconcellos-Neto and Brown-Jr, 1982)
Hybrid of <i>Papilio eurymedon</i> and <i>P. rutulus</i> (Papilionidae) (Wagner, 1978)

To know the size of butterflies of both species, a sample of 133 dried individuals of *T. claudina* (84 males and 49 females) and six females of *C. lacinia saundersi* were scanned at 600 DPI with the forewing length (FWL) in mm measured using ImageJ software (Rasband, 2013). All data were analyzed using Biostat 5.0 software (Ayres *et al.*, 2007) and graphs constructed using Excel spreadsheet or R software (R Core Team, 2013).

## RESULTS AND DISCUSSION

During the period of observation, three males of *T. claudina* harassed a newly emerged female of *C. l. saundersi* (Figures 1 a-d; the complete sequence included 105 pictures) in spite of the presence of more than five females of their own species foraging in inflorescences of *Bidens alba* (Linnaeus) a few centimeters apart. During 1200 s (= 20 minutes) of quantitative recording the female used 13 different inflorescences (mean time per inflorescence = 40.2 s; s. d. = 29.27 s; n = 13), jumping from one to another.

For the first 10 inflorescences, she was constantly followed by one *T. claudina* male and at the last three by two other *T. claudina* males (totaling three males; Figure 2). The time spent by males at the flowers was significantly cor-

related with time spent together with the female of *C. l. saundersi* ( $R = 0.89$ ;  $p < 0.000007$ ) which did not attempt to leave the flowers during the period of observation.

Mean FWL of adults of both sexes of *T. claudina* are significantly different and different from *Chlosyne* females ( $F = 155.06$ ; Tukey: male TC x female TC,  $p < 0.01$ ; male TC x female CL  $p < 0.001$ ; female x female CL = 0.001) (Table 2).

From 2004 to 2010, in the same study area we observed 121 different sequences on 46 sampling dates of males of *T. claudina* harassing conspecific females. All sequences ended with female rejecting males eventually. The behavior of male of *T. claudina* harassing their own females consists of circular flights around her attempting to land on her side. This is followed by landing on the flower or

**TABLE 2.** Forewing length in mm of both sexes of *T. claudina* and female of *Chlosyne lacinia saundersi*.

	Mean FW length	Standard deviation	n
<i>T. claudina</i> male	16.4	1.19	84
<i>T. claudina</i> female	17.5	1.43	49
<i>C. l. saundersi</i> female	25.9	1.34	6

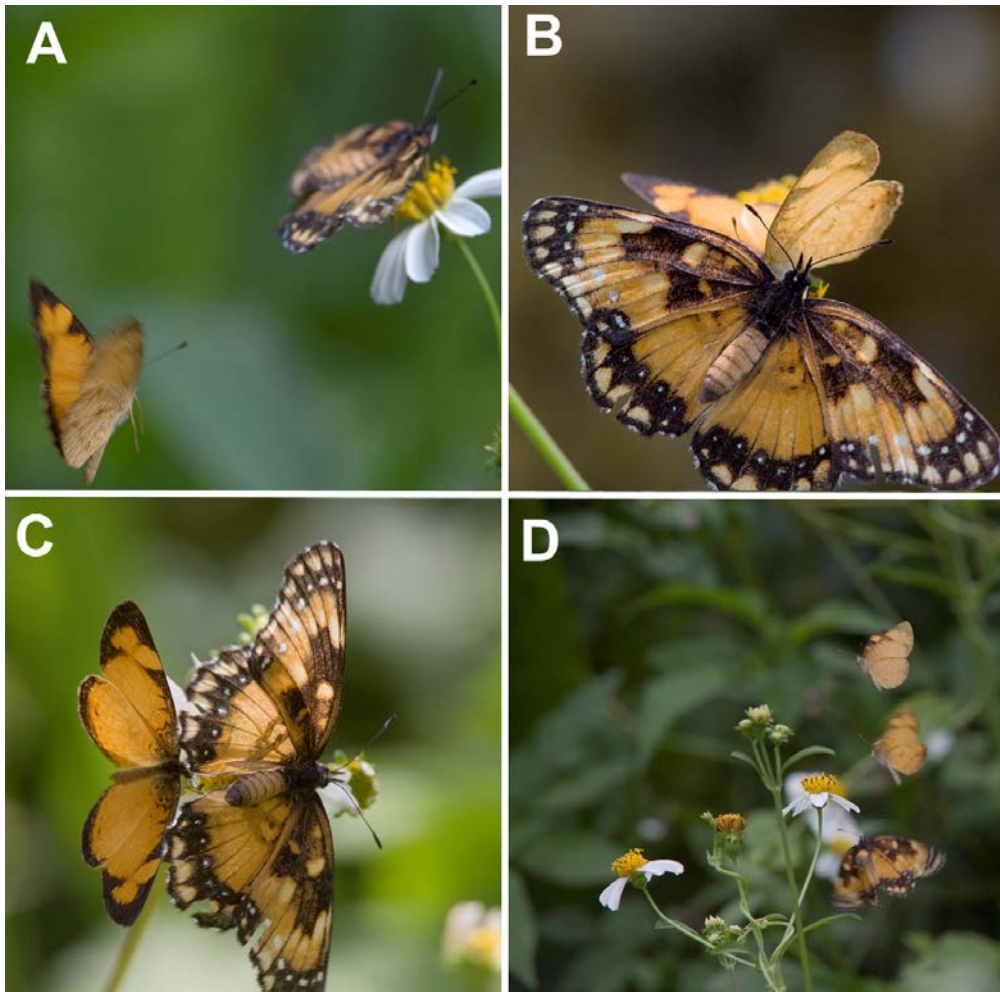


Figure 1. Three aspects of the interaction of males of *Tegosa claudina* with the female of *Chlosyne lacinia saundersi*. (a) 10:53:00 h; (b) 10:55:33 h; (c) 10:56:10 h; (d) 11:16:06 h.

leaf where the female was positioned and eventually trying to copulate with her, bending his abdomen to copulate. Females reject males, raising the abdomen to deter copulation. On five occasions, we observed a female being harassed by five males, and one by seven males. Sequences of mating behavior of *T. claudina* were documented in Francini (2010).

In butterflies, both females and males evaluate the quality and conditions (size, color, brightness, symmetry) of their potential partners or rivals, and thus adopt the most appropriate approaches for each situation (Schultz and Fincke, 2009). Therefore, we can discuss some scenarios to understand the observed behavior.

The first possibility is that *T. claudina* male (or males) are acting aggressively against *C. l. saundersi* females. This is unlikely, because the attack patterns are different from mating approaches. According to general observations, the ritualized fighting between males are very characteristic and remarkably similar across butterfly species, in which two males circle near each other (circling flight) until one of them gives up (Bergman *et al.*, 2010).

At first glance, the pattern characteristics show striking differences between the two species, which could discourage the male-female interaction. This leads to the second possibility, because males of *Phyciodes phaon* (W.H. Edwards, 1864) and *P. tharos* (Drury [1773]), a genus of Melitaeinae near *Tegosa*, show vigorous courtship behavior when caged with females of their own or of the other species (Oliver, 1982).

The third possibility is that the attraction of *T. claudina* males

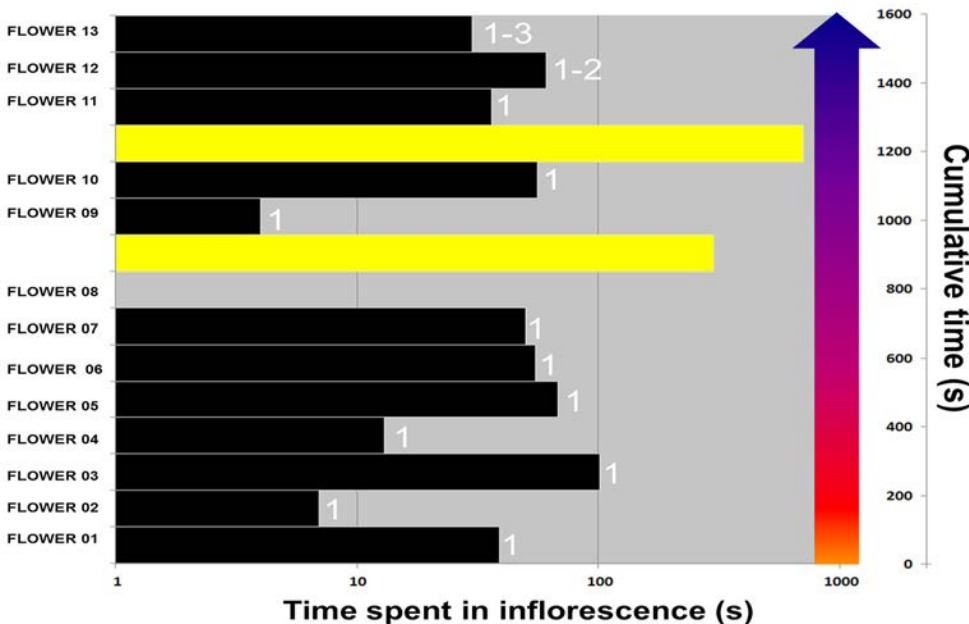


Figure 2. Time spent in seconds by *Chlosyne lacinia saundersi* female on inflorescences of *Bidens alba*. Number on each bar indicates what male of *Tegosa claudina* was together with the female. Scale of axis x is log 10. Yellow bars are intervals not quantified.



by the female of *C. l. saundersi* could be partially derived by overall similarity of color patterns of both species. Some animals also use UV reflectance patterns to recognize their own species and for the evaluation of sexual displays (Schultz and Fincke, 2009) regardless of visible coloration (White *et al.*, 2012). Our tests have not yet evaluated the possibility that the attraction in this case involved UV reflectance, but in any case the male's courting behaviors were very characteristic.

The fourth possibility is the significant difference in size between females of *T. claudina* and *C. l. saundersi*. In *T. claudina* there is a little size dimorphism between sexes, with males being just a bit smaller than females. Size dimorphism between sexes appears to be a pattern in most invertebrates and lower vertebrates (Arak, 1988). The choice of larger females by small and large males was observed and experimentally tested in the beetle *Diaprepes abbreviatus* (Coleoptera: Curculionidae) by Harari *et al.* (1999) and observed in aggregations of the blister beetle *Lytta magister* (Coleoptera: Meloidae) by Brown (1990). In an experimental approach using *Pieris protodice* (Lepidoptera: Pieridae), Rutowski (1982) showed a significant tendency of males to choose bigger and new females.

However, as the last possibility, we cannot discard the role of pheromones in the interplay between the sexes, which is more common in nocturnal Lepidoptera (e.g. Greenfield and Karandinos, 1979).

Crespi (1989), in a study of the causes of assortative mating in arthropods affirmed that mating by size is one of the most common mating patterns in natural populations. He proposed three hypotheses for this: mate choice, mate availability, and mating constraints. In our study, the mean size of *Chlosyne* female is 48% bigger than *T. claudina* females therefore mate choice appears to be the hypothesis best supported.

## CONCLUSIONS

Our observations showed clear evidence of the attraction by *C. l. saundersi* females on *T. claudina* males. Both species are Nymphalidae of the subfamily Melitaeinae, in tribes Chlosynina (*Chlosyne*) and Phyciodina (*Tegosa*). They are phylogenetically close but separated during the Eocene, at least 30 million years before present (Wahlberg and Freitas, 2007). In spite of all this evolutionary time, some traits still are not sufficiently differentiated to promote a complete pre-zygotic barrier.

## ACKNOWLEDGEMENTS

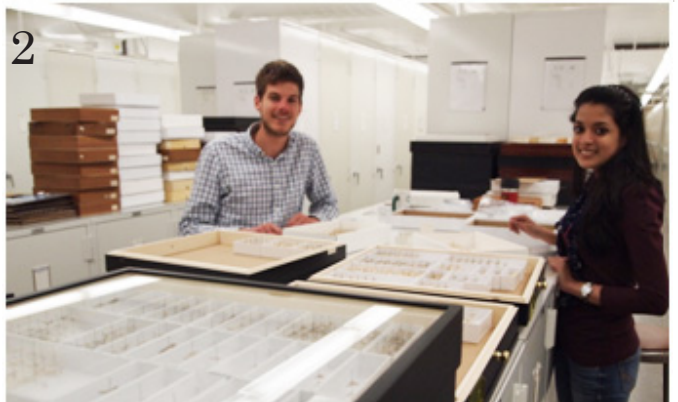
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## Ron Leuschner pyraloid donation





# Ron Leuschner donates over 11,000 specimens of Pyraloidea to the National Museum of Natural History

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Ron Leuschner, a Past President of the Lepidopterists' Society, was a life-long Lepidoptera collector and enthusiast. Over the course of his career as a collector, he amassed an impressive personal collection of Lepidoptera from around the world, but primarily from North America (Preston 1991). Since 1997, Ron had been donating portions of his collection to the National Museum of Natural History, Smithsonian Institution, Washington, D.C. (NMNH). His cumulative donations exceed 26,000 specimens, the most significant of which is 11,017 specimens of Pyraloidea. This donation represents an extraordinary resource for lepidopterists in the future.

The Leuschner Pyraloidea come mostly from California and the western United States, where Ron did most of his collecting, but it also includes specimens from the Neotropics and the Old World. This donation is of particular importance because it adds depth from the western United States, incorporating localities that are not represented and may not be represented in the future. Due to continued habitat degradation across the country, Leuschner's collections may prove one of a kind as habitats disappear. For many species in the Leuschner collection, the NMNH only has the type specimen; Leuschner's donation contributes a greater number of individuals, documenting phenotypic variation and geographic variation within species.

Obtaining and decanting this donation was a group effort. John Brown, a Research Entomologist with the Systematic Entomology Lab (SEL), sent empty insect boxes to Kelly Richers, who then took them to Ron's house, where his sizable collection was stored. Kelly and Ron transferred his specimens to the insect boxes and mailed them back to the NMNH.

Once at the NMNH, Gary Ouellette, a Museum Specialist (SEL), Alicia Hodson, a Technician (formerly at SEL), and two interns, Nick Silverson and Alvira Hasan, transferred and decanted from Level 1 insect boxes to Level 3 archival unit trays, and finally into drawers. Alma Solis, a Research Entomologist (SEL) and Curator of the Pyraloidea, then incorporated the specimens into the collection at the subfamily level.

Solis, Silverson, and Hasan also decanted ten insect boxes of ongoing pyraloid donations from Bo Sullivan and Kelly Richers, comprised of specimens from North Carolina and California, respectively. Alma Solis and other staff members at the NMNH and SEL are very grateful for these additions to the collection and the resources they will provide to lepidopterists for years to come.

## Literature

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Figure legends:

1. Gary Ouellette & Alicia Hodson decanting and sorting in the NMNH Lepidoptera sorting area.
2. Nick Silverson & Alvira Hasan decanting and sorting in the NMNH Lepidoptera sorting area.
3. Pyraloids in a mailer.
4. Pyraloids in unit trays.
5. Pyraloids in drawers ready to go into the Main Pyraloidea Collection.



# Metamorphosis

Julian Donahue

## Ronald H. Leuschner (1930-2014)

Ronald Henley Leuschner, of Manhattan Beach, California, passed away on September 4, 2014 at the age of 84. Ron was the son of Martin L. and Frances Leuschner. He was born in Philadelphia, Pennsylvania on September 2, 1930, but before he was five years old the family moved to



Oak Park, a suburb west of Chicago, where Ron grew up. He majored in electrical engineering at the University of Illinois, Chicago, where he was a member of Eta Kappa Nu, Tau Beta Pi, Sigma Tau and Phi Kappa Phi, all academic and engineering honor

societies, and then spent two years in the Army, where he was assigned to do geophysical exploration on the Greenland ice cap. Ron moved to Southern California in 1955 to start a job with Hughes Aircraft Company while also pursuing a Master's degree in Engineering at USC. At Hughes worked on Surveyor, the first unmanned spacecraft to land on the moon.

Ron met his future wife, Jeanne Wacholz, in L.A. (who ironically was from Chicago) and they wed on February 20, 1957. They were married for 52 years and had three children: Karen, Kristin, and Kurt. The family lived in Gardena until 1972, when they moved to Manhattan Beach. Ron worked in the aerospace industry for over 34 years. Ron was predeceased by his wife Jeanne, on February 28, 2009.

Ron served The Lepidopterists' Society in a number of capacities, some formal and many more in an informal manner. Since joining The Lepidopterists' Society in 1949 (missing being a charter member by only two years), he has served as Editor of the News (1973-76), Treasurer (1978-83), Vice President (1988-89), and President (1990-91). In addition, he had been Publications Coordinator for many years (selling memoirs and back issues, and sending publications to new members); since 1992 he had been an Assistant Secretary (Publications Manager) and since 1993 the Assistant Treasurer for Membership, a monumental task involving the annual preparation and mailing of ballots and dues notices, then collecting, recording, and depositing thousands of dollars of revenue--all of which he

accomplished with selfless dedication and scrupulous attention to detail until October 2012, when he was forced to retire due to health concerns.

But informally, if it is even possible, Ron was even better known. Traveling far and wide, both for fun and to collect, he was known across the continent and internationally. Ron's tall lanky figure was a constantly recognized persona, known for his patience and mentoring of novice and professional lepidopterists, drawing many to the "dark side" of moth collecting. Ron Leuschner collected in too many countries to mention, and attended innumerable international meetings and field meetings. Armed with his trusty dog-eared and heavily annotated *Hodges Check List of Lepidoptera*, he spent many hundreds of patient hours identifying moths in museums and for hundreds of persons across the continent, amateur and professional alike.

Ron's incredible memory could place a moth within a few Hodges' numbers of the identification, and for macro-moths there has not been anyone this author has seen who comes even close to his percentage of correct identifications without spending hours researching in a museum.

His knowledge was gained from countless hours in museums, learning the species and working with collections to determine, separate and learn the identifying characters of the species with which he was working. A visit to his basement revealed the extent of his research, with papers, original descriptions, books and monographs taking up all the wall and closet space of rooms filled with specimens, spreading boards, research and his own drawings and notes.

Ron exchanged specimens with dozens of eminent lepidopterists across the globe, and his assistance with discovering new species and loaning specimens was unrivalled.

At least the following species have been named directly for Ron Leuschner: *Anania leuschneri*, *Diedra leuschneri*, *Pterotaea leuschneri*, *Euxoa leuschneri*, *Orgyia leuschneri* and *Uncitruncata leuschneri*, in addition to the many paratypes of other species he contributed to identifications. In 1968 Ron described his only new species: *Eupithecia karenae*, a geometrid moth named after his daughter Karen.

The collection of Ronald H. Leuschner, over 100,000 specimens, was donated to the Smithsonian Institution (see page 175), The McGuire Center for Lepidoptera (University of Florida) and the Essig Museum of Entomology (University of California, Berkeley), as well as many specimens donated to the Natural History Museum of Los Angeles County, where he was a research associate, and the private collection of his friend, Kelly Richers.

Ron had recently been nominated for honorary life membership (Fall 2014 News, 56(3):146), and had been notified of such prior to his passing. We regret not being able to have this as a vote for the general membership.

-- Kelly Richers



# Palearctic alpine butterflies and a brief discussion of *Boloria montinus* Scudder

George O. Krizek

2111 Bancroft Pl. NW, Washington, D.C. 20008

In this short photoessay we present 32 Palearctic and one Nearctic species mostly inhabiting montane and also the highest European alpine areas. The purpose of this article is to discuss the question of possible holarctic occurrence of some of the shown butterflies, only in one case, we mention the Nearctic *Boloria montinus* (*Boloria titania montina* Scudder, sensu Klots) and its relation to the European *Boloria titania* (Esper). Three of the presented pictures deal with this question. There is some confusion in the nomenclature used in this connection.

Until recently, some authors (A. Klots, W. Howe, J. Scott, P. Opler, G. Krizek and others) believed that *Boloria titania* (Esper, 1793) was a holarctic species. In 1951 A. Klots writes: "Our forms are conspecific with the European *B. titania* Esper." E. Pike (in Scott, 1986) considers *Boloria chariclea* to be only a subspecies of *Boloria titania*. However, at the present time, most authors accept the opinion that *B. titania* does not live in the Nearctic. The "White

Mountain Fritillary" (*Boloria titania montina* Scudder) is actually a distinct species, called *Boloria montinus* (see our picture from Wyoming). Also the other populations belonging under *Boloria chariclea* Schneider (which is circumpolar) should not be considered *B. titania* (Esper).

Paul A. Opler (1999) states: "The Purple Fritillary (*Boloria titania*), previously thought to occur in N. America is limited to Eurasia. In Alaska, two different-appearing butterflies referable to the Arctic Fritillary (*Boloria chariclea*) fly in some localities at different season in differing habitats."

Jim P. Brock (2003) says about *Boloria chariclea*: "Difficult to distinguish from Purplish Fritillary (*B. montinus*) where the two occur together; some consider the two to be one species, and both were formerly confused with the Titania Fritillary of the Old World . . ." For this reason, some consider *B. montinus* to be a subspecies of *B. chariclea*.



Nymphalidae: *Boloria montinus*, Clay Butte, Beartooth Pass, Wyoming, July 22, 1996



Nymphalidae: *Boloria titania*, Echevnoz, Italy, July 7, 1980



Nymphalidae: *Boloria napaea* (m), Col du Lauterat, France, July 20, 1983 (Holarctic species)





Nymphalidae: *Boloria pales* (m), Argentiere, France, July 31, 1986



Nymphalidae: *Coenonympha gardetta*, Argentiere, France, July 31, 1986



Nymphalidae: *Mellicta varia* (m), Zermatt, Switzerland, August 2, 2001



Nymphalidae: *Euphydryas aurinia debilis* (f), Plätzwiesen Italian Alps, July 6, 1983



Nymphalidae: *Euphydryas cynthia* (m), Argentiere, France, July 31, 1986



Nymphalidae: *Euphydryas cynthia* (f), Grossglockner, Austria July 8, 1983





Nymphalidae: *Erebia alberganus*, pair, Breuil Cervinia  
Materhorn, Italy, August 6, 2001



Nymphalidae: *Erebia tyndarus*, St. Anton, Austria,  
August 11, 1986



Nymphalidae: *Erebia montana*, Täsch, Switzerland  
August 1, 2001



Nymphalidae: *Erebia gorge* (f), Stubenkogel, Austria  
July 19, 2002



Nymphalidae: *Erebia melampus*, Argentiere, France  
July 31, 1986



Nymphalidae: *Oeneis glacialis* (f), Little San Bernard Pass,  
France, July 26, 1983





Lycaenidae: *Lycaena alciphron gordius* (m), Sierra Nevada, Spain, June 28, 1882



Lycaenidae: *Albulina orbitulus* (m), Plätzwiesen, Italian Alps, July 7, 1983



Lycaenidae: *Lycaena hippothoe eurydame* (m), Argentiere, France, July 31, 1986



Lycaenidae: *Thersamonia thetis* (m), Sultandaglary, Turkey, July 19, 1988



Lycaenidae: *Glaucopsyche melanops* (m), High Atlas Mountains Morocco, May 12, 1987





Papilionidae: *Parnassius apollo* (f), Courmayeur, Italy  
August 4, 1986



Pieridae: *Pieris bryoniae* (f), Seiser Alm, Italy, July 5, 1983



Pieridae: *Colias phicomone* (m), Argentiere, France  
July 31, 1986



Pieridae: *Pontia callidice* (males)  
Top: Chamonix, France, July 31, 1983  
Bottom: Col du Calibier, France, July 24, 1983



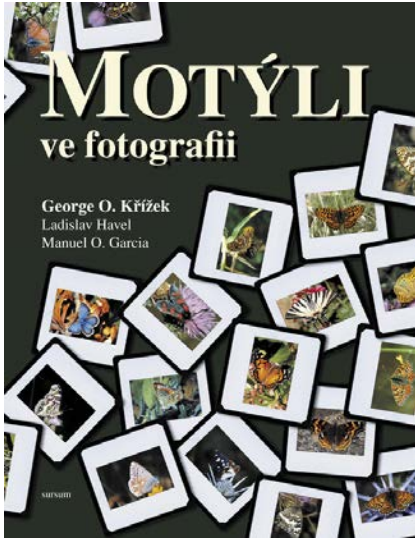
Zygaenidae: *Zygaena exulans*, Gornergrat, Zermatt, Switzerland  
July 31, 2001; this species flies up to snow line (3000m)





# Book Reviews

**Motýli ve fotografii** (Lepidoptera in photographs), 2006, by George O. Krížek, Ladislav Havel, and Manuel O. Garcia. Published by Sursum. Nakl. Tišnov, Czech Republic. 202 stran (pages), 568 barevných (color) fotografií, doporučená cena (price) 650 Kč, ISBN 80-7323-134-4. Information about the book is available on the internet at <http://www.sursum.cz/www-sursum-cz/eshop/0/3/5/51-Motyli-ve-fotografii>. Instructions for ordering the book are at the end of this review.



My review has two tracks. The first track is some background, and the second track is a description of this wonderful book. Curious? Read on.

When climbing the stairs to Dr. (He's an MD.) Krížek's upper sanctuary he off-handedly says, "we must go to the butterfly room to talk." And what a butterfly room it is! Most of us in the

US are familiar with Dr. Krížek's photos in *Butterflies East of the Great Plains* Opler and Krížek, (1984) and his outstanding contributions to the NEWS. The butterfly room, tucked away at the top of his house, in addition to cabinets and drawers, is chocked full of three-ring notebooks, each full of archival sheets, each archival sheet full of 35 mm transparencies. The notebooks bear labels from locations around the globe. It is an extremely valuable treasure trove of photographs from one of the all-time greats.

Dr. Krížek is charming and talks with animation about his life's avocation, including the time in 2003 when he was attacked and robbed by two experienced bandits who stole his camera and several rolls of exposed film. Dr. Krížek describes this traumatic experience in the NEWS of The Lepidopterists' Society, Vol 45, 2003, No. 3, p. 74. His wife, Blanka, is a wonderful hostess - they came to the US from the Czech Republic, and old world charm is exhibited throughout the house including the butterfly room. He carefully showed Pat, my spouse, and me his first butterfly net and some old setting boards. Fantastic!

Perhaps you can guess by now, nearly everything I saw in the butterfly room were photographs. Yet Dr. Krížek is an active collector. He owns several dozen California Academy and Cornell type drawers with mounted specimens. How does he do it all? During my short visit we did not have

time to go through the collection. A rain check perhaps for another visit.

Dr. Krížek explains it is difficult to get a book published in Europe unless a person is part of the "inner circle." I commented on the beautiful works being produced in Europe, and he raised his hands in modest protest. Then he showed me his 2006 book, the subject of this review. Spectacular! He gave me a copy, generously inscribed to me. It is now proudly in my library of Lepidoptera related books.

During the visit Dr. Krížek expressed his devotion and extreme gratitude to James K. Adams for James' perfect editorial work and time spent with Krížek's slides and texts published in the NEWS. I agree.

Now to the second track; the book. The authors worked on this book for more than 3 decades. The fauna presented by this book is central and western Europe, western Turkey, and a small part of northern Africa (Morocco) The authors emphasize that ALL the pictures (maybe 2 exceptions) demonstrate live butterflies in their natural habitats. No wonder it took 30 years to gather all these wonderful photos.

This is a skillfully produced book; even the photos on the dust jacket line up with the illustrations on the laminated hard cover. Dr. Krížek took most of the photos, and he modestly admits to writing most of the text. I do not read Czech, but I understand the symbols for male and female, I understand notations for dates, I know when I'm looking at a place name (for later use on Google), and I know how to look up species' names. Most species are illustrated by more than one photo, male and female, upper and under sides. Variation is shown where it might be helpful.

Most photos are butterflies and a few skippers. Some of the colorful zygaenid moths are included, and a few colorful beetles round out the last few pages. I found my first photo of a pure cream/yellow zygaenid, *Adscita stacies* (L., 1758).

The paper is nearly photo quality, and the registry is right on target; everything is crystal clear. The colors are brilliant, and each photo is a work of art. No questionable compositions here. The construction is sound; especially like the Smythe sewing so that the book lies flat when open.

Sometimes book review editors want the reviewer to give weaknesses about a book. After several weeks of careful consideration, I just cannot come up with anything I would change.

Go on line to buy a copy now, or put it on your Christmas list as a gift to yourself. At this price you must have one just to show off at meetings and casual get togethers. You will be greatly admired for having a copy. Dr. Krížek says the publisher has a few copies left. Do not be left out. The next paragraph gives step by step instructions for ordering a copy.



You do not have to understand Czech to buy the book. I sent a short note in English giving the name of the book, authors, and year. The book arrived about one month later. The cost of the book is \$25.65 US, postage is \$27.00 US. Send your order for the book to: Miroslav Klepáček at SURSUM, Cáhlovská 162, 666 01 Tišnov, Czech Republic. Sursum only accepts bank to bank wire transfers for payment. My bank charged me \$45.00 for the transfer. Total cost of book = \$101.50. In my mind a good buy.

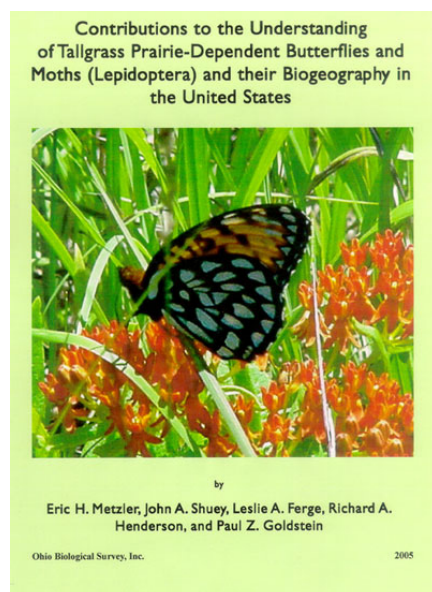
## Literature cited:

Opler, P.A. & G. O. Krizek. 1984. *Butterflies East of the Great Plains*. The John Hopkins University Press. Baltimore, MD. 294 pp.

Eric or Pat Metzler, P.O. Box 45, Alamogordo NM 88311-0045, [spruance@beyondbb.com](mailto:spruance@beyondbb.com)

### ***Contributions to the understanding of Tallgrass prairie-dependent butterflies and moths (Lepidoptera) and their biogeography in the United States.***

By Eric H. Metzler, John A. Shuey, Leslie A. Ferge, Richard A. Henderson, and Paul Z. Goldstein. 143 pages, 164 color images. ISBN 978-08672 71539. Ohio Biological Survey, Columbus, Ohio. Price \$30 USD. Publication date: 2005.



Anyone with an interest in prairie Lepidoptera likely already owns a copy of this book, due in part to the value it provides as a foundational reference. By taking a close look at many species known from prairies the authors identified 109 as being prairie-dependent. This selection is treated therein; with distribution maps, hostplant records, extensive citations and a few color photographs. The roughly 27 pages of citations this volume has assembled is one of the great strengths of the book. Regrettably so few species are thoroughly treated, but had the authors not limited themselves this volume would likely still be in preparation today.

The book begins by building a foundation for understanding prairie ecosystems and biogeography through discussing several notable hypotheses for grassland formation and historic migration routes. When it comes to any question on grasslands I often refer to this section first to begin my

search through the literature. The annotated list of 109 species starts with the butterflies and skipper and then moves through the rest of the families alphabetically. Each of the species has the current state of knowledge briefly summarized in several points. The distribution maps are a simple plotting of occurrence based on a sampling of specimen records. This method, in my opinion, is much more informative than attempting to predict general ranges which are ultimately misleading and belie the truly disjunct nature of distributions. Not to be overlooked is the discussion, forming one of the critical messages of this book. Insects, and surprisingly Lepidoptera, are usually neglected in habitat management practices. Managed burns often happen without this consideration and very little is known on the coevolution between insects and fire.

The 109 prairie-dependent species came from a broader list of 347, all of which were ranked from 1 to 6 with 1 indicating the greatest level of dependence. Unfortunately this information is only located in a somewhat cumbersome table that isn't cross-referenced to the annotated species list. In my original copy of the book I have penciled in these rankings on the species accounts to avoid flipping back-and-forth between sections. While species records west of the 100<sup>th</sup> meridian were intentionally excluded, it may have been useful to include a brief mention of their overall distribution. While this is generally acknowledged in the discussion, some species treated as moderately prairie-dependent are indeed widely distributed in the west, a fact likely unknown to a non-Lepidopterist.

This book is not for identifying specimens, does not make any taxonomic changes, and is not meant to be a comprehensive volume on grassland Lepidoptera. What it does is provide an incredibly important starting point for any further investigations into midwestern prairie species. Writing this review nearly ten years after publication has been an unfortunate oversight given how important it has been for summarizing our state of knowledge.

Christopher C. Grinter. *Collection Manager of Insects, Illinois Natural History Survey, Champaign, IL 61820.* [cgrinter@illinois.edu](mailto:cgrinter@illinois.edu)



[www.lepsoc.org](http://www.lepsoc.org) and <https://www.facebook.com/lepsoc>

# The Marketplace

**IMPORTANT NOTICE to ADVERTISERS:** If the number following your ad is "563" then you must renew your ad before the next issue!

**New Advertising Statement:** The News of The Lepidopterists' Society accepts advertising related to Lepidoptera and consistent with the purposes of the Society free of charge. Other types of advertising will not be accepted, regardless of the source. Acceptability of advertisements for publication is at the discretion of the News editor.

## Books/Electronic Images

For Sale: Lepidoptera books from personal library of over 600 volumes. Books are in excellent condition, mainly hardbound, some with custom bindings. All are out of print and most were published before 1999. I must sell due to lack of space to continue to store them. I do not have a current list of titles available, but am working on one that should be available soon. Available titles do include Jamaica and its butterflies by Brown and Heineman, The butterflies of North America by Howe, The generic names of the butterflies and their type species by Hemming (custom hardbound), Ithomiidae tribe Napeogenini by Fox and Real, Butterflies of Liberia by Fox, A revision of the American Papilios by Rothschild and Jordan (custom hardbound), How to know the butterflies by Ehrlich and Ehrlich, Butterflies of Britain and Europe by Higgins and Riley. In the meantime, before a more complete list of titles is available, I am making the following offer: An assortment of 50 books for \$200.00 or 20 books for \$100.00 (with a provision to ensure that you won't receive any duplicates to your present library). For more information contact John Masters, [quest4tvl@aol.com](mailto:quest4tvl@aol.com). 564

**NEW ISSUES OF PAPILIO (NEW SERIES):** #21, Argynnis (Speyeria) nokomis nokomis: geographic variation, metapopulations, and the origin of spurious specimens (Nymphalidae), by James A. Scott & Michael S. Fisher, 32 p. #22, Systematics and life history studies of Rocky Mountains butterflies, by J. Scott (parts by Norbert G. Kondla & Richard E. Gray), 78 p. #23, Identification of Phyciodes diminutor, P. cocyta, and P. tharos in northeastern U.S. (Nymphalidae), by J. Scott, 26 p. (Note: if you received a preliminary copy of #22 prior to the publication of this ad, download #22 again because pages have changed (socorro correction pp. 20, 26-27, Zoobank registration pp. 59, 78). Papilio (New Series) is now online (ISSN 2372-9449), treating systematics and biology of butterflies. All issues #1-23 now available as free printable pdfs at <http://digitool.library.colostate.edu>, click on Colorado State University, search for Papilio (New Series). Print quality is improved over some originals, esp. larger readable type in #6, better photos in #8, and b/w photos now color in #12. Printed copies of all issues can still be obtained (at cost of printing, postage, & handling) from J. Scott including the nice commercially-printed color plates in #12 and #18. James Scott, [JameScott@juno.com](mailto:JameScott@juno.com), 60 Estes St., Lakewood, CO 80226-1254, USA 564

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.

Only members in good standing may place ads (but see top of next column). **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. 562, 563) which denotes the volume and number of the **News** in which the ad first appeared. **Renew it Now!**

**Note: All advertisements must be renewed before the deadline of the**

### third issue following initial placement to remain in place.

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

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

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

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



**FOR SALE:** One copy of David Spencer Smith, Lee D. Miller, and Jacqueline Y. Miller's magnificent book "The Butterflies of the West Indies and South Florida." 1994. Oxford University Press, Oxford, UK. 264 pp. 32 color plates by Richard Lewington". This book is very hard to find. Only 800 copies were printed. This copy is in good condition and is signed by author Jacqueline Miller. It was formerly owned by the famous Everglades scientist John Ogden and bears his stamp. Contact Marc Minno (352-219-1009; marc.minno@gmail.com). 564

50 minute DVD, published December 2013, on the many ways that colours are generated in butterfly wings. "Gilded Butterflies and the Secrets of their Scales" draws on live butterfly footage from 18 countries worldwide and many scanning microscope images of diverse types of butterfly wing scales. See website at [www.cinebutterflies.com](http://www.cinebutterflies.com) for details. John Banks FRES, 28 Patshull Road, London NW5 2JY, UK 564

### Equipment

**FOR SALE:** 6 Cornell Cabinets, six drawer capacity, excellent condition. Buyer to arrange for local pickup or shipping. For details, contact Gary O'shea, 12 Drum Hill Drive, Summist, NJ 07901, or [lepman5@comcast.net](mailto:lepman5@comcast.net). 563

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

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

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

Cornell Drawers: Leptraps now offers Cornell and California Academy Storage Drawers. Drawers are made of Douglas Fir, Hardboard Bottom and Glass Top. Finished in Clear Satin Gloss Varnish. A single Card Holder with Pull or two Card Holder with a Knob Pull. Foam pinning bottom is available.

For more information on any of the above, visit our web site at: [www.leptraps.com](http://www.leptraps.com), or contact Leroy C. Koehn, Leptraps LLC, 3000 Fairway Court, Georgetown, KY 40324-9454; Tel: 502-542-7091. 563

## Membership Updates

Chris Grinter

Includes ALL CHANGES received by 14 November 2014

*New and Reinstated Members: members who have joined/renewed/been found/or rescinded their request to be omitted since publication of the 2012 Membership Directory (not included in the 2008 Membership Directory; all in U.S.A. unless noted otherwise)*

**Brockman, Nathan:** 1407 University Boulevard, Ames, IA 50011-3101.

**McAllister, Ben:** 9429 Liberty Road, Frederick MD 21701.

**Victoria, Joseph:** 5089 Merrifield Court, Spring Hill, FL 34608.

**King, Sharon:** 3934 Keeshen Drive, Los Angeles, CA 90066-4509.

**Chartier, David:** 1204 East Yampa Street, Colorado Springs, CO 80909.

**Grenis, Kylee:** 153 Wolf Creek Trail, Broomfield CO 80020.

**Dombroskie, Jason:** Department of Entomology, Comstock Hall, Cornell University. Ithaca, NY 14853.

**Whellan, Rodney:** 62 Bowman Street, Drummoyne NSW 2047, Sydney NSW, Australia.

**Leuschner, Kurt:** 70065 Sonora Road #267, Mountain Center, CA 92561.

**Evans, James:** 3301 Startan Court, Louisville, KY 40220.

*Address Changes (all U.S.A. unless noted otherwise)*

**Nelson, Michael W.:** Natural Heritage & Endangered Species Program, Massachusetts Division of Fisheries & Wildlife, 1 Rabbit Hill Road, Westborough, MA 01581

**Snyder, Jacqueline:** 804 Orange Grove Way, Folsom CA 95630

**Grinter, Christopher C.:** Illinois Natural History Survey. Collection Manger of Insects. 1816 S. Oak Street. Champaign, IL 61820



Leptraps Cornell Drawer

# Introductory assays of the effects of entomopathogenic nematodes and *B. thuringiensis* on the Cocoa Pod Borer, *Carmentia foraseminis*

Gabriel Cubillos

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## Abstract

Lethal effects of the entomopathogenic nematode *Steinernema* spp. and the bacterium *Bacillus thuringiensis* on the last instars of Cocoa Pod Borer, *Carmentia foraseminis* (Busck) Eichlin, were tested under laboratory conditions. The assay was performed at the Granja La Nacional, Támesis municipality (Antioquia department), Colombia. A concentration of 10000 Juvenile Infective Units (Ji) per larva was used for the nematode of the commercial product named NEMA G, and for the bacterium, the dose used was 5 grs/liter of the product DIPEL. The Control treatment consisted of larvae without inoculations. The results showed that the entomopathogenic nematode *Steinernema* spp. were 100% lethal against the borer larvae. *B. thuringiensis* bacteria had a similar results to the control treatment, as the adult emergence from *B. thuringiensis* inoculated larvae was equal to the control. Further study on potential nematode effects on eggs and pupae of the Cocoa Pod Borer is needed.

Key words: Cocoa, Biological control, *Carmentia foraseminis* (Busck) Eichlin, *Steinernema* spp., *Bacillus thuringiensis*.

## Introduction

The Cocoa Pod Borer, *Carmentia foraseminis* (Busck) Eichlin, family Sesiidae (Figure 1), is of economic importance, as damage on Cocoa can reach levels near 30%, especially in "peaks" of the harvest season.

This insect has been reported in Panamá, Colombia (Eichlin, 1995), Venezuela (Delgado, 2005 and Navarro and Cabaña, 2006) and in Perú (Cubillos, 2013).

Although studies conducted in Venezuela by Navarro and Cabaña (2006) found that *Trichogramma pretiosum* was an efficient control for *Carmentia foraseminis*, in Colombia under laboratory and field conditions it has been demonstrated that parasitoids of eggs of various species of the genus *Trichogramma* (*T. atopovirilia*, *T. exiguum* and *T. pretiosum*) did not significantly depress this stage of the insect (Cubillos, 2013). Equally, some inundative applications of the neuropteran *Crysoperla carnea* and sprays of *Bacillus thuringiensis* in field conditions did not have detrimental effects on the population of the Cocoa Pod Borer and, consequently, they did not significantly alter the impact of the moth.

It has been shown that the insecticide Deltamethrin was effective in controlling this insect/pest and to alleviate significant damage to harvests (Cubillos, 2013). However, investigating alternative biological control methods is important to attempt to lessen the potential impact on other organisms (a clean approach) and to avoid the generation of resistant insect/moth populations.

The studies developed by Rosmana *et al.* (2009, 2010) in Indonesia to control the Cocoa Pod Borer *Conopomorpha cramerella* with the entomopathogenic nematode *Steinernema carpocapsae*, indicate the possibility of applying this approach to the larvae of *Carmentia foraseminis*. As such, the nematode was investigated for use on this moth.

Another biological agent of interest because of its great spectrum of activity on the Lepidoptera larvae is the bacteria *Bacillus thuringiensis* (Hajek, 2004). First, it is important to know its lethal effects on the Pod Borer larvae and second, to evaluate its use in field conditions.

## Preliminary studies

For the nematode inoculation studies, I used NEMA G (registered mark), whose active ingredient is the entomopathogenic nematode *Steinernema* spp. (Figure 2).



Figure 2. Entomopathogenic nematode, *Steinernema* spp.

Preliminary assays were done inoculating 100000 Juvenile Infective Units (Ji) per larva, with resulting mortalities of 100%. However, studies made by Rosmana *et al.* (2010) shown that doses of 10000 Ji per larva gave similar results (Figure 3). So, for the inoculation studies, I used a dose of 10000 Ji per larva.



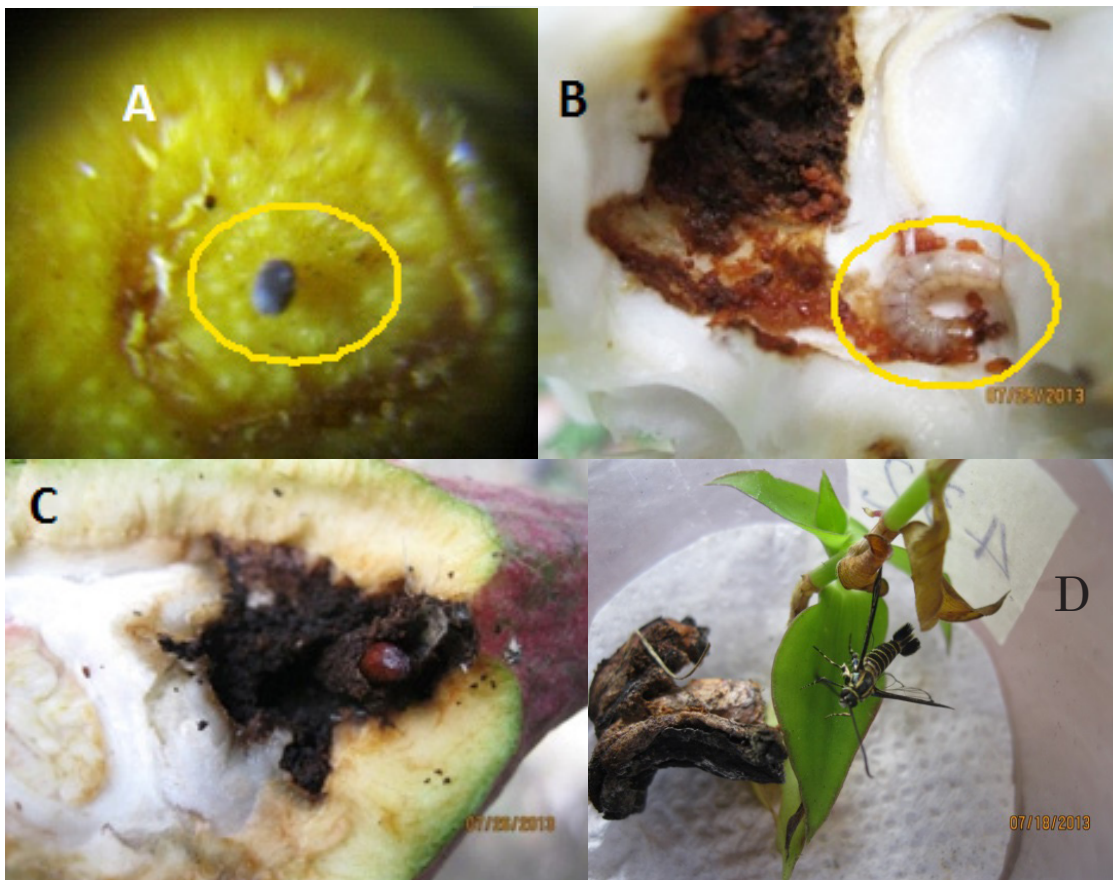


Figure 1: Different development stages of the insect *Carmenta foraseminis*. Egg (A), larva (B), pupa (C) and adult (D).

were conducted with larvae collected at El Porvenir Farm and Granja Agrícola La Nacional, sites both located in the municipality of Támesis.

I used a randomized complete-block design with three treatments and four replications (blocks). The blocks corresponded to collected larvae at different times from consecutive harvests and the treatments were composed of 15 larvae each (experimental units). The larvae were housed in individual plastic containers with their respective piece of pod. Each container was placed inside a plastic tray that was cover with muslin.

The following treatments were used:

1. *Steinernema* spp. (NEMA G commercial product) at a level of 10000 Ji (Juvenile Infective Units).
2. *Bacillus thuringiensis* (DIPEL comercial product of 38000 International Units per mg.).
3. Control (without inoculum)

For the *Steinernema* spp. inoculation, the technical sheet provided with the commercial product NEMA G was followed. With a 5 ml syringe, 1 ml of NEMA G at a concentration of 10000 Ji was applied on the substrate with one larva inside the piece of pod (Figure 4).

*Bacillus thuringiensis* was applied to the larvae within a suspension of DIPEL (registered mark) at a dose of 5 grams per liter of water. For this inoculation, the larva within the piece of pod was immersed for 10 seconds in the suspension (Figure 5).

The Control treatment was the Pod Borer larvae without inoculum.

The success of the inoculum was measured by the number of dead larvae after eight days of the application and by the number of the adults that emerged normally up to 28 days after the inoculation.



Figure 3. Larva of pod borer killed by *Steinernema* spp. inoculated at a concentration of 10000 Ji.

### Inoculation assays

The Inoculation experiments on pre-pupal Cocoa Pod Borers were carried out under laboratory conditions at the Granja Agrícola La Nacional, in the municipality of Támesis in Antioquia department, Colombia, South America. The natural conditions at this location are as follows: elevation of 950 – 1100 meters, with 2300 mm of rain per year, an average temperature of 23° C and relative humidity of 76%.

### Materials and methods

Between April 26 and July 28 2013, inoculation assays



Figure 4. Inoculation of borer's larvae with the Nema G product.



Figure 6. Larvae of the pod borer killed by the indicated agents.



Figure 5. Inoculation of larvae of *Carmenta foraseminis* with Dipel product.

## Results and discussion

Table 1 presents the averages of the number of dead larvae and number of the emerged adults in each treatment compared with the Control.

**Table 1.** Average numbers of dead larvae resulting from inoculations with Nema G and Dipel, and average number of adults emerged 28 days post inoculation.

Treatment	Avg # of dead larvae	Avg # of emerged adults 28 days post inoculation
Nema G	14.2 a <sup>1</sup>	0 a <sup>1</sup>
Dipel	2.0 b	6.7 b
Control	0.5 b	6.5 b

<sup>1</sup> Numbers with different letters differ statistically at a level of 5%.

In figure 6, you can appreciate the color and aspect of the larvae that were killed by Nema G and Dipel.

Results shown in Table 1 indicate that the entomopathogenic nematode *Steinernema spp.* exerts a meaningful lethal effect on borer's larvae compared with Dipel and control treatments. On the other hand, Dipel did not exhibit a significant difference to the control in number of larvae killed.

Similar to previous results, the average number of adults emerged in the Dipel treatment (6.7) also did not differ significantly in comparison to the control (6.5). However, the nematode *Steinernema spp.* had a tremendous impact on adult emergence, effectively reducing emergence to zero (Table 1). The adults that did not emerge in the Dipel and control treatments correspond to larvae that led to pupae that died due to natural parasitism or dehydration in laboratory conditions.

It can be inferred that the nematode *Steinernema spp.* is an organism with great potential for the biological control of Cocoa Pod Borer (*Carmenta foraseminis*). I highly recommend that continued research be conducted to determine: 1) the actual average number of nematodes that represents the lethal concentration (LC 50), 2) the nematode effects on eggs and pupae and 3) the evaluation of the nematode's potential effectiveness in reducing damage in field conditions.

I did consider that dead larvae killed by *Steinernema spp.* could potentially serve as an inoculum source for retrieving nematodes for later use. However, it was not possible to retrieve big quantities of nematode from killed larvae.

In this study, the bacterium *Bacillus thuringiensis* had neither effect nor specificity against the larvae of *C. foraseminis*. It would be advisable to assay again to confirm these results.



## Acknowledgement

The author expresses his gratitude to the Compañía Nacional de Chocolates SAS for funding this study. Also thanks to all the people that supported and facilitated the various activities related to the study and to those who reviewed the original paper.

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# From the Editor's Desk

James K. Adams

Dear members,

There is a lot packed into the 48 pages of this issue.

You will notice that in the next several pages there is some discussion of the possible Monarch listing petition. No matter which side you fall on I urge you to read what is presented here, and, if it matters to you, go online and read the actual petition itself. I do have to take issue with the pro-petition letter presented here for the statement "Once protection is granted . . .". That's extremely presumptuous and should read "If protection is granted . . .".

I am a bit low on submissions for the "Formative Experiences" column. If you have a story about how you got started in your interest in leps, **PLEASE SHARE** it!! Also, I am looking for submissions for the "First Encounters" column, describing your first encounter with some elusive bug, especially if it comes with an interesting story about the place you were or how you came in contact with the bug.



Left: Overwintering Monarchs (*Danaus p. plexippus*) January 2007 in the Monarch Butterfly Biosphere Reserve straddling states Michoacán and Mexico, northwest of Mexico City (photo by Michael Jeffords and Sue Post); Above: Monarch in Connecticut (male; photo by Michael Thomas).

**Conservation Matters: Contributions from the Conservation Committee**

**The committee's thoughts on the "Petition to protect the Monarch Butterfly (*Danaus plexippus plexippus*) under the Endangered Species Act"**

In August, four parties (The Center for Biological Diversity, The Center for Food Safety, The Xerces Society, and Dr. Lincoln Brower) petitioned "the Secretary of the Interior, through the United States Fish and Wildlife Service (USFWS), to protect the Monarch butterfly (*Danaus plexippus plexippus*) as a threatened species" (<http://www.xerces.org/wp-content/uploads/2014/08/monarch-esa-petition.pdf>). News of the petition traveled quickly throughout our community of lepidopterists, as well as state and federal governments, conservation groups, and all forms of social media. Reactions and opinions regarding the petition were diverse, spanning the gamut from full acceptance to full rejection. Given the disparity in opinions across the spectrum of members in our Society, the Conservation Committee has yet to come to a consensus regarding the petition. However, there is much within the petition regarding the Monarch's plight and need for conservation measures that the Committee and our Society can endorse enthusiastically. It is our wish to use the column in this issue to initiate a discussion among our membership regarding this subject/concern as well as others linked to the conservation of Lepidoptera.

There is strong evidence that the Monarch is currently in decline in North America. Annual monitoring of

overwintering adults in both California and Mexico has documented significant population decreases since 1997. Most telling are data for overwintering sites in Mexico: eastern Monarchs occupied less than two hectares in each of the last two winters—these numbers are down more than 75% from their average overwintering acreage over the past two decades (see Figure 12 from petition). This downward trend is threatening one of nature's most heralded and familiar biological phenomena. National and international actions on the Monarch's behalf are warranted.

The petition identifies an array of factors that could be causing the decline, including North American agricultural practices and policies, national energy policy, landuse changes in North America, release of mass-reared Monarchs, the continued degradation of overwintering habitat in both California and Mexico, climate change, and others. The evidential cases for these stressors range from generally well accepted to those that remain unsubstantiated. The relative weights of these stressors are of central importance, given that some these factors, such as climate change, are difficult targets for conservation efforts. While much of the petition is focused on genetically modified crops (GMOs) and current agricultural practices in the Midwest—and much could and

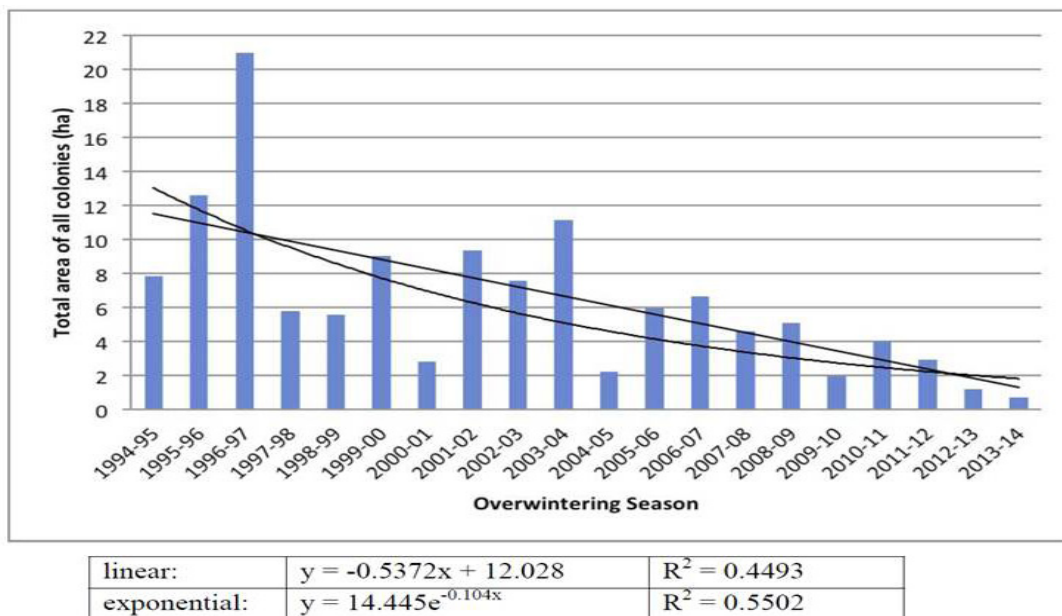


Figure 12 from the petition to list the Monarch as a Threatened species. The blue bars in the histogram show acreages of forest occupied by overwintering adults from 1994 to 2013. The black lines are the fitted regressions assuming linear ( $y = -0.54 + 12.03$ ,  $R^2 = 0.45$ ) and exponential decline ( $y = 14.44e^{-0.104x}$ ,  $R^2 = 0.55$ )

**Figure 12.** Total annual area occupied by overwintering butterflies in Mexico from 1994 through 2013, with linear (upper line) and exponential (lower line) regression analyses. The significant decline charted by Brower et al. (2012a, Fig. 1) through 2010-11 continues through 2013-14.





Monarch, in Connecticut (male; photo by Michael Thomas)

should be changed in such practices that would be more favorable to native biodiversity—evidence that GMOs and concomitant agricultural practices are the primary factors in Monarch decline is circumstantial and in need of study and corroboration. The population declines since 2011 have been so dramatic, and have occurred over such broad geographical areas, that many would argue that the region-wide droughts in northern Mexico and Texas, and not the sum of gradual changes in agricultural practices in the Midwest, are at the root of this collapse.

*Danaus plexippus* is not in danger of extinction; non-migratory populations of Monarchs occur in Florida and throughout much of northern Central America, and no one is saying that these populations are in danger. California overwintering populations, much smaller than those in Mexico, may be more secure than those overwintering in Mexico. But the migratory populations that exchange between Mexico and the eastern U.S. and Canada, are in a worrisome state of decline. The eastern migration phenomenon, which has brought global fame to this winged beauty and a greater appreciation for invertebrates in general, is threatened. This singular iconic insect of North America could become an ecological ghost, and, without sustainable migratory populations of Monarchs, what would we lose? The waxing and waning waves of butterflies moving in mass northward and southward across much of our continent may cease. The chance to witness trees draped with many thousands, perhaps millions of individual butterflies at the winter roost sites may be come to an end. The opportunity to see one of America's most familiar, beautiful, and beloved insects sailing through our gardens may become rare. For children, the chance to find and rear its striking caterpillar and to watch it change into its stunning chrysalis might be lost. The formative entomological and, perhaps more importantly, developmental experience of tens of thousands of school children watching this caterpillar metamorphose may become a memory of past generations. Most worrisome, we could lose one of the world's most magnificent biological phenomena. Perhaps more than any other wild insect on the continent, Monarchs enrich the quality of life across political, cultural, and socioeconomic boundaries.

While there is a wide diversity of opinions relative to specifics within the petition, there is much agreement that actions to stem the decline of the Monarch would be beneficial. Members of the Society are encouraged to plant milkweeds, control black swallowwort, bring about changes in mowing and spraying regimes that would favor milkweeds and the availability of late-season nectar sources, and endorse U.S. and Mexican efforts to protect overwintering sites. Certainly, much should be done to promote more environmentally friendly practices in the nation's farmlands. We should support efforts to conduct controlled scientific studies on the consequences of mega-agriculture to local and regional biodiversity and redouble efforts to determine if genetically modified crops have ecological impacts beyond their rows. All levels of increased engagement by our membership, through effort or dollar, can improve chances for the Monarch. Local actions are the stepping stones toward global solutions.

Regardless of whether the petition is successful or denied, considerable national and international attention has been drawn to the Monarch's plight. The U.S. Fish and Wildlife Service recently formed a "High-Level Federal Monarch Working Group" with representation from the heads of the U.S. Forest Service, National Park Service, Bureau of Land Management, Federal Highway Administration, Natural Resource Conservation Service, and others. The group is working to revise the North American Monarch Conservation Plan before President Obama meets with the leaders of Mexico and Canada in February 2015. Mexico and the World Wildlife Fund are also working on parallel conservation plans. The USFWS is taking actions to promote the welfare of this species on its refuges. Similar efforts are underway for the Monarch on National Forest lands by the U.S. Forest Service. The U.S. Department of Agriculture is looking to provide incentives for Monarch restoration on farms and exploring other ways to make farming friendlier to biodiversity. The Xerces Society has been exceptionally active and successful in their campaign to marshal interest and the financial commitments mentioned above. Certainly, the welfare of the Monarch and other invertebrates has been greatly elevated by the collective actions of the Xerces Society, Lincoln Brower, and other petitioners.

We, as a Society, are committed to preserving the Monarch for generations to come. We have enlisted in the Monarch Joint Venture project, offered our expertise to advise on pollinator conservation at the local, state, and federal levels, and many of our members are at the forefront of Monarch conservation efforts. We urge our membership to read the petition, ponder the issues, and share your views with policy makers, conservation groups, town leaders, and other partners. And more importantly, engage in actions that will benefit the Monarch as well as other wildlife.

Dave Wagner, Todd Gilligan and John Shuey – for the Conservation Committee

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# *The Mailbag . . .*

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## The Letter from those supporting the petition

The Honorable Sally Jewell, Secretary of the Interior  
 The Honorable Daniel Ashe, Director, U.S. Fish and Wildlife Service  
 Mr. Douglas Krofta, Chief, Branch of Listing, Endangered Species Program, U.S. Fish and Wildlife Service

November 13, 2014

Dear Madam Secretary of the Interior, Mr. Ashe, and Mr. Krofta,

We write to you to express our support to protect the monarch butterfly as a Threatened species under the Endangered Species Act (ESA).

The monarch butterfly population has declined dramatically, by an alarming, statistically significant 90% over 20 years of monitoring. While many factors threaten the monarch's habitat, it is the loss of milkweed from the key areas where monarchs breed in the American Midwest—primarily driven by extensive use of the herbicide glyphosate on genetically engineered glyphosate-resistant crops—that is thought to be the most significant contributor to the monarch's population decline. Other contributing factors may include climate change, severe weather events, logging in the overwintering habitat, widespread use of systemic insecticides, disease, and predation.

We request that the U.S. Fish and Wildlife Service (Service) take a leading role in protection and recovery efforts by granting the monarch butterfly protection as a threatened species under the ESA. ESA protection will allow the Service to establish a monarch recovery plan and promote the large scale conservation efforts needed to restore monarch populations.

Once protection is granted, we ask that the Service recognize the important role that research by scientists and citizen scientists has played, and will continue to play, in understanding and conserving the monarch butterfly and its habitat. To this end, we request that the Service streamline the permitting process, so that scientific and conservation research and citizen science activities are encouraged rather than deterred by a listing. In addition, we support the special 4(d) rule that the petitioners requested (on p. 159 of the petition) to exempt certain activities from the 'take prohibition' in order to facilitate monarch butterfly research, citizen monitoring, education, and conservation.

Sincerely,

**Michael Achey, M.D.**, Compass Medical  
**Sonia Altizer, Ph.D.**, Professor, University of Georgia, Athens, GA  
**Homero Aridjis**, President, Grupo de los Cien and Writer Mexico  
**Scott Hoffman Black, M.S.**, Executive Director, The Xerces Society for Invertebrate Conservation, Portland, OR  
**Calhoun Bond, Ph.D.** Professor, Greensboro College, Greensboro, NC  
**Lincoln Brower, Ph.D.**, Professor, Sweet Briar College, Sweet Briar, VA  
**Peter F. Brussard, Ph.D.**, Professor Emeritus, University of Nevada, Reno, NV  
**William Calvert, Ph.D.**, Austin, TX  
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**Laurence Cook, Ph.D.**, Professor, University of Manchester, Manchester U.K.  
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**Allen M. Young, Ph.D.**, Curator Emeritus of Zoology, Milwaukee Public Museum, Milwaukee, WI

**Myron P. Zalucki, Ph.D.**, Professor, The University of Queensland, Brisbane, Australia, The Honorable Sally Jewell, Secretary of the Interior

## Why the Monarch Butterfly should not be listed under the Endangered Species Act

Nick V. Grishin

Howard Hughes Medical Institute, Department of Biophysics and Biochemistry, University of Texas Southwestern Medical Center, 5323 Harry Hines Blvd., Dallas, TX, USA 75390-9050, grishin@chop.swmed.edu

To cut to the chase, the answer is self-evident for everyone familiar with American butterflies. It is simply because the Monarch, *Danaus plexippus plexippus* (Linnaeus, 1758) (Nymphalidae: Danainae), is one of the most abundant and widespread butterflies in the world (see Lotts & Naberhaus 2014 for the distribution records)—it is neither endangered nor threatened, and probably is the least likely butterfly to become one, compared to quite a few other butterfly and moth species. Unfortunately, this plain answer requires a detour.

Don't get me wrong, I love sophisms. As a kid, I was totally fascinated by them. I still am. Some of the sophisms are simple. Here is one. If A is a subset of B, and B is a subset of A, then A equals B. Since every black object has some white marks, white is a subset of black. Because a white object contains some black flecks, black is a subset



Overwintering monarchs January 2007 in the Monarch Butterfly Biosphere Reserve straddling states Michoacán and Mexico, northwest of Mexico City (photo by Michael Jeffords and Sue Post)

of white. And there you have it, white is the same as black! It didn't even take 159 pages to write this proof. Would you spot the flaw in the argument?

On August 26th 2014, public attention was drawn to an incomparably more elaborate sophism, presented as a 159-page petition to the Secretary of the Interior and the Fish and Wildlife Service seeking threatened status for the Monarch butterfly under the Endangered Species Act (ESA) (The Center for Biological Diversity, Center for Food Safety, The Xerces Society & L. Brower 2014, further referenced as CBD, CFS, XS & Brower 2014). It will probably take generations of biologists to dissect all the tenuous arguments in this diligently prepared document. For starters, if one replaces the name "monarch" throughout the document with a name of another common butterfly, would the main arguments still hold? I think that most of them would, suggesting that essentially any common butterfly may be petitioned for listing using this document as a generic template.

Why am I so confident that the petition is a sophism? To begin with, one of the petitioners, a renowned monarch scientist Dr. Lincoln Brower, implied so in a public interview: "I think you are going to have difficulty because the monarch is not an endangered species", and "Do I think the monarch butterfly will become extinct in its range? — no" (Pounds 2014). According to Pounds (2014) this was the first reaction of Brower on the petition in the works. A first reaction is rarely wrong, especially from someone as knowledgeable about the Monarchs as Dr. Brower. Pounds (2014) states that later "The 'threatened' designation made sense to Brower." But does it really make sense?

Let's rehash some definitions. "Before a plant or animal species can receive the protection provided by the ESA, it must first be added to the Federal lists of threatened and endangered wildlife and plants. ... An 'endangered species' is one that is in danger of extinction throughout all or a significant portion of its range. A 'threatened species' is one that is likely to become endangered in the foreseeable future throughout all or a significant portion of its range" (U.S. Fish & Wildlife Service 2011). Let's take Brower's expert opinion—the Monarch "is not an endangered species" (i.e., is not "in danger of extinction" according to the F&WS definition). Strangely enough, the petition (co-authored by Brower) states otherwise: "The dramatic loss of milkweed from the monarch's summer breeding grounds thus puts the monarch at risk of extinction" (CBD, CFS, XS & Brower 2014, p. 46). Further, think for yourself, is it likely that the Monarch, will become endangered soon over the significant portion of the USA ("its range" = USA)? I do not think it is more likely for the Monarch than for any other currently common insect species. Should all insects be listed then? It is unambiguous that "The ESA gives no preference to popular species or so-called 'higher life forms'" (U.S. Fish & Wildlife Service 2011).

The Monarch Watch website states: "Monarchs clearly aren't endangered. This petition requests threatened status for the monarch based on the presumption that the monarch migration is threatened due to the loss of a significant portion of its breeding range in the upper Midwest, i.e. the corn belt. But, is it? That's a matter of evidence and interpretation. As this discussion proceeds, it becomes clear that the arguments are "about the migration and not the species per se" (Monarch Watch 2014). And here lies the major problem. Migration is a behavioral phenomenon. However, the ESA is aimed at protecting named taxonomic units (such as species and subspecies) that are endangered (i.e., if nothing is done, they will go extinct very soon) or are expected to become endangered in near future (if nothing is done) (U.S. Fish & Wildlife Service 2011). As I see it, nobody in their right mind could say that such expectations apply to the nominate Monarch subspecies, i.e., *Danaus plexippus plexippus*, as a taxonomic unit. However, it is very clear that the ESA was not originally aimed at protecting unique behavior of a certain segment of a population of a very common animal. Therefore, invoking the ESA is simply wrong, and the petition should be dismissed right away without any further consideration just on these grounds.

I suspect that the petitioners are aware of this, so I call the petition "scientifically dishonest", because in order to fit the mold of the ESA (which is not possible), petitioners had to tweak the language at least slightly to make it fit. Here is one of such tweaks: "The dramatic loss of milkweed . . . puts the monarch at risk of extinction" (CBD, CFS, XS & Brower 2014, p. 46). As a scientist, I object to this approach. In my view, ends do not justify the means. Please don't get me wrong, I am positive that the petitioners act out of the most noble intentions to ensure the well-being of the magnificent animal. There is no dishonesty there. But to make the case sound convincing, the petitioners "overreach", i.e. they bend the truth here and there in the document. This should not be done. If the ESA does not apply (and it clearly does not in this case), scientific integrity should not be compromised to suggest otherwise. Sophisms are not the way to do the best science.

Enough about sophisms. What about the Monarchs? Winter roost counts estimate 33,000,000 Monarch butterflies in December 2013, which is the lowest since December 1994 (Howard 2014). For comparison, the average is about 330,000,000, which indicates that only 10% of the average was recorded last year. The lowest count before that was just a year before, in December 2012, at 60,000,000. The highest, and a significant outlier in all the counts, was 1996 with impressive 1,000,000,000. Should winter count results and apparent downward trend cause panic and urgent measures to boost the Monarch populations? Probably not, first, because there are still 30 million butterflies (imagine a "threatened" species with such an impressive count!), second, because insect populations fluctuate widely in numbers, even for insects with very small distribu-



tion ranges—see the discussion of 1000-fold fluctuations in *Boloria improba acrocneema* Gall & Sperling, 1980 population counts in Scott (2006, pp. 9–10).

Should we pay closer attention to the population dynamics of the Monarch with an attempt to understand the reasons for the apparent decline? Definitely yes, particularly because the reasons for population dynamics of insects are very poorly known and frequently not intuitive to people. It is essential to ensure the survival of the Monarch for future generations to enjoy and marvel about, and the best way would be to know more about its biology and figure out the real reasons for the decline. Moreover, the Monarch, due to its abundance and appeal, could become a model organism to learn more about population dynamics in invertebrates and its management practices. In popular press, the decline is frequently presented as “Monsanto vs. Monarch” (Center for Food Safety, 2014). This may be good journalism, and may sound appealing to many people, but it surely is a poorly conceived conservation practice. More impartial and rational thinkers were expressing doubts about these theories. For instance, Glassberg (2005) writes “it seems to me that the use of gm crops is highly unlikely to be the cause of this year’s Monarch decline,” and then suggests several excellent approaches to Monarch conservation.

I will take this opportunity to highlight the following example symbolizing both successes and difficulties faced by true conservationists. The Large Blue Butterfly *Maculinea arion* (Linnaeus, 1758) started disappearing across Europe in the middle of the last century (Strickland 2009). As so typically happens, the “mysterious disappearance of the Large Blue Butterfly across northern Europe was originally put down to its popularity among insect collectors” (Alleyne 2009). For various reasons, regulatory agencies frequently single out collectors as a very significant, if not the primary, threat to invertebrate populations despite a lack of factual evidence. The Large Blue was granted protection from collection, but the decline continued and the Blue eventually vanished from England. However, Dr. Thomas and colleagues had been studying the last English colony of these insects for several years prior to its demise (Thomas et al. 2009). The authors of this Science magazine article write, “Overexploitation (butterfly collecting) was ruled out as a factor”. Instead the following, seemingly surreal, scenario was presented. The most important discovery was that the Blue depends largely on one species of ant (*Myrmica sabuleti*) to survive. The Blue caterpillars were taken care of by ants during their later stages, and they fed on ant larvae. The Blue was disappearing because the *M. sabuleti* ant was dying out. *Myrmica sabuleti* was declining because the earth grew cooler than the ant could survive in. The ground became colder because the grass became taller and provided more shade. Grasses grew taller because rabbit populations were being extirpated. Rabbit colonies declined due to the disease myxomatosis. After this amazing chain of events was teased out, it became pos-

sible to maintain Blue populations reintroduced to the UK from Sweden by controlling grass height, thereby ensuring ant survival. Now, the Large Blue is thriving in England in nearly 80 separate sites due to diligent research by Dr. Thomas. “The successful identification and reversal of the problem provides a paradigm for other insect conservation projects” (Thomas et al. 2009). I could only wish we are able to pin-point the reasons for the decrease in the Monarch winter counts with this precision.

Back to the ESA. What if the act is modified to cover not only described species and subspecies, but also unusual and interesting behavioral traits? It is possible that the great eastern migration of the Monarch Butterfly would qualify as threatened, although the subspecies itself does not. Monarch migration seems more fragile than the subspecies itself, because migration may stop being adaptive in warmer climate, i.e., there would be little selective advantage to long-range migrating individuals versus short-range or non-migrating ones. The “Columbus hypothesis” of Vane-Wright (1993) appears quite sensible to me. Nevertheless, even if the ESA could cover behavioral phenomena, I don’t think it should offer protection to the Monarch at the present. Here are the three main reasons:

- 1) Monarch protection by the ESA, if granted, would shift the efforts (and funds) from really threatened animals that may be saved using the ESA, to a very common insect (33 million overwintering individuals last year). It would be wrong. Apparent decline of the Monarch does not appear more serious than the decline of many other butterfly species. For instance, Glassberg (2013) notes major decline or disappearance of many butterfly species in Westchester County, New York, but the Monarch is not among them. My observations agree with this trend that we see fewer butterflies in the east-northeastern US today than 20 years ago. The Monarch might even be the least declining of them, or maybe not declining much at all. The problem of many butterflies decreasing in numbers looks real, and the causes are not clear. I don’t see the causes being very widely discussed and diligently analyzed, yet. Yes, we see more people and more habitat disappearance and fragmentation, but there is still enough viable habitat. It is frequently bug-free. I suspect that in the northeast it might be the moth and mosquito spraying, but of course I don’t know. Invasive ants, parasites, diseases? Listing monarchs will not make the situation better. Diligent research akin to that done by Thomas et al. (2009) would.

- 2) The ESA, which is a good and necessary mechanism to preserve valuable segments of our heritage, is opposed to by many, if not most, landowners. It is a very serious problem in a country where most land is private, and people, instead of viewing rare animals as desirable heritage to have and take care of, view them as plague. If the Monarch petition is finally approved, it will exacerbate the problem on all fronts, simply because Monarchs are so common across the country.

3) Monarchs could benefit from bright new ideas about their conservation. I think that innovative new ideas from new bright minds are very much needed, and there is a mechanism in place to select them—NSF grant proposals. These do not have to emphasize rare taxonomic units, they could (and maybe should) concentrate on behavioral phenomena among others. Thus, it would be great to use an NSF (or similar in style) deep peer-review mechanism for dealing with monarch conservation. And this will be for the benefit of monarchs. The emphasis could be on conservation proposals that combine agricultural land use with monarch conservation practices. It will also be a much faster mechanism to distribute the funds, compared to years needed for the process with an ESA petition.

What is a better approach to conservation of Monarchs instead of ESA listing? Roadsides provide some of the best insect collecting locations, and frequently not because they are available and other places are not. Therefore, why not concentrate the effort of affecting public perception of “beauty” and “safety” by working towards better mowing practices? I am almost positive that monarch-aware (read insect-aware) mowing schedules across the nation and sprinkling milkweed seeds during mowing will bring the monarch populations to ever-high billions to please the public without the need of the ESA. Even more broadly, why aren't there special and very intensive conservation programs under the slogan “roadsides for insects,” similar in popularity to the slogan “Monsanto vs. Monarchs”? While there are some bright initiatives on this front, certainly much more could be done on establishing country-wide insect-aware mowing schedules.

For all these reasons, I believe that a person who truly cares about invertebrate conservation should stand up and oppose the petition to list the Monarch under the ESA, which may lead to the opposite than the desired goals. This Monarch petition is a skillfully crafted sophism, trying to demonstrate that white is black (or black is white). However, as history shows, it rarely pays off to trick the public. I sincerely hope that F&WS will find the petition “Not Substantial” and will continue with its good work directed at animals and plants that are truly endangered and threatened, and thus are in dire need of these efforts. The Monarch is clearly not one of them, and different mechanisms would be more appropriate to restore USA Monarch populations to the levels desired by the public. The best of those mechanisms will fully harvest wide collaborations between professional and citizen scientists, farmers, landowners and wide-ranging public fascinated by the Monarchs, all working together towards common conservation goals.

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# More images from the 2014 meeting of The Lepidopterists' Society, Park City, UT



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3. Color and B+W graphics should be good quality photos suitable for scanning or—preferably—electronic files in TIFF or JPEG format at least 1200 x 1500 pixels for interior use, 1800 x 2100 for covers.
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57	1 Spring	Feb. 15, 2015
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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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Jan Chu and Michael Collins, both alumni of high quality Cedar Rapids, Iowa high schools; both moved away from the bone-chilling winters! (photo by Jean Morgan)



Presenter Akito Kawahara (photo by Steve Mueller)



Charlie Covell and Louise Fall (photo by Steve Mueller)



Student presenter Jade Badon (photo by Steve Mueller)



Felix Sperling and Brian Banker; Brian seems suspicious about Felix's jovial mood! (photo by Steve Mueller)



Student presenter Vincent Ficarrotta (photo by Steve Mueller)



A very happy Kelly Richers! (photo by James K. Adams)



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