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NEWS OF THE LEPIDOPTERISTS' SOCIETY

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Reed Watkins -- a passion for Plume Moths

Membership Updates, Marketplace, Formative Experiences, Metamorphosis, Announcements ...

... and more!

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Front Cover:

Ultimate instar larva of Cucullia asteroides on Goldenrod (*Solidago*). September, 6, 2009, North Carolina, Haywood Co., Great Smoky Mountains National Park, Purchase Knob (eastern end of the park), 4800 feet. (photo by James K. Adams)

Rearing *Hamadryas* (Nymphalidae: Biblidinae: Ageronini) in South Texas: life histories of three species

Berry Nall

P.O. box 22, Falcon Heights, TX 78545 **lb@thenalls.net**

The Neotropical genus *Hamadryas* Hübner [1806] garners a great deal of attention from butterfly seekers in south Texas. Four species have been recorded in the lower Rio Grande Valley of Texas within the last 10 years: *H. februa ferentina* (Godart) [1824], *H. glauconome glauconome* (Bates) [1864], *H. guatemalena marmarice* (Fruhstorfer) [1916] and *H. feronia farinulenta* (Fruhstorfer) [1916] (Bordelon and Knudson 2009). *H. februa* and *H. guatemalena* appear regularly. *H. feronia* was last reported when Sassine collected it in December, 2007 (pers. comm.). *H. glauconome* was first reported when a voucher was taken about a year later, in November, 2008 (Bordelon and Knudson 2009). Since that discovery, Bordelon (pers. comm.) received information on a voucher of *H. glauconome* taken *prior* to his own, found in a series of *H. februa* from Rio Grande City by Tom Ortenberger on 16 Nov, 2007. This information was relayed by Andy Warren and confirmed by Mr. Ortenberger, making this specimen a technical US Record. It had not been realized until 2012, and confirmation was received in 2014 by Mr. Bordelon. The identity of this specimen was confirmed by mtDNA analysis (Ivonne Garzon, pers. comm.). Meanwhile, the author photographed a female on 6 Oct., 2011 (Nall 2014), and a male was photographed by John Rosford at the International Butterfly Center on 25 Aug., 2013 (Rosford 2013).

Beginning in July, and going through October, 2013, in the author's yard in Falcon Heights (Starr Co.), Texas, there was an early and strong influx of *H. februa*. A few individuals of *H. guatemalena* and a single *H. glauconome* followed. Captive females readily produced eggs, and three species of *Hamadryas* were reared over a three-month period. *H. februa* was also observed breeding under natural conditions when they began using *Dalechampia scandens* L. (Euphorbiaceae) vines that were growing in the yard.

This article presents complete life histories and general observations about the rearing of *H. februa ferentina*, *H. glauconome glauconome,* and *H. guatemalena marmarice* in south Texas. The immature stages of *H. glauconome* appear to be undescribed prior to this article.

Despite the regular presence of *Hamadryas* in the lower Rio Grande Valley, and despite the assumption that at least *H. februa* will feed on native *Tragia* spp. (Euphorbiaceae), there are no published reports of wild-breeding of *Hamadryas* in south Texas. This article also documents the use of *Dalechampia* spp. (and non-use of *Tragia*) by *Hamadryas februa* in Texas.

METHODS AND MATERIALS

All of the original adults of were collected at the author's home in Falcon Heights in western Starr County, Texas. Fermenting rotting fruit (primarily bananas and grapes) was placed in a bait trap and on a bait log in order to attract *Hamadryas* and other fruit, or sap-feeding butterflies to the yard. Presumed host plants available to the *Hamadryas* included *Tragia glanduligera* in the yard, and three potted *Dalechampia scandens* vines climbing a trellis and a fence. In a small greenhouse (1.2m x 3.6m x 2.3m high, covered with 50% shade cloth), *Tragia* and several more *Dalechampia* vines were growing. An automatic system misted the plants twice per day; the frequency of misting was increased to four times per day when outside temperatures regularly exceeded 40°C.

Adults were caught by net and by bait trap, and placed in the greenhouse with abundant rotting fruit. When egg production for a given species began, two to three eggs or first instars were brought into the lab for close observation; the rest were left in the greenhouse. The lab had no air-conditioning; the temperature was approximately 30-35°C throughout the primary studies. Host plant leaves were placed in 'water picks' to maintain freshness and held in/transferred to a mesh-covered aquarium or similar container that was cleaned each day. Daily photos were taken of each focal caterpillar. If one died, it was replaced with another of the same instar from the greenhouse. Additional late-instar caterpillars from the greenhouse or (eventually) the outside vines were brought into the lab for pupation.

A voucher specimen of each species was sent to David Wagner to be deposited at the University of Connecticut Insect Museum (UCMS). Three additional vouchers of *H. glauconome* (including the original female), were deposited in the Texas Lepidoptera Survey Research Collection (TLSRC). The identities of reared specimens of *H. februa* and *H. glauconome* were confirmed by mtDNA analysis (Ivonne Garzon, pers. comm.).

RESULTS

Rearing *Hamadryas februa ferentina* (Godart). Seven *H. februa* (3 males and 4 females) were captured and placed in the greenhouse during the week of 14 July. The first eggs were deposited on *Dalechampia scandens* on 23 July. The females, once oviposition began, were very active. After over 100 ova were obtained, the adults were released due to concerns with food plant supply. The following day, three ova were found on the outdoor *D. scandens* vines, but no more afterward. A week later, some of the same adults were recaptured and returned to the greenhouse; egg production began immediately. In late July and early August, greenhouse temperatures regularly reached 38°C despite extra misting. The larvae seemed unaffected by the heat or excess humidity. The first brood of *H. februa* emerged during the week of 11 August. Two pairs were retained to see if they would mate in the small flight enclosure/greenhouse. Mating was not observed, but oviposition began after several days, and a second generation of caterpillars was successfully obtained. Additional *H. februa* ova and larvae were gathered for observation from eggs deposited on the outside vines by wild females.

Ovum (Fig. 1). Ova laid singly: white, except near base, which is translucent. Average diameter 1.2 mm (n=4). Vaguely conical; slightly taller than wide with ca. 14-16 irregular ribs connected by cross-striations.

First instar (Figs. 2, 3). Head jet black, smooth, shiny, subcordiform. Prothoracic shield darkening to either side of midline. Thoracic legs shiny black. Body of neonate cream, changing to mottled brown and green after feeding. Primary setae from white tubercules. Length to nearly 4 mm before molting after 1 day.

Second instar (Fig. 4). Head black with numerous white and black spines of various sizes and two short black horns. Horns about 0.6 mm long with several small spines. Body black dorsally/brown ventrally, covered with short-branched scoli; on alternating segments scoli white, then black with white tips. Length to 7 mm before molting after 1 day.

Third instar (Fig. 5). Head black with short white and black thorns. Horns long (4 mm), branched, mace-like—swollen at apex with minute spines; shaft of each horn with short setae, and 5-6 large spines. Body remains brown ventrally with numerous white markings; wavy orange, thick spiracular stripe. Above this stripe body black or dark brown, crossed with two transverse bands of white checks between each segment. T1 with numerous straight or 2-branched spines. Dorsum: scoli on abdominal segments A1-A7 relatively short with up to 3 rami; these black except for A4 and A6, which are white. A7 with large scolus at rear of segment; similar enlarged scolus on A8. Bases of scoli on T2, A2, A4, and A6 light cream or orange rather than black. Subdorsal black scoli on T2-A8 larger, more heavily branched than, and slightly anterior to dorsal scoli. Supraspiracular area with row of short spines (usually black, straight except branched on T2-T3). Subspiracular spines short, straight, generally black. Subventer with clusters of white spines on each segment. Length to 12 mm before molting after 1-2 days.

Fourth instar (Fig. 6). Head red-orange with numerous white and black spines; horns about 6 mm but less capitate and mace-like at apex than those of previous instar. Body ground colors as third instar; typically checkered white dorsally and orange ventrally, with diffuse black bands around T2, T3, A7, and A8. Dorsally, thin creamy stripes run length of body; crossed by 4-5 transverse lines, producing the appearance of numerous dark spots between scoli. Most dorsal scoli with orange bases. Scoli on T2-T3 and A7-A8 thicker, larger, and more spinulose than rest; their bases generally dark. Supraspiracular and subspiracular spines often branched. Length to 14 mm before molting after 1-2 days.

Fifth instar (Fig. 7). Head: orange with numerous small white spines and, below each horn, two longer and darker spines. Horns 8-10 mm with several black or dark gray spines along axis; only slightly swollen at apex. Thoracic collar spines pale basally, and thoracic legs orange- these traits distinguish last instar *H. februa* from *H. glauconome*. Body coloration and markings variable. Ground color orange, with lighter orange or cream spiracular stripe. On melanic individuals, orange may be obscured except at bases of some dorsal and subdorsal spines. Dorsum with broad stripes that run length of body at level of each scolus. Stripes edged with white; center color varies from orange to green to black. Three to four pale bands cross dorsum of each segment midway between scoli. Base of each scolus generally pale, matching color of stripe that passes around it. Dorsal scoli with blackened rami; in spiracular areas rami and scoli pale (cream or pale green) from base to apices. Larvae may appear orange, green, black, or variegated, depending on color of dorsal stripes and scoli. Caterpillar to 31 mm; becomes prepupal after 4 days.

Prepupal larva (Fig. 8). Pale orange, translucent. Dorsum may be slightly darker than venter; retains some of black marks between segments (1 day).

Pupa (Fig. 9). Highly cryptic; tan to brown. Increasing in girth from cremaster to A2-A3; narrowing especially over dorsum, then widening again through thorax. Anterior with two horns having appearance of wide, flat antennae; usually with small gap between horns, then fusing together for about half their length before again separating before apices. Fine, dark, vein-like markings cover entire pupa; these especially noticeable on smoother surfaces. Dorsal surface from cremaster to probocis darker than rest of pupa. Length about 30 mm; width about 8 mm at widest point. Adult emerges after 5 days.

Observations. There was low mortality throughout the larval stages. Adults of normal size emerged from the pupae without problems.

Plate 1: *H. februa.* **Fig. 1** Ovum; **Fig. 2** neonate; **Fig. 3** first instar; **Fig. 4** second instar; **Fig. 5** third instar; **Fig. 6** fourth instar; **Fig. 7** fifth instar; **Fig. 8** pre-pupal larva; **Fig. 9** pupa.

Rearing *Hamadryas glauconome glauconome* (Bates). One *H. glauconome* female was collected on 3 September. It began producing ova 12 September, and continued to do so on warmer days (in dwindling numbers) until it died in late October. Also in late October, a second generation of caterpillars was obtained when a fresh female began laying eggs on the now-defoliated *Dalechampia* vines.

Ovum (Fig. 10). Ova laid singly: white, except near base which is translucent. Average diameter 1.1 mm (n=3). Vaguely conical, slightly taller than wide, with ca. 20 irregular ribs connected by cross-striations (more evident than ova of *H. februa*).

First instar (Figs. 11, 12). Indistinguishable from *H. februa.* Head jet black, smooth, shiny, subcordiform. Prothoracic shield darkened to either side of midline. Thoracic legs shiny black. Body of neonate cream, changing to mottled brown and green after feeding. Primary setae from white tubercles. Molting after 1 day.

Second instar (Fig. 13). Head black with numerous white and black spines of various sizes and two short black horns. Horns about 0.6 mm long with several small spines. Body brown (*cf. H. februa*), covered with short-branched scoli; from segment to segment, alternate white, then black with white tips. Length to 9 mm before molting after 1 day.

Third instar (Fig. 14). Head: upper 2/3 red-orange; lower 1/3 black, with numerous white and black spines. Horns long (4 mm), branched, mace-like—swollen at apex with minute spines; shaft of each horn with short setae, and 5-6 large spines. Body orange-brown, darker between segments, with numerous faint white markings. T1 with numerous straight or 2-branched black spines. Dorsum: black scoli on abdominal segments A1-A7 relatively short with up to 3 rami. A7 with large scolus at rear of segment; similar enlarged scolus on A8. Subdorsal black scoli over T2-A8; these larger, more heavily branched than, and slightly anterior to dorsal scoli. Supraspiracular area with row of short black spines; straight except branched on T2-T3. Subspiracular spines short, straight, black. Subventer with clusters of white spines on each segment. Length to 14 mm before molting after 1-2 days.

Fourth instar (Fig. 15). Head red-orange with numerous white and black spines. Horns about 6 mm, but less capitate and mace-like at apex than those of previous instar. Body ground colors as in third instar. Thin creamy stripes run length of body; crossed by 4-5 very faint (until molt) transverse lines between scoli. Scoli on T2-T3 and A2, A7-A8 thicker, larger, and more spinulose than rest. Supraspiracular and subspiracular spines often branched. Length to 19 mm before molting after 1-2 days.

Fifth instar (Fig. 16). Head and body patterns similar to *H. februa*; darker or variegated specimens of that species easily confused with *H. glauconome*. Latter distinguished by dark gray dorsal thoracic collar spines (T1), black thoracic legs, and brown stripe on distal end of prolegs. Head red-orange; areas over mouth and around stemmata darkened; numerous small white spines; below each horn, two longer black spines. Horns 8-10 mm with several black or dark gray spines along axis; only slightly swollen at apex. Body variegated. Dorsum with broad stripes that run length of body at level of each scolus. Stripes edged with white; center color black. Three to four pale bands cross dorsum of each segment midway between scoli. Dorsal scoli black with gray rami; basal area of scoli orange. Spiracular area orange with several fine white stripes. Spiracular and lower spines and scoli white. Caterpillar to 34 mm; becomes prepupal after 3-4 days.

Prepupal larva (Fig. 17). Dorsum dark brown, with original markings faintly visible; venter tan (1 day).

Pupa (Fig. 18). Highly cryptic; tan to (rarely) dark brown. Increasing in girth from cremaster to A2-A3; narrowing especially over dorsum then widening again through thorax. Anterior with two horns having appearance of wide, flat antennae; usually with small gap between horns, then fusing together for remainder of their length. Fine, dark, vein-like markings cover surface of wings. Dorsal surface from cremaster to A2 darkened. Small dark spot visible at center of A1; may terminate dark stripe that extends from cremaster. Length about 29 mm; width about 8 mm at widest point. Adult emerges after 4-5 days.

Observations. *H. glauconome* were most easily distinguished from *H. februa* during the third instar. Both the coloration and the resting position were distinctive. There was low mortality throughout the larval stages. However, problems appeared when it was time for the adults to emerge. One of the first four pupae in the rearing room died after thrashing violently for a day; the adult from a second, also active, pupa escaped but with wings that never unfurled. Results were worse in the greenhouse, where only one viable adult was obtained from the first circa 2 dozen pupae. A decision was made to bring future fifth-instar larvae into the rearing room, and mist the pupae with water 1-2 times per day. Pupae that were misted in the rearing room all eclosed properly. The adults obtained were generally of normal size, but the wings were very brittle and easily broken.

Rearing *Hamadryas guatemalena marmarice* (Fruhstorfer). On 1 September, a female *H. guatemalena* was taken in the bait trap and placed in the greenhouse; it began ovipositing six days later. As soon as oviposition began, mosquito netting was used to separate it from the *H. glauconome* female, which was also present. The *H. guatemalena* female's area was only about 1.2 m square, but this did not hinder egg production. By this time there was a dwindling supply of host plant, so the female was released after it produced about 2 dozen ova.

Plate 2: *H. glauconome*. **Fig. 10** Ovum; **Fig. 11** neonate; **Fig. 12** first instar; **Fig. 13** second instar; **Fig. 14** third instar; **Fig. 15** fourth instar; **Fig. 16** fifth instar; **Fig. 17** pre-pupal larva; **Fig. 18** pupa.

Ovum (Fig. 19). Ova laid singly or in stacked pairs; white. Average diameter 1.3 mm (n=2). Vaguely conical, slightly taller than wide, with ca. 12-14 irregular ribs connected by very faint striations.

First instar (Figs. 20-21). Head jet black, smooth, shiny, subcordiform. Prothoracic shield darkened to either side of midline. Thoracic legs shiny black. Body of neonate yellow-green, changing to mottled- brown and green after feeding. Primary setae from white tubercles. Length to 5 mm before molting after 1 day.

Second instar (Fig. 22). Head black with numerous white spines of various sizes and two short black horns. Horns about 0.8 mm long with 3-4 large spines. Body dark brown dorsally, brown ventrally. Covered with short-branched scoli; these brown with white tips. Length to 10 mm before molting after 1 day.

Third instar (Fig. 23). Head black with black spines lining margin. Uppermost spines about half width of face; length decreases toward stemmata. Horns long (4 mm), branched, mace-like—at apex with minute spines; shaft of each horn with short setae, and 5-6 large spines. Body brown ventrally, black dorsally. T1 with numerous straight or 2-branched black spines. Four rows of black scoli along trunk: subdorsal (large, branched), supraspiracular, spiracular, and subspiracular (mostly simple or bifurcate). Scoli on T2-T3, A2, and A7 larger than on other segments. A7 with large scolus at rear of segment; similar enlarged scolus on A8. Dorsal row of cream spots; most segments with pair of spots in front of subdorsal scoli and 2 pairs of spots behind scoli. Additional subspiracular row of paired cream spots. Length to 16 mm before molting after 1-3 days.

Fourth instar (Fig. 24). Head as third instar. Horns about 6 mm but less capitate and mace-like at apex than those of previous instar. Body ground colors remain same. Dorsal cream spots larger, elongated. Subdorsal scoli on T3, A2 and A8, and dorsal scoli on A7-A8 thicker and more spinulose than rest. Supraspiracular and subspiracular spines often branched. Length to 30 mm before molting after 2-3 days.

Fifth instar (Fig. 25). Head as fourth instar, horns longer than 7 mm. Dorsal spots yellow, larger. Ventral and prolegs purple. Many small yellow spots in subspiracular area; some covered with wash of purple. Most scoli deep gray. Spinulose scoli notably thickened. Caterpillar to 34 mm in length and becomes prepupal after 5-6 days.

Prepupal larva (Fig. 26). Little change from fifth instar (1 day).

Pupa (Fig. 27). Two-toned pale and dark green, increasing in girth from cremaster to A2-A3; narrowing especially over dorsum then widening again through thorax. Anterior with two horns that give the appearance of wide, flat antennae. Horns diverge, pointing sideways (*cf. H. februa* and *H. glauconome*); white/pale green at edges, darkening to deep green in center. Wings very pale green with fine, dark green, vein-like markings. Dorsum pale green; dark green along each side. Length about 34 mm; width about 5 mm at widest point. Adult emerges after 5-6 days.

Observations. Larvae in the greenhouse developed during a week of (very unusual) continual light rain and drizzle. They began to disappear one by one until all perished. At first a spider was suspected, but the eventual discovery of a diseased caterpillar suggested that the wet conditions caused the problem. The three *H. guatemalena* caterpillars kept in the lab developed properly. (The *H. glauconome* larvae in the greenhouse at the same time seemed unaffected by the moisture.) The adults obtained from the lab larvae were of normal size and healthy.

Adults. Common field marks (e.g. Brock and Kaufman 2006, Glassberg 2007) used to identify Texas' *Hamadryas* are presented in Plate 4. *H. glauconome* is the only species that shows sexual dimorphism. The male is immediately identified by a large whitened area in the subapical area of the forewing (see Fig. 34). The female, on the other hand, is confusingly similar to *H. februa*. The dorsum of both species may be almost monochromatic, but may also contain hues of gray, brown, and blue (thus the term "glaucous"). Ocelli of both contain red-orange crescents. *H. glauconome* may be identified by the complete absence of red cells in the median discal cross bar, and (less reliably) by a pale background color under the forewing spot in R_3-R_4 (Figs. 28-29). Ventrally, *H. glauconome* has no red in the distal cross bar, and it has a white circle at the center of the black submarginal bar in Cu_1-Cu_2 (Figs. 31-32). *H. guatemalena* is distinguished by DHW ocelli that have inner and outer blue rings (Fig. 30), and a white spot on the VFW (Fig. 33). It is most likely to be confused with *H. feronia* (not shown). The field marks just mentioned were consistent for all of the *Hamadryas* specimens raised in this study.

Natural History Notes. Eggs of each species were most often placed on the underside of leaves. Females typically landed on top of the leaf, tucking the abdomen underneath; *H. glauconome* was also observed standing on the underside of the leaf. When leaves were abundant, usually only one to three eggs were placed on a leaf. Freshly placed eggs were covered with clear fluid, which was especially notable when the *H. guatemalena* female (only) stacked two eggs together.

Remarkably, in the warmth of the lab larvae of all three species passed through 4 instars in 5 days. First instars cut out a leaf vein upon which they rested. As in related nymphalids, a frass chain was built to extend this vein, regularly by *H. glauconome* and *H. guatemalena*, and occasionally by *H. februa*. On either side of the perch, the caterpillar would silk together a dangling string of leaf pieces (Fig. 35). The young larvae also decorated their bodies with frass during the first instar, and occasionally during the second. Presumably these steps provide protection from a subset of predators. The leaf vein resting site was abandoned after the second instar. Third instar *H. februa* and

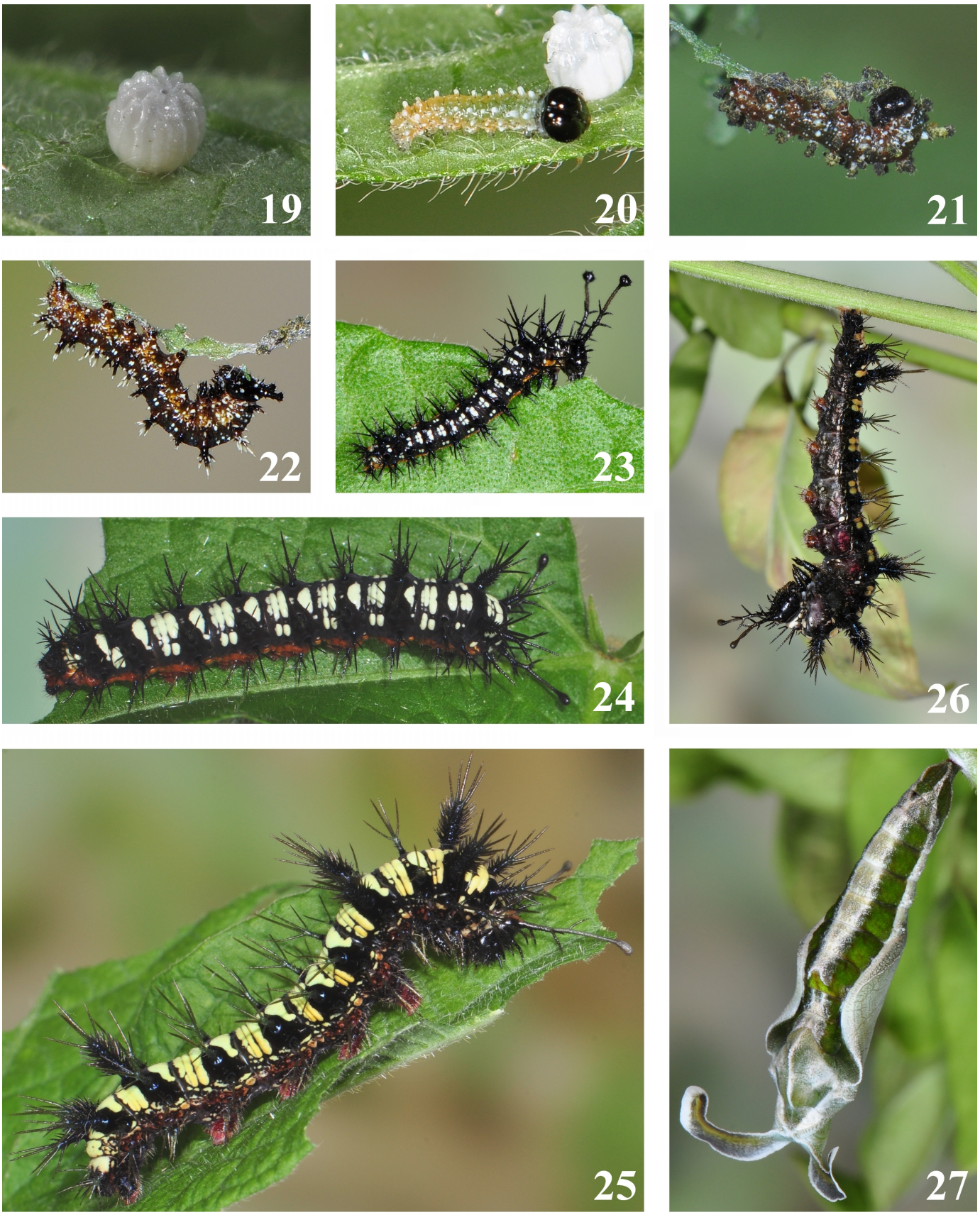

Plate 3*: H. guatemalena.* **Fig. 19** Ovum; **Fig. 20** neonate; **Fig. 21** first instar; **Fig. 22** second instar; **Fig. 23** third instar; **Fig. 24** fourth instar; **Fig. 25** fifth instar; **Fig. 26** pre-pupal larva; **Fig. 27** pupa.

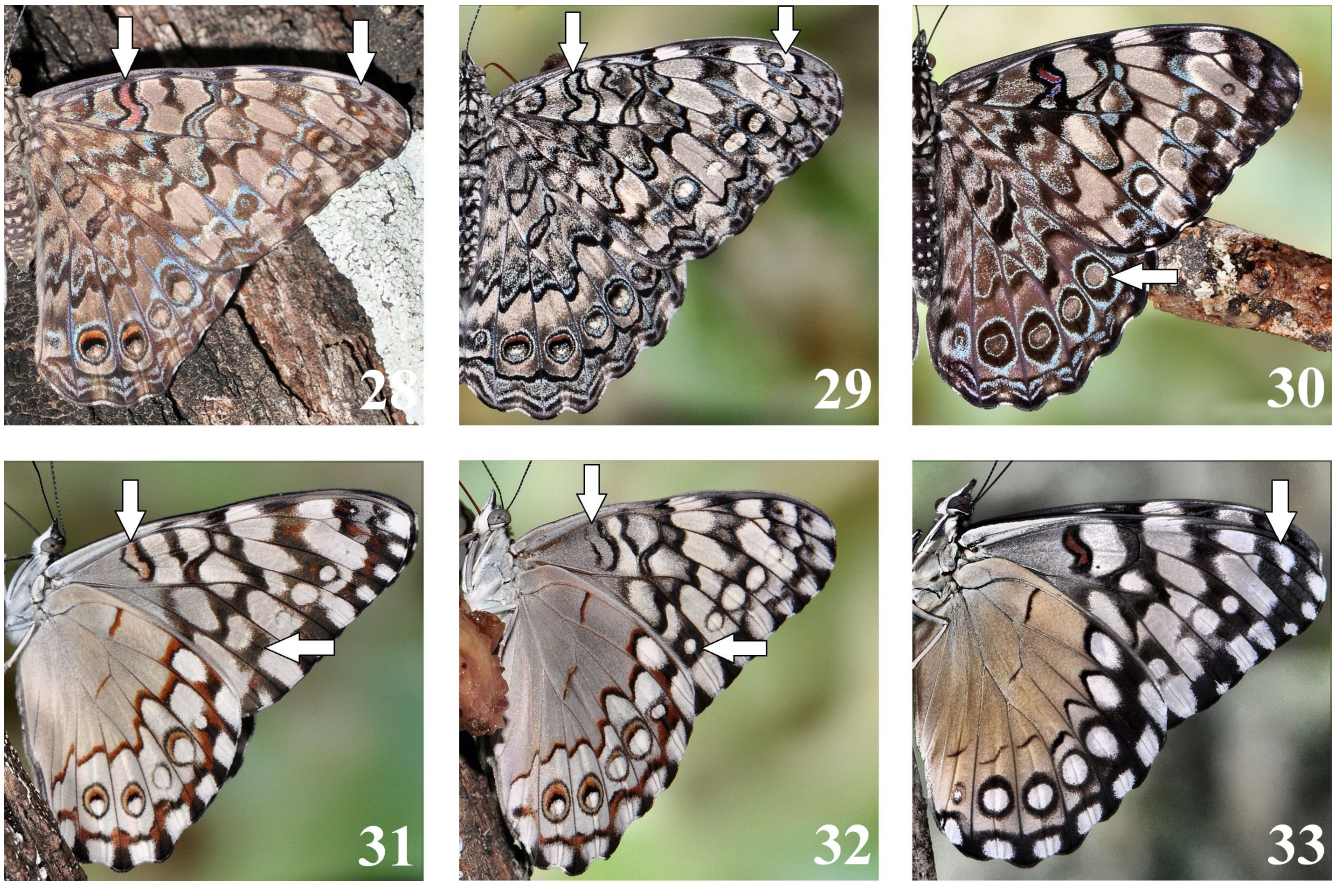

Plate 4*:* Field marks for identifying south Texas *Hamadryas.* Dorsal views: **Fig. 28** *H. februa;* **Fig. 29** *H. glauconome;* **Fig. 30** *H. guatemalena.* Ventral views: **Fig. 31** *H. februa;* **Fig. 32** *H. glauconome;* **Fig. 33** *H. guatemalena.*

H. guatemalena typically rested on leaf surfaces with face and horns pressed to the leaf; *H. glauconome*, by contrast, rested with the head facing out and horns held near the body.

In the yard, ova were occasionally attacked by lacewing larvae (Neuroptera, Chrysopidae) (Fig. 36), and twice spiders were found to have predated early-instar larvae (Fig. 39). No parasitism was observed. Last instars on the outside vines were commonly missing one or both of the clubs on the end of the horns. It would be interesting to determine the cause of this damage.

A dry high pressure front with strong winds occurred at a time when first instar *H. glauconome* were in the greenhouse and first instar *H. februa* were on the outside vines. All died, apparently killed by the wind, since temperatures were not extreme. Older caterpillars of both species seemed unaffected. In November, the last *H. glauconome* and *H. februa* larvae were molting to the fifth instar when a cold front came through, dropping temperatures to 6°C and 4°C on successive nights. It was the second night before the 6 caterpillars could be moved into the lab. All of the caterpillars were still alive 3 days later, but only one of each species survived to pupate, and the adults that issued were too weak to fly.

H. februa adults appeared to adapt to the greenhouse much better than did the other species. They commonly perched on walls and pots, or glided around comfortably, while *H. glauconome* adults and the captured *H. guatemalena* were generally flapping against or clinging to the ceiling. The discomfort of *H. glauconome* may be due to its preference for higher perches (Monge-Nájera et al. 1998) and its more-retiring nature (Jenkins 1983). No raised *H. guatemalena* adults were held in the greenhouse.

Some of the raised *H. februa* adults were recognizable and stayed around the yard for several weeks after being released. (A couple of them had to be removed from the bait trap daily!) Adults of the other two species stayed only a week at most, but it may be that they have more of a tendency to disperse than *H. februa*. More observation is necessary to assign causes to this behavior.

Host Plant Observations. The plant of choice for oviposition, and the primary food source for all of the caterpillars, was *Dalechampia scandens.* This plant is used by a variety of *Hamadryas* species (Muyshondt and Muyshondt 1975a). It is a robust vine native to Central and South America, and a distinct species from the African vine once considered conspecific (Pemberton and Liu, 2008).

A small specimen of *Dalechampia aristolochiifolia* Kunth (Euphorbiaceae) was also growing in the author's yard. This plant is an ornamental commonly sold under the name

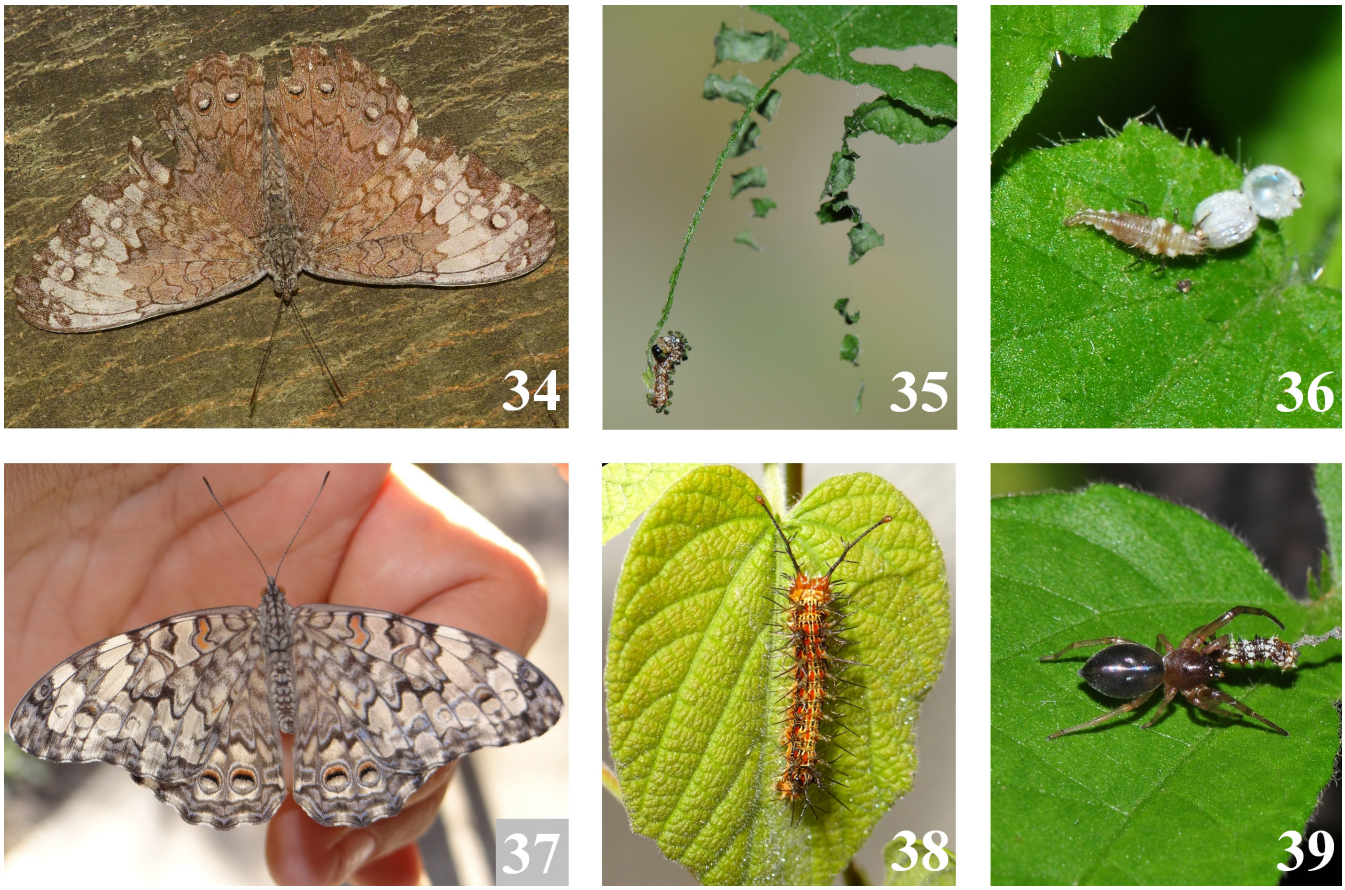

Plate 5*:* **Fig. 34** *H. glauconome* male, USA: TX: Mission: National Butterfly Center 25-Aug-13 (photo J. Rosford); **Fig. 35** leaf-vein perch made by first instar H. februa, flanked by typical leaf strings; **Fig. 36** predation of *Hamadryas* ovum by lacewing larva; **Fig. 37** wild-bred adult *H. februa* 23-Oct-13, USA: TX: Edinburg (photo: C. Traylor); **Fig. 38** wild-bred *H. februa* larva on *D. aristolochiifolia* 15-Oct-13, USA: TX: Edinburg (photo: C. Traylor); **Fig. 39** predation of second instar *H. februa* by jumping spider.

Costa Rican Butterfly Vine and often mistakenly listed as *Dalechampia dioscoreifolia* Poepp. (Kubitzki, 2014). Leaves of this plant were offered to fifth instar *H. februa*, and they readily accepted it. The *D. aristolochiifolia* vine was transplanted to a pot and placed in the greenhouse when the *H. glauconome* female was present. The female eventually oviposited on the vine, and it was defoliated by the early instars.

H. februa is known to use *Tragia volubis* L. (Euphorbiaceae) (Muyshondt and Muyshondt 1975a). It has been presumed that *Hamadryas* species are using *Tragia* in south Texas (Jenkins 1984, Bordelon and Knudson 2009). *Tragia glanduligera* Pax & K.Hoffm. was made available to all the females collected, but no eggs were placed on it. Late-instar larvae of all three Hamadryas species refused to eat the leaves. An effort was made to forcibly convert *H. februa* to *T. glanduligera* at every stage. Last instars, at best, nibbled on the leaves before pupating. All other instars died, even when again offered *Dalechampia*. Late in the season, when *H. februa* were depositing eggs on defoliated *Dalechampia* vines in the yard, dozens of ova were transferred to *T. glanduligera*. Two larvae survived to the second instar, but none further. The plants or branches offered were healthy and had mature leaves, new leaves, flowers, and seeds. The *H. februa* larvae were also offered leaves of *Tragia ramosa* Torr.; this plant too was rejected. These *Tragia* do not appear to be acceptable hosts for *Hamadryas* (unless suitability changes under special environmental conditions). Two more species remain to be tested, *Tragia amblyodonta* (Müll. Arg.) Pax & K. Hoffm. and *Tragia brevispica* Engelm. & A.Gray, but both have somewhat restricted populations (K. King, pers. comm.).

Breeding under Natural Conditions in Texas. In late August *Hamadryas* ova were found on the outdoor *Dalechampia scandens* vines. New eggs appeared regularly through the end of October, even after the plants had been virtually defoliated. All larvae that reached an identifiable size were *H. februa*. Catherine Traylor (pers. comm.) of Edinburg (Hidalgo County, TX) found ova and larvae of *H. februa* on her *D. aristolochiifolia* vine in September. (See Figs. 37-38.)

Why have wild-bred larvae not been reported previously? Part of the explanation may well be the unpalatability of *T. glanduligera*, the most common south Texas *Tragia* (Richardson and King 2011). But Traylor and the author (and likely others) have been growing *D. aristolochiifolia* for years without finding larvae. In 2011 and 2012,

the author held *H. februa* with *D. scandens* in pop-up containers, and those did not produce eggs. It seems there must be some minimal moisture conditions needed to stimulate oviposition. In dry July, productive *H. februa* females released from the greenhouse did not produce ova in the yard, but they started ovipositing again as soon as they were returned to the humid greenhouse. Oviposition began on outside plants only after substantial rains fell. Costa Rican *Hamadryas* go through a reproductive diapause in the latter half of the dry season (Young and Borkin 1985). It may be that females reaching south Texas are similarly affected by dry conditions, and that in typical years the climate results at least in reproductive quiescence. The summer of 2013 then was an exception, with adequate conditions for breeding.

DISCUSSION

The life history of *H. guatemalena guatemalena* was described from El Salvador by Muyshondt and Muyshondt (1975b). The *H. g. marmarice* larvae in this study were very similar to theirs; the only notable difference being *marmarice* developed more rapidly. A caterpillar from Mexico of *H. g. marmarice* pictured on the Butterflies of America website (Warren et al. 2012) is similar to those reported here.

The Muyshondts (1975a) also described the life history of the Salvadoran *H. februa ferentina*, and Young (1974) the same insect from Costa Rica. The Salvadoran population only would occasionally stack two eggs. The Muyshondts make no reference to third instars having white dorsum spines on A4 and A6 (and they describe the instar in the minutest detail). Fifth instars sometimes had black heads. Unique characters of the Costa Rican population include larvae remaining on the bared midrib of a leaf through the third instar, and fourth-fifth instars being very aggressive toward each other when coming into contact. Pictures of *H. februa ferentina* larvae from Costa Rica are posted on the Butterflies of America website (Warren et al. 2012). There may actually be two species of *Hamadryas* pictured there; in any event, the pictured caterpillars and pupae have significant morphological differences from the *H. f. ferentina* raised in this study.

Crackers, as *Hamadryas* are commonly called today, are famous for the clicking noise some species make in flight, especially when males interact. However, not all populations of a given species will produce sound. For example, Monge-Nájera and Hernández (1991) make note of a mute population of *H. februa* in Venezuela. In this study, only *H. guatemalena* were observed to make cracking sounds. The author has never heard the clicking noise emitted by the *H. februa* of south Texas, even when males were interacting with each other, or when adults were flying from a perch in agonistic behavior (Young 1974). In 2013 this species was seen almost daily over a three month period, and often multiple individuals were observed. This suggests that *H. februa* in south Texas may be mute. (Interactions involving male *H. glauconome* were not observed, so it would be premature to speculate about their ability to produce sound.)

Acknowledgments

The author would like to thank Charles Sassine for providing information on *H. feronia*, Cat Traylor and John Rosford for providing photos, and Charles Bordelon, Jr., Ed Knudson, and David Wagner for reviewing the manuscript and suggesting improvements.

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Formative Experiences:

Caitlin LaBar
2700 Allen St. #D103, Kelso, WA 98626
caitlinlabar@gmail.com

My fascination with insects began when I was old enough to walk. During family hikes, if my younger sister and I were lagging, my parents would point out a slug, beetle or interesting plant a little further down the trail. To this day, whenever I go hiking, I find myself paying attention more to what is at my feet rather than the view and general landscape. Encouraged by my parents who challenged me to observe and ask questions about plants and animals, I never settled for a simple "that's a ladybug", I wanted to know what *kind* of ladybug, Convergent or Nine-spotted? I loved to explore our backyard in western Washington, picking up beetles and other creepy-crawlies, often keeping them in buckets and trying to figure out what they ate. Home-schooled until I entered college, my parents encouraged me to apply my interest in bugs to whatever we were learning, such as teaching myself all the insect orders when we were learning the biological classification system.

After moving to eastern Washington when I was nine, and seeing all the butterflies on our small farm, my love of insects quickly narrowed to butterflies and I began learning the names of local species. I started collecting specimens, keeping them in recycled plastic containers with scraps of styrofoam in the bottom. Although many of these original specimens were destroyed by dermestid beetles, a few survived, such as a Woodland Skipper (*Ochlodes sylvanoides*) mounted on a sewing pin, a reminder of my first attempt at collecting. During this time, I was hungry to learn anything about butterflies and devoured every insect-related book I could find at the public library, and soon joined the Young Entomologists' Society. While I enjoyed their newsletters, I longed for something more specific to butterflies. I had yet to hear of the Lepidopterists' Society or North American Butterfly Association, overlooking references to these groups in the backs of some of the books I was reading and never thinking to search for butterfly-specific groups on the internet. However, all of that was about to change.

Two years into earning a Geography degree from Central Washington University, my advisor asked me and my sister (also majoring in geography at CWU) to accompany her on a weekend trip to the Sinlahekin Wildlife Area (SWA) in Okanogan County, Washington. She needed to evaluate the current summer intern and wanted us to decide if the program was something we would like to do the following summer. We visited the SWA in mid-July 2003, and it was impossible to contain my delight over the number of butterflies and all the new species I was seeing. Although the internship was to focus on developing the geographic information systems (GIS) database, the wildlife area manager also asked me to conduct a butterfly survey and begin work on an educational display of specimens. My sister and I returned as interns for two months the following summer and had a glorious time exploring the Sinlahekin.

During those two months, I experienced a turning point in my growth as a lepidopterist. The SWA manager had heard that a group of "butterfly people" were meeting in nearby Omak, and he asked if I would like to check it out and attend their Friday evening lecture - of course I said yes! It was the annual conference of the Washington Butterfly Association, a local chapter of NABA. The first person to greet us when we walked through the door was Jonathan Pelham, who introduced us to several others in the room. The rest of the evening was a blur, overwhelmed with meeting so many other lepidopterists and filled with excitement of finally discovering a group with my interests. The next day I attended their field trip to Moses Meadows, and received some much-needed help in identifying fritillaries and other local butterflies. Within a year I learned of and immediately joined the Lepidopterists' Society, attending my first conference in 2005 at Sierra Vista, Arizona.

A lot has happened since then as I continue to expand my knowledge of Lepidoptera. Through my blog and presentations to schools, I hope to encourage others to explore the marvelous world of butterflies. Speaking as someone who for years had longed to be part of a "butterfly group" before finally hearing of LepSoc and NABA, I encourage us to increase the visibility of these groups to the next generation of those with a budding interest in butterflies and other insects who are waiting to be mentored.

30 + years ago, when I was teaching the honors introductory biology course at the University of Texas, Austin, I spent some time lecturing about gynandromorphs (in *Drosophila*). About a year later one of my ex-students from that course brought me several slides he had taken of an Io moth that he had found in the field. "Is this one?" he asked. "Sure is," said I, "how good of you to remember." Unfortunately the student's name is long since forgotten. Enjoy!!

Michael Menaker, Commonwealth Professor of Biology, Department of Biology, University of Virginia, (434) 982-5767 **mm7e@virginia.edu**

Announcements:

Call for Season Summary Records

It is once again the time of year to start preparing your submissions for the annual Season Summary report. The annual report is sent as a hardcopy to members each year, and each year's data is also incorporated into the on-line database. Take the time to access the Season Summary database through The Lepidopterists' Society home page (http://www.flmnh.ufl.edu/lepsoc/) and do a few searches. The value of the on-line database increases as your data gets added each year. Please take the time to consider your field season and report range extensions, seasonal flight shifts, and life history observations to the appropriate Zone Coordinator. Zone Coordinators, their contact information, and the scope of their zone appears on the inside back cover of every issue of the "News".

There are a number of factors that make it necessary for the Zone Coordinators to meet a reporting deadline each year. As a result, you should have your data to the Zone Coordinator(s) no later than December 15, 2014. In most of our Nearctic zones, you have long since put away your cameras, nets, bait traps, and/or lighting equipment by that time anyway.

All records are important. Reporting the same species from the same location provided a history for future researchers to use. Report migratory species, especially the direction of flight and an estimated number of individuals. Again, all of these records may be used in the future.

Season Summary Spread Sheet and Spread Sheet Instructions

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

Important reminder to contributors using MAC computers to submit Season Summary records

PC operating systems save dates based upon a 1900 format, whereas MAC operating systems save dates based upon a 1904 *default* format. The Lepidopterists' Society master database is maintained in PC format. As a result, if you submit your season summary records on an Excel spreadsheet generated on a MAC to a Zone Coordinator who operates a PC system, without first disabling the default date setting, the dates will be off by 4 years and 1 day. If you submit your season summary records on an EXCEL spreadsheet generated on a MAC to a Zone Coordinator who operates a MAC system, without first disabling the default date setting, the dates will appear proper to the Zone Coordinator but the dates will be off by 4 years and 1 day when they are incorporated into the master data base. In some cases, MAC system dates sent to a Zone Coordinator operating a MAC system are off 8 years and 2 days (we haven't figured that one out). The following are instructions so that this problem will never rear its ugly head again.

Instructions

When a MAC user sits down to enter the very first record of the season, he/she must create a new Excel file. **Before typing in any data,** go to "Tools", then "Options" or "Preferences" depending upon your version of Excel, "Calculations", and ***uncheck*** the 1904 box. Once the data is entered, save this file, and close. If supplemental data is entered directly into this file by keypunching it in, there will not be any problems. However, do NOT paste in MAC data from another file into your file without first ensuring that the 1904 box was *unchecked* in their file PRIOR to entering any of data. Unfortunately, once data has been entered in a file, it does NOT do any good to retroactively *uncheck* the date box!!!

By following these few steps, it is a simple matter to accommodate MAC records. However, you, as the original contributor, must ensure that those steps are taken. Improperly dated records will be rejected and your important records will not get into the database.

Photos for the Front and Back Covers

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

Leroy C. Koehn, Season Summary Editor, 3000 Fairway Court, Georgetown, KY 40324-9454, **Leptraps@aol.com**.

PayPal is the easy way to send money to the Society

For those wishing to send/donate money to the Society; purchase Society publications, t-shirts, and back issues; to pay late fees; or purchase space in the Marketplace for Commercial ads, PayPal is a convenient way to do so. The process is simple: sign on to www.PayPal.com, and navigate to "Send Money", and use this recipient e-mail address: **kerichers@wuesd.org**; follow the instructions to complete the transaction, and be sure to enter information in the box provided to explain why the money is being sent to the Society. It's as simple as that—and be sure to let us know if you have any difficulties with the process.

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).

Corrections to items in the Summer 2014 News (vol. 56:2)

In the Article "Uncommon Clearwing Moths (Sesiidae) from southeastern Arizona" (pages 58-61), the company listed at the bottom of Table 2 (pg. 59) as providing "Custom Lures" should read "Pherobank BV" (in the Netherlands), not "Pherotech". The authors apologize for any confusion.

New Membership Directory Notice -- October 17, 2014, Deadline for Changes in Your Information

The Society publishes a Membership Directory every two years, and it's that time again. Contact me to change any of your information: address, phone, e-mail, list of interests, and privacy preferences. If you are unsure of the information we have on file for you, ask me for a "screenshot" of your membership record. I will e-mail it to you as a PDF or, if you don't have e-mail, I will mail it to you. Chris Grinter (**cgrinter@gmail.com**), Dept. of Zoology, Denver Museum of Nature and Science, 2001 Colorado Blvd., Denver, CO 80205-5798; cell: (847)767-9688.

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,** or Carol A. Butler, 60 West 13th Street, New York, NY 10011, (212)807-0008; **cabutler1@verizon.net.** Do NOT send actual books -- we match up reviewers with authors and have the authors send copy directly to the reviewer.

The Society of Kentucky Lepidopterists Annual Meeting: 40th Anniversary

The meeting will be at the University of Kentucky, Lexington, KY. Friday and Saturday November 14 & 15. We will meet in the Insect Museum in the Dimock Animal Pathology Building. There will be the "Gathering of Lepidopterists" on Friday evening. This is the 40th Anniversary of the Society. Dr. Covell will be attending and he will present a talk on the history of our Society. The University of Kentucky Insect collection will be open for viewing. For additional information visit the Society's website: **http://www.kylepidopterists.org**

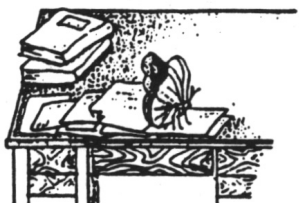
The Society of Kentucky Lepidopterists is open to anyone with an interest in the Lepidoptera of the Great State of Kentucky. We are a very active organization. We have two or three field meetings every year. Annual dues are $15.00.

To join the Society of Kentucky Lepidopterists, send dues to:

Les Ferge, 7119 Hubbard Ave, Middleton, WI 53562; **lesferge@gmail.com**

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**) and he will be glad to help you out.



From the Editor's Desk

James K. Adams

Dear members,

"Conservation Matters" is back! The "Formative Experiences" column is continuing! "Digital Collecting" will be back next issue with more lovely pictures from the neotropics by Kim Garwood. My apologies to Kim for not getting her column into this issue

Enjoy the second 52 page issue of the News in a row!!

Deimatic coloration in Owl butterflies

Alexandra Kouznetsova

Karolinska Institutet, Kopparvägen 33, 176 72 Järfälla, Stockholm, Sweden 32303 **sash_geppan@hotmail.com**

First of all, what is deimatic coloration?

Deimatic coloration is the type of coloration which is considered to be a startling signal that is frightening to the predators of the mimic. Deimatic patterns are present on many different animals, and are a frequently occurring phenomenon among Lepidoptera.

This is how deimatic signals are described by the zoologist M. Edmunds:

"Deimatic behaviour produces mutually incompatible tendencies in a predator: it stimulates an attacking predator to withdraw and move away. This results in a period of indecision on the part of the predator (even though it may eventually attack), and this gives the displaying animal an increased chance of escaping." (Edmunds, 1974)

Several hypotheses have been developed in order to explain the origin of deimatic patterns. One of the ideas that was put forward is the *eye-mimicry hypothesis*. It states that deimatic coloration in form of bigger eyespots is an attempt to mimic the eyes of the attacker's own enemy, thus intimidating the attacker (Blest, 1957).

Following this reasoning, it should be possible to extend the eye-mimicry hypothesis to include other features of the mimic, such as patterns on various body parts, and assume that they, like the eyespots, are an attempt to resemble the corresponding patterns on the enemy of the attacker.

Could such a case exist among Lepidoptera?

Let us look at how deimatic coloration is displayed by a particular Lepidoptera genus.

The genus *Caligo* consists of two dozen species known as Owl butterflies, which inhabit southern North America and almost all of Central and South America. The large, usually yellow eyespots present on the underside of the hind wings of *Caligo* are a famous example of deimatic patterns. According to the eye-mimicry hypothesis, the two eyespots imitate the eyes of an owl, an assumption that gives rise to the butterfly's name.

While these two big eyespots of *Caligo* do not vary considerably in appearance, Owl butterflies also bear various wing patterns, which differ from species to species.

Assuming that the eyespots and wing patterns of Owl butterflies are in fact an attempt to mimic the appearance of an owl, and knowing that there are other different pattern elements between species, we can pose the question: do the wing patterns present on *Caligo* mimic appearances of particular owls present in the area?

Four examples can be considered, each consisting of one owl species and several species of *Caligo* with wing patterns similar to the features of the owl. The groups are assembled using visual similarity in coloration as the basis, which is determined based on patterns existent on the underside of fore and hind wings of Lepidoptera and features of the head and, in one case, neck and chest of owl.

The four owl-*Caligo* groups and similar features, as well as distribution areas of the *Caligo* are outlined in Table 1.

Discussion

Table 1 assembles the groups based only on the appearance of the owl and the butterflies.

In order to suggest that *Caligo* are mimicking the appearance of particular owls, a case must be made that the owls' prey and the butterflies' predators are the same species. This is hard to determine exactly but can be generalized.

The four owls that are indicated in the examples are of various sizes and thus hunt different prey:

- The Crested owl is a medium-sized owl and feeds mainly on insects and small vertebarates, similar to the Pacific Screech owl.
- The Great Horned owl is a large owl, which hunts a large variety of species including mammals, birds, reptiles, amphibians, fish and insects.
- The Pacific Screech owl is a medium-sized owl and feeds similarly to the Crested Owl.
- Finally, the Spectacled owl is a medium-sized to large owl and feeds on small mammals, insects, spiders, insectivorous birds and frogs.

As Owl butterflies are quite large, not every predator can manage to capture one. It is also of importance that *Caligo* are most active at dusk, when diurnal animals are not around. That is why Owl butterflies are hunted mostly by small amphibians and reptiles and only by a few insectivorous birds.

Comparing the descriptions above, we find that small amphibians and reptiles are the main "link" between all owls and their mimics, which means that the mimicry of *Caligo*-butterflies may be mainly directed towards them.

By logic, it is profitable for mimics to resemble owls that

TABLE 1: Owl	Resembling *Caligo*/ Distribution area	Similar features
Crested owl *(Lophostrix cristata)* [Figure 1]	*suzanna* /Colombia [TL] *euphorbus euphorbus* / Brazil: Amazonas[TL] *euphorbus menoetius*/ Brazil: Amazonas[TL]	1. Two thick white lines on Lepidoptera wings and above eyes of owl. 2. General common colors: Red-brown, dark brown and black (FW and HW of Lepidoptera and head of owl).
Great Horned owl *(Bubo virginianus)* [Figure 2]	*idomeneus rhoetus* /Brazil: Para, Amazonas [TL] *idomeneus superba f. praecana* /Peru [TL] *idomeneus ibykus* /Brazil: Minas Gerais [TL] *idomeneus ariphron* / Brazil: Espírito Santo [TL]	1. Orange coloration of hind wings and around eyes of owl. 2. General common colors: brown, black, orange and white (FW and HW of Lepidoptera and head, neck and chest of owl).
Pacific Screech owl *(Megascops cooperi* [Figure 3]	*brasiliensis sulanus* /SE Mexico to Panama *telamonius memnon* /E & SW Mexico to Nicaragua *telamonius menus* /Costa Rica to Colombia	1. Darker wavy lines on edge of hind and fore Lepidoptera wings and sides of head of owl. 2. General common colors: yellowish, light/dark brown (FW and HW of Lepidoptera and head of owl).
Spectacled owl *(Pulsatrix perspicillata)* [Figure 4]	*idomeneus hippolochus* / Bolivia [TL] *menoetius aristophanes* / Bolivia [TL] *memnon pavonides* / Colombia [TL]	1. White bands on hind wings of Lepidoptera and around eyes of owl. 2. General common colors: black (HW of Lepidoptera and head of owl).

Note that the yellow eyespots and owl eyes are excluded from the comparison, as they are in common for all *Caligo* and owls presented.

Abbreviations in the table:

- TL = Type Locality, i.e. the geographical place of capture, collection, or observation of the name-bearing type of a nominal species or subspecies. Note that type locality is not necessarily the geographical distribution area of a "typical" representative of the nominal species or subspecies.
- FW and HW = Fore Wings and Hind Wings respectively.
- Cardinal directions are abbreviated as S for South, N for North etc.

are recognised as threatening by a number of insectivorous animals (mentioned above), as that would increase the chances of the mimicry provoking a startle-response in the enemy and hence, the survival chances of the butterfly.

It should also follow that owls inhabiting large territories are potentially recognized by a larger number of insectivorous animals, than would be owls with local ranges.

Indeed, three out of four species of owl included here (Crested owl, Great Horned owl and Spectacled owl) inhabit wide territories in South, Central and/or North America (figs. 1, 2 and 4). These owls are encountered and potentially recognized as threatening by insectivorous animals over a large geographic range, simply because these owl species can be abundant. Frequent encounters between insectivorous animals and owls with large distribution areas should further the survival and spread of owl butterflies mimicking these owls. Supposedly, this reasoning can explain the similarity in patterns, which can be seen between the owls and Owl butterflies that are mentioned here as examples. (This is not to say that mimicking patterns of local owls cannot occur, only that it may be less likely.)

The process of an Owl butterfly adapting a coloration, which mimics the appearance of an owl, is a process that progresses with indirect interaction between the Lepidoptera and the avian predator by means of various insectivorous animals. Therefore, the case where the individuals with the most resembling patterns are singled out most efficiently is when the indirect interaction is most active. That would occur when the mimic and its model inhabit significantly overlapping geographical territories, as they would both have abundant contact with the insectivorous animals that constitute "the link". Examples of this case can be seen on maps of figures 1 and 4, which illustrate the distribution areas of the Crested owl & its potential mimics and the Spectacled owl and its potential mimics, respectively.

However, in some cases the distribution areas of predator and its potential mimic do not overlap (the case of the Great Horned owl, illustrated on map in fig. 2) or overlap very little (the case of the Pacific screech owl, illustrated on map in fig. 3), even though pattern resemblance between them is notable.

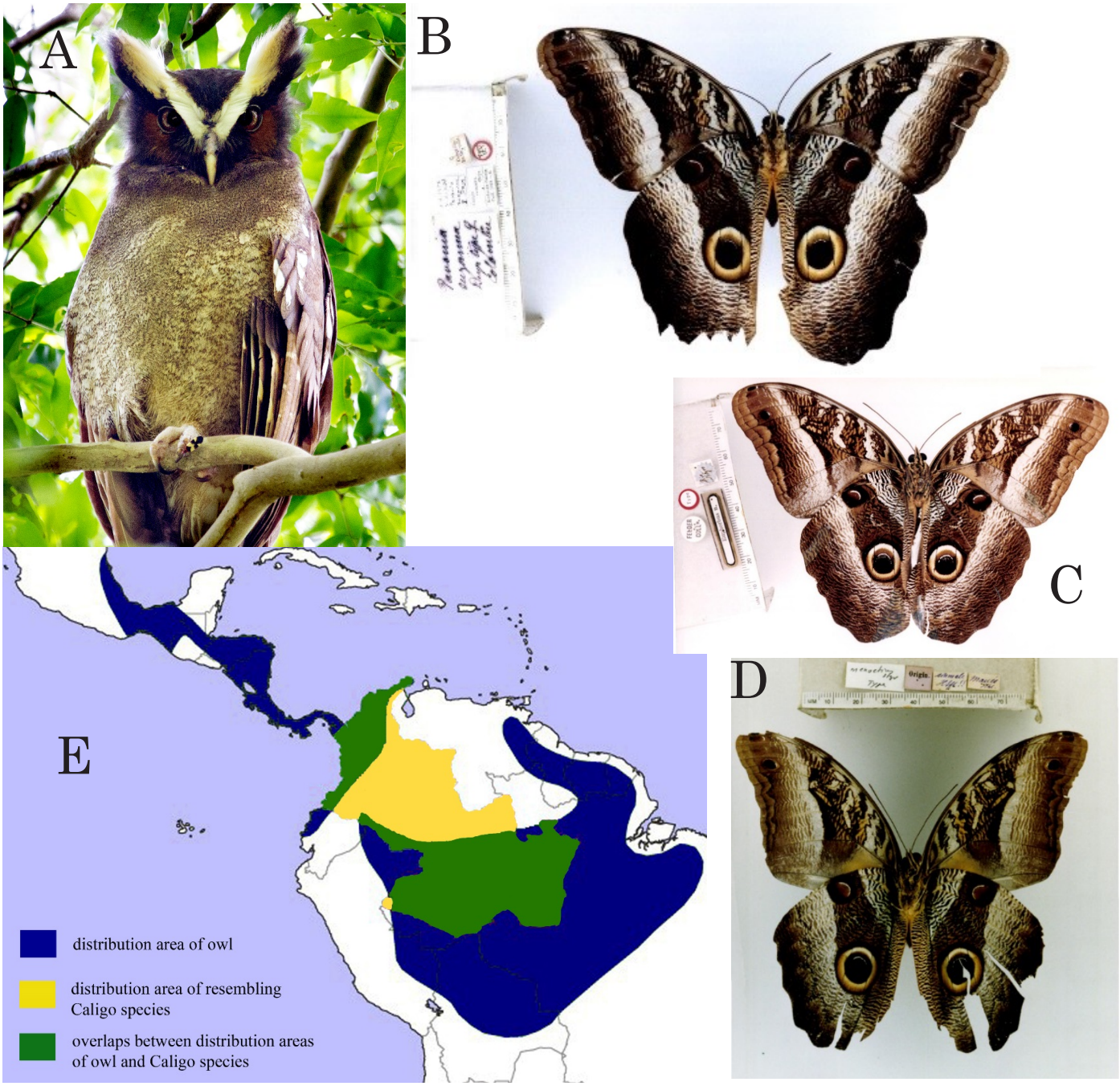


Figure 1. **A**. Crested owl (*Lophostrix cristata*) (Photo by Chris Jiménez); **B**. *Caligo suzanna*; **C**. *Caligo euphorbus euphorbus* (B & C by Gerardo Lamas,© Trustees of the BMNH); **D**. *Caligo euphorbus menoetius* (photo by Gerardo Lamas, © Trustees of the Museum für Naturkunde, Berlin); **E**. Distribution of Crested owl, and *C. suzanna, C. euphorbus euphorbus* and *C. euphorbus menoetius*. Original image from owlpages.com. Edited in Photoshop.

There are two apparent explanations for this.

The first reason for resemblance in partial coloration in particular owl butterflies and owls, which do not inhabit the same geographical area, could be that their similarity is only coincidence.

Secondly, this could be explained by occurrence of factors that have influenced populations of *Caligo* mimics and/or specific owl. The influence of external factors on the populations could have led to their increase or decrease and/or migration or dispersal. In either way, the result is a change in geographical territory of one or several species involved. Thus, an interaction between certain species of *Caligo* and owl by means of insectivorous animals might have existed in very recent evolutionary history and resulted in resemblance of *Caligo* patterns to partial owl coloration. However, after alterations in distribution areas of avian predators and/or Lepidoptera, populations of some *Caligo* species "mimicking" certain owls may have

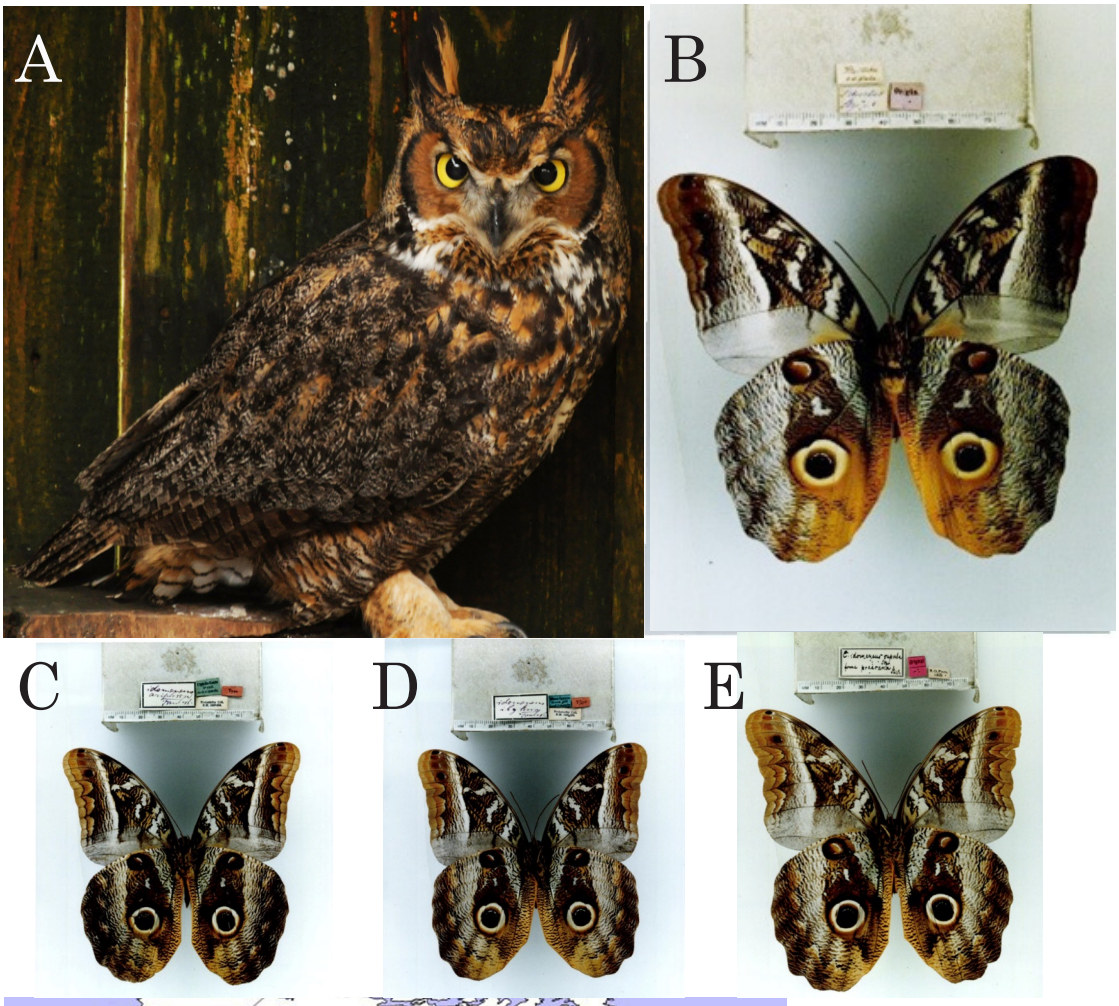


Figure 2. **A**. North Andean Great Horned owl (*Bubo virginianus nigrescens*) (photo by Johannes Pfleiderer); **B**. *Caligo idomeneus rhoetus*; **C**. *Caligo idomeneus ariphron;* **D**. *Caligo idomeneus ibykus*; **E**. *Caligo idomeneus praecana*. (B-E by Gerardo Lamas; B,E © Trustees of the Museum für Naturkunde, Berlin; C,D © Trustees of the BMNH) **F**. Distribution of the Great Horned owl, and *C. idomeneus rhoetus, C. idomeneus praecana, C. idomeneus ibykus* and *C. idomeneus ariphron*. Distribution area depicted of the owl is for all *Bubo virginianus* ssp. The particular coloration of the North Andean Great Horned owl (*Bubo virginianus nigrescens*) shown is characteristic for several subspecies of the Owl, inhabiting North, Central, and northern South America. Original image from owlpages.com. Edited in Photoshop.

continued to exist independently of their mimic model.

Notably, there are several other points of view on deimatic patterns in form of eyespots and coloration. Stradling (1976) discusses that the eyespots and patterns surrounding them on the wings of *Caligo* mimic the heads of amphibians and reptiles. The main argument for this hypothesis is that *Caligo* mostly rest in the position when their wings are folded, in which only one of the large eyespots is visible from any angle of approach.

Janzen et al. (2010) states that deimatic patterns, referred to as *eye-like* and *face-like color patterns*, on tropical caterpillars and pupae of Costa Rican species are not an attempt to mimic a particular predator (in this case a snake), but rather to resemble a general one. This idea is supported by the argument that favouring of exact resemblance of a mimic to a certain predator species may create a superabundance of a particular deimatic coloration, which would increase the likelihood of insectivorous birds learning to associate that pattern with harmless prey.

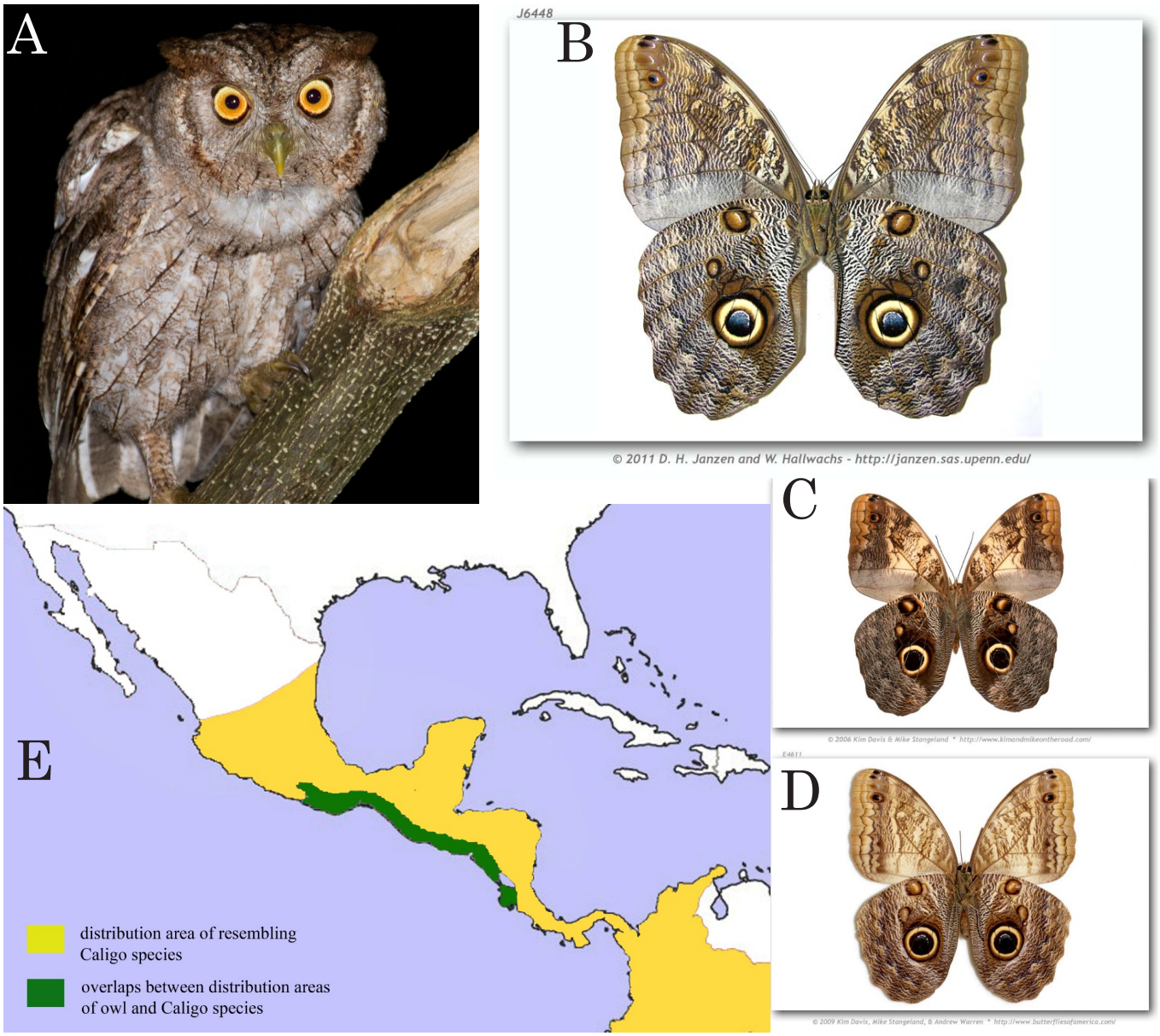


Figure 3. **A**. Pacific Screech owl (*Megascops cooperi*) (Photo by Chris Jiménez); **B**. *Caligo brasiliensis sulanus* (photo by Dan Janzen and Winnie Hallwachs); **C**. *Caligo telamonius memnon* (photo by Kim Davis and Mike Stangeland); **D**. *Caligo telamonius menus* (photo by Kim Davis, Mike Stangeland and Andrew Warren. © Trustees of MGCL); **E**. Distribution of Pacific Screech owl, and *C. brasiliensis sulanus, C. telamonius memnon* and *C. telamonius menus*. Original image from owlpages.com. Edited in Photoshop.

Another theory is the conspicuousness hypothesis, which states that eyespots are not intimidating due to their resemblance to predators' eyes, but because of their conspicuous round form and color contrast (Stevens, 2008).

These ideas are not necessarily mutually exclusive, and several of them can work for the same species. For instance, a naïve predator might avoid a *Caligo*-butterfly due to the eyespots' conspicuousness, while an experienced one has learned to associate eyespots and certain patterns with a particular enemy. From one angle of approach the wings of *Caligo* may resemble an owl and from another – a snake.

In theory, the more defense mechanisms the butterfly possesses, the better is its chance of survival. Or, to rephrase it, if several strategies prove to be successful for an individual or a group of individuals, then natural selection will act in the direction of preserving the traits enabling those strategies.

Acknowledgements

I would like to thank Alexandra Balogh (PhD at the Department of Zoology at Stockholm University) for guidance and assistance with the project. I would also like to thank Gerardo Lamas (executive officer at the Department of Entomology at UNMSM) and Martin Olofsson (PhD at Department of Zoology at Stockholm University) for providing reading material for the project.

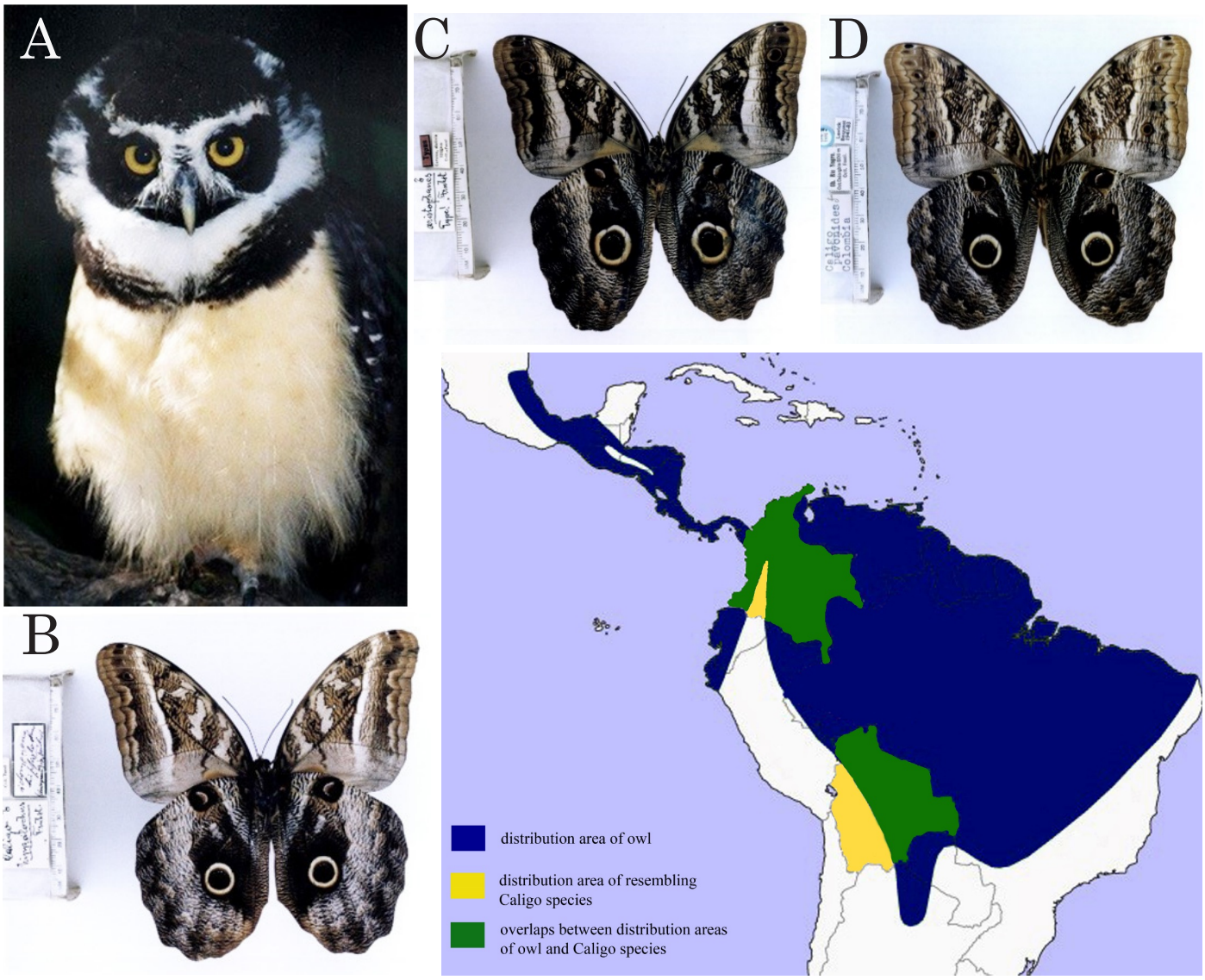


Figure 4. **A**. Spectacled owl (*Pulsatrix perspicillata*) (photo by Vladmír Motyčka); **B**. *Caligo idomeneus hippolochus,* main resembling species; **C**. *Caligo menoetius aristophanes,* secondary resembling species; **D**. *Caligo memnon pavonides,* secondary resembling species (B-D, by Gerardo Lamas; B,C © Trustees of the Swedish museum of Natural History; D © Trustees of the BMNH); **E**. Distribution of Spectacled owl and *C. idomeneus hippolochus, C. menoetius aristophanes* and *C. memnon pavonides*. Original image from owlpages.com. Edited in Photoshop.

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In memoriam: Rafael Fernando Rey Cárdenas 1958-2010

Andrew F. E. Neild[1] & Tomasz W. Pyrcz[2]

[1]Scientific Associate, The Natural History Museum, Life Sciences Dept., Cromwell Rd., London SW7 5BD, UK
andrew.neild@blueyonder.co.uk
[2]Zoological Museum, Institute of Zoology, Jagiellonian University, Ingardena 6, 30-060 Kraków, Poland
tomasz.pyrcz@ul.edu.pl

On the 22nd May 2010 the talented Venezuelan Lepidopterist Rafael Fernando Rey Cárdenas died in San Cristóbal, Táchira state, of a heart attack at the tragically young age of 51.

Fernando, as he preferred to be known, was born in Caracas on 10th December 1958 to Colombian parents of Spanish and Italian descent (José Alberto de Jesús Rey Cubillos and Mery Cardenas de Rey). He was the youngest of four children, with a sister and two brothers (Lucía, Luís Alberto, and Ricardo José), and also had several half brothers and sisters. He went to school initially in San Cristóbal, but spent most of his youth in Bogota, Colombia, where he graduated from secondary school in 1978, having studied at both San Juan Bautista de la Salle and Colegio San Juan Eudes. Subsequently he returned to San Cristóbal, spending most of the remainder of his life there or in neighbouring towns within Táchira state.

Figure 1. Fernando was amused by the persistence of this male Neographium agesilaus which spent a long time "puddling" on his shirt. This photo was taken in September 1997 at one of his favourite sites, along the Río Frío, in the SE of the Sierra de El Tamá, Táchira, Venezuela.

Fernando was passionate about butterflies from his early childhood. Although he collected all butterfly groups throughout his life, he specialised in Pieridae, and concentrated most of his time and effort collecting and studying the Venezuelan species, correctly considering that this family was relatively neglected by collectors in Venezuela, and hoping that his research work would provide important contributions to our knowledge of the butterfly fauna of his homeland. His discoveries proved him right.

Over the course of many years he sampled a tiny forest he found on the outskirts of San Cristobal, called Hacienda Pánaga (Chucurí), at around 650-750 m elevation, which is possibly the single most species-diverse site that has been sampled for butterflies in Venezuela (pers. obs.). Fernando compiled a checklist of the Pieridae of Hacienda Pánaga which, although never published, was made available on his web site. Fernando later created a report and annotated checklist of the Pieridae of Táchira state (Rey, 1994) which was published by the Universidad Nacional Experimental de Táchira (UNET) where he worked. Although concentrating on Pieridae, Fernando took every opportunity to sample every species of butterfly he encountered, and was exceedingly adept at spotting new and unusual taxa, specimens of which he freely and generously offered to friends and colleagues for study, especially the two authors of this paper. As a result, his specimens, data, and observations from Hacienda Pánaga and other areas of the country were used in numerous scientific publications, and especially in *The Butterflies of Venezuela* book series (Neild 1996, 2008), in which his contribution was gratefully acknowledged with the naming in his honour of *Adelpha paraena reyi* by the first author (Neild, 1996).

The second site "discovered" by Fernando for lepidopterology was the valley of San Vicente de la Revancha in the Tamá National Park (Táchira). There he spent several months collecting in the Fundo Piedras Blancas, a private

property just above San Vicente, at some 2100-2300 m elevation. As a direct consequence he gathered many new records of butterfly species for Venezuela. However, as Fernando himself acknowledged, the biggest achievement of his lepidopterological career was the discovery of an extraordinary undescribed species of *Catasticta* Butler (see Fig. 2) in the cloud forest of Fundo Piedras Blancas which perfectly mimics the abundant pierid species *Leptophobia eleone* Doubleday. The species is so rare and local, and access to its locality so difficult, that one of the authors of this present paper (TP), who was asked by Fernando to co-author its description, is still probably the only other person privileged to have observed the species in its natural environment. *Catasticta revancha* as it came to be named (Rey & Pyrcz, 1996), is the only endemic species of pierid in Táchira state, and one of the few endemic species of this family in Venezuela. Its appearance is unusual and its phylogenetic status is puzzling to lepidopterists. The sampling in Fundo Piedras Blancas was extremely fruitful and resulted in the discovery of several other taxa, including an endemic subspecies of *Perisama* Doubleday, *P. bomplandii reyi* described by Attal and Crosson du Cormier (2003).

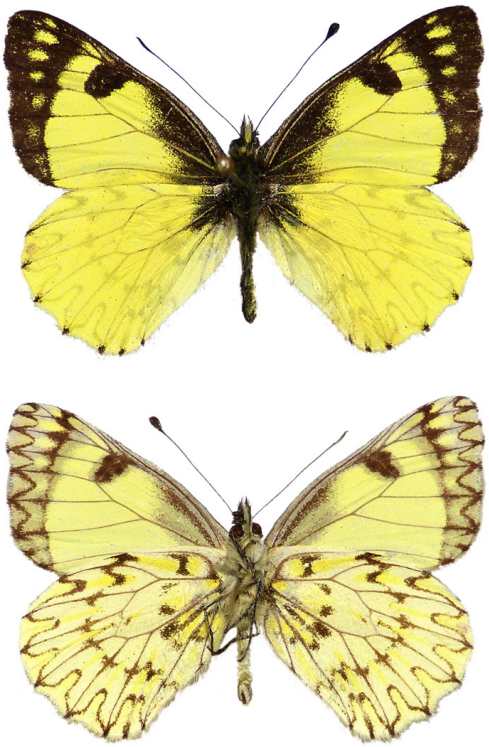

Figure 2. A male of Catasticta revancha Rey & Pyrcz from Fundo Piedra Blanca (3,200 m), Sierra de El Tamá, Táchira, Venezuela (Neild collection, UK). Forewing length is 22 mm.

Although Fernando concentrated his collecting around his home in Táchira state, especially in the Tamá range and in the valley of the upper Doradas river, he also participated in several lepidopterological expeditions to other areas of Venezuela, including south of the Orinoco, in Amazonas and Bolívar states, where he also made important discoveries. These expeditions were often extremely tiring and demanding, and his health suffered in pursuit of his passion, especially in the absence of funds to adequately finance his trips – when he visited Maroa in western Amazonas state, he lived in the shell of an abandoned house where he was bitten mercilessly by mosquitoes, and walked the long and exceedingly hot and humid track towards Yavita daily, suffering severe dehydration which forced him to drink water from streams, leading to severe gastro-intestinal problems. In the early 1990s Fernando made an ascent of the legendary Mount Roraima (Bolívar), during which he collected an individual of an endemic genus and species, subsequently named *Protopedaliodes kukenani* by Viloria and Pyrcz (1994). In 1996 he joined one of us (TP) on an expedition to the Páramo El Tamá (Táchira), which proved to be especially successful, as two new subspecies of *Catasticta* were discovered, throwing new light on the systematics of high elevation species in this genus. They were described by Fernando in co-authorship with the late Janusz Wojtusiak (Poland) as *Catasticta uricoecheae inopa* and *Catasticta tricolor tomasi* (Wojtusiak & Rey, 1999). During the same expedition numerous undescribed taxa of pronophiline satyrines were discovered. They were important contributions to the ongoing faunal study of the Pronophilini of the El Tamá range (Pyrcz & Viloria, 2007). Fernando's contribution to that project was acknowledged by the dedication to him of one of the most beautiful species of pronophiline occurring in that range, *Pedaliodes reyi* (Fig. 3, see Pyrcz & Viloria, 2007). Later trips to the same range during the early years of the 21st century specifically searching for new *Catasticta* once again paid dividends with a notable contribution to the revision of the Venezuelan *Catasticta* by Bollino and Costa (2007), who named *Catasticta philoscia reyi* in gratitude for "his skilful observations and precious notes" about their ethology (Mauro Costa tells us, pers. comm., that Fernando spent more than 70 days totally alone in the cloud forests and páramo of La Revancha , suffering all the trials of character associated with solitude and the extremes of penetrating damp and cold and blazing unrelenting sun). In 2008 Fernando and TP returned to explore the cloud forest and páramo of El Tamá, and once again new and interesting records were added to the faunal list of Táchira and Venezuela. Subsequent to his untimely passing, Fernando's contribution to Venezuelan butterfly science was honoured with the dedication of a brassoline (owl) butterfly *Eryphanis zolvizora reyi* Bristow, Neild, De Sousa & Huertas (Blandin *et al*., 2014).

As we have already noted, Fernando's great passion in life was for butterflies, and to a lesser extent insects. He was a great admirer and a protégé of the late great Venezuelan entomologist Francisco Fernández Yépez, in whose house he stayed during a month long internship in 1985 at the Facultad de Agronomía at the Universidad Central de Venezuela (Maracay). Unable to find paid work in his preferred profession as an entomologist, he returned to Barrio Obrero in San Cristóbal to live with his father, who

Figure 3. A male of Pedaliodes reyi Pyrcz & Viloria from the Betania to La Linea trail (2800-2850 m), Sierra de El Tamá, Táchira, Venezuela (Muzeum Zoologiczne Uniwersytetu Jagiellońskiego, Kraków, Poland). Forewing length is 29 mm.

owned a musical school (Cátedra Musical San Cristobal). Like his father and sister, Fernando was a naturally gifted musician. He started to learn the English horn and Oboe, but after his instruments were stolen, had to give up because he was unable to afford to replace them! Instead he studied musical theory and solfège for four years in the Escuela de Música Miguel Ángel Espinel in the late 1980s, after which he taught first and second year students at the Escuela de Música Francisco J. Marciales in nearby Rubio in 1988 and 1989, and later also trained teachers at the Universidad Nacional Experimental de Táchira (UNET), San Cristóbal, in 1990. At the end of the 80s and in the early 90s he took a number of Entomological courses at the UNET, where he found employment from 1990 until 1999, firstly as a technician in the laboratory of entomology at the UNET under the dipterologist Gustavo Perruolo, and then as a curator in the Museum of Entomology. During this period he led occasional lessons and field courses and proved to be a very good teacher highly appreciated by his students. Unfortunately his work was very poorly remunerated, and on many occasions we remember Fernando telling us that he had not been paid for many months. Quite apart from the socio-economic impact that this had on his life, it also frustrated Fernando's wishes to further his interests – he was, for example, never able to afford to subscribe to the Lepidopterists' Society (or to any other entomological association) despite wishing to do so. Eventually financial problems led him to seek other means to support himself. He left San Cristóbal for some years and bred rabbits in La Cristalina, near Capacho. This rabbit farm, which he ran with a friend, was profitable for some years but the business eventually failed. He returned to San Cristóbal and tried all manner of things to make a living such as rearing cats and orchids, or postal stamp exchange. Nothing really went well. He was unemployed for most of the last decade of his life, and his health suffered as a result.

Fernando took comfort in this difficult period from the end of the 90s in the emerging Venezuelan internet service, enthusiastically developing his huge web site at the UNET, even creating a fledgling search engine. He hosted pages covering all of his varied interests, but primarily the Pieridae of Táchira, collectibles such as wooden pencils, as well as the poems that he authored, many of which were published by the local press, and which revealed that he was a real man of renaissance, and highly cultivated (he was fascinated by traditional Indian and Chinese medicine, and took classes of Feng Shui and Yoga).

Even though his situation at times seemed hopeless, Fernando always looked on the bright side of life, and with a quick wit he would dismiss the concerns of well-meaning friends. When asked what he did to occupy himself, he quipped: "in the morning I laze around doing nothing, in the afternoon I rest, and at night I sleep to recover all the energy I lost during my hard day's work!".

Although he never married, nor had children, his poems and good looks attracted the attention of many female admirers, a fact that he certainly appreciated. And so we finish this testament to Fernando by quoting one of his many poems verbatim, because it perfectly illustrates the humble and self-effacing idealist he was …. It was written after finally meeting a woman who was perfect in his eyes. He attempts to list all her wonderful attributes, but words fail him. He finds peace in her company, and knows that his heart and soul will finally sense perfection in her embrace … but ultimately she is unreachable, and disinterested, because, as his personal note that follows the poem so frankly states, he has none of the very attributes that he sees are so perfect in her …

Así eres - alegre, sencilla, laboriosa, simpática, amable y cordial, consciente, humilde, hacendosa, preocupada, constante y especial. . . Detallista, madura, animosa, tierna, sincera y sentimental, sensible, honesta, cariñosa, suave, interesante y esencial. . . Así Eres y aún más, que no sé cómo explicar; y junto a Ti encuentro paz. . . No dudo que he de ganar porque mi alma cambia su faz y mi corazón te empieza a amar.

"Durante muchos años estuve buscando la mujer perfecta y cuando la encontré escribí este soneto en honor a ella …. pero ella seguía buscando al hombre perfecto, porque yo de "eso" no tengo nada."

"Frey", as he used to sign off his emails, always included this phrase below in his digital signature, and we feel it is a fitting epitaph for him …

"Recuerda que cada día de nuestras vidas es importante ... SER ALGO ESPECIAL." (Remember that every day of our lives is important … BE SOMETHING SPECIAL.)

Fernando may not have realised it, but he lived up to this mantra of his. He was indeed very special to those that knew him and loved him. He was a wonderful, warm, charismatic fellow with a heart of gold, and he will be missed by us all.

Note: the facts included in this obituary were collated from a number of sources, including the internet, friends and colleagues, conversations with Fernando's sister Lucía, and a Curriculum Vitae written by Fernando himself. We have attempted to check all the information included above but it has proven impossible to precisely verify some of the details.

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This aberrant Morpho specimen is from the collection of Fred Bower (**freddiebower60@yahoo.com)**, who lives in Lockport, NY. The data that came with the specimen is South America: Colombia, ex pupa 16 August 2012, from T. Mansfield. Fred indicates that this seems to be an aberrant of the species *peleides*, and also indicates that upon discussion with other people that there is some distinct agreement on the species.

The Marketplace

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FLOWER VISITATION BY COLORADO BUTTERFLIES (40,615 RECORDS) WITH A REVIEW OF THE LITERATURE ON POLLINATION OF COLORADO PLANTS AND BUTTERFLY ATTRACTION. By James A. Scott. 190 pages; pdf free at **http://digitool.library.colostate.edu.** This is a scientific book listing all my records of species of butterflies visiting hundreds of flower species, mostly in Colorado, using scientific names. Butterfly preferences are determined. All the ways butterflies are attracted to flowers are explored (including an extensive literature review) including flower color, shape, ultraviolet reflection, nectar quality, floral scents, plus butterfly vision, proboscis length, sense of smell, etc. The second part of the book arranges the records by plants, to determine which flowers are popular, and includes flowers that are shunned (most pretty flower species in nature are actually unpopular). Known pollinators of all these plants are given, the only modern compilation of pollinators of Colorado plants. Pollination by butterflies is completely reviewed with numerous examples worldwide. Visits to other adult foods are included, foods such as sap, fruit, honeydew, dung, mud, etc.), and the chemicals attracting butterflies to these foods are pinpointed with thorough literature search, including simple chemical recipes you can make to attract butterflies that like carrion and dung etc. Learn about butterflies, bees, flies and other insect pollinators —it's all in this well-stuffed book. 562

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.

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

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

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

Selected issues of the Lepidoptera of North America published in the Contributions of the C.P. Gillette Museum of Arthropod Diversity are now available as downloadable pdf's on the Colorado State University library's ftp site as part of the Colorado Digital Library. There are currently 6 issues containing significant information about Lepidoptera that are already online. These include most recent issues by James A. Scott (see previous page), Ken Davenport's revised annotated list of Kern/Tulare butterflies, Richard's Holland's publications on New Mexico *Glaucopsyche lygdamus* and *Plebejus icarioides* and a biogeographic study of the butterfly faunas of the mountains in the Chihuahuan region [mainly New Mexico], Andy Warren's butterflies of Oregon, and one of the parts of the Fort Sill, Oklahoma survey. You may find these by going to http://digitool.library.colostate.edu and keying in "Contributions of the C.P. Gillette Museum." Most of the other publications in the Moths of Western North America and the Lepidoptera of North America subseries should be served on-line by the end of summer 2014. We also intend to serve pdf's of other publications and metadata of interest to lepidopterists. If one wishes a printed copy of a particular publication it may be downloaded at no cost and printed at a printer of your choice. Hard copies of selected issues may still be ordered from BioQuip.com. 562

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 for details. John Banks FRES, 28 Patshull Road, London NW5 2JY, UK 562

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FOR SALE: Night collecting sheet. The convenient collapsable and quickly erected apparatus from Bio-Quip. Almost brand new and in excellent condition. Configured as an arch (or semi-circle) 82 inches across and 87 inches high. The frame consists of 10 pieces of 3/8" aluminum tube, 24" long connected with elastic cord. After the frame is constructed and set up (anywhere with moderately level ground) the smooth reflective white sheet is fastened to it with velcro loops. Can be used with either black light or mercury vapor that is suspended from the frame or mounted on tripods. Two-sided operation. Includes carrying case. Weight is 2.2 pounds. $75.00 or best offer. Contact: John Masters, **quest4tvl@aol.com**. 562

FOR SALE: 100 U.S. National Museum System (USNM/ Smithsonian) Drawers with glass tops. 18 in. X 18 in. X 2.5 in. Drawers are in good shape. $8.00 each. Located in Ohio; buyer to arrange for local pickup or shipping. Contact Mike Gilligan (**mtgillig@tds.net**). 562

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**. 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.

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The need for Milkweed: report on the international initiative to address the decline of the Monarch Butterfly (*Danaus plexippus*)

Carol A. Butler

60 West 13th Street, New York, NY 10011 **cabutler1@verizon.net**

Introduction

Because they make regular and predictable annual migrations, monarch butterflies (*Danaus plexippus*) are considered a mobile species. The migratory generation of monarchs travels thousands of kilometers along flyways from breeding to non-breeding grounds, stopping to rest and feed along the way. Every aspect of the journey is crucial, and they may face multiple threats in each habitat. Relatively few monarchs that begin the journey south from North America to Mexico survive the six- to nine- month migration cycle to lay their eggs on the return journey north. In a complex, intergenerational relay, their progeny in two or three relatively short-lived subsequent generations have the task of rebuilding the population so that the next migratory generation starts out in robust numbers. A major challenge when attempting to conserve a mobile species is that the effectiveness of a conservation action taken at one site depends on the condition of other sites that may be geographically and politically distant (Runge et al, 2014). You will see below how this applies to efforts to address the monarch butterfly population decline.

The origins of an organism can be discovered by analyzing the ratio of stable isotopes present in its tissues. Isotopes are atoms of the same chemical element that have a different atomic mass because they have different numbers of neutrons. Isotopes are considered stable if they persist in their elemental form, and almost all natural elements on Earth are stable isotopes. Stable isotope analysis indicates that more than half of the monarch migrants that overwinter in Mexico originate from eggs laid in the "corn belt" in the Midwestern United States (Miller et al, 2012); the others arrive from the eastern, western, and southern portions of the breeding range. Using stable isotope measurements along with other variables, Flockhart et al (2013) determined that monarchs that make the journey north to re-colonize the Midwest were produced largely in Texas.

Over the past twenty years the numbers of migrating monarchs have fluctuated, and in recent years the population that arrives in Mexico has diminished dramatically. Although there are still millions of monarchs flying each year, some fear that the unique biological phenomenon of the annual monarch migration has become endangered. This article is an effort to review the decline of the monarch population that migrates to Mexico, and to discuss past, present, and projected conservation efforts. I have tried to be thorough in my review, and any errors are undoubtedly mine.

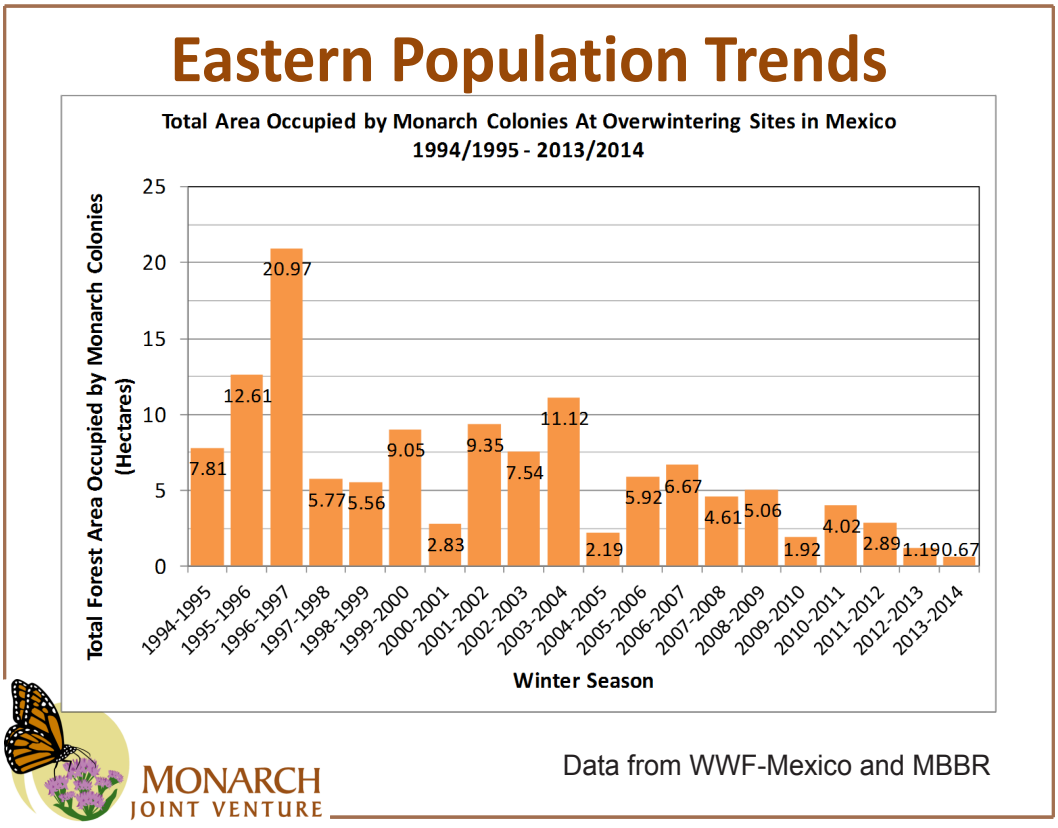

Figure 1. Monarch colony area at overwintering sites in Mexico for past 20 years.

Defining the problem

Relatively few east coast monarchs are recovered in Mexico, suggesting that they have a reduced chance of reaching the Mexican overwintering sites when they migrate ((Howard & Davis, 2009; Garland & Davis, 2002; Brindza et al, 2008; McCord & Davis, 2010). Some of them may overwinter at alternative sites in Cuba (Dockx et al, 2004), southern Florida (Brower, 1995), and along the U.S. Gulf coast (Howard et al, 2010). Monarchs that originate west of the Continental Divide generally fly to the coast of California to spend the winter in several small groves of trees. Blogs suggest that the west coast overwintering population has diminished to some degree, but there is almost no formal data reported (Stevens and Frey, 2010). The discussion below focuses on the monarch migration from the Great Plains and southern Ontario because that population is the one on which there is the most data.

Pathogens, parasitoids, and Bt pollen have been shown to result in some monarch mortality, but the three main hypotheses that are consistently posed to explain the decline in the monarch population over the past 20 years are habitat loss in the overwintering grounds in Mexico, habitat loss on the breeding grounds in the United States and southern Canada, and extreme weather events.

The statistical tools of decision theory were used by Flockhart et al (2014) to create a model conservation strategy for the monarch, and their analysis of the data yielded the following conclusion: *"…recent population declines stem from reduction in milkweed host plants in the United States that arise from increasing adoption of genetically modified crops and land-use change, not from climate change or degradation of forest habitats in Mexico. Therefore, reducing the negative effects of host plant loss on the breeding grounds is the top conservation priority to slow or halt future population declines of monarch butterflies in North America."*

Milkweed

There is little doubt that native milkweeds (*Asclepias spp.)* are central to the survival of the monarch butterfly because their leaves are the only food on which monarch larvae can survive. Female monarchs can smell milkweed host plants from miles away, and they lay one egg at a time on its leaves. Females can be tempted to lay eggs on invasive members of the milkweed family-- Asian swallow-wort (*Calotropis gigantean*) and European black swallow-wort (*Cynanchum louisea*, also known as *Vincetoxicum nigrum)*-- but the larvae do not survive to maturity (Baby et al, 2013; Casagrande & Dacey, 2007).

Surveys conducted in Iowa that measured the amount of *Asclepias syriaca* in corn and soybean fields found significant decreases in density over time (Harzler & Buhler, 2000; Hartzler, 2010). The Monarch Larva Monitoring Project (MLMP) is a citizen science project developed by researchers at the University of Minnesota to collect long-term data on larval monarch populations and milkweed habitat. Utilizing thousands of amateur naturalists/citizen scientists in the field collecting data at hundreds of sites in the United States (as well as in Canada and Mexico), Pleasants and Oberhauser (2013) estimated that, similar to what was documented in Iowa, the number of milkweed plants in the Midwest declined by 58 percent between 1999 and 2010, and they estimated that monarch egg production in the Midwest in that period dropped an estimated 81 percent. They found direct parallels between the generally declining annual counts of the overwintering population in Mexico (Rendón-Salinas et al, 2011; Monarch Watch, 2011) and the increasing use of the weed killer glyphosate on cultivated fields of corn and soybean in the United States that are genetically modified to be herbicide resistant. They acknowledge that other factors have played a role in the declining monarch populations, but the loss of milkweed is the first cause-and-effect relationship they have been able to document.

The only reports I found that challenged the idea of a monarch population decline were by Andrew K. Davis of the University of Georgia and his colleagues Their work, based on the analysis of data from fall monitoring stations at Cape May, New Jersey and Peninsula Point, Michigan that span 15 and 19 years respectively, did not find significant population declines (Meitner et al, 2004; Walton et al, 2005). He acknowledged (2012) that his monitoring data is relatively crude (volunteers walked or drove a standardized route and only recorded the numbers of low-flying or grounded southbound monarchs they saw funneling through), and that his results do not necessarily adequately reflect the size of the entire fall generation (Davis & Garland, 2002). In addition, these "peripheral

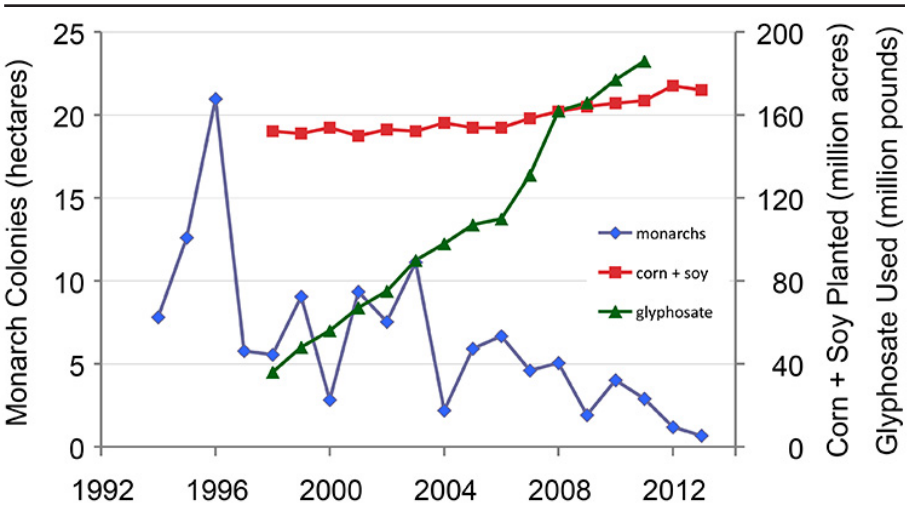

Figure 2. Glyphosphate use and potential Monarch decline.

source populations" (Wassenaar & Hobson, 1998) are not necessarily affected by the conditions that plague the Midwest (Brower, 2012a), and his work does not diminish the overall concern about monarch survival.

Three Amigos Summit, February 19, 2014

The leaders of the United States, Mexico, and Canada gathered for an economic summit meeting in Toluca, Mexico, formally titled "The North American Leaders' Summit". To encourage President Obama, President Peña Nieto of Mexico, and Prime Minister Harper of Canada to take an active role in supporting the survival of monarch butterflies, an international group of scientists, writers, artists, and environmentalists presented them with letters that urged mitigation of the breeding habitat losses. One of the letters was authored by Lepidopterists' Society members Lincoln Brower and Ernest Williams, and was signed by a number of other distinguished people, including members Chip Taylor and Bob Pyle.

The letters addressed the issue of government subsidies for producing corn ethanol that have encouraged farmers to cultivate small and large parcels of land that previously supported milkweed. The great majority of the corn and soybean varieties that are now planted in central North America are genetically modified to be herbicide- resistant, allowing farmers to spray fields with herbicides that kill milkweeds and other non-crop plants.

The excerpt below is from the Brower/Williams letter submitted in February, 2014 to the three leaders.

"If the monarch butterfly migration and overwintering phenomenon is to persist in eastern North America, mitigation of breeding habitat loss must be initiated. As Mexico is addressing the logging issues, so now must the United States and Canada address the effects of our current agricultural policies. Managing roadsides for native plants, including milkweeds, could be a significant tool to partially offset the loss of habitat. There are 3.2 million miles of roads east of the Rocky Mountains. If 25-foot roadside strips and medians were managed to support the growth of milkweeds, then eastern U.S. roadsides could contribute more than 19 million acres of milkweed habitat. If two monarchs were produced per acre of habitat, then these roadsides could produce nearly 40 million monarchs, i.e., about one tenth of the 20 year average number of monarch butterflies overwintering in Mexico. Within the agricultural heartland, a second mitigation effort should promote more extensive buffers of native plant communities at field margins. Collaborative exclusion of field margins in cooperation with farming communities could add substantially and help assure the continuation of the World's most revered butterfly. An incentive program to pay farmers to set aside toxin-free areas for milkweeds and pollinators could be a move in the right direction."

During the summit meeting, Mexican President Peña Nieto announced, "We have agreed to conserve the monarch butterfly as an emblematic species of North America which unites our three countries." Monarchs were mentioned again in the joint final statement that also addressed energy, immigration, border security, and other issues: "Our governments will establish a working group to ensure the conservation of the monarch butterfly, a species that symbolizes our association."

Trilateral meeting in Querétaro, Mexico, May 25-30, 2014

I became interested in what would be done to follow-up on the recommendations made in Toluca, and, because the monarch situation was on the agenda, I accepted an invitation to be a member of the U.S. delegation (as an observer) to the XIX Canada/Mexico/U.S. Trilateral Committee Meeting for Wildlife and Ecosystem Conservation and Management in Querétaro City, Mexico. The Trilateral Committee was established in 1995 to address the priorities of the North American bioregion, and it consists of working tables (species of common concern, ecosystem conservation, migratory birds, etc.) that hear reports about ongoing projects and make recommendations to the three governments for future collaborative action.

I attended a plenary session about monarchs as well as an afternoon at the ecosystem conservation working table that focused on monarch reports from the U.S. and Mexico. Karen Oberhauser of the University of Minnesota presented on both days, framing the situation based on her thirty years of studying monarchs. Mexican scientists who work in the Monarch Butterfly Biosphere Reserve (MBBR) and/or are affiliated with the Mexican conservation groups CONANP (Comisón Nacional de Áreas Naturales Protegidas), SEMARNAT (Secretaría de Medio Ambiente y Recursos Naturales), and INECC *(Instituto Nacional de Ecología y Cambio Climático*) made enlightening presentations as well (see below for details).

Follow-up to the Trilateral meeting

On June 20, 2014, President Obama issued a memo creating a task force co-chaired by the Secretary of Agriculture and the Administrator of the Environmental Protection Agency. He directed them to include representatives from at least 14 other government departments in the task force, and he gave the group 180 days to develop a National Pollinator Health Strategy, "which shall include explicit goals, milestones, and metrics to measure progress." The mandate of the task force is to increase and improve pollinator habitat, with specific directives for each government department that is represented. (http://www.whitehouse.gov/the-press-office/2014/06/20/presidential-memorandum-creating-federal-strategy-promote-health-honey-b) The Lepidopterists' Society sent a letter of support for this initiative to the co-chairs and to President Obama.

The working table reports from the Trilateral meeting have begun to trickle in; the species of common concern report arrived in mid-July. Once all the reports have been submitted to the Trilateral's Executive Committee, the Committee will issue its recommendations to the three governments. The High Level Monarch Butterfly Working Group met privately at Querétaro during the Trilateral meeting and an attendee reported that they agreed to recommend revising and updating the 2008 *North American Monarch Conservation Plan* as a starting point. The Plan was originally created to provide a scientific foundation for monarch conservation efforts and is still quite timely. (http://www.mlmp.org/Resources/pdf/5431_Monarch_en.pdf)

United States efforts

Small and large projects are underway to distribute native seeds and plugs. They aim to raise public awareness about monarch habitat conservation and to promote the inclusion of milkweed in habitat restoration efforts. Some examples follow:

- In New York's Adirondack Mountains, a monarch flyway, a grass roots effort by the group AdkAction.org is distributing 10,000 copies of a monarch brochure throughout the Adirondack Park. Each brochure will have a Ziploc bag attached with a small amount of common milkweed seeds.
- Also in New York, the American Littoral Society's *Operation Milkweed: Save the Monarch Butterfly* is working with local schools to plant milkweeds in open areas around Broad Channel and the Rockaway Beach area in Queens, New York. The National Parks and Conservation Association matched individual contributions of up to 50 dollars. (www.ioby.org/project/american-littoral-societys-operation-milkweed-save-monarch)
- A larger, collaborative effort known as the *Monarch Joint Venture* (MJV) involves numerous federal and state agencies, NGOs, and private citizens. Chaired by University of Minnesota biologist Karen Oberhauser, its work is based on the North American Monarch Conservation Plan. MJV also provides information about what individuals and organizations can do to promote monarch conservation, and it highlights monarch habitat "success stories" throughout the U.S. on its website (www.monarchjointventure.org).
- The Xerces Society, an MJV partner, is engaged in *Project Milkweed,* an extensive effort to encourage the planting of regionally appropriate native milkweed species. With support from conservation grants, private foundations, and community partners, they have collaborated with the native seed industry to produce new sources of milkweed seed in California, the Great Basin, Arizona, New Mexico, Texas, and Florida- areas of the monarch's breeding range where native seed has not been reliably available. (www.xerces.org/milkweed/)
- Monarch Watch provides detailed information on their website about planting milkweed, and they offer native milkweed plugs that are grown from locally-sourced seeds to individuals and organizations. (www.monarchwatch.org/milkweed/guide)

A personal communication from biologist Chip Taylor, founder/director of Monarch Watch, highlights the limitations of local efforts: "*We will soon announce a program to distribute a flat of 32 milkweed plugs to about 200 schools and non-profits... We are getting lots of orders for milkweeds but, even if we succeed in getting folks to plant 100k milkweeds this year, it will be but a tiny fraction of what will be needed to save the monarch migration.*" Taylor stressed that an effective program to support monarchs would necessitate massive milkweed seed production and intensive efforts to reseed degraded areas- nothing short of a large scale mitigation effort.

Past and present U.S. Government efforts

Government efforts to increase milkweed production should be reflected in the next farm bill, which is due in about five years. The Agricultural Act of 2008, known as the "farm bill", was where the government responded to the economic losses caused by the scarcity of honeybees associated with Colony Collapse Disorder. The bill outlined specific efforts aimed at fostering pollinator health in all 50 states. Farmers and ranchers of privately owned or leased working land became eligible to voluntarily undertake specific on-farm conservation research and to implement conservation practices in return for financial and technical assistance.

Government support for pollinator health takes place under the umbrella of the USDA's Natural Resources Conservation Service, primarily under the Environmental Quality Incentives Program (EQIP), and under the auspices of the Farm Service Agency (FSA). Grants for projects are awarded competitively in a limited number of priority areas that are established each year on the national level and independently by individual states. Pollinator projects fall into the wildlife priority, and there were 25 national wildlife projects from 2004 through 2010 with funding totaling $7.9 million, out of a total of 136 nationwide EQIP grants totaling $53.4 million. At the state level during that period there were 16 funded projects for wildlife ($0.75 million). We found only one project specific to milkweeds-- California in 2010 awarded $117,983 to a project for increasing the availability of milkweed seed. Thirty-three national conservation grants were awarded in 2013, and only two were directly aimed at pollinator health, and their descriptions did not specifically mention milkweed. Priorities eligible for conservation grants in 2014 have been announced, and the national program *does* have a wildlife category that includes pollinator projects ("to develop regional, crop-specific guidance providing the vegetative species, landforms, and necessary acreage to support

appropriate populations of managed and wild pollinators per unit area of pollinated crops"). On the state level, priorities vary. New York State, for example, does not have wildlife as a priority category this year; New Hampshire does include pollinator habitat enhancement ("seeding trials and establishment techniques") among its 2014 priorities. Additional detailed state-by-state information is available online and from state NRCS officials.

Changes in the Agricultural Act of 2014

The 2014 farm bill took a step backward, directly reducing overall funding for conservation programs by roughly $4 billion over ten years. Under the 2008 farm bill, 12.8 million acres were enrolled each year in conservation programs, but the 2014 farm bill decreased the annual enrollment to 10 million acres.

The Conservation Stewardship Program (CSP) rewarded agricultural producers that maintained and improved their existing conservation systems and adopted additional conservation activities that addressed priority resources concerns. CSP included the Wildlife Habitat Incentive Program (WHIP) that supported conservation-minded landowners who wanted to "increase biodiversity and improve wildlife and pollinator habitat on their land." The 2014 farm bill eliminated the funding for the WHIP program, although some of its functions are said to be rolled into EQIP.

Mexican efforts

Millions of migratory monarchs, mostly from east of the Rocky Mountains, overwinter in diapause for up to five months at a number of sites in the Oyamel forests of the Transverse Neovolcanic Range of mountains in central Mexico. In 2013-2014, fewer than 50,000 ha were occupied by monarchs, in comparison with an estimated 500,000 ha occupied when the area was located by Canadian zoologist Fred Urquhart in 1975. He had begun experimenting with tagging monarchs in 1937, eventually perfecting his technique and, with the help of volunteers, tagging "hundreds of thousands of migrating monarchs…all across the continent" with the goal of tracking them to their overwintering area in Mexico (Urquhart, 1976). Lincoln Brower recently estimated that in 2013-2014, 88 percent of the monarchs in Mexico occupied only two of 12 overwintering sites that had been used in the past, and five of the sites had no monarchs at all.

For many years, the monarch population decline was attributed primarily to the harsh conditions and the alarming loss of habitat in the overwintering area. The Mexican scientists who presented at the May, 2014 Trilateral Meeting expressed satisfaction with the progress that has been made in curtailing the degradation of the Mexican habitat, and their accomplishments are impressive.

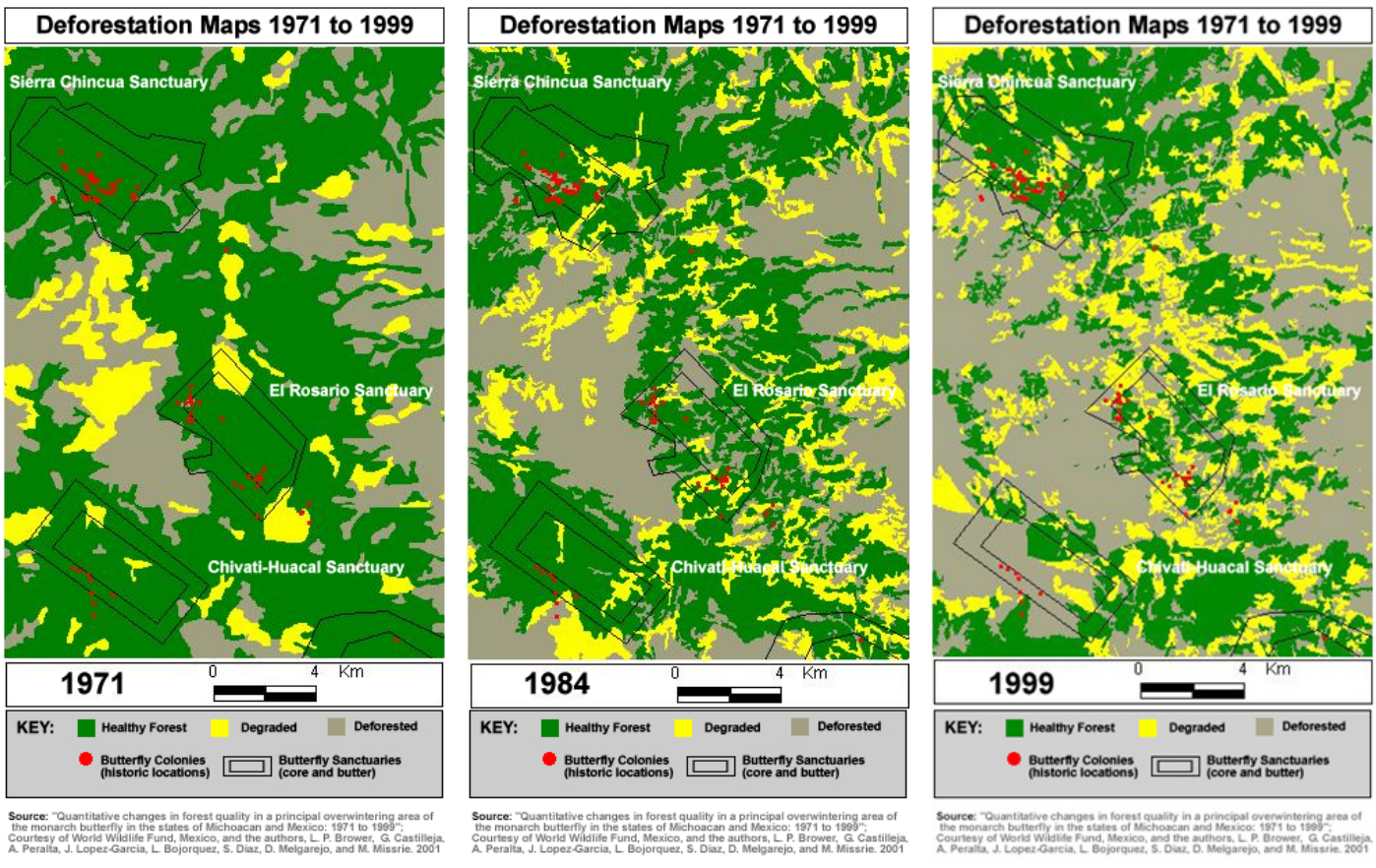

Figure 3. Deforestation at overwintering sites in Mexico since 1971.

In past years, trees in what is now a protected area were felled legally and illegally. They were processed in local sawmills to supply producers with wood chips to make particle board. Farmers whose land was overgrazed contributed to the degradation of the forest by cutting down trees to increase the size of their pastures. Several steps were taken to gain control over the area:

- 1980: The overwintering area was designated a *Reserve and Wild Fauna Refuge*, but no restrictions were imposed.
- 1986: 16,110 ha (62 square miles) comprising five areas were designated the *Monarch Butterfly Special Biosphere Reserve*. Forestry was restricted in the core of each area but illegal logging remained widespread.
- 2000: The Reserve was expanded and renamed the *Monarch Butterfly Biosphere Reserve* (MBBR). It was expanded to include 56,259 ha (216 square miles), with three core areas and two buffer zones. The core zones, in which logging was forbidden, were increased from 4491 ha to 13,552 ha. In the surrounding buffer zones, controlled logging and forest activities were allowed.
- 2008: The Reserve was declared a World Heritage Site, and a permanent monitoring system was established to control for forest fires and illegal logging.
- 2009: Large-scale illegal logging was virtually eliminated. Even clandestine sawmills that had been protected by criminal gangs were dismantled.
- A $5 million trust fund was set up with a gift from the Packard Foundation to provide incentives for conservation (payment for not extracting timber) and for restoration of the core areas and the watersheds. Logging permits were revoked or purchased, and the former permit-holders were compensated for the loss of their logging rights. To stimulate the area's economy, local people (*ejidos*) are paid by the trust to maintain the core zones, to monitor 11 colonies in the area for illegal activity, and for fire management. They are also involved in efforts to regulate tourism and to minimize the damage it causes.

Aquaculture

In an effort to generate economic activity for the local inhabitants, a rainbow trout farm was established in the El Lindero river basin in 1992. After the expansion of the MBBR in 2000, the industry grew to include 16 farms that produced about 90 tons of trout annually. New farms continue to be established, and the producers of rainbow trout in the MBBR recently created the *Pro-Monarch Aquaculture Union* that brought together 31 farms with the goal of promoting trout products and supporting their marketing and distribution.

Future plans in Mexico

Recent publications by researchers in Mexico reflect the focus on reforestation and restoration of the MBBR (Soto-Correa et al, 2014; Sáenz-Romero et al, 2012; Blanco-Garcia et al, 2011). Developing environmental policy to minimize the impact of ecotourism on wildlife in the MBBR and supporting the local economy are also high priorities (Esquivel-Rios et al, 2014). Research has been initiated in the past year to study and monitor the monarch's migratory routes within Mexico, with 40 to 50 citizen scientists already monitoring several isolated areas along the flyways. The goal is to develop a comprehensive proposal that encompasses approximately 18 protected areas so that detailed study of the entire flyway is possible.

Canadian efforts

Canada had a handful of delegates out of a total of about 150 at the Trilateral meeting, and I did not notice any scheduled reports about Canadian projects on the program. I found evidence online of three Canadian efforts:

- Canada adopted its Species at Risk Act (SRA) in December, 2002 (the U.S. Endangered Species Act was enacted in 1973). In 2008, monarchs were listed in Canada as a "species of special concern", the least serious category. The SRA calls for a management plan to be proposed and implemented, but I found nothing posted.
- Canada had a five-year project (2009-2013), the NSERC-CANPOLIN Strategic Network, which brought together 44 researchers at 26 institutions across Canada to explore "the full scope of the pollination problem" from an interdisciplinary perspective. References online to the project are in the future tense; no report or recommendations were found.
- In a March 12, 2014 update, an environmental law firm (Saxe Law Office) posted that Ontario's Ministry of Agriculture and Food intends to prepare an amendment that would update Canada's Schedule of Noxious Weeds by removing milkweed from the Schedule. "*Removing milkweed from the Schedule will allow it to be planted widely, for example in gardens, on road verges, and railway and power line rights of way, as conservation groups are encouraging people to do*."

Conclusion

In 2014 the federal government announced a $3 million program to increase support for crops favored by honeybees in the five states in the Upper Midwest that host as many as 65 percent of the nation's honeybee colonies. Beekeepers are skeptical about the impact of these programs, and that raises a red flag about well-intentioned milkweed initiatives. A major commercial beekeeper, John Miller, said that by spreading the money across five states over several years, "…you've got about a Dixie cup worth of seeds going into a field" in any one season.

Chip Taylor of Monarch Watch is similarly wary of inadequate milkweed initiatives. Although the plan presented in the Toluca letter may sound viable, he feels "…*the task*

ahead is massive." In his opinion, "*we simply don't have the capacity to replace this many milkweeds… providing the seeds, plugs and planting along these right-of-ways is no trivial undertaking. … to plant one milkweed for each acre lost would take years and years*."

As Lepidopterists' Society members and enthusiasts, we should support sound initiatives and be prepared to actively involve ourselves in efforts to preserve the monarch migration for future generations. Although I realize that we need a massive effort, I planted milkweed in my Manhattan back yard-- we do see monarchs in Greenwich Village from time to time. The establishment of multiple large and small projects will begin to increase the amount of milkweed available to nourish and replenish the monarch population each year, and hopefully the promised government efforts will follow soon enough to make a major impact.

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Lineodes multisignalis -- new to the U.S.

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Lineodes multisignalis Herrich-Schäffer (Crambidae, Spilomelinae) - new to the U.S.

Charles V. Covell, Jr. and James E. Hayden

The McGuire Center for Lepidoptera and Biodiversity, Florida Museum of Natural History, Hull Rd. at SW 34th Street, Gainesville, FL 32611-2710 **ccovell@flmnh.ufl.edu, James.Hayden@freshfromflorida.com**

While attending an annual «Butterfly Days» event at the Fairchild Tropical Botanical Gardens in Coral Gables, Miami-Dade County, Florida, in 2007, CVC put out a blacklight bucket trap on the night of July 28. The paucity of moths collected was very disappointing. Most of the moths were small and unfamiliar. Thus only a few specimens were spread and put aside for later identification.

In January 2014, JEH identified one of these specimens as *Lineodes multisignalis* Herrich-Schäffer (1868; type locality "Cuba"). The maculation and genitalia match two specimens in the McGuire Center collected as part of a faunal inventory of the United States Naval Base, Guantanamo Bay, Cuba (Matthews et al. 2012). The living moth is illustrated in Núñez Águila and Barro Cañamero (2011), and he also examined a specimen determined by W.T.M. Forbes in the Museum of Comparative Zoology (Cambridge, MA). This species has not previously been recorded from the United States.

Among the Nearctic fauna, this species most closely resembles *L. vulnifica* Dyar, which occurs in southern Texas (Hayden et al. 2013). *Lineodes multisignalis* can be separated from other Nearctic *Lineodes* species by the combination of two wing pattern features: the forewing lacks a yellow dash on the distal margin (whereas *L. vulnifica* has a dash), and on the hindwing the dark discal spot and marginal shade contrast with the clear central area (other species that also lack the yellow forewing dash have an entirely suffused hindwing). In addition, the single, bifid cornutus is unique among *Lineodes* species that we have dissected.

The life history is unknown, but related species feed on Solanaceae. This specimen and the male genitalia preparation, MGCL #1,762, are deposited in the collection of the McGuire Center for Lepidoptera and Biodiversity, Florida Museum of Natural History, Gainesville, FL U.S.A.

We thank Deborah Matthews for her initial identification of the Guantanamo Bay specimens and for making them available for study. We also thank her for reviewing this manuscript.

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Fig. 1. *L. multisignalis* male from Miami-Dade County, Florida. Fig. 2. Lateral view of *L. multisignalis* head. Fig. 3. Male genitalia of *L. multisignalis* from Miami-Dade County, Florida.

Membership Updates...

Julian Donahue

Includes ALL CHANGES received by 15 August 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)

Blackwell, Gabriel: c/o Stephen Blackwell, 1118 Montview Road, Knoxville, TN 37914-5031.
Cain, Delmar: [address omitted on request]
Chadwick, Wyatt Rose: 801 Bronx River Road, Apt. 2H, Bronxville, NY 10708-8042.
Chamberlin, Steve (Ph.D.): 267 Harding Avenue, Waukegan, IL 60085-2171.
Chamberlin, Zachary: [address omitted on request]
Daly, Kathryn Margaret (Ms.): University of Alaska Fairbanks, P.O. Box 752714, Fairbanks, AK 99775-2714.
Douglas, Arthur S.: 5902 South Halm Avenue, Los Angeles, CA 90056-1438.
Dvorak, Stanley K.: 1819 Olive Street, Ramona, CA 92065-1741.
Ficarrotta, Vincent Miles: 614 SW 4th Street, Gainesville, FL 32601-6654.
Hageman, Dillon: 4433 Griffin Court, Unit A, Scott Air Force Base, IL 62225-6734.
Hageman, Kaitlyn: 4433 Griffin Court, Unit A, Scott Air Force Base, IL 62225-6734.
Hand, David J.: P.O. Box 292, Hegins, PA 17938-0292.
Hawthorne, Steven D.: 1945 Birdsong Avenue, Red Bluff, CA 96080-2568.
Heyer, Robert J. (Ph.D.): 46 Washington Street, Red Bank, NJ 07701-1838.
Klodzen, Jeanette (Ms.): [address omitted on request]
LeBlanc, Elizabeth: 2718 Madison Street, Hollywood, FL 33020-5734.
May, Cassius: c/o Maya May, 57 Hewlett Street #2, Boston, MA 02131-1509.
Muise, Gregory D.: 12123 Las Nubes Street, San Antonio, TX 78233-5944.
Randall, Stephen A.: 3016 South Arkle Street, Visalia, CA 93292-1788.
Richards, John L. (M.D.): 9708 South 2740 West, South Jordan, UT 84095-3206.
Richter, Nicholas: 25271 Pizarro Road, Lake Forest, CA 92630-4201.
Ryan, Sean: 1530 McKinley Avenue, South Bend, IN 46617-2635.
Schachat, Sandra: Mississippi Entomological Museum, P.O. Box 9775, Mississippi State, MS 39762-9775.
Staedtler, Tayt: c/o Bergin Staedtler, 140 8th Avenue, Inman, KS 67546-8062.
Weiss, Melanie: 2132 169th Avenue NE, Bellevue, WA 98008-2642.
Wodock, Virginia (Mrs.): 521 Rosemont Ringoes Road, Apt. 3, Stockton, NJ 08559-1133.

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

Bowman, Donald E.: 5854 South Taft Court, Littleton, CO 80127-3109.
Gades, Steven J.: 1009 West 4th Street, Waterloo, IA 50702-2803.
Horton, Tom: 5109 West Molly Lane, Phoenix, AZ 85083-1292.
Pautsch, Richard: 427 Pearl Street, Boulder, CO 80302-4930.
Powell, David: 3133 Leawood Drive, Lansing, MI 48910-3730.
Raschko, Michael L.: 12145 SW Lausanne Street, Wilsonville, OR 97070-7403.
Shank, Stephanie: 2449 North Maxie Way, Meridian, ID 83646-3832.
Shepard, Jon H.: 4925 SW Dakota Avenue, Corvallis, OR 97333-3917.
Vidal, Mayra: 1649 East Girard Place, Apt. 425B, Englewood, CO 80113-9134.

Metamorphosis

Julian Donahue

Frank D. Fee, of State College, Pennsylvania, on 16 March 2014. Mr. Fee, the son of Frank Dillman and Margaret Kenderdine Fee, was born in Reading, Pennsylvania on 22 May 1941. For many years he had been a metallurgist for Bethlehem Steel Co. He was affiliated with the Department of Entomology and the Frost Entomological Museum at Pennsylvania State University, and specialized in the Lepidoptera and other insects of Pennsylvania. Frank is said to have been "…to some extent a recluse and his entomological acquaintances knew little of his personal life." He had been a member of the Society since 1970.

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Conservation Matters: Contributions from the Conservation Committee

Status and conservation of the federally endangered Schaus Swallowtail Butterfly

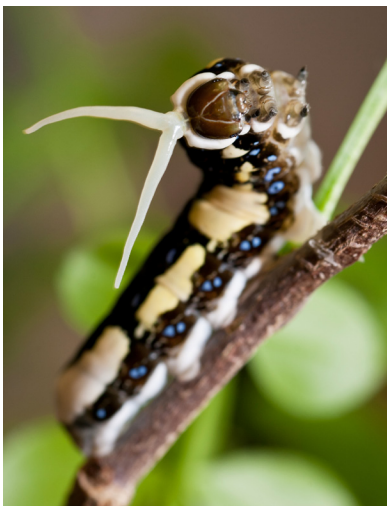
Jaret C. Daniels

The McGuire Center for Lepidoptera and Biodiversity, Florida Museum of Natural History, University of Florida, P.O. Box 112710 Gainesville, FL 32611-2710 **jdaniels@flmnh.ufl.edu**

The Florida Keys boast a remarkably diverse butterfly fauna with more than one hundred recorded taxa in a relatively small geographic area. In addition, some sixteen butterfly subspecies are endemic, or nearly so, to subtropical Florida. Collections, surveys, and other observations offer a wealth of valuable information about the nature of this unique community of butterflies and how it has changed through time. Change is nothing new to south Florida environments. They are by nature dynamic systems that regularly experience disturbances from tropical cyclones, fires, and other natural events, as well as from human activity. Florida's proximity to the West Indies has also brought about change by the colonization of new taxa from neighboring islands, as evidenced by the ever-expanding list of new records. Island populations, where inhabiting a true archipelago or defined as living within pockets of remaining habitat surrounded a matrix of inhospitable landscapes, are inherently vulnerable and prone to extirpation. As many of these isolated populations have become increasingly more fragmented and exposed to a wider assortment of threats and perturbations, their long-term persistence has increasingly been challenged. Not surprisingly then, within the last several decades, over twenty south Florida butterfly taxa have experienced alarming declines. Within this mix are the Miami blue (*Cyclargus thomasi bethunebakeri),* Bartram's scrub-hairstreak *(Strymon acis bartrami),* and Florida leafwing (*Anaea troglodyta floridalis)*, the three most recent Florida butterflies added to the U.S. Endangered Species list.

The magnitude of these declines sparked the formation of a statewide working group to help address butterfly conservation and recovery needs in Florida more effectively. Initiated in 2007 and led by the Florida Fish and Wildlife Conservation Commission, the Imperiled Butterflies of Florida Workgroup (IBWG)(and made up of representatives from US Fish and Wildlife Service, National Park Service, Florida Natural Areas Inventory, Florida Department of Environmental Protection, University of Florida, and the North American Butterfly Association) represents the first such coalition of its kind to comprehensively focus on all at-risk butterflies of an entire state. The goals of the IBWG are to promote the regular exchange of information among stakeholders; identify data gaps, research priorities, and management needs; and develop new partnerships for recovery – in essence, to have a real and measurable impact on mitigating the recently documented declines.

The workgroup has identified key action items to collaboratively address. The most recent of these targeted is the federally endangered Schaus' swallowtail (*Heraclides aristodemus ponceanus*). Schaus' Swallowtail is an iconic butterfly endemic to south Florida and the Florida Keys; additional subspecies occur in the Bahamas, Cuba, and Hispaniola. Historically, it occurred in tropical hardwood hammocks from south Miami (Miami-Dade County) to Lower Matecumbe Key (Monroe County), Florida. However, as a result of habitat loss, possible non-target pesticide impacts, and other primarily anthropogenic factors, the butterfly's overall geographic range and population numbers have been severely reduced over the past many decades. Prompted by these declines, Schaus' Swallowtail was listed by the US Fish and Wildlife Service as Threatened on April 28, 1976 (USFWS 1976), becoming the first insect added to the Endangered Species Act concurrently with the Bahamian swallowtail (*Heraclides andraemon bonhotei*). This status was later reclassified as Endangered on August 31, 1984 (USFWS 1983). It remains the only federally listed swallowtail butterfly in the United States.



Schaus' Swallowtail 4th instar larva

Over the last several decades, the stronghold of the population has been limited to several islands within Biscayne National Park (mainly Elliott Key) and a few hammocks on north Key Largo; both areas are largely under conservation. Regular intensive population monitoring was initiated in 1984, when only 70 adults were detected range-wide. During the remainder of the 1980's, population numbers fluctuated between an estimated 600 to 1,000 adults annually. Although Hurricane Andrew (a category 5 storm) made landfall just north of Homestead in August 1992 and directly impacted all occupied habitat areas, the population sufficiently rebounded by 1994 to over 600 recorded individuals and was presumed stable (Emmel and Daniels 2005). After 1995, population estimates

Tropical Hardwood Forest habitat of Schaus' Swallowtail

Marked individual on Elliott Key

were increasing to pre-hurricane levels, in part due to a captive breeding and reintroduction program directed by the University of Florida. By 2000 however, population estimates had again fallen below 250, likely the result of prolonged drought conditions, and funding for continued monitoring was all but gone. Since 2003, no systematic or rigorous surveys have been conducted in recent years and all available data have been generated from short-term (often single-day) counts and observations in a limited portion of the taxon's range. Nonetheless, the recorded numbers of adult butterflies derived from these limited survey efforts over the past decade have been dramatically low, raising significant concern about the current status and immediate risk of extinction of this much esteemed butterfly in Florida.

Consequently in 2010, the Imperiled Butterflies of Florida Workgroup targeted the renewal of intensive annual population monitoring efforts as a top priority action to determine the current status and range-wide occupancy of the taxon and help inform immediate and future management actions. Resulting collaborative surveys involving some ninety individuals from all IBWG-member agencies and organizations over the past three years (2011-13) revealed extremely depressed population numbers, with a low of only four adult butterflies recorded range-wide in 2012. In response, the U.S. Fish and Wildlife Service issued an Emergency Action in 2012 authorizing the take of livestock into captivity for the purpose of establishing an assurance laboratory colony and head-starting program. The following spring, several gravid females (including the first female seen in over two years) were temporarily captured and allowed to oviposit in flight cages on Elliott Key in Biscayne National Park. The resulting ova were transported back to the University of Florida in Gainesville and reared to pupation. A total of 70 pupae resulted, a portion of which were used for a second round of laboratory propagation in early 2014. The remaining pupae were retained for eventual adult release on Elliott Key during the single annual flight period later that spring. The ensuing laboratory breeding effort was extremely productive as well yielding nearly 1,000 captive reared organisms – well over 100 times more than the numbers recorded in the wild during the last three survey years combined. This productivity had an almost immediate impact on the wild population numbers. All told, over 350 organisms (308 late instar larvae and 46 adults) were successfully released on Elliott Key in 2014. This effort combined with improving habitat conditions over the past two years stemming from a more consistent start to the rainy season and increased rainfall in south Florida (combined two-year departure from normal of +7.8 inches between March and June), helped realize a much improved year. The recently completed 2014 comprehensive surveys recorded some 400 adults.

The University of Florida will direct another round of captive breeding later this year and conduct organism reintroductions again in spring 2015. Combined with an upcoming fifth consecutive year of comprehensive range-wide surveys to assess longer-term population trends, total geographic area of occupancy, and evaluate the ongoing conservation efforts, we are increasingly optimistic about the continued recovery of Schaus' swallowtail in Florida.

Adult male Schaus' Swallowtail

The long and short of it: observations of a one trick pony

Arthur M. Shapiro

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

Yeah, I'm in a rut. I've been in it for over 50 years. I count butterflies. You might say that's most of what I do.

This is a brief account of how I came to be in custody of the largest butterfly-monitoring database in North America, and one of the two largest in the world.

I grew up in Philadelphia, where I got imprinted on butterflies by about age 10 or 11. We lived at the northwestern edge of the city; the country was nearby. I had access to a marvelous array of habitats. The butterfly fauna had already shrunk dramatically from what it had been 50 or 60 years before, but it was still very rich. In Junior High my two great passions were butterflies and weather. I was a devout follower of a TV weatherman named Wally Kinnan, known locally as "The Terror of Tredyffrin Township." I combined my two passions into a dedication to phenology, the science of biological seasonality. I kept careful records of the first date I saw each butterfly species. It was a habit I was to keep for life. I was thrilled to see a European Cabbage Butterfly in mid-March. I was even more thrilled to document early-winter emergence of the Orange Sulphur—so thrilled that I published a note on it. It was my first scientific publication. I was 17.

That note brought me into contact with Harry K. Clench. Harry was a butterfly taxonomist—a specialist in the Gossamer-Wings (blues, coppers, hairstreaks)—at the Carnegie Museum in Pittsburgh. He, too, was obsessed with phenology. He had been monitoring the butterfly fauna at Powdermill Nature Preserve in western Pennsylvania and plotting the number of species flying vs. calendar date. He developed a sine function that described the pattern he observed, and published it in the journal *Ecology* in 1967. Unlike most Lepidopterists, Harry was well aware of contemporary developments in evolutionary ecology. Specifically, he was aware of the great emphasis being put on interspecific competition as an organizing force in ecological communities, a result of the recent nexus of the modeling work of the "MacArthur school" and the concept of character displacement advanced by W.L. Brown, Jr. and E.O. Wilson, a couple of young ant taxonomists! He viewed phenology as a phenomenon of resource partitioning, with time being the resource. In this he was way ahead of the curve, and he had no real idea of what might actually be the underlying object of the putative competition—nectar, perhaps? But we shared a vibe. I was now an undergraduate at the University of Pennsylvania and a junior member of Robert MacArthur's lab. I attended all the seminars and sat rapt at the feet of the big names of the generation that would dominate American ecology: Richard Levins, Bob Ricklefs, Martin Cody, Jared Diamond, Mike Rosenzweig. I was steeped in the lore of interspecific competition.

At the same time, in our correspondence I showed Harry that his Powdermill phenology did not match mine in suburban Philadelphia, and his sine wave didn't predict my species/date curve. At a deeper level, I was skeptical that a model like Harry's was useful unless it *pointed to mechanisms,* and I told him so. At the time there was lively controversy among ecologists as to what mathematical models best fit the distribution of commonness and rarity in communities. MacArthur was in the thick of it with his famous "broken stick model." The point for many of us, including me, was that the model giving the best fit should give us insight into what determines the distribution of commonness and rarity. For example, some models involved "niche pre-emption," the idea that the order in which species arrived determined who got the goodies. We were still batting these ideas back and forth when Harry died suddenly at age 54 in 1979. By then I was deeply into what I am still doing now. Alas, MacArthur was dead too, of cancer at 42 in 1972. But he had done more for my phenological interest than mere intellectual stimulation. While I was still at Penn, he sent me to the Chiricahua Mountains in southeastern Arizona to study the factors determining butterfly species diversity on an altitudinal gradient. The study was far too short to give any meaningful answers, but it cued me in to the fairly obvious control of butterfly phenology by the summer monsoon.

At Penn I initiated a butterfly-monitoring project at the Tinicum Wildlife Preserve, near Philadelphia International Airport. I would go down to Tinicum, a short trip from the Penn campus, and walk a prescribed route, recording all the butterflies I saw—every week if I could swing it, every other week most of the time, from April through October. That study was eventually published as an Appendix to a report on Tinicum prepared on contract by another of my early mentors, the vegetation ecologist Jack McCormick, for the Conservation Foundation. It got me committed in principle to doing a longer-term, definitive butterfly-monitoring study. The objective was to use multivariate statistics to identify the climatic factors that exercised the greatest control over butterfly phenology. I needed a minimum of five years' data to make a go of this. I was a graduate student at Cornell for four, and most of my field activity was extensive, not intensive. After receiving my Ph.D. in 1970, I took up a faculty position at Richmond

College, the Staten Island unit of the City University of New York. Here I was dealing with a familiar fauna, similar to the one I had grown up with in Philadelphia. My wife Adrienne and I decided to survey the entire island to compare the fauna to that documented by William T. Davis at the turn of the century. In 1970 the "biodiversity crisis" had not really kicked in yet, and such resurveys after many decades were still uncommon (though Cody and Diamond were doing them for birds). The results of that project were not what I expected. True enough, species tied to human disturbance had become more abundant, and some specialists had disappeared. But we also found specialists that Davis had apparently missed. Most were relatively obscure skippers—the most spectacular was the Arogos Skipper, new to the whole region, and certainly not a recent arrival! But I had scarcely gotten a good handle on the Staten Island fauna when I unexpectedly got a job offer from the University of California at Davis. I took it.

There was, of course, no guarantee of tenure -- but I would have a probationary period of at least five years, long enough to implement my plan. And California was ideal for it. The Mediterranean climate, with its very high variance in the timing and amount of precipitation, was ideal for the type of statistical analysis I wanted to do. The topographic and vegetational gradients created the opportunity to monitor multiple sites along a transect. I spent my first full year in California, 1972, learning the vegetation and the butterfly fauna and scoping out possible monitoring sites, initiating the first - Suisun - that summer. I spent so much time afield that my Department Chairman called me in for a "one-on-one," warning me that my colleagues had noticed how infrequently I was to be seen in the lab. They were used to the bench model of laboratory research, I said. I assured him that if I was to get tenure I had to learn California ecology cold, and that's what I was doing. In the first two years I still had trouble identifying some butterflies, particularly the larger Fritillaries. I called them "species 1,""species 2," etc. until my first Ph.D. student, Steve Sims, who had learned his "frits" from the extremely savvy Lepidopterist Sterling Mattoon, of Chico, taught me what was what.

My initial venture was an overreach. I picked out too many sites! As an Assistant Professor I had almost no control over my schedule. I was assigned to teach introductory Zoology and then introductory Biology, assignments that were immensely time-intensive. And then I was named Master Adviser in the Zoology major, with (at that point) some 435 students. After a couple of field seasons, I had to drop some sites. I picked them up again much later – in 1988.

But what I did was to implement my Tinicum protocol. In 1975 a symposium, "Ecology and Evolution of Communities," edited by Cody and Diamond, was published in memory of Robert MacArthur. His intimates, associates and students were invited to contribute chapters – including me. My chapter was called "The Temporal Component of Butterfly Species Diversity" and was both an overview of the aims and design of my project and a report of what had been learned thus far. The book became a classic.

I got tenure.

No one gets tenure based on a long-term project. I got tenure based on "quick-and-dirties," the short-term narrowly-focused type of research that had become the norm in American science since Thomas Hunt Morgan's research with Drosophila revolutionized the industry. But this had been intended as a medium-term project. What drove it into the long term was climatology.

One of the first things I studied in depth when I arrived in the region was a report and statistical breakdown on the climatology of Sacramento, published as a technical report by NOAA. It not only documented how variable the Mediterranean climate was—it showed that that variation occurred on multiple time scales. The late Gold Rush period was a time of extraordinary unpredictability and frequent extremes. Things then settled down for several decades. My arrival coincided with the revival of the 19th-Century unpredictability, which manifested as a remarkable two-year drought in the mid-1970s, in the midst of my study. The wildness continued; the data, both climatic and Lepidopterological, were just too good to even think of stopping. There was no time to analyze the data. I was too busy collecting more, doing more "quick-and-dirties," teaching and advising undergraduates, training graduate students, serving on committees, blah, blah. But as I got more seniority I got more control over my schedule, and by 1988 I had ten monitoring sites on a transect parallel to Interstate 80, from Suisun in the west to Sierra Valley in the east, right over the crest of the Sierra Nevada. And gradually I got to where, by managing my time efficiently, I could spend 200 days a year at my sites. I was even able to run off to Argentina in the dead of the Northern Hemisphere winter to do projects there during the austral summer!

And so it happened that finally my graduate students, led by Matt Forister, who is now tenured at the University of Nevada-Reno, called me in and said I HAD to start analyzing all those data. So we did. We secured a National Science Foundation grant to create my Web site and put all the data on it and to secure statistical help—because the nature of the data was such that we often had to invent our own procedures or modify existing ones to apply them to get the answers we wanted. That's a whole story in itself.

So we're now in Year 43 of what was supposed to be a 5-year study. The aims and the context have changed. In the early 1970s, if there was concern about climate change, it was that we were sliding into the next glacial epoch. My goals—understanding climate controls on phenology as a "community" phenomenon, what I have called "phenofaunistics", were at the level of short-term fluctuations ("noise"), not responses to long-term trends

Continued on p. 144

Reed Watkins: a passion for Plume Moths

Nick Silverson and M. Alma Solis

Systematic Entomology Laboratory (SEL), ARS, USDA, c/o National Museum of Natural History, MRC 168
Washington, D.C. 20013 **Nicholas.Silverson@ars.usda.gov, Alma.Solis@ars.usda.gov**

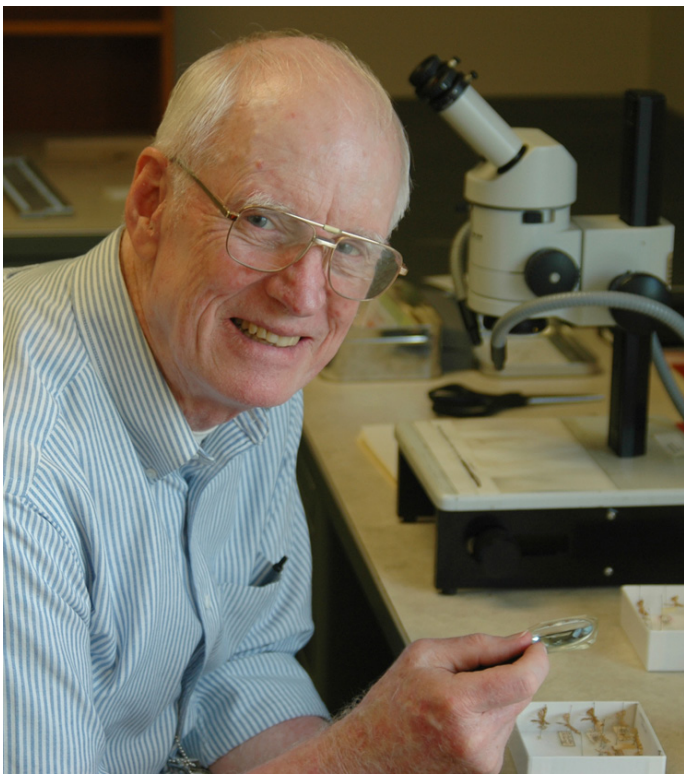


Figure 1. Reed Watkins on the NMNH Lepidoptera floor (Photo courtesy of C. Covell).

If it's Tuesday, you will know exactly where to find Reed Watkins (Fig. 1). He will be in the Lepidoptera collection at the National Museum of Natural History (NMNH), where he has been volunteering every Tuesday for the past 13 years. Reed has donated an estimated 6,760 hours of his time to curate one of the largest collections of plume moths in the world (Fig. 2, 3). Reed has an impressive set of skills for a self-described amateur lepidopterist that he developed by reading scientific journal articles and providing demonstrations for the Ohio Lepidopterists. He prepares the insects, catalogues them by their scientific names, and possesses a vast knowledge of the literature.

Plume moths, also known by the scientific name of Pterophoridae, are a group of micromoths that have clefts with fringed lobes on their forewings and hindwings that resemble plumes (Covell 1984; Scoble 1992; Matthews 2006) (Fig. 3). When at rest, these moths fold their wings to form a distinctive "T"-shape. Because of their unique resting shape**,** plume moths are easily recognizable on illuminated sheets used at night for collecting moths. There are 1,138 species of plume moths, present in all zoogeographical regions (Gielis 2003). Economically important species include the grape plume moth (Fig. 3), a pest on grapes, and the arti-choke plume moth, a pest on artichokes. Larvae are even more structurally unique than adults, with long, often elaborate setae, or hairs, that vary from species to species (Fig. 4). The pupae also have intricate setae that are used to hook and attach to a host plant (Fig. 4). The larvae commonly feed on asters, or the Asteraceae (Matthews & Lott 2005), where they generally bore into plant tissue, and occasionally mine or fold leaves.

Figure 2. Reed Watkins stands by a cabinet of plume moths at the NMNH.

Figure 3. The grape plume moth, *Geina periscelidactyla* Fitch, adult and pupal case collected and determined by E. Jäckh in Van Corlandt Park, The Bronx, New York in 1971. Specimen deposited at the NMNH. (Photo by N. Silverson).

Reed's life-long interest in insects led him to become a founding member of the Ohio Lepidopterists where he resided. In Ohio Reed had graduated from Oberlin College in 1960 and for 32 years worked as a Research Physicist with the Atomic Energy Commission. Soon after the club's inception in 1979, the group participated in a project funded by the Ohio Division of Natural Resources, Division of Wildlife, to inventory the flora and fauna of Ohio. The

Figure 4. *Oidaematophorus eupatorii* (Fernald) larva (left) and pupa (right) (Photo courtesy of D. Matthews Lott)

Ohio Lepidopterists turned out in spades and received a substantial grant to start the Ohio Survey of Lepidoptera, charged with inventorying all of Ohio's butterflies and moths. Reed was responsible for managing and organizing the database for this survey. Eric Metzler, of the Ohio Lepidopterists, notes that Reed's remarkable dedication and attention to detail while databasing lent an incredible amount of credibility to the survey.

During the Ohio Survey of Lepidoptera some families of moths encountered were extremely difficult to identify, especially the plume moths. Reed decided to take responsibility for this family. While researching plume moth collections, Reed noticed that there were a particularly large number of plume moths in the *pro tem*, or temporary, unidentified holding section, of the Cleveland Museum of Natural History in Ohio. Using Barnes and Lindsay's 1921 publication, the last major work on plume moths, Reed focused on collecting information and pictures that would help him identify plume moths. This was a considerable task for Reed after 60 years of inactivity in insects and their identification. Although Reed was primarily interested in butterflies when he started with the Ohio Lepidopterists, it was his dedication to this survey that led him to become an authority on plume moths.

After Reed retired, he moved to the Eastern Shore of Maryland with his wife, Cocoa, to be closer to family. He soon discovered that Mike Pogue, a Research Entomologist with the Systematic Entomology Laboratory (SEL), USDA, also lived in the Eastern Shore and took the commuter bus to the NMNH in Washington, D.C. every day. This connection gave Reed the opportunity to begin volunteering at the NMNH. After several in-depth conversations where Reed outlined his well thought out, long-term plan to Alma Solis, the Curator of the plume moths, she gave Reed a free hand with the collection.

The plume moth collection at the NMNH resides in 163 drawers and six cabinets**,** an increase from three cabinets when Reed began his work. Over his tenure, Reed has accomplished the incredible task of sorting and identifying a large portion of the *pro tem*, particularly from the United States, as well as confirming identifications and relabeling unit trays and cabinets (Fig. 5). Taking unsorted specimens all they way to final incorporation is a detailed, multi-step process. Typically, Reed starts with an unsorted drawer and separates similar looking specimens into unit trays, he organizes these trays by collector and location, makes temporary genus and location labels, and adds notes with pertinent information (Fig. 6). If specimens require no further identification, he makes permanent labels and incorporates the specimens into the collection. Specimens sometimes require dissection for further identification; these are then kept in the *pro tem* until Reed or other researchers are able to identify them.

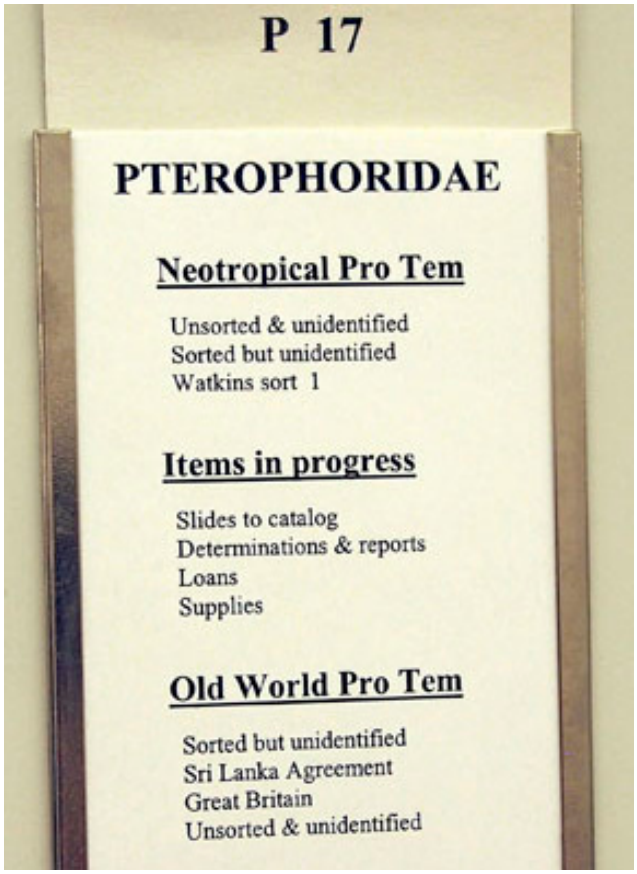


Figure 5. NMNH Cabinet label by Reed Watkins.

Reed has upgraded the plume moth collection in many ways. For example, he applied a consistent color-labeling scheme of faunal regions, and relabeled drawers and trays to accommodate new species. In addition, Reed has compiled an inventory of plume moth holdings at the NMNH and he continues to update this list, which is available online (**http://entomology.si.edu/Collections_Leps_Pterophoridae.htm**).

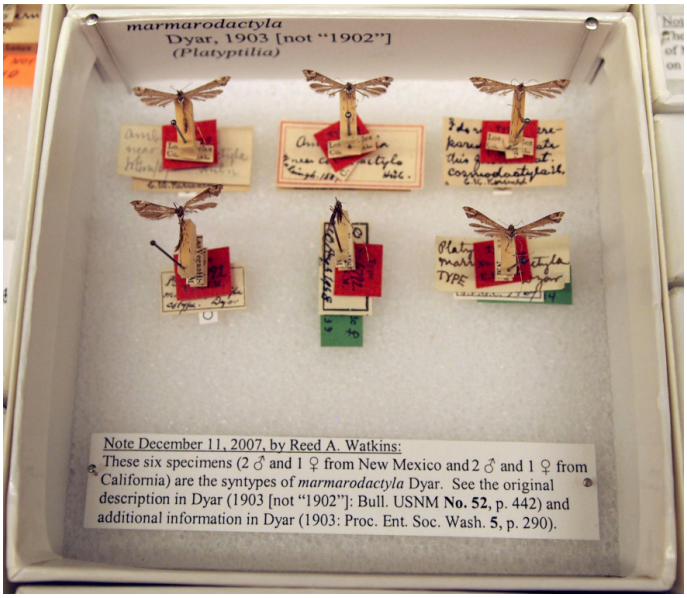


Figure 6. Unit tray of plume moths with Reed Watkins' curation notes.

Reed has also worked closely with others in the field of plume moths to upgrade the NMNH collection. Debbie Matthews (Biological Scientist at the McGuire Center for Lepidoptera and Biodiversity in Gainesville, FL) helped dissect and identify many plume moths as part of her dissertation and at Reed's request. Cees Gielis (Researcher at the Naturalis Biodiversity Center in Leiden, The Netherlands) visited the NMNH and did considerable work dissecting and identifying specimens and his catalog is currently used for NMNH plume moth curation. In collaboration, Reed, Debbie, and Cees made accurate, literature-based incorporations of the *pro tem*. Alma contributed by having the species list placed on the NMNH website, facilitating the photography of plume moth type specimens, dissection of plume moth *pro tem*, and having the plume moth genitalia slides catalogued.

Reed continues to make great contributions to the plume moth collection at the NMNH. He keeps track of material requested for scientific study. He is checking Gielis' recent generic and species descriptions against originally published descriptions and incorporating the specimens. Part of this recent incorporation included two genera not previously represented at NMNH from Madagascar, *Setosipennula* Gibeaux 1994 and *Helpaphorus* Gibeaux 1994. Additionally, Reed has assisted in the North American Lepidoptera Barcoding Project in collaboration with the Barcode of Life Data Systems (BOLD) at the University of Guelph in Canada and the inventory of Valles Caldera National Preserve (VCNP), New Mexico. He is also working on a manuscript with Debbie and Cees detailing the discovery of three species that had originally thought to be one.

Reed's personal collection, mainly from Ohio and summer trips to the southwestern United States, where he grew up, reflects this specialized interest in plume moths. He generously plans to donate his collection to NMNH. Alma Solis and the Smithsonian Institution are very grateful for Reed's extraordinary contributions to the NMNH and the study of plume moths worldwide.

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Observations of a one trick pony

Continued from p. 141

("signal"). By the time we got down to serious analysis it was clear that we had splendid materials for studying *both* signal and noise, and telling them apart. My private obsession now was part of a global problem, with far-reaching consequences. And of course, monitoring projects, including butterfly-monitoring projects, are sprouting everywhere now, like mushrooms after a rain. But we got there first.

There are some lessons here, to wit:

1. Things often turn out to be different from what one thought they were.
2. The short time frames of grant cycles and the publication demands of academic careerism work against doing long-term projects. Now that they have assumed great urgency, such barriers are beginning to be lifted. But old ways die hard.
3. Creativity, spontaneity, and variety are all wonderful things. But sometimes doing exactly the same thing for 50 years turns out to be worthwhile. This is your one-trick pony speaking.

For more information: **amshapiro@ucdavis.edu**

Visit **http://butterfly.ucdavis.edu**

NOTE: The University Honors Program at UC Davis invites old coots like me to give retrospective talks like this before we die or turn into a turnip. This is a slightly-edited version of my talk, given in April, 2014, on the occasion of nothing in particular.--AMS

Tidbits from the 2014 meeting of The Lepidopterists' Society, Park City, Utah

2014 Lep Soc Awards -- Charlie V. Covell, Jr.

The meeting was splendid in every way. Thank you, your spouses, and our colleagues for doing all the hard work that goes into such an event! I enjoyed a Sunday field trip to Bountiful Peak with Jeff Baier and brought some *Hemileuca eglanterina* and *H. hera* back with me to Florida. Many, many thanks!

To improve on my job as Awards Chair, I want to send you the following report of awards given at this meeting:

1.Harry K. Clench Award for best student presentation: Prizes: First place (and certificate), $500; second place, $250. Entries at 2014 meeting: 12.

Winner: Julian Dupuis, Sperling lab, Univ. of Alberta, for his presentation "Characterizing hybrids across the *Papilio machaon* group of swallowtail butterflies in North America." Second place: Sandra Schachat, Richard Brown lab, Mississippi Entomological Museum, for her presentation "Analysis of wing pattern in Micropterigidae: comparing multiple models of lepidopteran wing pattern evolution."

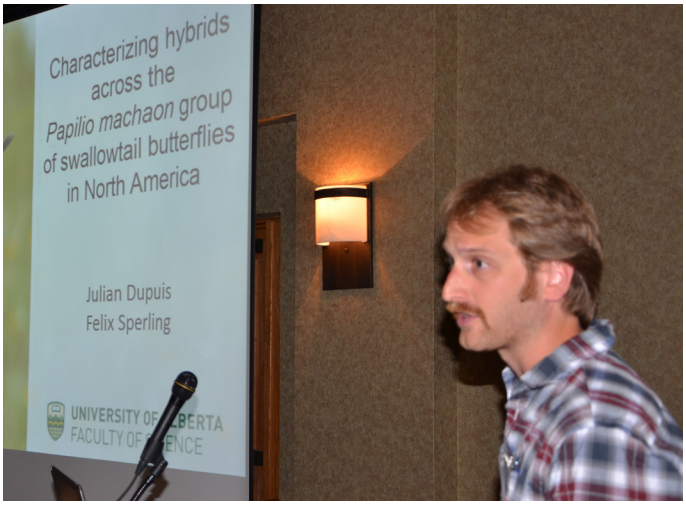
2. Alexander B. Klots Award for best student poster: Prize, $250 and certificate. Winner: Francesca Ponce (not pictured), Kawahara lab, McGuire Center, Florida Museum of Natural History, for her poster "Molecular phylogeny, phylogeography and anti-predatory eyespot evolution in *Eumorpha* caterpillars (Lepidoptera: Sphingidae)."

(No runner up selected this year)

3. Special Honorable Mention (certificate given at barbecue): Jasmine James, on her 11th birthday - youngest person ever to give a presentation at an annual meeting of the Society - for her presentation "The flight, nectaring and roosting behavior of Leona's Little Blue Butterfly (*Philotiella leona*)."

4. Mather Award: Travel grant up to $1000.00. First year of existence. No applicants, so no award. There will be an announcement for this award in the next issue of the News explaining eligibility and application procedure.

5. Door prize drawing: This year 68 items given away. Thanks to BioQuip Products, Leptraps LLC, Butterfly Wing Bling, Zerene Stacker, Entomological Reprint Specialists, and many individuals. I was assisted by Megan McCarty and Tom Sperling.



Julian Dupuis, Harry K. Clench award first place winner (photo by Ranger Steve Mueller)

Sandra Schachat, Harry K. Clench award second place winner, with president Todd Gilligan (photo by James K. Adams, apologies to both, this was the photo I had!!)

Jasmine James, special honorable mention, youngest to ever present at a Lep Soc meeting (photo by Ranger Steve Mueller)

Proposal for Honorary Life Membership: Ronald H. Leuschner

Ron Leuschner, 2004 (photo by James K. Adams)

Ronald H. Leuschner has served The Lepidopterists' Society in a number of capacities, some formal and many more in a more 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 has been Publications Coordinator for many years (selling memoirs and back issues, and sending publications to new members); since 1992 he has 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 has accomplished with selfless dedication and scrupulous attention to detail. Ron accomplished this until October 2012, when he was forced to retire due to health concerns.

But informally, if it is even possible, Ron is even better known. Traveling far and wide and known across the continent and internationally, Ron's tall lanky figure is 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 has collected in too many countries to mention, and has attended innumerable international meetings and field meetings. Armed with his trusty dog-eared and heavily annotated Hodges *Check List of Lepidoptera,* he has spent many hundreds of patient hours identifying moths in museums and for hundreds of persons across the continent, amateur and professional alike.

If a moth can be identified phenotypically, Ron's incredible memory will place the 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.

This knowledge has been gained by 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 is working. A visit to his basement reveals the extent of his research, with paper, 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 has exchanged specimens with dozens of eminent lepidopterists across the globe, and his assistance with discovering new species and loaning specimens is unrivalled. I have had the honor to collect with Ron for some 28 years, have traveled across the country and into Canada with him, and have spent joyful hours in awe in his collection rooms. Working with him for hours upon hours taking species record information for the County Lists of California, having him double check records, watching him gather additional information on species merely adds to the admiration and gratitude I feel for his patience, time and efforts on behalf of persons interested in Lepidoptera.

At least the following species have been named directly for Ron: *Anania leuschneri, Diedra leuschneri, Pterotaea leuschneri, Euxoa leuschneri, Orgyia leuschneri* and *Uncitruncata leuschneri*, in addition to the many paratypes of other species he has contributed to identifications.

If there is a person who exemplifies what the ideal is for Honorary Life Membership in the Lepidopterists' Society, it is Ronald H. Leuschner. -- Kelly Richers.

Lep Soc 2014 Pictures

Images on page 147 are by Ranger Steve Mueller (below, photo by James Adams)

Thomas Simonsen and Debbie Matthews examining items in the Vendors room

The Jones family: Grayson, Brandie, Auburn, Kameron & Tony

Christi Jaeger, President Todd Gilligan, & Vazrick Nazari

Kirsten Verster and Sheryl Stout at the Reception Desk

Part of the James family: Rhiannon, David & Annabell

Jonathon Pelham, Fred Stehr, and Jackie Miller

Jonathan Xing, Michael Collins, & Megan McCarty

Lep Soc 2014 Pictures

Images on this page are by James K. Adams

Brian Scholtens and Jeffrey Pippen

Stephen Mason and Craig Segebarth

Megan McCarty, happy to be giving away some wine as a door prize

Geoff Martin and M. Alma Solis

Chris Grinter and David Bettman

The Koehns, Leroy and Betty

The Van der Wolfs, Wil and Hugo, enjoying the banquet

Key for the group photo on the back of the News:

1. Mike Toliver
2. Karl Gardner
3. John Lane
4. Evi Buckner-Opler
5. Carol Butler
6. Kim Garwood
7. Eric Metzler
8. Pat Metzler
9. Ruth Anne Peacock
10. Mike Fisher
11. Terry Arbogast
12. Jim Reed
13. Brian Banker
14. Hugo Van der Wolf
15. David Plotkin
16. Jan Chu
17. Stephen Mason
18. Debbie Matthews
19. Rebecca Bennik
20. Robert Mower
21. Paul Opler
22. Leroy Koehn
23. Betty Koehn
24. Julian Dupuis
25. Fred Stehr
26. Mike Sabourin
27. Ciatlin LaBar
28. John Beck
29. Jackie Miller
30. Christy Dalsing
31. Tim Dalsing
32. Jo Nunnallee
33. Suzette Slocomb
34. David Nunnallee
35. John Peacock
36. David Fall
37. Charlie Covell
38. Wayne Whaley
39. Louise Fall
40. Jonathan Xing
41. Jonathan Pelham
42. Rik Littlefield
43. Vernon Evans
44. Minjia Zhong
45. Geena Hill
46. Paul Johnson
47. Kirsten
48. Steve Cary
49. Ranger Steve Mueller
50. Felix Sperling
51. Todd Gilligan
52. Christi Jaeger
53. Paul Hammond
54. Don Tangren
55. Patrick Adams
56. James Adams
57. Stan Gorodenski
58. ??
59. Dave McCarty
60. Steve Spomer
61. Michael Collins
62. Dave McCorkle
63. Tom Emmel
64. Xing Meng
65. ??
66. Jeff Pippen
67. Ben Cieslak
68. Kuiyi Xing
69. Jade Badon
70. Akito Kawahara
71. Dan Rubinoff
72. Thomas Simonsen
73. Todd Stout
74. Nick Grishin
75. Craig Segebarth
76. Vincent Ficarotta
77. Wayne Wehling
78. Nancy Silver
79. Vazrick Nazari
80. John Snyder
81. Alessandro Giusti
82. Rob Martin
83. Wil Van Der Wolf
84. Geoff Martin
85. Jerry Powell
86. Megan McCarty

If you know the people numbered 47, 58 and/or 65, or if you recognize an error, please let me know.

A partial list of those that were missed in the making of the photo follows. There may be more people that were missed and not listed here, and if you know of someone please let me know.

1. Brian Scholtens
2. Ron Roscioli
3. Ann Marie De Angelis
4. Sheryl Stout
5. Ray Stanford
6. Kit Stanford
7. Julian Donahue
8. Chuck Harp
9. Cindy Harp
10. David Bettman
11. Chris Grinter
12. The Mark Walker family
13. Ed Gage
14. Jeff Baier
15. Kelly Richers
16. Chris Tenney
17. Alex Bic
18. The David James family
19. The Tony Jones family

Membership

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

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

Dues Rate

Active (regular)	$ 45.00
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Change of Address?

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

Julian P. Donahue, Assistant Secretary, The Lepidopterists' Society 735 Rome Drive, Los Angeles, CA 90065-4040. Phone (323) 227-1285, FAX (323) 227-0595, ***Julian@lepsoc.net***

Our Mailing List?

Contact Julian Donahue for information on mailing list rental.

Missed or Defective Issue?

Requests for missed or defective issues should be directed to: Julian Donahue, Asst. Treasurer, 735 Rome Drive, Los Angeles, CA 90065-4040, (323) 227-1285, **julian@lepsoc.net**). Please be certain that you've really missed an issue by waiting for a subsequent issue to arrive.

Memoirs

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

Submissions of potential new Memoirs should be sent to:

Lawrence E. Gall
Computer Systems Office
Peabody Museum of Natural History
P. O. Box 208118, Yale University
New Haven, CT 06520-8118
lawrence.gall@yale.edu

Journal of The Lepidopterists' Society

Send inquiries to:
Keith Summerville
(see address opposite)
ksummerville@drake.edu

Book Reviews

Send book reviews or new book releases to the Editor of the News:

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

WebMaster

John A. Snyder
Dept. of Biology, Furman University
Greenville, SC 29613-0001
(864)244-7939
john.snyder@furman.edu

Submission Guidelines for the News

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

1. Electronically transmitted file and graphics—in some acceptable format—via e-mail.

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

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.

4. Typed copy, double-spaced suitable for scanning and optical character recognition. Original artwork/maps should be line drawings in pen and ink or good, clean photocopies. Color originals are preferred.

Submission Deadlines

Material for Volume 56/57 must reach the Editor by the following dates:

Issue	Date Due
56 4 Winter	Nov. 15, 2014
57 1 Spring	Feb. 15, 2015
2 Summer	May 20, 2015

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

Executive Council

President

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

Past President

Andrew Warren
McGuire Center for
Lepidoptera & Biodiversity
Florida Museum of Natural
History, P.O. Box 112710
Gainesville, FL 32611-2710
(352)273-2015
andy@butterfliesofamerica.com

Vice Presidents

Mirna Casagrande
Departamento de Zoologia
Universidade Federal do
Parana, Caixa Postal 19020
81531-980 Curitiba, Parana
BRAZIL 41 3361-1569
mibras@ufpr.br

Delano Lewis, Director
Office of Research & Grants
Dept. of Bio., Chem., and
Environmental Science
Northern Caribbean Univ.
Mandeville, Jamaica, W.I.
1-(876)963-7744
delano.lewis@ncu.edu.jm

Todd Stout (1st VP)
1456 North General Drive
Salt Lake City, UT 84116-
4306, (801)438-3602
todd_stout29@hotmail.com

Secretary

Michael Toliver
Division of Math and Science
Eureka College
300 E. College Avenue
Eureka, IL 61530-1500
miketol@eureka.edu

Assistant Secretary & Assistant Treasurer

Julian P. Donahue
735 Rome Drive, Los Angeles,
CA 90065-4040. Phone (323)
227-1285, FAX (323) 227-0595,
Julian@lepsoc.net

Treasurer

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

2nd Assistant Treasurer

Ron Leuschner
1900 John Street
Manhattan Beach, CA 90266-
2608, (310) 545-9415
ronleusch@aol.com

Publications Manager

Kenneth R. Bliss
2438 Falcon Drive
Round Rock, TX 78681-2755
(512)850-1700
krbliss@gmail.com

Editor, News of The Lepidopterists' Society

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

Editor, Journal of The Lepidopterists' Society

Keith Summerville
Dept. of Environmental
Science and Policy, 131 Olin
Hall, Drake University
Des Moines, IA 50311-4505
(515)271-2265
ksummerville@drake.edu

Editor, Memoirs of The Lepidopterists' Society

Lawrence F. Gall
(see Memoirs opposite)

WebMaster

John A. Snyder
(see WebMaster opposite)

Members-At-Large

Megan McCarty, Kathleen Prudic, Mark Walker, Carol Butler, Michael Collins, Jennifer Zaspel John Calhoun, Wayne Wehling, Robert Dirig

Season Summary Zone Coordinators

Refer to Season Summary for Zone coverage details.

Chief Season Summary Coordinator and Editor

Leroy C. Koehn
3000 Fairway Court
Georgetown, KY 40324
(502) 370-4259
leptraps@aol.com

Zone 1, The Far North:

James J. Kruse
Forest Entomologist
USDA FS, Alaska Region 10
State and Private Foresty,
Forest Health Protection
3700 Aiport Way
Fairbanks, AK 99709
(907) 451-2701
jkruse@fs.fed.us

Zone 2, The Pacific Northwest:

Jon H. Shepard
6420 Barabanoff Rd., Nelson,
BC, Canada V1L 6Y1
(250) 352-3028
shep.lep@netidea.com

Zone 3, The Southwest:

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

Zone 4, The Rocky Mountains:

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

Zone 5, The Plains:

Ronald Alan Royer
Division of Science,
Minot State University
Minot, ND 58707-0001
Office: (701)858-3209
FAX: (701)839-6933
ron.royer@minotstateu.edu

Zone 6, Texas:

Charles Bordelon
Texas Lepidoptera Survey
8517 Burkhart Road
Houston, TX 77055
texaslepsurvey@sbcglobal.net

Zone 7, Ontario and Quebec:

Maxim Larrivee
Collections entomologiques
et recheche, Insectarium de
Montréal/Espace pour la vie
4581, rue Sherbrooke E.
Montréal, Québec
Canada H1X 2B2
(514) 872-0474, ***maxim.lar-rivee@ville.montreal.qc.ca***

Zone 8, The Midwest:

Leslie A. Ferge
7119 Hubbard Avenue
Middleton, WI 53562-3231
(608) 836-9438
lesferge@gmail.com

Zone 9, The Southeast:

Brian G. Scholtens
Biology Department
College of Charleston
66 College Street
Charleston SC 29424-0001
(803) 856-0186
scholtensb@cofc.edu

Zone 10, The Northeast:

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

Zone 11, Mexico & the Caribbean:

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

Attendees at the 63rd annual meeting of The Lepidopterists' Society, July 16- 19, 2014, Park City, Utah
(Photo by Tony Jones)