

Celebrating
10 YEARS
 2004-2014

MCGUIRE CENTER NEWS

A newsletter of the McGuire Center for Lepidoptera and Biodiversity ■ Florida Museum of Natural History ■ **APRIL 2014**

FROM THE EDITOR: Andrei Sourakov



A caterpillar of the Apollo butterfly, *Parnassius apollo* (Papilionidae).

This issue marks the 10th year of the McGuire Center's existence. In 10 years, considerable progress has been made, far beyond the scope that can be covered in a single newsletter. Our collections have more than doubled in size. The number of students currently working on degrees at the McGuire Center has quadrupled. The volume of research papers published by staff and students has increased annually, beginning with 20-30 publications per year just 10 years ago to the current rate of 60-70 papers per year. The research itself has become more diverse with our labs using techniques not in existence 10 years ago. In this issue, we provide an overview of the collections and their uses, as well as select snippets of McGuire Center research.

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- History of the Collection
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History of the McGuire Center's collection

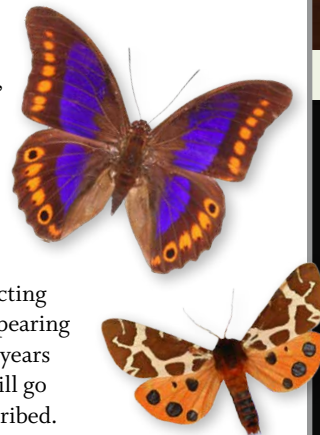
The collections of the McGuire Center are a result of efforts of thousands of people over the last two centuries. It is not unusual to find specimens predating the Great Depression, and there are entire subsets of specimens from the end of the 19th century and the early 20th century. Though many specimens have been collected by professional entomologists, a large portion of the collection is a result of contributions from amateur lepidopterists. On average, the McGuire Center receives 30-40 donations per year, ranging from several specimens to more than a million.

- Two major Lepidoptera collections existed in Florida in the public domain prior to the construction of the McGuire Center: one as a subset of the Florida State Collection of Arthropods, and the other in the Florida Museum of Natural History's Allyn Museum in Sarasota.
- In 2004, these two collections and respective curators were brought under one roof and additional staff hired as part of the state of Florida matching funds to the founding gift from the McGuire Family Foundation.
- Today, about 50 students, postdocs, preparators, research associates and staff members are working at the McGuire Center, comprising the largest group of Lepidoptera researchers in the world.
- McGuire Center researchers have produced more than 400 scientific publications since 2004. Researchers worldwide also have produced numerous publications as a result of their work while visiting the collections or borrowing specimens.

Geographic and taxonomic strengths

The McGuire Center's collections include specimens from around the world. While there has been a larger emphasis on research in the Americas, recent acquisitions from the Palearctic region include many groups, for which the McGuire Center now has collections that rival the best European museums. The collection is comprehensive taxonomically with more than 90 percent of all butterfly genera and the majority of described species. Though new butterfly species are described monthly, the greatest work for future taxonomists lies in describing the rich moth fauna of the tropics.

- The greatest diversity of life, including Lepidoptera, is in the tropics.
- There are over 150,000 described species of Lepidoptera from more than 120 families, most of which are moths.
- The need for further collecting is urgent: faunas are disappearing at an astounding rate, and years from now, many species will go extinct without being described.
- Collections are the only way to preserve a trace of what is being destroyed by development.



A Junior Volunteer works in the collections.



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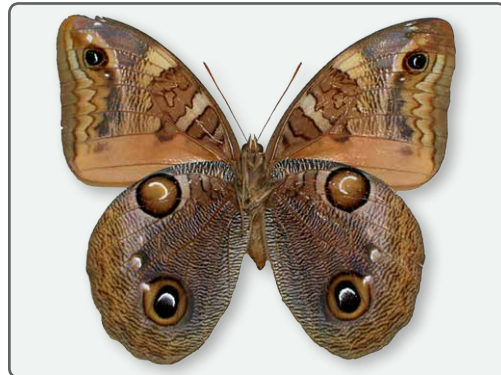
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How is the collection used?

The development of genetic methods brought new life into collections-based research. Taxonomic research, which remains important for understanding biodiversity, is poorly funded, and hence few students are being taught to become taxonomists in the traditional understanding of this word. However, molecular methods, fashionable and sometimes efficient, have developed to a point where a dry piece of tissue, such as a leg from a specimen collected many years ago, offers a DNA source that can be sequenced.

Examples of collection uses:

- Photography: books, monographs, websites, field guides.
- Dissections: morphological research, taxonomy, systematics.
- Data mining: conservation policies, distribution maps, climate change.
- Tissue samples: DNA-based research on genetics of wing patterns, taxonomy, DNA bar coding, phylogenetics (studying evolutionary relationships).
- Identifications of pests sent from the quarantine facilities at U.S. Customs and USDA.
- Voucher specimen depository. This includes type specimens, the “standard” on which a new species is described.



In 2007, McGuire researchers described a new species of Owl butterfly, *Opsiphanes blythekitzmillerae*.

Utilizing museum collections to study the impact of climate change on butterflies and moths

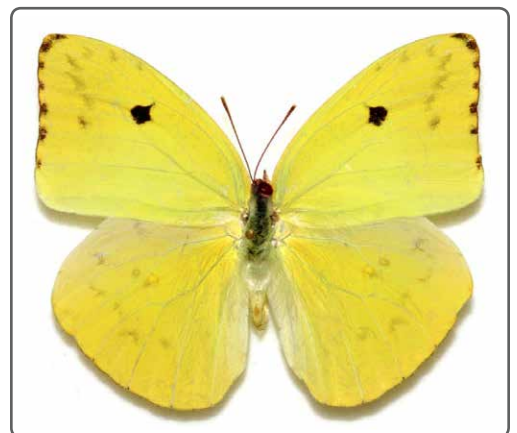
Human-mediated environmental change is affecting the distribution of many organisms on the planet, including butterflies and moths. Museum specimens provide a rich source of historical data that can be used to understand how distribution patterns, morphology, phenology and other factors have changed over time. Students and staff in Akito Kawahara’s lab at the McGuire Center are using data from Museum specimens from selected target species to examine how global change has affected the distribution of butterflies and moths over the last century.

- Preliminary evidence from several species shows butterflies and moths have shifted their distributions over the last century.
- It remains unclear whether certain species are more affected than others, but we predict they may be.
- This study will digitize Museum specimens to determine how distribution patterns, morphology, phenology and other factors have changed.
- We are currently seeking funding from the National Science Foundation and other granting agencies to study these phenomena.

Discovery of the Pink-spot Sulphur butterfly in Florida (Pieridae: *Aphrissa neleis*)

- This species was first detected from Florida during the re-curation of the genus *Aphrissa* in the McGuire collections; it had been misidentified as a similar species. *Aphrissa neleis* is otherwise known from Cuba and Andros.
- Specimens from 1959 and the 1980s were found in the collections, documenting a new U.S. record; in 2011 McGuire researchers suggested the possibility the species may still reside in southern Florida.
- In late 2011, a review of photos submitted by amateur South Florida photographers revealed many *Aphrissa neleis* from the 2000s, confirming its continued presence in southern Florida.
- In early 2012, the caterpillar food plant for *A. neleis* was determined as the non-native *Lysiloma sabicu*, and the butterfly was then found in most areas where this tree has been planted in southeast Florida.

Reference: Warren, A. D. & J. V. Calhoun. 2012. A treasure hidden in plain sight: *Aphrissa neleis* is a resident in southern Florida, USA (Lepidoptera: Pieridae: Coliadinae). *News of The Lepidopterists’ Society* 53(4):133-134.



The Pink-spot Sulphur butterfly, a new record for Florida. (Pieridae: *Aphrissa neleis*)



Calisto hysius, Dominican Republic

Recent Research Stories

"Darwin's Butterflies?" DNA bar coding and the radiation of the Caribbean butterfly genus *Calisto*

Two centuries after Darwin described adaptive radiation in Galapagos finches, Andrei Sourakov is studying a group of Caribbean butterflies that may have diversified in a similar way. These butterflies show a high degree of diversity and are derived from a common ancestor. During their speciation process they occupied a variety of ecological niches feeding on a variety of plants. In addition to traditional tools of taxonomy and fieldwork, DNA bar coding proved to be the perfect tool for creating order from the chaos of too many species that were described based on wing pattern variations. The genus is restricted to the Caribbean and encompasses 60 species, which is by far the greatest radiation of butterflies in the region.

- The taxonomy of insects has made large advances, thanks to the recent introduction of molecular techniques.
- Wing patterns, life histories and morphological ultra-structures are all useful for understanding species boundaries.
- On the island of Hispaniola, 20 percent of the butterflies belong to the genus *Calisto*, the species of which are difficult to distinguish.
- DNA bar coding helped resolve many taxonomic problems in this butterfly group important for understanding Caribbean biogeography, and clarifies questions morphological analyses are unable to resolve.

Reference: Sourakov A. and E. V. Zakharov. 2011. "Darwin's butterflies?" DNA bar coding and the radiation of the endemic Caribbean butterfly genus *Calisto* (Lepidoptera, Nymphalidae, Satyrinae). *Comparative Cytogenetics* 5: 191-210.

A new genus & species of Skipper from Jamaica's Cockpit Country

McGuire researchers described the first new species of butterfly from Jamaica in nearly two decades. It is so distinctive and unlike other skippers that it was placed in its own new genus.

- *Troyus turneri* was described from one male and one female from Jamaica's Cockpit Country; only one additional specimen has since been found, making this one of the world's rarest butterfly species.
- Based on morphology and DNA comparisons, this species is most closely related to various continental American genera.
- News of the discovery of *Troyus turneri* was widely disseminated on the Internet, e.g.: <http://news.ufl.edu/2012/12/03/jamaican-skipper/>
- The discovery of *T. turneri* has generated much excitement in Jamaica: jiep.org/drupal/sites/default/files/JIEP_Newsletter_Jan2013_Final.pdf

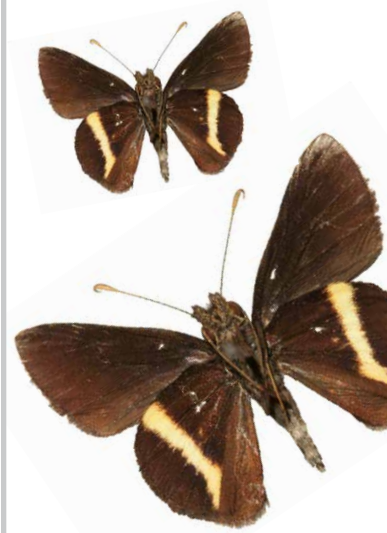
Reference: Turland, V. A., A. D. Warren & D. S. Lewis. 2012. A new genus and species of Moncini from Jamaica, West Indies (Lepidoptera: Hesperidae: Hesperinae). *Tropical Lepidoptera Research* 22(2):66-73.

Butterflies of America: The world's largest butterfly website!

The aim of this website, which was created and is maintained with the expertise of McGuire Center staff and research associates, is to develop a comprehensive online resource that includes information on taxonomy, identification, distribution, habitat, life history and bibliography for all butterfly taxa in America, including species, subspecies and undescribed geographic variants.

- The site currently displays more than 160,500 images of over 8,300 species and numbers are growing every day.
- Images are displayed in thumbnail format for easy comparison and study of variation.
- The species list includes the latest taxonomic arrangements and entries are added as soon as new taxa are described.
- Thousands of type specimens from nearly all of the world's major Lepidoptera collections are included.
- More than 400 amateur and professional photographers/ lepidopterists have contributed images and information to the site.
- Virtually any butterfly from North or South America can be identified by consulting images on the website.

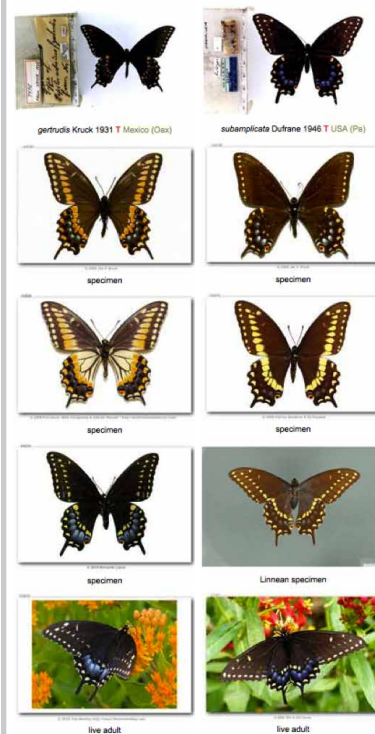
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A new species of Skipper butterfly, *Troyus turneri*.



A satellite image of the Caribbean Sea as seen from space.





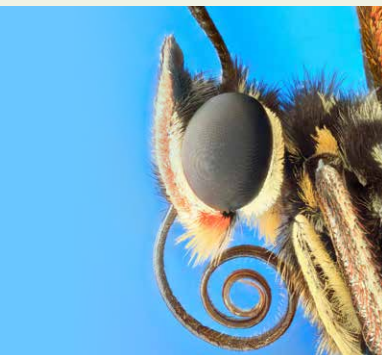
Logan Locascio prepares Bella moth specimens during his science fair project.



Bella moth, *Utetheisa ornatrix*



Blue Morpho, *M. helenor peleides*



Head and mouth parts of the Blue Morpho

Gainesville area secondary students' Lepidoptera-related projects win science fair competitions and are published in scientific journals

Experiments by middle school student Logan Locascio showed that Bella moth larvae feeding on one plant species caused the insects to develop much faster than feeding on another. For Locascio, the experiments resulted in a third-place finish at the State Science & Engineering Fair of Florida and a special award for an agriculture-related project. Two years of work by high school student Alexandra Sourakov showed that while some butterflies search for food using their eyes, others rely mostly on their sense of smell. Using the Blue Morpho butterfly as her model species, she also showed that not only antennae, but also other organs, may be responsible for smelling volatile chemicals in food. Alexandra won first place in zoology at the State Science & Engineering Fair of Florida.

- Raising the next generation of scientists requires mentoring that can start in middle school through participation in regional science fairs.
- While projects can be (and most often are) purely educational, students can also be involved in answering real research questions and the results of their work can be published in scientific journals.
- Research projects by two area secondary students in Gainesville were supervised by researchers at the University of Florida and the USDA, and helped to understand the nutritional ecology of butterflies and moths.

Reference: Sourakov, A. and L. M. Locascio. 2013. Exotic *Crotalaria* species as host plants of the Ornate Bella Moth, *Utetheisa ornatrix* (Lepidoptera: Erebididae), in Florida: Laboratory biology. *Florida Entomologist* 96(2): 344-350.

Sourakov, Al., A. Duehl, and An. Sourakov. 2012. Foraging behavior of the Blue Morpho and other tropical butterflies: the chemical and electrophysiological basis of olfactory preferences and the role of color. *Psyche*, vol. 2012, 10 pages, doi: 10.1155/2012/378050.]



Alexandra Sourakov conducts bioassays for her science project in the McGuire Center's Butterfly Rainforest exhibit.



A close-up of a *Phidippus* jumping spider and three species of hairstreaks, from left, *Arawacus togarna*, *Calycopis cecrops* and *Parrhasius m-album* (intact and with false head missing).

Two heads are better than one: how hairstreak butterflies escape jumping spiders

Although traditionally birds have been blamed for most of the predation pressure on butterflies, new Florida Museum of Natural History research shows in the case of hairstreak butterflies, evolution may be driven by a much smaller enemy: the jumping spider. Experiments showed the Red-banded Hairstreak butterfly, whose spots and hindwing tails imitate a false head, successfully escaped all attacks from the jumping spider. When 11 other butterfly and moth species from seven different families were exposed to the jumping spider, they were unable to escape attack in every case. Data were collected by analyzing the videotapes by analyzing recorded video of spider-prey interactions made in the laboratory.

- Small butterflies and moths exhibit a variety of defensive patterns.
- The false head pattern supposedly deflects the attacks by predators, but experimental evidence has been limited.
- There are thousands of butterflies sharing false-head patterns and behavior.
- There are more than 4,000 species of jumping spiders, many of which hunt butterflies.
- Laboratory tests revealed the effectiveness of the false-head pattern as a defense mechanism against jumping spiders.

Reference: Sourakov, A. 2013. Two Heads are better than one: False Head allows *Calycopis cecrops* (Lycaenidae) to escape Predation by a Jumping Spider, *Phidippus pulcherrimus* (Salticidae). *Journal of Natural History*, 47(15-16): 1047-1054.

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A species of the Regal moth, *Citheronia*, from Central America.

Missing in Mesoamerica: A biodiversity inventory of the Lepidoptera of Honduras

Mesoamerica is a biodiversity hotspot that includes all tropical and subtropical ecosystems from eastern Panama north and west through Central America to southern Mexico. With an area of 43,278 square miles, Honduras is the second-largest country in Central America. More than three-quarters of the country is comprised of rugged mountains that reflect its geological history caused by the collision of three tectonic plates. The topography of Honduras provides the opportunity for increased microhabitats and evolution. There have been numerous publications on the biodiversity of Lepidoptera in the neighboring countries, but until 2012, the biodiversity of Lepidoptera was the least-known throughout Honduras at a time when the country has one of the world's highest deforestation rates.

- Historical geological evidence indicates a wide separation of North and South America into the late Miocene with completion of the land connection during the Pliocene.
- The current checklist based on literature records and recent field studies includes 861 butterflies and 1,441 moth species.
- Identifications of species collected during the seven field surveys is ongoing. At least 3,000 species have been collected, and the total for the country is expected to exceed 6,000.

Reference: Miller, JY, DL Matthews, AD Warren, MA Solis, DJ Harvey, P Gentili Poole, R Lehman, TC Emmel, and CV Covell, Jr. 2012. An Annotated List of the Lepidoptera of Honduras. *Insecta Mundi* 0205: 1-72.

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New endowment honors founding director Thomas C. Emmel

In thankful recognition of the leadership and vision provided by Thomas Emmel during the planning, development and first 10 years of growth of the McGuire Center for Lepidoptera and Biodiversity, the **Thomas C. Emmel Founding Director's Endowment** has been created.

The McGuire Center for Lepidoptera and Biodiversity has grown to include one of the world's largest Lepidoptera collections, representing most of the world's 20,000 butterfly species and many of the estimated 245,000 moth species. **The Thomas C. Emmel Founding Director's Endowment** will equally support collections improvement and collection-based research (in the form of graduate research fellowships and project grants) at the McGuire Center. Fund administrator Andrew Warren, along with the McGuire Center staff and director, will be responsible for annual decisions regarding disbursement from the endowment earnings.

Please join us in supporting this important endowment to ensure the continuation of our long-term mission. Gifts may be made in several ways including one-time cash gifts, pledges over several years, gifts of stock, insurance or property and bequests. If you would like to make a credit card gift, please go to the Florida Museum website at www.flmnh.ufl.edu/mcguire019211 and designate your gift to the **Thomas C. Emmel Founding Director's Endowment**.

Please make checks payable to the UF Foundation and indicate the **Thomas C. Emmel Founding Director's Endowment** on the check and mail to:

Marie Emmerson
Director of Development
Florida Museum of Natural History
PO Box 112710
Gainesville, FL 32611-2710

If you have any questions about making a gift, please email Marie Emmerson, emmerson@ufl.edu, or call 352-256-9614.



Helicopsis cupido (Riodinidae)



Eunica sophonisba
(Nymphalidae: Biblidinae)



The Uncertain Owllet, *Bia actorion*
(Nymphalidae)



The Corinna Daggerwing, *Marpesia corinna*
(Nymphalidae: Cyrestinae)

Mapping and conserving the world's richest butterfly fauna

The Andes Mountains cover just 1.4 percent of the world's land surface but contain approximately 22 percent of the world's butterfly species. With similar diversity in other animal and plant groups, the Andes contain perhaps the richest and most complex biodiversity of anywhere on the planet. The extreme rarity of some species, the inaccessibility of remote, steep and densely forested mountain ranges, and the rapid changes in fauna across elevations and between valleys, make mapping and understanding the distributions of Andean species a major challenge. Nevertheless, such distribution data are needed to identify threatened species and priority areas for biodiversity conservation.

- The Tropical Andean Butterfly Diversity Project is an international collaboration among institutions and scientists (www.andeanbutterflies.org).
- The project conducted training courses for 180 students in five countries, funded 19 student projects and organized a conference and workshop in Peru.
- Distribution data from more than 170,000 museum specimens were databased and the conservation status of more than 300 species was assessed, helping to identify Key Biodiversity Areas in the tropical Andes.
- More than 100 butterfly species new to science in the last 20 years have been described from Ecuador (www.butterfliesofecuador.com).
- Ecuador now has the best-studied tropical Andean country fauna, and results are being used to identify priority areas to conserve Ecuadorian butterflies and publish a series of field guides.

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New lepidopteran fossil from the Canyon Ferry Reservoir Deposit in Southwestern Montana

A new fossil species, *Lethe montana* (Nymphalidae: Satyrinae), was recently described from the Canyon Ferry Reservoir in southwestern Montana, from a deposit of early Oligocene (about 32 million years ago). This fossil is closely aligned with the ancestral stock of two other species distributed in northern Thailand, Vietnam and Formosa. Analysis of this fossil species suggests that its ancestor originated in the Old World and migrated to North America via the Bering Land Bridge.

- Fossil butterflies provide a geological time line on the evolution and origin of species.
- Such fossils are rare, with only a little more than 50 known. A single wing of *Lethe montana* was found in the Canyon Ferry Reservoir Deposit.
- The closest living relatives of *Lethe montana* occur in the Himalayas, northern Vietnam, Thailand and Formosa.
- This species migrated to North America during the Oligocene via the Bering Land Bridge.

Reference: Miller, J Y, LD Miller, MA Ivie. 2012. A New Lepidopteran Fossil From the Canyon River Reservoir Deposit in Southwestern Montana (Lepidoptera: Nymphalidae: Satyrinae). Bulletin of the Allyn Museum 167: 1-12.

Contact: Jacqueline Y. Miller, jmiller@flmnh.ufl.edu



Tropical Andean cloud forest, eastern Ecuador

Biodiversity and biogeography of the Lepidoptera in the Bahamas: Past, present and future

Lepidoptera play a significant role in studies of biodiversity since they are excellent bioindicators of particular habitats, are associated with specialized larval host plants, and are also involved in pollination. Nearly 83 butterfly species (102 taxa) have been recorded in the Bahamas of the more than 238 species represented in the West Indies, but knowledge of the moths is woefully incomplete. Hampson (1901, 1904) originally recorded 297 moths from Bonhote's and Chamberlain's collections in Nassau and on Andros, but based on our knowledge for all Lepidoptera recorded in Florida and Cuba, we estimate the biodiversity of Lepidoptera throughout the Bahamas should include about 2,000-2,500 taxa.

- Current distribution patterns are reflected in the geological history of the islands and the Caribbean Basin.
- Based on literature records and preliminary surveys, we located 591 moth species, 65 of which are new distributional records.

Reference: Matthews, DL., JY Miller, MJ Simon and G Goss. 2012. Observations of plume moths on North Andros Island, Bahamas, and notes on new records and species previously recorded from the Bahamas (Lepidoptera: Pterophoridae). Insecta Mundi 0236: 1-12.

Contact: Deborah L. Matthews, dlott@flmnh.ufl.edu

Climate, geography, color pattern and the evolution of Neotropical butterflies

The Neotropical region is renowned for many remarkable radiations in its endemic animal and plant groups, but the principal causes of lineage diversification remain poorly understood. New hypotheses of species relationships based increasingly on DNA sequence data, coupled with unprecedented information about species distributions, biology and morphology, are now enabling novel research in model groups. McGuire Center researchers are studying how abiotic factors such as climate, evolutionary age and geographic barriers, as well as ecological factors such as species interactions, host plant preferences and wing patterns, have influenced the evolution of Neotropical butterflies.



Evolution of *Catasticta*, a diverse genus of Andean butterflies, and examples of brilliant wing pattern coloration in preponine butterflies

- Ph.D. student Sebastián Padrón studies *Catasticta* butterflies, one of the most diverse radiations in the tropical Andes.
- *Catasticta* caterpillars feed on mistletoes and many of the 100 species have narrow distributions and are of conservation interest.
- Research on *Catasticta* evolutionary history using DNA sequences will examine the timing and causes of diversification. Current data show that the genus may have evolved outside the Andes.
- Ph.D. student Elena Ortíz is examining how wing pattern and geography have been involved in the evolution of *Prepona*, some of the world's most spectacular and colorful butterflies.
- Research has focused on field and museum visits to Latin America, and databasing and photography of the Florida Museum preponine collection.
- Samples are now available for DNA study for all species, and data from about 6,000 butterflies are being used to make distribution maps.

Reference: Chazot, N., Willmott, K. R., Santacruz, E. P., Toporov, A., Hill, R. I., Jiggins, C. D., & Elias, M. (2014). Mutualistic mimicry and filtering by altitude shape the structure of Andean butterfly communities. *The American Naturalist*, 183(1), 26-39.

Pyrz, T. W., Willmott, K., Garlacz, R., Boyer, P., & Gareca, Y. (2013). Latitudinal gradient and spatial covariance in species richness of tropical Lepidoptera in the Andes. *Insect Conservation and Diversity*.

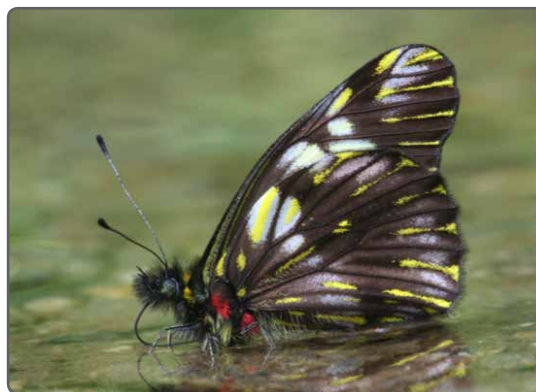
Matos-Maravi, P. F., Pena, C., Willmott, K. R., Freitas, A. V., & Wahlberg, N. (2013). Systematics and evolutionary history of butterflies in the *Taygetis* clade (Nymphalidae: Satyrinae: Euptychiina): Towards a better understanding of Neotropical biogeography. *Molecular Phylogenetics and Evolution*, 66(1), 54-68.

Rosser, N., Phillimore, A. B., Huertas, B., Willmott, K. R., & Mallet, J. (2012). Testing historical explanations for gradients in species richness in heliconiine butterflies of tropical America. *Biological Journal of the Linnean Society*, 105(3), 479-497.

Understanding rarity

Why do some species occur throughout the tropics while others are confined to a single river valley or mountaintop? What explains orders of magnitude differences in the abundance of closely related species? Climate, habitat and host plant preferences, and positive and negative interactions among species are all likely important factors in explaining the distribution and abundance of species. Answering these questions is critical to understanding what factors drive global patterns of biodiversity, how these are likely to be affected by climate and landscape changes, and how best to conserve biodiversity.

- Ph.D. student María F. Checa studies how climate and habitat affect butterfly abundance.
- A week's sampling every two months, for three years, has been completed in three west Ecuadorian forests, a global biodiversity hotspot.
- Butterfly populations fluctuate markedly within and among years due to climate variability, particularly in dry forests. Butterflies with narrow distributions seem to be more vulnerable to climate and habitat change.
- Ph.D. student Geoff Gallice is researching how patterns in resource use affect butterfly abundance and distribution.
- Rarity may be linked to resources, so Gallice is focusing on host-plant use in clearing butterfly caterpillars.



Catasticta ctemene



Forbestra olivencia
(Nymphalidae: Ithomiini)



Pupa of *Tithorea harmonia*
(Nymphalidae: Ithomiini)



Eggs of *Mechanitis*
(Nymphalidae: Ithomiini)



A pupating caterpillar of *Godyridina*
(Nymphalidae: Ithomiini)



Miami Blue, *Cyclargus thomasi bethunebakeri*



Schaus' Swallowtail, *Heraclides aristodemus ponceanus*



Jaret Daniels and Stephanie Sanchez work in the field.



A Schaus' Swallowtail larvae raised in captivity.

Managing roadsides for insect pollinators

Pollinators are critical to our environmental and economic well-being. By most estimates, nearly 80 percent of the earth's flowering plants rely on animal pollinators, primarily insects, to ensure reproduction. This includes hundreds of crops grown for food, spices, animal forage or medicine. Alarming, managed and wild insect pollinators have suffered declines in recent years, prompting proactive strategies to help minimize disruption of the valuable ecosystem service they provide. Roadsides are linear habitat strips that can offer valuable resources for pollinators. They support a wide variety of flower-rich forage, provide nesting sites, and promote connectivity between habitat fragments. Researchers in Associate Curator of Lepidoptera Jaret Daniels' lab are investigating how roadside vegetation management affects native insect pollinator diversity, the availability of floral resources, and mobile organism mortality.



This Palamedes Swallowtail, *Papilio palamedes*, is one of the billions of butterflies killed by vehicles every year.

- The Florida Department of Transportation is responsible for management and care of 1 of every 200 acres of the state's total land area.
- Preliminary results indicate the schedule of regular roadside vegetation management has a profound effect on floral composition, with frequent mowing yielding the lowest species richness and abundance.
- With proper management, the habitat along roadsides may help support the pollination needs of adjacent agricultural lands and natural areas.
- Master's student Dale Halbritter examined how the frequency of roadside mowing influenced the abundance of live butterflies and the number of butterfly casualties resulting from organism-vehicle collisions.
- Flight behavior and organism size influenced road kill rates, with migratory species and larger butterflies experiencing significantly higher relative mortalities.



This Schaus' Swallowtail larva, *Heraclides aristodemus ponceanus*, is in a defensive posture with its osmeteria exposed.

Conserving imperiled butterflies

Two butterflies found only in southern Florida, the Zestos Skipper (*Epargyreus zestos oberon*) and the Rockland Grass Skipper (*Hesperia meskei pinocayo*) are now presumed to be extinct. The losses of these subspecies represent the first butterfly extinctions in Florida, and are among the few butterflies known to have become extinct in the United States. Over the last few decades, numerous other South Florida butterflies have also experienced severe declines. The Imperiled Butterflies of Florida Workgroup, of which the McGuire Center is a member, is proactively addressing key conservation and management issues to help stabilize or restore these at-risk species and their habitats, and increase the likelihood of successful recovery.

- Listed as federally endangered, Schaus' Swallowtail (*Heraclides aristodemus ponceanus*) is an endemic South Florida butterfly and one of the most critically imperiled insects in North America.
- We directed comprehensive, multi-agency, range-wide surveys in 2012 and 2013, and collected wild stock for the purpose of reestablishing a captive breeding population at the Center.
- Suffering catastrophic population declines over the past few decades, the Miami Blue (*Cyclargus thomasi bethunebakeri*) is a federally endangered butterfly that now exists only on a few small islands in the lower Florida Keys.
- As part of a long-term study, we tracked the impact of multiple stressors, including hurricanes, rainfall and temperature, on population abundance and habitat, and chronicled the first-known island extinction of an imperiled insect due in part to an invasive vertebrate (green iguana).

Butterflies and fire

Fire is a ubiquitous yet stochastic force of disturbance in virtually all terrestrial ecosystems. It is highly influential in shaping, promoting and sustaining certain successional stages, and is a major contributor to the dynamic nature of living systems—including the life history of numerous organisms. The Frosted Elfin (*Callophrys irus*) is a rare butterfly that inhabits fire-prone and fire-managed ecosystems. Throughout its range, it occurs in relatively small, often isolated populations that are limited to similarly small remnant habitat fragments. As a result, it is particularly at-risk of local extinction from frequent fire events of varying intensity and scope. Developing appropriate management strategies is critical to help improve conditions for rare organisms and ensure the long-term persistence of their populations.

- The Frosted Elfin has been noted to pupate in the leaf litter or soil and may be able to endure or escape the immediate detrimental effects of fire.
- Ph.D. student Matthew Thom studied the ecology of the Frosted Elfin and its ability to avoid the lethal or sub-lethal temperatures resulting from prescribed fire.
- Survival of Frosted Elfin pupae and successful adult emergence was significantly negatively correlated to heat and peak temperature.
- The results suggest management using fire should be rotated between years, involve a fast moving fire, and be limited to only a portion of the habitat.



The Frosted Elfin butterfly, *Callophrys irus*, in North Florida.

Hawkmoth anti-bat ultrasound and echolocation jamming

Bats and moths have been engaged in aerial warfare for over 50 million years. The night sky is full of predatory bats, and moths have evolved a suite of counter-adaptations, including bat-detecting ears and the active production of sound back at predators. One of the many research projects in the Kawahara Lab is focused on studying how, when and why hawkmoths produce ultrasonic sounds in response to bat attack. Preliminary data based on DNA sequences and behavioral experiments indicate males and females of some hawkmoths produce sound to jam bat echolocation, and that ultrasound jamming has evolved multiple times in hawkmoths.

- Hawkmoths jam bat sonar by stridulating ultrasonic files on their genitalia.
- Jamming confuses the bat and prevents it from finding the moth at night.
- Jamming has evolved multiple times in unrelated hawkmoth species.
- Ultrasound detecting ears are found on hawkmoth mouthparts, and they sense bat echolocation.
- Ultrasound-producing hawkmoths appear to be predominantly found in tropical regions, which may be correlated with insectivorous bat diversity.
- This work is funded by the National Science Foundation and conducted in collaboration with the Barber Lab at Boise State University.

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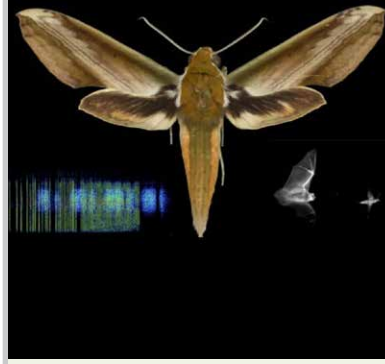
Butterfly and moth evolution and diversification

Lepidoptera constitutes one of the largest orders of insects with more than 160,000 described species. Many are model organisms and important for studies on genomics, physiology and ecology. Butterflies play a key role as indicators of habitat quality and many are charismatic and important to the public. While recent molecular studies have uncovered some evolutionary relationships among families of Lepidoptera, many are far from being clear. This project utilizes data from large RNA sequences to construct an evolutionary tree of a megadiverse insect order.

- We are using next-generation sequence data (transcriptomes) to uncover major relationships of butterflies and moths.
- Surprisingly, butterflies appear to be closely related to small “micro moths” and not larger moths.
- Our studies, based on more than 2,500 genes, show many relationships that were not well understood are now established with fairly high confidence.
- Students and postdocs in the Kawahara Lab are working on various parts of the evolutionary tree.
- This project is being conducted as part of a collaborative effort with the University of Maryland, Australian National Insect Collection and the 1KITE consortium in Germany.

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Hawkmoths jam bat sonar with ultrasonic sounds.



These *Manduca* and other hawkmoths were photographed with lights in Box Canyon, Ariz.



The Townsend's big-eared bat, *Corynorhinus townsendii*



This insectivorous bat was one used by the Kawahara group for bat-moth interaction experiments in Borneo.

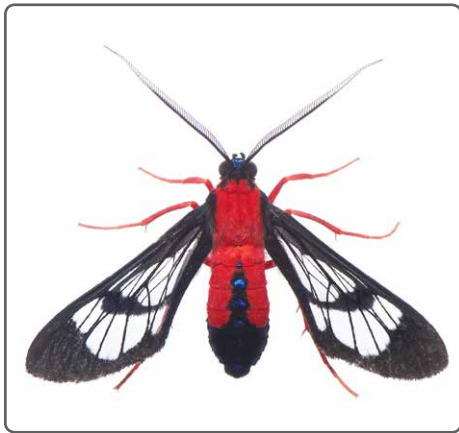
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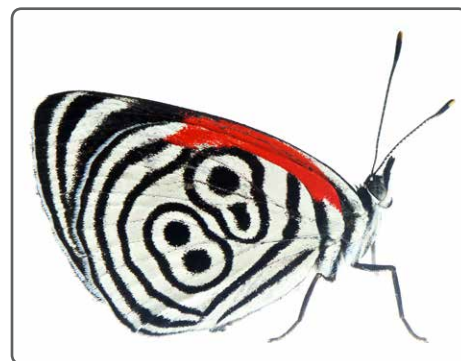
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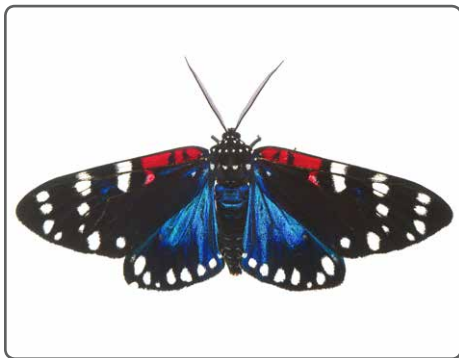
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The Faithful Beauty, *Composita fidelissima* (Arctiidae)

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Park, K. T., Y. S. Bae, S. Kim, and J. B. Heppner. 2013. Genus *Torodora* Meyrick in Cambodia (Lepidoptera: Lecithoceridae: Torodorinae), with descriptions of three new species. *Journal of Natural History* 47(35-36): 2289-2304.



A Zebra Longwing, *Heliconius charithonia* and Julia butterfly, *Dryas iulia* (Nymphalidae)

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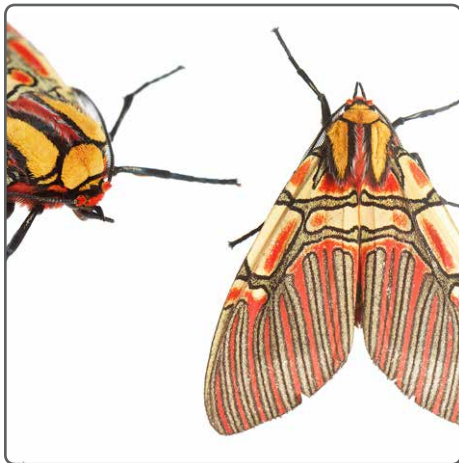
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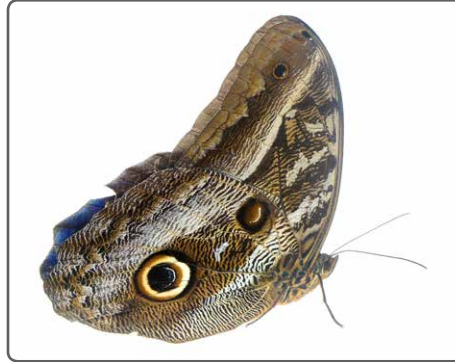
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Falcon Sphinx moth, *Xylophanes falco* (Sphingidae)

Student and Staff News

Student News - **Sandy Koi** successfully defended her master's in entomology, "Ecology and Conservation of *Eumaeus atala* Poey 1832" and graduated in December 2013 with the guidance of her major professor, Jaret Daniels. Koi also presented her research thesis to several chapters of the North American Butterfly Association and continues to monitor re-introduced and wild colonies of the Atala butterfly in South Florida. She is now planning to pursue a Ph. D. in entomology. **Geoff Gallice** received grants from the Sophie Danforth Conservation Biology Fund and a Fulbright Scholarship for his work in Peru. He spent nearly a year in Peru, where he studied clearing butterfly ecology and taught *Wild Lands Studies* – a six-week ecology and conservation field course. Gallice also received a scholarship for attending the NSF-funded *Technology in Tropical Asian Forestry* field course in Yunnan, China, which will take place in July 2014. **Jade Badon** successfully defended his master's thesis on "The Effects of Anthropogenic Land Use on the Distribution of Butterflies in Negros Oriental, Philippines." After his defense, he also presented his research in a lecture at the Institute of Environmental and Marine Sciences (Silliman University, Philippines). Badon is now working on his doctorate in entomology. **Matt Thom** successfully defended his doctorate dissertation in July 2013, titled: "The Ecology and Conservation of *Callophrys irus*: the Role of Fire and Microhabitat." Thom then accepted a post-doc with the USDA-ARS, investigating floral resource production and pollinators in Morris, Minn. **Maria Fernanda Checa** published a new book about butterflies of Ecuador: "*Hadas Haladas del Yasuni*" (Winged Fairies from Yasuni). She received grants of \$20,000 from the Pontifical University of Ecuador and Trampa Editorial to continue her research and publish the book. She also received a grant of \$18,000 to continue monitoring effects of climate variability on butterfly communities in Western Ecuador. Checa taught two undergraduate courses at Pontifical University: *Biology of Butterflies* and *Insect Ecology*, and two undergraduates worked and defended their theses under her supervision. One thesis was on hilltopping behavior in butterfly communities from dry forests, and the other on variability of bait efficiency to attract butterflies. In May 2013, **Francesca Ponce** accompanied Akito Kawahara in Panama for two weeks to conduct fieldwork on hawkmoths. **Elena Ortíz Acevedo** received a grant from the University of Florida Natural Area Advisory Committee to create signs depicting butterflies and their natural history. She is working on the project under the guidance of Andrei Sourakov. **Peter Houlihan, Lary Reeves, Geena Hill and Yaneke Paulay** conducted field work in Arizona during summer 2013. **Nick Homziak** presented a paper with Akito Kawahara at the Entomological Society of America Annual Meeting in Austin, Texas: "Towards a revision and phylogeny of the genera *Heteranassa* (Smith 1899), *Elousa* (Walker 1857) and *Coxina* (Gueneé 1852)." **Sebastián Padrón** received a doctoral dissertation improvement grant and Ecociencia EcoBecas grant for his work on molecular phylogeny

and biogeography of highly diverse Andean butterflies in the genus *Catasticta*. Thanks to this funding, Padrón conducted fieldwork in Ecuador and visited major collections in Europe to obtain samples for his research.

A combined meeting of Lepidopterists' Society, Association for Tropical Lepidoptera and Southern Lepidopterists' Society took place in Gainesville from June 26 to July 1, 2013. The meeting was hosted by the McGuire Center and was a great success, with over 150 participants in attendance.

Many McGuire Center students presented their research at the meeting:

Jia, Q., and A. Y. Kawahara. "Systematics, host plants, life histories of *Phyllocnistis* species on citrus (Lepidoptera, Gracillariidae, Phyllocnistinae)."

Johns, C., D. R. Rubinoff, and A. Y. Kawahara. "Preliminary phylogeny of Hawaiian leaf mining *Philodoria*." [This presentation won first place in competition for the best student poster].

Ponce, F. V., and A. Y. Kawahara. "Molecular phylogeny of *Eumorpha* hawkmoths." [second place best student poster].

Houlihan P. R., M. E. Harrison, N. C. Marchant, and S. M. Cheyne. "Butterflies amidst the modern era of exploitation on Borneo: their diversity, ecology, and conservation."

Thom M. D. "Pupation behavior of the Frosted Elfin butterfly, *Callophrys irus* Godart: consequences for mortality by fire for litter and soil dwelling organisms."

Koi S. "New and revised life history of *Eumaeus atala* (Lepidoptera: Lycaenidae)."

Halbritter, D. and J. C. Daniels. "Integrating historical biogeography and ecology to explain the distribution patterns of pine butterflies (Lepidoptera: Pieridae)." [This presentation won second place in competition for the best oral presentation].

Plotkin, D. "New species and new distribution records of Caribbean Geometrinae (Lepidoptera: Geometridae)."

Badon, J. A. T. "The effects of anthropogenic land use on the distribution of butterflies in Negros Oriental, Philippines." [third place best student poster].

Student life in Akito Kawahara's lab continues to be active: after graduating from John Hopkins, **Peter Houlihan** joined the group to work on his doctorate; a new master's student, **Nicholas Homziak**, moved from the University of New Mexico, where he completed his bachelor's degree; **Christopher Johns** from the



Members of the the Kawahara lab collected moths in Box Canyon, Ariz., during the summer.



The Aspen Lappet, *Phylodesma tremulifolia* (Lasiocampidae)



The Nessus Sphinx, *Amphion floridensis* (Sphingidae)



The Small Elephant Hawk-moth, *Deilephila porcellus* (Sphingidae)



Euthrix potatoria (Lasiocampidae)

**MCGUIRE CENTER
SEMINAR SCHEDULE
FALL SEMESTER, 2013**

Aug. 27: Kawahara lab group, Dale Halbritter & Andrei Sourakov, The McGuire Center: "What I did last summer."

Sept. 3: Charles V. Covell Jr., The McGuire Center: "Some butterflies of Kentucky and their host plants and nectar sources."

Sep. 17: James P. Cuda, Department Entomology & Nematology: "Surveys in East Africa for *Acrapex* sp. (Lepidoptera: Noctuidae), a stem-boring natural enemy of the invasive cogongrass, *Imperata cylindrica*."

Oct. 1: Andrei Sourakov, Tom Emmel, Nancy Turner & Peter Houlihan, The McGuire Center: "McGuire Center's lepidopterological trip to Vietnam in collaboration with the Vietnam National Museum."

Oct. 15: Chris A. Johns, The McGuire Center: "Preliminary molecular phylogeny of the endangered Hawaiian leafmining moth genus *Philodoria* (Gracillariidae)."

Nov. 5: Diego R. Dolibaina, Universidade Federal do Paraná, Brazil: *Celaenorrhinus* (Hesperiidae: Pyrginae): phylogeny and taxonomy of the american species."

Nov. 12: Geoff Gallice, The McGuire Center: "Los Amigos: A concession for the conservation of biodiversity in the Peruvian Amazon"

Nov. 19: Mirian M. Hay-Roe, ARS, USDA: "Migratory patterns of the fall armyworm, ecological and physiological findings."

Dec. 3: Andrew Warren, The McGuire Center: "Spotted sulphurs, striped spiders, and some very unlucky moths: New discoveries from right here in Florida."

Student and Staff News

University of Florida also began work on his master's thesis; **Lary Reeves** finished his master's at UF and joined the Kawahara lab to work on his doctorate; **Qianju Jia** came from China to work on his master's thesis focusing on microlepidoptera. A number of undergraduate and high school students are currently working in the Kawahara lab: **Michelle Gionti**, **Yaneke Paulay**, **Jillian Sullivan**, **Francesca Ponce** (UF), and **Minjia Zhong** (Buchholz High School). Several new students also joined Keith Willmott's lab in the last year: **Shinichi Nakahara** came from Japan and **Denise Tan** from Singapore to work on Euptychiina, a group of Neotropical nymphalid butterflies. McGuire faculty Willmott, Kawahara and Jackie Miller recently received a National Science Foundation grant that makes this work possible (read more about the grant here: <http://news.ufl.edu/2013/09/11/butterfly-group/>)

Collecting Expeditions and Fieldwork - Debbie

Lott and **Jackie Miller** conducted field work in Honduras (Reserva Biológica Uyuca and Parque Nacional Pico Bonito) in July and August 2013. They also traveled to the Guantanamo Bay Naval Base, Cuba, in October on a collecting expedition. **Akito Kawahara** worked in Borneo in April 2013, where he discovered how female hawkmoths produce ultrasound. The same month, Kawahara worked in Hawaii studying endangered Lepidoptera. In June, he traveled to Arizona to study hawkmoth-bat interactions, and returned to Borneo in February 2014 to help film a new documentary on animal flight with BBC and David Attenborough. **Charlie Covell** worked in Kentucky on the annual Fourth of July butterfly count and continued with the Paynes Prairie moth survey in North Central Florida. **Vladimir Lukhtanov** worked in the field in Peru, Kazakhstan, Georgia (Caucasus), Israel and Cyprus. **Andrei Sourakov**, **Peter Houlihan**, **Ian Segebarth**, **Tom Emmel** and **Nancy Turner** traveled to a number of localities in Vietnam to sample moths and butterflies as a part of a collaborative biodiversity project with the Vietnamese National Museum of Natural History. **Ian Segebarth** conducted field work in Peru in June 2013, and he and **Emmel** worked on a *Cercyonis oetus* population dynamics project in Colorado and led Museum expeditions to Bali and the Komodo Islands. In February 2014, Ian Segebarth, Emmel and **Craig Segebarth** also led a survey of the overwintering Monarch colonies in Mexico. **Andy Warren's** fieldwork this year was conducted throughout Florida and in Alabama, Georgia, the Carolinas, Texas, New Mexico and Colorado. Warren also hosted Diego Dolibaina from the Universidade Federal do Paraná, Brazil, who worked in the collections studying skippers. **J.D. Turner**, curator of Riodinidae, whose research is on the behavior, classification and geographic diversity of these butterflies, conducted field studies for three weeks in Panama. He also collected Lepidoptera for five weeks in Cass County, Minn. **John Heppner** conducted research expeditions to French Guiana,



The mercury vapor lamp attracted numerous insects during the research expedition to Arizona.

Guatemala, Vietnam and Malawi. **Keith Willmott** conducted a two-month-long research expedition to Ecuador.

Conferences - During summer 2013, the combined 62nd Annual Meetings of the Lepidopterists' Society, Association for Tropical Lepidoptera and Southern Lepidopterists' Society was hosted by the Hilton University of Florida Conference Center and the McGuire Center for Lepidoptera and Biodiversity. The meeting was co-chaired by Tom Emmel and Jackie Miller, but required the effort of all McGuire Center staff and students. Conference participants (172) traveled from nine countries as far as Vietnam and United Kingdom, Israel, Kenya and many worked in the Center's collections before and after the meeting. Sixty-three oral and seven poster presentations ranged from studies on microlepidoptera, the bat-moth arms race and the current status of silkmoths and wild silks production in Africa and Asia to special symposia on conservation management. At the banquet, Dr. William McGuire spoke on the worldwide impact of Lepidoptera and museums, and the Karl Jordan Medal was presented to James S. Miller.

In addition to students, several McGuire Center staff also presented their research at the conference:

Lott, D. M. "Florida plume moths: some recent discoveries and a synopsis of the known fauna."

Hayden, J. E. and R. Mally. "Review of the *Leucinodes* group (Pyraloidea: Crambidae: Spilomelinae)."



The White Dragontail, *Lamproptera curius* (Papilionidae), exhibits mud-puddling behavior in Vietnam.

Covell, C.V. and **C. L. Segebarth**. "The Kentucky Lepidopterists: 40 years of field work and fellowship, with remarks and reminiscences."

Sourakov, A. "On the biology of moths that feed on the coral bean in Florida."

Miller J. Y., L. D. Miller, and M. A. Ivie. "A new lepidopteran fossil from the Canyon Ferry Reservoir deposit in southwestern Montana (Lepidoptera: Nymphalidae: Satyrinae)."

Daniels J., E. Saarinen and J. Saarinen. "The impact of tropical cyclones, invasive species and drought on an endangered South Florida butterfly."

Willmott K. R. "Mapping and interpreting patterns of species richness in neotropical butterflies."

Rubinoff, D., Haines, W., and **A. Y. Kawahara**. "Deciphering diversity in Hawaii's most diverse moth group (*Hyposmocoma*)."

Kawahara, A.Y., **J. Breinholt**, B. Leavell, I. J. Kitching, and J. R. Barber. "Anti-bat behavioral strategies, and evolutionary routes in the escalation of the bat-insect arms race."

Breinholt, J. and **A. Y. Kawahara**. "Phylogenomic analysis of silk moths and relatives."

Regier, J.C., C. Mitter, M. P. Cummings, D. R. Davis, C. Parr, S. Weller, **A. Y. Kawahara**, J. C. Sohn, J. Brown, J. Baixeras, A. Zwick, A. Bazinet. "Status report on the LepTree Molecular Phylogeny Project."

Lewis, D., F. Codamine, **S. Nakahara**, **A. Y. Kawahara**, and F. A. Sperling. "Divergence times, historical biogeography, and diversification processes in the Neotropics: a total-evidence approach for the continental radiation of *Heracles* swallowtails."

Warren, A. D. "Please Do Not Disturb The Spiders! AKA: Front Porch Scientific Discoveries."

Other national and international conference presentations:

Kawahara, A.Y. and **J. B. Breinholt**. 2013. "Phylotranscriptomics with 1,000 genes: How many loci are needed for a robust phylogeny of Bombycoidea?" Sixth International Meeting on Insect Phylogeny, Dresden, Germany.

Barber, J.R., and **A. Y. Kawahara**. 2013. "Escalation of the bat-moth arms race." Invited symposium presentation, SICB Annual Meeting, San Francisco.

Breinholt, J. B., and **A. Y. Kawahara**. 2013. "Research on lepidopteran biogeography at the FLMNH." Biogeography meeting, Coral Gables, Fla.

Miller, J. Y. 2013. "Biodiversity and Biogeography of the Lepidoptera in the Bahamas." Bahamas National Natural History Conference, invited presentation, College of the Bahamas, Nassau, Bahamas.

Williams N. M., J. Peters, N. Williams, K. Ullmann, K. Ward, R. Isaacs, J. Tuell, E. May, K. Mason, **J. C. Daniels**, J. D. Ellis and **J. A. Pence**. 2013. "Operation Pollinator: Evaluation of flowering plant mixes for supporting pollinator biodiversity in agricultural systems." International Conference on Pollinator Biology, Health and Policy, Penn State University.

McGuire Center in the Media - The University of Florida hosted the 2013 Annual Meeting of the National Association of Science Writers in November 2013. Nearly 400 attendees visited the McGuire Center collections during the opening night reception, prompting numerous Internet posts about the Center, some of which can be found here: <http://storify.com/AndyBugGuy/tweets-from-the-welcome-reception>. Several McGuire Center staff and students, including **Andy Warren** and **Peter Houlihan**, participated in the conference. Warren continues his involvement with science communication, and recently attended the 2014 Science Online Together meeting at North Carolina State University. Several research projects conducted at the McGuire Center were featured this year in national media and on websites such as Science Daily: "Spiders, not birds, may drive evolution of some butterflies" (<http://www.sciencedaily.com/releases/2013/03/130312102547.htm>) "Hawkmoths use ultrasound to combat bats" (<http://www.sciencedaily.com/releases/2013/07/130704100835.htm>). The McGuire Center's research associate, Nick Grishin, co-authored a study describing two new butterflies from the eastern U.S. (<http://www.sciencedaily.com/releases/2014/02/140219102319.htm>). The effort to reconstruct the evolutionary history of all Lepidoptera remains a work in progress (<http://news.ufl.edu/2013/04/12/lepidoptera-tree-of-life/>). The McGuire Center was also featured by NPR's Radiolab (<http://www.radiolab.org/story/goo-and-you/>). The McGuire Center's Butterfly Rainforest now has live web cameras, allowing Internet users to observe butterflies feeding or emerging from their pupae (<http://www.flmnh.ufl.edu/discover/life-on-earth/live-critter-cams/>).

Courses Taught - **Debbie Lott** assisted with the field portion of the *Tropical Entomology* course taught by Ron Cave and **Jackie Miller** that took place in Honduras, July 24-Aug. 3, 2013. While in Honduras, Miller and Cave also supervised students' individual studies in *Tropical Entomology*. **Andrei Sourakov** is teaching an individual study course on *Ecology of Trophic Interactions in Lepidoptera* during spring 2014.



The Streaked Sphinx, *Protambulyx strigilis* (Sphingidae)

MCGUIRE CENTER SEMINAR SCHEDULE SPRING SEMESTER, 2014

Jan. 7: Andrei Sourakov, The McGuire Center: "Notes from the backyard: How well do we know our best-known leps?"

Jan. 21: Stewart Peck, Carleton University, Ottawa, Ontario: "Pleistocene bones and beetles: the story of the California tar pits."

Feb. 4: David M. Plotkin, The McGuire Center: "Skeletal morphology of Caribbean Emerald Moths (Geometridae: Geometrinae)."

Feb. 18: Jade Badon, The McGuire Center: "The effects of anthropogenic land use on the distribution of butterflies in Negros Oriental, Philippines."

Mar. 11: Maria Checa, The McGuire Center: "Hadas aladas del Yasuni (Winged fairies from Yasuni, Ecuador)"

Mar. 25: Dean Teresa Balsler, Soil and Water Science, UF: "Here be dragons - Charting our way forward into the new world."

April 8: Akito Kawahara, The McGuire Center: "Research in the Kawahara Lab: From bat-moth interactions in Borneo to the evolution of endangered moths in Hawaii."

Apr. 22: Thomas C. Emmel, The McGuire Center: "A tenth anniversary retrospective of the McGuire Center for Lepidoptera & Biodiversity."



SAVE THE DATE:
Sept. 26-28, 2014

Combined meeting of the Southern Lepidopterists' Society and Association for Tropical Lepidoptera at the McGuire Center.

Student and Staff News

Akito Kawahara taught *Invertebrate Phylogenetic Systematics, Molecular Phylogenetics and Spider Biology*. He also co-taught with **Jesse Breinholt** a course on *Phylogenomics*. **Vladimir Lukhtanov** taught *Molecular Systematics and Phylogenetics* for undergraduate students at St. Petersburg University (Russia). He also supervised a Ph. D. dissertation that was successfully defended by N. A. Shapoval titled “Interspecific hybridization and hybrid speciation in *Agrodiaetus* blue butterflies (Lepidoptera, Lycaenidae): analysis of molecular and cytogenetic markers.” **Keith Willmott** taught *Insect Biogeography* in spring 2013. **Jaret Daniels** taught *Insect Pollination Ecology* in fall 2013 and *Grant Writing* in spring 2013 & 2014.

Grants and Awards - Charles V. Covell received the William D. Winter Service Award bestowed by The Lepidopterists’ Society at the 2013 Annual Meeting and was elected chairman of the Southern Lepidopterists Society for 2014- 15. **Andrei Sourakov** was re-elected president of the board of directors of the Center for Systematic Entomology. He also received the 2013 Prudential Davis Productivity Award from the University of Florida. **Akito Kawahara** received the Excellence Award for Assistant Professors from the University of Florida. **Andy Warren** finished his term as president of the Lepidopterists’ Society, but continues to serve as a chair of the Nominations Committee and member of other committees for the Society. Several grants were awarded to the staff during the last year, including the above mentioned NSF grant for studying euptychiina butterflies, NSF grant for Dimensions of Biodiversity (**Keith Willmott**, PI), Operation Pollinator grant from Syngenta Crop Protection, Plant for Wildlife grant from Florida Wildflower Foundation, grants for conservation of the Schaus’ Swallowtail Butterfly from the Minnesota Zoo and U.S. Fish and Wildlife Service (**Jaret Daniels**, PI), grant from the National Geographic Society for inventory of Lepidoptera and synthesis of their biodiversity and biogeography at Lucayan Archipelago (**Jackie Miller**, PI), grant from the Russian Foundation for Basic Research for unraveling higher level phylogenetic relationships of skipper butterflies (**Vladimir Lukhtanov** and **Andy Warren**, Co-PIs), and NSF grants for studying ultrasonic stridulation in hawkmoths and for fieldwork in French Guiana (**Akito Kawahara**, PI).

New Staff - Muhammad Z. Ahmed (Zee)

has recently joined the McGuire Center as a postdoc. He earned his master’s from South China Agricultural University with a thesis titled “Molecular Identification and Phylogeny of *Bemisia tabaci* and its *Wolbachia*” and his doctorate from the University of Pretoria, South Africa, on “The Causes and Consequences of Horizontal Transmission: a Case Study on *Wolbachia*.” At the McGuire Center, he is working with Akito Kawahara on the interactions between *Wolbachia* bacteria and leafminer moths. **Lisa Taylor** has joined the Center as a courtesy research scientist after finishing her doctorate at Arizona State University and postdoctoral work at the University of Pittsburgh. She is interested in sexual selection, communication and the evolution of animal color patterns. Much of her work focuses on multi-colored jumping spiders and their colorful prey. Taylor investigates how the psychology of these tiny predators may drive the evolution of aposematism in their prey, as well as how female psychology drives the evolution of the elaborate courtship displays of males. At the Museum, she is currently collaborating with Andrei Sourakov to explore interactions between jumping spiders and moths.



Papilio machaon larva (Papilionidae)



The African moon moth, *Argema mimosae* (Saturniidae)



The Spotted Fritillary, *Melitaea didyma* (Nymphalidae)



A mating pair of the Apollo butterfly, *Parnassius apollo*, (Papilionidae)



A caterpillar of a silk moth, *Syssphinx montana* (Saturniidae), from Arizona.