Resting on the smallest wings: The flight of conservation

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Abstract

Sarah Casson and Nicole Wooton attended the 2015 Neotropical Lepidoptera Course from March 6–15 at the Serra Bonita Reserve, in Camacan, Bahia, Brazil. The course is designed to provide students with a solid foundation in identification, classification, morphology, and biology of Lepidoptera associated with tropical habitats. It aims to promote future studies in the Neotropics and to develop contacts between internationally renowned scientists and students. Focused primarily on the ecology and systematics of Neotropical Lepidoptera, the course provides background and hands-on experience in the most important aspects of collecting, sorting, and preparing specimens; recognizing morphological characters in adults and larvae; and the identification of the most common moth families—tools that are useful for a wide array of Lepidoptera studies anywhere on the planet.

The Serra Bonita Reserve (SBR) is located in Brazil’s famous Atlantic Forest, one of the most endangered and species-rich biomes on earth. Four primates occur there and Birdlife/SAVE Brazil has designated SBR as an Important Bird Area. Approximately 5,000 species of Lepidoptera have been identified at SBR, including a number of endangered species such as Heliconius nattereri, one of the rarest butterflies on earth. It is estimated that some 11,000 Lepidoptera species exist at the station (the same number found in the US and Canada combined).

Sarah Casson e Nicole Wooton participou da 2015 Neotropical Lepidoptera Curso de março 6–15 na Serra Bonita Reserve, em Camacan, Bahia, Brasil. O curso é projetado para fornecer aos alunos uma base sólida na identificação, classificação, morfologia e biologia de Lepidoptera associadas a habitats tropicais. Destina-se a promover estudos futuros na região Neotropical e desenvolver os contactos entre cientistas e estudantes de renome internacional. Focado principalmente na ecologia e sistemática de Neotropical Lepidoptera, o curso fornece apoio e hands-on experiência nos aspectos mais importantes da recolha, triagem e preparar espécimes; reconhecer caracteres morfológicos em adultos e larvas; e a identificação das famílias traça mais comuns — ferramentas que são úteis para uma ampla gama de estudos Lepidoptera em qualquer parte do planeta.

A Serra Bonita Reserve (SBR) está localizado na famosa Mata Atlântica do Brasil, um dos biomas mais ameaçados e ricos em espécies do planeta. Quatro primatas ocorrem lá e Birdlife/SAVE Brasil designou SBR como uma Important Bird Area. Aproximadamente 5,000 espécies de lepidópteros foram identificadas em SBR, incluindo um número de espécies ameaçadas de extinção, como Heliconius nattereri, uma das borboletas mais raras do mundo. Estima-se que cerca de 11,000 espécies de lepidópteros existam na estação (o mesmo número encontrado em os EUA eo Canadá combinado).

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Field Report

“Learning how to successfully kill a butterfly is what we’re here to do,” said Dr. Andrew Brower, professor at Middle Tennessee State University and an expert on Nymphalid butterflies. He addressed a room full of students, researchers and naturalists at the Serra Bonita Reserve, located in the Atlantic Forest, or Mata Atlântica, of Bahía, Brazil. Over 70 percent of the room was under the age of 30, and they were all, in one form or another, there to study butterflies and moths. With only 8 percent of the original ecosystem remaining, the Atlantic Forest of Brazil urgently needs all the conservation help it can get. And the next generation of scientists is ready to help (Fig. 1).

Lepidopterists—studiers of scaly-winged, curling-hollow-tongued butterflies and moths (the Lepidoptera)—help provide fascinating science that naturally lends itself to conservation stories. A group of these researchers, including the authors, spent two weeks with the conservation team at the Serra Bonita Reserve to deliver crucial information about the health of the remaining Brazilian Atlantic Forest.

With its extremely high levels of biodiversity, much of which is endemic only to this rainforest, Serra Bonita Reserve has been globally recognized as a UNESCO Biosphere Reserve. The Brazilian Atlantic Forest represents one of the most important and endangered ecosystems in the world.

“Some birders—from Bird Life International, I think it was—came by one day to see the birds,” said Vitor Becker, owner of the Serra Bonita Reserve. “Sitting on the porch,” he explained, “the researchers recorded 140 species of birds in a day. And they never even left the porch.” Serra Bonita Reserve, with a total of 400 bird species now recorded, is a family-run private reserve of 17,000 acres created to protect and study the remnants of this forest and its inhabitants.

The moth and butterfly collections created by the lepidopterist researchers during this trip, representing 40 different families (4,000 individuals)—and the many more specimens in Vitor’s private collection—play an essential role in the forest’s protection (Figs. 2 & 3).

Dr. Bower explained to the newer collectors: “You’re not decimating butterfly populations from collecting. You’re contributing to the body of knowledge that helps conserve them.” This body of scientific knowledge shows why a region should be conserved for its biodiversity and what species benefit from the conservation of an ecosystem.

To soothe anyone’s worries about indiscriminate insect execution, Dr. Bower referred to a 2001 study by McKenna et al., saying that “the number
of Lepidoptera killed by cars and trucks along roadways for the entire state of Illinois for one week is 20,000,000 individuals.”

As Dr. Bower spoke about the techniques of a successful butterfly kill, smoke rose in the valley below us. The endangered forest was being burned to create new cow pastures: a reminder of the looming threats of habitat loss. And so each day we hiked into the rainforest armed with large, soft white nets and tiny envelopes to capture and hold the specimen. The intrigue of butterflies and moths is only useful to current conservation science efforts once an exhaustive database of specimens has been collected.

While we walked through dense jungle that extended over a hundred feet above our heads, the researchers discussed moth specimen presentation, specialized parasites of caterpillars, bat-butterfly ultrasound interactions, and the evolutionary branching of butterflies from the tropical savannah. Most researchers had a favorite Lepidoptera family for studying: Noctuidae, Limacodidae, Nymphalidae. (Or: “nocturnal moths”, “slug caterpillars”, “brushfooted butterflies”.)

A local Brazilian example of butterfly-centric conservation lies within one of the most thoroughly studied butterfly groups: the genus Heliconius, or longwings. One species of longwing, Heliconius nattereri, has been found to live only in a tiny slice of habitat within the Atlantic Forest.

“Everybody knows about Heliconius nattereri in that region now,” said Dr. Jim Miller, course professor and research associate from the American Museum of Natural History. “Even the people who didn’t know about butterflies know it. Before, we could save the forests with flagship organisms like the golden lion tamarin or the harpy eagle. Now we can do that with Heliconius nattereri.”

But such conservation stories can only be told when based on sound scientific research. Any conservation story based on arbitrary or unsupported science hurts the larger conservation agenda.

“I only support storytelling [of conservation issues] if it has good, thorough science behind it,” said Dr. Lee Dyer, professor of Biology at the University of Nevada, Reno. The other lepidopterists agree: accurate, exhaustive, unbiased scientific research is required before stories can be shared.

Luckily for Serra Bonita Reserve conservationists, butterflies and moths lend themselves to both intriguing studies and fascinating stories, from big iridescent blue Morpho butterflies to spikey Saturniidae moth caterpillars. But Lepidoptera do not function like most iconic conservation species. Most species that are chosen to represent a landscape-scale conservation project, such as the North American Grizzly Bear, have an easily identified influence on the entire ecosystem. For butterflies and moths, the species spread and their environmental effects are less well known, but are still important to interconnected ecosystems.

The conservation of butterflies is the conservation of species interactions. Scientists estimate that 11,000 species of butterflies and moths live at Serra Bonita, the same number found in the US and Canada combined. Many of these Lepidoptera species are endemic to the higher elevations along the reserve’s mountain ridge, requiring specific conditions to survive. They have particular needs—it is common for their caterpillar stage to require a single species of plant to eat — and finding a mate involves complex biogeochemical interactions. To protect Lepidoptera is to protect a diversity of plant, bat, ant and parasite species, all of which depend on the presence of Lepidoptera and upon which Lepi-
Thus far, the Serra Bonita Reserve is protecting the butterflies and moths in a small corner of the remaining Atlantic Forest, while also keeping the cow pastures at bay. It’s no wonder that families and rising conservation leaders alike are increasingly focusing their efforts on private realm land protection. Though painstaking and complex in its execution, private conservation is the best option in many endangered landscapes and is gaining more attention today in the environmental realm globally. Even in the US, the Land Trust Alliance reports that private land trusts have protected 47 million acres of land, which is over half the entire acreage currently under the US National Park Service’s protection. The trend is growing, too, with 10 million new acres of land since 2005. According to the Land Trust Alliance, private land trusts are the fastest growing segment of the conservation community in the US. The protection of these lands and similar areas across the globe often starts with the concerns of private citizens.

Vitor and Clemira Becker, owners of the private Serra Bonita Reserve, were living in Brasilia, 600 miles away from the Reserve, when they began to see the destruction of the Atlantic Forest. Each trip to the rainforest to gather specimens for their collection heightened their worries. Frustrated by the failure of national government-established protected areas, and alarmed by the damages, they took action themselves. The couple sold their home and gathered together their savings and retirement pension to buy a plot of relatively untouched forest on the slopes of the Serra Bonita mountain range, overlooking the old cacao farming municipality of Camacan.

“They even sold part of their moth collection,” their daughter, Moema, said in a confiding tone. Thousands of hours go into collecting, pinning and cataloguing individual insects, and a serious collection represents both a scientific archive and a lifetime achievement. But the sacrifice of selling part of their Lepidoptera collection was crucial: the forest, one of the most biodiverse places in the world, was diminishing rapidly and national efforts were poor at best.

Today, urgent threats to the forest are never far from the Becker family’s minds. In the past 10 years, the family and the reserve’s corresponding NGO, the Uriacu Institute, have protected 2,200 hectares. They hope their continued efforts of research and outreach will find pockets of like-minded partners who can help save the remaining 7,500 hectares of the Serra Bonita mountain range, critical habitat within the Brazilian Atlantic Forest.

As climate change worsens and poses a heightened threat to endangered ecosystems like the Brazilian Atlantic Rainforest, the continued conservation work of the Serra Bonita Reserve will prove essential in protecting a plethora of species from extinction.

“Losing a species is like losing a library full of books,” said Dr. Dyer to the roomful of young researchers. Each species and its diverse interactions is a Shakespearian play, he continued, and threats ranging from habitat destruction to climate change are destroying a library that, in many cases, has never been read.

It is too late to save the entire Atlantic Forest library, but the work of next generation researchers and conservationists continues to bring to light new intriguing species, many never before known to science — new interactions, and new hope for
FIELD REPORT: Lepidoptera Course

the remaining ecosystem—one butterfly book at a time.

Acknowledgements
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References

Fig. 4. Students on the course working in the laboratory and collecting out in the field. Credits: Bruno Miranda and Helber Adrian Arevalo Maldonado.