# *WINGS*

## ESSAYS ON INVERTEBRATE CONSERVATION

THE XERCES SOCIETY FALL 2010

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# Introduction

*Scott Hoffman Black*

In 1971, Robert Michael Pyle founded the Xerces Society with the intent of protecting butterflies. Although the Society has broadened its interests over the ensuing four decades and now works on behalf of a wide variety of invertebrates—beetles, dragonflies, caddisflies, snails, to name just a few—butterflies have remained at the core of our work. Whether supporting Pyle's efforts as the first chair of the Lepidoptera Specialist Group of the International Union for Conservation of Nature (IUCN) from 1976 to 1982, using legislation to protect at-risk species, or working with farmers and land managers to create or manage habitat, the Xerces Society has maintained a focus on butterflies.

We continue to advocate for the most endangered butterfly species and have reinvigorated our monarch-protection program, working to better understand and protect monarch overwintering areas in California and the native milkweed species that support summer populations. We have also recently expanded our international role, as I begin chairing the IUCN's newly reformed Butterfly Specialist Group.

This issue of *Wings* is dedicated to global butterfly conservation, highlighting the partnership between the IUCN and the Xerces Society and illustrating some of the threats facing butterflies—and the inspiring efforts that are being made to protect them. We have essays on butterfly diversity in Turkey and how dams and other developments pose a risk to this precious resource; how the loss of traditional farming methods may be threatening some species in Japan; and how formerly common butterflies in Florida have been declining. We also have articles on the history of global butterfly conservation and on methods for assessing the global status of butterfly species. We hope the essays and photographs will encourage you to get engaged in butterfly conservation in your local area and beyond.

**Long recognized as symbols of fragility and beauty, butterflies are indicators of a healthy environment. Concerted conservation efforts are needed to ensure that they retain their position in both our imaginations and our landscapes. Green-underside blue (*Glaucopsyche alexis*), photographed by Evrim Karaçetin.**

# Assessing the Status of the World's Butterflies

*Owen T. Lewis*

I remember vividly my first experience of the extraordinary diversity of tropical rainforests. Spectacular butterflies filled the air, and each individual I encountered seemed different from the last. In fact, habitats such as tropical forests are home to at least half of all species on Earth. These are also among the most threatened habitats globally, and it seems likely that many tropical forest insects and other invertebrates are threatened with extinction. We often hear about endangered birds, whales, or primates, but how many of us can name a globally endangered butterfly? That fewer than four hundred of the planet's eighteen thousand or so butterfly species have had their global conservation status formally assessed by the International Union for Conservation of Nature highlights this disparity.

**The IUCN is undertaking an assessment of the world's butterflies, based on a random sample of fifteen hundred species. This may include rare butterflies as well as common ones such as the orange tip (*Anthocharis cardamines*), shown here. Photograph by Silaev Andrey Aleksandrovich, iStockphoto.**

Butterflies are probably the best-known group of terrestrial invertebrates, but we still understand remarkably little about their conservation status globally. In comparison with birds and mammals—for which high-quality information on species distributions, status, and threats is often available—our knowledge about butterflies is slight. Thus, it is hardly surprising that vertebrates rather than invertebrates are typically used to set conservation priorities and to monitor trends in biodiversity. For example, indices showing changes in the status of birds, mammals, and amphibians are now used to track progress toward achieving the conservation commitments made by nations under the Convention on Biological Diversity. We know, however, that invertebrates are key players in many ecosystem functions and services, and that they are sensitive bellwethers of environmental change, so it would be helpful if they too could be included in these conservation indices.

To address this data gap, the IUCN is mounting a new effort to assess the status of the world's butterflies, the Red List Index for Butterflies (sampled approach), funded by the Esmée Fairbairn Foundation and the Institute of Zoology, part of the Zoological Society of London. The project draws together contributions from an informal network of

**The purple sapphire (*Heliophorus epicles*) has a dramatically different appearance with wings closed and open. Photographed in West Malaysia by Adrian Hoskins.**

approximately thirty butterfly experts from all over the world. Currently we do not know what fraction of butterflies globally is at risk of extinction, whether levels of peril vary geographically or taxonomically, what the major threats to butterflies are, and whether these differ from those affecting other taxa. As coordinator of this project, I hope that our work will help to answer all of these questions and will push butterflies, as flagship invertebrates, higher up the worldwide conservation agenda.

The IUCN provides a standardized method for carrying out assessments of the conservation status of individual species and publishes them in the Red List. Species are assigned threat categories—"Least Concern," "Near Threatened," "Vulnerable," "Endangered," "Critically Endangered"—based on such factors as rates of population decline, population size, area of geographic distribution, and the degree of fragmentation of population and distribution. Those species in the categories "Critically Endangered," "Endangered," and "Vulnerable" are at high risk of extinction and are considered "Threatened."

Typically, these Red List assessments can be carried out from a desk rather than in the field, drawing together information from scientific publications and expert knowledge. Systematic compilations of data on conservation status for groups such as butterflies can allow conservationists to identify taxa, regions, or habitats that are of particular conservation concern. Furthermore, if the assessment process is repeated regularly, then trends can be measured over time. This is the logic applied in calculating Red List indices for use as a conservation monitoring tool; by comparing the number of threatened species in repeated re-assessments, conservationists can determine whether the global or regional status of sets of species is improving or deteriorating.

With eighteen thousand species, there are too many butterflies on Earth for us to assess the conservation status of them all. Instead, our strategy is to focus on a random subset of fifteen hundred species. A genuinely random sample should be representative of butterflies

**The Indian fritillary (*Argynnis hyperbius*) has a wide distribution from East Africa across South and Southeast Asia to Japan, and south to New Zealand. Photograph by Masaki Ikeda.**

more widely in terms of the geographic and taxonomic spread of species as well as being indicative of their conservation status, and thus should provide an unbiased assessment of butterflies as a whole. For example, we do not set out to investigate rare species that may be more likely to be threatened, nor do we sample fixed numbers of species from different countries or continents.

There is no up-to-date inventory of all butterfly species, which may surprise some people. Compiling such an inventory provided the first challenge in applying the Red List index approach, because a random subset of species for assessment purposes must be drawn from a comprehensive list. Fortunately, various butterfly experts have documented regional butterfly faunas for many parts of the world, including, for example, the entire Neotropical realm. These lists provided the starting point for compiling a global species list.

The next challenge is to sort out some of the taxonomic confusion surrounding butterfly names. It is not easy to assess the conservation status of a species when its identity is uncertain! Butterfly taxonomy is in a constant state of flux, and much of the information available on particular species may be linked to incorrect or obsolete names. In particular, a great many butterfly names are synonyms—different names applied to the same species. Furthermore, historically, many species have been misclassified, and in many cases individuals have been misidentified, providing misleading information on distributions. All of these problems require considerable detective work to resolve.

Once these taxonomic problems have been adequately addressed, the next stage is to gather relevant information on the selected species, by consulting experts and by using whatever sources of information are available in the literature. For the relatively well-studied butterflies of Europe and North America, this is often straightforward; abundant information is typically available and experts are very familiar with the targeted species, even rare ones. In these cases we are able to calculate the area of distribution of each butterfly species, and in some cases we can even calculate approximate population sizes and trends. All of this information is useful for placing species into one of IUCN's threat categories.

The great majority of species, however, are little-known inhabitants of tropical forests, areas that are among

the most data-poor and most difficult to study. For example, around 20 percent of the world's butterfly species occur in Colombia, which represents less than 1 percent of Earth's land area. Many tropical forest species are known from a handful of records, and some from a single specimen alone. If, for instance, a species is known from one remote location in the forests of Central Africa but has not been recorded for fifty years, it is very difficult to know whether it is extinct, or is very rare, or has simply been overlooked. This is where evidence provided by regional butterfly experts can be invaluable. Even if they have never seen a particular species, they may know the localities where it has historically been recorded, whether the forest at these sites has been destroyed, and whether butterfly collectors (who are to thank for the large majority of records for these species) have searched the right locations at the right time. Many of these poorly known species may prove, with better study, to be much more widely distributed and experts may be able to infer from the behavior of related butterflies whether they are likely to have been overlooked elsewhere.

The results from the project should be ready by the end of the year, thanks to the participation and help of butterfly enthusiasts worldwide. One of the most rewarding aspects of this work has been the contacts I have been able to make with fantastically committed and knowledgeable lepidopterists, both amateur and professional, all around the world. In the short term I hope that the project will serve as a catalyst for further data sharing. It has already achieved one aim, formation of a new IUCN Butterfly Specialist Group, chaired by Xerces Society executive director Scott Hoffman Black. It may also inspire surveys in the field targeting particular species or sets of species that may be at risk: what butterfly enthusiast could resist the urge to travel to a remote rainforest in an attempt to rediscover a long-lost species? In the longer term, I hope that our work will ensure that butterflies get the recognition they deserve in terms of conservation planning and action—and that people will find it as easy to name a butterfly that is globally endangered as they do other more charismatic species.

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**Well-camouflaged butterflies like the aptly named magnificent leafwing (*Coenophlebia archidona*) can be hard to spot. Such simple things can influence estimates of population size. Photographed in Peru by Adrian Hoskins.**

# Butterflies in Turkey's Kaçkar Mountains

*Evrim Karaçetin and Hilary Welch*

Surveying butterflies in Turkey's Kaçkar Mountains was a once-in-a-lifetime experience, though at times rather a nail-biting one. On the narrow, cliff-hugging roads, confronting oncoming traffic was a test of the driver's reversing skill—and of the passengers' nerves. However, the steep mountainsides, deep valleys, and fast-flowing rivers that make driving hazardous also help make this region of northeast Turkey important for butterflies. A three-hour journey will take you from hot dry shrublands along the Çoruh River, up leafy valleys past sun-drenched hay meadows, through subalpine pastures and forests, and finally to sparsely vegetated peaks, traversing a diversity of ecosystems that provide niches for many different species.

The Kaçkars rise steeply from the Black Sea's southeast coast and lie at the crossroads of two continents. They are part of the southwestern arm of the Caucasus Mountains, a formidable range rising to 18,500 feet (5,640 meters), which spans the gap between the Black Sea and

**The stunning landscape and flower-filled meadows of the Kaçkar region are a big attraction to butterfly watchers as well as to the butterflies themselves. A butterfly camp held in 2009 was attended by enthusiasts from Turkey and four other countries, and participants saw more than 140 species of butterflies. Photograph by Hilary and Geoff Welch.**

**The higher areas of the Kaçkar Mountains are dominated by subalpine and alpine meadows. The Russian heath (*Coenonympha leander*) is a species limited to these open habitats. Photograph by Evrim Karaçetin.**

the Caspian Sea and forms a major physical and ecological divide between Asia and Europe. Politically, the Caucasus region includes Georgia (which shares the Black Sea coast with Turkey), Armenia and Iran in the south, and Azerbaijan on the Caspian to the east. To the north, the mountains extend into Russia.

The Caucasus is recognized as a global hotspot for wildlife. Twenty-five percent of the plant species in the region, 23 percent of the reptiles, 17 percent of the amphibians, and 13 percent of the mammals, are found nowhere else in the world. In northeastern Turkey, there are clusters of sites that are internationally recognized as important for birds and plants. Despite global awareness of the region's wildlife, no assessment of the overall importance of the Caucasus for butterflies had been made until about five years ago, when construction began on the Baku-Tbilisi-Ceyhan pipeline.

Built to transport crude oil from oil fields in the Caspian Sea to Ceyhan, a Turkish port on the Mediterranean coast, the pipeline passes through northeastern Turkey. The pipeline company's Environmental Investment Programme funded a project to identify the priority areas for wildlife conservation in the Turkish Lesser Caucasus, an area of 13,500 square miles (35,000 square kilometers). This project studied data for wildlife—including butterflies—and found that the 700-square-mile (1,800-square-kilometer) area around the town of Yusufeli in the Kaçkar Mountains was a remarkably rich center of biological diversity: a hotspot within a hotspot.

This concentration of biodiversity demands conservation action. Consequently, the Lesser Caucasus team initiated a follow-on project to help people in the area develop sustainable livelihoods that would actively conserve the region's wildlife. Supported by 1.8 million euros of funding from the European Union's Environment in Developing Countries Programme (roughly equivalent to 2.25

**The Apollo (*Parnassius apollo*) is found in high-altitude areas across Europe and Asia. As global warming causes temperatures to rise and habitats to change, this species has little room to move higher in the mountains, and so is at risk. Photograph by Evrim Karaçetin.**

million dollars), the project was implemented by a partnership of nongovernmental organizations with a university and a government ministry.

A driving force behind the effort to protect butterflies has been Doğa Koruma Merkezi (DKM, the Nature Conservation Centre). In 2008, in her role as senior conservation officer with DKM, one of the authors of this article, Hilary Welch, was given responsibility for organizing the biodiversity fieldwork in the Yusufeli region for the EU-funded project. Welch saw the task of forming the butterfly field team as both an exciting opportunity and a serious challenge, and from the start planned that lepidopterist Evrim Karaçetin and herself would be core members, so as to build their own experience and knowledge of Turkey's butterflies. Despite being born and brought up in Turkey, Karaçetin had never had the chance to visit the far northeast before; the region was not new to Welch, who is an experienced birder but a relative newcomer to butterflies. To fill the knowledge gap, the support of experienced field people was needed. Welch and Karaçetin thus counted themselves extremely lucky when three of Europe's top butterfly conservationists—Dirk Maes of Belgium, Szabolcs "Safi" Sáfián of Hungary, and Simon Spencer from Britain—agreed to join them for different periods.

The study area is located within the watershed of the Çoruh River, which drains the south and east slopes of the Kaçkar Mountains before emptying into the Black Sea on the Georgian coast. The Çoruh watershed includes the Barhal, Güngörmez, Çevreli, and Hatila rivers. The team of core members and rotating specialists, with logistical support from local project staff, carried out six weeks of tough but extremely rewarding fieldwork in this fabulous region.

Along the Çoruh River and its tributaries the hot, relatively dry climate has created a Mediterranean enclave, pro-

viding habitats for steppe butterflies. Among the species observed only here were the Turkish fiery copper (*Lycaena ochimus*), with its blazing tangerine wings, and the little tiger blue (*Tarucus balkanicus*), a delightful butterfly with both silver-blue spots and black stripes on the white underside of its wings. A butterfly which was always good to see even though not brightly colored was the Anatolian tawny rockbrown (*Pseudochazara mamurra*). The valleys along the Çoruh are also home for the Hi blue (*Polyommatus merhaba*), which seems to be endemic to this river system.

Northward and up into the Kaçkar Mountains, the dry grasslands and shrublands give way to subalpine and alpine meadows. It was here that the team found the Apollo (*Parnassius apollo*), the false heath fritillary (*Melitaea diamina*), and the Russian heath (*Coenonympha leander*), easily identified by a neat row of eyespots and silver marginal lines. In addition, the Caucasian clouded yellow (*Colias caucasica*) and Lederer's heath (*Coenonympha symphyta*), both endemic to the Lesser Caucasus, were spotted. These meadows have been managed by people living a pastoral existence for more than ten thousand years, and this has created a rich mosaic of habitats from forests to pastures. Finding ways to encourage people not to abandon traditional farming patterns in these mountains is crucial for maintaining the ecosystem and the butterflies it supports.

Moving northeast, the land drops into the Hatilla Valley. Here, the orientation of the valley and proximity of the Black Sea produce greater precipitation, and the extensive grasslands are reduced to small openings and pastures in extremely varied and lush mixed forests. Violet fritillary (*Boloria dia*) and pearly heath (*Coenonympha arcania*) were among the species recorded only in this bioregion.

During the survey, the team recorded 180 species of butterflies—nearly half of Turkey's total—including 21 species that were new to the region. Since 2008 additional species have been recorded; the Yusufeli-Artvin area alone now has a list of 201 species, a total that few European countries can beat!

Not all of the news is good, however. After completion of fieldwork at Yusufeli it was learned that there are plans for hydroelectric developments that will affect every valley and watercourse the team surveyed. These are part of the Turkish government's plan to generate more electricity and less carbon dioxide through promoting renewable-energy initiatives countrywide. While such initiatives are to be welcomed, the effect of

**Within the Kaçkar region, the little tiger blue (*Tarucus balkanicus*) is found only in the hot, dry climate of the Çoruh watershed. Photograph by Evrim Karaçetin.**

the projects on natural water cycles and on this mountainous landscape—and therefore on the area's local people and on its biodiversity—will be devastating.

While the places most directly impacted will be the valley bottoms and watercourses—sections of which are likely to become completely dry at certain times of year—the surrounding landscape will also be affected, as rivers are channelized to follow the contours of mountainsides, tunnels are dug to pipe water through mountains, generating stations are built, pylons are installed to carry electricity out of the region, and roads are built for construction and future maintenance. These will destroy areas of habitat over a much wider area and cause immediate butterfly population losses, but more insidious will be the fragmentation of the remaining populations and the resulting local isolation and slow but steady declines. For example, the large dam to be built on the Çoruh River at Yusufeli (part of a separate and already partly implemented large-scale hydroelectric scheme) will wipe out some populations of the endemic Hi blue, fragmenting and isolating those subpopulations that remain. Of course, since the plans for the dams and hydroelectric projects in the Kaçkar Mountains are not clear, their precise impact on butterflies is also unclear, but it is certain that butterfly populations will be negatively affected.

The authors had an unforgettable time in the field in 2008 and wanted to share with others what they had discovered. So, in 2009, DKM, building on the previous year's experience (and with funding from the Dutch government's BBI-Matra program), organized a butterfly-watching camp, bringing together enthusiasts and conservation experts to enjoy the Yusufeli area's butterflies. The camp also served as an example of responsible nature-based tourism. With everything organized through local people, it demonstrated the potential that such tourism has as a source of additional income. During the seven days of the camp the group of eighteen, comprising Turkish butterfly watchers and experts from the United States, Belgium, the Netherlands, and England, recorded a phenomenal 142 species, and proved that a camera, close-focusing binoculars, and patience are all that is needed to enjoy, photograph, and, if desired, study the finer differences between *eurypilus* and *argyrognomon*, *anteros* and *artaxerxes*, *corydonius* and *dorylas*. . . .

Looking forward, it is to be hoped that these efforts—both to assess the status of the butterflies and to help the people in the region see possibilities for active participation in conservation—will lead to many more people having the opportunity to enjoy the butterflies of the Kaçkar Mountains.

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*An assistant professor in the Environmental Science Program at Erciyes University, Turkey, Evrim Karaçetin completed her Ph.D. at Oregon State University in the United States.*

*Hilary Welch has been involved in nature conservation in Britain and the Middle East for more than thirty years. She is a senior conservation officer at DKM, a Turkish NGO based in Ankara.*

*Following Butterfly Conservation's sixth international symposium in Reading, UK, a petition was launched in opposition to the hydroelectric developments. To learn more, please visit www.savekackars.com.*

# Conservation of Butterflies In Japan's Changing Environments

*Yasuhiro Nakamura*

The Japanese butterfly fauna includes at least 240 species. A few of them have worldwide distribution and would be easily recognized by American and European visitors. These include the Old World swallowtail (*Papilio machaon*), the cabbage white (*Pieris rapae*), the small or American copper (*Lycaena phlaeas*), and the painted lady (*Vanessa cardui*). Other species would be less familiar to visitors, even though there is considerable overlap at the genus level between the Japanese, American, and European faunas. By exploring the major habitats of Japan—semi-natural grassland, marshy grassland, oak woodland and forests, beech forests, and alpine grassland—the more intrepid visitor would be able to spot a significant proportion of Japan's butterflies.

Some 15 percent of butterfly species, though, are at risk and are listed in the Red Data Book of Japan. Grassland butterflies are most threatened. For example, the populations of the checkerspot *Melitaea scotosia* and the fritillary *Fabriciana nerippe* have both declined by more than 90 percent in the last half century. Development and pesticide use have contributed to this dramatic loss. Another major cause of grassland butterfly decline is change in traditional land uses that have occurred, mainly since the 1950s, in areas known as *satoyama*.

Literally translated, *satoyama* means village (*sato*) mountain (*yama*), and re-

**More than 240 species of butterflies can be seen in Japan, including some that have global distribution. Old World swallowtail (*Papilio machaon*), photographed by Lisa Nead.**

fers to the countryside around settlements as it transitions from residential areas into the surrounding mountains. This highly diverse landscape is dominated by small fields, and can include grasslands, coppice woodlands, rice paddies, pine groves, and irrigation ponds, as well as the villages themselves. The *satoyama* once covered about 20 percent of the total land area of Japan, and has been maintained by traditional forms of farming and forestry. In the temperate region of Japan, *satoyama* woodlands are generally oak (species such as *Quercus serrata* and *Q. acutissima*). These woodlands were typically managed by coppicing, in which the trees are cut to the stump at intervals of ten years or more. They regrow with multiple stems that are harvested for use as firewood and charcoal or as the substrate for cultivation of shiitake and other mushrooms. Woodland mushrooms were also collected. Grasslands were maintained as hayfields and pasture, providing animal feed, roof thatching, green manure for crop fields, and fuel. In addition to a sustainable supply of such resources, the mosaic *satoyama* landscape provided important semi-natural habitat for a variety of plants and animals, including butterflies.

Now, changes in rural culture and populations are altering the *satoyama*. Their economic value has been lost to waves of industrialization, the increased use of oil for heating, and the introduction of chemical fertilizers. Consequently, most *satoyama* ecosystems have been abandoned or destroyed, a trend that has accelerated in the last thirty or forty years. The abandonment of traditional

**Social and economic changes are altering traditional farming practices in the *satoyama*, countryside around villages and towns in Japan. The resulting habitat changes place many butterflies at risk. Photograph by Yasuhiro Nakamura.**

**Due to predation by the non-native green anole lizard, the Ogasawara blue (*Celastrina ogasawaraensis*) is now found on just one of the islands in the Ogasawara archipelago. Photograph by Yasuhiro Nakamura.**

management has placed a question mark over the future of the butterflies and other wildlife of the *satoyama*.

Grasslands have been hit worst. In the Edo Period (1603–1868), grasslands covered more than 30 percent of Japan. Work done by Dr. Jun-ichi Ogura of Kyoto Seika University demonstrates that by the early 1900s grasslands had declined to about 13 percent of the country. Now they are less than 1 percent of the land, resulting in the extreme decline of grassland butterflies. Woodland butterflies have fared better, at least for now. Although more than forty species breed in actively managed coppice woodlands, only a few species are listed as threatened, and the rate of decline remains at a relatively low level.

Threats to Japan's butterflies are not limited to the mainland. The Ogasawara Islands (also called the Bonin Islands) are a volcanic archipelago of more than thirty islands that lie about 620 miles (1,000 kilometers) south of the Japanese mainland. As is typical of isolated oceanic islands, a considerable proportion of wildlife species are endemic—approximately 30 percent of insects on the Ogasawaras are found nowhere else—but many foreign plants and animals are now established. The Ogasawara blue (*Celastrina ogasawaraensis*), a butterfly endemic to the Ogasawaras, was relatively common until the 1970s but declined rapidly and is now found on only one island. The main cause of decline is predation by the green anole (*Anolis carolinensis*), a non-native lizard from North America that is thought to have arrived in the islands during two decades of U.S. occupation following World War II. Efforts are now being made to eradicate the green anole to protect the butterfly, but elimination of the lizard, with an estimated population of more than six million in the Ogasawaras, is considered to be almost

impossible. Thus, as a practical matter, says Mr. Mitsuhiko Toda of the Japan Wildlife Research Center, exterminating the lizard is a high priority only in certain areas where it is thought to have the most likelihood of success.

Despite the various pressures on Japan's butterflies, we are fortunate that none of them have gone extinct. The Ogasawara blue and the checkerspot *Melitaea scotosia* are in extreme peril, however, and the need to prevent their extinction has contributed to the development of a butterfly conservation movement in Japan.

The first step was taken in 1965, when the Lepidopterological Society of Japan founded the Research Group of Nature Conservation, now the Conservation Committee. The Society has undertaken a number of additional measures to protect butterflies, including putting on seminars and generating publications about butterfly conservation, creating a Red List of threatened butterflies in each prefecture (roughly equivalent to a state in the United States, or to a British county), developing a nationwide survey of garden butterflies, petitioning for butterfly conservation, and managing habitat for threatened species. Despite these efforts, the decline of butterflies has accelerated over recent decades, mainly because of a shortage of specialists doing actual conservation work.

In 2004, feeling a sense of urgency about the state of Japan's butterflies, I called some colleagues and established the Japan Butterfly Conservation Network, which subsequently became the Japan Butterfly Conservation Society. The work of this organization focuses on research into endangered species and their conservation, publicity and educational activities, and providing advice on butterfly conservation to administrative agencies, citizen groups, and the general public. The Society has undertaken monitoring and conservation activities for more than fifteen endangered species, including organizing volunteer work parties to restore and manage habitats. The Society also promotes the importance of conservation in general, and, through various educational activities—including an annual butterfly-conservation symposium attended by about three hundred people—emphasizes the value of butterflies as an indicator of the health of the natural environment.

**Since the middle of the twentieth century, populations of the fritillary *Fabriciana nerippe* have declined by some 95 percent. Photograph by Yasuhiro Nakamura.**

Public awareness about environmental conservation has been increasing. Activities to conserve the *satoyama*

—aimed at preserving wildlife as well as at improving the landscape and forests and expanding recreational opportunities—have also grown. There are now more than a thousand organizations related to caring for the *satoyama*.

Governmental policy on biodiversity in Japan is framed by the National Biodiversity Strategy, which was first published in 1995 in accordance with the Convention on Biological Diversity, the international treaty agreed to at the Earth Summit in June 1992. This strategy is reviewed periodically, and, under its guidance, national biodiversity projects are making substantial progress. The Third National Biodiversity Strategy, published in 2007, has as one of its three targets the conservation of "region-specific animals, plants, and ecosystems in accordance with regional characteristics." Local prefectural governments also speak publicly about the importance of conserving threatened species. Even so, it is clear that current measures are insufficient, and that not enough resources are dedicated to preserving biodiversity.

The Japan Butterfly Conservation Society sets targets at the national and prefectural levels to protect threatened butterflies from extinction. The Society recognizes that we need to address conservation from both the scientific and social points of view, as these are closely linked. We also need to improve the wider landscape for butterflies, and not focus only on threatened species. Global warming is a particular issue: the impact of changes in vegetation and of extraordinary or unseasonal weather on Japan's butterflies is of increasing concern. In the spring of this year, the number of adult *Luehdorfia japonica* swallowtails was relatively low in most of the country, probably due to the unseasonally cool weather in April. In addition, at least ten species may be shifting their distribution northward; in an island nation this could significantly damage biodiversity, because there is a limit on how far distributions can move in response to climate change. All of this places a greater urgency on conserving and restoring the *satoyama*. In particular, a new approach is needed to maintain this landscape in an economically sustainable manner. Projects using native grasslands and coppice woodlands as biomass resources are already underway, and such efforts could well play a role in combating climate change.

My own interest in insects, particularly butterflies, began when I was in elementary school. I would roam the forests and paddy fields near Tokyo, watching the abundant insects and fishes in *satoyama* that has now become a residential neighborhood, with the attendant loss of many good butterfly sites. For me it would be a great pleasure to bring back the wildlife that once inhabited this environment. Although my work with the Japan Butterfly Conservation Society is just beginning, with a few projects accomplished so far, I live in hope of progress toward the coexistence of humans and butterflies in our near future.

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*The executive director of the Japan Butterfly Conservation Society, Yasuhiro Nakamura has a particular interest in the conservation biology of butterflies. He was previously a researcher at the Japan Wildlife Research Center and an assistant professor at the Gifu Academy of Forest Science and Culture.*

# Florida Butterflies

*Jaret Daniels*

On a recent butterfly-monitoring trip to south Florida, it occurred to me that I have made this long and at times mind-numbing drive down the peninsula from Gainesville approximately sixty-five times over the past twenty years. Since my first trip, much of the surrounding landscape has changed, and not for the better. Roadsides and natural areas used to be alive with butterflies, but these days, unfortunately, such sights are more the exception than the rule. As with a great many other areas, the environment of south Florida and the Florida Keys has been significantly altered and continues to face many new emerging threats. Numerous species have suffered the consequences, butterflies included.

The butterfly fauna of south Florida is strongly influenced by the presence of the West Indies island chain to the south and has long been a destination for collectors seeking local rarities or the odd tropical vagrant. Today, it appeals to butterfly watchers for the same reasons. The Florida Keys in particular boast a remarkably diverse fauna—more than a hundred recorded species in a relatively small geographic area. In addition, some sixteen subspecies are endemic, or nearly so, to tropical Florida. Collections, surveys, and other observations offer a wealth of valuable information

**Change is a constant for butterflies in south Florida and the Keys. The gray ministreak (*Ministrymon azia*) may be encountered one year and then not seen for the next two or three. Photograph by Kim Davis and Mike Stangeland.**

**Evidence suggests that an increasing number of Florida's butterflies are in trouble. The Florida duskywing (*Ephyriades brunnea floridensis*) is a species in decline. Photograph by Bill Bouton.**

about the past, present, and future of this unique community of butterflies. Unfortunately, within the last several decades, approximately thirty butterfly species have experienced alarming declines, a loss of diversity that has received surprisingly little attention.

Change is nothing new to south Florida environments. They are by nature dynamic systems that regularly experience disturbances from tropical cyclones 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 butterfly species from the islands, as evidenced by an ever-expanding list of species records. Island populations, whether inhabiting a true archipelago or defined as living within pockets of remaining habitat surrounded by inhospitable landscapes, are inherently volatile. They go through constant change in which extinction is balanced by the regular influx of immigrants.

For those who have spent time in the Florida Keys, or in any place in extreme south Florida for that matter, it is quite clear that there is a tremendous turnover of species from month to month and from year to year. Butterflies such as the Cuban crescent (*Anthanassa frisia frisia*), the amethyst hairstreak (*Chlorostrymon maesites*), and the gray ministreak (*Ministrymon azia*) remain unseen for extensive periods and then, seemingly out of nowhere, pop up only briefly and in just one site. The same inconsistencies can often be witnessed for more widespread south Florida species, such as the barred yellow (*Eurema daira*), Julia (*Dryas iulia*), malachite (*Siproeta stelenes*), and Florida white (*Glutophrissa drusilla*). A monitoring trip to Matheson Hammock Park in Miami or to Key Largo may turn up numerous individuals of these species, while subsequent visits to the same location may result in no sightings. Still other butterflies—the atala (*Eumaeus atala*) and the

**The great southern white (*Ascia monuste*) is one of a variety of species that are common in many years but scarce in others. The reasons for this are little understood. Photograph by Bill Bouton.**

great southern white (*Ascia monuste*), for example—undergo considerable population fluctuations, experiencing boom and bust years, more or less cyclical for some commoner species but variable and little understood for others.

Over the years, researchers and butterfly enthusiasts have gotten used to this inherently unpredictable fauna, but recently the changes have become all too predictable. Survey after survey seem to support the same trend of low numbers and limited sightings, and the resulting data suggest a system-wide decline. By the early 1980s, butterflies such as the little metalmark (*Calephelis virginiensis*), Hayhurst's scallopwing (*Staphylus hayhurstii*), and the palmetto skipper (*Euphyes arpa*) had disappeared from the Florida Keys. In the years that followed, other butterflies, including the Bahamian swallowtail (*Papilio andraemon*), apparently winked out. Soon after the destruction caused by Hurricane Wilma in 2005, known populations of the nickerbean blue (*Cyclargus ammon*) and the Florida leafwing (*Anaea troglodyta*) were lost on Big Pine Key. Most alarming, though, has been the likely extirpation of the Rockland grass skipper (*Hesperia meskei pinocayo*), endemic to Florida, and the Zestos skipper (*Epargyreus zestos zestos*), found nowhere else in the United States. If indeed gone, they would represent the first documented losses to Florida's butterfly fauna and would be among the few butterfly extinctions known to have occurred in the entire United States.

Many other south Florida butterflies are in very serious trouble. The well-publicized collapse of the Miami blue (*Cyclargus thomasi bethunebakeri*) from a widespread, locally common butterfly to a critically imperiled candidate for federal listing exemplifies the

situation. Today, the Miami blue barely clings to existence in the Lower Keys, despite considerable and aggressive efforts at conservation. What may be even more disturbing, though, is that such declines are occurring on conservation lands, even in historic stronghold locations. Populations of the tropical buckeye (*Junonia evarete*), the Florida purple wing (*Eunica tatila*), Bartram's hairstreak (*Strymon acis*), the Florida white, Klot's palatka skipper (*Euphyes pilatka klotsi*), the Dina yellow (*Pyrisitia dina*), the Florida duskywing (*Ephyriades brunnea floridensis*), and Schaus' swallowtail (*Papilio aristodemus ponceanus*) are either in decline or are critically habitat-limited, or both.

The primary factors triggering the losses are poorly understood at best. A variety of anthropogenic and biological factors have been implicated, including habitat loss and fragmentation, mosquito-control spraying, fire (both wild and intentional), exotic predators and parasitoids, and inadequate habitat management, along with the typical assortment of demographic, genetic, and environmental influences on the persistence of small, widely separated populations. Moreover, basic species-specific data—regarding the general ecology, population dynamics, threats, habitat requirements, and best management practices—are incomplete, and therefore obtaining these data must be a high priority for future research.

**The Miami blue (*Cyclargus thomasi bethunebakeri*) is one of Florida's best-known butterflies, thanks largely to campaigns to protect it and save it from extinction. Photograph by Jaret Daniels.**

Despite the many problems, not all the news is bad. The magnitude of these declines sparked the formation of a statewide working group to 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 represents the first such coalition in the Southeast to focus on insects. The workgroup intends to promote the regular exchange of information among agencies, identify research priorities and educational needs, and catalyze the development of additional partnerships for butterfly recovery. With this renewed interest and engagement, I am optimistic that, in another twenty years, the landscape seen out of the window during trips across Florida will once again dance with butterflies.

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*Jaret Daniels has more than sixteen years of experience working with imperiled butterflies in the United States and the Caribbean. He is the assistant director for research for the Florida Museum of Natural History's McGuire Center for Lepidoptera and Biodiversity.*

# Butterfly Conservation in 2010: How We Got Here

*Robert Michael Pyle*

No one who has followed the two best-known strands of Paul R. Ehrlich's multifaceted life should be surprised by the condition we find ourselves in with respect to butterflies and their conservation today. Stanford professor and Xerces counselor Ehrlich's first book was the brilliant and pioneering field guide and key, *How to Know the Butterflies*, published in 1961 with Anne H. Ehrlich; and his laboratory has made Edith's checkerspot (*Euphydryas editha*) one of the most well-studied organisms in the scientific world. The second strand appeared in 1968 with publication of his landmark volume *The Population Bomb*, in which he forecast disastrous ecological effects from the rapidly growing human population. Since he wrote the book, world population has doubled, from about three and a half billion people to nearly seven billion. Put the two together, and what do you get? A perfect example of Ehrlich's impact formula, or IPAT: I = P x A x T (where I is Environmental Impact; P is Population; A is Affluence; and T is Technology). In other words, butterflies in a world of hurt.

Yet, as painful as it is to recognize the many ways in which butterflies (and other invertebrates) have come into grave jeopardy through the demands made by our own abundant kind upon the land, it is also exhilarating to see the many responses—energetic, sophisticated, often effective—from those who

**Edith's checkerspot is one of the best-studied butterflies. This subspecies, Taylor's checkerspot (*Euphydryas editha taylori*), is found only to the west of the Cascade Range in Oregon, Washington, and British Columbia. Photograph by Dana Ross.**

**The loss of the large copper from Britain in the middle of the nineteenth century sparked early conservation efforts for butterflies. In 1927, a reintroduction was attempted at Woodwalton Fen with individuals of the Dutch subspecies (*Lycaena dispar batavus*, shown here). Photograph by Adrian Hoskins.**

care. Of course we also fumble and stumble in territory and among organisms we barely know, let alone comprehend. But the vigor and results of butterfly conservation today are far greater than we might have imagined in the 1960s.

In fact, the modern movement to protect our butterflies got going just about the same time that *The Population Bomb* appeared. But first, let's go back farther, to the draining of the English Fens, the great marshes of East Anglia. Begun by the Romans nearly two millennia ago and perfected by the Dutch in the eighteenth century, the drainage was largely complete by the middle of the nineteenth. Soon, entomologists began to notice the absence of wetland insects they had come to know and love. One in particular, the large copper (*Lycaena dispar dispar*), a brilliant and beloved butterfly, became extinct in Britain around 1848. Its loss, and that of several other species over the next decades, inspired much comment. In 1925 the first group dedicated to the cause arose: the Committee for the Protection of British Lepidoptera, organized under the Royal Entomological Society of London (and chaired by Lord Walter Rothschild, uncle of the late Xerces counselor Dr. Miriam Rothschild).

Parallel events occurred in the United States during the same era. In 1875, San Francisco lepidopterist Herman Behr wrote to his friend Herman Strecker in Pennsylvania: "*Glaucopsyche xerces* [the Xerces blue] is now extinct as regards the neighborhood of San Francisco. The locality where it used to be found is converted into building lots, and between German chickens and Irish hogs no insect can exist besides louse and flea." On the opposite coast in 1876, A. R. Grote expressed concern for the famous White Mountain butterfly (*Oeneis melissa semidea*) on New Hampshire's Mt. Washington. "What

time, on Bigelow's Lawn," he wrote, "I see the ill-advised collector, net in hand, swooping down on this devoted colony, of ancient lineage and more than Puritan affiliation, I wonder if, before it is too late, there will not be a law passed to protect the butterflies from the cupidity of their pursuers. I commend this colony to the protection of all good citizens of the state of New Hampshire." It is doubtful that collectors could threaten this elusive butterfly of difficult terrain. Nevertheless, Grote's plaint must be considered—along with Behr's nearly simultaneous lamentation for the Xerces blue—as the beginning of butterfly conservation awareness in North America.

Although butterflies benefited incidentally from the creation of America's first national parks, it was the middle of the twentieth century before active steps were taken to protect them. The ordinance passed by the City of Pacific Grove, California in 1952 to protect monarchs (later joined by an ordinance protecting overwintering sites) represented a growing appreciation of butterflies. But the earliest concrete efforts to conserve them may have been two actions in the 1960s. The first was George Rawson's attempt to reintroduce the atala (*Eumaeus atala*), then exceedingly rare (and, later, the namesake of the Xerces Society's erstwhile journal), into Everglades National Park in Florida. Soon after came the creation of what may well have been the first habitat reserve set aside for an American butterfly, the Moxee Bog preserve in Yakima County, Washington, established on behalf of a relict population of the silver-bordered fritillary (*Boloria selene atrocostalis*) by the Nature Conservancy, thanks to the work of Dr. David McCorkle. It was also McCorkle who proposed the original conservation committee of the Lepidopterists' Society at its 1967 annual meeting in Corvallis, Oregon, at which I presented a paper on "Conservation and the Lepidopterist." In that same year, William Sieker published a paper entitled "The Importance of Protecting Natural Habitats—NOW!" It was clear that something was brewing.

Desiring to pursue the science of butterfly conservation, I found the only place to go was England, where it all began. Under a Fulbright-Hays Scholarship, I studied under John Heath and a half-dozen other British scientists at the Monks Wood Experimental Station. John was developing the British Butterfly Recording Scheme, which led to conservation mapping for butterflies. Eric Duffey was investigating the ecology of reintroducing continental large coppers to Woodwalton Fen. Jack Dempster was doing the same with British swallowtails at Wicken Fen (Darwin's favorite beetle-collecting grounds), and Jeremy Thomas was working with him as a graduate student studying the autecology of black and brown hairstreaks. Ernie Pollard was launching his now-famous "Pollard Walk" butterfly transect method. The place was a hotbed of cutting-edge science in service of rare insect conservation and restoration; it was exciting to be there! But when I left I had no notion what to do with it all.

It was a lecture on the conservation of the British large blue (*Maculinea arion eutyphron*) by Grahame Howarth at the Linnaean Society that gave me the idea. Howarth said, "If we lose the large blue, let's let it be a symbol that we should never lose another British butterfly." On the way north on the train that night,

December 9, 1971, I realized that we had already lost a blue in the United States—the Xerces blue, which had passed from Earth in about 1943. "X" also stood for extinction. "Let's have the Xerces Society," I thought, and began sending out postcards. About that time the beloved lepidopterist Jo Brewer published an article on butterfly conservation in *Audubon*. I wrote to her, and she joined me as co-director. Xerces was underway.

One of the postcards went to Yale University professor Charles Remington, co-founder of the Lepidopterists' Society in 1947. He staged a symposium on "Endangered and Extinct Lepidoptera" at the group's meeting in San Antonio in 1972, and asked me to present the Xerces idea there. This resulted in my undertaking doctoral studies with him at Yale, which became Xerces' incubator. The first Xerces meeting, at Yale in 1974, featured Miriam Rothschild and Alexander B. Klots; the second, at Cornell, included Roger Tory Peterson as a great supporter. It was again back at Yale in 1985 when the board hired Xerces' first executive director, Melody Mackey Allen, and American butterfly conservation entered the professional arena. Allen recruited an extraordinary succession of presidents, including Drs. E. O. Wilson and Thomas Eisner, who vastly enhanced Xerces' credibility. That tradition continues today with our distinguished president, Dr. May Berenbaum.

Meanwhile, on the world stage, the International Union for Conservation of Nature extended its remit to invertebrates. I became the first chair of the IUCN Lepidoptera Specialist Group. The Group (including several of my

**Wicken Fen in eastern England may be considered a crucible of butterfly conservation. Much visited by Charles Darwin, it was home to early conservation attempts and is now protected as a Site of Special Scientific Interest. Photograph by Tim Laughton.**

Monks Wood mentors) met at the International Congress of Entomology in Washington, D.C., in 1976, and declared the migratory monarch winter roosts in Mexico—then only recently located!—and California to be the top priority in world butterfly conservation. The next year I studied conservation needs of the giant birdwing butterflies in Papua New Guinea, and, at the 1978 IUCN General Assembly in Ashkhabad, Turkmenistan, Queen Alexandra's birdwing (*Ornithoptera alexandrae*) and its rainforest habitat joined monarchs as a top priority. Thanks to the vision of Sir Peter Scott, the first Invertebrate Red Data Book was compiled and published by the IUCN and the World Wildlife Federation, and butterfly conservation came of age.

The subjects of many of Xerces' earliest campaigns, such as the Oregon silverspot (*Speyeria zerene hippolyta*) and the Karner blue (*Lycaeides melissa samuelis*, recently revised to *Plebejus samuelis*), have since become federally listed. Whereas the articles published in the sixties were lonely exceptions, you can no longer open an issue of the *News* or *Journal* of the Lepidopterists' Society (or any like publication) without finding much of the content relating to conservation ecology. The same is true of the agendas of all of the major meetings of the learned biological societies, and many labs besides Ehrlich's are working on questions of butterfly and moth ecology and management.

The British Butterfly Conservation Society has grown into Butterfly Conservation, a powerhouse of conservation in the United Kingdom and Europe, with Sir David Attenborough as its president. Most European countries and others across the globe have equivalent organizations, but few are as influential. Many American states have agency officials detailed to monitor and protect small-scale animals and their habitats, though

**Not all species that are federally listed as endangered are limited to a single area. Small populations of the Karner blue are scattered across a thousand miles from Minnesota to New York. Photograph by Bill Bouton.**

**The Oregon silverspot (*Speyeria zerene hippolyta*), now listed as threatened under the U. S. Endangered Species Act, was the subject of an early Xerces campaign. Photograph by Dana Ross.**

a number of states lack legislation that protects insects. A recent meeting of the Imperiled Butterfly Conservation and Management program in Oregon brought together dozens of butterfly conservation professionals from all over the country. I'm not sure whether I was more dumbfounded by that or by a visit with entomology graduate students at a western university, who all wanted to know how they could get jobs with Xerces or in butterfly conservation. We've come a long way from the early days when grad students in certain entomology departments called us "the Jerkses Society."

And now Xerces executive director Scott Hoffman Black is taking on the duties of chairing the IUCN Butterfly Specialist Group. This can only serve to strengthen the Xerces Society's international ties and the sharing of information, knowledge, and expertise for the conservation not only of North America's, but of the entire world's rich heritage of butterflies and moths. There is no escaping that Paul Ehrlich's predictions have largely come to pass, and that butterflies, like ourselves, stand at great risk from the baleful effects of human excess. In the fifty years since his book by that name, we still desperately need to learn "how to know the butterflies." But the history of our efforts in that direction is also rich, with many dedicated scientists and others taking part along the way. We may take courage in the progress we've made together, all of us who care about these bright wings of summer, and the world they so enliven.

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*A student of Lepidoptera for fifty years and their conservation for more than forty, Bob Pyle writes and studies nature in tidal southwest Washington. His most recent book is* Mariposa Road: The First Butterfly Big Year.

## Xerces Society Takes a Global Lead on Butterfly Conservation

With nearly twenty thousand species worldwide, butterflies as a group are not at risk because most species are generalists or are widely distributed. A significant number of species, though, are highly specialized or are restricted to one or a few small patches of habitat. In addition, recent studies show that some species that were formerly widespread or common are now declining. This puts a question mark over the future of many butterfly species across the globe.

With that in mind, the International Union for Conservation of Nature (IUCN) has re-formed its Butterfly Specialist Group to bring together scientists and conservationists in a cooperative effort to facilitate butterfly conservation projects worldwide. Scott Hoffman Black, executive director of the Xerces Society, was appointed as chair of this Specialist Group.

At a recent meeting of the IUCN Species Survival Commission Invertebrate Conservation Subcommittee in Cambridge, England, Scott discussed his hopes that the Butterfly Specialist Group will prioritize work in countries and regions traditionally underserved by butterfly conservation organizations, so that meaningful progress can be made without duplicating their efforts.

Over the next six to eight months, a steering committee will be identified and developed. One of the first tasks to be undertaken by the Specialist Group is a questionnaire to be sent to butterfly researchers and conservationists worldwide to identify species or regions in most need of help. Once this needs assessment is complete an action plan will be developed to prioritize individual species status assessments, surveys, and direct conservation action.

The Xerces Society has agreed to make its staff members available to help drive the process forward, especially in the early stages while the global network is being assembled. For more information or to become involved in this process, please contact Ashley Minnerath, ashley@xerces.org.

## Xerces is a Founding Partner in the Monarch Joint Venture

When monarch butterflies come up in conversation, we usually think of the epic journey they make to their winter roosts in the hills of Michoacan, Mexico, where they gather by the millions, blanketing trees. What people often do not realize is that many monarchs west of the Continental Divide overwinter along the coast of California. Although not as extensive as their Mexican counterparts, these winter roosts may contain tens of thousands of butterflies.

Reports on the status of overwintering populations of monarchs are concerning. Annual counts on the California coast have revealed a nearly 90 percent population decline across most sites—and some sites have fared signifi-

cantly worse. For example, overwintering populations at Natural Bridges State Beach near Santa Cruz have plunged from 120,000 monarchs in 1997 to only 1,300 in 2009. Population declines at overwintering sites in Mexico have also been well documented.

The precise cause of these losses is unknown, but scientists believe that they are due to changes in both overwintering areas and summer breeding habitat. Overwintering sites in Mexico have been impacted by deforestation and catastrophic winter storms, and some California sites have been lost to encroaching development; California's remaining overwintering sites are also changing due to aging trees. In summer breeding areas, long-term drought and urban and agricultural development have reduced the amount of milkweed.

The Xerces Society is a founding member of the Monarch Joint Venture, a partnership of federal and state agencies, nongovernmental organizations, and academic programs, that are joining together to protect monarchs and the habitat they need to survive. Xerces and the Monarch Joint Venture are assessing the current condition of overwintering sites in California, developing management guidelines for the overwintering groves, and reviewing the laws regulating the management of these sites. We are also working across the southern and southwestern United States to develop sources of locally native milkweed seed that can be used to restore habitat for monarchs.

You can help monarchs by planting milkweed and other nectar-rich native flowers and by eliminating or reducing pesticide use. If you live in California, you can join the annual Thanksgiving counts of overwintering monarchs and encourage your elected officials to protect overwintering sites. You can also help by donating to the Xerces Society's Monarch Campaign. For more information, contact info@xerces.org.

**Monarch overwintering sites in California are typically groves of eucalyptus, shown here, or Monterey cypress. Thousands of butterflies spend the winter months in sites along the California coast. Photograph by Ryan Poling, iStockphoto.**

## Announcing the Publication of *Attracting Native Pollinators*

We are excited to announce that our new book, *Attracting Native Pollinators: Protecting North America's Bees and Butterflies*, will be published in February by Storey Publishing, North Adams, Massachusetts. *Attracting Native Pollinators* is coauthored by four Xerces staff members—Eric Mader, Matthew Shepherd, Mace Vaughan, and Scott Black—in collaboration with Gretchen LeBuhn, a San Francisco State University botanist and director of the Great Sunflower Project.

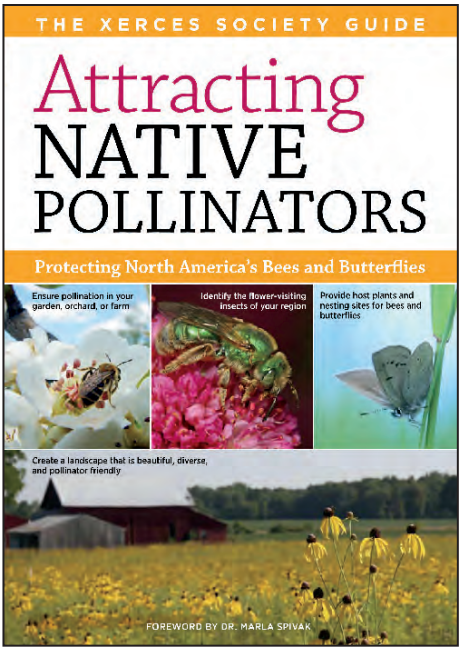
Since Xerces published the groundbreaking *Pollinator Conservation Handbook* in 2003 conservation practices have evolved, and that book has begun to show its age. At 380 pages, *Attracting Native Pollinators* provides dramatically expanded breadth and detail, reflecting the latest understanding about creating and managing pollinator habitat.

Illustrated with hundreds of color photographs and dozens of specially created illustrations, *Attracting Native Pollinators* is divided into four sections:

◆ **Pollinators and Pollination** explains the value of pollinators, and includes informative chapters on the natural history and habitat needs of bees, butterflies, flies, beetles, and wasps.

◆ **Taking Action** provides comprehensive information on ways to help pollinators and on creating nest sites and safe foraging areas. It includes guidance on conserving pollinators in all kinds of landscapes: gardens, natural areas, farms, recreation land, even ecoroofs.

◆ **Bees of North America** provides help with identifying the more abundant and important bee species, and supplies detailed profiles of more than thirty commonly encountered genera.




◆ **Creating a Pollinator-Friendly Landscape** shows how various kinds of land, including urban gardens, suburban parks, and farms, can be enhanced to support diverse pollinator populations. Sample planting designs and fifty pages of illustrated plant lists facilitate selection of the best plants for any region.

According to Douglas W. Tallamy, author of *Bringing Nature Home*, "*Attracting Native Pollinators* belongs on the bookshelf of everyone who values the future of the natural world."

To pre-order your copy, visit www.xerces.org. Xerces Society members receive a discount. Books will be shipped in late February.

## Pollinator Short Courses Presented Across the Country

Xerces' Pollinator Conservation Program has launched a three-year project to provide training to U.S. Department of Agriculture conservation staff, partners, and farmers on ways to improve conditions for pollinators. In the past six months, our staff has presented sixteen day-long pollinator short courses to more than six hundred people in eleven states, from Oregon to New Hampshire. We will continue these presentations over the next two years, bringing the number of states visited to three dozen.

Each short course equips attendees with the latest research-based approaches to reversing the trend of pollinator decline, particularly on working farms. Funding has been provided by the USDA Natural Resources Conservation Service and Sustainable Agriculture Research and Education's Professional Development Program.

## Reprints of Publications by Thomas Eisner Now Available

A love of insects has been the foundation of Thomas Eisner's professional life, and drew him to serve as Xerces president for fourteen years. Retired now from Cornell University, where his prolific research and teaching career spanned more than five decades, he is offering reprints of his publications to fellow insect enthusiasts for a limited time.

Tom's work includes writings on scientific research, conservation, human rights, and other issues. To view his bibliography, visit www.nbb.cornell.edu/neurobio/Eisner/eisner.html. To request reprints, send an email to te14@cornell.edu, by May 1, 2011. Include the publication number(s), as well as a complete mailing address.

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For information about membership and our conservation programs for native pollinators, endangered species, and aquatic invertebrates, contact us:

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**The painted lady (*Vanessa cardui*) is one of the world's most widespread butterflies, being found on all continents except South America and Antarctica. Sadly, recent studies are showing that even such common species are in decline. Photograph by Bill Bouton.**

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**A $30 per year Xerces Society membership includes a subscription to *Wings*.**

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**Our cover photograph shows a malachite (*Siproeta stelenes*). Many butterflies live in environments subject to ceaseless change by natural events and human activities; populations of malachites in southern Florida are in constant flux and may or may not be found in the same site from one year to the next. Photograph by Bill Bouton.**