

The Butterfly People—and their impacts on the creatures they love

by

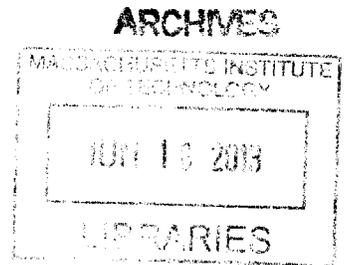
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# The Butterfly People—and their impacts on the creatures they love

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## ABSTRACT

Humans have been entranced by butterflies for thousands of years. This thesis parses apart the complex interactions between humans and butterflies, focusing specifically on people whose lifestyles are significantly intertwined with butterflies. On-site research observing butterfly collectors, breeders, museum curators, photographers and conservationists was conducted, along with historical and biological research. The effect of humans on butterflies was also analyzed, and it was discovered that enthusiasts often have unexpected impacts on butterfly populations.

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Title: MIT Museum Director and Adjunct Professor in the Science, Technology & Society Program

On July 23, 2006, Ed Newcomer, an undercover Fish and Wildlife agent, finally managed to catch Hisayoshi Kojima. After his plane descended into Los Angeles, Kojima had hidden his valuable cargo in a slim wooden box and attempted to exit the airport. But a suspicious customs official detained him and notified the agent. When Kojima first saw Newcomer, he seemed relieved, thinking him a friend. Instead, Newcomer showed Kojima his badge and arrested him for smuggling.

This was a triumphant moment for Newcomer. He had been trying to catch Kojima in the act since 2003, having infiltrated his smuggling ring. The Fish and Wildlife service had been after Kojima even longer than that, with Kojima's name first being tied to an infamous case back in 1995. Other agents had attempted to unearth enough evidence to arrest the smuggler, but without success.

Kojima earned his livelihood from illicit activities, smuggling and then selling his contraband for tens of thousands of dollars. It was remarkably easy for him to sneak his illegal goods of choice across country borders. Kojima considered himself the Indiana Jones of smuggling. With his round, friendly, almost-boyish face, he hardly seemed the criminal type.

He didn't deal in weapons, drugs or explosives, but something more unusual; he made his fortune selling rare, poached butterflies. When Newcomer first visited Kojima's small apartment in Los Angeles, he saw shelves stuffed with rare insects, both dead and alive, all ready to sell to anyone willing to pay the price. Customers loved him because his specimens were of the highest quality and his prices were the lowest. Of course, competing salesmen hated him for the same reasons.

Even so, by the end of the undercover sting, Newcomer had spent \$14,500 on various purchases, including two Queen Alexandria specimens that Kojima sold to him for \$8,500.

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I was a bit disappointed to be assigned as an intern in the butterfly room at the Harvard Museum of Comparative Zoology (MCZ). Although an insect-lover myself, I have always shied away from butterflies. I was put off by how acceptable it was for ditzy girls to get butterflies tattooed on their ankles. I preferred the stinging, buzzing kind of bug: wasps, bees and flies, perhaps because the pretty girls with the butterfly ankles wrinkled their noses at these unappreciated creatures.

So I began my internship expecting to be slightly bored. I didn't anticipate becoming interested in the specimens or the people that looked after them. But upon starting work, I was surprised to find the butterflies so carefully spread and mounted, the labels on the pins often reflecting the personalities of the collectors. The unique characters of the butterflies and of the people that so obviously loved them drew me in.

Some collectors sketched small, detailed maps denoting where they had caught a particular butterfly, while others would stuff the abdomen of

their specimen with cotton, to ensure that the midsections would stay plump and attractive for eternity. A few collectors painstakingly raised butterflies from caterpillars and listed the date of their emergence from the chrysalis. Many of the butterflies were over a hundred years old, but so carefully preserved that only the dust on their wings told of their age.

Human's love affair with butterflies spans thousands of years. Throughout history, they have been included in mythology, depicted in art, and written about in literature. Paintings of butterflies go as far back as 1350 B.C. in Thebes, Egypt, and the Greek word for butterfly, *psyche*, is the same word that is used for the human soul. Scientists have gradually unraveled some of the secrets of caterpillars' miraculous metamorphosis into butterflies and engineers continue to study the nanostructures of their iridescent wing scales in the hopes of creating new pigments.

Ecologists have learned that some butterflies' spectacular wings are brightly colored to indicate that they are poisonous or unpalatable, while other innocuous species mimic the appearance of poisonous ones. Some have brilliant eyespots that spook animals into believing that the butterfly is much larger than it is. It is ironic that the butterfly's beauty, which originally evolved to ward off predators, has attracted the attention of the most formidable predator of all: mankind.

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There is a distinctive smell that emanates from the butterfly room, a combination of dust, fumigants and balsa wood. There are multiple barriers to prevent a curious wanderer from stumbling across this hidden collection, including security guards, a private elevator and a door that is always locked unless someone is in the room.

My museum boss, Rod Eastwood is the caretaker of this vast collection: hundreds of thousands of butterflies tightly packed into a room not much larger than a small studio apartment. He mirrors a trend that is noticeable in many butterfly enthusiasts: people who learn extensively about butterflies, not for the sake of a PhD, or in order to advance their career, but out of a genuine and fierce desire. Many butterfly people have had other vocations before devoting their time to this, their true passion.

"It's never too late to change direction in your life," Eastwood likes to tell people. Australian by birth, Eastwood spent his childhood roaming around "the Bush", as he calls it, playing with insects and lizards. But he spent a substantial part of his professional life as civil engineer. It wasn't until he was 50 that he finally decided to start over as an undergraduate and then a doctoral student in zoology. But butterflies have always held a prominent place in his life. Long before he became an entomologist, Eastwood was publishing papers on butterflies. By the time he came to Harvard as a postdoctoral student, he had amassed a personal collection that included Lepidoptera of every family from all over the world.

Eastwood now lives butterflies. He works in the butterfly room six days a week, often staying until seven at night, peering at specimens under a magnifying glass, correcting centuries old misidentifications and repairing

crumbling pin labels. With his bouncing white hair, slightly lined face and jeans pulled up to his navel, Eastwood at sixty-six, is unmistakably older than the other postdoctoral candidates in the MCZ and everyone treats him more like a professor. Before he inspects a butterfly, he has to don his reading glasses, perching them on the tip of his nose much like a librarian.

Sharon Stichter comes into the room from time to time to work alongside Eastwood. A woman perhaps in her seventies, she lets out a shivery, girly laugh when I tell her that I am interested in her work. She claims to not be an expert in Lepidoptera, but has no difficulty rattling off a string of well-informed observations about the life cycle of swallowtails. Stichter spends much of her time in the room poring over old manuscripts, trying to piece together the history of butterfly collecting in Massachusetts.

When I first meet Stichter, she is absorbed in collectors' journals. She squints at the documents as she writes comments about them, pressing the pen hard against her notebook, as if to permanently cement historical facts not just onto the paper, but also onto her mind. Like Eastwood, she too had led a completely unrelated life before finally settling on butterflies. And also like Eastwood, she has already had an impact in the community of butterfly people. A retired professor of American History, she has done something that nascent researchers dream of: becoming a co-author on a paper published in the prestigious science journal *Nature*.

The historical records she has pieced together, along with butterfly surveys from the Massachusetts Butterfly Club, are being statistically analyzed to map regional changes in butterfly populations. Along with Harvard Forest scientists, Stichter has been able to show how butterflies are reacting to climate change, discovering that butterfly species are moving north as the temperature increases. Warm-climate butterflies, such as the Giant Swallowtail, are moving into Massachusetts, while cold-climate butterflies—the Aphrodite Fritillary, for example—are moving out. Stichter and her collaborators believe that this is occurring partly because climate change is causing their host plants to grow in higher latitudes and native Massachusetts' butterflies are migrating north to follow their food source.

Though Stichter and Eastwood are around the same age and work side-by-side peaceably enough, they disagree about butterfly management and conservation. Eastwood, a collector, believes that specimens can be responsibly caught without negatively impacting wild populations. This is possible, he argues, if butterflies are collected in reasonable numbers and precious reproductive individuals, such as young females, are left alone to breed and lay eggs. Stichter, on the other hand, belongs to the North American Butterfly Association (NABA), which discourages collection for anything other than scientific research. Since Stichter and Eastwood hold rather moderate views, they get along. However, more militant collectors and conservationists are often at odds with one another.

There is history hidden beneath the wings of the butterflies in MCZ, secrets that they can tell us about the time period in which they were caught. Some of the butterflies in the Harvard collection are over 200 years

old, the labels yellowed and cracking, the ink faded to a faint grey. They come from places that no longer exist on the map, listed under antiquated names like “Formosa” and “Kowloon.” These butterflies are true relics of the past. Though their colors remain vibrant behind cabinet glass, the world in which they were caught was dramatically different from our own.

Some of the world’s most beautiful butterflies are from Formosa, now known as Taiwan. From the collection tags, it is evident that many of these specimens were first caught and pinned in Taiwan and then sold to wealthy collectors in the U.S. Two particular species in the collection, the Great Purple Emperor and the Taiwan Large Crow, have already become extinct on the island. They are large and charismatic: the Great Purple Emperor has swaths of iridescent blue-violet on its wings, while the Taiwan Large Crow has delicate lavender spots, making them highly coveted. Their demise in Taiwan is due in part to the collecting that made it possible for them to stay preserved at Harvard, reminders of a more fertile past.

Taiwan was once a butterfly haven. There are 400 butterfly species known to live on the island, of which a substantial minority (twenty percent) are endemic – that is, found only in Taiwan. By comparison, the whole of North America—over 680 times larger than Taiwan—only has about 700 butterfly species. But recently, Taiwan’s butterflies have been under threat. Some populations have been reduced to one percent of their original size, and a few species have already become extinct. Urbanization and deforestation are mainly to blame for these losses, but exportation has also taken its toll. From the 1950s through 1970s, at the zenith of the exportation craze, Taiwan shipped out up to 30 million butterflies a year. This booming industry buoyed the economy and supported thousands of families who caught butterflies and worked in butterfly processing factories. Many exported specimens were turned into ornamental decorations and pinned specimens that were sent all over the world. But this trade came at an enormous cost to the butterfly populations themselves.

Eastwood maintains that many of the Taiwanese butterflies were harvested sustainably, and perhaps they were, but he had to concede that the extinction of the Taiwan Large Crow in the 1960s coincided with the peak of exportation.

Many of the butterflies in the Harvard collection, like the Great Purple Emperor, are rare and legally unobtainable today. They were taken from their native jungles and plains before collectors knew that species could become extinct. Some are beautiful, displaying shocking shades of yellow, orange, and blue in intricate designs that are emulated in contemporary art. Some are unremarkable until one reads the label and realizes that a remarkable person, such as the author (and former MCZ curator of Lepidoptera) Vladimir Nabokov, caught and pinned the plain specimen. As populations continue to decline, these butterflies will become increasingly important to scientific study; but at the same time, they will also become more valuable to personal collectors.

It was at the MCZ that I first heard the words “butterfly” and “poaching” used together in the same sentence. Eastwood said the phrase in passing when he told me that Kojima, the infamous butterfly smuggler, had been arrested a few years previously. Butterfly poaching was an alien concept to me, as I preferred to imagine them flying in the wild. But I was fascinated by the idea that people would risk everything for the very same butterflies that I so indifferently worked with. What drew so many people to butterflies? What made people want to hunt them?

I decided to learn more about butterfly people, since they were the ones—not the butterflies—that piqued my interest. I had no idea where my inquiries would take me. But I ended up traveling from my hometown in Pennsylvania, to the desert in Southern Texas, to the lush suburbs of Florida, to the state parks of Massachusetts, in order to learn more about butterfly people. I found not only butterfly collectors and curators, but also butterfly breeders, photographers, scientists, and, of course, poachers. Butterfly people, like the insects they love, come in many forms, live in many different places, and have vastly different lifestyles.

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“It’s like anything else: if you really like something a lot, you want it, you got to possess it; and that was basically how I got started. I saw these beautiful little insects flying around and I just had to have them,” says Jerry McWilliams, a butterfly collector.

We are out on a muggy August night as McWilliams pins his large white sheet to a square frame of PVC pipe. On one side of the fabric, he hangs a black light and on the other, a mercury vapor bulb. When the wind blows the sheet puffs out like a sail, eerily illuminated by the ghostly lamps. He’s gotten into the habit of telling the police beforehand where and when he will be black lighting for moths, after being reported for suspicious behavior on a few occasions.

It is understandable that the neighbors are wary here in northwestern Pennsylvania. Located firmly in the Rust Belt of the United States, poverty has caused many farmers and factory workers to turn to abusing and manufacturing methamphetamines. To the police, it is more likely that someone out in the woods, flashing odd lights into the darkness, is involved in a drug deal rather than a moth collecting trip.

We have to wait until 10 P.M. for the sun to set. The insects start arriving gradually, at first, but then in swarms. By 10:30, the sheet is covered in various invertebrates. A praying mantis lands on my shoulder, hunting for insects that are drunk on light, now careless and easily caught. Giant water beetles, caddis flies, and midges all crawl across the surface of the sheet, some feeding, some mating and some warming their wings before they fly off back into the forest. But McWilliams is only interested in the moths that shiver on the cloth. He decides which he will capture and which he will spare, the pros and cons carefully weighed in his mind. While we are out black lighting, McWilliams doesn’t take more than twenty out of the hundreds of moths we see fluttering by.

Moths and butterflies belong to the same insect family: Lepidoptera. Although they are related, there are different methods of catching moths versus butterflies. Instead of swishing a butterfly net in the daytime, in the evening, McWilliams uses bright lights to lure moths in. Then, he catches them in small kill jars that contain ethyl acetate.

He is remarkably spry for someone in his sixties, and his youthful blue eyes and slim build are starkly contrasted against his full white beard. His movements are quick and graceful as he swoops in to capture his specimens.

The moths struggle briefly inside his killing jar, beating their wings against the glass. They die and slide to the bottom, legs pointing upward. The ethyl acetate must be strong enough to kill the moths quickly, so that their wings will not be destroyed as they try to escape.

Damaged butterflies are common in the wild and, unless they are unusually rare, aren't of much interest to McWilliams. Many species use their wings the way a lizard uses a detachable tail: showcasing these attractive appendages to seduce predators away from their vulnerable body. The oldest butterflies often have highly battered wings as a result of being hunted. When McWilliams selects the most pristine specimens to capture, he is actually removing the youngest (and most reproductively important) members of the butterfly population.

Like undercover agent Ed Newcomer, McWilliams worked for the Fish and Wildlife Service before retiring. His knowledge of butterflies and moths is deep. When we are out in the field together, he is able to identify almost all the moths I inquire about. Because of this insight, he can avoid collecting butterflies that are protected by the Endangered Species Act. McWilliams also tries to understand why certain species are considered rare, since population distributions can be uneven. Some species that are uncommon in Pennsylvania are found in huge numbers in other parts of the country, while other butterflies have small, isolated communities that are vulnerable to population collapse.

After spending hours outside, McWilliams returns to his house in Erie, Pennsylvania, the night's catch in tow. It is there that the moths will be prepared for pinning in the morning.

McWilliams has a home on a nice suburban street. His house is small and square with a stone façade and a few trees in the front yard. His immaculate rows of gleaming specimen cabinets are the front room, facing the street. But he isn't worried about thieves being tempted by his collection. Chances are, there aren't any Kojimas lurking around here, and many people in the area find butterfly collecting to be strange. In contrast to the MCZ, there is little protection here and the wide window of the hobby room allows pedestrians a clear view of rows of carefully mounted butterflies. Their wings lie flat on wooden boards, stuck through with pins, almost resembling voodoo dolls.

For me, the room's true value lies in the decades of memories that it contains: nights spent out in the cold, days spent trudging through poison ivy, mornings skidding across sandy dunes. All of these butterflies with

reminisces attached are neatly labeled and filed in drawers that McWilliams pulls out enthusiastically for anyone who cares to see.

I bring McWilliams a Poplar Sphinx—a large brown moth with swirling eyespots—so that he can teach me how to pin. To keep the dead moth flexible, McWilliams first “relaxes” it by placing it in a damp container or injecting the moth with water. Then a single pin is stuck through the thorax with the labels attached after that. Other pins are used to prop up the abdomen and to keep the antennae in place. On a wooden spreading board, the wings are pulled open and spread out. They are held down with parchment-like paper until the butterfly dries out in the desired position. Now in his sixties, McWilliams’ hands quiver as he delicately pins the moth, revealing a hidden spot of deep fuchsia on the hindwing.

He says his children call him “Shaky” because of his trembling. Despite this, he still deftly positions the moth in place, making sure that the wings are perpendicular to the thorax, the antennae are curved upward, and the abdomen is straight and high. From a crumpled dead bug, he creates an ideal image, taken for granted by people who admire butterflies in museums. They do not realize that butterflies do not live and die in this perfect pose, but must be coaxed into it.

Even a brush of a finger can knock off a leg or flake off wing scales. After pinning three moths myself, I am utterly exhausted, having spent the entire time in a state of anxious concentration. I am devastated when I poke a tiny hole in a forewing with an errant pin. Perhaps seeing the moths twitching in the bottom of the killing jar has made me more nervous to work with them. If I mangle their wings, it is if they died in vain.

But McWilliams has been pinning insects for over fifty years and is calm as he instructs me. Growing up, he knew that many people considered his passion for butterflies odd. Because he was a boy interested in a stereotypically feminine creature, he hid his hobby from classmates at school. His collecting soon turned into a fascination with the science behind butterflies, and he started reading about their life history and behavior. After learning about the scientific usefulness of butterfly specimens, McWilliams began curating with a purpose.

Often, there are more butterfly specimens than there is space to accommodate them in natural history museums. Rod Eastwood frequently turns down donations to the butterfly room. Naïve collectors who create enormous collections of unlabeled specimens will probably never be able to donate their butterflies to museums.

But McWilliams has willed his collection to the Carnegie Museum of Natural History. Wanting future scientists to know as much about his butterflies as they can, he keeps fastidious pin labels that include the name of the collector, the date of capture and GPS coordinates indicating the butterfly’s location. With this data, it will be easy for researchers to reconstruct butterfly populations that existed during McWilliams’ lifetime.

As populations decline and young people become more disconnected from nature, McWilliams is troubled at the thought that they may never know

butterflies as intimately as he does. “Our generation is the last generation of insect collectors. The younger generations are just pulling further and further away from the natural world,” he laments.

Though humans had been admiring butterflies for thousands of years, it wasn't until the 1600s that scientists started collecting butterflies in order to study and classify them. But it was British naturalists during the 1800s that first treated butterflies as objects to covet and own. Although entomology is constantly progressing, many Victorian Era capturing and pinning methods are still used today. By traveling all over the U.S. and abroad in pursuit of the natural specimens he desires, McWilliams is emulating the British explorers of old.

“On taking it out of my net and opening the glorious wings, my heart began to beat violently, the blood rushed to my head, and I felt much more like fainting than I have done when in apprehension of immediate death,” wrote British naturalist Alfred Russel Wallace when he captured a new species of Indonesian butterfly, known today as Wallace's Golden Birdwing.

Wallace collected and observed all types of animals and plants, but was particularly fond of butterflies. He discovered the existence of warning coloration in nature after carefully observing butterflies and their vibrant wing patterns. Charles Darwin believed that the colorful appearance of many male animals was a result of sexual selection and he was stumped by the bright colors displayed by sexually immature caterpillars. But Wallace had extensive experience handling gorgeous, tropical butterflies and noticed firsthand that they often smelled strange and were unpalatable. He came to the conclusion that caterpillars' coloring are often a warning to predators that something unpleasant will happen if they are eaten. Their vibrancy denotes something dangerous or forbidden, much the way humans use neon orange cones in construction sites or fluorescent vests during hunting season.

Monarch butterfly wings—with their bright orange and yellow spots—are actually poisonous, causing birds to vomit once they have sampled the butterfly. This experience is unforgettable; a Blue Jay will refuse to eat another Monarch or any butterfly that looks like a Monarch, after learning this particularly painful lesson.

After discovering his celebrated Golden Birdwing, Wallace set out to catch as many individuals as he could. Though he cared about the biology of the butterflies, he was also very concerned with the aesthetics of the specimens he collected. He lamented, “I was thus able to bring away with me more than a hundred of both sexes, including perhaps twenty very fine males, though not more than five or six that were absolutely perfect.” Some of his specimens are now preserved at the MCZ.

It was intrepid, high profile explorers like Wallace that inspired many ordinary British citizens to take a closer look at their own native wildlife. During the Victorian period, collecting was a very popular hobby and butterfly expeditions into the countryside were a common outing for city

dwellers. From factory workers to kings, every class in Britain participated in collecting.

There were thousands of serious British collectors who obtained great numbers of butterflies and many more casual hobbyists in addition to that. It was popular to create enormous drawers with hundreds of specimens arranged in geometric patterns and these collectors fleeced populations to decorate their homes. Some even wiped out local colonies of the most charismatic butterflies, such as the Large Blues, in their quest to fill cabinets.

The wealthiest of butterfly enthusiasts, such as Baron Walter Rothschild, hired collectors to travel all over the world to catch butterflies for them and employed curators to care for their collections. Despite being born into immense wealth, Rothschild's desire for butterflies was insatiable and at the time of his death he had amassed a collection of over 2 million specimens, almost bankrupting his family as a result.

Like many fads, butterfly collecting had monetary potential. With the help of his "collections agent," Samuel Stevens, Wallace managed to fund his lengthy, expensive expeditions to South America and the Malay Archipelago by selling off some of his exotic specimens. Though Wallace was rarely in Britain during their fifteen-year partnership, Stevens procured the best prices for his collection and used the money to provide Wallace with the necessary provisions during his trips.

Butterflies were in high demand in Britain during the 1800s. Middlemen placed advertisements in newspapers attempting to buy enormous numbers of rare butterflies. A posting in an 1857 entomology journal, for example, requests 2,880 Northern Brown Argus specimens, for example. These middlemen, in turn, would sell them at a higher price to their wealthy clients.

Of course, the promise of profit attracted criminals as well as naturalists. Label tampering—something Kojima was also guilty of—was common practice. Many butterfly salesmen were guilty of faking the collector's identity, capture location, or the species of their specimens. When certain British species of butterflies became scarce, some salesmen would get butterflies from the European Continent and lie about their provenance. Prominent collector Edwin Birchall ventured to claim that it was impossible to know the true origin of a butterfly unless the buyer had caught it himself.

These businessmen, trustworthy or not, were also destructive of the populations they hunted. In 1887, a collector named Frederick Frohawk attributed the extinction of the Purple Emperor in Chattenden Woods, Kent, to the work of two commercial butterfly salesmen. Catching up to a hundred specimens a day for years, Frohawk believed these men had managed to overwhelm even the butterflies' prolific reproductive capabilities.

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January is the worst month to see butterflies in southern Texas, but I didn't know that when I flew down to see Jeffrey Glassberg's newest project: The National Butterfly Center, the flagship institution of the North American Butterfly Association (NABA). It is located near the border of Mexico in Mission, Texas, an agricultural stronghold that holds a citrus festival every

year. Many of the signs and advertisements don't even have English below the ubiquitous Spanish, and I have to guess my way around restaurant menus.

The cold snap comes in right as I arrive, and I spend most of my time shivering in a thin jacket, looking up into a gray sky that seems to serve no purpose other than to repel butterflies. The people in Mission freeze along with me but are happy about the weather. It rains twice while I am there, bringing much needed moisture to their irrigated desert.

Glassberg is a very tall man who bends his body down almost into the shape of a candy cane to talk with me, eye to eye. His closely set, blue eyes glow behind wire-rimmed glasses. I am intimidated. As the President of NABA, he is a powerful force in the butterfly community. With Glassberg at its helm, NABA has taken aim at collectors and breeders, writing articles publicly attacking them.

When I ask him about butterfly collecting, Glassberg confidently tells me that one-third of all collectors have psychosexual disorders. He explains that butterflies are beautiful and therefore capturing them is associated with possessing women.

His name seems to come up in every conversation I have with butterfly people. Sometimes it is in admiration or exasperation, or a combination of both. But regardless of the connotation, he leaves a lasting impression on everyone, including me. Many people are afraid of him. Some are even wary of talking to me, fearing his reaction; they only voice their true opinions off the record. But others believe that his uncompromising stance is necessary to preserve the strength and integrity of butterfly communities.

The National Butterfly Center is a smart new building, designed by the architect of the United States Holocaust Museum. Though the outside is somber white stone, the inside is painted a vibrant lime green, which offsets the enormous photographs of tropical butterflies on the wall. There is a gift shop, with a few chrysalises in a cage on the table. I can't help but feel that there is an unfinished quality to the place, and that there is still much work to be done before it fulfills Glassberg's lofty vision.

But the Center already attracts butterfly people from all over the country, drawn to the unique opportunity of seeing butterflies only found in the far south of the United States. Climate change means that more charismatic Mexican butterflies are making their way north. Just two days before I arrive, the Center had 60 species of butterflies flitting around its flower gardens.

I stand outside, fighting off the cold, as Glassberg explains his grand plans for the property. I wonder how he (who grew up on Long Island) feels about being surrounded by so much space, by bearing the responsibility of reversing the ecological damage that has occurred on the property.

The land surrounding the National Butterfly Center is dry and bare in the winter. The Lower Rio Grande has been heavily developed, with habitat loss taking an enormous toll on native ecosystems including butterfly

communities. Vast fields have already been harvested this year, bringing to mind a scene from a Steinbeck novel. The Center itself was built on an old onion field and NABA— with the help of the Fish and Wildlife Service and other governmental organizations—is just starting to replant native trees, flowers and grasses that were originally removed to make room for crops. The field is making a slow comeback, surrounded on one side by a scrubby forest of jicama and a row of planted Mexican olive trees lining the back of the building. Behind the Center lies a vast expanse, which Glassberg hopes to transform into native savannah and wetlands, extending the modest flower garden until it reaches the forest. A group of old buildings, including a few straw huts, sit rather forlornly at the opposite end of the 100 acres. Glassberg plans to transform these into research stations, where scientists can stay to study butterflies on the newly “native” land.

Glassberg wants The National Butterfly Center to change how people interact with butterflies, leading to a greater corpus of knowledge. He hopes that people will not only admire their appearance, but also observe their behavior.

“We know tremendously more about birds...butterflies we know less about. You put away the nets or the shotgun, you learn more, you get more information, you are able to do more science,” Glassberg says.

Many members of NABA, including Sharon Stichter, are decidedly anti-collecting. The Massachusetts Butterfly Club is a chapter of NABA and fights frequently break out on the Club’s email list if members venture to support butterfly capture. Some admit to collecting butterflies in their formative years, confessing to this fact ashamedly, as if identifying themselves as former alcoholics. Even Glassberg collected butterflies in order to study the evolutionary relationships between Neotropical hairstreaks. But they are careful to emphasize that they do not catch butterflies anymore, that they are “recovered collectors.”

In the past, there was very little guidance for naturalists who wished to watch butterflies. Glassberg recalls, “All of the books that called themselves field guides to butterflies, if you looked at them, you could see that they were all field guides to dead butterflies.”

But with sharper binoculars and macro cameras, many butterfly enthusiasts have evolved from collecting to photographing and observing butterflies. Their passion for these creatures, however, hasn’t changed, and they pursue butterfly photographs just as single-mindedly as collectors seek their specimens. Glassberg, a huge proponent of this movement, has taken photos of rare butterflies that would make any collector gasp in envy. Like Alfred Russel Wallace, he is willing to go to any lengths to find these elusive creatures; horseback riding, for example, up a pathless mountain in the Black Hills in South Dakota just to catch a glimpse of a rare fritillary. The butterflies in his photographs are often portrayed resting on flowers calmly. Their compound eyes, like faceted jewels, seem to stare into the camera, bemused at the sight of a lens instead of the anticipated net.

Glassberg has also done his part to provide naturalists with guides to watching butterflies. His books, "Butterflies Through Binoculars" has both East and West Coast editions and shows lively butterflies in their natural habitat. His newest book, "Butterflies of North America," includes caterpillar and pupae identifications.

Although there are still diehard collectors, Glassberg is confident that over time, new generations will move toward butterfly watching and photography.

"The birding thing took a long time also, because people started using binoculars in the 1890s, 1900, and it wasn't until the 30s and later that people switched. And the difference was that it was harder to shoot birds than it is to net butterflies. So it's going to take a while," says Glassberg.

There is an air of optimism in The National Butterfly Center, and everyone is genuinely excited when new species are spotted on the property. It seems like every other day NABA is posting pictures on their Facebook page, detailing some fantastic new butterfly that was spotted, returning to the rejuvenated habitat.

But despite the Center's success, I can't help but feel that Glassberg is fighting a losing battle.

Though collectors have had an impact on butterfly populations, urbanization, deforestation, pollution, and other human development are the greatest factors in butterfly extinction. Habitat loss, a huge concern to scientists, affects the vast majority of butterfly species. There are nineteen butterflies on the Endangered Species List, many of which are vulnerable due to the specificity of their lifecycle. Having only a few host plants and living in niche ecosystems, these butterflies are unable to quickly adapt to environmental change.

As an ecologist and conservation biologist, Nick Haddad studies some of the scarcest butterflies in North America. He focuses on the Miami Blue, Saint Francis' Satyr, and Crystal Skipper, which are all endangered species. These butterflies teeter on the brink of extinction and have populations only in the hundreds or thousands.

"You are talking about species that have slipped through all the other safety nets that we have...And so at that point we are not talking about the practical arguments for conservation, we're talking about the ethical arguments for keeping species alive," says Haddad.

The Saint Francis' Satyr caterpillar, for example, feeds exclusively on a particular species of sedge. Unfortunately, this sedge will only grow in areas that have experienced disturbances, such as abandoned beaver dams or forest fires. Since humans remove beavers from wetlands, considering them nuisances and carefully control forest fires, these vital habitats are now disappearing. The Saint Francis' Satyr is now exclusively found in Fort Bragg, North Carolina, only managing to survive in one protected area where beavers have been reintroduced; bomb ranges, a result of testing missiles in Fort Bragg, experience fires that also enable the necessary sedges to grow.

Though butterfly populations can be resilient up to a point, these species are trapped in an extremely delicate balance, where even one person can have a devastating effect. Though habitat loss can push butterflies to the brink of extinction, a greedy collector can push a species over the edge.

“You could easily take a number that is within the realm of what somebody could collect in a day or a couple of days... [This] could be the difference in the persistence of a species,” says Haddad.

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Connie Hodsdon, a butterfly breeder, hears stories about butterflies acting in unexplainable ways all the time. She says that the most rewarding part of her profession is to have her customers, “...take the time to write to me or to call me and say, ‘...maybe you can explain why this happened, but we released all of the butterflies, but one just stayed with his little granddaughter and sat on her shoulder... and we couldn’t get it to fly away.’” She doesn’t know why butterflies act strangely during funerals and there is an air of superstition about her that I have seen in other breeders.

Hodsdon is in her sixties and keeps her gray hair cut short. Her large hazel eyes twinkle mischievously behind glasses. Like many Floridians living near the water, she is very tan. Her voice is gravelly and full of earnest conviction as she talks about her history with butterflies and her business.

Although collecting butterflies is not as popular as it once was, some people now view live butterflies as status symbols. For example, releasing butterflies during the couple’s send-off has become a fashionable way of making a wedding ceremony memorable. And, surprisingly, funerals have also become a common venue for butterfly release. For funerals, it is the symbolism of metamorphosis that makes the act meaningful—the image of a freed butterfly representing, perhaps, the spirit of the deceased ascending to the afterlife.

The popularity of live butterflies at weddings, funerals and other significant events supports a small industry of butterfly breeding. It is an expensive venture: just a dozen Monarchs can cost a hundred dollars, with an additional fifty-dollar shipping charge. But despite the cost, the demand for these butterflies always exceeds the supply, and there are now a growing number of breeders working profitably to satisfy this expanding niche market.

I am Hodsdon’s intern for a day, and she trains me as if I were planning on setting up my own butterfly breeding business. We are walking around her property as she explains her set-up. Her backyard is far from typical. She uses modern technology such as drip irrigation systems, plant-washing stations, and sun reflecting screens to increase the quality and quantity of her butterflies. The humid Floridian climate enables her to grow all sorts of trees, bushes and vines in wild profusion. Many of her plants are used for butterflies to lay eggs on and to feed their caterpillars. But some she grows to feed herself, and I see one of her Chihuahuas chewing on a fallen avocado the size of a soft ball.

There are female butterflies hovering around Hodsdon's rows of carefully cultivated vegetation. They are wild, attracted from the neighboring suburbs to the staggering diversity of plants she has on her seven-tenths of an acre. Female butterflies must lay their eggs on plants so that when they hatch, the caterpillars will have plenty to eat. Many types of butterflies only use one species of plant. It is important, not only for breeders but also for gardeners, to be familiar with butterflies and their corresponding host species. People that plant gardens with flowers that are rich in nectar, but grow few host plants, will never have many butterflies in their yard.

Hodsdon has three flight houses for her butterflies to breed in, and she usually keeps the females and males separated until she wants them to mate. Since it is not a mating day, the male butterflies desperately hang off the netting partition, trying their best to reach the females. Although I'm still not a butterfly fan, I can't help but feel a connection with a female butterfly as it lands on my shirt in the flight house.

It is January, so Hodsdon is only raising a few types including Zebra Longwings (Florida's state butterfly), Monarchs and Giant Swallowtails. In the summer she will raise many more, including a few of the nine species that the USDA allows to be transported across state lines. These nine butterflies have populations all over the country, which prevents them from becoming invasive when released. Hodsdon also breeds species native to Florida that she sells only in state.

There is an indoor lab to protect the caterpillars from temperature fluctuation and disease. As part of my internship, Hodsdon shows me how to care for Monarch caterpillars, which require daily attention. I refresh their food stock and dump out insect frass. I handle caterpillars in all different stages of growth, moving them between plastic cages. They grow tremendously from day to day and by the time they get ready to undergo metamorphosis, they have already molted five times. As I pick up their squishy, yellow and black-banded bodies, I realize that it has been a very long time since I have touched a caterpillar. Perhaps Jerry McWilliams' lament about my generation is true.

Hodsdon tells me, "My biggest fear is being hit by Nosema." She speaks of her butterflies lovingly, her face clouding over when she talks about her past year dealing with Nosema, a fungal parasite that attacks insects. Butterfly breeders and beekeepers dread this fungus much like farmers fear blights.

Disease is always in the forefront of Hodsdon's mind, and she keeps her caterpillar laboratory immaculately clean. She takes extra precautions in order to avoid contaminating her stock, such as cleaning the tables and floors with alcohol and bleach solutions and wearing gloves while handling the caterpillars. Since host plants may carry bacteria or parasitic organisms, she washes the leaves in bleach and then rinses them with water before adding them to the cages. She even dips Monarch eggs in Milton, a sterilizing solution intended for baby bottles.

For all of her breeding butterflies, she removes a few scales off the abdomen with scotch tape so that she can observe them under a microscope. She checks for *Ophryocystis elektroscirrha*, also known as OE, a protozoan parasite that looks like “brown little footballs” scattered amongst the butterfly scales.

When she was four years old, Hodsdon’s mother helped her raise caterpillars into Cecropia moths. Hodsdon began experimenting with breeding techniques for a science fair project when she was in high school, selectively mating hamsters for different color patterns. After years of varied, unsatisfying jobs, such as working as a waitress, a caterer, and a health insurance saleswoman, she finally started designing butterfly gardens in 1987 and raising butterflies in 2000.

Now she breeds her butterflies to be, “Big as bats,” which she believes gives them a better chance of survival while being shipped to other states. She finds it highly rewarding to help caterpillars undergo the process of metamorphosis.

Learning how to raise butterflies is tricky. The care required to successfully rear caterpillars and butterflies differs from species to species. It’s incredibly easy for a well-meaning person to starve a caterpillar by offering it the wrong plant or poisoning it with leaves doused in pesticides. Despite being one of the most charismatic insects, the life history and behavior of many butterflies remains unknown. This lack of knowledge poses a challenge to breeders, who are often forced to experiment in order to discover the best methods to raise their broods.

During our day together, Hodsdon shares tricks of the trade that she has learned over the course of a decade. She shows me how to bruise the leaves of the host plant, so that the female butterflies can locate it quickly. She tells me to hold a chrysalis up to my cheek to check the pupa inside: if it is exuding an inner coolness, the pupa is still alive, but if it feels dry and warm, it is most likely dead. She demonstrates how to gently nudge the posterior of the caterpillar, to make sure that it isn’t molting.

Butterfly breeding is a controversial topic to many naturalists, who resent the release of farm-raised butterflies. It is not known if excessive inbreeding can cause genetic abnormalities or survival weaknesses. Furthermore, like many domesticated animals kept in close quarters, butterflies raised in captivity can fall prey to disease. Although Hodsdon regularly screens her butterflies for OE and Nosema, she is the first one to admit that there are other breeders who aren’t as careful.

Released butterflies also have the potential to become invasive species. The intentional release of nonnative butterflies may seem farfetched, but it occurs more often than one would think. One collector told me of a professional photographer who brought butterflies up from Mexico and released them in the Southern US, in order to take pictures of them in a foreign environment. Ed Newcomer speculates that small-scale live butterfly smuggling happens all the time and rarely goes detected. Even Kojima was

able to sneak enormous live beetles into the US, which he would sell for tens of thousands of dollars.

But Hodsdon argues that much of what breeders do is well intentioned and that by releasing butterflies, they are helping to replenish populations that are being decimated by habitat loss.

“There’s not too many things I can do to make a big difference, so it’s just a little difference here and a little difference there,” she says.

Some people scoff at this notion. But even common butterflies, such as the Monarch, have declined by 60 percent, a result of their hibernation forests in Mexico being destroyed by illegal logging. There are other butterfly species that aren’t just declining, but going extinct. Luckily, there are also scientists, such as Jana Johnson of Moorpark College, California who are attempting to save these endangered species.

Working with a team of forty interns, Johnson is attempting to save the Palos Verdes Blue, which are on the brink of extinction. Thought to be extinct for eleven years, one lone group of Palos Verdes Blue was discovered in 1994 on the Californian Palos Verdes peninsula, making it possibly the rarest butterfly in the world.

She first breeds and then raises Palos Verdes Blue caterpillars in captivity until they reach adulthood. Finally, she releases some of the butterflies (keeping others for breeding stock) on the Palos Verdes Peninsula, hoping that the females will be able to mate and lay their eggs on their host plants. This will enable the next generation of butterflies to repopulate their native habitat, with the end goal being self-sustaining populations of Palos Verdes Blue in the wild.

But these programs are not without problems. Each endangered species needs specialized care in order to live and breed in captivity and it has taken ten years for Johnson and her predecessor, Rudi Mattoni, to figure out how to rear Palos Verdes Blues. Like the St. Francis’ Satyr, the Palos Verdes Blue needs environmental disturbances in order for its host plants, such as Common Deerweed, to grow. Because of this, vegetation in their released habitat must be constantly removed. Some residents living near release sites resent having Palos Verdes Blue habitats in their neighborhoods, complaining about the ugly barrenness of these areas.

But successful captive breeding and release programs are already well established for some mammals, amphibians, and fish; butterflies, despite the logistical issues, may be the next to follow this pattern.

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The Fish and Wildlife Service first heard of Kojima when he was tied to the first high profile butterfly poaching case back in 1995. Richard Skalski, Thomas Kral, and Marc Grinnell were found guilty of poaching thousands of rare butterflies in various national parks including Death Valley National Monument and Grand Canyon National Park. These men were well aware that what they were doing was illegal and even wrote notes to each other ending with the phrase “Yours in poaching.”

Skalski, ironically working as an exterminator at Stanford University, was the first to be identified. Agents recall that his house was similar to “Buffalo Bill’s” from The Silence of the Lambs because of the enormous number of chrysalises hanging above his bed. When the butterflies emerged, he would put them in a refrigerator to preserve the beauty of their new wings. The overall impression of Skalski’s residence, with hundreds of specimens in various stages of metamorphosis, was truly eerie.

During the investigation, officials confiscated 2,200 butterflies and estimated their collective value at \$300,000. The poachers had caught fourteen out of the nineteen butterflies on the Endangered Species list, including types that even national museums did not have in their own collections.

Thomas Kral, a real estate appraiser, still stolidly defends his actions. He even wrote a personal manifesto in 2005 (ten years after the butterfly poaching case), titled “Biodiversity Discovered: Solving the Mystery of the Global Species Count and Exploding the Myth of the Sixth Extinction.”

In this document, Kral claims that the current mass extinction of species is pure fallacy and that only 3 to 5 species a year may go extinct, compared to the tens of thousands that are estimated by scientists. He argues that the federal government shouldn’t protect any terrestrial invertebrates, including butterflies; anyone who wishes to save a species should pay for the conservation out of their own pocket. He makes the assumption that most insects do not directly benefit humans and therefore have no reason to be protected.

He concludes, “Conservation biology needs to be guided by real data and rational decisions, rather than bad science and misguided emotions.” Kral does not have a scientific background but still confidently disputes years of research conducted by experienced ecologists and conservationists.

Though it was gratifying to catch Kojima after twelve years, there was a downside. According to Newcomer, one of the most depressing aspects of the case is that in order for Kojima to receive a 21-month sentence and a \$38,731 fine, he first had to be caught smuggling goods into the United States. If Kojima had just been found guilty of poaching under the Lacey Act (written specifically to protect endangered wildlife), he would have spent a maximum of only one year of jail and a paid a fine of just \$1,000—a fraction of the cost of one endangered butterfly specimen on the black market.

Because some butterflies can be found in such great abundance, it is difficult to imagine that other species may be on the brink of extinction. Many people don’t consider insects to be vital wildlife, and that misconception is made worse by the fuzzy laws that government agencies put in place. There is currently no one federal body that regulates the breeding and shipping of butterflies, which is something unheard of for other farm raised animals. Even squirrels—whose numbers have exploded in urban areas—require a permit to hunt, and yet rare butterflies are not protected, even in state parks, unless they are threatened enough to make the Endangered Species List.

The Lacey Act, which prevents illegal harvesting, trade or transport of wildlife and plants, was written back in 1900, but is still used today. The law was made to be intentionally lax in order to protect hunters (more sympathetic figures in the past) who accidentally killed animals they did not have permission to hunt, and first time offenders are usually not even charged.

But since 1900, the status and perception of endangered species has changed tremendously. In the past century, a staggering number of species has been lost and there are now worldwide conservation efforts. Gone are the days where explorers would traipse through the jungle, shooting butterflies out of the canopy with buckshot. Although the Lacey Act has been amended to ban the transportation and release of animals and plants that may become invasive species, the act has not been adjusted to reflect the existence of wildlife poachers and the dire need for these targeted species to be rigorously protected.

Newcomer believes that the lax penalties and small fines mandated by the outdated Lacey Act are not enough to discourage wildlife criminals and decided to wait to arrest Kojima for the more serious offense of smuggling. Of course Kojima's customers were complicit in his illegal trade; but regrettably, the Fish and Wildlife Service could only charge a small number of those involved because Kojima had skillfully hidden the identities of his clients. Newcomer asserts that almost all of these buyers were aware that Kojima was poaching and smuggling butterflies, since he was able to obtain fantastic species that no other seller could. Even Newcomer himself bought a male Wallace's Golden Birdwing—now an endangered species—from Kojima, at the steep price of \$1,800.

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Though collecting practices have changed over the years, the butterflies that fascinate people have not. The urge to possess beautiful things has been around since mankind's beginning. Even butterfly photographers and breeders talk about butterflies with a tone of ownership. Sometimes this protective instinct can benefit the butterfly, inspiring conservationists from all walks of life to step in and defend this creature and its native habitats. Other times, it inspires greed and avarice, causing people to act in ways that only harm the butterflies that they hold so dear.

Because of this, it is difficult to ascertain whether the actions of a particular butterfly person are helpful or harmful, in the long run. In the past, for instance, many wealthy collectors gathered massive numbers of butterflies for their own personal gratification; but today their extravagant collections are invaluable to research institutions like Harvard's Museum of Comparative Zoology.

Though many butterfly photographers believe that they have no impact on butterfly populations, they may be inadvertently damaging native habitats, pursuing the best picture. Conversely, by raising and releasing Monarchs, Connie Hodsdon may be weakening the wild stock, but she is also raising butterflies native to Florida that may become threatened due to

habitat loss. In the future, scientists may come to her, seeking advice for raising finicky endangered species. It will be up to subsequent generations to understand the overall impact these people have had.

Butterfly people openly disagree amongst themselves about the best way to appreciate and protect butterflies, and these disagreements can cause some factions to work in direct conflict with each other. For example, collectors have the potential to undo important scientific and conservation work. Sometimes scientists must release their bred butterflies in secret, to prevent collectors from capturing these rare species. According to Sharon Stichter, the Massachusetts Butterfly Club was forced to make their butterfly population data private, to discourage collectors from going to survey areas in order to catch specimens.

Butterfly breeding also poses its own problems. NABA believes that released butterflies can disrupt ecosystems and compromise native butterfly populations. They can also interfere with NABA's annual butterfly surveys, artificially inflating population numbers. This business has also created opportunities for a new kind of wildlife poacher. Hoping to make some quick money, some people have been catching large numbers of live butterflies in the hopes of selling them as breeding stock.

Though they condemn the disruptive actions of breeders and collectors, even NABA isn't without controversy; many butterfly people have accused them of bullying individuals into giving up practices that NABA does not agree with. Instead of uniting the butterfly community, some have claimed that they are guilty of dividing it even further.

But there is a silver lining. Butterfly people are complicated and their influence on the creatures they love are just as complex; sometimes their actions have unintended consequences that can even benefit butterflies. Thomas Kral, one of the three men who were found guilty of poaching back in 1995, actually discovered the endangered St. Francis' Satyr butterfly. It is well known that he captured some specimens for his collection, but this undetected species may have gone extinct altogether without Kral's expert eye for rarity. Ironically enough, it may be due to the actions of a poacher that butterfly conservationist Nick Haddad can now work toward saving the St. Francis' Satyr.

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