

Conservation of Butterflies

In Japan's Changing Environments

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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 cultiva-

tion 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. Mitsuhiro 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



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

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.

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.

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.