## University of Hawai'i Master Gardener Program



## The Kamehameha Butterfly and the Pulelehua Project

by William Haines, UH-CTAHR, Dept. of Plant and Environmental Protection Sciences Funded by the Hawai'i Dept. of Land and Natural Resources, Division of Forestry and Wildlife

The Kamehameha butterfly (Vanessa tameamea, Family Nymphalidae) is one of only two butterflies native to Hawai'i, although many other butterflies have been introduced. It is one of our most beautiful and beloved native insects, and was officially adopted as the State Insect of Hawai'i in 2009, when a group of students from Pearl Ridge Elementary School proposed it to the legislature. The Kamehameha butterfly occurs on all of the main Hawaiian Islands, but unfortunately, its range is shrinking. In the early 1900s the butterfly was commonly seen at low elevations in wet parts of the islands like Manoa and Hilo. Even as late as the 1980s, the butterfly was common in the forests of Tantalus, but it no longer occurs there, even though its host plants are relatively common. It is unclear exactly why the butterfly has declined, but introduced predators (such as ants) and parasitic wasps have probably played a role, along with loss of suitable habitat due to invasive weeds.

The **Pulelehua Project** is a "citizen science" effort to map distributions of the Kamehameha butterfly with help from the general public. *Pulelehua* is Hawaiian for butterfly. When hikers encounter Kamehameha butterflies or their immature stages (eggs or caterpillars), they can submit photos to the Pulelehua Project website, along with where and when the ob-



Winged wonders. Adult Kamehameha butterflies are the most conspicuous stage of the life cycle, but also the most active, and it is rare to see them up close. They spend much of their time fluttering around the canopy, making them difficult to identify or photograph. They sometimes bask in the sun on vegetation with their wings outstretched, showing off their beautiful colors, but when they rest with their wings closed they are much less obvious! Butterflies, especially males, are attracted to tree wounds, particularly on the trunks of koa, where they feed on fermented sap. Females can sometimes be seen resting on or near māmaki or other host plants. Warning: there are several non-native orange and black lookalikes in Hawai'i! Visit our website to learn how to identify them.

servation was made. The data collected by citizen scientists will be used to create a statewide habitat map for the butterfly, based on climate, elevation, vegetation, and other environmental variables. Habitat maps will not only identify new locations where the butterfly might be found, but also locations where reintroductions are most likely to be successful. We hope this will include locations within residential communities where backyard gardens of host plants will be most likely to attract butterflies. The effort is sponsored by the Division of Forestry and Wildlife in Hawaii Department of Land and Natural Resources.

## You can help!

It's as simple as taking a picture with your phone! If you are a hiker or often visit wet natural areas where native plants still persist, please visit www.KamehamehaButterfly.com to learn how to recognize the different stages of the Kamehameha butterfly and its host plants. Once your photos are uploaded to the site, they are checked by the project staff to confirm identification, then used to update our map of sightings.Your observations are valuable data, and will be used to protect this beautiful butterfly.We are also studying the genetic diversity of Kamehameha butterfly populations, and ultimately, we hope this study helps prevent the further decline of our charismatic State Insect.

Many have asked whether it is possible to bolster Kamehameha butterfly populations by planting their host plants in backyards. Whether this will significantly help populations is unknown, but it surely cannot hurt, and is worth a try! The Kamehameha butterfly relies on native trees and shrubs in the nettle family (*Urticaceae*), and it lays its eggs only on these plants. The most common and widespread host plant is



Jewels of the forest. Females lay their eggs on the upper or lower surface of young leaves of their host plants. Eggs are about the size of a pinhead and start out light brown or gold, darkening as the caterpillar develops inside. A few days before hatching, the head and hairs of the caterpillar can be seen through the transparent shell. Among the threats to the Kamehameha butterfly are tiny wasps (Trichogrammatidae) that parasitize eggs. More than 20 wasps can emerge from a single butterfly egg!

**māmaki** (*Pipturus* spp.), which naturally grows in wet forests and gulches. Māmaki is a small, fastgrowing tree that is easily propagated from seed, and is sometimes available in local garden stores. Most nurseries that specialize in native plants will have it in stock. Be sure to use plants grown from seed collected on your own island, preferably as close to your home as possible, since different species and varieties of māmaki may be restricted to different islands, and it is best to "buy local" when it comes to genetics of native plants. Māmaki requires a lot of moisture, and thrives in partial shade, so it is important to keep this in mind when selecting a location for your planting. It is most suitable for areas with



Caterpillar calling cards. In some ways, caterpillars are the easiest life stage to search for. Young caterpillars build tentlike shelters to protect themselves from predators and parasitoids. A caterpillar's first task when it hatches is to use its mandibles to cut a wide arc, starting at the leaf's edge. This produces a flap, which the caterpillar folds and ties to the underside of the leaf. Caterpillars live inside these little tents, feeding on the leaf from the safety of their home. Surveyors can search for the smooth, semi-circular "bites" taken out of the leaf, which are distinct from other types of insect damage. The shelters persist after the caterpillar has moved on or been attacked by predators, making it possible to infer presence of the Kamehameha butterfly even when actual butterflies or caterpillars aren't found. Volunteer scientists are encouraged to take pictures of caterpillar shelters and submit them to the website.

high rainfall. In addition to being potentially used by the Kamehameha butterfly, māmaki can be used by you! Its leaves are used in traditional Hawaiian medicine, and can be made into a refreshing tea.

Whether or not a backyard planting of māmaki is successful at attracting a population of Kamehameha butterflies is probably mostly determined by the **distance** from natural butterfly populations. Although the Kamehameha butterfly is unlikely to be found in most residential or urban areas, it can sometimes be found in rural neighborhoods or areas near wet gulches and forests where native vegetation has not been choked out by invasive weeds. The butterfly is fairly common in the Volcano area of Hawaii Island, and has successfully colonized backyard māmaki plantings there. A citizen scientist recently surprised us with a confirmed sighting of a Kamehameha butterfly in the Temple Valley area of Kāne'ohe, so we know that the butterflies at least venture into residential areas on Windward Oʻahu.

Other factors that likely impact the viability of backyard plantings include the presence of **preda-tors** such as **wasps**, **lizards**, **birds**, and especially **ants**. Although these predators are difficult to control in many cases, ants are one predator that can be feasibly managed, if not necessarily eradicated. Barrier products such as Tree Tanglefoot can be applied around the trunk of trees (once they are a few years old) to exclude ants, but be sure to keep nearby vegetation and structures clear of the māmaki, so that ants cannot crawl onto its branches via other trees or fences. Certain species of ants can also be controlled by applying granular baits such as Amdro, Maxforce, or Advance, or using bait stations with liquid baits such as Terro. Different ant baits are designed to target different species, so before applying baits, make sure you have properly identified the ant(s) that are dominant in your yard. Although it is difficult to control birds in a way that would not also exclude butterflies (e.g. netting), some people

**Eating machines**. As caterpillars grow, they change color and become a vibrant green (rarely reddish brown), with spines all over the head and body. Mature caterpillars abandon their shelters and live out in the open, consuming lots of food and growing rapidly. They chew from the leaf margin inward, often consuming the entire leaf except for the midrib. At this stage, caterpillars are vulnerable not only to predators and parasitoids, but also diseases. Just before pupation, caterpillars are about 2.5 inches long. They pupate as a dangling chrysalis, which may be hanging near, but not necessarily on, the host plant.





swear that "scarecrow" tactics can be effective, such as hanging CDs from branches or purchasing a fake owl to place near your māmaki.

Adult Kamehameha butterflies feed on both flower nectar and on sap oozing from the wounds of trees such as **koa** (*Acacia koa*). Therefore, planting flowering plants along with māmaki may make your yard more attractive. A native plant nursery should be able to recommend some good options, if you want to keep your garden native. One commonly grown native plant is yellow-flowered **ko'oko'olau**, (*Bidens* spp.), in the daisy family, which can coincidentally also be used to make tea. The butterflies have

also been observed feeding on rotten banana fruits still on the stalk, so the presence of some kind of fermenting fruit or other sweet substance may help attract them to your yard.

We assume that the more māmaki you can plant in your yard, and the closer you are to suitable natural habitat, the more likely it is that it will be found by a female butterfly looking for a place to lay her eggs. If you can convince your neighbor to plant a few māmaki trees as well, your chances should get better! If you do succeed in attracting Kamehameha butterflies, please send us a photograph! Our hope is that if enough people plant and properly manage māmaki in residential areas near natural populations, the range of the Kamehameha butterfly will expand back into residential areas where it used to be found. Perhaps one day the butterfly will once again be a common visitor to gardens in windward areas of Hawaii!

## Learn how to recognize the different stages of the Kamehameha butterfly and its host plants.

Website: www.KamehamehaButterfly.com

Email: pulelehua@ctahr.hawaii.edu

Kamehameha butterfly caterpillar [YouTube] http://www.youtube.com/watch?v=GwUKQYRhhq8



Pipturus albidus (Mamaki, mamake) Images by Forest & Kim Starr