



BUG BIZ

Pest Management and Insect Identification Series



Danaus plexippus, Monarch Butterfly (Lepidoptera: Nymphalidae)

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Description

The monarch butterfly, *Danaus plexippus*, is one of the most well-known butterflies in North America. Adults are easily recognized by the orange wings laced with black stripes and speckled with white dots along the edge. Large adults have wingspans up to 4 inches across (104 mm). Eggs are soft white in color with longitudinal ridges, $\frac{1}{25}$ to $\frac{1}{2}$ of an inch (0.9 to 2.1 mm) in length. Newly emerged larvae (caterpillars) possess white abdomens and black heads. Mature larvae have repeating white, black and yellow stripes. Larvae can reach nearly 2 inches (50 mm) in length when fully developed. Their true antennae are nearly invisible, but the second segment bears a pair of black filaments that may aid in sensory function. A similar pair is present on the eighth segment. The thorax bears three pairs of true legs, and “false legs” (prolegs) are present under each abdominal segment beyond the second. These act like suction cups, allowing the caterpillar to move about the plant while feeding. The pupa, also known as the chrysalis, is light turquoise-green with golden flecks and is approximately $1\frac{1}{4}$ inches (3 cm) long.

Life Cycle

The life cycle of the monarch has four stages: egg, larva, pupa and adult. The average lifespan is two to six weeks, except for the last generation of the year, which can live up to eight to nine months. Females can lay 300 to 500 eggs over a two-to-five-week period. The eggs are laid on the underside of milkweed (*Asclepias* spp.) plants, protecting it from the weather. The larvae hatch three to eight days later. The first meal is the egg case, which contains vital nutrients. From then on, caterpillars feed exclusively on milkweed. They undergo five successive molts as they grow. During the fifth instar, they leave the milkweed in search of a place to pupate into the pupal stage (chrysalis). The larvae typically select sheltered locations high off the ground for protection. The chrysalis' turquoise-green coloring and golden spots that



Danaus plexippus adult on flowering milkweed (Steven Katovich, Bugwood.org).



Monarch full wingspan (Rebecca D. Wallace, University of Georgia, Bugwood.org).



Left: *Monarch chrysalis* (Whitney Cranshaw, Colorado State University, Bugwood.org). Right: *Monarch caterpillar on milkweed* (Karan A. Rawlins, University of Georgia, Bugwood.org).

reflect light make it difficult for predators to see during this vulnerable stage. After 8 to 15 days, depending on temperature, the adult butterfly emerges. The wings of newly emerged butterflies are reduced and may appear shriveled. Butterflies require a vertically oriented surface to accomplish the critical task of expanding and flattening the wings before they are capable of flying, a process that may take several hours.

Migration

Monarchs are native to North and South America and have been introduced to other places where milkweed (*Aesclepias* spp.) has been introduced, including Hawaii, Australia and New Zealand, with sporadic occurrences elsewhere. There are two groups of monarchs in North America: the western monarchs, which breed west of the Rocky Mountains and overwinter in Southern California, and the eastern monarchs, which breed in the eastern United States and Canada and overwinter in central Mexico.

The eastern North American monarch has a spectacular multigenerational annual migration. The migratory generation of monarchs, those that emerge in late August through September, do not immediately enter the reproductive stage like their predecessors. To conserve energy for their great journey, the reproductive organs do not fully develop. They travel to the Sierra Madre Mountains of Mexico, where they overwinter from October to late March in oyamel fir (*Abies religiosa*) forests. The mountain hillsides of the oyamel forests provide the perfect microclimate for the butterflies to survive, with humidity levels high enough to prevent them from drying out. It is only with the lengthening of daylight hours the following spring that their reproductive organs complete development, and a new generation emerges to begin the journey back home. Unlike the migratory generation that traveled south, multiple generations are required to make the return trip to North America.

The Close Relationship Between Monarchs and Milkweed

Monarchs feed only on milkweed during the larval stage. Many species of milkweed exist, and all produce toxic compounds known as cardenolids. This compound is found in the leaf tissue, which deters herbivores other than a few specialists. Monarchs have evolved physiological traits that make them cardenolide tolerant, which allow the caterpillars to contain high amounts of cardenolids. Thus, monarch caterpillars contain high amounts of cardenolids. This deters most vertebrate predators, such as birds, lizards and small mammals. Nevertheless, a few species of specialized parasitoids use monarch caterpillars as hosts, notably some species of tachinid flies, braconid wasps and tiny members of the wasp family Peromalidae. These parasitoids deposit eggs into larvae or pupae and the parasitoids develop internally. Often the larvae appear normal until the parasitoids pupate. They eventually kill the monarch before it reaches the adult stage. Various insect predators, especially vespid wasps (*Polistes* and *Vespula*) are undeterred by the sequestered toxins and will prey on monarch caterpillars.

Threats to Survival / Conservation

The eastern monarch population has decreased by roughly 80% since the 1980s based on surveys by monarch researchers. The close relationship between the monarch and milkweed places a heavy reliance upon the plant. Deforestation, urbanization and loss of naturalized open fields around farmland have contributed to the disappearance of milkweed. That, in combination with the growing rate of improper pesticide use, has caused a decrease in monarch populations in their breeding habitats in North America. Illegal deforestation of the oyamel forests in Mexico has dramatically reduced the overwintering habitat available for the migratory generation from eastern North America. Planting milkweed species in home gardens, community gardens and along hedgerows can supplement food plant availability and welcome monarchs into your community. Rearing monarchs is a wonderful pastime and project for introducing young people to nature study, but controversy exists about whether it contributes in any measurable way to increasing overall monarch numbers. Mass rearing monarchs often results in disease problems and may interfere with migratory behavior. Conserving and restoring native habitats where host plants occur naturally is a much more effective approach to supporting monarchs and other butterfly species.

References

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PUB3782 (online) 4/21

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