

Danaus plexippus (Monarch Butterfly)

Order: Lepidoptera (Butterflies and Moths)

Class: Insecta (Insects)

Phylum: Arthropoda (Arthropods)



Fig. 1. Monarch butterfly, *Danaus plexippus*.

[<http://kids.nationalgeographic.com/content/dam/kids/photos/animals/Bugs/H-P/monarch-butterfly-grass.jpg>.adapt.945.1.jpg, downloaded 2 March 2016]

TRAITS. The monarch butterfly is the most commonly known species of butterfly due to its distinctive orange, black and white pattern (Fig. 1). The adult insect has six legs (but only uses its middle legs) and four wings (2 forewings, 2 hind wings) with two antennae on its head and a wingspan of approximately 10cm (National Geographic, 2016). The wings itself are reddish-orange bordered in black and covered in black veins. Within the outer borders of each wing are two series of small white spots and on the tips of the forewings are also a few larger white and pale orange spots (Wikipedia, 2016). In addition, similar small white spots are present on its head and shoulders and its body is covered in tiny hairs that serve a protective function. The underside of the wings has a similar pattern to the upper side, but are typically a dull yellow-brown rather than bright orange (National Wildlife Federation, 2016). This species exhibits sexual dimorphism whereby the males tend to be slightly larger than the females. Although both males and females are similar in appearance, the veins on the males are thinner and less intense than the females and they possess a small black patch in the centre of their hind wings that is used to store pheromones (Nature Works, 2016).

DISTRIBUTION. This species is usually common in moist, coastal areas but rare in the tropics (Kitching, 1999) thus it is widespread over North and South America as well as Australia and New Zealand (Fig 2). It is also found in some Caribbean islands, including Trinidad and Tobago. Due to its intolerance of cold, wintry climates the monarch butterfly is migratory and so travels from north to south (from North America to the coast of southern California or central Mexico) to escape the winter periods (Brower, 1995).

HABITAT AND ACTIVITY. Found in diverse habitats ranging from grasslands to forested areas depending on the season. During the warm temperatures of spring and summer, the adult monarch butterfly inhabits the grasslands or open meadows (where milkweed plants are present) but as the temperature begins to drop, it spends the overwintering periods in wooded/ forested areas such as the Oyamel fir forests of central Mexico or in the woods along the coast of southern California. These woods are dominated by eucalyptus trees, Monterey pines and cypresses which provides its requirement of ample sunlight and vegetation as well as protection from most predators (Miller, 2012). Diurnal i.e. active during the day when there is sunlight available to find food or mates and rests during the night or when it is cloudy by hanging upside down, hidden among the foliage of leaves and twigs. However, during the overwintering periods, the monarch butterflies congregate (roost) on the trunks of forest trees forming colonies (Fig. 3). When these colonies are stable, they become inactive with little to no movement which occurs during the coldest months. As the humidity increases, they become active again and colonies move together in search of water and agricultural fields until they disperse, returning north to their individual lifestyle (Oberhauser and Solensky, 2004).

FOOD AND FEEDING. The diet of the monarch butterfly changes as it develops. The adult monarch butterfly feeds on the nectar of flowers, including milkweeds (Fig. 4) whereas the juveniles feed exclusively on the leaves of milkweed plants (National Wildlife Federation, 2016). Thus, this species can be described as a herbivore. Since the monarch butterfly feeds on plants (i.e. primary producers), its trophic level is therefore primary consumer. Using its proboscis (straw-like hollow tongue), this butterfly drinks the liquid produced by these plants. Although it is unclear how often these butterflies feed, nectar output is usually highest around midday and so it can be deduced that they feed several times throughout the day. The nectar collected is stored as fats and lipids in their bodies in preparation for the migration period.

POPULATION ECOLOGY. They are typically solitary insects although they come together during the southern migration forming clusters. As the clusters arrive in the forests, they gather on the barks of trees forming colonies (Oberhauser and Solensky, 2004). They are only found in pairs whilst mating. Males tend to be territorial, warding off other males as well as hummingbirds. They are also not seen interacting with other butterfly species. Most monarchs do not live long, only approximately five weeks but the over-wintering monarch butterflies (i.e those that migrate) live longer usually up to 8 months (National Wildlife Federation, 2016). Although these butterflies are an abundant species, their numbers have declined over the years due to many factors such as logging and climate change.

REPRODUCTION. This species undergoes the process of metamorphosis which includes the complex cycle from egg, larva and pupa to adulthood (Fig. 5). The overwintering populations of the monarch butterfly begin mating in the spring. The males tackle the females to the ground

where they mate (Wikipedia, 2016). Each female can mate up to seven times and lays eggs on the underside of the leaves of the milkweed plants as they continue to make their way northwards until they eventually die off (National Geographic, 2016). The female that mates several times can lay between 290-1180 small, oval-shaped, cream-coloured eggs, each of which is laid singly (Wikipedia, 2016). These eggs develop and hatch within 3-8 days to produce larvae (caterpillars) that are striped in black, white and yellow-green, with two projections at each end (Encyclopedia Britannica, 2016). Since the adult female butterfly usually does not survive long after laying eggs, there is no parental care thus the caterpillar continues its life cycle into adulthood alone.

BEHAVIOUR. Juvenile behaviour: The larva (caterpillar) of the monarch butterfly spends most of its life feeding on milkweed plants. Initially at a length of approximately 6mm, the caterpillar feeds and moults continuously for up to 2 weeks until it attains a length of approximately 45mm (Encyclopedia Britannica, 2016). It then attaches itself by its hindlegs to a horizontal surface and moults once more into a chrysalis (an opaque, blue-green pupa with small gold spots). It remains in this state for 2 weeks surviving off the stored fats from its larval stage until it emerges as an adult butterfly (Wikipedia, 2016).

Antipredator behaviour: The bright orange colour of the adult monarch butterfly acts as a warning, signalling to predators that it is poisonous and foul tasting. This poison is as a result of the toxins (alkaloids) accumulated from its diet of milkweed plants during its larval stage, which cause cardiac arrest to predators if ingested. It shares a Mullerian mimicry relationship with the viceroy butterfly that is similar in coloration and is also unpalatable to predators (Encyclopedia Britannica, 2016).

Communication: They communicate with each other using scents and colours. By releasing the pheromones on their hindwing, the males attract the females to mate and their bright colour signals its poisonous nature (National Wildlife Federation, 2016).

APPLIED ECOLOGY. The IUCN has declared the monarch butterfly near-threatened and the migration from North America has been classed an endangered biological phenomenon (Wildscreen Archive, 2016). This is due to the loss of habitat as a result of logging of the forests, climate change which affects migration as well as breeding times and the use of pesticides which kill the milkweed plants they feed on (National Wildlife Federation, 2016). In order to protect these pollinators, the Monarch Butterfly Biosphere Reserve was established and several areas of the overwintering forests in Mexico have been protected against logging.

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Author: Jo-Anna E. Henry

Posted online: 2016



Fig. 2. Monarch butterfly distribution.

[<http://kids.nationalgeographic.com/content/dam/kids/photos/animals/Bugs/H-P/monarch-butterfly-grass.jpg.adapt.945.1.jpg>, downloaded 2 March 2016]



Fig. 3. Overwintering monarch butterflies on trees in Mexico.

[<https://www.pinterest.com/annieamk/monarch-butterfly/>, downloaded 7 March 2016]



Fig. 4. Adult monarch butterflies feeding on milkweed flowers.

[<https://www.nwf.org/News-and-Magazines/National-Wildlife/Gardening/Archives/2010/Native-Plants-for-Pollinators.aspx>, downloaded 7 March 2016]

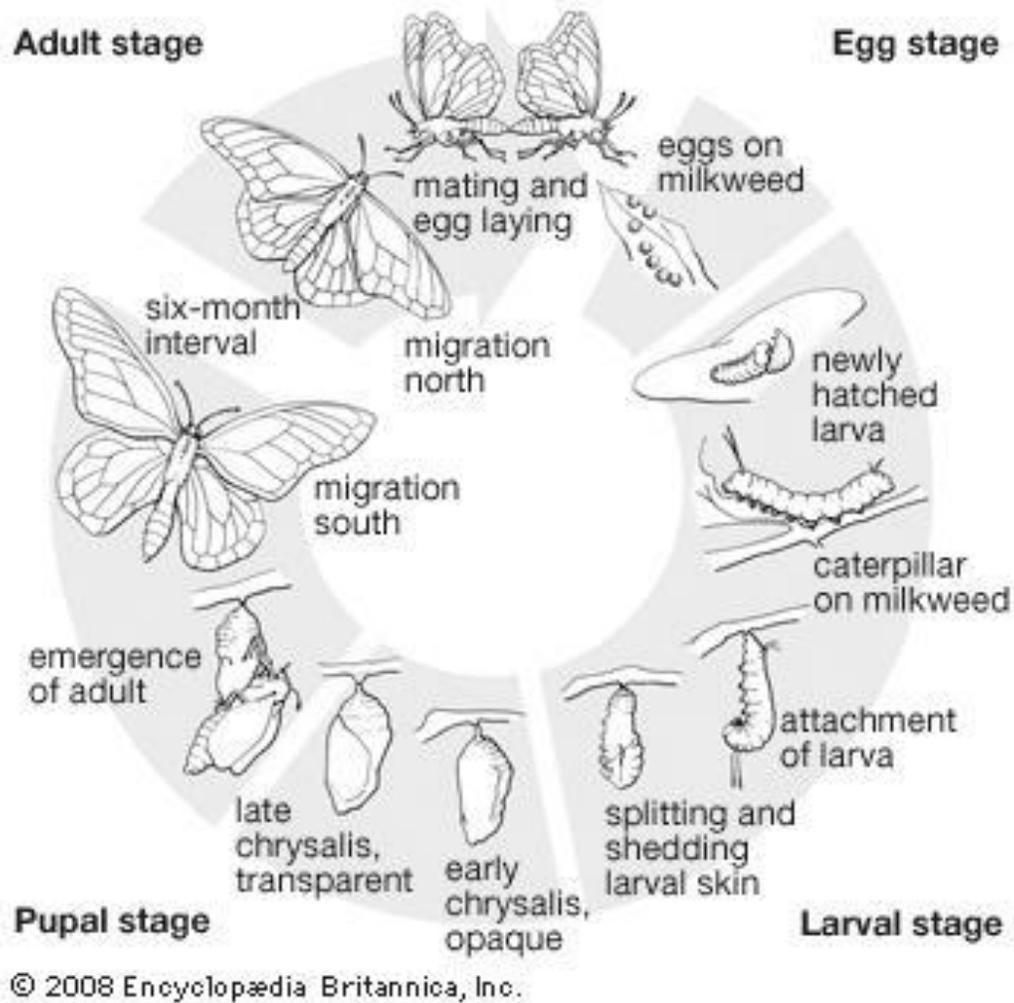


Fig. 5. The life cycle of the monarch butterfly.

[<http://www.britannica.com/science/life-cycle/images-videos/Life-cycle-of-the-monarch-butterfly/110819>, downloaded 7 March 2016]

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