**The Monarch Butterfly in North America**

The **monarch butterfly** (*Danaus plexippus*) is among the most recognized, studied, and loved of all of North America’s insects. Children study monarchs in [school](/wildflowers/pollinators/Monarch_Butterfly/teacherandstudent/index.shtml). Researchers and [citizen scientists](/wildflowers/pollinators/Monarch_Butterfly/citizenscience/index.shtml) track their migration and breeding. Conservationists and government agencies are concerned about threats to [breeding](/wildflowers/pollinators/Monarch_Butterfly/biology/index.shtml), [migration](/wildflowers/pollinators/Monarch_Butterfly/migration/index.shtml), and [wintering](/wildflowers/pollinators/Monarch_Butterfly/migration/index.shtml) habitats.

The annual migration cycle of the monarch butterfly has been described as the most spectacular in the insect world. It has been called an “endangered natural phenomenon”. This species and its migration are dependent upon [conservation](/wildflowers/pollinators/Monarch_Butterfly/conservation/index.shtml) of habitats in all three North American countries: Canada, the United States, and Mexico.

Awareness of the monarch butterfly’s [life cycle](/wildflowers/pollinators/Monarch_Butterfly/biology/index.shtml) and [habitat requirements](/wildflowers/pollinators/Monarch_Butterfly/habitat/index.shtml) is essential for their survival and an important step in the conservation of this animal. Many government agencies, organizations, and [individuals](/wildflowers/pollinators/Monarch_Butterfly/do/index.shtml) across North America are working on projects to conserve monarch habitats and their migration.

**Summary**

Butterflies go through a life cycle. There are four stages. The first stage is the eggs. This is where a girl butterfly lays eggs. She lays them on a leaf. The second stage is the caterpillar. This is where the eggs hatch. It takes about five days for the eggs to hatch. A caterpillar then comes out. At this stage, the caterpillar eats all the time. It also grows really fast. Once it is all the way grown, the third stage starts. This stage is the chrysalis. The caterpillar makes a chrysalis. The caterpillar is inside the chrysalis. Inside the chrysalis, it starts to change. It soon changes into a butterfly. Once the caterpillar has changed into a butterfly, the fourth stage starts. This is also that last stage in the life cycle. The fourth stage is the butterfly. A butterfly comes out of the chrysalis. It can now learn to fly. It can also find a mate. When it finds a mate, it lays eggs. Then the lifecycle process starts all over again.

**Different kinds of Butterflies**

There are many different kinds of butterflies. Here are some different kinds:

**Monarch**: This is the most known butterfly in North America. This butterfly has orange and black wings. In the fall they go to Mexico.

**Painted Lady**: Also called the thistle butterfly. This butterfly is everywhere in North America. The wings are orange and brown. The tips of its wings have black and white spots.

**Viceroy**: This butterfly is the same color as a Monarch. But it is smaller than a monarch. This butterfly is everywhere in the United States.

**Red-Spotted Purple**: This type of butterfly has many different colors. The top of the wings are blue. There are small red and white dots on the tops of the wings. The bottoms of its wings are a red and brown color. It also has orange spots. This butterfly flies fast. It is hard to catch. They like to sit on rotting fruit. They also like to sit in gardens.

**Buckeye**: This butterfly is seen in the United States. It is also in some places in Mexico. This butterfly is brown and orange. It also has patterns on its wings. These patterns look like eyes. These are used to scare off predators. This scares off other animals because it does not look like a butterfly.

**Zebra Longwing**: This butterfly has black and white stripes. It also likes the warm weather. It lives in Mexico and the United States. These butterflies eat pollen. They also live longer than many other kinds of butterflies.

**Fun Facts about Butterflies**

Butterflies taste with their feet.

Butterflies do not have mouths.

Butterflies need sun to fly.

Butterflies fly during the day.

Butterflies can see some colors. They can see red, yellow, and green.

Butterflies cannot fly if they are too cold. They need to be warm to fly.

Butterflies have their skeleton on the outside of their body. This is to protect them. It keeps the water inside of their body. This is good because they do not dry out.

The wings of a butterfly are transparent. The wings of a butterfly have tiny scales. These give their wings color. This is why they do not look transparent to us.

**Do Butterflies Migrate? Where Do They Go?**

'Monarch Butterflies Migrate Each Fall and Like To Hibernate In  
Certain Trees In Groups

Have you heard of the [Monarch butterfly migration?](http://www.monarch-butterfly.com/monarch-migration.html) Well, other butterflies migrate too! There are many other species of butterflies that also migrate. For example, the [Painted Lady](rearing.shtml), Common Buckeye, American Lady, Red Admiral, Cloudless Sulphur, Skipper, Sachem, Question Mark, Clouded Skipper, Fiery Skipper and Mourning Cloak are all butterflies that migrate as well.

There are different reasons why butterflies will migrate toward other places. Did you know that all butterflies are cold-blooded creatures? They simply can not handle the colder weather so have to travel somewhere warmer. They also need to stay where their food source is – if it’s winter and there are no flowers, they can not stay there.

If weather changing is not a problem, like for the butterflies in the tropics, butterflies will often migrate away in order to establish new colonies. The reason for this is that if they stay in one place for too long, the butterfly caterpillars will consume all of their food in that one area, and so the butterflies will starve to death. So migrating to new places will ensure their survival and their food source.

Monarch butterflies are not able to survive the cold winters of most of the United States so they migrate south and west each autumn to escape the cold weather. The monarch migration usually starts in about October of each year, but can start earlier if the weather turns cold sooner than that.

The monarch butterflies will spend their winter hibernation in Mexico and some parts of Southern California where it is warm all year long. If the monarch lives in the Eastern states, usually east of the Rocky Mountains, it will migrate to Mexico and hibernate in oyamel fir trees. If the monarch butterfly lives west of the Rocky Mountains, then it will hibernate in and around Pacific Grove, California in eucalyptus trees. Monarch butterflies use the very same trees each and every year when they migrate, which seems odd because they aren’t the same butterflies that were there last year. These are the new fourth generation of monarch butterflies, so how do they know which trees are the right ones to hibernate in? Monarch butterflies are the only insect that migrates to a warmer climate that is 2,500 miles away each year.

Sponsored Content

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Fun Butterfly Facts for Kids**  Check out our range of fun butterfly facts for kids. Learn about the lifecycle of butterflies, their wings, what they eat and much more. Read on and enjoy a variety of interesting information about butterflies. | |  |  |  |
|  | |  |  |  |
| * Butterflies are insects. * A butterfly’s lifecycle is made up of four parts, egg, larva (caterpillars), pupa (chrysalis) and adult. * Butterflies attach their eggs to leaves with a special glue. * Most caterpillars are plant eaters (herbivores). * Fully grown caterpillars attach themselves to a suitable twig or leaf before shedding their outside layer of skin to reveal a hard skin underneath known as a chrysalis. * An adult butterfly will eventually emerge from the chrysalis where it will wait a few hours for its wings to fill with blood and dry, before flying for the first time. * Butterflies can live in the adult stage from anywhere between a week and a year, depending on the species. * Butterflies have four wings. * Butterflies often have brightly coloured wings with unique patterns made up of tiny scales. * Most butterflies feed on nectar from flowers. * Butterflies have taste receptors on their feet. * Scientists estimate that there are between 15000 and 20000 different species of butterfly. * Birdwing butterflies have large, angular wings and fly in a similar way to birds. * Monarch butterflies are known for their long migration. Every year monarch butterflies will travel a great distance (sometimes over 4000 km), females will lay eggs and a new generation of monarchs will travel back, completing the cycle. |  |  |  |

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Butterfly

From Wikipedia, the free encyclopedia

Jump to: [navigation](/l), [search](/l)

For other uses, see [Butterfly (disambiguation)](/wiki/Butterfly_(disambiguation)).

|  |  |
| --- | --- |
| **Butterflies Temporal range:** [**Palaeocene**](/wiki/Palaeocene)**-Recent, 56–0** [**Ma**](/wiki/Megaannum)  [**Pre HYPERLINK "/wiki/Precambrian"Є**](/wiki/Precambrian)  [**Є**](/wiki/Cambrian)  [**O**](/wiki/Ordovician)  [**S**](/wiki/Silurian)  [**D**](/wiki/Devonian)  [**C**](/wiki/Carboniferous)  [**P**](/wiki/Permian)  [**T**](/wiki/Triassic)  [**J**](/wiki/Jurassic)  [**K**](/wiki/Cretaceous)  [**Pg**](/wiki/Paleogene)  [**N**](/wiki/Neogene) |  |
| /wiki/File:Fesoj\_-\_Papilio\_machaon\_(by).jpg/wiki/File:Fesoj\_-\_Papilio\_machaon\_(by).jpg |  |
| [*Papilio machaon*](/wiki/Papilio_machaon) |  |
| [**Scientific classification**](/wiki/Taxonomy_(biology)) **/wiki/Template:Taxonomy/Rhopalocera****/wiki/Template:Taxonomy/Rhopalocera** |  |
| Kingdom: | [Animalia](/wiki/Animal) |
| Phylum: | [Arthropoda](/wiki/Arthropod) |
| Class: | [Insecta](/wiki/Insect) |
| Order: | [Lepidoptera](/wiki/Lepidoptera) |
| Suborder: | **Rhopalocera** |
| **Subgroups** |  |
| * Superfamily [Hedyloidea](/wiki/Hedyloidea): * [Hedylidae](/wiki/Hedylidae) * Superfamily [Hesperioidea](/wiki/Hesperioidea): * [Hesperiidae](/wiki/Hesperiidae) * Superfamily [Papilionoidea](/wiki/Papilionoidea): * [Papilionidae](/wiki/Swallowtail_butterfly) * [Pieridae](/wiki/Pieridae) * [Nymphalidae](/wiki/Brush-footed_butterfly) * [Lycaenidae](/wiki/Lycaenidae) * [Riodinidae](/wiki/Riodinidae) |  |

**Butterflies** are [insects](/wiki/Insect) in the [clade](/wiki/Clade) Rhopalocera from the [order](/wiki/Order_(biology)) [Lepidoptera](/wiki/Lepidoptera), which also includes [moths](/wiki/Moth). Adult butterflies have large, often brightly coloured wings, and conspicuous, fluttering flight. The group comprises the large [superfamily](/wiki/Superfamily_(zoology)) [Papilionoidea](/wiki/Papilionoidea), along with two smaller groups, the skippers (superfamily [Hesperioidea](/wiki/Hesperioidea)) and the moth-butterflies (superfamily [Hedyloidea](/wiki/Hedyloidea)). Butterfly fossils date to the [Palaeocene](/wiki/Palaeocene), about 56 million years ago.

Butterflies have the typical four-stage insect life cycle. Winged adults lay eggs on the food plant on which their [larvae](/wiki/Larva), known as [caterpillars](/wiki/Caterpillar), will feed. The caterpillars grow, sometimes very rapidly, and when fully developed, [pupate](/wiki/Pupa) in a [chrysalis](/wiki/Chrysalis). When [metamorphosis](/wiki/Metamorphosis) is complete, the pupal skin splits, the adult insect climbs out, and after its wings have expanded and dried, it flies off. Some butterflies, especially in the tropics, have several generations in a year, while others have a single generation, and a few in cold locations may take several years to pass through their whole life cycle.

Butterflies are often [polymorphic](/wiki/Polymorphism_(biology)), and many species make use of [camouflage](/wiki/Camouflage), [mimicry](/wiki/Mimicry) and [aposematism](/wiki/Aposematism) to evade their predators. Some, like the [monarch](/wiki/Monarch_(butterfly)) and the [painted lady](/wiki/Vanessa_cardui), [migrate](/wiki/Insect_migration) over long distances. Some butterflies have [parasitoidal](/wiki/Parasitoid) relationships with organisms including protozoans, flies, ants, and other invertebrates, and are [predated](/wiki/Predation) by vertebrates. Some species are pests because in their larval stages they can damage domestic crops or trees; other species are agents of [pollination](/wiki/Pollination) of some plants, and caterpillars of a few butterflies (e.g., [harvesters](/wiki/Miletinae)) eat harmful insects. Culturally, butterflies are a popular motif in the visual and literary arts.

**Contents**

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* [1 Etymology](/l)
* [2 Taxonomy and phylogeny](/l)

**Etymology**

/wiki/File:Common\_brimstone\_butterfly\_(Gonepteryx\_rhamni)\_male\_in\_flight.jpg/wiki/File:Common\_brimstone\_butterfly\_(Gonepteryx\_rhamni)\_male\_in\_flight.jpg

/wiki/File:Common\_brimstone\_butterfly\_(Gonepteryx\_rhamni)\_male\_in\_flight.jpgThe original "butter-fly"? A male brimstone ([*Gonepteryx rhamni*](/wiki/Gonepteryx_rhamni)) in flight

The [*Oxford English Dictionary*](/wiki/Oxford_English_Dictionary) derives the word straightforwardly from [Old English](/wiki/Old_English) *butorflēoge*, butter-fly; similar names in [Old Dutch](/wiki/Old_Dutch) and [Old High German](/wiki/Old_High_German) show that the name is ancient. A possible source of the name is the bright yellow male of the brimstone ([*Gonepteryx rhamni*](/wiki/Gonepteryx_rhamni)); another is that butterflies were on the wing in meadows during the spring and summer butter season while the grass was growing.[[1] HYPERLINK "/l"HYPERLINK \l " HYPERLINK "/l"[2]](/l)

**Taxonomy and phylogeny**

Further information: [Prehistoric Lepidoptera](/wiki/Prehistoric_Lepidoptera)

/wiki/File:Prodryas.png/wiki/File:Prodryas.png

/wiki/File:Prodryas.png[*Prodryas persephone*](/wiki/Prodryas), a [Late Eocene](/wiki/Late_Eocene) butterfly from the [Florissant Fossil Beds](/wiki/Florissant_Fossil_Beds_National_Monument). 1887 engraving

/wiki/File:PZSL1889Plate31\_Fossil\_Papilionid\_Butterfly\_Lithopsyche\_antiqua\_from\_Early\_Oligocene\_Bembridge\_Marls.png/wiki/File:PZSL1889Plate31\_Fossil\_Papilionid\_Butterfly\_Lithopsyche\_antiqua\_from\_Early\_Oligocene\_Bembridge\_Marls.png

/wiki/File:PZSL1889Plate31\_Fossil\_Papilionid\_Butterfly\_Lithopsyche\_antiqua\_from\_Early\_Oligocene\_Bembridge\_Marls.png[*Lithopsyche antiqua*](/wiki/Lithopsyche_antiqua), an [Early Oligocene](/wiki/Early_Oligocene) butterfly from the Bembridge Marls, [Isle of Wight](/wiki/Isle_of_Wight). 1889 engraving

The earliest [Lepidoptera](/wiki/Lepidoptera) fossils are of a small moth, [*Archaeolepis mane*](/wiki/Archaeolepis), of [Jurassic](/wiki/Jurassic) age, around 190 million years ago (mya).[[3] HYPERLINK "/l"HYPERLINK \l " HYPERLINK "/l"[4]](/l) Butterflies evolved from moths, so while the butterflies are [monophyletic](/wiki/Monophyletic) (forming a single [clade](/wiki/Clade)), the moths are not. The oldest butterflies are from the [Palaeocene](/wiki/Palaeocene) [MoClay](/wiki/MoClay) or [Fur Formation](/wiki/Fur_Formation) of Denmark. The oldest American butterfly is the [Late Eocene](/wiki/Late_Eocene) [*Prodryas persephone*](/wiki/Prodryas) from the [Florissant Fossil Beds](/wiki/Florissant_Fossil_Beds_National_Monument).[[5] HYPERLINK "/l"HYPERLINK \l " HYPERLINK "/l"[6]](/l)

Traditionally, the butterflies have been divided into the [superfamily](/wiki/Superfamily_(zoology)) [Papilionoidea](/wiki/Papilionoidea) and the smaller groupings of the [Hesperioidea](/wiki/Hesperioidea) (skippers) and the more moth-like [Hedyloidea](/wiki/Hedyloidea) of America. [Phylogenetic](/wiki/Phylogeny) analysis suggests that the traditional Papilionoidea is [paraphyletic](/wiki/Paraphyly) with respect to the other two groups, so they should both be included to form a single butterfly group, the clade **Rhopalocera**.[[7] HYPERLINK "/l"HYPERLINK \l " HYPERLINK "/l"[8]](/l)

Butterfly families

|  |  |  |  |
| --- | --- | --- | --- |
| **Family** | **Common name** | **Characteristics** | **Image** |
| [Hedylidae](/wiki/Hedylidae) | American moth-butterflies | Small, brown, like [geometrid moths](/wiki/Geometridae); antennae not clubbed; long slim abdomen | /wiki/File:Macrosoma\_bahiata.jpg/wiki/File:Macrosoma\_bahiata.jpg |
| [Hesperiidae](/wiki/Hesperiidae) | Skippers | Small, darting flight; clubs on antennae hooked backwards | /wiki/File:Hesperia\_comma-01\_(xndr).jpg/wiki/File:Hesperia\_comma-01\_(xndr).jpg |
| [Lycaenidae](/wiki/Lycaenidae) | Blues, coppers, hairstreaks | Small, brightly coloured; often have false heads with eyespots and small tails resembling antennae | /wiki/File:Maculinea\_arion\_Large\_Blue\_Upperside\_SFrance\_2009-07-18.jpg/wiki/File:Maculinea\_arion\_Large\_Blue\_Upperside\_SFrance\_2009-07-18.jpg |
| [Nymphalidae](/wiki/Nymphalidae) | Brush-footed or four-footed butterflies | Usually have reduced forelegs, so appear four-legged; often brightly coloured | /wiki/File:AD2009Aug01\_Vanessa\_atalanta\_01.jpg/wiki/File:AD2009Aug01\_Vanessa\_atalanta\_01.jpg |
| [Papilionidae](/wiki/Papilionidae) | Swallowtails | Often have 'tails' on wings; caterpillar generates foul taste with [osmeterium](/wiki/Osmeterium) organ; pupa supported by silk girdle | /wiki/File:Papilio\_troilus01.jpg/wiki/File:Papilio\_troilus01.jpg |
| [Pieridae](/wiki/Pieridae) | Whites and allies | Mostly white, yellow or orange; some serious pests of [*Brassica*](/wiki/Brassica); pupa supported by silk girdle | /wiki/File:Large\_white\_spread\_wings.jpg/wiki/File:Large\_white\_spread\_wings.jpg |
| [Riodinidae](/wiki/Riodinidae) | Metalmarks | Often have metallic spots on wings; often conspicuously coloured with black, orange and blue | /wiki/File:Necyria\_bellona\_manco\_NovaraExpZoologischeTheilLepidopteraAtlasTaf36.jpg/wiki/File:Necyria\_bellona\_manco\_NovaraExpZoologischeTheilLepidopteraAtlasTaf36.jpg |

**Biology**

/wiki/File:Inachis\_io\_top\_detail\_MichaD\_crop.jpg/wiki/File:Inachis\_io\_top\_detail\_MichaD\_crop.jpg

/wiki/File:Inachis\_io\_top\_detail\_MichaD\_crop.jpgThe wings of butterflies, here [*Inachis io*](/wiki/Inachis_io), are covered with coloured scales

**General description**

/wiki/File:Antennae\_ctb.png/wiki/File:Antennae\_ctb.png

/wiki/File:Antennae\_ctb.pngButterfly antennal shapes, mainly clubbed, unlike those of moths. Drawn by C. T. Bingham, 1905

Further information: [Glossary of entomology terms](/wiki/Glossary_of_entomology_terms) and [Comparison of butterflies and moths](/wiki/Comparison_of_butterflies_and_moths)

/wiki/File:Laothoe\_populi\_5.jpg/wiki/File:Laothoe\_populi\_5.jpg

/wiki/File:Laothoe\_populi\_5.jpgUnlike butterflies, most moths (like [*Laothoe populi*](/wiki/Laothoe_populi)) fly by night and hide by day.

Butterfly adults are characterized by their four scale-covered wings, which give the Lepidoptera their name ([Ancient Greek](/wiki/Ancient_Greek) λεπίς lepís, scale + πτερόν pterón, wing). These scales give butterfly wings their colour: they are pigmented with [melanins](/wiki/Melanin) that give them blacks and browns, as well as [uric acid](/wiki/Uric_acid) derivatives and [flavones](/wiki/Flavones) that give them yellows, but many of the blues, greens, reds and [iridescent colours](/wiki/Iridescence) are created by [structural coloration](/wiki/Structural_coloration) produced by the micro-structures of the scales and hairs.[[9] HYPERLINK "/l"HYPERLINK \l " HYPERLINK "/l"[10] HYPERLINK "/l"HYPERLINK \l " HYPERLINK "/l"[11] HYPERLINK "/l"HYPERLINK \l " HYPERLINK "/l"[12]](/l)

As in all insects, the body is divided into three sections: the head, [thorax](/wiki/Thorax_(insect_anatomy)), and [abdomen](/wiki/Abdomen). The thorax is composed of three segments, each with a pair of legs. In most families of butterfly the antennae are clubbed, unlike those of [moths](/wiki/Moth) which may be threadlike or feathery. The long proboscis can be coiled when not in use for sipping nectar from flowers.[[13]](/l)

Nearly all butterflies are [diurnal](/wiki/Diurnal_cycle), have relatively bright colours, and hold their wings vertically above their bodies when at rest, unlike the majority of moths which fly by night, are often [cryptically](/wiki/Crypsis) coloured (well camouflaged), and either hold their wings flat (touching the surface on which the moth is standing) or fold them closely over their bodies. Some day-flying moths, such as the [hummingbird hawk-moth](/wiki/Hummingbird_hawk-moth),[[14]](/l) are exceptions to these rules.[[13] HYPERLINK "/l"HYPERLINK \l " HYPERLINK "/l"[15]](/l)

[Sexual dimorphism](/wiki/Sexual_dimorphism) in [*Anthocharis cardamines*](/wiki/Anthocharis_cardamines)

|  |  |
| --- | --- |
| /wiki/File:Anthocharis\_cardamines\_Weinsberg\_20080424.jpg/wiki/File:Anthocharis\_cardamines\_Weinsberg\_20080424.jpg  Male | /wiki/File:Anthocharis\_cardamines\_female\_(5709794696).jpg/wiki/File:Anthocharis\_cardamines\_female\_(5709794696).jpg  Female |

Butterfly [larvae](/wiki/Larva), [caterpillars](/wiki/Caterpillar), have a hard ([sclerotised](/wiki/Sclerotin)) head with strong mandibles used for cutting their food, most often leaves. They have cylindrical bodies, with ten segments to the abdomen, generally with short prolegs on segments 3–6 and 10; the three pairs of true legs on the thorax have five segments each.[[13]](/l) Many are well camouflaged; others are aposematic with bright colours and bristly projections containing toxic chemicals obtained from their food plants. The [pupa](/wiki/Pupa) or chrysalis, unlike that of moths, is not wrapped in a cocoon.[[13]](/l)

Many butterflies are [sexually dimorphic](/wiki/Sexual_dimorphism). Most butterflies have the [ZW](/wiki/ZW_sex-determination_system) [sex-determination system](/wiki/Sex-determination_system) where females are the heterogametic sex (ZW) and males homogametic (ZZ).[[16]](/l)

**Distribution and migration**

*See also lists of butterflies of* [Australia](/wiki/List_of_butterflies_of_Australia) ([Tasmania](/wiki/List_of_butterflies_of_Tasmania), [Victoria](/wiki/List_of_butterflies_of_Victoria)), [Britain](/wiki/List_of_butterflies_of_Great_Britain), [India](/wiki/List_of_butterflies_of_India), [Minorca](/wiki/List_of_butterflies_of_Minorca), [North America](/wiki/List_of_butterflies_of_North_America), [Taiwan](/wiki/List_of_butterflies_of_Taiwan), [Trinidad and Tobago](/wiki/List_of_butterflies_of_Trinidad_and_Tobago)

Further information: [Lepidoptera migration](/wiki/Lepidoptera_migration), [Insect migration](/wiki/Insect_migration), and [Animal navigation](/wiki/Animal_navigation)

Butterflies are distributed worldwide except Antarctica, totalling some 18,500 species.[[17]](/l) Of these, 775 are [Nearctic](/wiki/Nearctic_ecozone); 7,700 [Neotropical](/wiki/Neotropic_ecozone); 1,575 [Palearctic](/wiki/Palearctic_ecozone); 3,650 [Afrotropical](/wiki/Afrotropic_ecozone); and 4,800 are distributed across the combined Oriental and Australian/[Oceania](/wiki/Oceania) regions.[[17]](/l) The [monarch butterfly](/wiki/Monarch_butterfly) is native to the Americas, but in the nineteenth century or before, spread across the world, and is now found in Australia, New Zealand, other parts of Oceania, and the [Iberian Peninsula](/wiki/Iberian_Peninsula). It is not clear how it dispersed; adults may have been blown by the wind or larvae or pupae may have been accidentally transported by humans, but the presence of suitable host plants in their new environment was a necessity for their successful establishment.[[18]](/l)

/wiki/File:MonarchWanderungKlein.gif/wiki/File:MonarchWanderungKlein.gif

/wiki/File:MonarchWanderungKlein.gif[Monarch](/wiki/Monarch_(butterfly)) migration route

/wiki/File:Angangueo\_monarchs.jpg/wiki/File:Angangueo\_monarchs.jpg

/wiki/File:Angangueo\_monarchs.jpgOverwintering monarchs cluster on [oyamel](/wiki/Oyamel) trees near [Angangueo](/wiki/Angangueo), Mexico.

Many butterflies, such as the [painted lady](/wiki/Vanessa_cardui), monarch, and several [danaine](/wiki/Danainae) migrate for long distances. These migrations take place over a number of generations and no single individual completes the whole trip. The eastern North American population of monarchs can travel thousands of miles south-west to [overwintering sites in Mexico](/wiki/Monarch_Butterfly_Biosphere_Reserve). There is a reverse migration in the spring.[[19] HYPERLINK "/l"HYPERLINK \l " HYPERLINK "/l"[20]](/l) It has recently been shown that the British painted lady undertakes a 9,000-mile round trip in a series of steps by up to six successive generations, from tropical Africa to the Arctic Circle — almost double the length of the famous migrations undertaken by monarch.[[21]](/l) Spectacular large-scale migrations associated with the [monsoon](/wiki/Monsoon) are seen in peninsular India.[[22]](/l) Migrations have been studied in more recent times using wing tags and also using [stable hydrogen isotopes](/wiki/Hydrogen_isotope_biogeochemistry).[[23] HYPERLINK "/l"HYPERLINK \l " HYPERLINK "/l"[24]](/l)

Butterflies navigate using a time-compensated sun compass. They can see polarized light and therefore orient even in cloudy conditions. The polarized light near the ultraviolet spectrum appears to be particularly important.[[25] HYPERLINK "/l"HYPERLINK \l " HYPERLINK "/l"[26]](/l) Many migratory butterflies live in semi-arid areas where breeding seasons are short.[[27]](/l) The life histories of their host plants also influence butterfly behaviour.[[28]](/l)

**Life cycle**

/wiki/File:Mating\_Pair\_of\_Spotted\_Fritillaries\_on\_Greater\_Pignut.JPG/wiki/File:Mating\_Pair\_of\_Spotted\_Fritillaries\_on\_Greater\_Pignut.JPG

/wiki/File:Mating\_Pair\_of\_Spotted\_Fritillaries\_on\_Greater\_Pignut.JPGMating pair of [spotted fritillaries](/wiki/Melitaea_didyma) on [greater pignut](/wiki/Bunium_bulbocastanum)

Butterflies in their adult stage can live from a week to nearly a year depending on the species. Many species have long larval life stages while others can remain [dormant](/wiki/Diapause) in their pupal or egg stages and thereby survive winters.[[29]](/l) The [Melissa Arctic](/wiki/Oeneis_melissa) (*Oeneis melissa*) overwinters twice as a caterpillar.[[30]](/l) Butterflies may have one or more broods per year. The number of generations per year varies from [temperate](/wiki/Temperateness) to [tropical regions](/wiki/Tropics) with tropical regions showing a trend towards [multivoltinism](/wiki/Voltinism).[[31]](/l)

/wiki/File:Thymelicus\_sylvestris\_m1.JPG/wiki/File:Thymelicus\_sylvestris\_m1.JPG

/wiki/File:Thymelicus\_sylvestris\_m1.JPGThe male small skipper ([*Thymelicus sylvestris*](/wiki/Thymelicus_sylvestris)) has [pheromone](/wiki/Pheromone)-releasing "sex brands" (dark line) on the upperside of its forewings.

[Courtship](/wiki/Courtship) is often aerial and often involves [pheromones](/wiki/Pheromone). Butterflies then land on the ground or on a perch to mate.[[13]](/l) Copulation takes place tail-to-tail and may last from minutes to hours. The male passes a [spermatophore](/wiki/Spermatophore) to the female; to reduce sperm competition, he may cover her with his scent, or in some species such as the Apollos ([*Parnassius*](/wiki/Parnassius)) [plugs her genital opening](/wiki/Mating_plug) to prevent her from mating again.[[32]](/l)

The vast majority of butterflies have a four-stage life cycle; [egg](/wiki/Egg), [larva](/wiki/Larva) (caterpillar), [pupa](/wiki/Pupa) (chrysalis) and [imago](/wiki/Imago) (adult). In the genera [*Colias*](/wiki/Colias), [*Erebia*](/wiki/Erebia), [*Euchloe*](/wiki/Euchloe), and *Parnassius*, a small number of species are known that reproduce [semi-parthenogenetically](/wiki/Parthenogenesis); when the female dies, a partially developed larva emerges from her abdomen.[[33]](/l)

**Egg**

/wiki/File:2012-06-27\_Aporia\_crataegi\_eggs\_Malus\_domestica.JPG/wiki/File:2012-06-27\_Aporia\_crataegi\_eggs\_Malus\_domestica.JPG

/wiki/File:2012-06-27\_Aporia\_crataegi\_eggs\_Malus\_domestica.JPGEggs of black-veined white ([*Aporia crataegi*](/wiki/Aporia_crataegi)) on [apple](/wiki/Apple) leaf

/wiki/File:Butterfly\_laying\_eggs\_underneath\_a\_leaf.jpg/wiki/File:Butterfly\_laying\_eggs\_underneath\_a\_leaf.jpg

/wiki/File:Butterfly\_laying\_eggs\_underneath\_a\_leaf.jpgA butterfly laying eggs underneath the leaf

Butterfly eggs are protected by a hard-ridged outer layer of shell, called the *chorion*. This is lined with a thin coating of wax which prevents the egg from drying out before the larva has had time to fully develop. Each egg contains a number of tiny funnel-shaped openings at one end, called *micropyles*; the purpose of these holes is to allow sperm to enter and fertilize the egg. Butterfly eggs vary greatly in size and shape between species, but are usually upright and finely sculptured. Some species lay eggs singly, others in batches. Many females produce between one hundred and two hundred eggs.[[33]](/l)

Butterfly eggs are fixed to a leaf with a special glue which hardens rapidly. As it hardens it contracts, deforming the shape of the egg. This glue is easily seen surrounding the base of every egg forming a meniscus. The nature of the glue has been little researched but in the case of [*Pieris brassicae*](/wiki/Pieris_brassicae), it begins as a pale yellow granular secretion containing acidophilic proteins. This is viscous and darkens when exposed to air, becoming a water-insoluble, rubbery material which soon sets solid.[[34]](/l) Butterflies in the genus [*Agathymus*](/wiki/Agathymus) do not fix their eggs to a leaf, instead the newly laid eggs fall to the base of the plant.[[35]](/l)

Eggs are almost invariably laid on plants. Each species of butterfly has its own host plant range and while some species of butterfly are restricted to just one species of plant, others use a range of plant species, often including members of a common family.[[36]](/l) In some species, such as the [great spangled fritillary](/wiki/Great_spangled_fritillary), the eggs are deposited close to but not on the food plant. This most likely happens when the egg overwinters before hatching and where the host plant loses its leaves in winter, as do [violets](/wiki/Viola_(plant)) in this example.[[37]](/l)

The egg stage lasts a few weeks in most butterflies, but eggs laid close to winter, especially in temperate regions, go through a [diapause](/wiki/Diapause) (resting) stage, and the hatching may take place only in spring.[[38]](/l) Some temperate region butterflies, such as the [Camberwell beauty](/wiki/Nymphalis_antiopa), lay their eggs in the spring and have them hatch in the summer.[[39]](/l)

**Caterpillar larva**

/wiki/File:Papilionidae\_-\_Papilio\_machaon-2.JPG/wiki/File:Papilionidae\_-\_Papilio\_machaon-2.JPG

/wiki/File:Papilionidae\_-\_Papilio\_machaon-2.JPG[Aposematic](/wiki/Aposematism) caterpillar of [*Papilio machaon*](/wiki/Papilio_machaon), in threat pose

Butterfly larvae, or caterpillars, consume plant leaves and spend practically all of their time searching for and eating food. Although most caterpillars are herbivorous, a few species are [predators](/wiki/Predation): [*Spalgis epius*](/wiki/Spalgis_epius) eats [scale insects](/wiki/Scale_insect),[[40]](/l) while lycaenids such as [*Liphyra brassolis*](/wiki/Liphyra_brassolis) are [myrmecophilous](/wiki/Myrmecophily), eating ant larvae.[[41]](/l)

/wiki/File:Lycaenid\_ant\_sec.jpg/wiki/File:Lycaenid\_ant\_sec.jpg

/wiki/File:Lycaenid\_ant\_sec.jpg[Mutualism](/wiki/Mutualism_(biology)): ant tending a [lycaenid](/wiki/Lycaenidae) caterpillar

Some larvae, especially those of the [Lycaenidae](/wiki/Lycaenidae), form [mutual associations](/wiki/Mutualism_(biology)) with ants. They communicate with the ants using vibrations that are transmitted through the [substrate](/wiki/Substrate_(biology)) as well as using chemical signals.[[42] HYPERLINK "/l"HYPERLINK \l " HYPERLINK "/l"[43]](/l) The ants provide some degree of protection to these larvae and they in turn gather [honeydew secretions](/wiki/Honeydew_(secretion)). [Large blue](/wiki/Large_blue) (*Phengaris arion*) caterpillars trick [*Myrmica*](/wiki/Myrmica) ants into taking them back to the [ant colony](/wiki/Ant_colony) where they feed on the ant eggs and larvae in a parasitic relationship.[[44]](/l)

/wiki/File:Four-horned\_Sphinx\_(Elm\_Sphinx).jpg/wiki/File:Four-horned\_Sphinx\_(Elm\_Sphinx).jpg

/wiki/File:Four-horned\_Sphinx\_(Elm\_Sphinx).jpg[Cryptic](/wiki/Camouflage) [countershaded](/wiki/Countershading) caterpillar of a hawkmoth, [*Ceratomia amyntor*](/wiki/Ceratomia_amyntor)

Caterpillars mature through a series of developmental stages known as [instars](/wiki/Instar). Near the end of each stage, the larva undergoes a process called [apolysis](/wiki/Apolysis), mediated by the release of a series of [neurohormones](/wiki/Neurohormone). During this phase, the [cuticle](/wiki/Cuticle), a tough outer layer made of a mixture of [chitin](/wiki/Chitin) and specialized [proteins](/wiki/Protein), is released from the softer [epidermis](/wiki/Squamous_epithelium) beneath, and the epidermis begins to form a new cuticle. At the end of each instar, the larva [moults](/wiki/Ecdysis), the old cuticle splits and the new cuticle expands, rapidly hardening and developing pigment.[[45]](/l) Development of butterfly wing patterns begins by the last larval instar.

Caterpillars have short antennae and several [simple eyes](/wiki/Simple_eye_in_invertebrates). The [mouthparts](/wiki/Insect_mouthparts) are adapted for chewing with powerful mandibles and a pair maxillae, each with a segmented palp. Adjoining these is the labium-hypopharynx which houses a tubular spinneret which is able to extrude silk.[[9]](/l) Butterfly caterpillars have three pairs of true legs on the thoracic segments and up to six pairs of [prolegs](/wiki/Proleg) arising from the abdominal segments. These prolegs have rings of tiny hooks called crochets that are engaged hydrostatically and help the caterpillar grip the substrate.[[46]](/l) The epidermis bears tufts of [setae](/wiki/Seta), the position and number of which help in identifying the species. There is also decoration in the form of hairs, wart-like protuberances, horn-like protuberances and spines. Internally, most of the body cavity is taken up by the gut, but there may also be large silk glands, and special glands which secrete distasteful or toxic substances. The developing wings are present in later stage instars and the [gonads](/wiki/Gonad) start development in the egg stage.[[9]](/l)

**Pupa**

/wiki/File:Chrysalis5504.jpg/wiki/File:Chrysalis5504.jpg

/wiki/File:Chrysalis5504.jpg[Chrysalis](/wiki/Chrysalis) of [gulf fritillary](/wiki/Gulf_fritillary)

When the larva is fully grown, hormones such as [prothoracicotropic hormone](/wiki/Prothoracicotropic_hormone) (PTTH) are produced. At this point the larva stops feeding, and begins "wandering" in the quest for a suitable pupation site, often the underside of a leaf or other concealed location. There it spins a button of silk which it uses to fasten its body to the surface and moults for a final time. While some caterpillars spin a [cocoon](/wiki/Pupa) to protect the pupa, most species do not. The naked pupa, often known as a chrysalis, usually hangs head down from the cremaster, a spiny pad at the posterior end, but in some species a silken girdle may be spun to keep the pupa in a head-up position.[[33]](/l) Most of the tissues and cells of the larva are broken down inside the pupa, as the constituent material is rebuilt into the imago. The structure of the transforming insect is visible from the exterior, with the wings folded flat on the ventral surface and the two halves of the proboscis, with the antennae and the legs between them.[[9]](/l)

The pupal transformation into a butterfly through [metamorphosis](/wiki/Metamorphosis) has held great appeal to mankind. To transform from the miniature wings visible on the outside of the pupa into large structures usable for flight, the pupal wings undergo rapid mitosis and absorb a great deal of nutrients. If one wing is surgically removed early on, the other three will grow to a larger size. In the pupa, the wing forms a structure that becomes compressed from top to bottom and pleated from proximal to distal ends as it grows, so that it can rapidly be unfolded to its full adult size. Several boundaries seen in the adult colour pattern are marked by changes in the expression of particular transcription factors in the early pupa.[[47]](/l)

**Adult**

The reproductive stage of the insect is the winged adult or [imago](/wiki/Imago). The surface of both butterflies and moths is covered by scales, each of which is an outgrowth from a single [epidermal](/wiki/Epidermis) cell. The head is small and dominated by the two large [compound eyes](/wiki/Eye). These are capable of distinguishing flower shapes or motion but not for clearly viewing distant objects. Colour perception is good, especially in some species in the blue/violet range. The [antennae](/wiki/Antenna_(biology)) are composed of many segments and have clubbed tips (unlike moths that have tapering or feathery antennae). The sensory receptors are concentrated in the tips and can detect odours. Taste receptors are located on the palps and on the feet. The mouthparts are designed for sucking and the [mandibles](/wiki/Mandible) are usually reduced in size or absent. The first maxillae are elongated into a tubular [proboscis](/wiki/Proboscis) which is curled up at rest and expanded when needed to feed. The first and second maxillae bear palps which function as sensory organs. Some species have a reduced proboscis or maxillary palps and do not feed as adults.[[9]](/l)

The thorax of the butterfly is devoted to locomotion. Each of the three thoracic segments has two legs (among [nymphalids](/wiki/Nymphalidae), the first pair is reduced and the insects walk on four legs). The second and third segments of the thorax bear the wings. The leading edges of the forewings have thick veins to strengthen them, and the hindwings are smaller and more rounded and have fewer stiffening veins. The forewings and hindwings are not hooked together ([as they are in moths](/wiki/Wing_coupling_(Lepidoptera_anatomy))) but are coordinated by the friction of their overlapping parts. The front two segments have a pair of [spiracles](/wiki/Spiracle) which are used in respiration.[[9]](/l)

The abdomen consists of ten segments and contains the gut and genital organs. The front eight segments have spiracles and the terminal segment is modified for reproduction. The male has a pair of clasping organs attached to a ring structure, and during copulation, a tubular structure is extruded and inserted into the female's vagina. A [spermatophore](/wiki/Spermatophore) is deposited in the female, following which the sperm make their way to a seminal receptacle where they are stored for later use. In both sexes, the genitalia are adorned with various spines, teeth, scales and bristles, which act to prevent the butterfly from mating with an insect of another species.[[9]](/l) After it emerges from its pupal stage, a butterfly cannot fly until the wings are unfolded. A newly emerged butterfly needs to spend some time inflating its wings with [hemolymph](/wiki/Hemolymph) and letting them dry, during which time it is extremely vulnerable to predators.[[48]](/l)

**Behaviour**

/wiki/File:Australian\_painted\_lady\_feeding.jpg/wiki/File:Australian\_painted\_lady\_feeding.jpg

/wiki/File:Australian\_painted\_lady\_feeding.jpgAn [Australian painted lady](/wiki/Australian_painted_lady) feeding on a flowering shrub

Butterflies feed primarily on [nectar](/wiki/Nectar) from flowers. Some also derive nourishment from [pollen](/wiki/Pollen),[[49]](/l) tree sap, rotting fruit, dung, decaying flesh, and dissolved minerals in wet sand or dirt. Butterflies are important as pollinators for some species of plants. In general, they do not carry as much pollen load as [bees](/wiki/Bee), but they are capable of moving pollen over greater distances.[[50]](/l) [Flower constancy](/wiki/Flower_constancy) has been observed for at least one species of butterfly.[[51]](/l)

Adult butterflies consume only liquids, ingested through the proboscis. They sip water from damp patches for hydration and feed on nectar from flowers, from which they obtain sugars for energy, and [sodium](/wiki/Sodium) and other minerals vital for reproduction. Several species of butterflies need more sodium than that provided by nectar and are attracted by sodium in salt; they sometimes land on people, attracted by the salt in human sweat. Some butterflies also visit dung, rotting fruit or carcasses to obtain minerals and nutrients. In many species, this [mud-puddling](/wiki/Mud-puddling) behaviour is restricted to the males, and studies have suggested that the nutrients collected may be provided as a [nuptial gift](/wiki/Nuptial_gift), along with the spermatophore, during mating.[[52]](/l)

Butterflies use their antennae to sense the air for wind and scents. The antennae come in various shapes and colours; the hesperids have a pointed angle or hook to the antennae, while most other families show knobbed antennae. The antennae are richly covered with sensory organs known as [sensillae](/wiki/Sensillum). A butterfly's sense of taste is coordinated by chemoreceptors on the [tarsi](/wiki/Arthropod_leg), or feet, which work only on contact, and are used to determine whether an egg-laying insect's offspring will be able to feed on a leaf before eggs are laid on it.[[53]](/l) Many butterflies use chemical signals, [pheromones](/wiki/Pheromone); some have specialized scent scales ([androconia](/wiki/Androconia)) or other structures ([coremata](/wiki/Coremata) or "hair pencils" in the Danaidae).[[54]](/l) Vision is well developed in butterflies and most species are sensitive to the ultraviolet spectrum. Many species show sexual dimorphism in the patterns of UV reflective patches.[[55]](/l) Colour vision may be widespread but has been demonstrated in only a few species.[[56] HYPERLINK "/l"HYPERLINK \l " HYPERLINK "/l"[57]](/l) Some butterflies have organs of hearing and some species make [stridulatory](/wiki/Stridulation) and clicking sounds.[[58]](/l)

/wiki/File:Butterfly\_midflight.jpg/wiki/File:Butterfly\_midflight.jpg

/wiki/File:Butterfly\_midflight.jpg*Heteronympha merope* taking off

Many species of butterfly maintain territories and actively chase other species or individuals that may stray into them. Some species will bask or perch on chosen perches. The flight styles of butterflies are often characteristic and some species have courtship flight displays. Butterflies can only fly when their temperature is above 27 °C (81 °F); when it is cool, they can position themselves to expose the underside of the wings to the sunlight to heat themselves up. If their body temperature reaches 40 °C (104 °F), they can orientate themselves with the folded wings edgewise to the sun.[[59]](/l) Basking is an activity which is more common in the cooler hours of the morning. Some species have evolved dark wingbases to help in gathering more heat and this is especially evident in alpine forms.[[60]](/l)

As in many other insects, the [lift](/wiki/Lift_(force)) generated by butterflies is more than can be accounted for by steady-state, non-transitory [aerodynamics](/wiki/Aerodynamics). Studies using [*Vanessa atalanta*](/wiki/Vanessa_atalanta) in a [wind tunnel](/wiki/Wind_tunnel) show that they use a wide variety of aerodynamic mechanisms to generate force. These include [wake capture](/wiki/Wake_capture), [vortices](/wiki/Vortices) at the wing edge, rotational mechanisms and the [Weis-Fogh](/wiki/Torkel_Weis-Fogh) '[clap-and-fling](/wiki/Clap-and-fling)' mechanism. Butterflies are able to change from one mode to another rapidly.[[61]](/l)

**Ecology**

/wiki/File:Braconid\_parasitoid\_wasp\_Apanteles\_sp\_eggs\_%26\_Lime\_Butterfly\_(Papilio\_demoleus)\_cat\_W\_IMG\_2862.jpg/wiki/File:Braconid\_parasitoid\_wasp\_Apanteles\_sp\_eggs\_%26\_Lime\_Butterfly\_(Papilio\_demoleus)\_cat\_W\_IMG\_2862.jpg

/wiki/File:Braconid\_parasitoid\_wasp\_Apanteles\_sp\_eggs\_%26\_Lime\_Butterfly\_(Papilio\_demoleus)\_cat\_W\_IMG\_2862.jpg[Braconid](/wiki/Braconid) [parasitoidal](/wiki/Parasitoid) wasp ([*Apanteles*](/wiki/Apanteles) species) cocoons attached to lime butterfly ([*Papilio demoleus*](/wiki/Papilio_demoleus)) caterpillar

**Parasitoids, predators, and pathogens**

Butterflies are threatened in their early stages by [parasitoids](/wiki/Parasitoid) and in all stages by predators, diseases and environmental factors. [Braconid](/wiki/Braconidae) and other parasitic wasps lay their eggs in lepidopteran eggs or larvae and the wasps' parasitoid larvae devour their hosts, usually pupating inside or outside the desiccated husk. Most wasps are very specific about their host species and some have been used as biological controls of pest butterflies like the [large white butterfly](/wiki/Pieris_brassicae).[[62]](/l) When the [small cabbage white](/wiki/Pieris_rapae) was accidentally introduced to New Zealand, it had no natural enemies. In order to control it, some pupae that had been parasitised by a chalcid wasp were imported, and natural control was thus regained.[[63]](/l) Some flies lay their eggs on the outside of caterpillars and the newly hatched fly larvae bore their way through the skin and feed in a similar way to the parasitoid wasp larvae.[[64]](/l) Predators of butterflies include ants, spiders, wasps, and birds.[[65]](/l)

Caterpillars are also affected by a range of bacterial, viral and fungal diseases, and only a small percentage of the butterfly eggs laid ever reach adulthood.[[64]](/l) The bacterium [*Bacillus thuringiensis*](/wiki/Bacillus_thuringiensis) has been used in sprays to reduce damage to crops by the caterpillars of the large white butterfly, and the [entomopathogenic fungus](/wiki/Entomopathogenic_fungus) [*Beauveria bassiana*](/wiki/Beauveria_bassiana) has proved effective for the same purpose.[[66]](/l)

**Defences**

/wiki/File:Heliconius\_mimicry.png/wiki/File:Heliconius\_mimicry.png

/wiki/File:Heliconius\_mimicry.png[*Heliconius*](/wiki/Heliconius) warns off predators with [Müllerian mimicry](/wiki/M%C3%BCllerian_mimicry).[[67]](/l)

Further information: [Defense in insects](/wiki/Defense_in_insects), [Antipredator adaptation](/wiki/Antipredator_adaptation), [Mimicry](/wiki/Mimicry), and [Seasonal polyphenism](/wiki/Seasonal_polyphenism)

Butterflies protect themselves from predators by a variety of means.

/wiki/File:Papilio\_cresphontes\_larva\_defensive.JPG/wiki/File:Papilio\_cresphontes\_larva\_defensive.JPG

/wiki/File:Papilio\_cresphontes\_larva\_defensive.JPG[Giant swallowtail](/wiki/Giant_swallowtail) caterpillar everting its [osmeterium](/wiki/Osmeterium) in defence; it is also [mimetic](/wiki/Mimesis_(biology)), resembling a bird dropping.

Chemical defences are widespread and are mostly based on chemicals of plant origin. In many cases the plants themselves evolved these toxic substances as [protection](/wiki/Plant_defense_against_herbivory) against herbivores. Butterflies have evolved mechanisms to sequester these plant toxins and use them instead in their own defence.[[68]](/l) These defence mechanisms are effective only if they are well advertised; this has led to the evolution of bright colours in unpalatable butterflies ([aposematism](/wiki/Aposematism)). This signal is commonly [mimicked](/wiki/Mimicry) by other butterflies, usually only females. A [Batesian mimic](/wiki/Batesian_mimicry) imitates another species to enjoy the protection of that species' aposematism.[[69]](/l) The [common Mormon](/wiki/Papilio_polytes) of India has female morphs which imitate the unpalatable red-bodied swallowtails, the [common rose](/wiki/Pachliopta_aristolochiae) and the [crimson rose](/wiki/Pachliopta_hector).[[70]](/l) [Müllerian mimicry](/wiki/M%C3%BCllerian_mimicry) occurs when aposematic species evolve to resemble each other, presumably to reduce predator sampling rates; [*Heliconius*](/wiki/Heliconius) butterflies from the Americas are a good example.[[69]](/l)

/wiki/File:Bird-damaged\_Speckled\_Wood\_Pararge\_aegeria.JPG/wiki/File:Bird-damaged\_Speckled\_Wood\_Pararge\_aegeria.JPG

/wiki/File:Bird-damaged\_Speckled\_Wood\_Pararge\_aegeria.JPGEyespots of [speckled wood](/wiki/Speckled_wood_(butterfly)) (*Pararge aegeria*) distract predators from attacking the head. This insect can still fly with a damaged left hindwing.

[Camouflage](/wiki/Camouflage) is found in many butterflies. Some like the oakleaf butterfly and [autumn leaf](/wiki/Doleschallia_bisaltide) are remarkable imitations of leaves.[[71]](/l) As caterpillars, many defend themselves by freezing and appearing like sticks or branches.[[72]](/l) Others have [deimatic](/wiki/Deimatic) behaviours, such as rearing up and waving their front ends which are marked with eyespots as if they were snakes.[[73]](/l) Some papilionid caterpillars such as the giant swallowtail ([*Papilio cresphontes*](/wiki/Papilio_cresphontes)) resemble bird droppings.[[74]](/l) Some caterpillars have hairs and bristly structures that provide protection while others are gregarious and form dense aggregations.[[69]](/l) Some species are [myrmecophiles](/wiki/Myrmecophile), forming [mutualistic associations](/wiki/Symbiosis) with [ants](/wiki/Ant) and gaining their protection.[[75]](/l) Behavioural defences include perching and angling the wings to reduce shadow and avoid being conspicuous. Some female [Nymphalid](/wiki/Nymphalid) butterflies guard their eggs from parasitoidal [wasps](/wiki/Wasp).[[76]](/l)

The Lycaenidae have a false head consisting of eyespots and small tails (false antennae) to deflect attack from the more vital head region. These may also cause ambush predators such as spiders to approach from the wrong end, enabling the butterflies to detect attacks promptly.[[77] HYPERLINK "/l"HYPERLINK \l " HYPERLINK "/l"[78]](/l) Many butterflies have [eyespots](/wiki/Eyespot_(mimicry)) on the wings; these too may deflect attacks, or may serve to attract mates.[[47] HYPERLINK "/l"HYPERLINK \l " HYPERLINK "/l"[79]](/l)

Many tropical butterflies have [seasonal forms](/wiki/Seasonal_polyphenism) for dry and wet seasons.[[80] HYPERLINK "/l"HYPERLINK \l " HYPERLINK "/l"[81]](/l) These are switched by the hormone [ecdysone](/wiki/Ecdysone).[[82]](/l) The dry-season forms are usually more cryptic, perhaps offering better camouflage when vegetation is scarce. Dark colours in wet-season forms may help to absorb solar radiation.[[83] HYPERLINK "/l"HYPERLINK \l " HYPERLINK "/l"[84] HYPERLINK "/l"HYPERLINK \l " HYPERLINK "/l"[85]](/l)

**In culture**

/wiki/File:Xxvi\_dinastia,\_frammento\_di\_rilievo\_parietale,\_tebe,\_664-525\_ac\_ca.\_04.JPG/wiki/File:Xxvi\_dinastia,\_frammento\_di\_rilievo\_parietale,\_tebe,\_664-525\_ac\_ca.\_04.JPG

/wiki/File:Xxvi\_dinastia,\_frammento\_di\_rilievo\_parietale,\_tebe,\_664-525\_ac\_ca.\_04.JPG[Ancient Egyptian](/wiki/Ancient_Egypt) relief sculpture, [26th dynasty](/wiki/26th_dynasty), [Thebes](/wiki/Thebes,_Egypt). c. 664–525 BC

**In art and literature**

/wiki/File:Xvxi1.jpg/wiki/File:Xvxi1.jpg

/wiki/File:Xvxi1.jpgButterfly and Chinese [wisteria](/wiki/Wisteria), by Xü Xi. Early [Song Dynasty](/wiki/Song_Dynasty), c. 970

Butterflies have appeared in art from 3500 years ago in [ancient Egypt](/wiki/Ancient_Egypt).[[86]](/l) In the ancient [Mesoamerican](/wiki/Mesoamerica) city of [Teotihuacan](/wiki/Teotihuacan), the brilliantly coloured image of the butterfly was carved into many temples, buildings, jewellery, and emblazoned on [incense burners](/wiki/Censer). The butterfly was sometimes depicted with the maw of a [jaguar](/wiki/Jaguar), and some species were considered to be the reincarnations of the souls of dead warriors. The close association of butterflies with fire and warfare persisted into the [Aztec civilisation](/wiki/Aztec_civilisation); evidence of similar jaguar-butterfly images has been found among the [Zapotec](/wiki/Zapotec_peoples) and [Maya civilisations](/wiki/Maya_civilisation).[[87]](/l)

Butterflies are widely used in objects of art and jewellery: mounted in frames, embedded in resin, displayed in bottles, laminated in paper, and used in some mixed media artworks and furnishings.[[88]](/l) The [Norwegian](/wiki/Norwegians) [naturalist](/wiki/Naturalist) [Kjell Sandved](/wiki/Kjell_B._Sandved) compiled a photographic [*Butterfly Alphabet*](/wiki/Butterfly_Alphabet) containing all 26 letters and the numerals 0 to 9 from the wings of butterflies.[[89]](/l)

/wiki/File:Alice\_05a-1116x1492.jpg/wiki/File:Alice\_05a-1116x1492.jpg

/wiki/File:Alice\_05a-1116x1492.jpgAlice meets the caterpillar. Illustration by Sir [John Tenniel](/wiki/John_Tenniel) in [Lewis Carroll](/wiki/Lewis_Carroll)'s [*Alice in Wonderland*](/wiki/Alice_in_Wonderland), c. 1865

Sir [John Tenniel](/wiki/John_Tenniel) drew a famous illustration of Alice meeting a caterpillar for [Lewis Carroll](/wiki/Lewis_Carroll)'s [*Alice in Wonderland*](/wiki/Alice_in_Wonderland), c. 1865. The caterpillar is seated on a toadstool and is smoking a [hookah](/wiki/Hookah); the image can be read as showing either the forelegs of the larva, or as suggesting a face with protruding nose and chin.[[1]](/l) [Eric Carle](/wiki/Eric_Carle)'s children's book [*The Very Hungry Caterpillar*](/wiki/The_Very_Hungry_Caterpillar) portrays the larva as an extraordinarily hungry animal, while also teaching children how to count (to five) and the days of the week.[[1]](/l)

One of the most popular, and most often recorded, songs by [Sweden](/wiki/Sweden)'s eighteenth-century bard, [Carl Michael Bellman](/wiki/Carl_Michael_Bellman), is "[Fjäriln vingad syns på Haga](/wiki/Fj%C3%A4riln_vingad_syns_p%C3%A5_Haga)" (The butterfly wingèd is seen in Haga), one of his [*Fredman's Songs*](/wiki/Fredman%27s_Songs).[[90]](/l)

[*Madam Butterfly*](/wiki/Madam_Butterfly) is a 1904 [opera](/wiki/Opera) by [Giacomo Puccini](/wiki/Giacomo_Puccini) about a romantic young Japanese bride who is deserted by her American officer husband soon after they are married. It was based on [John Luther Long](/wiki/John_Luther_Long)'s short story written in 1898.[[91]](/l)

**In mythology and folklore**

/wiki/File:Carl\_Spitzweg\_033.jpg/wiki/File:Carl\_Spitzweg\_033.jpg

/wiki/File:Carl\_Spitzweg\_033.jpg*Der Schmetterlingsjäger* (The butterfly hunter) by [Carl Spitzweg](/wiki/Carl_Spitzweg), 1840

According to [Lafcadio Hearn](/wiki/Lafcadio_Hearn), a butterfly was seen in Japan as the personification of a person's soul; whether they be living, dying, or already dead. One Japanese superstition says that if a butterfly enters your guest room and perches behind the bamboo screen, the person whom you most love is coming to see you. Large numbers of butterflies are viewed as bad [omens](/wiki/Omen). When [Taira no Masakado](/wiki/Taira_no_Masakado) was secretly preparing for his famous revolt, there appeared in [Kyoto](/wiki/Kyoto) so vast a swarm of butterflies that the people were frightened — thinking the apparition to be a portent of coming evil.[[92]](/l)

/wiki/File:ButterflyWingServingTray.jpg/wiki/File:ButterflyWingServingTray.jpg

/wiki/File:ButterflyWingServingTray.jpgA serving tray decorated with butterfly wings

Diderot's [*Encyclopédie*](/wiki/Encyclop%C3%A9die) cites butterflies as a symbol for the soul. A Roman sculpture depicts a butterfly exiting the mouth of a dead man, representing the Roman belief that the soul leaves through the mouth.[[93]](/l) In line with this, the ancient Greek word for "butterfly" is ψυχή (*psȳchē*), which primarily means "soul" or "mind".[[94]](/l) According to [Mircea Eliade](/wiki/Mircea_Eliade), some of the [Nagas](/wiki/Naga_people) of [Manipur](/wiki/Manipur) claim ancestry from a butterfly.[[95]](/l) In some cultures, butterflies symbolise [rebirth](/wiki/Reincarnation).[[96]](/l) The butterfly is a symbol of being [transgender](/wiki/Transgender), because of the transformation from caterpillar to winged adult.[[97]](/l) In the English county of [Devon](/wiki/Devon), people once hurried to kill the first butterfly of the year, to avoid a year of bad luck.[[98]](/l) In the Philippines, a lingering black butterfly or moth in the house is taken to mean a death in the family.[[99]](/l) Several American states have chosen an [official state butterfly](/wiki/List_of_U.S._state_butterflies).[[100]](/l)

**Collecting, recording, and rearing**

Collecting butterflies was once a popular hobby; it has now largely been replaced by photography, recording, and rearing butterflies for release into the wild.[[1]](/l) The zoological illustrator [Frederick William Frohawk](/wiki/Frederick_William_Frohawk) succeeded in rearing all the butterfly species found in Britain, at a rate of four per year, to enable him to draw every stage of each species. He published the results in the folio sized handbook *The Natural History of British Butterflies* in 1924.[[1]](/l)

**In technology**

Further information: [Biomimicry](/wiki/Biomimicry)

Study of the [structural colouration](/wiki/Structural_colouration) of the wing scales of swallowtail butterflies led to the development of more efficient [light-emitting diodes](/wiki/Light-emitting_diode).[[101]](/l) The structural colouration of butterflies is inspiring [nanotechnology](/wiki/Nanotechnology) research to produce paints that do not use toxic pigments and in the development of new display technologies