

Butterflies

- [Taxonomy](#)
- [Interesting facts](#)
- [Developmental stages](#)
- [Photo gallery](#)
- [References](#)

Taxonomy

cellular organisms - Eukaryota - Fungi/Metazoa group - Metazoa - Eumetazoa - Bilateria - Coelomata - Protostomia - Panarthropoda - Arthropoda - Mandibulata - Pancrustacea - Hexapoda - Insecta - Dicondylia - Pterygota - Neoptera - Endopterygota - Amphiesmenoptera - Lepidoptera

Interesting facts

- Various sources report number of butterfly species in the world from 24,000 to 28,000 and in United States and Canada from 561 to about 725 species.
- Butterfly can overwinter as egg, chrysalis, or adult. Earliest spring generation of butterflies emerge from overwintered chrysalises. Later spring butterflies develop from overwintered (**diapausal**) eggs. Butterflies developed from eggs that were laid by overwintered adult butterflies appear later yet. Summer generation of butterflies has shortest time span because these butterflies are usually do not survive long enough to live until the time when they can overwinter. Generation of butterflies also called **flight**.

- Bechina Purplewing (*Eunica bechina*) lays eggs on ant-defended plant *Caryocar brasiliense* (Pequi, also called "souari nut"). Experiments with ants pinned to leaves shown that the butterflies avoid ovipositing on plant parts occupied by ants, however, presence of non-predatory sap-sucking insects did not affect the oviposition. This is the first demonstration that herbivorous insects can recognize predatory species by using visual clues. This interesting decision-making behavioral adaptation permits specialization on a risky, ant-defended host.
- In fall, Eastern North American monarch juvenile butterflies undertake a spectacular long-range migration to Mexico, during which they determinately fly in the south/southwesterly direction. Reproductive spring and summer butterflies, in contrast, are unable to exhibit directional, oriented flight. Fall-born juvenile butterflies are hormone deficient, which leads to reproductive arrest and increased longevity. Also, gene expression analysis reveals a suite of 40 genes whose differential expression in brain correlates with directional flight behavior.
- While most butterflies feed on nectar, in tropical forests many tropical species feed on fruit. Based on variation in proboscis morphology and feeding behavior, fruit-feeding butterflies can be divided in two groups: piercing butterflies that are efficient at foraging on soft substrates, and sweeping butterflies that use a wide range of substrates, but have lower intake rates.
- *Lepidoptera* are relatively short-lived. However, one field mark-recapture study of butterflies in Uganda had shown that fruit-feeding butterflies enjoy unusually long life span that ranged from 67 (*Bicyclus auricruda*) to 293 days (*Euphaedra medon*).
- Butterflies wing coloration consists of so-called **structural colors**. In contrast with chemical colors, which depend on pigments, structural colors are the result of the interaction of the light (multiple reflections) with physical structures of the size comparable to the wavelength of light. Such colors usually cause iridescence. The source of butterfly's wing structural colors are scales: there are normally two layers of

chitinous scales tiled distally across each of the dorsal and ventral wing surfaces: the basal scales, which lie directly above the wing lamina, and the cover scales, which overlay them. Usually the cover scales are responsible for producing the reflected colors. The scales' components (**photonic structures**) form the basis for a wide diversity of complex architectures that accounts for such a great variety of butterflies' wing coloration.

- Eyespots are found in a variety of animals. Many butterfly species sport especially prominent eyespots on their wings. Eyespots are generally defined as circular, often occurring in bilaterally symmetrical pairs, markings on the body of an animal, composed of colors contrasting with the surrounding body area. Evolution of eyespots as antipredator strategy has been discussed since 19th century. Two main theories had been advanced: **intimidation hypothesis** and **deflection hypothesis**. According to the first theory, large conspicuous eyespots located on the dorsal surface of the wing are usually seen only when the butterfly suddenly opens its wings. These eyespots may intimidate predators by several mechanisms: by resemblance with its enemy eyes (**mimicry**), by sudden change in appearance, or by advertizing the large size of the prey animal. According to the second theory, the eyespots function in drawing predatory attack to less vital region of an animal's body. Both theories have their merits and some confirming experiments were performed. However, often, results were contradictory or lacking proper controls, as a result, both theories receive their share of criticism, and the role of many eyespots in the survival remains unknown.

Developmental stages (life cycle)

All butterflies pass four main stages: egg, larva, pupa, adult. Time frame varies between species. In summer, monarch butterfly's life cycle from egg to adult takes about 6-8 weeks. Migrating and overwintering fall monarch butterflies live for 5-8 months depending on the time when they awakened and distance they had to cover during their migration.

- egg

Female butterflies lay their eggs on **host plants** that are one species or group of related species. Eggs are tiny and are laid singly or in small clutches. They are firmly glued to the surface. Non-diapausal eggs usually hatch in about a week after oviposition. Most butterfly species lay between 100 and 300 eggs.

- larval

Larval stage of butterflies is called **caterpillar**. First meal of tiny 1st instar caterpillar usually is its own egg shell. Caterpillars undergo 4 moltings until they reach 5th instar. Fourth and fifth instar caterpillars may look quite differently from first three instars and up to 30,000 times larger than the first instar. Main occupation of all caterpillars is eating. Because they have a lots of enemies (birds, lizards, ants, frogs, and others) many caterpillars have an impressive arsenal of protective mechanisms. Caterpillar stage can last from 2 weeks to up to a month, and this is the longest life stage in many butterflies and moths.

- chrysalis

Chrysalis is a **pupa** stage of butterflies and moths. After 5th instar molts, its new skin becomes rigid outer shell of the pupa. Chrysalis is attached to the substratum (such as tree bark) by **cremaster** (a support hook or a cluster of hooks), and, sometimes, by a silky girdle. Unlike many moths, butterflies do not spin a cocoon. Inside the chrysalis, the caterpillar undergoes dramatic **metamorphosis**, during which anatomical structures of the future butterfly gradually develop including wings and proboscis. About a day before the adult butterfly emerges, the chrysalis becomes transparent and adult butterfly's colors become visible. Pupa stage takes 10-14 days depending on the butterfly species and temperature.

- imago

- o newly eclosed

Juvenile butterfly emerges through a crack in the chrysalis' shell. Before taking its first flight the butterfly should wait when vessels in its wings get filled with blood, stiffen, and dry out.

- o adult

Fully developed, reproductively competent butterfly. In contrast with herbivorous caterpillars, adult butterflies are frugivorous or nectarivorous. During its short stage as a flying insect, butterflies must find mates; after successful fertilization, female butterflies need to find their preferred host plants where they will lay eggs

Photo gallery

Life cycle stages



Monarch butterflies' mating. Mating results in fertilization of female's eggs, after which she becomes ready to lay eggs.



Monarch butterfly's egg.



Caterpillars of Baltimore Checkerspot (*Euphydryas phaeton*) on their host plant *Chelone glabra* (turtlehead).



Newly eclosed Monarch butterfly among chrysalises on different stages of development.

Species



Hypolimnas bolina
(**Great Eggfly**), male. It is also called **Great Egg-fly** and **Blue Moon Butterfly**.



Hypolimnas bolina, female. The species is a sexually dimorphic (male and female differ in appearance) nymphalid (family *Nymphalidae*) butterfly distributed from Madagascar to Easter Island (west to east) and from Japan to Australasia (north to south).



Kallima inachus
(**Orange Dead Leaf**) is a nymphalid butterfly found in tropical Asia from India to Japan. With wings closed, it looks like a dry leaf and is a spectacular example of camouflage. With its wings opened it reveals strikingly bright orange and blue color pattern.



Graphium agamemnon (**Tailed Jay**) is a predominantly fluorescent green and black butterfly that belongs to the swallowtail family. The butterfly is also called **Green Spotted Triangle, Tailed Green Jay** or **Green Triangle**. It is a common tropical species in India, Sri Lanka through Southeast Asia, and in Australia.



Biblis hyperia (**Red Rim**) is distributed from Mexico to Paraguay.



Morpho peleides (Blue Morpho) is a beautiful iridescent tropical butterfly found in Mexico, Central America, northern South America, Paraguay and Trinidad. It feeds on juice of rotten fruits.



Caligo memnon (**Tawny Owl**) is a butterfly of the Nymphalidae family. Found in rainforests of Central America, owl butterflies feed on the juice of rotting fruit.



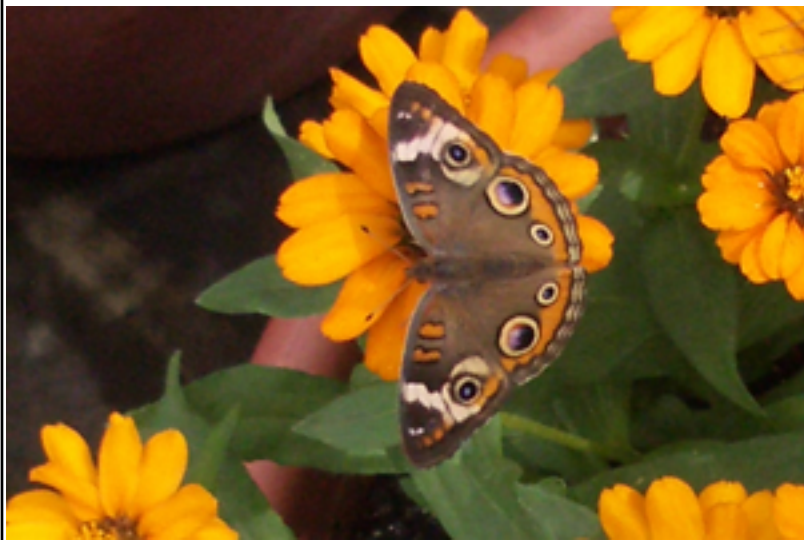
Catonephele numilia (**Grecian Shoemaker**), male. This dimorphic species are distributed from Mexico to South Brazil and Argentina.



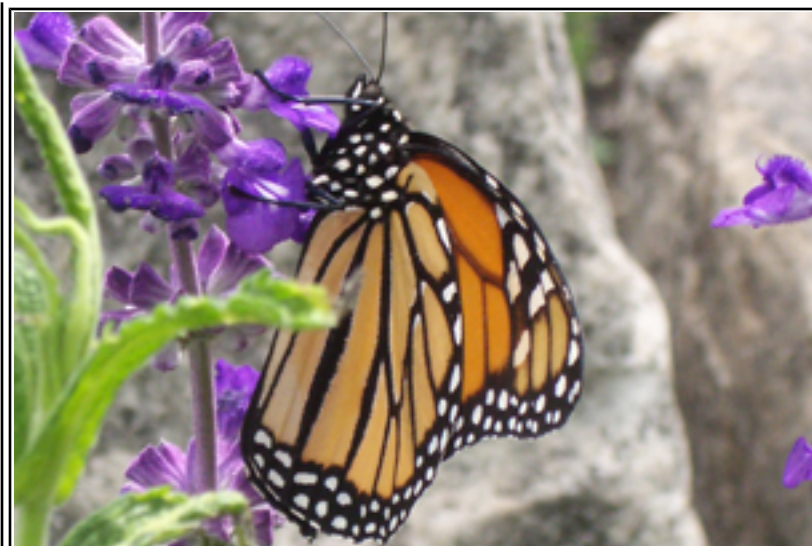
Heliconius erato (**Small Postman**) is one of the few butterflies that collects and digests pollen. The species is found throughout northern South America and, depending on location, can have highly variable coloration and form.



Heliconius charitonius (**Zebra Longwing**) is found throughout North, Central and South America and, is an official butterfly of state of Florida (United States). Similar to *Heliconius erato*, it feeds on pollen.



Junonia coenia (**Common Buckeye**) is found in all parts of the United States except the northwest, and is especially common in the South, the California coast, and throughout Central America and Colombia. Adults feed on nectar.



Danaus plexippus
(**Monarch**) is very common butterfly that is found from North and South America and the Caribbean to Australia, New Zealand, and some oceanic islands of the Pacific and the Atlantic.

References

PubMed articles

- Sendoya SF, Freitas AV, Oliveira PS. Egg-laying butterflies distinguish predaceous ants by sight. *Am Nat.* 2009 Jul; 174(1):134-40. **PMID: 19456265**
- Zhu H, Gegear RJ, Casselman A, Kanginakudru S, Reppert SM. Defining behavioral and molecular differences between summer and migratory monarch butterflies. *BMC Biol.* 2009 Mar 31; 7:14. **PMID: 19335876**
- Välimäki P, Kivelä SM, Jääskeläinen L, Kaitala A, Kaitala V, Oksanen J. Divergent timing of egg-laying may maintain life history polymorphism in potentially multivoltine insects in seasonal environments. *J Evol Biol.* 2008 Nov **PMID: 18717750**
- Ingram AL, Parker AR. A review of the diversity and evolution of photonic structures in butterflies, incorporating the work of John Huxley (The Natural History Museum, London from 1961 to 1990). *Philos Trans R Soc Lond B Biol Sci.* 2008 Jul 27 **PMID: 18331987**
- Molleman F, Zwaan BJ, Brakefield PM, Carey JR. Extraordinary long life spans in fruit-feeding butterflies can provide window on evolution of life span and aging. *Exp Gerontol.* 2007 Jun **PMID: 17360139**
- Stevens M. The role of eyespots as anti-predator mechanisms,

principally demonstrated in the Lepidoptera. *Biol Rev Camb Philos Soc.* 2005 Nov **PMID: 16221330**



Last updated 07/06/09
nemose@live.com

©Nemose 2008 - 2009 All rights reserved