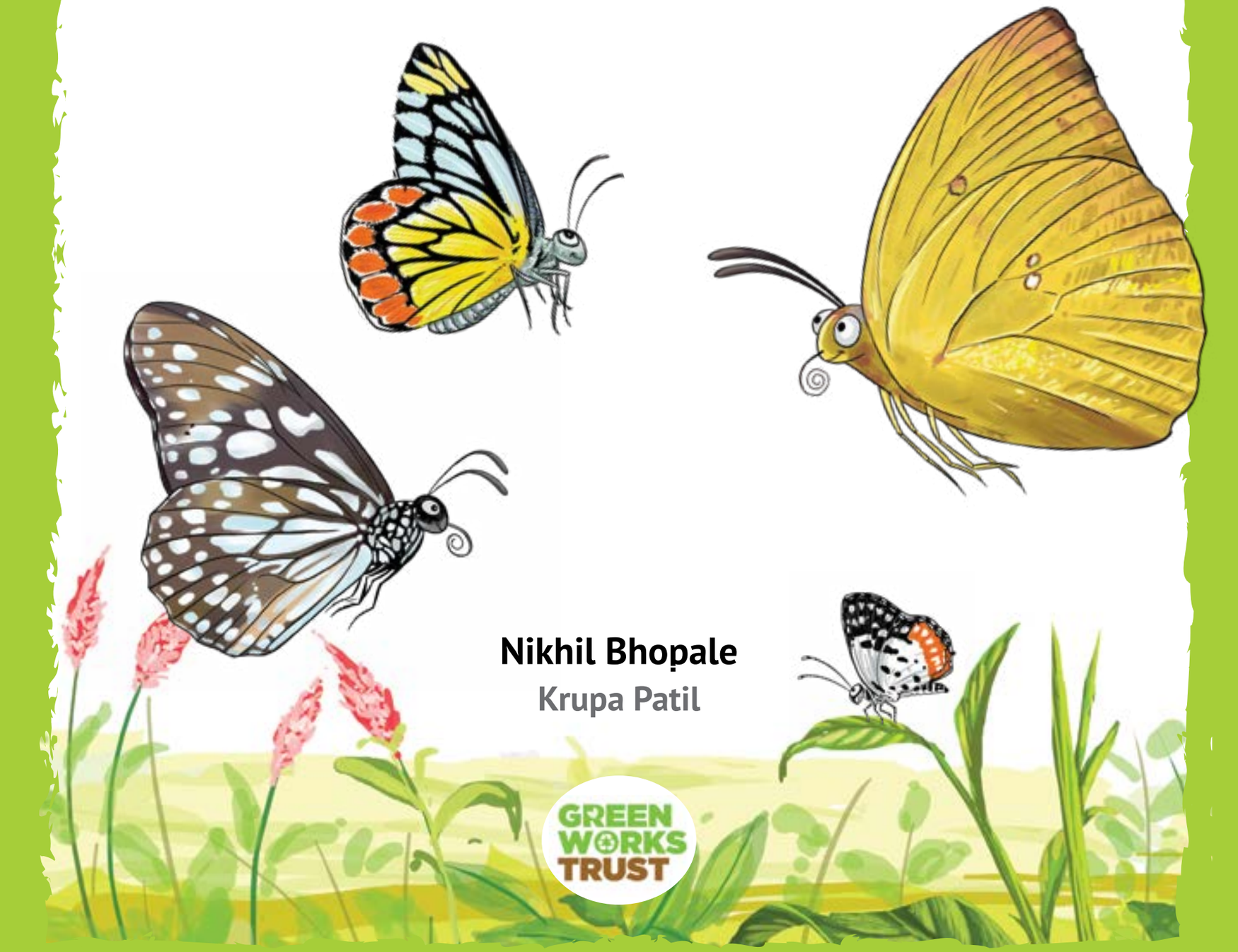
THE 'FUN'CYCLOPAEDIA ON INDIAN WILDLIFE

BUTTERFLIES

Loads of fascinating info, fun facts and an identification guide



Nikhil Bhopale

Krupa Patil

GREEN WORKS TRUST

THE 'FUN'CYCLOPAEDIA ON INDIAN WILDLIFE

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CREDITS
The Butterflies 'Fun'cyclopaedia Team
Conceptualised and authored by: Nikhil Bhopale
Co-conceptualised, visualised and word-crafted by: Krupa Patil
Mythological story (on page 10) input by: Mallika Ravikumar
Page layout and DTP by: Kushal Sutar
Illustrated by: Sachin Pandit, Krupa Patil, Shutterstock
Photo cutouts by: Ganesh Nirmal, Krupa Patil
Photo sourcing by: Sarvesh Abhyankar
Video editing by: Atharva Raut

Photo contributers: Abhay Soman, Abhijit Jagtap, Anitava Roy, Atanu Bose, Dattaprasad Sawant, Fahim Khan, Saji K, Ganesh Hegde, Haneesh K M, Hemant Ogale, Ketan Aloni, Kishor Shirkande, Krupa Patil, Kunal Chakraborty, Mandar Sawant, Milind Bhakare, Milind Pandit, Muktai Kuwalekar, Nikhil Bhopale, Ninad Raote, Paresh Churi, Paresh Kale, Pranav Gokhale, Ravi Bhambhure, Rohan Lovalekar, Rohit Girotra, Sagar Sarang, Samir Gulavane, Sarvesh Abhyankar, Shubhajit Mazumder, Tushar Bhagwat, Uday Agashe, Vasudeesha Hosabettu, Vedawati Padwal, Vikrant Jathar, Vivek Sarkar & Manoj Nair.

Video contributers: Alok Bhave, David Raju, Deepa Parikh, Krupa Patil, Paresh Churi, Ramesh Shenai, Roshan Upadhyay, Sagar Satpute, Sangeeta Jain, Sonam Patil, Veda Nadendla, Nikhil Bhopale.

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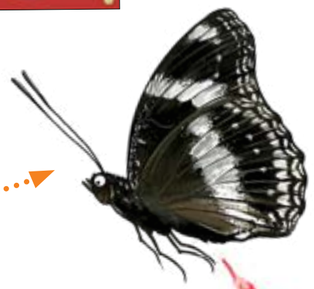

And, don't miss these icons:

click for more info

click for amazing videos

Foreword from the 'Butterfly Man of India'

I am truly delighted to see this very vividly colourful E-book on butterflies for children brought out by Nikhil Bhopale and his team at *Green Works Trust*. I am very happy for this very unique initiative because writing for children is lot more difficult. Here, they have very creatively used colourful illustration and simple language for a child to understand and get interested to know more about butterflies.

After seeing this book so attractively designed and profusely illustrated, I truly envy today's younger generation for having such resources at their disposal to learn so early. I wish somebody should have written a book like this when I was in school; so much I missed.

This is a perfect way to introduce children to our nation's rich biodiversity and spread awareness among the younger generation that will encourage them to study and protect our natural heritage. I am sure that such innovative initiative will attract younger generation to appreciate insects like butterflies, moths, dragonflies and other insects with a renewed interest. I am glad that Nikhil and his team has taken a good lead in their pursuit to spread awareness among the younger generation, and I congratulate him and his team for bringing out this very interesting book.

Nikhil is an excellent naturalist, as I know him since he was part of my team when we were at the *BNHS*. I am glad that he has chosen this path to bring people closer to nature. I wish him the very best in this endeavour. Though Nikhil has written this book for children, I am sure even their parents and teachers are surely going to fall in love with these flying jewels, and together, they will surely strive hard to protect nature, which is now the need of the hour.

- Isaac Kehimkar
Chairman and Director,
iNaturewatch Foundation, Navi Mumbai

Author's Note

I still remember the days of my childhood playing (rather messing!) with butterflies, dragonflies, damselflies, fireflies, crabs, frogs and other tiny creatures. Yes, I am specifying 'tiny creatures' because THEY were the ones who gave ME the feeling of 'How giant I am!' Rest everyone around were taller than me. Catching butterflies, tying thread to tails of dragonflies, holding wings of damselflies, keeping fireflies in a matchbox, holding a stick in front of crab and observing them hold on to it by their massive claws, jumping with frogs... all of these kept me actively curious.

I was just 11 when my mother encouraged me to go for treks and nature camps. Possibly this triggered my initial interest in natural history which grew leaps and bounds with time. I entered this field as a snake rescuer and met people with similar interests. This led me to more people from varied fields and my curiosity led me to other fields too. I learnt a lot about birds from my friend Mr Sudeep Athavale. Later, I came across some books on butterflies which Sudeep had. And that was my first introduction to butterflies. The book was written by Mr Isaac Kehimkar. My luck brought me to BNHS where I was fortunate enough to work with this eminent author. His continuous encouragement raised my interest in butterflies to a much higher level.

Now, as I write this book on butterflies, I recall all my wonderful experiences which I have collected from the field. I thank my lovely team who worked tirlessly with me to put this book together. And I thank my wife Dipali Bhopale, my son Sarus and my parents Rekha and Milind Bhopale for always allowing me to chase my non-materialistic goals, allowing me to continue my passion, and giving me immense encouragement for making of this book

- Nikhil Bhopale

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Common Wanderer ©Krupa Patil

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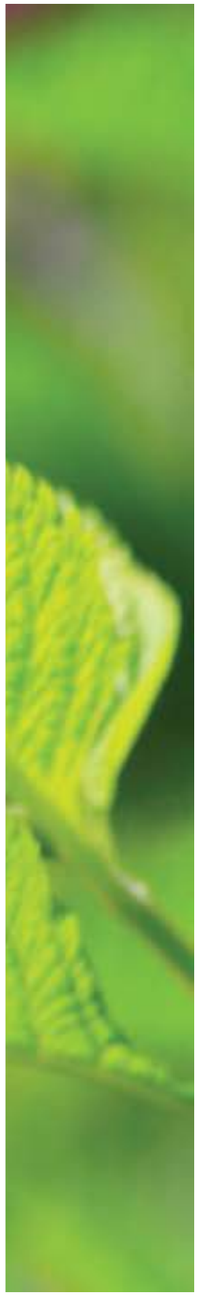


Welcome to the world of butterflies

Who are they?

They are butterflies!! Actually, they are hexapods and belong to **Sub Phylum Hexapoda; Class Insecta; Order Lepidoptera**. Difficult to understand, is it? Let's go step-by-step.

- They are invertebrate creatures with six legs. Hence, called **Hexapoda** which means '**six-legged**'. ('Hex' means six; 'poda' means legs)
- Hexapods are divided into two Classes. They are the Class which has **mouth parts outside the body** and thus, fall in Class **Insecta**.
- And, they are insects with **scaly wings** hence, they get placed in Order **Lepidoptera**. In Latin, 'lepid' means scales and 'pteron' means wing.

Didn't know that butterflies had scaly wings?? Well, read this book and get to many more fascinating facts about them.

'Lepidoptera' may seem like a big word, but let's make it simple for you. Just say...
lay + pee + dop + tera

How many are they?

There are about **17,000 to 20,000 species** of butterflies on the back of this Earth out of which, about **1335 species** are seen in India.

Our home sweet homes

We stay **almost everywhere**— in gardens, jungles, on shores, in deserts, on mountains and in snow... and in cities too. You can often see us right outside your window.

Butterflies have been seen in places where temperatures flare up to 50°C and also where they drop as low as -20°C. They have been seen at high altitudes; as high as about 5400m above sea level. That is as high as the 1800th floor of a super tall building.

DID YOU KNOW THIS?
Butterflies are seen in all continents of the Earth, except Antarctica.

Size does matter

Butterflies can be as tiny as a micro sim card. The tiniest known butterfly is the **Small Grass Jewel** which is all of 12mm. And the biggest one is the **Southern Birdwing** which measures 190mm; except one known individual of **Golden Birdwing** which measured 194mm! That's as tall as your school notebook or as big as your wide-spread palm.

Who named them 'butterflies'?

Who on Earth decided to call it a "butterfly"? And why?? Does it really look like flying butter?

It is believed that a long, long time ago, when a man saw a Yellow Brimstone butterfly, he exclaimed in excitement, "That's a Butter-fly". Its bright yellow wings seemed like a flying blob of butter to him. And thus, the name spread far and wide.

Can you believe it? All butterflies actually have names. And there are pretty interesting stories behind naming butterflies. You can read about them on page 48.

Going places

Butterflies are so attractive that they have found their way to Indian postal stamps. Several **postal stamps** are dedicated to these flying jewels which travel far and wide stuck on envelopes. Take a look at a few.

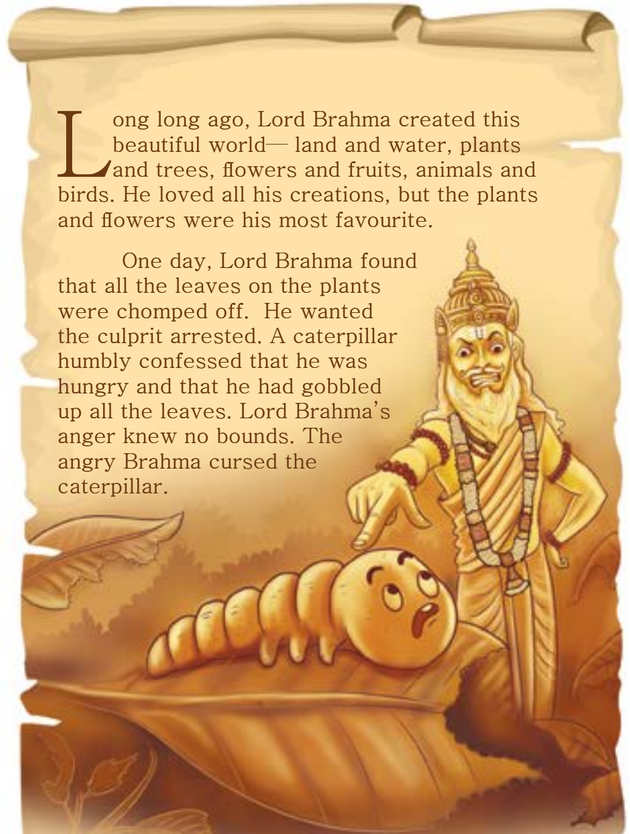
Long long ago

Butterflies have been on this planet much before humans came into existence.

They have stayed here since the times when the enormous dinosaurs ruled this planet. Some of the oldest butterfly fossils are 200 million years old. Whoa!!

Long long ago, Lord Brahma created this beautiful world— land and water, plants and trees, flowers and fruits, animals and birds. He loved all his creations, but the plants and flowers were his most favourite.

One day, Lord Brahma found that all the leaves on the plants were chomped off. He wanted the culprit arrested. A caterpillar humbly confessed that he was hungry and that he had gobbled up all the leaves. Lord Brahma's anger knew no bounds. The angry Brahma cursed the caterpillar.



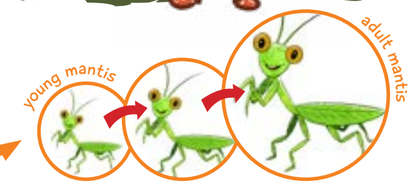
"You shall become like a stone forever; with no legs to walk and no jaws to eat. You will just hang by the leaves, but won't be able to eat those leaves again!", said Brahma.

And the caterpillar hung on a leaf like a lifeless blob. Days passed by. Unable to bear the caterpillar's plight, a few good-hearted birds and animals pleaded to Lord Brahma to forgive the poor caterpillar. Brahma agreed to free the caterpillar in a few days. The caterpillar fell at the Lord's feet in gratitude. Brahma was pleased with the caterpillar but, couldn't take back his curse completely. Instead, Brahma granted a boon and said, *"Henceforth, every caterpillar would go to sleep like a lifeless blob for a few days but, wake up as one of world's most beautiful creatures— the butterfly!"*

Metamorphosis in butterflies

Lime Butterfly ©Saji K

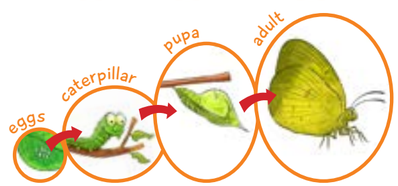
All living creatures grow. Babies grow up to become adults. But in most cases, they grow in size and the adult looks similar to its young one. Look at this praying mantis.



However, some creatures, like the frog and the butterfly change their forms completely as they grow.

Huh? Change forms?? What does that mean???

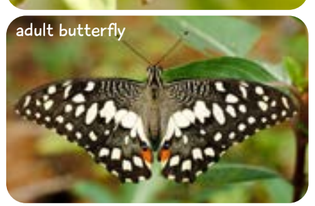
Look at these pictures. The butterfly eggs are 'small and round'. The caterpillar is 'green and long'. The pupa is just a hanging 'blob'. And the butterfly is a 'colourful, winged creature'. There is nothing in a caterpillar that tells you it is going be a beautiful butterfly. This transformation while growing up is called '**metamorphosis**'.



Let's make this word easy to say. You just have to say...

meta + mor + fo + sis

Take a look at some photos showing the metamorphosis of a Lime butterfly.



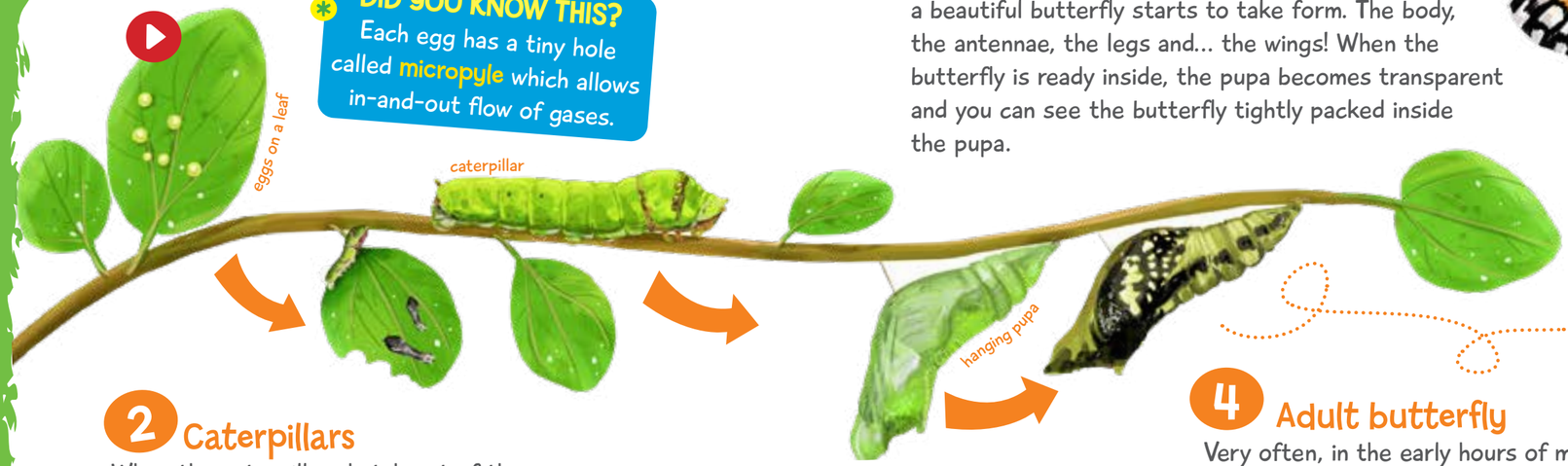
©Dattaprasad Sawant

A butterfly changes its form 4 times in its entire life. These are called the 4 main stages of the butterfly. Let's get to know what really happens and how the eggs transform into beautiful, winged butterflies. It's like magic; let's take a look.

1 Eggs

The story begins when a Mamma butterfly lays tiny eggs on a plant. When the caterpillar is ready to come out, the egg turns transparent. You can even see the baby caterpillar inside.

DID YOU KNOW THIS?
Each egg has a tiny hole called micropyle which allows in-and-out flow of gases.



2 Caterpillars

When the caterpillars hatch out of the eggs, they are mighty hungry. But guess what? Their thoughtful Mamma butterfly has selected a plant with lots of fresh green leaves. The hungry caterpillars just eat and eat and eat! And they become fatter and fatter.

This is the only stage in which they grow in size. They grow so rapidly that the caterpillar can no longer fit into its own skin. So the skin is shed and a new skin is ready underneath. A caterpillar can do this 'change of clothes' several times. Each time it changes, it gets a new look called the 'instar'.

DID YOU KNOW THIS?
Baby caterpillars are also called larvae or grubs.

By now the caterpillar is tired of eating and it decides to pupate.

3 Pupa

The caterpillar makes a small house for itself called the pupa. It is also called the chrysalis. This is where the real magic happens!

Inside the pupa, the caterpillar melts into a mushy juice. The juice slowly and steadily starts transforming and a beautiful butterfly starts to take form. The body, the antennae, the legs and... the wings! When the butterfly is ready inside, the pupa becomes transparent and you can see the butterfly tightly packed inside the pupa.

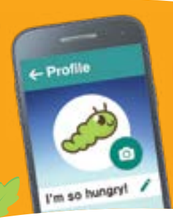
DID YOU KNOW THIS?
The process of a butterfly emerging from its chrysalis is called eclosion.

4 Adult butterfly

Very often, in the early hours of morning, the butterfly decides to emerge from the pupa. It breaks open the pupa and struggles it way out into its new world.

The newly emerged butterfly has wet, crumpled wings. The butterfly has to unfold its wings by strongly pumping a fluid into the veins of its wings. Then the wings have to be dried completely. Once the wings are dry, the butterfly is ready to take flight. When the Sun comes up and shines, the butterfly basks for a while and then takes its first flight.

On a lighter note :)



Oh, that's such an old picture. I must update my DP and change my status right away!!

This butterfly goes in search of food and a mate. Upon mating, the female will lay eggs and thus, the cycle of life continues.

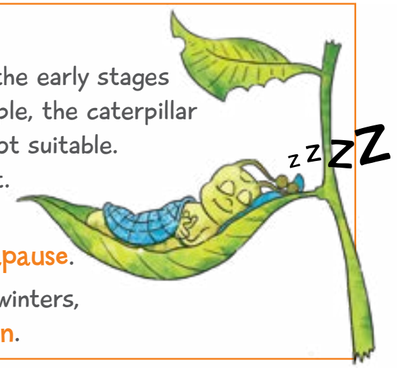
Life stages caught on camera

Here's a collection of photos which document interesting events from the life cycle of various butterflies.

All photos in this collection © Milind Pandit except, photo of egg with 1 rupee coin © Nikhil Bhopale

The secret of 'Diapause'

Butterflies have a phenomenal ability of taking a 'pause' in the early stages of their life, if they sense any adverse conditions. For example, the caterpillar can delay its birth from the egg, if the weather outside is not suitable. And how do they know that? Read * on page 12 to find out.



Caterpillars give up eating and go into an inactive mode. Look at this caterpillar taking a long sleep. This is called **diapause**.

On the other hand, adult butterflies take a long sleep — in winters, it is called **hibernation** and in summers, it's called **aestivation**.

Knowing the anatomy

Southern Birdwing ©Paresh Kale

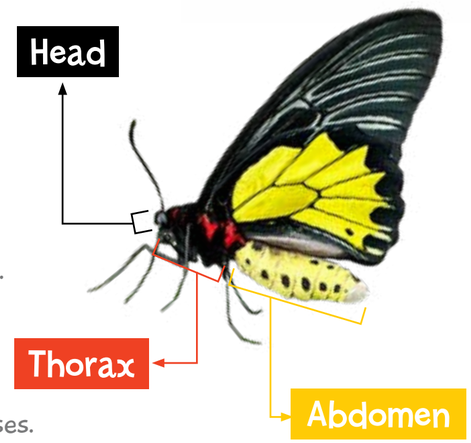
Like all other insects, the body of a butterfly is made up of 3 parts: head, thorax and abdomen.

The head carries 4 important organs, which are the eyes, the antennae, the proboscis and the palpi.

The thorax is the middle part of a butterfly's body. It carries the most attractive part of a butterfly– its wings. The thorax also bears 3 pairs of dainty legs.

The abdomen is the tail end of the butterfly's body which has segments and it hosts several important systems.

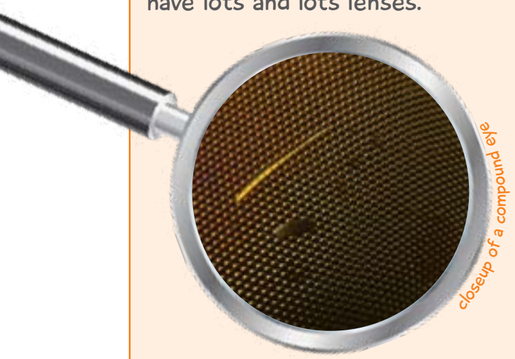
Let's take a closer look at the body parts and their uses.



The body of a butterfly

1 Eyes

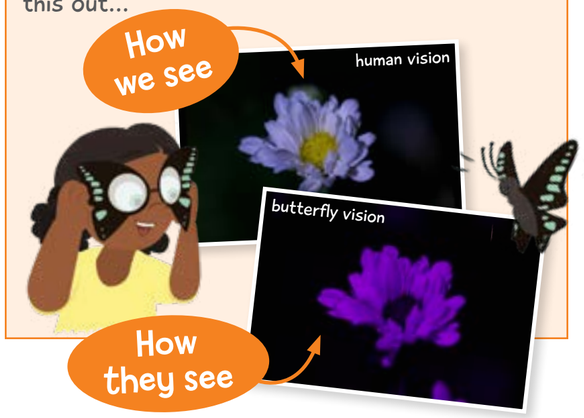
A butterfly has two types of eyes. They have two simple eyes which are very small and not even visible to us. What we see is a pair of **compound eyes**. These special kind of eyes have lots and lots lenses.



The compound eyes help the butterfly to see many more colours than we do. They also help them see very minute movements.

Our vision is '**trichromatic**'. This is because, we have 3 types of cells in our eyes. But butterflies have about 6 types of cells, thus showing them many, many more colours. Wow, it must be fun to see like a butterfly!

What more... butterflies can also see **UV light** which is not visible to the human eye. Check this out...



2 Antennae

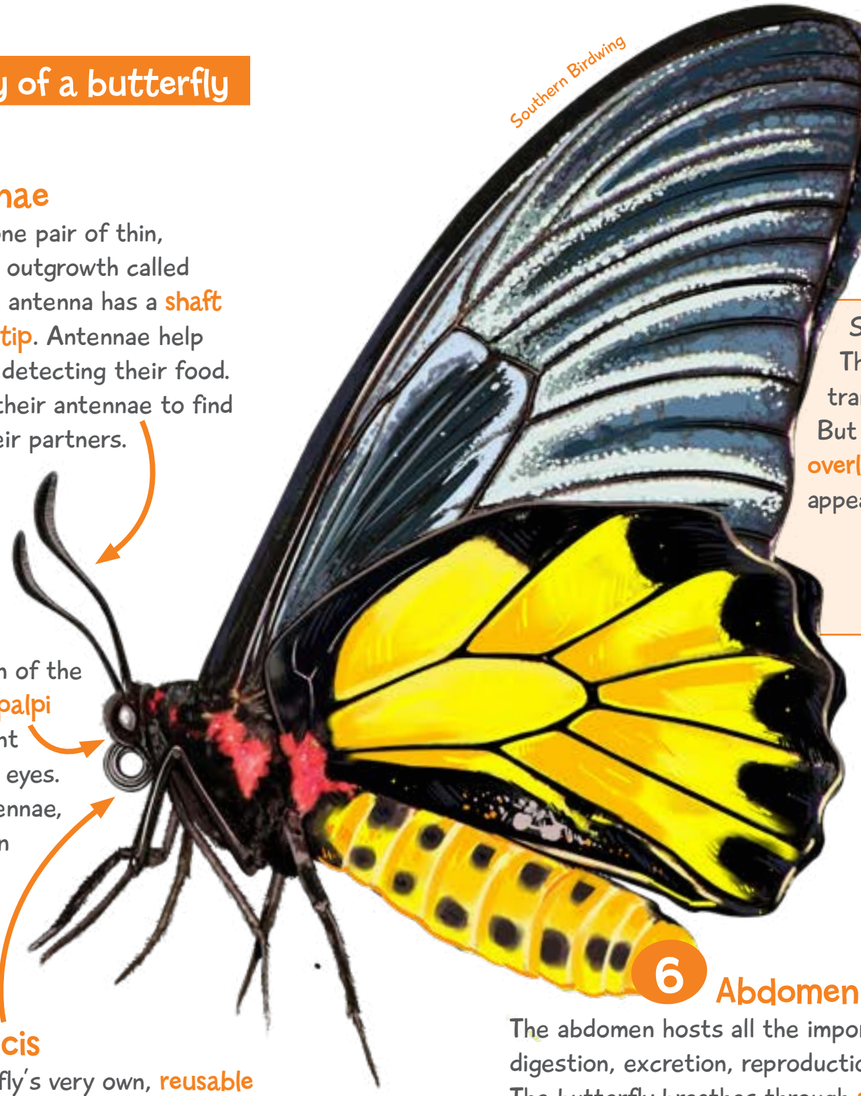
The head has one pair of thin, erect, hair-like outgrowth called antennae. Each antenna has a **shaft** and a **clubbed tip**. Antennae help butterflies for detecting their food. They also use their antennae to find and choose their partners.

3 Palpi

Olfactory organ of the butterfly- the **palpi** are located right in between the eyes. Along with antennae, the palpi help in detecting the butterfly's food.

4 Proboscis

It is the butterfly's very own, **reusable straw** which stays coiled up until it's thirsty. See how this butterfly sips yummy nectar from the flower using its long proboscis.



5 Wings

Every butterfly has 2 pairs of wings- 2 **fore wings** and 2 **hind wings**. With a variety of shapes and sizes, the wings are colourful and have attractive patterns on them. The wings help the butterfly to fly and they also help to maintain balance while flying in strong winds.

So who painted these lovely wings? The truth is that the wings are actually transparent or sometimes, semi-transparent. But they are covered with thousands of tiny, **overlapping scales** which are coloured. The wings appear colourful because of these colourful scales.

6 Abdomen

The abdomen hosts all the important functions like digestion, excretion, reproduction and even, respiration. The butterfly breathes through **spiracles**, which are tiny holes on either side of the abdomen.

7 Legs

3 pairs of legs stick out of the thorax. Each leg has a **thigh**, a **shank** and a **foot**... just like ours. But, their legs are so dainty that these parts are not easily visible. However, on a closer look, one can even see a **pair of claws** on its foot.

Why do butterflies need claws? Have never seen them hunt or kill prey.

Turn to ✱ on page 20 to find the answer.

Surprising facts about butterflies

You use your ears to HEAR. And I hear from my entire body. Cool, isn't it?

Your brain is inside your head and mine is in my thorax.

You can BREATHE with your nose. And I do with my abdomen!!

You can WALK, RUN and JUMP with your two legs! But my six legs help me TASTE! Beat that!!

DID YOU KNOW THIS?

The caterpillar has a dozen tiny eyes... 6 on each side of its head. But, believe it or not, it is still almost blind. It can only sense light and detect shapes.

The body of a caterpillar

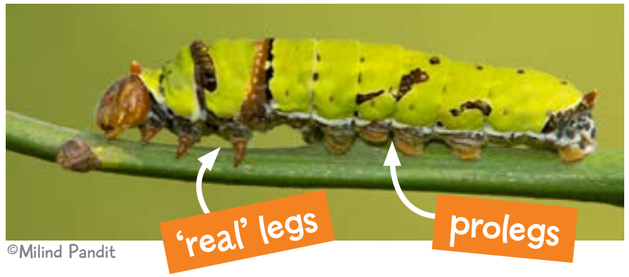
Just like the butterfly, the caterpillar's body also is made up of 3 parts— the head, thorax and abdomen. However, the caterpillar has some organs which are not present in the adult butterfly. Let's get to know them.

1 Mouth parts

The caterpillar is a hungry creature and so Mother Nature gave it mandibles. These are mouth parts or jaws with which the caterpillar can chomp on green leaves. However, when the caterpillar turns into a butterfly, the mandibles get replaced with a proboscis.

2 Bonus legs

We know that the butterfly has 6 legs. But in addition to these legs, the caterpillar has 10 bonus legs which are attached to its abdomen. These do not have the same structure as the legs and hence are false legs. They are called prolegs or pseudo legs. *



©Milind Pandit

Prolegs are small, squishy, sucker-like stubs that help the caterpillar to grip on leaves and branches.

3 Special accessories

Some caterpillars have special organs like the nectary gland and osmeterium. Err...WHAT-rium?? Ha ha...Read more about them on * pages 28 and 29.

It's time for food

Common Jezebel ©Dattaprasad Sawant

Time for food? Now, you're talking!! Soups and salads, *rotis* and kebabs, *idlis* and *dosas*, pizzas and *pav bhajis*, cakes and *jalebis*... hmm, YUM! The mere thought of good food makes our taste buds happy, isn't it? Yummy food is loved and relished by everyone... babies, kids, elders... just everyone.

But hey, it's not the same in butterflies. They do not feed all throughout their lives. Out of the 4 stages in their life cycle, only the larval and adult stage are 'feeding stages'. The other two are 'non-feeding stages'. That means, only caterpillars and adult butterflies can feed. And you know what? The caterpillars are the ones who can 'eat' because they have mouth parts which can chew. But butterflies can only drink with their straw-like proboscis. The eggs and pupae cannot feed because they do not have a mouth at all!

So, let's find out what's in store for the thirsty butterflies and hungry caterpillars.

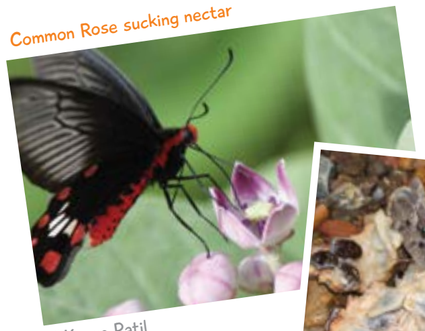
What do butterflies feed on?

Butterflies need various nutrients like salts and minerals and hence they feed on a variety of things. Some butterflies have a sweet tooth and they need a dessert along with their normal meal! These butterflies sip nectar from flowers and they get good amounts of sugar from it. Let's not forget— butterflies can only **sip-and-drink**. Let's check out what's on their menu.

1 Flowers

Butterflies can detect their food from a distance. They sit on the flowers and put their proboscis inside the flowers to suck out **nectar**.

Common Rose sucking nectar



©Krupa Patil

Blue Oakleaf feeding on a custard apple

©Milind Bhakare

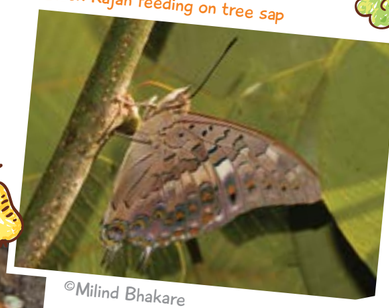
2 Fruits

Butterflies feed on fruits too. But they seem to prefer **rotten fruits** which are softened and probably more juicy. Thus the proboscis can effortlessly suck juices from these fruits.

3 Sap

Butterflies feed on **tree sap** which oozes out from the bark. They suck this sap using their proboscis.

Black Rajah feeding on tree sap



©Milind Bhakare

4 Leaves *

Have you seen butterflies perched on leaves for a long time? If you observe closely, you will notice that they scratch the surface of the leaves with the tiny claws on their feet and then sip the oozing liquid. Why so?
Turn to * page 29 and find out.

The human connection

Believe it or not... butterflies not only drink human **sweat** but they also feed on other body fluids like **urine**.

Common Imperial ©Sarvesh Abhyankar

4 Animal carcass

Butterflies not only feed on plant material, but also animals. Hey, they don't kill animals. They feed on **dead animals**. Butterflies have been seen sucking juices from dead carcasses of insects, fishes, snakes, tortoises, crabs and even birds.

Tawny Rajah feeding on a dead snake

©Muktai Kuwalekar

Great Nawab and Common Nawab feeding on scat

©Kunal Chakraborty

5 Animal and bird excreta

Can you imagine anyone having a feast on poop? But butterflies actually do it. Some butterflies enjoy feeding on animal excreta like **dung**, **scat** and **bird droppings**.

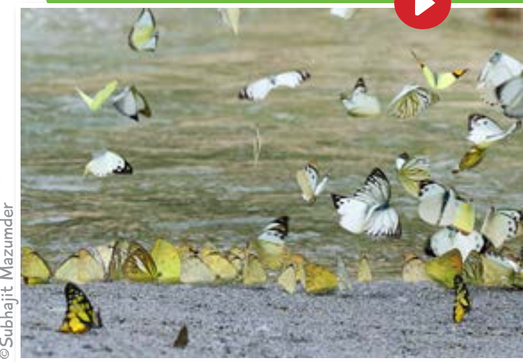
DID YOU KNOW THIS?

If the butterfly's food gets dried up, the butterfly excretes a fluid on it to make it wet. Then, using its long proboscis, it sips on its moist food.

Branded Straw Ace ©Nikhil Bhopale

Mud-puddling in butterflies

That's party time!! Really... Mud-puddling is like a party for butterflies.



©Subhajit Mazumder

It is a **social activity** where hundreds of butterflies, mostly males, of one or more species gather together on muddy banks of streams and ponds. And what do they do?

The male butterflies **suck salts** along with water from the wet soil. They may do this for hours. Gathering salts help them attract a female butterfly. The 'saltiest male' gets a female... easily!

Read more about it on * page 40.

What's there for the hungry caterpillars?

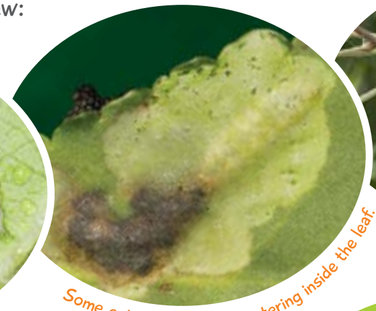
The caterpillar is a small-sized eating machine with a HUGE appetite. When a caterpillar hatches out, its first meal is its own egg. After gobbling up the egg, this caterpillar now starts munching on the leaves around it. The caterpillar eats and eats and eats. Different caterpillars have different eating styles.

Caterpillar devouring its own egg. ©Milind Pandit

Let's take a look at a few:

Some chew the edges. ©Krupa Patil

Some punch holes in leaves. ©Milind Bhakare



Some eat from within by entering inside the leaf. ©Milind Bhakare

Some just leave behind the veins.

A 'SMART' diet

Some species of butterflies choose **milkweed** plants to lay their eggs. When the caterpillars hatch out, they feed on the leaves of these milkweed plants.

So, what's so SMART about it? Read on...

The milkweed plants are poisonous. These caterpillars feed on the leaves of these plants. This makes the caterpillars poisonous and hence, predators stay away from them.

This is indeed a 'smart diet' which gives the caterpillar protection from its predators.

Some caterpillars feed on fruits and veggies. Like the Cabbage White or Guava Blue caterpillars who enter inside and feed on the pulp from within.

Not just greens

Caterpillars don't just have a green diet. Caterpillars of some species are **carnivorous**; that means they eat other living animals. Like the caterpillar of the Apefly butterfly feasts on mealy bugs and scaly bugs.

DID YOU KNOW THIS?
Caterpillars are known to eat 27,000 times their body weight during this 'hungry' stage in life.

Butterflies on the menu

Green Marsh Hawk feeding on Jester ©Vivek Sarkar, Manoj Nair

Gecko feeding on Evening Brown ©Dattaprasad Sawant

We have read about what butterflies and caterpillars feed on. Now, it's time to know WHO feeds on THEM.

After all, it's nature. A predator today is a prey tomorrow. And butterflies are no exception.

It's a BIG BAD world out there for the butterflies. Right from the time eggs are laid there are predators waiting to make a meal out of them. The eggs, caterpillars, pupae and butterflies— all are on the menu!

And who are the predators? Let's find out. The list is really long. Take a deep breath and read on...

Predators on the look out

The predators' marathon

A female butterfly is capable of laying up to 500 eggs. But, she lays about only 100 eggs, because many females die before laying eggs. Out of the 100, some eggs get eaten by predators like wasps, ants and only about 95 hatch. The caterpillars that hatch are highly vulnerable. About 85 of them are devoured by birds, wasps, spiders etc. Only 10 caterpillars grow fully and turn into pupae. Half of these pupae get eaten by lizards, ants or wasps or they die of desiccation or fungal infections. As a result, only about 4 emerge as butterflies!! Out of these, only 2 survive till they mate and lay eggs. The remaining 2 get eaten by monkeys, birds, spiders, lizards, dragonflies and frogs.

Jaw-dropping story, isn't it? Looks like predators are always on the look out for food. We'll now see some examples of how predators make a meal of eggs, caterpillars, pupae and adult butterflies.

In this scene, let's find out who's ready to attack.

1 Parasitoid wasp

Some parasitoid wasps lay their eggs inside the egg of butterfly. So when their larvae hatch, they feed on the developing caterpillar.

2 Wasps

This potter wasp first smartly paralysis a caterpillar and then drags it inside its mud house. Then the wasp lays its egg in the mud house and seals it, ensuring food for its hungry hatched larva.

3 Ants

Look how these ants attack and devour this pupa.

4 Birds

This bee-eater chases its prey and swiftly catches it mid-air. It then sits on its perch and enjoys its winged meal. These are called pursuit predators.

5 Frogs

Frogs often silently wait near puddles or in moist mud and grab mud-puddling butterflies. These are called ambush predators.

An interesting, unusual study

In Costa Rica, an unusual survey was done to study the feeding behaviour of a bird called Rufous-tailed Jacamar. And this study resulted in some interesting findings. Let's take a look at what exactly happened.

The Setup

In an enclosed area, Jacamars were offered more than 1600 butterflies of 133 different species.

The Feeding

35% Ignored at sight
5% Failed attacks
20% Attacked; rejected
40% Attacked; killed and eaten

The Observations

Birds killed bright coloured butterflies, but didn't eat them. Dull coloured butterflies were preferred by the birds and eaten in much more numbers. Turn to * on page 28 to read more.

Capturing the capture of prey

Here's a collection of photos taken by photographers who were present at the right time and right place with a camera! Take a look at some **perfectly-timed clicks**.

©Atanu Bose

©Paresh Churi

©Milind Bhakare

©Paresh Churi

©Dattaprasad Sawant

Think about it

When we say 'predator', most of us imagine a creature who ruthlessly catches butterflies, kills them and eats them. As we watch the butterflies trying to escape and save their lives, our heart bleeds for the beautiful, winged jewels. Now, take a moment and think...

We have read the story 'The Predators' Marathon' on page 24. Now, just imagine if the female laid all 500 eggs and all those 500 survived to become adult butterflies. What will happen? Such enormous numbers of caterpillars will feed hungrily on plants and so many butterflies will eventually deplete all available food resources.

Predators actually keep a natural check on them. Now, do we still call them 'ruthless predators'? The choice is yours!

Nature to the rescue

©Nikhil Bhopale

The butterfly is 'camouflaged'? What's that?
That means, the colours of the butterfly match the colours of its background. That makes the butterfly easily blend with the background and thus, difficult to spot. Getting camouflaged is the simplest way by which butterflies can keep themselves safe from predators.

We know that butterflies are surrounded by predators all throughout their lives. Hence, it is important that they keep themselves safe from these predators during all stages in their life. But how??

Trust Mother Nature to come up with some brilliant ideas which protect these delicate winged beauties from predators. 'Camouflage' is just one of the ideas. Let's find out more such ideas with which they keep themselves hidden and safe from their predators.

Here are a bunch of examples to show how butterflies have developed protection measures to keep themselves safe from predators.

Shhh... Let's hide!

Hiding is the easiest tactic that one can use to keep safe. Just stay at a place where no one can see you. SIMPLE!

Mamma butterflies usually lay eggs on the **underside** of the leaf.

Even the caterpillar knows that it has to pupate under the leaf. Hence, many pupae are seen on the underside of leaves.

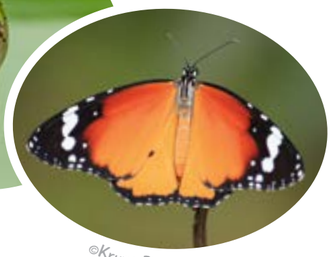
©Milind Bhakare

Some caterpillars **roll up inside leaves** and stay there. They peep out to eat and again go back into their hideout. They even pupate inside rolled leaves.

Warning... Stay away! *

In nature, it's an unsaid rule that anything **bright and shiny** is dangerous. One must not go near it. And that's what some butterflies use to their advantage. Look at the metallic-shine of this pupa of a Common Crow butterfly. And see the alarming red wings of the Plain Tiger butterfly which keep predators at bay.

©Tushar Bhagwat



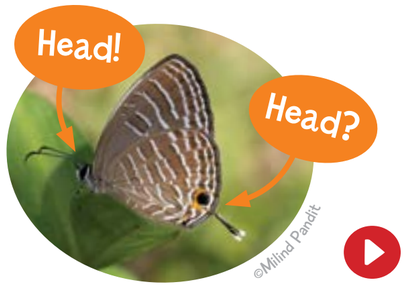
©Krupa Patil

Make friends!

Caterpillars of some species of butterflies stay with ants. These caterpillars have a special gland called the **nectary gland**. * It gives out a sweet syrup which the ants relish on. In turn, the ants fiercely protect the caterpillar from its predators. Smart friendship, isn't it?

Fooled you!

Yes, butterflies ARE indeed very smart. And Mother Nature has given them special gifts, too. Take a look at this butterfly.



©Milind Pandit

The hind wings have black dots that look like **eyes**. The wings have **tiny tails** also, which look like antennae. When the butterfly sits, it moves these 'false antennae' and **distracts attention** of the predator. The predator gets fooled and grabs the tail while the butterfly takes flight and escapes.

©Vasudeesha Hosabettu

See how this Slate Flash butterfly has made an easy escape from a predator.

DID YOU KNOW THIS?

Some caterpillars 'play dead' when they see danger approaching. They drop down on the ground and stay still, as if dead, till the predator has gone away.

Horns OK Please!

Caterpillars of some species of butterflies look fully armed with armour. They have some outgrowths which look like horns and give them a scary appearance.

©Milind Bhakare

©Haneesh K M

Some caterpillars even have a special weapon. When they are threatened, two horn-like organs shoot out from their head. That's called **osmeterium**. The osmeterium gives out a strong smell which shoos-off the predator. *

©Milind Bhakare

©Ravi Bhambhure

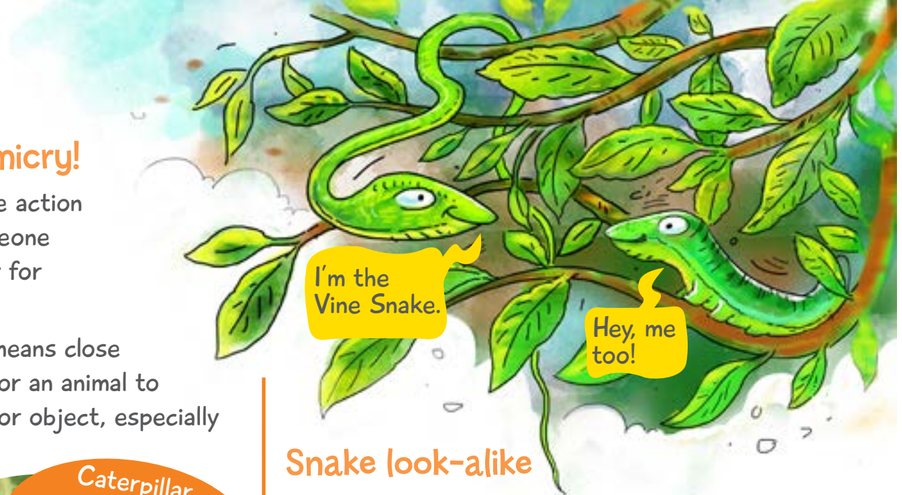
Perfect potion! *

Some butterflies sip **alkaloids** from leaves of some plants which make them **distasteful** and thus, keeps predators away. Sometimes, they get tipsy if they do excess intake of these alkaloids. That's when they are drunk!!

Time for mimicry!

What's mimicry? It is the action or skill of imitating someone or something, especially for entertainment.

But in nature, **mimicry** means close **resemblance** of a plant or an animal to another plant or animal or object, especially for protection.



Snake look-alike

The caterpillar of the **Great Orange Tip** butterfly is a wonder. This little caterpillar looks like a Vine snake.

©Milind Bhakare


©Nikhil Bhopale

Butterfly? Nah!

It's a dried leaf. Indeed, this butterfly looks like a dried leaf and the drab colours offer fabulous camouflage in the leaf litter.

The model-mimic bond

Have you seen mimicry artists in entertainment shows? It is fun to watch them mimic celebrities — famous film stars, singers and politicians. They dress up like that celebrity, they talk like them, they walk like them and they act like them and make the audience roll in laughter. But some butterflies take mimicry very seriously. For them, it is not entertainment. It is **survival**! Let us see an example:

A **Plain Tiger butterfly** is poisonous and it shows off its bright orange-red colour to warn its predators. If a predator (let's say a bird) eats this butterfly, it causes terrible vomiting. Now, that's called 'food poisoning'. The bird eats it once and learns a lesson for life. Because of this, birds stay away from these butterflies.

The model


©Krupa Patil

The **Danaid Eggfly**, on the contrary, is not poisonous, but it has smartly evolved to mimic the Plain Tiger. It not only looks like the Plain tiger but also imitates its slow flight. The predators mistake it for the Plain tiger and thus, do not dare to eat it.

The mimic


©Nikhil Bhopale

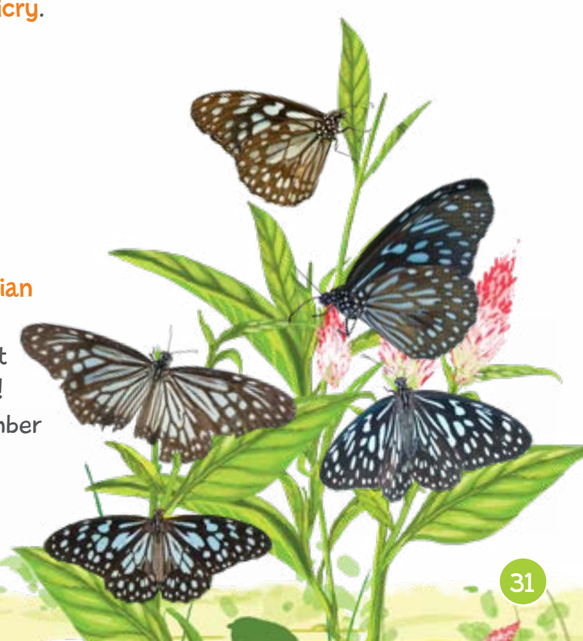
DID YOU KNOW THIS?
Only females do mimicry; males don't.

Another such example is the poisonous **Common Crow** being mimicked by the non-poisonous **Great Eggfly**. That's called, **Batesian mimicry**.


©Hemant Ogale


©Dattaprasad Sawant

There is a different kind of mimicry called the **Mullerian mimicry**. Here, many different distasteful species mimic one another. They all are different species; but they look the same and they taste the same- YUCK! So every time a predator goes for them, they remember the 'look' of the butterfly and decide never to take it again. Look, there are 5 butterflies of 3 different species on this bush.



Three-in-one!

Some butterflies use not-just-one, but multiple ideas, at a time, to save themselves from predators.

Just imagine this... YOU are a predator; let's say a bird! You are looking for food and you spot a lovely blue butterfly flying around you in a forest. You lock your eyes onto it and keep tracing its flight. Suddenly, the butterfly goes missing! "Where did it go??", you wonder.

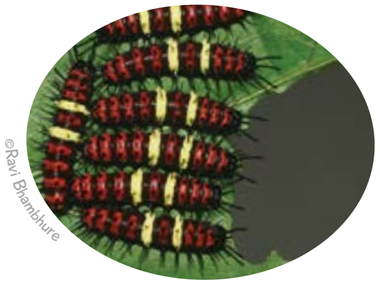
That's the game of the **Oakleaf butterfly**. Suddenly, while flying, it sits on a tree trunk with its wings fully closed. The underside of the wing of this bright blue butterfly is dull, drab and brown. It looks just like a dried leaf. It opens its wings, once in a while, to show off the blue colour, reminding the predator that bright colours in nature means danger! That's called 'flashing' colour. Thus, **bright colour + mimicking dried leaf + flash colouration** becomes the Oakleaf's safety formula.

Another example is this **Tiger Palmfly** butterfly. The underside of its wing has cryptic patterns which camouflages with tree trunks. And the upper side looks like the distasteful blue tiger butterflies; flashing the bright blues. Thus, **camouflage + bright colour + mimicry** is the safety formula for the Tiger Palmfly.

©Nikhil Bhopale

United we survive!

Caterpillars of the **Tamil Lacewing** butterfly sit huddled together and appear bigger. Probably the red colour of all these caterpillars comes together to put up an alarming signal to predators.



©Ravi Bhambhure

Butterflies on the move

©Samir Gulavane

Don't you like going on a long vacation? When your city gets too hot to handle, you go for a holiday in the hills. Butterflies also go off on a journey in search of suitable weather or adequate food. That's called **migration**.

Basically, butterflies are very delicate insects. They cannot tolerate extreme weather conditions— be it harsh heat, extreme cold or heavy rains — and hence, they migrate. Different species of butterflies do different types of migration. There are 3 types of migrations observed by scientists and experts. They are **Short Distance** Migration, **Long Distance** Migration and **Dispersal** Migration.

Let's take flight to the next page and take a look at the 3 kinds of migrations with some live examples.

DID YOU KNOW THIS?
Butterflies are known to migrate over land, hills, deserts, rivers and even seas.

Short distance migration (SDM)

Hi! I am the Great Eggfly butterfly. When the heat in my area becomes too harsh and makes the area dry, I fly away to a close-by shady, moist area where I feel comfortable. That's how we do Short Distance Migration.

Hey, I am the Indian Tortoiseshell butterfly. We stay high up in the Himalayan mountains. But when it gets too cold here, we fly down to lower valleys of the Himalayas where it is less cold. If the valleys get too warm, we fly back to mountains. This is how we too, do Short Distance Migration.

Hey, I am the Red Helen butterfly. I love the dense forests in the mountains of Western Ghats. But when it rains heavily, we temporarily fly down to lower areas of Konkan. And when the rains recede, we may go back to the mountains. That's how we do Short Distance Migration.

LDM route of Blue Tiger butterflies

LDM route of Crimson Rose butterflies

Western Ghats

Eastern Ghats

Long distance migration (LDM)

Hey. I am the Crimson Rose butterfly. Many of us staying in the southernmost parts of India (eg Kerala) sense the approaching monsoons. This region gets very heavy rainfall which we cannot tolerate. So we start moving northwards, along the Western Ghats. Huge congregations fly over till Karnataka. From here, the journey takes a turn eastwards and reaches the Eastern Ghats. From there, we may cross-over to the Western Ghats using the same route we came from or the journey continues southwards, along the Eastern Ghats, and the congregations come back to the Western Ghats. This long journey is called Long Distance Migration.

Hey do you think that these dainty butterflies can fly such long distances? Here's the secret behind it: The same individuals need not complete the entire journey. On their journey, they roost, they feed, they lay eggs and the new individuals from this next generation continue the journey. Thus, this long, round trip is completed by its successive generations.

©Dattaprasad Sawant

Hi. I am the Blue Tiger butterfly. We are seen flying northwards from the southern parts of Maharashtra. To avoid heavy rain, we migrate in large numbers thus doing Long Distance Migration.

DID YOU KNOW THIS?
The longest known butterfly migration is by the Painted Lady butterfly. They are known to cover a distance of up to 12,000 kms. Whoa!!

Dispersal migration (DM)

Hello. I am the Emigrant butterfly.
Some of us staying in the semi-arid areas of the Deccan plateau are known to do Dispersal Migration. I will tell you what that is.

Emigrants lay many eggs at a time, at the same place. The hungry caterpillars feed voraciously on the plants around and then pupate. But due to this heavy 'grazing', they finish all the food around. The caterpillars haven't even left a few leaves for butterflies to lay eggs. So, as soon as the butterflies emerge from the pupae, they migrate in different directions. This is called Dispersal Migration. When the butterflies find a suitable place, they lay eggs there, ensuring that the emerging caterpillars have adequate food around them.

DID YOU KNOW THIS?
Butterflies are the most studied insects in India. However, their migration continues to fascinate experts and is a much-needed study topic.

Gully-bottoming

Gully-bottoming is an interesting behaviour seen in butterflies. Let's find out what it is...

It has been observed that various species of butterflies often gather together at one place. This is a damp, moist and well-shaded place which is chosen by the butterflies to avoid harsh weather. At such places, many butterflies of various species are seen in large congregations. This is called gully-bottoming.

Many of these individuals could be 'migrants'. And you know what??

With so many butterflies around, there is a high possibility of finding suitable mates. These sites of gully-bottoming are 'happening hubs' for match-making. In such areas, if the condition is favourable, the butterflies pair-up and mate, too.

Playing the game of love

Mating pair of Red Pierrot ©Milind Pandit

Have you ever seen a 'DOUBLE' butterfly? Can you guess what it means?? Your options are:
(a) Two butterflies had a fight and decided not to see each other's face again
(b) Two butterflies accidentally got stuck together by a drop of super glue
(c) The two butterflies are like Siamese twins who are joined together since birth
(d) None of the above

And the right answer is (d) None of the above.

So, what's the right answer?? What ARE these double butterflies? And WHY are they like that? Actually, these 'DOUBLE' butterflies are a mating pair. One of them is a male and the other is a female. Mating is done for reproduction so that the female can lay eggs and there can be many many more beautiful butterflies. This is a very important process for the butterflies—from finding a mate to mating. Let's find out more about this. Read on...

1 Hill topping

How do butterflies look for their mates? What's better than a hilltop? Some butterflies fly high, over hill tops to get a better view of their surroundings. They can thus, easily locate any females which are flying around. Look at these **Great Eggfly** males who are **hill topping** to look for females.

2 Patrolling

Some males perch on a healthy host plant and patiently wait for females to come near. During this time, they drive away other competitor males by chasing them.

Check out this alert **Blue Pansy** butterfly **patrolling** his territory and chasing away another male.

Different butterflies show different ways of doing **patrolling**.

Some male butterflies keep flying in circles around females. Some males take short flights to scan for females.

Some males are also seen circling around plants with hanging pupae; hoping that female butterflies will emerge from them.

3 Hair pencils

Males of some species of butterflies, like this **Common Crow** butterfly, have a special way to attract females. They have a brush-like outgrowth at the end of their abdomen which is called **hair pencils**. They throw open their hair pencils while flying up and down, when they are on a trip to find females. These hair pencils give out **pheromones** which attract female butterflies.

Take a close look at the hair pencils.

©Dattaprasad Sawant

4 Scent pouch

Males of some species of butterflies have a special **scent pouch** on the hind wing.

©Dattaprasad Sawant

See how the female **Striped tiger** butterfly touches the scent pouch with her antennae to check out the male.

5 Mating

After various ways of finding and attracting the mate, the male and female butterfly come together to mate. **Mating** in butterflies is an important process, like in all other living beings, which helps in reproduction.

Mating pairs of butterflies are seen where the male and female butterfly look stuck together back-to-back. They are seen perched on bushes or hanging under leaves. Sometimes, pairs are even seen flying together while mating mid-air.

After successful mating, the female butterfly finds a suitable place and lays her eggs. That's how a new life begins.

Great Orange Tip

©Uday Agashe

In case the female butterfly doesn't want to mate with the male, she raises her abdomen to show rejection.

©Milind Pandit

The caring male

The possessive male

In few species like the Apollos and **Tawny Coaster**, the male does not want to share his female with anyone else. So, he puts a plug to his female after mating. This plug called **sphragis** doesn't allow the female to mate with anyone else.

DID YOU KNOW THIS?

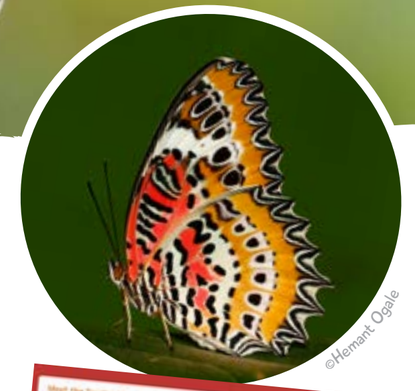
While mating, the male transfers all the collected salts to the female. These salts are gathered by the male while mud-puddling and are helpful to make healthier eggs. Hence, these salts are given as a 'wedding gift' to her.

©Hemant Ogale

This beauty is called the **Lacewing**. Truly, what a lovely butterfly! Be it with wings wide open or with closed wings. Its colours, its patterns are sheer beauty! Just like a piece of art painted on canvas. Looks like Mother Nature made it with lots of love.

This lovely butterfly is just one masterpiece from the many many artistic creations of Mother Nature. There is so much diversity and variation in butterflies that you'll be amazed.

Let's a take a look at the wide variety of butterflies—their diversity, their variation, their interesting names and photographs of some commonly seen beautiful butterflies around us.



©Hemant Ogale

Mother Nature's creative workshop

We know that there are 1335 species of butterflies in India. That means so many different types of butterflies! We must be so proud of so much diversity!! Some have interesting antennae, while others have fascinating legs. Some have unique wings, while others have interesting eyes. So many shapes, so many colours, so many patterns. And what makes it more interesting? This amazing diversity is seen in all four stages of life— eggs, caterpillar, pupa and butterfly.

So what are we waiting for? Let's take a look at some beautiful photographs of butterflies, their eggs, caterpillars and pupae. Get ready to get stunned with their diversity!!

Eggs

Caterpillars

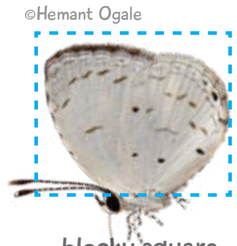
Pupae

Colours

Butterflies are most loved for being so bright and colourful. They are like a **flying rainbow**. Just think of a colour and you are sure to find a butterfly of that colour.

Shapes

If you observe butterflies carefully, you will find them in so many shapes and sizes. Most butterflies fit in common **geometrical shapes** which you can easily identify. Look at the shapes of these butterflies.



©Hemant Ogale

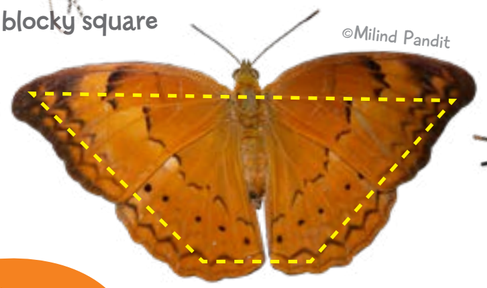
blocky square

©Milind Pandit

sleek rectangular

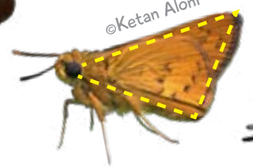
©Milind Pandit

roundy oval



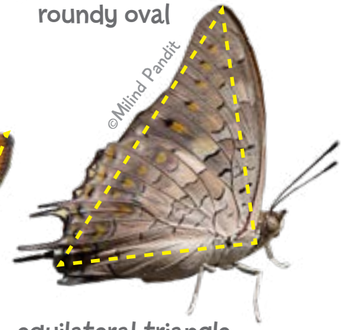
©Milind Pandit

buckety quadrilateral



©Ketan Aloni

right-angled triangle



©Milind Pandit

equilateral triangle

Why is this heap of dried leaves lying here?

Look closely... One of these leaves is a butterfly— the Blue Oakleaf. Its wings are **leaf-shaped** and the outer side is brown with a vein-like pattern, so it perfectly looks like a dried leaf. But when the butterfly opens its wings, they are bright blue in colour!

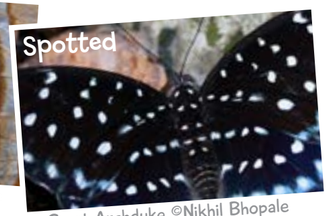
Patterns on wings

Wings, the most attractive part of the butterfly's body, show many different patterns. Check them out...

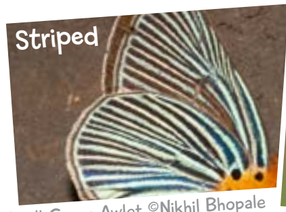
Common Wanderer ©Sarvesh Abhyankar

Tiger Palmfly ©Nikhil Bhopale

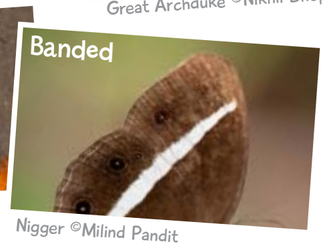
Gladeye Bushbrown ©Nikhil Bhopale



Great Archduke ©Nikhil Bhopale



Small Green Awlet ©Nikhil Bhopale



Nigger ©Milind Pandit

Tails on wings

Some species of butterflies have outgrowths on the edge of their wings. Let's call them 'tails'. See how many types of tails these butterflies have.

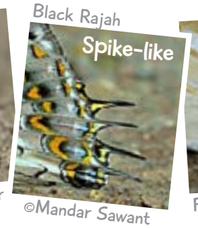
Chain Swordtail ©Milind Pandit

Sword-like

Orchid Tit

©Sarvesh Abhyankar

Black Rajah



©Mandar Sawant

Fluffy Tit ©Milind Bhakare

Butterflying spots in India

OMG... so many lovely butterfly pictures on this page!! Don't you feel like actually seeing them flying around you? So, what are you waiting for? Just pack your bags and head straight to the 3 Biodiversity **Hotspots** in India where you will get to these beauties. Remember! You have to visit these places in the right season. So read on to plan your next outing to one of these promising butterflying spots.

1 Eastern Himalayas
Eaglenest Wildlife Sanctuary, Talle Wildlife Sanctuary (Arunachal Pradesh) from July to October

2 Indo-Burma
Balpakaram National Park, Baghmara Reserve Forest, Siju Wildlife Sanctuary in Garo Hills (Meghalaya) in October, November or March, April

3 Western Ghats & Srilanka
Tungareshwar Wildlife Sanctuary (Maharashtra), Cotigao Wildlife Sanctuary (Goa), Sharavati Wildlife Sanctuary (Karnataka) from July to October and in February and March.

Same same, yet different!

Same same, yet different! What does it really mean? It's simple! It's called **variation**. By definition, variation is a different or a distinct form or a version of anything.

In butterflies, it means, that there is difference in size, shape, colour or behaviour within the same species of butterflies.

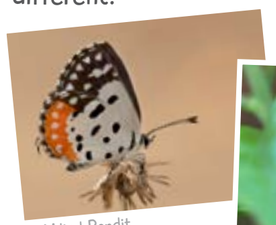
It is important to know that there is a lot of variety in size, shape, colour and behaviour in DIFFERENT species of butterflies. But, that's called diversity.

When variety is seen within the SAME species, then it's called variation. So, never get confused between '**diversity**' and '**variation**'.

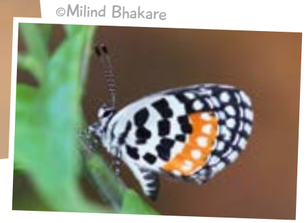
There are 4 major kinds of variations seen in butterflies. Come on, let's take a look.

1 Geographical Variation

Same species of butterflies look different in different regions. Take a look at these photographs of the **Red Pierrot** butterfly. One is clicked in the **Western Ghats** of peninsular India and the other is taken at the **Khasi hills** in North-east India. Though they are the same species, don't they look different?



©Milind Pandit



©Milind Bhakare

Just like these kids... a girl from South India and a boy from north-east. We can make out that they come from two different regions.

2 Seasonal Variation

Butterflies of some species like the **Common Bush Brown** show seasonal variation. It is also called **Polyphenism**. Take a look at the polyphenism in **Peacock Pansy** butterflies.

Butterflies which emerge during the monsoon are brighter and more attractive while, the ones that emerge in summer have dull colours and patterns on their wings are hardly visible or sometimes missing.

3 Individual Variation

Have you seen siblings and cousins of the same family? They are all similar but actually each one looks different. See these photographs of some **Common Emigrants** which look similar but are so different.

4 Sexual Variation

Like there are boys and girls in humans, there are males and females in butterflies. In some species of butterflies, the male and female look identical. But in some species, the male and female look very different from each other and that's called **sexual variation**!

Dimorphism

Take a look at the male and female of the **Danaid Eggfly**. The female looks very different than the male. When sexual variation has 2 forms, it is called dimorphism. 'Di' means two and 'morphs' mean forms. Hence, **dimorphism**.

Polymorphism

As the name suggests, there are **multiple morphs** of the same species of butterfly, seen in the same area, at the same time. This is best demonstrated by the **Common Mormon**. Here's how: The female Common Mormon has 3 different forms. Let's call them avataars!

The first avataar looks like the Common Rose. The second avataar is similar to the Crimson Rose. And the third avataar looks like the Common Mormon males.

What's in a name?

The legendary writer Shakespeare once wrote "What's in a name?". Hey, but when it comes to butterflies, there are so many interesting stories in a name. Naming a butterfly is an interesting journey. Some butterflies are named after its look, some after the food, some after their flight and so on. Let's sniff out such interesting stories behind names of some butterflies. So... what's in their name?

Their look

The names of some butterflies are just simple and straight. No rocket-science behind naming them!

The wings are yellow in colour and they have orange tips. So, its name is **Yellow Orange Tip**. And the other one is **White Orange Tip** butterfly.

This one is called the **Great Orange Tip** as it is the largest amongst all orange tips.

DID YOU KNOW THIS?

This butterfly is named after a character in a French play called 'Pierrot' who painted his face white and wore a black-and-white costume.

Pierrot species ©Rohit Girotra

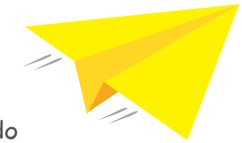
This butterfly is called the **Giant Red Eye**. Now, there are no prizes for guessing the reason behind this name :)

Getting to know the origin or history behind a name is called its '**etymology**'.

Their Flyways

Most skippers are named after their flight.

Zip... Zap... Zoom go the **Darts**. Palm Darts, Grass Darts have a quick darting flight.



Swifts are truly swift flyers and they do complete justice to their names.

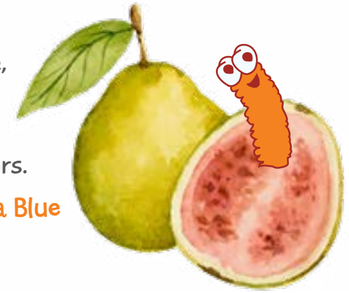
And there are **Bobs** with a bobbing flight. They are seen with a dipping flight which goes up-and-down.

Some other butterflies like the **Sailers** are also aptly named after their flight. They flap their wings a few times in a quick flicker and then keep them steady to effortlessly float and sail in the air.

Their Food

Butterflies like the Gram Blue, Pea Blue, Guava Blue, Castor, Palmfly, Yamfly are named after the food of its caterpillars.

Caterpillar of the **Large Guava Blue** pupates inside a guava fruit.



Naming butterflies

Like all plants and animals, butterflies also have 2 names — a **common name** and a **scientific name**. You will read these names in the 'photo albums'.

Common name is the one used by enthusiasts; and scientific name is the one used by researchers and experts. The scientific name has 2 parts — genus and species ... it's like having a name and surname ... just like we do. Take this one for example:

Common name: Common Jezebel
Scientific name: *Delias eucharis*

©Dattaprasad Sawant

Idioms and phrases

Butterflies have flapped their way into literature, too. Take a look at these idioms; each one with a different meaning.

"as gaudy as a butterfly"

That means 'very colourful'. Some super colourful butterflies must have inspired someone to coin this idiom.

"butterflies in the stomach"

That means 'feeling nervous'. So when butterflies have exams, do the have 'humans' in their stomach? LOL!

"break a butterfly on a wheel"

That means 'to apply unnecessary amount of force to achieve something very simple and insignificant'.

"social butterfly"

That means 'being friendly'.

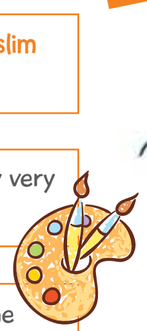
It's a butterfly! Or a moth?

When you see a winged beauty fly past your eyes, you might wonder whether it was a butterfly or a moth. And why not? Butterflies and moths do look similar because they are cousins and both belong to the very large group of insects called **Lepidoptera**. So let's find out how to identify a butterfly and differentiate it from a moth.

Butterflies are **diurnal**. They are active during daytime. They become most active when the sun shines bright.

Butterflies have a **slim** and **slender** body.

Butterflies are mostly very **bright** and **colourful**.



Butterflies have **clubbed antennae**. Some have a straight club, while some are curved. Some have a blunt end, while some even have a tiny projection over the club. If you see any of these, you can be sure, it is butterfly.

Butterfly

Striped Tiger Butterfly

Moth

Tussar Silk Moth

Moths are **nocturnal**. They are active during the night. They are out on moonlit nights when the whole world sleeps.

Moths have a **fat** and **robust** body. Sometimes the body is also furry.

Some moths have thin **tapering antennae** and some others have fancy, **feathery** ones.

Moths are usually **dull**-coloured and **drab**-looking.

Here's a quick recap

Butterfly	Moth
active during day	active during night
wings are colourful	wings are dull and drab
body is slim and elongated	body is fat and robust
antennae are clubbed	antennae are tapering or hairy

Identifying butterflies

So many butterflies! WHO are they? WHAT are they called? HOW does one identify them?

It's simple. Start looking for them. Butterflies are all around us. All you need to do is... start '**butterfly-watching**'. It is an interesting activity. Start watching their shapes, sizes and colours. Observe the way they fly and the way they perch. When they come and when they go. What they do and what they don't. You will soon start finding them familiar. Then, try to find out their names. The '**photo albums**' from page 57 to page 79 will help you identify a few commonly-seen butterflies. But, to start identifying butterflies yourself, you will have to first learn to observe them and then, describe them correctly to experts.

Ask yourself these questions

1 What's the size?

Describing the size of a butterfly can be highly subjective. Hence, we need to give some 'standard' references while describing them.

For example, when I say "I saw a bird which was the size of a sparrow", you get a fair idea of how small the bird was. If I say, "I saw a bird which was roughly the size of an eagle", you can visualise how big the bird was.

Similarly, to describe butterfly sizes correctly, the best way is to compare them to a few commonly-seen butterflies. So, first get yourself familiarised with these commonly-seen species given on this **B-scale**.

What's a B-scale?

It is a simple scale that tells you the size of a butterfly. This B-scale will help you understand and describe the sizes of various butterflies that you see. Here's how:

First, broadly describe the size of the butterfly you are watching.
Small-sized = 12mm to 49mm
Medium sized = 50mm to 99mm
Large sized = 100mm to 194mm

Then, identify a species shown on the B-scale which your butterfly is closest to, in size. Now go ahead, describe it.

For example: "I saw a medium-sized butterfly which was slightly bigger than the Common Jezebel." Or "I saw a large-sized butterfly, but it was not as big as a Blue Mormon."

2 What's the habitat?

All butterflies prefer certain habitats and are most likely to be seen there. Noting down the habitat proves to be an important key in identifying a butterfly. So, observe the habitat it was seen in. It could be a forest or a grassland/scrub land or near human settlement.

forest grass/scrub human settlement

H can be seen in all habitats

3 What's the strata?

Is the butterfly flying? If yes, observe the strata. Now, what's strata? Simple! Strata means layers. Here, it means the height at which the butterfly is flying. Some butterflies often fly close to the ground while, some are seen flying higher up.

So, where do you see it flying? Make a note.

below eyelevel above eyelevel at eyelevel

can be seen at all levels

4 What's it feeding on?

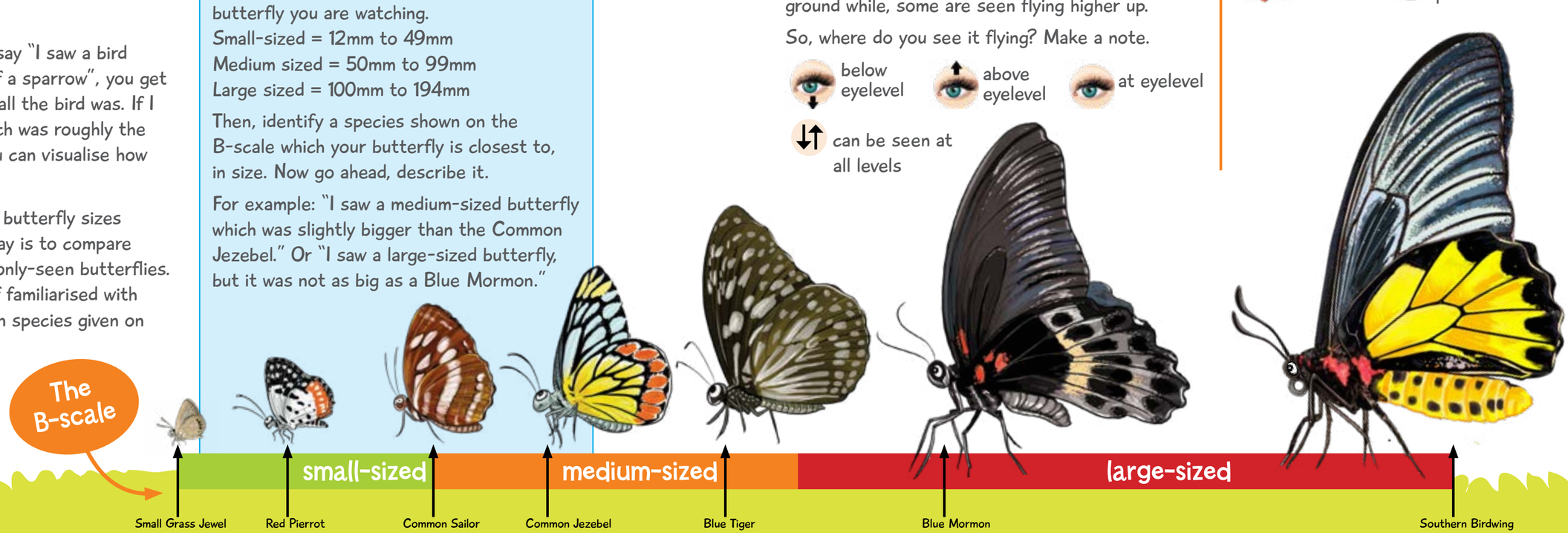
Is your butterfly feeding? Watch closely. You already know that butterflies do have food preferences. Certain species will be seen feeding on certain specific foods. These will help in the identification process.

Let's take a look at the icons of the variety of food butterflies feed on.

flowers fruits

sap excreta

carcass puddles



5 What's its sitting position?

We all have a favourite sitting position, don't we? Similarly, each butterfly also has a specific way to sit. Some sit with wings wide open, while some sit with wings fully closed. Some keep their wings slightly open. Here are a few sitting positions.

Bushbrown©Krupa Patil

Common Castor©Sarvesh Abhyankar

Small Salmon Arab ©Krupa Patil

Swift species ©Krupa Patil

But, here's a catch...

Butterflies don't always sit in the same position. Just like us. When we have to relax, we sit in a particular way... When we have to do yoga, we sit differently... When we have to poop, our sitting style changes.

Ha ha, Interesting, isn't it?

Similarly, butterflies sit for various activities like feeding, nectaring, puddling, resting and basking.
A butterfly may sit in different positions, depending on the activity it is doing.

Basking is a mighty important activity for butterflies. Hence, they have special 'basking positions' too.

Read on to know more.

Butterflies are '**poikilothermic**'. Now, what does that mean? It simply means they cannot regulate their body temperature; like we do.

Let's make it simpler! Even when the atmospheric temperate around us changes, our body continues to be at the same temperature. But that's not the case with butterflies. Butterflies prefer to maintain their body temperature between 30 to 39 degrees. But, their body temperature changes, when the weather around them changes. And that's why they have to regulate their body temperature.

After the cool nights, they have to bask in the Sun to make themselves warm. Just like we do... Sun-bathing!

Some species of butterflies vibrate their wings.
Just like we rub our hands on a cold winter morning.

6 What's the basking position?

There are seven types of basking positions seen in butterflies. Let's see who does what type of basking and why.

Lateral basking


Satyr species

Some butterflies like the Satyrs have a unique way bathing in the Sun. They sit with wings closed right above their back. And then, they keep tilting left-and-right to make sure that underside of each wing is exposed to the sunlight.

Dorsal basking


Large Green-underwing

Butterflies which do dorsal kind of basking, spread their wings flat to bask in the Sun. In this position, they can warm their body and wings at the same time.

But, with wings spread wide apart, they can be easily spotted and can become a quick meal for their predator. Hence, most dorsally-basking butterflies are brightly-coloured, reminding predators to stay away. They can be unpalatable to most predators.

All photos on this page ©Nikhil Bhopale

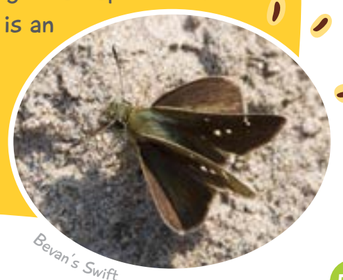
Acute basking


Large Cabbage White

Have you ever seen a fashion shoot? There are boys holding shiny, white reflectors to light up the models. Butterflies with white or yellow wings do exactly that, while basking. They hold their wings at an angle to reflect the sunlight and direct it straight to their body. That's acute basking.

Double acute basking

This is kind of basking is seen only in butterflies like Swifts, Darts, Demons, etc. They have a unique position for basking in which, forewings are held in acute basking position and hindwings are kept in a dorsal basking position. It is an eye-catching pose; so do try to find such double acute basking butterflies.

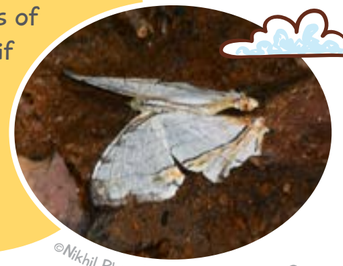

Bevan's Swift

Appressed basking

This is a peculiar pose seen in Eggflies, Apollos, Maps and Pansies.

'Appress' means to press something close to something else. See carefully... you'll notice that this Map butterfly has pressed its wings downwards such that the tips of the forewings are touching the ground. It looks as if the butterfly is pressing itself close to the ground.

Butterflies often take this position when the surrounding is relatively cooler or there is a sudden cloud overcast for some time.



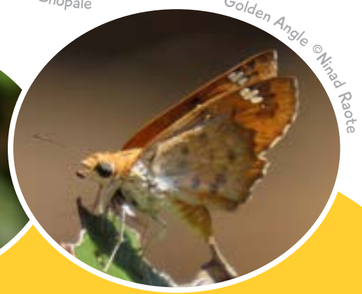
©Nikhil Bhopale

Body basking

This basking behavior is rarely seen in butterflies. In this pose, they keep their wings open with a gap, only as much as their body width. The gap is just enough to allow the sun rays to warm the body of the butterfly. This is seen in two types of butterflies.

Indian Sunbeam ©Nikhil Bhopale

Butterflies which usually sit with wings fully closed; sometimes open their wings just enough for body basking.



Golden Angle ©Nirad Raote

Butterflies which usually sit flat with wings fully open; sometimes close their wings leaving a gap which is just enough for body basking.

Baronet ©Kishor Shirkande

When the basking done and the butterflies have warmed their bodies, they don't need any more sunlight. It's time to take a break. That's called Vertical Basking. This is a heat-avoiding posture where the wings are tightly closed over the body, pointing directly at the Sun. Aha! Now, the body of the butterfly is in a cool shade of its wings.

©Nikhil Bhopale

Yes, there's a saying — Families that eat together, stay together! :)

But... families? Butterfly families?? You mean *Khandaans*?? Huh???

Do butterflies really have families? Yes, they do. Just like we do :)

Butterflies are sorted into 6 'families' based on the similarities they have. These families have names, too. But they are not as simple as ours — Joshis, Banerjees, Singhs, Sharmas, Iyers, Khans or D'Souzas. Butterfly families have names like Hesperiidae, Papilionidae, Pieridae, Lycaenidae, Riodinidae and Nymphalidae. Quite a mouthful, right?

But, don't worry. We have made them simpler for you.
Read on to meet the families and their members (that means 'species'). You can find them in the 'photo album' sections.

The Hesperids

Family name: Hesperiidae (Hes-pe-ree-dee); commonly called Skippers

Skippers are small to medium-sized butterflies.

Found in shades of oranges and browns.

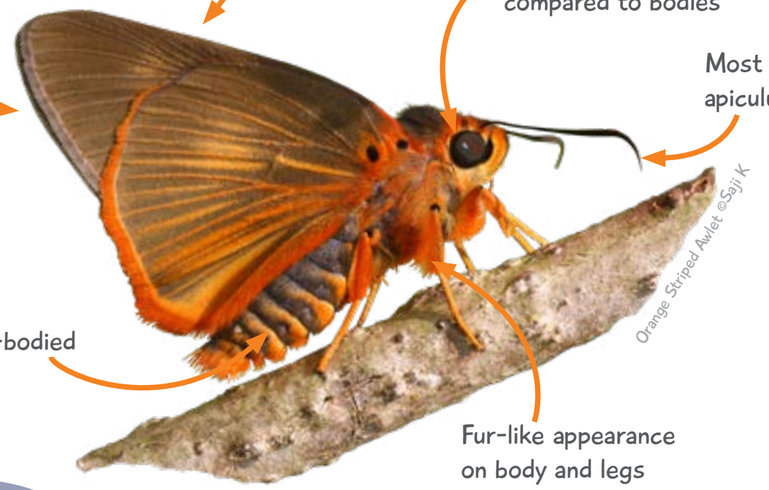
Their body structure

Wings are small in size; compared to their body

Wings appear triangular in shape

Eyes are large as compared to bodies

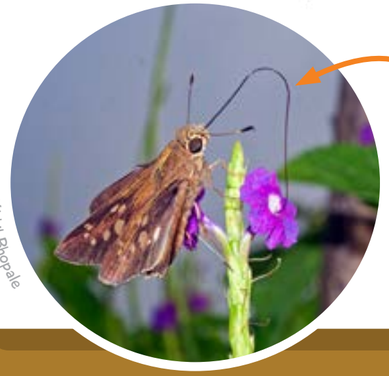
Most have apiculus



Orange Striped Awlet ©Saji K

Stout-bodied

Fur-like appearance on body and legs



©Nikhil Bhopale

Skippers have a visibly long proboscis as compared to their body. Look at this Conjoined Swift — how effortlessly it sucks nectar from flowers of the Indian Snakeweed.

Their flight

They do a complete wing flap during flight.

They are fast flyers ... making rapid, erratic movements; hence called 'Skippers' which also means striker.

The flights of skippers:

The Dart flight The Swift flight The Bob flight

Most prefer to stay close to ground; hence; we often seen below our eye-level.

Vindhyan Bob ©Nikhil Bhopale

Their sitting position

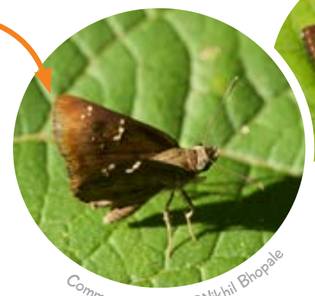
Groups like Swifts, Darts, Aces, Hoppers, Awls, Awlets, Bobs, Demons, Flitters, Lancers, Redeyes, Palmers (let's call them group A) sit in fully-closed-wing position.

Sometimes, group A are seen sitting in hybrid position.

Vindhyan Bob ©Nikhil Bhopale

Groups like Flats and Angles (let's call them group B) sit in fully-open-wing position; hence they are called 'Flats'.

Sometimes, group B are seen sitting in partially-open-wing position.



Common Small Flat ©Nikhil Bhopale

Golden Angle ©Milind Pandit

Their food

Caterpillars from the Skipper family stay inside rolled up leaves or grass stems. Most caterpillars feed at night.

©Milind Pandit

DID YOU KNOW THIS?
Butterflies sitting in hybrid position come ONLY from the Skipper family. *

Meet the Hesperids

1. Chestnut Bob (*Lambrix sasala*)
2. Dark Palm Dart (*Telicota bambusae*)
3. Indian Palm Bob (*Suastus gremius*)
4. Brown Awl (*Badamia exclamationis*)
5. Common Small Flat (*Sarangesa dasahara*)
6. Golden Angle (*Caprona ransonnettii*)
7. Grass Demon (*Udaspes folus*)
8. Orange Awlet (*Burara jaina*)
9. Giant Red Eye (*Gangara thyrsis*)

©Abhijit Jagtap

©Ketan Aloni

©Milind Bhakare

©Nikhil Bhopale

©Nikhil Bhopale

©Sarvesh Abhyankar

©Nikhil Bhopale

©Saji K

©Rohit Girotra

The Papilionids

Family name: Papilionidae (Pah-pee-lio-nee-dee); commonly called Swallowtail butterflies

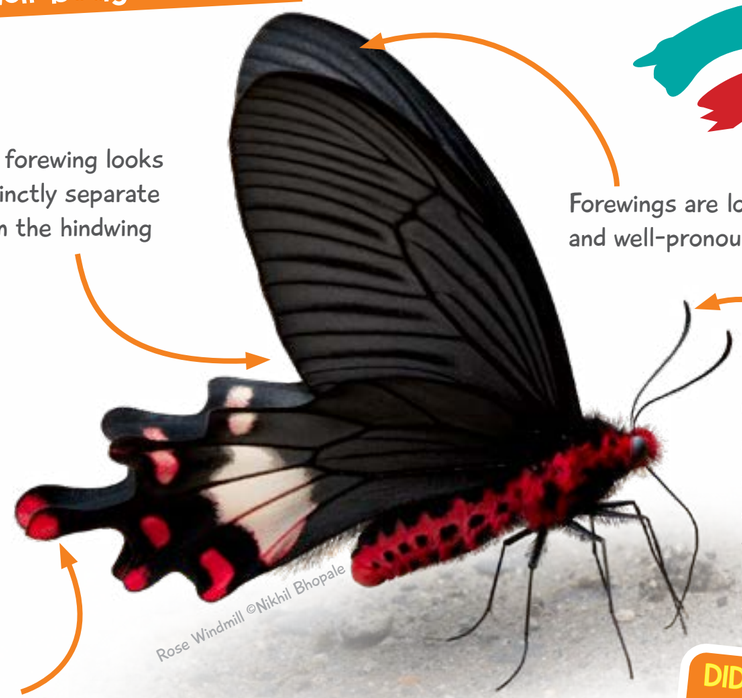
Swallowtails are medium to large-sized butterflies.

Their body structure

They are multi-coloured; hence, attractive

The forewing looks distinctly separate from the hindwing

Forewings are long and well-pronounced



Clubs of the antennae are mostly curved. They are long, slim and hence can't be distinguished from its shaft.

Rose Windmill ©Nikhil Bhopale

Most of species from this family have tailed hindwings

DID YOU KNOW THIS?
The largest species of butterflies found in India belongs to this family.

Papilionids are closely related to the Pieridae family.

Their flight

They are strong flyers and their flight looks elegant.
They don't easily settle on anything during their flight; hence, it seems like a **Restless** flight.
The tip of forewings keep vibrating until they settle down for puddling.

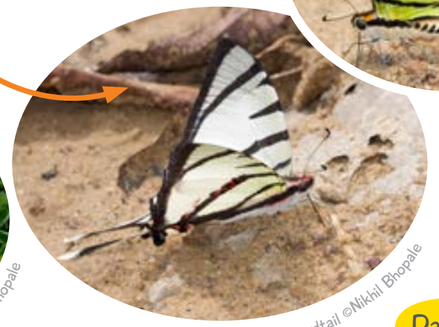
Common Rose ©Krupa Patil

Their sitting position

Most species sit in partially-open or fully-closed wing position.
Very few sit in fully-open-wing position, like the Apollos.

Five-bar Swordtail ©Nikhil Bhopale

Common Blue Apollo ©Nikhil Bhopale



Four-bar Swordtail ©Nikhil Bhopale

DID YOU KNOW THIS?
None of the Swallowtails are ever seen in hybrid position.

©Milind Bhakare

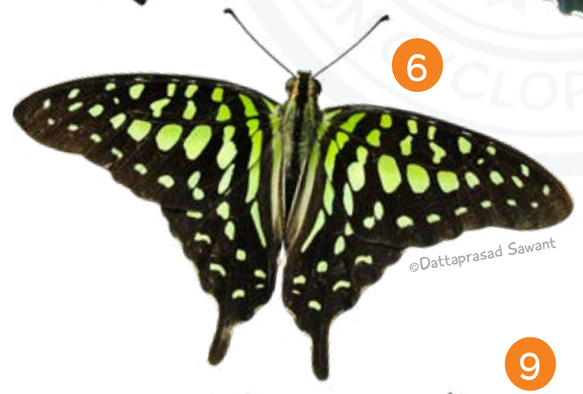
All caterpillars from this family have **osmeterium** and they use it to keep predators at bay.

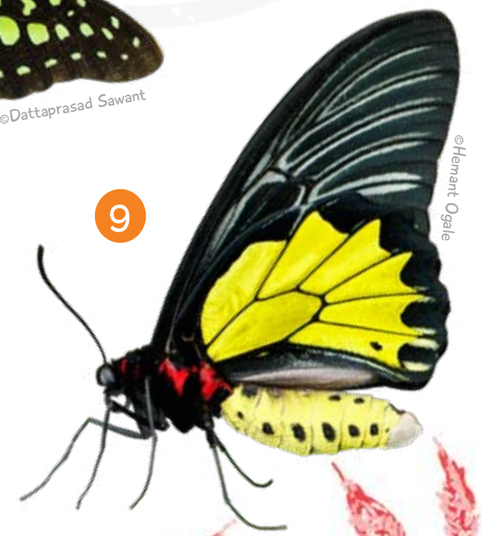
©Ravi Bhambhure

Meet the Papilionids

THE BUTTERFLY PHOTO ALBUM 'FUN'CYCLOPAEDIA

1. Common Jay (*Graphium doson*)
2. Southern Bluebottle (*Graphium sarpedon*)
3. Spot Swordtail (*Graphium nomius*)
4. Common Rose (*Pachliopta aristolochiae*)
5. Lime Butterfly (*Papilio demoleus*)
6. Tailed Jay (*Graphium agamemnon*)
7. Common Mormon (*Papilio polytes*)
8. Red Helen (*Papilio helenus*)
9. Southern Birdwing (*Troides minos*)





The Pierides

Family name: Pieridae (Pee-ree-dee); commonly called White and Yellows

Majority of the species in the Pieridae family are medium sized butterflies; while few are small in size.

As the name suggests, these are mainly yellow and white in colour; sometimes with a combination of red, orange, black etc.

Their body structure

The abdomen of Pierides is narrow and thus, appears slim.

©Haneesh K M

Pioneer ©Nikhil Bhopale

When sitting with wings closed, the hindwings overlap on the forewings such that they almost cover the forewings with only the apex of the forewing is visible; unlike Swallowtails.

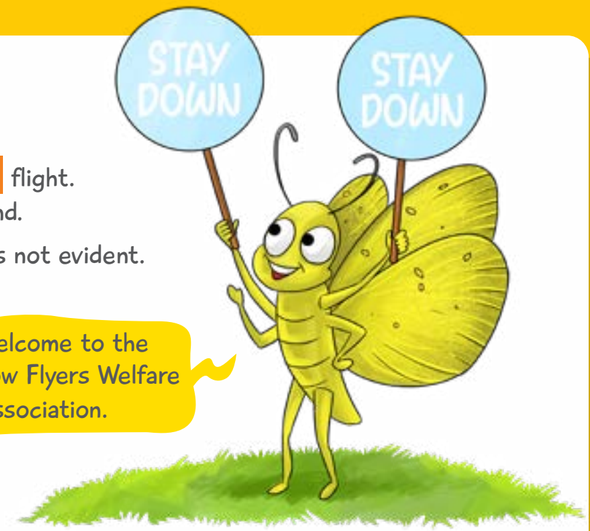
The abdomen of Pierides is almost never visible in sitting position.

Their flight

Many are weak fliers and display a very **weak** flight. Hence, they are seen flying close to the ground.

In flight, forewings and hindwings distinction is not evident.

Most prefer to stay close to ground; hence; we often see them around and below our eye-level.



Their sitting position

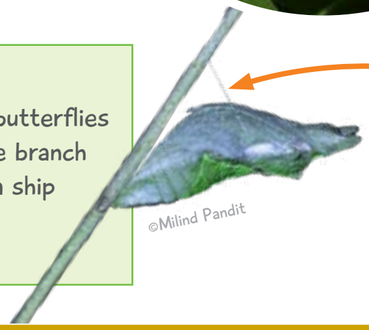
Most sit in fully-closed wing position.

Only a few sit in fully-open wing position.

Common Grass Yellow ©Milind Bhakare

Striped Albatross ©Pranav Gokhale

DID YOU KNOW THIS?
No species in this family has prominent, antenna-like tails.



©Milind Pandit

That's a pier.

DID YOU KNOW THIS?
The name of this family - Pieridae was derived from this pier.

Their behaviour

The tip of pupa of these butterflies are connected back to the branch by a thin thread just like a ship gets connected to the mainland by a pier.

Meet the Pierides

1. *Great Orange Tip (Hebomoia glaucippe)*
2. *White Orange Tip (Ixiax mariane)*
3. *Spotless Grass Yellow (Eurema laeta)*
4. *Psyche (Leptosia nina)*
5. *Common Wanderer (Pareronia hippia)*
6. *Small Salmon Arab (Colotis amata)*
7. *Common Gull (Cepora nerissa)*
8. *Common Jezebel (Delias eucharis)*
9. *Common Grass Yellow (Eurema hecabe)*
10. *Mottled Emigrant (Catopsilia pyranthe)*

The Lycaenids

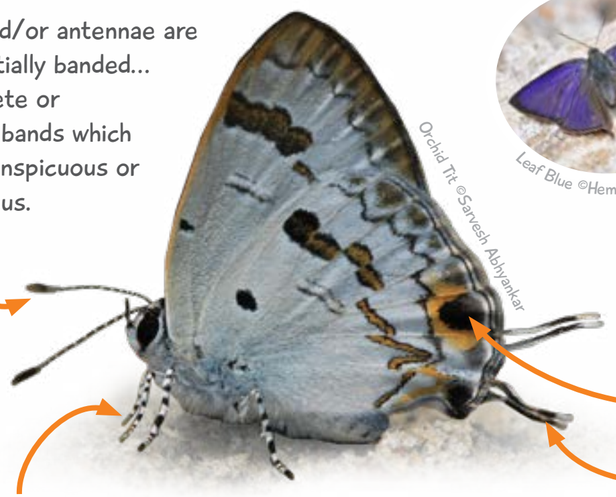
Family name: Lycaenidae (Lie-see-nee-dee); commonly called Blues

Butterflies in this family are tiny to medium sized.

Their body structure

The upper side of wings has shades of blue in varying proportions. The undersides are usually duller.

The legs and/or antennae are fully or partially banded... with complete or incomplete bands which could be conspicuous or inconspicuous.



Hindwings in many species have tornal spots and tails.

Forelegs in males are smaller in size; often not seen used during walking.

DID YOU KNOW THIS?
Most butterflies from this family are dimorphic.

Males show little to extensive blues on the upper side.

Females are darker with lesser or no blues on the upper side.

Their flight

There are both, strong and weak flyers in this family.

Strong flyers have fast, steady and **predictable** flight.

Whereas, weak flyers have slow, rickety and **unpredictable** flight.

Weak flyers are found close to the ground whereas, strong flyers can fly above our eye-level.

DID YOU KNOW THIS?
The smallest species of butterfly found in India belongs to the Lycaenidae family.

Their sitting position

Most sit in fully-closed wing position.

Few sit in partially-open position.

But none of the butterflies from this family, ever sit in fully-open or hybrid position.

Their behaviour

Caterpillars of few species are strictly insectivorous.

Many species from this family have special secretory organs. And what do these organs secrete? Turn to ✱ on page 28 to know more.

Meet the Lycaenids

THE BUTTERFLY PHOTO ALBUM FUN CYCLOPAEDIA

1. Pea Blue (*Lampides boeticus*)
2. Plains Cupid (*Chilades pandava*)
3. Slate Flash (*Rapala manea*)
4. Common Pierrot (*Castalius rosimon*)
5. Lime Blue (*Chilades lajus*)
6. Zebra Blue (*Lepotes plinius*)
7. Common Line Blue (*Prosotas nora*)
8. Tiny Grass Blue (*Zizula hylax*)
9. Common Hedge Blue (*Acytolepis puspa*)
10. Common Cerulean (*Jamides celeno*)


©Rohit Girotra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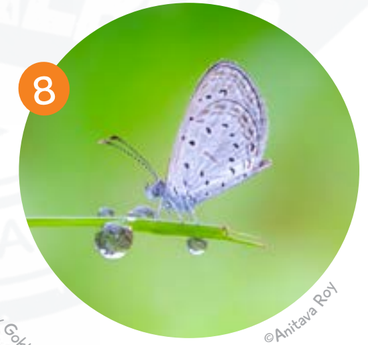
©Dattaprasad Sawant


©Nikhil Bhopale


©Paresh Kale


©Abhay Soman


©Anitava Roy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DID YOU KNOW THIS?
Few butterflies in the 'Blues' family are actually yellow or orange or even bright red in colour! Take a look to believe it.


©Sagar Sarang


©Nikhil Bhopale


©Milind Bhakare

The Riodinidaes

Family name: Riodinidae (Ree-yo-dee-nee-dee); commonly called the Metalmark butterflies

Most species are small-sized; except a few which are medium-sized.

Mostly found in warm colours like yellows, oranges and browns.

Their body structure

Punchinello ©Nikhil Bhopale

Hindwings are lobed.

Forelegs in males are evidently smaller in size compared to the other four legs; hence, never used during walking.

DID YOU KNOW THIS?
There are 2 groups of Metalmark butterflies- Punches and Judies.

Their flight

Punches are strong and fast flyers; whereas Judies are weak flyers compared to Punches.

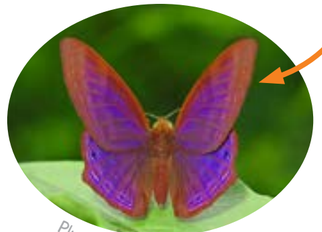
Mostly they are seen flying close to ground; but Punches can go to higher canopies also.

DID YOU KNOW THIS?
Many species have metal-like marks on the wings; hence the name. But, this is seen in South American species where the family name was given. Worldwide, family names are the same, but the metal marks are not seen in species all over the world.

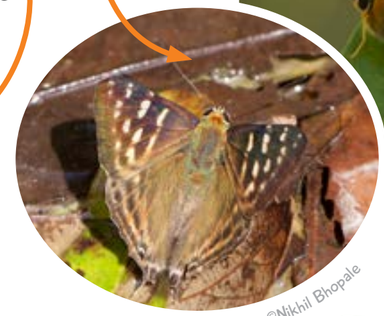
Their sitting position

Punches are seen sitting in fully-closed and partially-open wing positions.

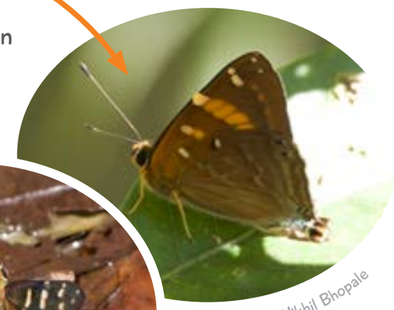
Judies are always seen sitting in partially-open wing position as they are unable to close their wings fully.



Plum Judy ©Paresh Churi



Tailed Punch ©Nikhil Bhopale



Mixed Punch ©Nikhil Bhopale

Males of this family are highly pugnacious and territorial. They often fight over their territories.

DID YOU KNOW THIS?
Most species of this family are seen in North and North-east India; only 2 species are seen in Peninsular India, out of which, 1 is seen only in Kerala.

The Nymphalids

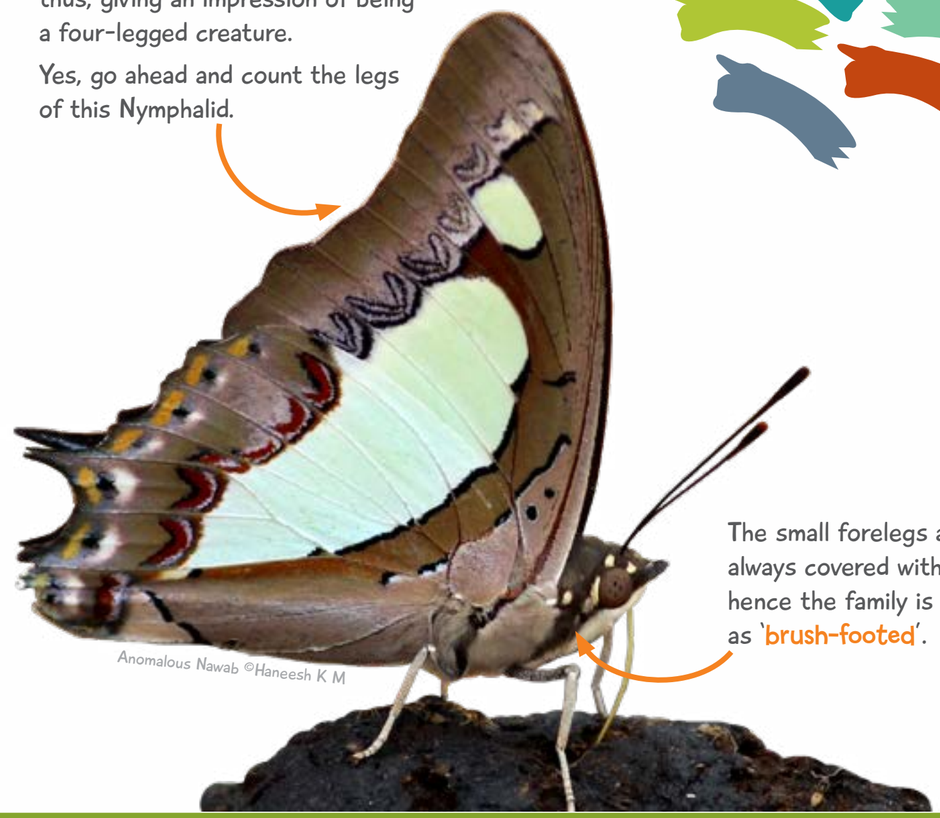
Family name: Nymphalidae (Nim-faa-lee-dee); commonly called Brush-footed butterflies

Butterflies in this family are small to large sized.

They are very colourful and display a wide palette of colours.

Like all other butterflies, Nymphalids too have 6 legs. But, the first set of legs is so small that it is not visible; thus, giving an impression of being a four-legged creature.

Yes, go ahead and count the legs of this Nymphalid.



Anomalous Nawab ©Haneesh K M

The small forelegs are always covered with hair, hence the family is known as '**brush-footed**'.

Their flight

Most Nymphalids are strong flyers.

Nature's design studio

Nymphalids look like they are straight out of a design studio, don't they? A signature collection by Mother Nature! :)

Just observe the colours, textures, patterns, borders and frills on them.

Their sitting position

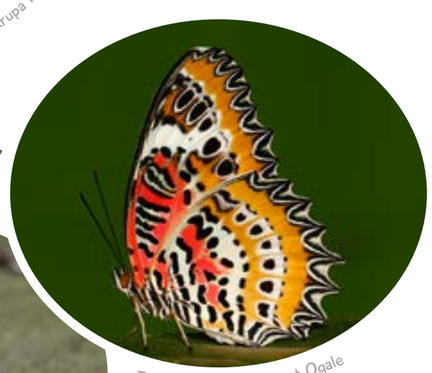
Butterflies like the Yeomans, Rustic, Commander, Sergeants, Sailers, Lascars, Barons, Baronet, Maps, Joker, Castor, Jesters, Tortoiseshell, Painted Lady, Pansies, Eggflies sit with wings fully open.

Blue Pansy ©Milind Pandit

Commander ©Krupa Patil

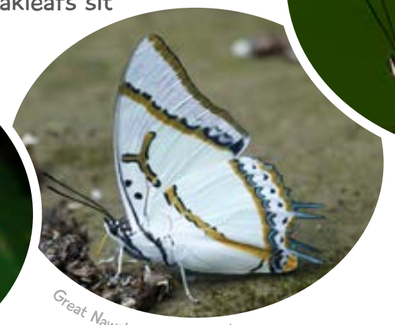
Cruiser ©Hemant Ogale

Tigers, Crows, Nawabs, Rajahs, Palmflys, Evening Browns, Walls, Woodbrowns, Treebrowns, Silverstripes, Bushbrowns, Meadowbrowns, Nigger, Satyrs, Argus, Rings, Costers, Lacewings, Oakleafs sit with wings fully closed.



Tamil Lacewing ©Hemant Ogale

Gladeye Bushbrown ©Nikhil Bhopale



Great Nawab ©Nikhil Bhopale

DID YOU KNOW THIS?
Caterpillars of some species of this family feed on poisonous plants.

Meet the Nymphalids

1. Common Sailer (Neptis hylas)
2. Lemon Pansy (Junonia lemonias)
3. Common Baron (Euthalia aconthea)
4. Blue Tiger (Tirumala limniace)
5. Common Crow (Euploea core)
6. Commander (Moduza procris)
7. Common Leopard (Phalanta phalantha)
8. Plain Tiger (Danaus chrysippus)
9. Great Eggfly (Hypolimnas bolina)
10. Common Evening Brown (Melanitis leda)

THE BUTTERFLY PHOTO ALBUM FUN CYCLOPAEDIA

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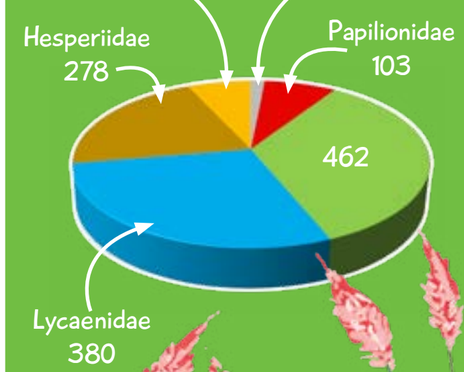
DID YOU KNOW THIS?

Nymphalidae is the largest family amongst all families; comprising of 462 species. That means 462 master creations! Impressive, isn't it?

And the other wonders are:



The families chart

	HESPERIIDAE (SKIPPERS)	PAPILIONIDAE (SWALLOWTAILS)	PIERIDAE (WHITE AND YELLOWS)	LYCAENIDAE (BLUES)	RIODINIDAE (METAL MARKS)	NYMPHALIDAE (BRUSH-FOOTED)
SIZE	Small to medium sized butterflies	Medium to large sized butterflies; except 2 species of Apollo and Dragontails	Most of the species are medium sized butterflies; while few are small	Tiny to medium sized butterflies	Most species are small sized; except 2 species which are medium sized	Small to large sized butterflies
COLOUR	Mostly in shades of browns	Multi-coloured; hence, attractive	Mainly yellow and white in colour; with a combination of red, orange, black, etc	Upper side of wings has shades of blue in varying proportions	Mostly found in warm colours like yellows, oranges and browns	Colourful butterflies; except Rings and Bushbrowns
BODY STRUCTURE	• Stout-bodied with fur-like appearance on body and legs • Large eyes compared to bodies • Visibly long proboscis compared to body • Wings small in size compared to body • Wings appear triangular in shape • Most have apiculus	• Most of them have tailed hindwings • Forewings are long, well-pronounced and distinctly look separate from the hindwing, unlike whites and yellows • Clubs of the antennae are mostly curved. They are long, slim and hence can't be distinguished from its shaft.	• Most species are sexually dimorphic • When sitting with wings closed, the hindwings overlap on the forewings such that they almost cover the forewings with only the apex of the forewing is visible; unlike swallowtails. • No species in this family has a prominent, antenna-like tail	• The legs and/or antennae are fully or partially banded... with complete or incomplete bands which could be conspicuous or inconspicuous. • Mostly dimorphic — males show little to extensive blues on the upper side; whereas females are darker with lesser or no blues on the upper side • Hindwings of many species have tornal spots (which resemble eyes) and have tails (which resemble antennae) • Forelegs in males are smaller in size; not seen used during walking	• Most have lobed hindwings • Most have tailed hindwings • Forelegs in males are evidently smaller in size compared to the other 4 legs; hence, never used during walking	• Though they have 6 legs, the first set of legs is very small and hence not visible; thus, giving an impression of being a four-legged creature • The small forelegs are always covered with hair, hence also known as 'brush-footed'
FLIGHT	• They do complete wing flap during flight • Fast flyers making rapid, erratic movements; hence called 'Skippers' which also means striker • Some skippers are called 'Bobs' because of a bobbing pattern in their flight • Most prefer to stay close to ground; hence; we often seen below our eye-level	• Strong flyers and their flight looks elegant • Don't easily settle during flight; hence, restless flight • Tip of forewings keep vibrating until they settle down for puddling	• Many are weak fliers and hence, fly close to the ground • In flight, forewings and hindwings distinction is not evident • Often seen around eyelevel and below	• Both, strong and weak flyers • Strong flyers have fast, steady and predictable flight; whereas weak flyers have slow, rickety and unpredictable flight • Strong flyers fly above our eye-level • Weak flyers are found close to the ground	There are 2 groups- Punches and Judies • Punches are strong and fast flyers; Judies are weak flyers compared to Punches • Mostly seen close to ground; whereas Punches can go to higher canopies	• Most of them are strong flyers • Groups like Rings and Eveningbrowns are weak flyers • Some groups like Crows, Tigers and Sailers have a weak flight, but they can glide well. Hence, they can be called good flyers.
SITTING POSITION	• Groups such as swifts, darts, aces, hoppers, awls, awlets, bobs, demons, flitters, lancers, redeyes, palmers sit in fully-closed-wing position (group A) • Sometimes, group A are seen sitting in hybrid position • Groups like flats and angles sit in fully-open-wing position; hence they are called 'Flats' (group B) • Sometimes, group B are seen sitting in partially-open-wing position • Butterflies sitting in hybrid position come ONLY from this family	• Most species sit in fully-closed or partially-open wing position • Very few sit in fully-open-wing position (Apollos) • None are ever seen in hybrid position	• Most sit in fully-closed wing position; few in fully-open wing position • When sitting with wings closed, the hindwings overlap on the forewings such that they almost cover the forewings with only the apex of the forewing is visible; unlike swallowtails	• Most sit in fully-closed wing position • Few in partially-open position • None of them ever sit in fully-open or hybrid position	• Punches sit in fully-closed and partially-open wing position; while Judies are seen sitting in partially-open wing position • Judies cant close their wings completely	• Fully-open-wing: Yeomans, Rustic, Commander, Seargents, Sailors, Lascers, Barons, Baronet, Maps, Joker, Castor, Jesters, Tortoiseshell, Painted Lady, Pansies, Eggflies • Fully-closed-wing: Tigers, Crows, Nawabs, Rajahs, Palmflys, Evening Browns, Walls, Woodbrowns, Treebrowns, Silverstripes, Bushbrowns, Meadowbrowns, Niger, Satyr, Argus, Rings, Costers, Lacewings, Oakleafs
EXTRA INFO	This family is know to be a link between moths and butterflies. Some taxonomists even consider them to be moths.	• Largest species found in India belongs to this family • Closely related to Pieridae family	Found in open meadows or openings in forests	• Many species have special secretory organs • (Smallest species found in India belongs to this family)	• Males are pugnacious (very territorial) • This family was earlier placed in Blues as a sub-family • Most species of this family are seen in North and North-east India; Only 2 species are seen in Peninsular India with 1 seen only in Kerala	It is the largest family of butterflies in India with 462 species included under it.

Butterflies and us

Mother Nature is our best teacher and the wilderness our biggest university! There's a lot to learn from this university and from these tiny, dainty creatures — the butterflies!

What can we possibly learn from a butterfly? LOTS!!!

And that's called **biomimicry**. That means to learn from elements or processes in nature and imitate or replicate them to solve complex human problems. This is a science and an indeed a very helpful one to mankind. Here are some brilliant ideas inspired by butterflies which go a long way to reaffirm how important butterflies are to us.

Guardians of the nation!

Can a tiny, squishy creature power the making of a bulky, mighty giant that can save a nation? Yes, it can. IT HAS!

War tanks used in World War 1 were inspired by the structure of a caterpillar and its ability to walk on any terrain.

Segmented body, many shoes, the front brain and the clasper rear... everything is 'taken' from the caterpillar. Turn to * on page 18.

Energy-efficient purifiers

Butterfly wings have structures made of '**chitin**' that are light-weight yet strong and are also water-repellent. An iridescent honeycomb-like structure found on the wings of a metalmark butterfly fuelled the idea of adding a thin coat of specially-fabricated metal oxides on Air purifiers. This not only acted as a catalyst to destroy air pollutants but also made the product more energy-efficient.

Cooler homes

Some species of butterflies like the **Great Eggfly** or the **Danaid Eggfly** can change the colour on their wings when held at an angle. This is called '**structural colouration**' where the scales are arranged in a way to change the colour so as to reflect heat when it's not required.

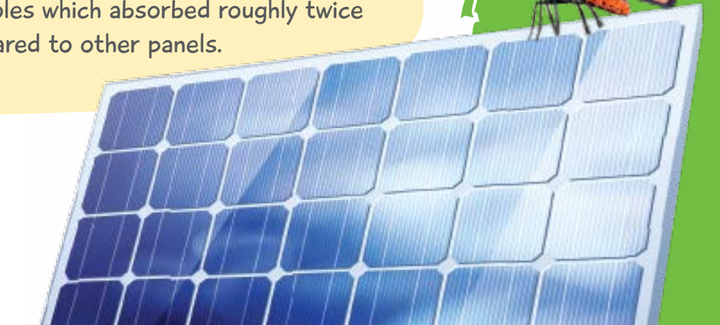
This structure was mimicked to make exterior paint of buildings so that it could reflect light from a certain angle and thus, reduce heat absorption. This paint was tested in hot cities in Bangladesh, Phoenix and New York. And guess what? It kept the homes cooler and also reduced the air-conditioning expense by up to 30%. That's a super-saver offer!

Solar power

So, what was the inspiration? The black wings of the **Common Rose** butterfly.

And, what was the creation? Thinner and lighter solar panels with increased capacity of capturing sunlight.

A **bio-engineer** (yes, there is a career like that!) studied the wings of the Common Rose under an electron microscope and saw randomly-spaced holes which scattered the sunlight allowing the butterfly to absorb more heat. They also made the wings lighter. There it was! The idea for a new, improved solar panel.
The bio-engineer came up with a thin-film with similar randomly-spaced holes which absorbed roughly twice as much heat compared to other panels.



Careers in butterflies

Love butterflies very much? Want to be with butterflies... forever? If the answer is YES, then why not make butterflies your career? Just DO what you love and you will LOVE what you do! Just like the bio-engineer who got fascinated with the wings of the Common Rose. You can also try to get into:

1 Butterfly Research
Become a butterfly researcher and contribute to a much-needed study about butterflies. You can work as a Scientist or a Curator.

2 Butterfly Tourism
Be a tour operator, conduct tours to butterfly destinations and introduce tourists to the wonderful world of butterflies.

Why are butterflies so important?

Huh? Important? That too, butterflies?

How can such tiny, dainty creatures be of any importance to us? But that's the beauty of Mother Nature. Every creature, big or small, is important. We might not even realise its importance but they do play a very important role. Read on to find out how these little insects make a BIG difference to our lives.

Heard of the 'food chain'?

Yes... the food chain in which insects eat leaves; frogs eat insects; snakes eat frogs and eagles eat snakes. Popular, isn't it?

But this is just ONE example. There are many, many more food chains ... hundreds and thousands of them present in the nature around us. Many creatures, big and small, one gobbling-up another and making a wide-spread network of preys and predators.

And do you know who's the most important in this network of food chains? Who's the real hero?? It's the one who gets gobbled-up. The prey!

The real heroes

Like our soldiers — the jawaans — who live for our nation and die for the nation, the butterflies live to fascinate us and die to become prey for many others. If the prey doesn't die, the predator won't survive. And if the predator doesn't survive, who will play the role which Mother Nature has given them? Let's now see what exactly the butterflies do.

Become the food of pollinators

We know that pollinators are very important. Many pollinators, like birds, are dependant on butterflies for their food. Several species of butterflies make a large part of the yummy diet of birds like Mynas, Parakeets, Babblers and Drongos. Butterflies, though are popularly known to pollinate, very few actually do pollination themselves. Yet, they are extremely useful in pollination because they become the food for many bird pollinators.

DID YOU KNOW THIS?
Almost 98% of the butterflies sacrifice their lives at various stages during their lifecycle ... just to serve the food chain. What a selfless life!

Become the food of seed dispersal agents

Butterflies are food for not only pollinators, but also for many seed dispersal agents like barbets. Barbets are often seen stuffing themselves with berries and small fruits. When these birds poop, the undigested seeds of the fruits drop down to the ground along with the poop and they give rise to new trees!

These frugivorous barbets are seen feeding their young ones with juicy caterpillars. Hence, butterfly caterpillars become the diet of seed dispersal agents during their growing-up days.

DID YOU KNOW THIS?
Some species of butterflies are known to pollinate flowers.

Be it pollination or seed dispersal... butterflies directly or indirectly play an important role in these processes by being the food of pollinators and seed dispersal agents. Either way, it gives rise to more trees. So, we can say that butterflies help in increasing the green cover which, in turn, gives us the much-needed oxygen and water.

Isn't that awesome? Small things do make a big difference.

Threats to butterflies

These wonderful creatures, though very important, are highly troubled. And the main culprits are:

Climate Change

Climate Change is probably the mother-of-all concerns. You might have heard that 'Climate Change' is happenning. But what exactly happens in 'Climate Change'?

Actually, it is very complex. But if we have to put it simply, we can say that there are sudden, unexpected and extreme changes in climate.

And we all know that butterflies are so sensitive to changes in weather. No wonder they get so sad with Climate Change because they are probably one of the first ones to get affected.

Habitat loss

Habitat Loss is another problem-word. It worries all animals... big and small... and is probably one of the biggest threats to our wildlife. Butterflies, too are losing their homes to agriculture, urbanisation and industrialisation. Sad huh?!

Dedicated to the 1335
species of fascinating
butterflies who inspired us
to create this book.

This ‘fun’cyclopaedia is a Nature education
and awareness initiative by

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