



Bug Discovery Kit

DURING-TRIP



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resource kit

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Introduction

Topic Overview



What's this kit about?

This **Bug Discovery Kit** provides an introduction to the wonderful world of **insects and other invertebrates**.

The resources included in the kit may be used for independent learning on the topic of insects and invertebrates, or may also be used before, during, or after a field-trip to the Zoo. **This particular section contains activities to do during the field-trip!**

The activities may also be used to complement the following books on the P1 and P2 STELLAR reading list:

1. P2 book: A Butterfly is Born
2. P2 book: The Underground Dance
3. P2 book: Life in a Shell
4. P2 book: The Grasshopper and the Ant
5. P2 book: Walking through the Jungle

How to use this kit

PRE-TRIP PACK



This entire Bug Discovery kit consists of **3 resource packages**, which are divided into:

1. **Pre-trip**
2. **During-trip** (*you are currently viewing the During-trip package*)
3. **Post-trip**

Within each resource package, you'll find an introduction with a topic overview, information about the kit, and tips on how to plan your own visit to the Zoo.

You'll also find activity outlines and instructions, followed by a glossary of relevant terms, and all printable resources needed for each specified activity.

While some activities are more suited to pre-trip, during trip, or post-trip purposes, feel free to switch their order depending on how you have planned your lesson!



Planning Your Zoo Trip



Getting to the Zoo

Morning traffic is always unpredictable, so to make the best of your fieldtrip and arrive as planned, we recommend that you leave school earlier. Check out the [location and transportation information page](#) on the zoo website for more details to help you plan your arrival. You can also download a soft copy of the park map for your reference on that page.

Admission

Find out more about school rates, ride pricing, and even book your tickets on [our website's school groups portal](#).

Behaviour

Prepare your students on your chosen topic and what they should look out for at Singapore Zoo. You can let your students know more about [proper behaviour at the zoo](#), such as no teasing or unsupervised feeding of the animals.

Education programmes

If you're planning to sign your students up for an education programme offered by our Education department, you may get [more info about our different offerings here](#). For Primary school students, we suggest [Behind-the-Scenes tours](#), [Guided tours](#) at exhibits, and [enrichment programmes](#).

Planning a teachers' recce trip

If you're planning a self-guided learning journey around the park, it's best to first familiarize yourself and the rest of the teaching staff with the Zoo! Visit our [Education pre-visit page here](#) to download a [recce form](#), or email us directly about a recce at eduadmin.zoo@wrs.com.sg.

Activity 1

EXPLORE FRAGILE FOREST

About this activity

Relevant STELLAR book	P2 – The Underground Dance, Walking through the Jungle, A Butterfly is Born
Relevant subject discipline	English language, science
Values in action	<ul style="list-style-type: none">✓ Integrity, responsibility – being personally responsible in correctly completing a task entrusted to them✓ Critical and inventive thinking – using deductive skills to learn about the animals and their adaptations from observation✓ Collaboration and information skills – working together as a team towards a common goal✓ Self-directed learning – discovering the answers for themselves
Objective	To encourage observation and comparison skills, within the topic of invertebrates vs vertebrate, insect vs arachnid
Recommended group size	<ul style="list-style-type: none">✓ If another teacher/facilitator is present: Class to be split into 2 groups, with 15 per facilitator✓ If self-guided: groups of 5 (6 groups in total)✓ Activity is completed as a class
Materials included	<ul style="list-style-type: none">• Photo pack (bee, centipede, grasshopper)• Observation sheet
Additional materials (not included)	Writing materials (per student), watch

Opening the activity

- Read P2 STELLAR books, “Walking Through the Jungle”, and/or “The Underground Dance”
- “Walking Through the Jungle”
 - Ask the students which senses the boy used, and how
 - Discuss the animals in the book – are these the only animals living in a jungle?
 - What other animals might there be?
- “The Underground Dance”
 - What kind of animals were living underground in the book?
 - Are these animals that you know of? How are they different?
 - How might living underground be helpful to them?
- Focus on 3 invertebrates to focus on from these books: bee, grasshopper, centipede
- Download and complete the pre-trip activities, **Bug Spotter** and **Invertebrate Dominoes**

Remarks:

You might wish to download post-trip activity “Puzzle Zoom” for the photo ID cards.

Activity instructions

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- Preparation**
1. Locate the “Explore Fragile Forest” printable package (after this instruction sheet)
 2. Print 1 photo pack in A4 or A3 size (for yourself)
 3. Print 1 observation sheet for each student
 4. This activity is divided into 3 mini-activities, to reduce crowding in the exhibit and to encourage self-guided discovery
 5. Brief the groups on how to use the observation sheet – they are to use a section for each station location, and record their observations with the help of the suggested options
 6. The class can be split into 2 groups (15 each), with 1 group working forwards from Discovery Centre to Discovery Outpost, and another group working backwards in the other direction
 7. **If self-guided:** 1 teacher/facilitator in the Aviary, and 1 at the Discovery Outpost. 6 groups of 5 students each to rotate around the 3 activity stations
-

- Gameplay**
- Fragile Forest Discovery Centre (Before the entrance to Biodome)**
1. **Animals found here include:** katydid, rhino beetle, jungle nymph, toads, frogs
 2. Students are to compare all the animals – **which are insects and which are not?**
 3. How did they arrive at these answers? Get them to note down their observations in their sheet

Fragile Forest Biodome (Aviary)

1. **Animals found here include:** lemur, Malayan flying fox, mousedeer, crowned pigeon, eclectus parrot, sloth, iguana, whistling duck, saki monkey
2. As the teacher/facilitator, you’ll be in this area
3. Tell the groups that they’re **to compare your photos of a bee, centipede, and grasshopper to all the animals** they’ll be seeing in the biodome
4. **Which are vertebrates, which are not?** How are they different from these 3 animals (in the photos)? How did they arrive at these answers?
5. Get them to note down their observations in their sheet

Fragile Forest Discovery Outpost (After exit to Biodome)

1. **Animals found here include:** scorpion, tarantula, caterpillar, chrysalis, butterfly, cockroach, frog
 2. Students are to compare all the animals – **which are insects and which are arachnids?**
 3. How did they arrive at these answers? Get them to note down their observations in their sheet
-

- Closing activity**
- Gather the students after their self-directed exploration of Fragile Forest
 - Facilitate the sharing and discussion
 - Which did they get right? Which did they not get right?
 - What were the reasons they didn’t get the correct comparisons/answers?
-

Further exploration

Learn more about insect adaptations

After this exercise in observation and visual comparison, it’s time to delve a little deeper into the world of insects. To learn more about insects and some of their unique adaptations, you could take up a programme, **Enrichment Class: Bug Discoveries**, with our Education Department.

This class includes workshop facilitation and encourages learning through station-based activities. More information can be found on our website, [here](#).

Glossary

Adaptations	The process of change by which an organism or species becomes better suited to its environment
Antenna	A pair of long, thin, sensory appendages on the heads of insects, crustaceans, and other arthropods
Arachnid	An arthropod animal with 8 legs, of the class <i>Arachnida</i>
Chrysalis	Usually refers to the pupa of butterflies
Insect	A small arthropod animal with 6 legs, generally 1 or 2 pairs of wings
Invertebrate	An animal lacking a vertebral column, or backbone
Larva	The active, immature form of an insect. Usually one that differs greatly from the adult and forms the stage between egg and pupa
Life cycle	The series of changes in the life of an organism, including reproduction
Metamorphosis	In insects or amphibians, the process of transformation from an immature form to an adult form in two or more distinct stages
Myriapod	An arthropod group with elongated bodies and numerous leg-bearing body segments. Includes centipedes, millipedes, and related animals
Nectar	A sugary fluid secreted within flowers to encourage pollination by insects and other animals
Pupa	An insect in its inactive immature form, between larva and adult
Vertebrate	Animals that have a brain enclosed in a skull, and a segmented spinal column (backbone)

Printable package

1. Observation sheet

Each section will have a segment with pointers on what to look out for, and checkboxes that students may use to record their observations.

2. Photo-pack

Photos of a centipede, grasshopper, and bee. To be used for closer observation and comparison with animals within the Biodome.

EXPLORE FRAGILE FOREST

DATE:

NAME



FROG DISCOVERY CENTRE

Name of animal
Observation Has 6 legs Has 3 body parts
checklist Has 8 legs Has 2 body parts
Description / Observations

Compare the animals! Find 1 insect and 1 animal that isn't an insect

Name of animal
Observation Has 6 legs Has 3 body parts
checklist Has 8 legs Has 2 body parts
Description / Observations

DISCOVERY OUTPOST

Name of animal
Observation Has 6 legs Has 3 body parts
checklist Has 8 legs Has 2 body parts
Description / Observations



Name of animal
Observation Has 6 legs Has 3 body parts
checklist Has 8 legs Has 2 body parts
Description / Observations

BIODOME

Compare the animals in the biodome with your photo cards. What differences can you see?

Name of animal
Observation Has no legs
checklist Has 2 legs
 Has 4 legs
 Covered in scales
 Covered in feathers
 Covered in fur

Description / Observations

Name of animal
Observation Has no legs
checklist Has 2 legs
 Has 4 legs
 Covered in scales
 Covered in feathers
 Covered in fur

Description / Observations









Photo by Satyamon1993 on Wikimedia Commons

Activity 2

PUZZLE ZOOM

About this activity

Relevant STELLAR book	P2 – Walking through the Jungle
Relevant subject discipline	Science
Values in action	<ul style="list-style-type: none"> ✓ Self-directed learning – discovering the answers for themselves ✓ Collaboration and communication skills – working together as a team towards a common goal ✓ Critical and inventive thinking – using deductive skills to learn about the animals and their adaptations from observation and questioning
Objective	<p>Improve observation skills, and to learn some adaptations and characteristics of the animals found there:</p> <ul style="list-style-type: none"> • Forest layers that animals tend to be found in • Characteristics about colour, body covering • Short fun facts <p>If given the option, the ID cards may also be used as a standalone for self-directed learning</p>
Recommended group size	<ul style="list-style-type: none"> ✓ Groups of 3 ✓ Debrief conducted as a class
Materials included	<ul style="list-style-type: none"> • Puzzle Zoom Question cards (10 double-sided questions, 2 double-sided cards per sheet of paper) • Puzzle Zoom Explanation cards (10 double-sided explanations, 2 double-sided cards per sheet of paper)
Additional materials (not included)	Lamination (recommended for outdoor use of cards)

Opening the activity

- Read **P2 STELLAR book “Walking in the Jungle”**
- Ask the students what kinds of animals the main character (the boy) encountered in the jungle
- Get the students to think about how the main character (the boy) discovered all these animals:
 - Did he spot all the animals first?
 - What sounds did the animals make – were they all the same?
 - Round off this discussion by prompting students to highlight how observant the boy was and which senses he used
 - Emphasise that these are skills they’ll be practicing during their fieldtrip

Activity instructions

- Preparation**
1. Locate the “Puzzle Zoom” printable package
 2. Print 5 decks of Puzzle Zoom Question cards (1 deck for every 6 students)
 3. Print 1 deck of Puzzle Zoom explanation cards for yourself (and/or other facilitators), to debrief the class as a whole after the activity

- Gameplay**
1. Split the class into groups of 6 students
 2. Give each group of 6 students 1 deck of Puzzle Zoom cards (10 cards)
 3. Divide each group of 6 into 2 groups of 3, and get them to divide the deck into half (each triplet gets 5 cards)
 4. Ensure that each group of 3 doesn't get repeated cards
 5. The cards are zoomed in photographs of animals you might find in Fragile Forest
 6. The groups are to explore Fragile Forest on their own and identify which animals the cards are zoomed in pictures of, and the group to correctly identify all the cards in their deck first wins!
 7. Recommended duration (3 students completing 5 cards):
 8. Once all the groups have gathered, use the deck of explanation cards to reveal the correct animals
 9. Use the prompting questions to start a class discussion over what some of that animal's adaptations or characteristics are

Remarks

1. For a **self-guided exploration** of Fragile Forest, print 1 **explanation deck** for each student group, and let them roam freely in the biodome
2. They'll be able to use the cards to identify and learn more about any animals they spot

- Closing**
- Get the students to share their experiences exploring the Fragile Forest exhibit
 - Which animal they spotted was their favourite? Why?
 - What were some sounds they heard? Which animals made those sounds? Were the sounds different from what they expected? How so?
 - Facilitate the sharing and discussion
 - How did the animals react when they walked past them / approached too closely?
 - Did all the animals behave the same way in that situation? Why do you think so?
 - Why do you think all these animals in Fragile Forest can live together – will any of them eat each other?
 - Round off the session by linking the activity to the importance of observation – it's possible to learn a lot about the animal just by observing it

Further exploration

Enrichment programme during your Zoo visit

After seeing some of the jungle's smaller critters for themselves, why not learn a little bit more about insects and what makes them special? As an alternative during-trip activity, you could take up a programme, **Enrichment Class: Bug Discoveries**, with our Education Department!

This class includes workshop facilitation and encourages learning through station-based activities. More information can be found on our website, [here](#).

Glossary

Adaptations	The process of change by which an organism or species becomes better suited to its environment
Antenna	A pair of long, thin, sensory appendages on the heads of insects, crustaceans, and other arthropods
Arachnid	An arthropod animal with 8 legs, of the class <i>Arachnida</i>
Biodiversity	The variety of plant and animal life in the world or in a particular habitat, a high level of which is usually considered to be important and desirable
Body covering	The external, covering of an animal – might be skin, feathers, scales, exoskeleton, or hair
Canines	The pointed teeth between incisors and premolars of a mammal, often greatly enlarged in carnivores
Carnivorous	An animal that feeds on other animals
Chrysalis	Usually refers to the pupa of butterflies
Crest	A comb or tuft of feathers on the head of a bird
Exoskeleton	An exterior, protective or supportive structure or shell of many invertebrates
Insect	A small arthropod animal with 6 legs, generally 1 or 2 pairs of wings
Invertebrate	An animal lacking a vertebral column, or backbone
Larva	The active, immature form of an insect. Usually one that differs greatly from the adult and forms the stage between egg and pupa
Life cycle	The series of changes in the life of an organism, including reproduction
Metamorphosis	In insects or amphibians, the process of transformation from an immature form to an adult form in two or more distinct stages
Myriapod	An arthropod group with elongated bodies and numerous leg-bearing body segments. Includes centipedes, millipedes, and related animals
Nectar	A sugary fluid secreted within flowers to encourage pollination by insects and other animals
Poison	A substance that is capable of causing illness or death of a living organism when ingested or absorbed
Proboscis	An elongated, sucking mouthpart that is typically tubular and flexible
Pupa	An insect in its inactive immature form, between larva and adult
Rainforest	A dense forest rich in biodiversity, found typically in tropical areas with consistently heavy rainfall, usually along the equatorial belt
Venom	A substance that is capable of causing illness or death of a living organism when introduced into the bloodstream
Vertebrate	Animals that have a brain enclosed in a skull, and a segmented spinal column (backbone)
Warning colours	Conspicuous colouring that warns a predator that an animal is unpalatable or poisonous

Printable package

Animal list:

- | | | |
|--------------------------|----------------------------|---------------------|
| - Lemur | - Iguana | - Eclectus parrot |
| - Tree-nymph caterpillar | - Malayan flying fox (bat) | - Crowned pigeon |
| - Tree-nymph chrysalis | - Great eggfly chrysalis | - Jungle nymph |
| - Tree-nymph butterfly | - Mousedeer | - Hissing cockroach |
| | - Saki monkey | - Scorpion |

Printable package consists of (arranged in this order):

- Question cards (**page 14 - 20**) – print double-sided to save paper
- Explanation cards (**page 21 - end**) – printed double-sided to have the explanation behind the correct photo

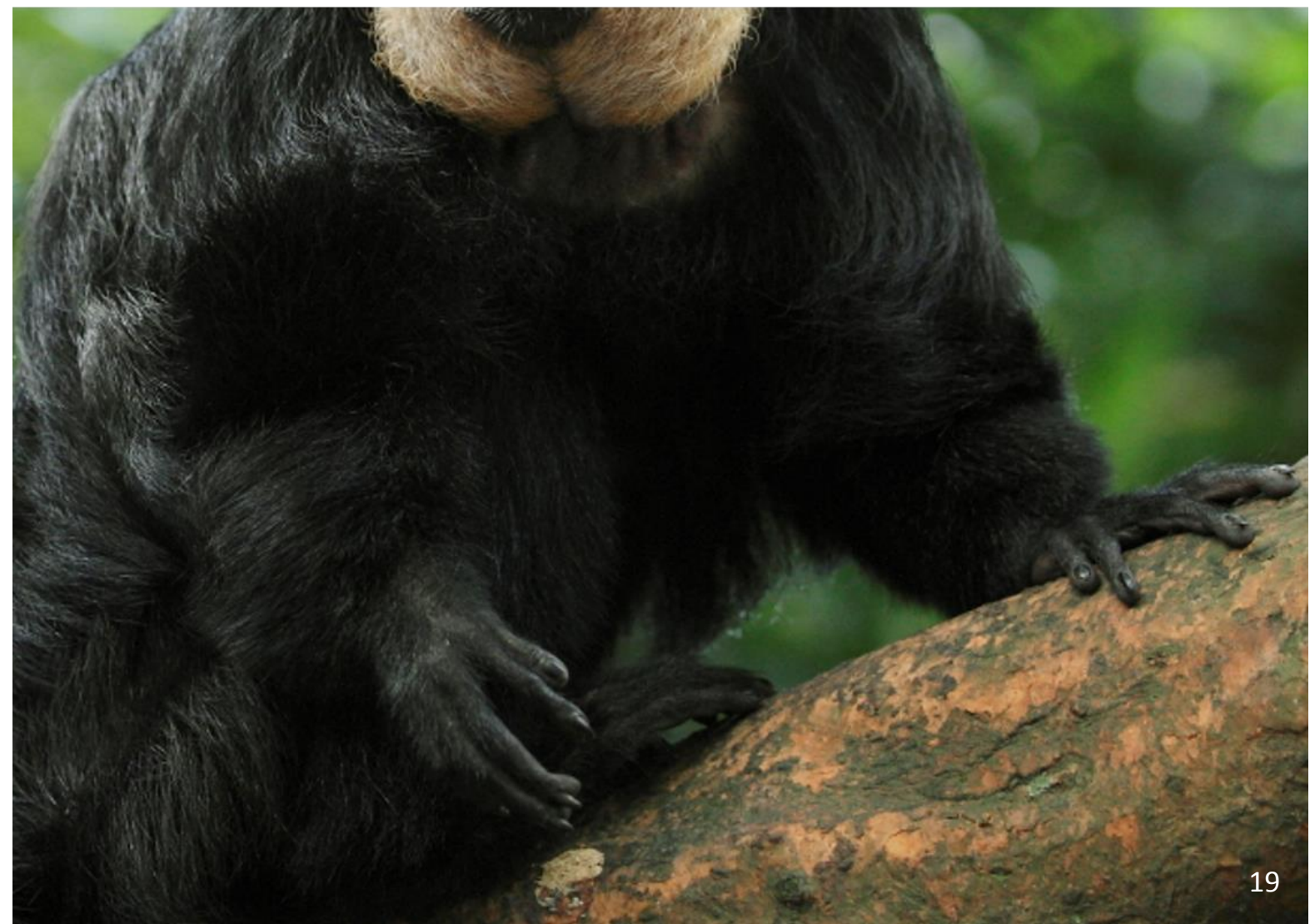




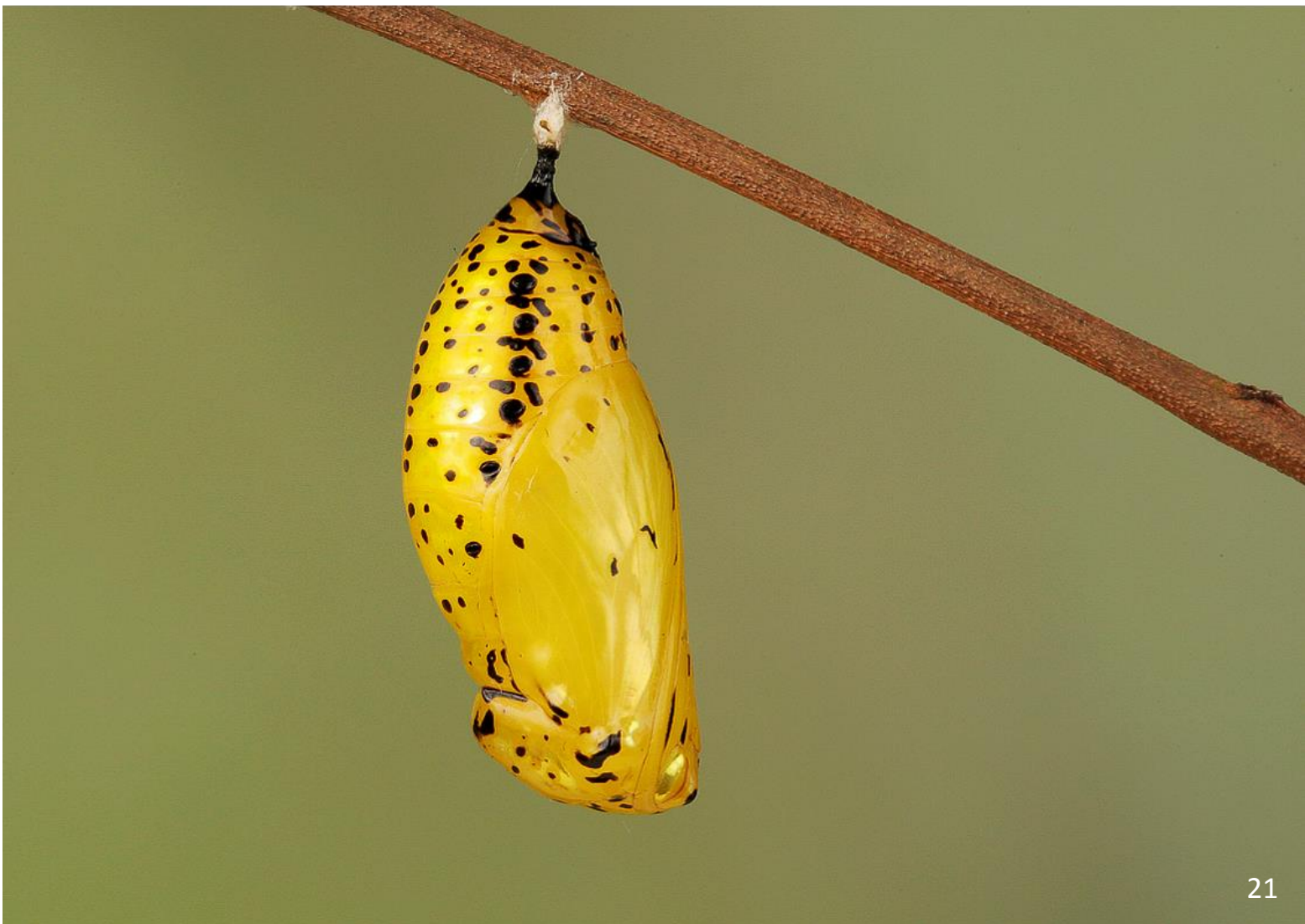












Jungle Nymph

What does this animal **remind** you of?

Jungle nymphs are **stick insects** (the heaviest species too!)

What **colours** do you see?

Females are green and much larger than the brown males

Do you think this insect can **fly**?

The large females can't fly – look at their **tiny wings!**

If she can't fly, how do you think she **protects** herself?

Observe the **large spikes** all over her body, and her **colour**

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Tree Nymph Chrysalis

What does this **remind** you of?

It resembles a dew drop! This is actually the **chrysalis** of a **tree nymph butterfly**

What is a chrysalis?

It's the **pupa** (3rd) stage of a butterfly's life cycle

What **colours** do you see? How does this help the chrysalis?

Gold/yellow. Makes it seem like a **shining droplet, not food**

Why is it upside down?

The chrysalis is the **most vulnerable** stage – being under a leaf helps hide it well from hungry predators

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Great eggfly chrysalis

What does this **remind** you of?

It resembles a **dried leaf**! This is actually the **chrysalis** of the great eggfly butterfly

What is a chrysalis?

It's the **pupa** (3rd) stage of a butterfly's life cycle

What **colours** do you see? How does this help the chrysalis?

Brown. Makes it seem like a **dried, shriveled leaf, not food**

Why is it upside down?

The chrysalis is the **most vulnerable** stage – being under a leaf helps hide it well from hungry predators

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Hissing cockroach

What does this animal **remind** you of?

This is a Madagascar hissing cockroach!

Does it look **hard or soft**?

Cockroaches are insects, and have **exoskeletons**. This cockroach has a hard exoskeleton for protection

Does it look like cockroaches you might see around Singapore? What are some differences?

This hissing cockroach is **larger**, and it has **striped patterns** on its body. Its antenna are not as long too

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Tree Nymph Caterpillar

What **colours** do you see?

Black, white, red

How do these colours help the caterpillar?

In the animal kingdom, these colours are usually used as **warning colours** – they mean the animal could be poisonous or venomous!

Why do you think the leaves have holes?

The caterpillars **feed on leaves**. They're really fussy eaters, so each species of caterpillar prefers to eat only specific types of plants

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Tree Nymph Butterfly

What **colours** do you see?

Black, white

Does the tree nymph butterfly still look like its caterpillar?

No, it doesn't.

Do butterflies feed on the same things caterpillars do?

Butterflies **drink nectar** from flowers. They have colour vision, which helps them find flowers to feed on

If you manage to spot one feeding, what do you see?

A long mouthpart that helps them suck up nectar from flowers. It's called a **proboscis**

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Scorpion

How many legs does a scorpion have?

8 legs. It's an **arachnid**!

What do you see at the end of its tail?

A **sting**. The scorpion uses it to inject its prey with venom

Do you think scorpions eat meat or plants?

Meat! They're **carnivorous** hunters

What else has the scorpion have to protect itself or hunt for food?

Strong **pincers**. They use these to grab prey, and sometimes tear the prey apart

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Mousedeer

Where did you spot this animal?

On the forest floor – the lowest level of the rainforest

Which senses do you think are most important to the mousedeer?

Sight – They have large eyes, to see better during dawn and dusk

Hearing – They have large ears, and listen carefully for predators

Did you spot any protruding teeth?

If yes, then you just spotted a **male** mousedeer! Only males have visible **canine teeth** protruding from their mouth

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Ring-tailed Lemur

What does this animal remind you of?

They look like monkeys, but they're not! Lemurs are primates (just like monkeys and apes), and are found in Madagascar

Are the lemurs sitting close together?

Yes. Lemurs are social animals, meaning they like to live in groups

What is a lemur's body covering?

Fur/hair! It is a mammal

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Iguana

What does this animal look like?

A large lizard. Iguanas are lizards in the reptile family

Do you think this lizard can climb walls?

No! Those lizards are geckos, and they have special feet to help them climb walls. This iguana is too heavy for that, although they are good at climbing trees to look for leaves to eat

What is an iguana's body covering?

Scales! It is a reptile

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Malayan flying Fox



Malayan Flying Fox

This animal can fly! Is it a bird? Why?

This is a bat! Bats are **mammals**, as they are covered in fur and give birth to live young

How do bats rest?

They **hang upside down** from a perch. They have strong claws for this

What do you think these bats eat?

Fruits. These are fruit bats, and you can spot them feeding off fresh watermelon, bananas, and other fruits at the feeding deck

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Saki Monkey

What is their body covering?

Fur! They are mammals

Are the monkeys sitting close together?

Yes. Saki monkeys are **social** animals, meaning they like to live in groups

Do all the Saki monkeys look the same? Describe some differences

You found a **female saki monkey!** The females have browner fur, and lack the large white puffy faces that males have

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Eclectus Parrot

What is their body covering?

Feathers! They are birds

Do these parrots make any sounds?

Yes. If you listen closely, these parrots make a loud, high-pitched honk occasionally

Do all the Eclectus parrots look the same? Describe some differences

You might have noticed a bird which looks exactly like this parrot but green in colour – **that's the male eclectus parrot!** Their green helps them camouflage as they look for food in the rainforest. The females are red

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Crowned Pigeon

Where can you find these birds?

On the **forest floor**. They can fly, but prefer to mostly walk. They are the largest pigeon species, and are thus heavier

How do you think they got their name?

The large crest of feathers on their head, which resembles a crown!

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