

Watercolour of a Goliath Stick Insect, *Eurycnema goliath*, by Sally Elmer, Queensland Museum.

The Camouflage Master

YEAR 4 – LIFE CYCLES



QGC

FUTUREMAKERS



**QUEENSLAND
MUSEUM NETWORK**



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Glossary



Writing exercise



Group activity



Go! – hands on exercise



Check List



Need to know information



Watch a video



Take a photo

Future Makers is an innovative partnership between Queensland Museum Network and Shell's QGC project aiming to increase awareness and understanding of the value of science, technology, engineering and maths (STEM) education and skills in Queensland.

This partnership aims to engage and inspire people with the wonder of science, and increase the participation and performance of students in STEM-related subjects and careers — creating a highly capable workforce for the future.

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Australian Curriculum Links

YEAR 4

Science Understanding

Biological sciences

Living things have life cycles (ACSSU072)

Living things depend on each other and the environment to survive (ASSU073)

Science as a Human Endeavour

Science involves making predictions and describing patterns and relationships (ACSHE061)

Science knowledge helps people to understand the effect of their actions (ACSHE062)

Science Inquiry Skills

With guidance, identify questions in familiar contexts that can be investigated scientifically and make predictions based on prior knowledge (AC SIS064)

With guidance, plan and conduct scientific investigations to find answers to questions, considering the safe use of appropriate materials and equipment (AC SIS065)

Consider the elements of fair tests and use formal measurements and digital technologies as appropriate, to make and record observations accurately (AC SIS066)

Use a range of methods including tables and simple column graphs to represent data and to identify patterns and trends (AC SIS068)

Compare results with predictions, suggesting possible reasons for findings (AC SIS216)

Reflect on investigations, including whether a test was fair or not (AC SIS069)

Represent and communicate observations, ideas and findings using formal and informal representations (AC SIS071)

Design and Technologies Processes and Production Skills

Critique needs or opportunities for designing and explore and test a variety of materials, components, tools and equipment and the techniques needed to produce designed solutions *(ACTDEP014)*

Generate, develop, and communicate design ideas and decisions using appropriate technical terms and graphical representation techniques *(ACTDEP015)*

Select and use materials, components, tools, equipment and techniques and use safe work practices to make designed solutions *(ACTDEP016)*

Evaluate design ideas, processes and solutions based on criteria for success developed with guidance and including care for the environment *(ACTDEP017)*

Plan a sequence of production steps when making designed solutions individually and collaboratively *(ACTDEP018)*

Introduction

This learning resource has been designed to allow students the opportunity to get up close and experience first-hand the different life cycle stages of the Goliath Stick Insect, a local resident of many suburban backyards in South East Queensland. A visit to the Stick Insectarium in the Discovery Centre at the Queensland Museum is recommended, however it can also be completed in the classroom using additional resources and the links provided in the document.

As this resource has been designed to complement classroom-based teaching and learning experiences, students are assumed to have developed knowledge about the following biological science concepts from year three science:

Living things can be grouped on the basis of observable features and can be distinguished from non-living things (*ACSSU044*)

- recognising characteristics of living things such as growing, moving, sensitivity and reproducing
- recognising the range of different living things
- sorting living and non-living things based on characteristics
- exploring differences between living, once living and products of living things

MUSEUM PERSPECTIVES



Source: Queensland Museum Image Collection.

Discover the Camouflage Master at the Discovery Centre, Queensland Museum, South Brisbane

The Goliath, Children's and Spiny Leaf stick insects can be found in the Discovery Centre insectarium where your students can observe the different stages of a stick insect's life cycle right in front of their very eyes. Students can search for stick insect eggs amongst the leaves and frass, observe the baby stick insects or nymphs as they grow into adults.

The term 'phasmids' (pronounced fas-mids), is the scientific name for the group of insects we commonly call stick insects. These amazing creatures are so well-camouflaged that they are very difficult to see amongst foliage.

Activity 1: Creature Feature

(Onsite at Queensland Museum, South Brisbane)



Live stick insects are housed in *Creature Feature* in the Discovery Centre at the Queensland Museum. During your visit find out as much as you can about the life cycle of the stick insect and record the key information below.

1. What do adult stick insects remind you of? Why do you think they look like this?



2. How many different kinds of stick insects can you see? Use your camera to take photos of each different species of stick insect on display.

3. What are the common and scientific names of the different stick insects on display?



4. Describe where the stick insects live at the Queensland Museum? Are the adults and babies all housed together? Why do you think that is? (Use your camera to take photographs of where they are kept.)

5. Observe the stick insects for a few minutes. Describe their behaviour and how they move.

6. What do stick insects eat? What might eat them in the wild?

7. In nature certain trees provide a reliable source of fresh leaves for stick insects to eat. Suggest ways to ensure that they always have fresh leaves to eat inside an insectarium.

8. In nature rain provides living things with water which is essential for survival. How might stick insects get water to drink inside an insectarium? Can you spot any clues?



Common Misconception

Phasmids, or stick insects, are sometimes confused with a different group of insects called the "Mantids," also called the Praying Mantis. These are predators (carnivores), with large, spiny front legs, held folded ready to strike and grasp prey. In contrast Phasmids are plant-eaters (herbivores).

See if you can find a Praying Mantis in the Discovery Centre.

Observe the life-cycle stages of the Goliath stick insect

(Onsite at Queensland Museum, South Brisbane)



Instructions

Look closely at each stage of the stick insects life cycle in the Discovery Centre and record what you see using photographs and/or diagrams. Draw as large as possible and make note of any colours that you see.

Step 1: Finding Eggs

Use the plastic tongs provided to separate the stick insect eggs from the frass and the leaves, and place into the relevant containers. (Frass is another name for poo).



Source: Queensland Museum Image Collection.

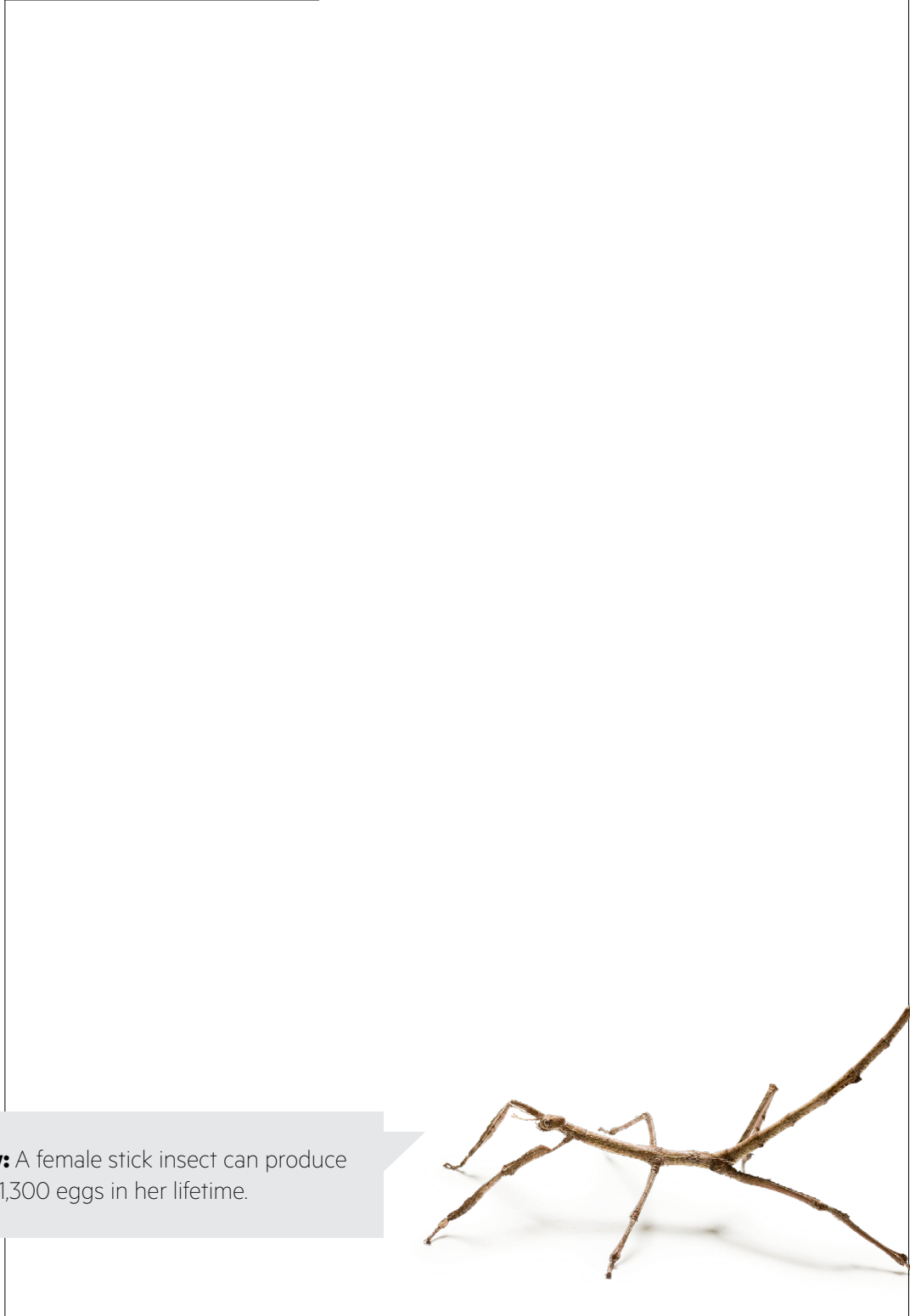


Source: Queensland Museum Image Collection.

Step 2

Look closely at the different types of stick insect eggs that you have placed in the dish and draw them in the space below. What do you notice?

Types of Stick Eggs



Did you know: A female stick insect can produce between 100 -1,300 eggs in her lifetime.

Step 3

Compare the adult stick insect to the baby. Have a close look at the baby stick insects. These are called **nymphs**. The young shed their skin as they grow, this is called **moulting**. Nymphs go through a series of moults, and with each moult they more closely resemble the adult.



Source: Queensland Museum Image Collection.

Sketch and/or take photographs of some of the different kinds of nymphs in the space below. Make note of their **similarities and differences**. Why are they different colours? Label your drawing and make a note of any colours you can see.

Nymph Stages



Did you know: The skin that has been shed by the nymph is full of protein and is eaten by the developing nymph.

Step 4

Have a look in the glass insectarium where the adult stick insects live. Can you find the stick insects? Using your phone, take photographs and/or draw the different types of adult stick insects in the space below. Can you see both male and female stick insects?

Clues: Female stick insects are often larger and appear rounder as they are full of eggs. A male stick insect is shorter, thinner and can fly better than the larger female.

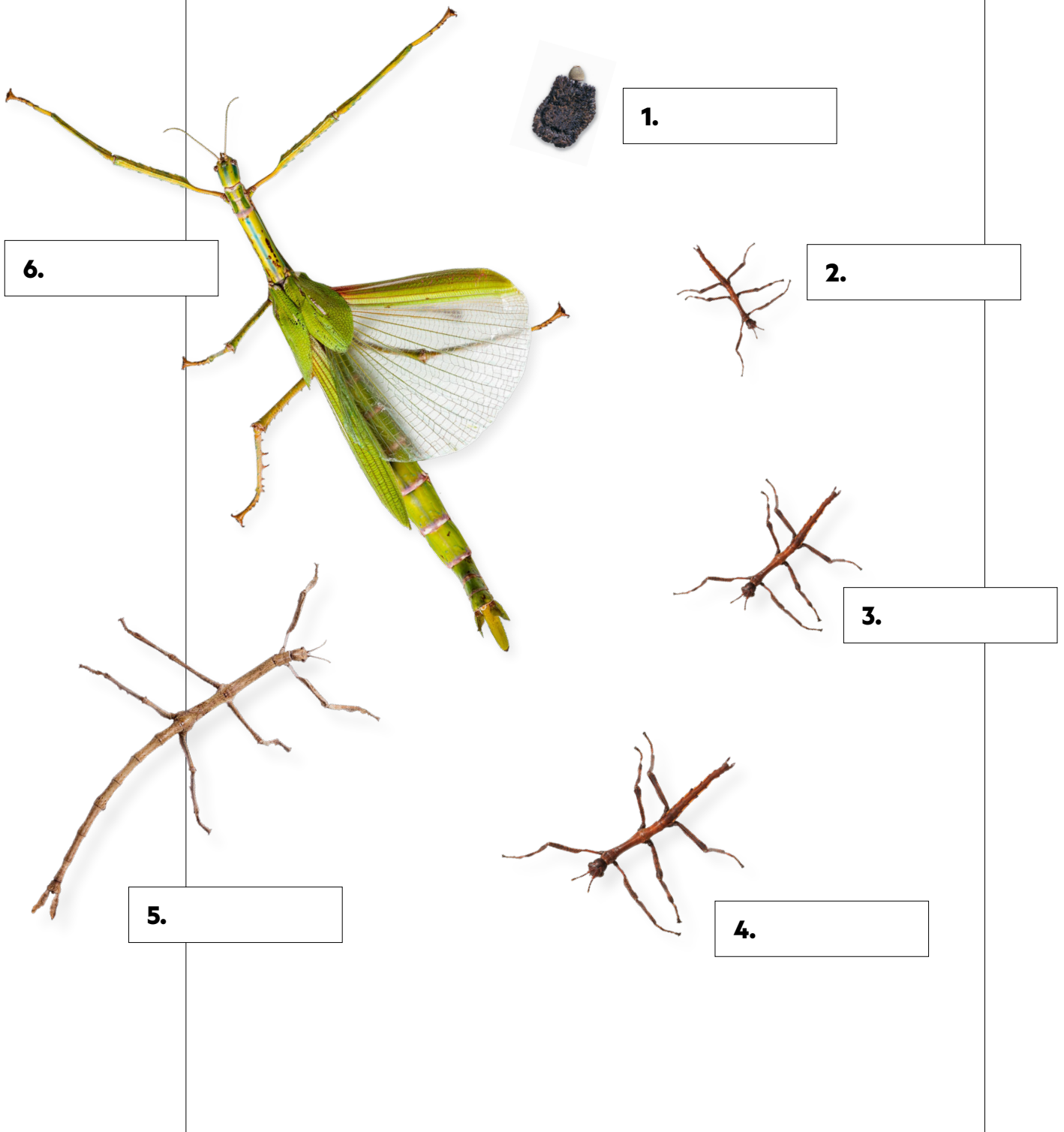
Adult Stage



Step 5

Life Cycle Summary: Label each stage of the stick insect lifecycle on the diagram below. The time taken from egg to adult for the stick insect ranges from three to six months.

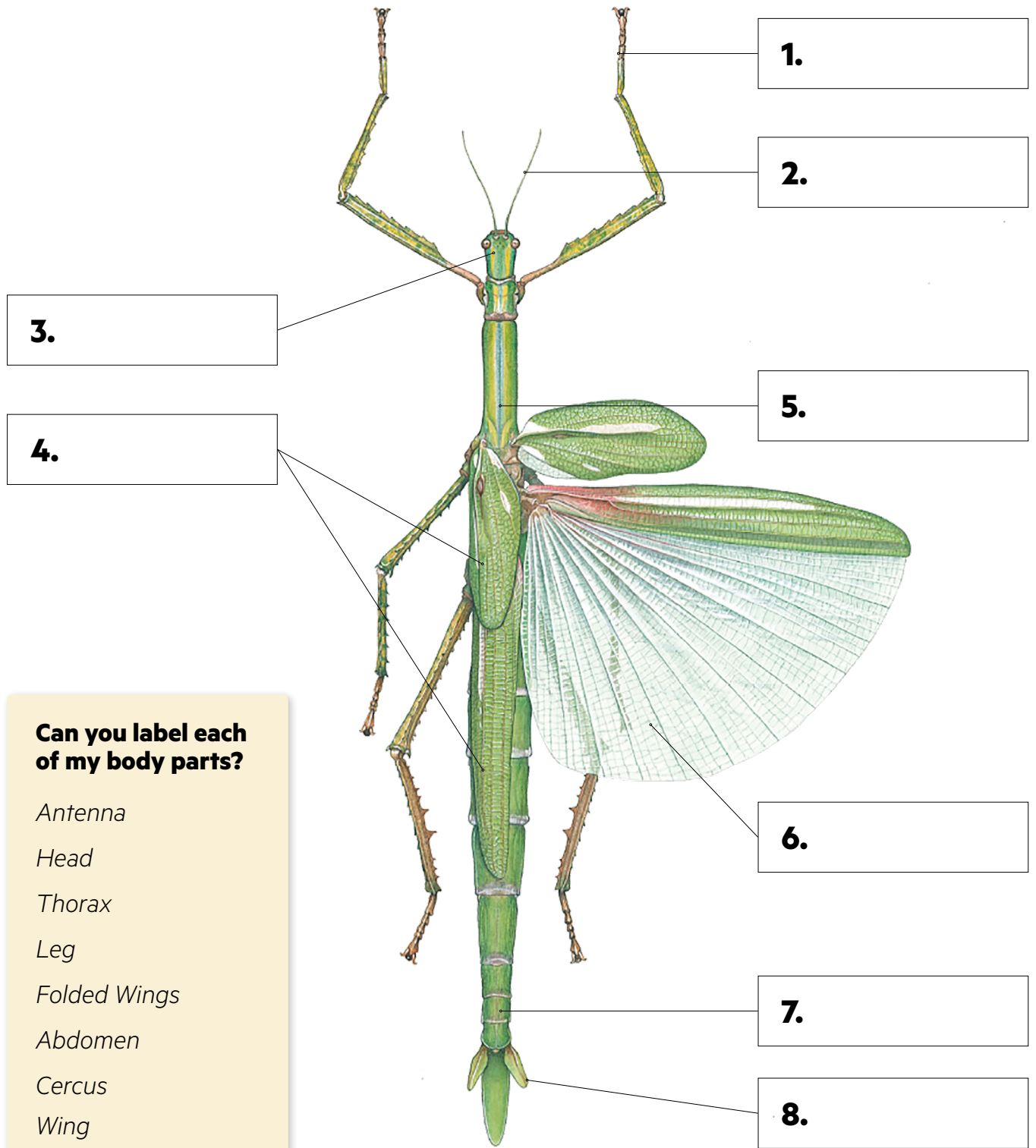
The Cycle of Life: Goliath Stick Insect



Insect Anatomy Challenge



What is my name?



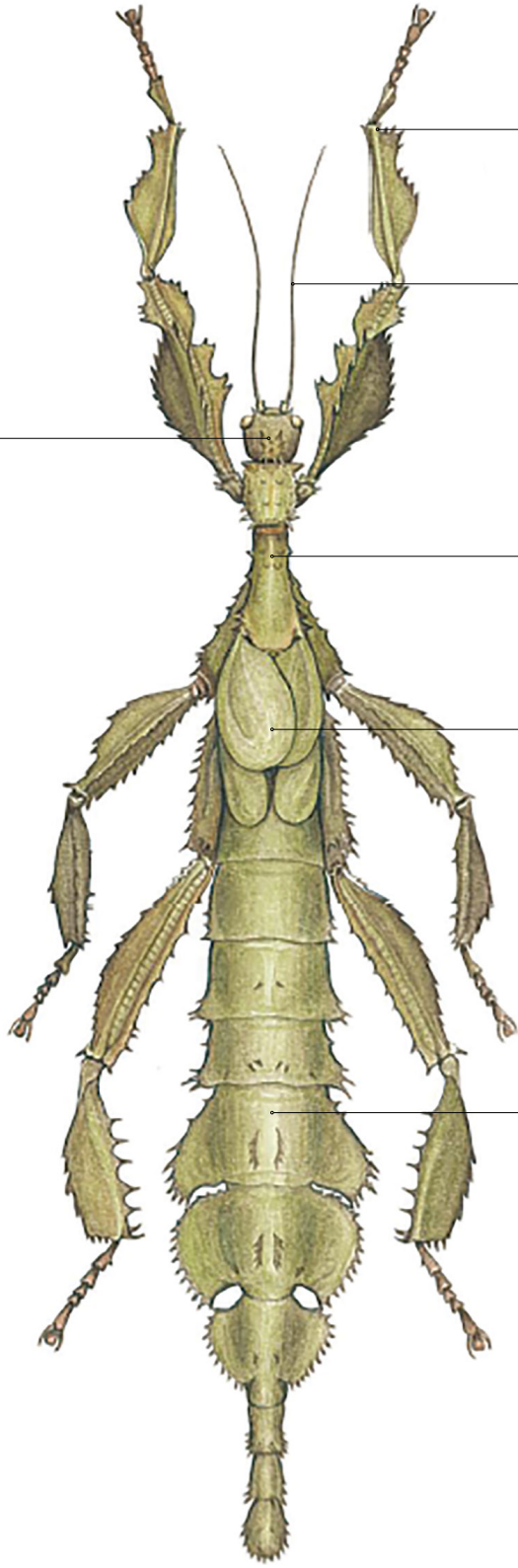
Can you label each of my body parts?

- Antenna
- Head
- Thorax
- Leg
- Folded Wings
- Abdomen
- Cercus
- Wing

Source: Queensland Museum Image Collection

Insect Anatomy Challenge

What is my name?



1.

2.

3.

4.

5.

Can you label each of my body parts?

Antenna
Head
Thorax
Leg
Folded Wings
Abdomen

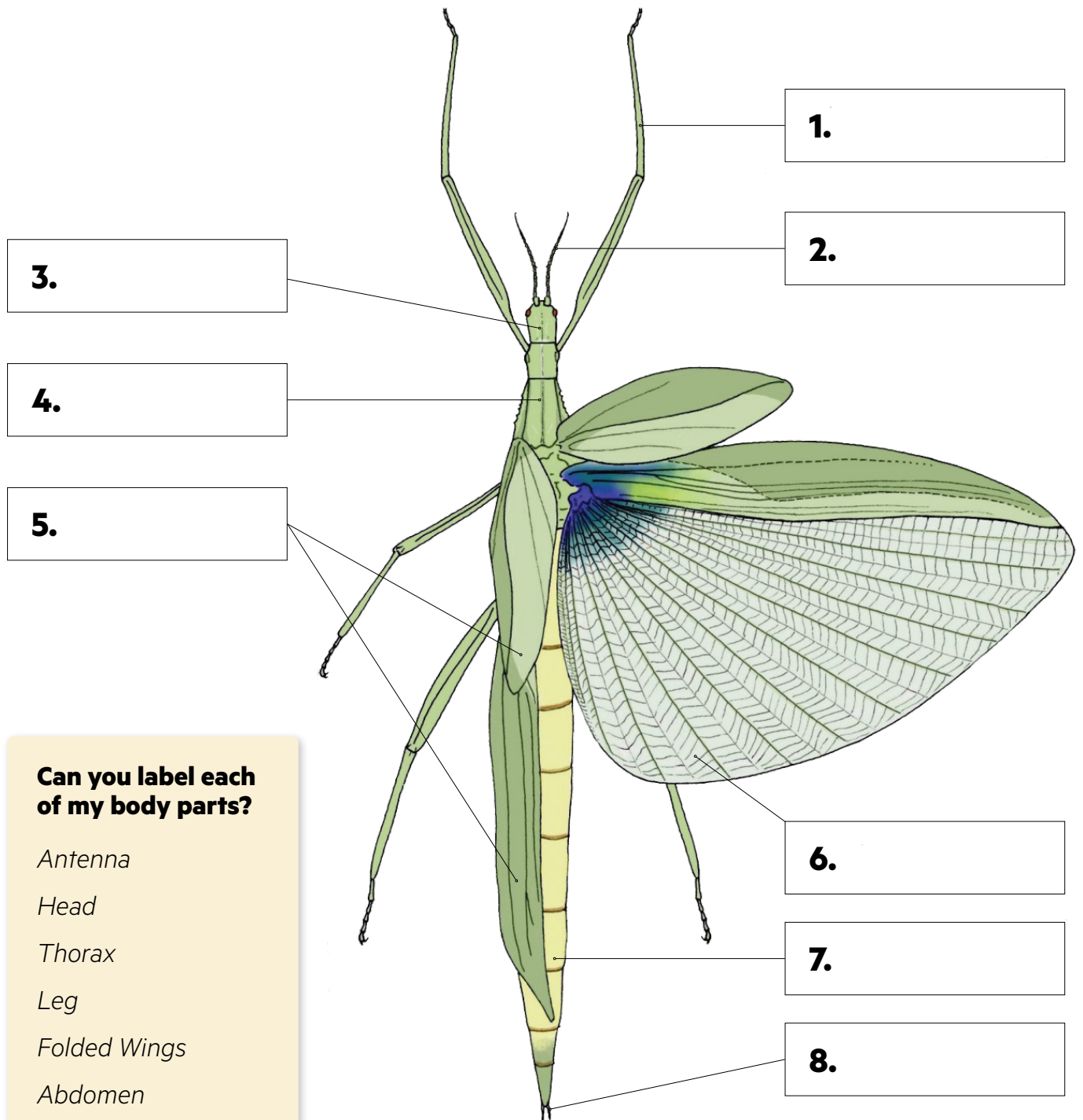
6.

Source: Queensland Museum Image Collection

Insect Anatomy Challenge



What is my name?



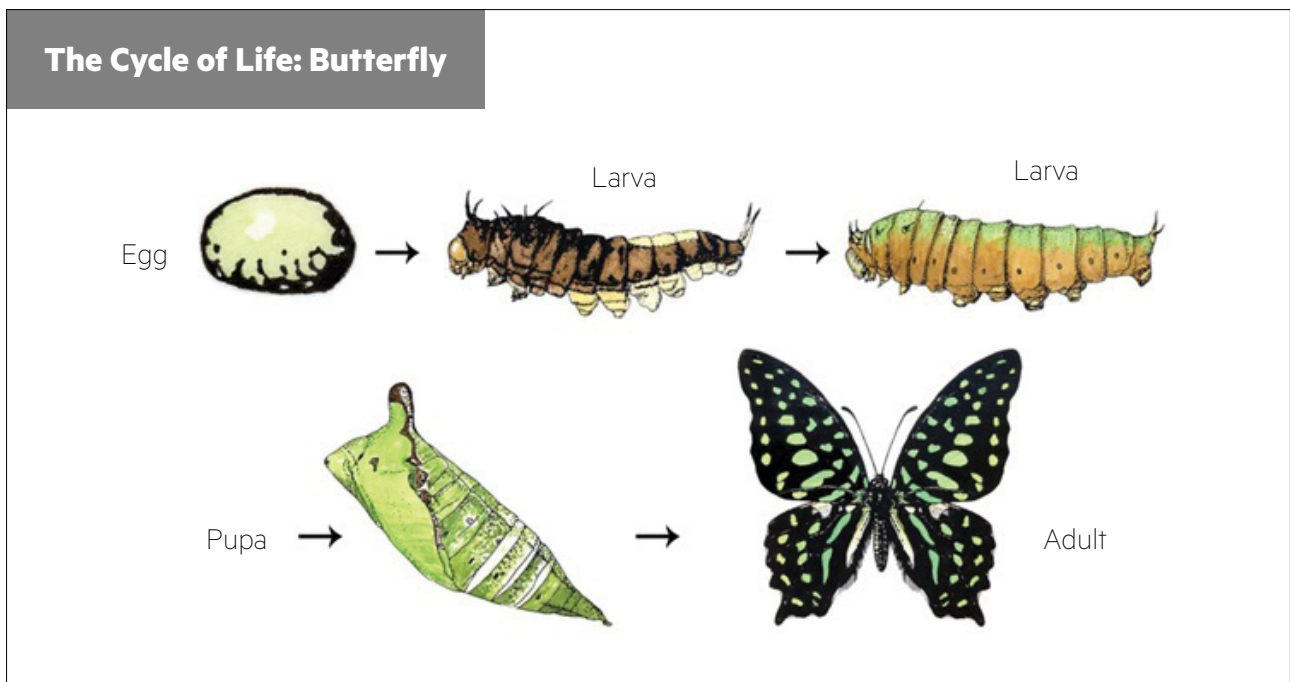
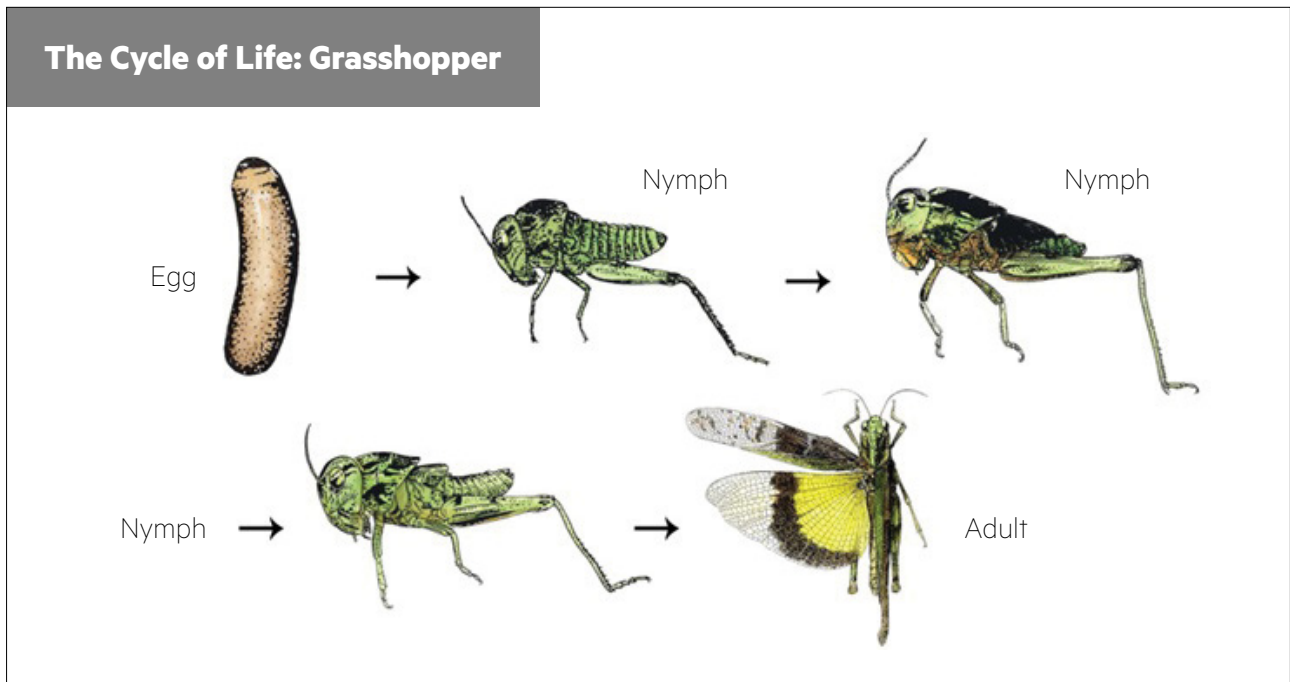
Can you label each of my body parts?

- Antenna
- Head
- Thorax
- Leg
- Folded Wings
- Abdomen
- Cercus
- Wing

Source: Queensland Museum Image Collection

Investigate Further

Insect Life Cycles



Additional Resources:

The following links may provide useful resources if you **cannot** make it into the Queensland Museum.

[Stick and Leaf Insects - Order Phasmatodea](#)

[Minibeast Wildlife's Bugshop](#)

[Goliath Stick Insect, the Camouflage Master - *Eurycnema goliath*](#)

[Goliath Stick Insect – *Eurycnema goliath*](#)

MUSEUM PERSPECTIVES

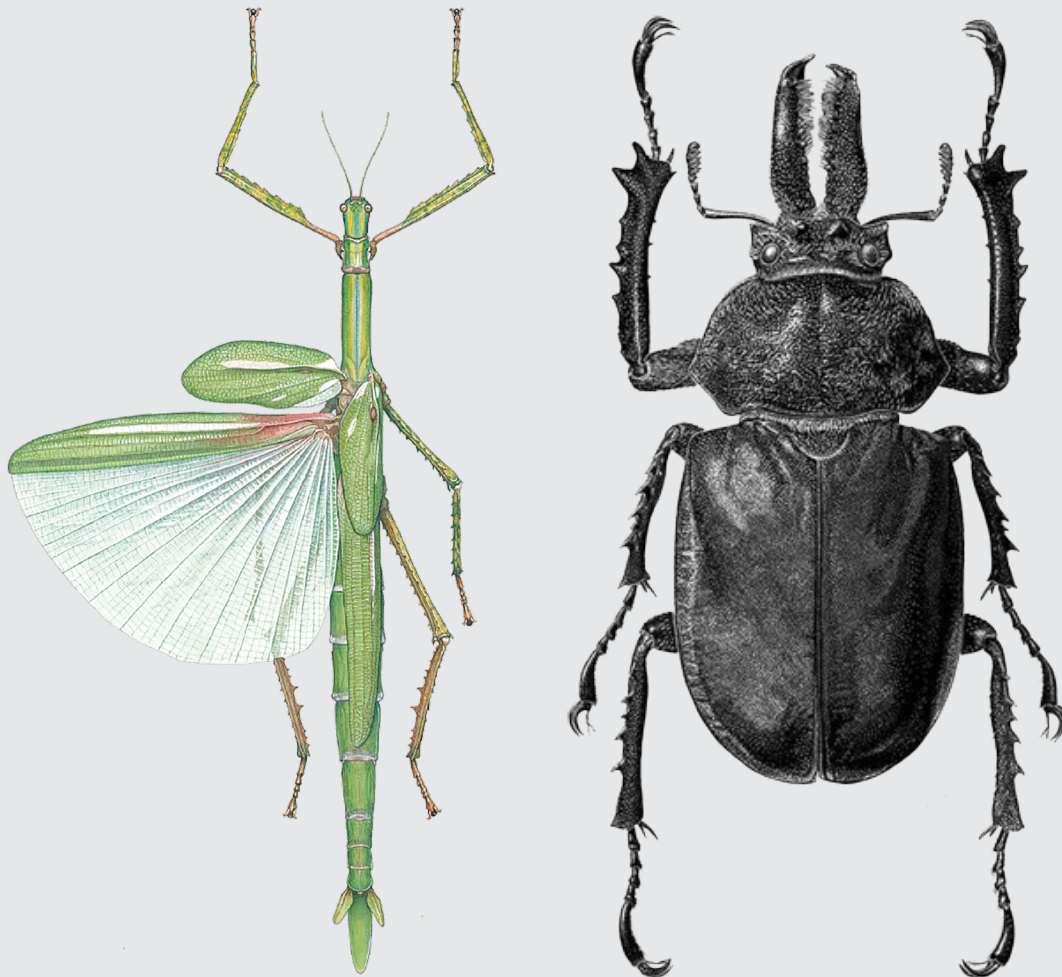
Teacher Resource: STEM Careers — Dr Christine Lambkin, Entomologist



Watch this [video](#) to see how Christine's interest in Science, Biology, Entomology, Teaching and Scientific Illustration provide a unique and fascinating pathway to becoming the Curator of Entomology at the Queensland Museum.

Scientific Illustration (Insect) at the Queensland Museum

Scientific illustration and photography is used to save thousands of words in scientific papers. An illustration can clearly show the important features which distinguish different species at a glance.



Left: Watercolour of a Goliath Stick Insect, *Eurycnema goliath*, by Sally Elmer, QM.

Right: Ink on scraperboard illustration of the rare Queensland Stag Beetle, *Sphaenognathus munchowae* Moore and Monteith, 2004, by Geoff Thompson, Queensland Museum

Activity 2: Design Challenge — Making an insectarium for your stick insects (In the Classroom)



Many insects can be kept alive in captivity. This means that we can study their feeding, moulting, pupation, egg-laying and warning behaviour. Insectariums can be made from all sorts of materials ranging from the traditional shoebox to polystyrene vegetable boxes which have no holes. Doors and windows can be added with a thin-bladed hobby knife. Glass, Perspex, plastic film or fly wire provide the essential viewing window.

Living things depend on their environment to survive. In this design challenge you will work in pairs to make an insectarium to care for your own stick insects. To understand what features your insectarium must have in order to successfully raise Goliath Stick Insects read the information below on: *How to care for your stick insects* before starting the design process.



How to care for your stick insects

- 1. Feeding** Stick insects are vegetarians. They need a regular fresh supply of tender gum leaves. The leaves need to be kept in a container of water. This water will need to be replaced after a week.
- 2. Water** It is important to keep the enclosure humid, but not wet or the stick insects will die. Spray a small area of the leaves 2-3 times a week with an atomiser or mister.
- 3. Handling** When you change the leaves you will need to carefully transfer each of the young insect nymphs from the old leaves to then new ones. To do so, gently encourage the nymphs to crawl onto your hand or crawl onto a paintbrush. Pulling it from the foliage with even moderate force may cause it to lose limbs.
- 4. Growing** The nymphs have a lot of growing to do, and some species may reach over 20cm long. As they grow they moult, and to moult they need space to hang. If they cannot hang properly to dry and harden they will die or become deformed. This is why the enclosure must be tall. From young nymph to adult may take four months or more, and the adult may live for a further 6 months. These times may vary between species and growth rates can vary throughout the year.
- 5. Breeding** Females of the species lay several eggs per day, for several months. The eggs can be collected and kept in a clear, lidded container until they hatch. Hatching may take many months, or even a year or more.

6. Hatching the Eggs Eggs can be found on the bottom of the enclosure amongst the frass (poo) and leaves. Collect and transfer the eggs into a larger container, to give the hatching nymphs plenty of room to emerge. Find a deep container such as a plastic takeaway food container, or a clear plastic drinking cup. Make sure the new container has a secure lid and ventilation. A hole can be cut into the lids of containers and a piece of fine mesh, nappy liner or chux, secured over the container before replacing the lid. If a drinking cup is used, a circle of the above materials can be secured over the top with a rubber band. A small piece (approx. the size of a 5c coin) of moistened tissue can be placed in the container to prevent the eggs from drying out. Be careful not to make the container too wet, as mould will develop on the eggs.

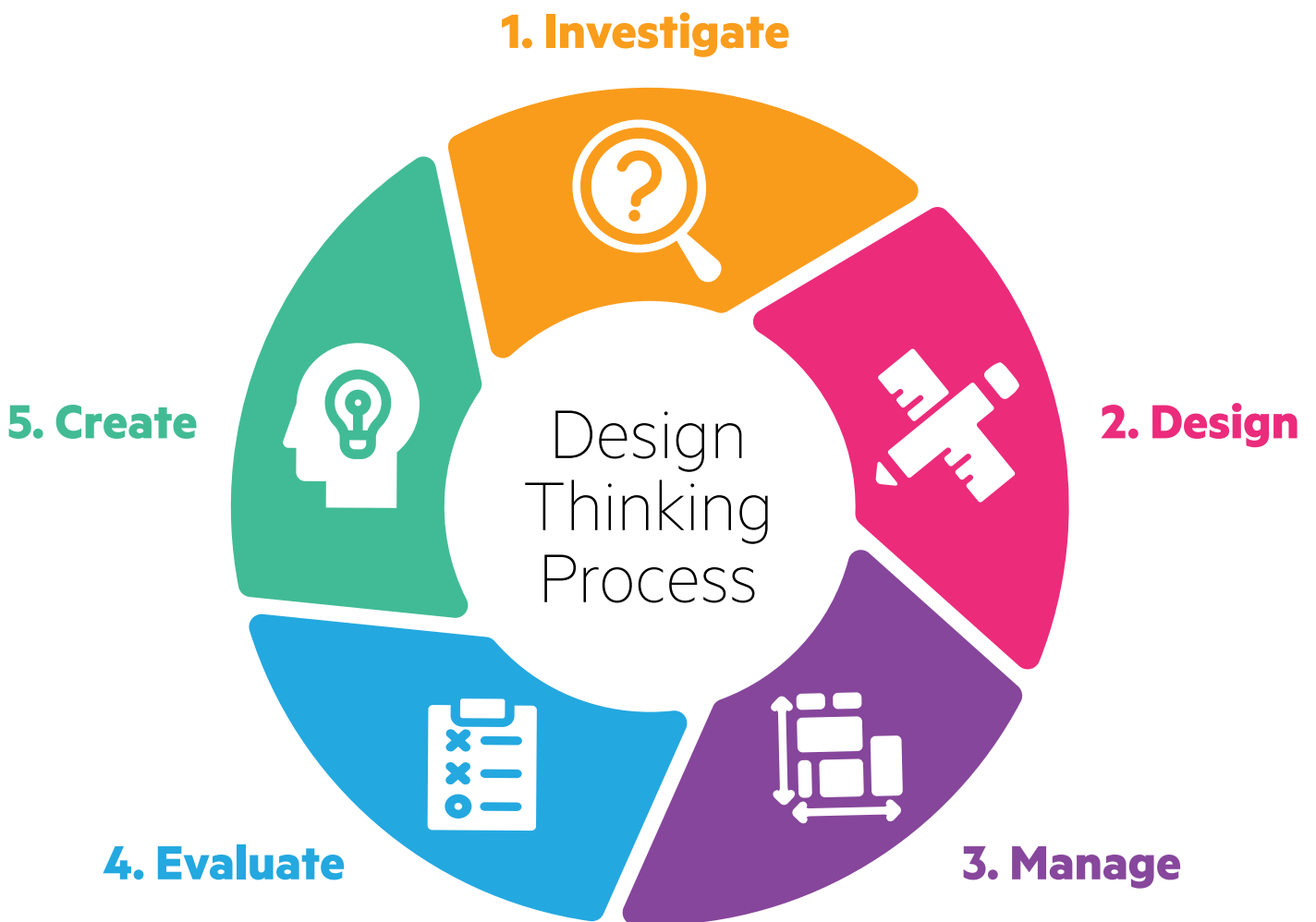


Source: Queensland Museum Image Collection.

Design Thinking

Design thinking involves the use of strategies for understanding design needs and opportunities, visualising and generating creative and innovative ideas, planning, analysing and evaluating those ideas that best meet the criteria for success.

This design challenge: making an insectarium for your stick insects will be based on the following stages.





1. Investigate

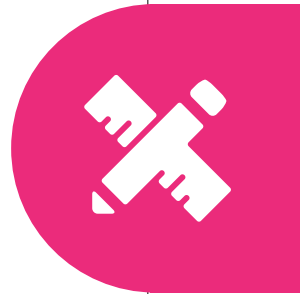
Investigate what requirements stick insects have during each stage of their life cycle. How will this information inform your design?

A large, empty rectangular box with a thin black border, intended for students to take notes or draw during the investigation phase.



2. Design your solutions

Draw your designs. You may need to seek some feedback on your design and make changes to ensure it meets the needs of the stick insects as they grow.

A large, empty rectangular box with a thin black border, intended for students to draw their design solutions. It occupies most of the page below the text.



3. Manage

- (i) Make a list of any materials you will need and construct a model of your insectarium. Your model can be made out of found materials e.g. cardboard. It does not have to be made out of final materials or be the actual size.

Materials





(ii) Share your model with your classmates in a brief presentation (3min) and use any feedback that you get to improve your design. Record the feedback here.

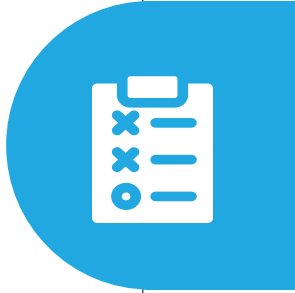

Feedback





4 & 5. Evaluate & Create

- (i) Utilise your feedback.
- (ii) Collect the materials you need to make your insectarium.
Describe any modifications you made and why you made them.
- (iii) Create your final insectarium.



Purchasing Stick Insects

Livestock of some species are often available by mail order from:

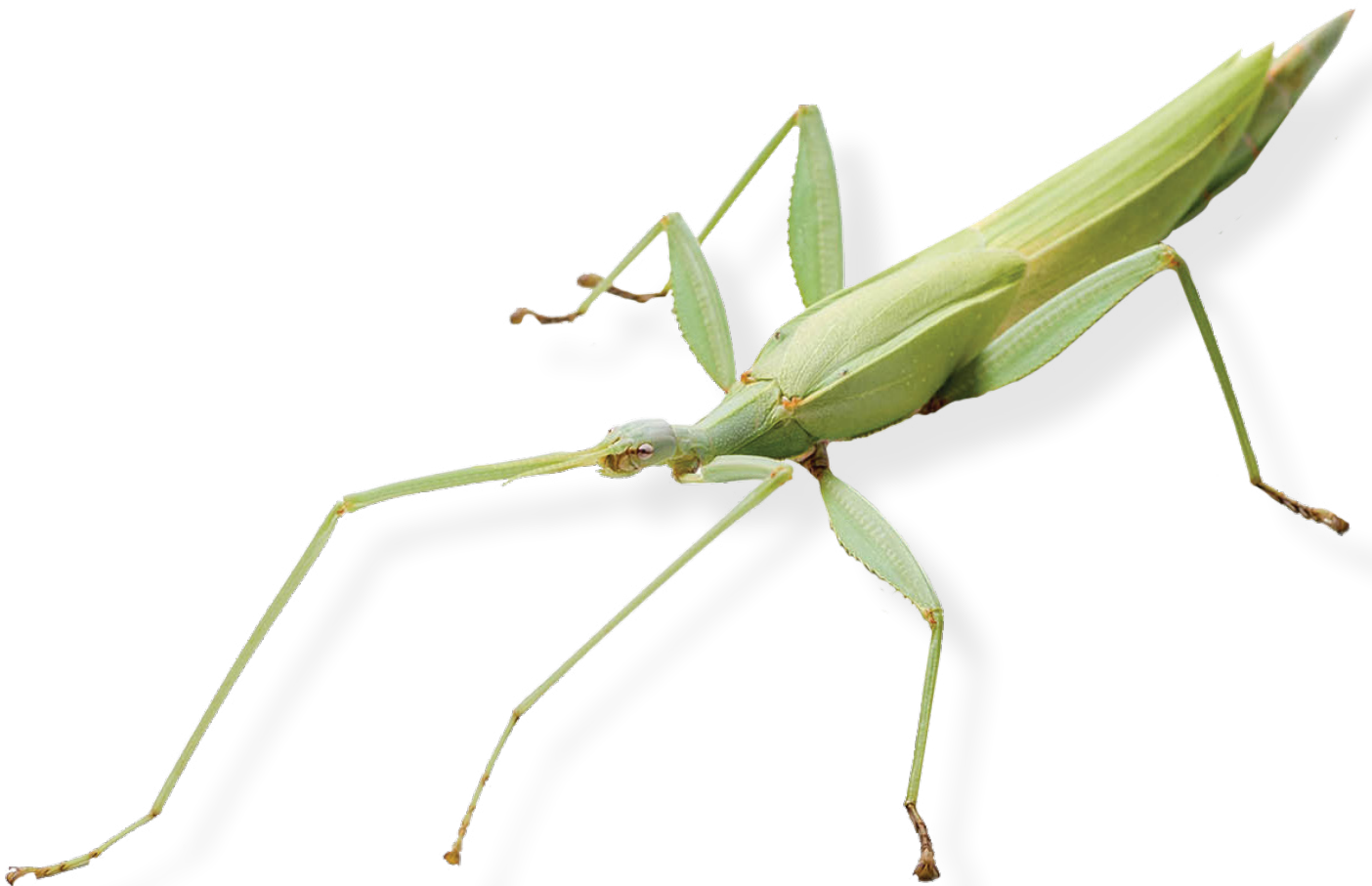
- Mt Glorious Biological Centre (07) 3289 0161 (South Queensland)
- The Australian Insect Farm (07) 4063 3860 (North Queensland)
- Minibeast Wildlife 0434 998 263 (North Queensland)

Once your nymphs have reached adult stage, answer the questions on Worksheet 2.

Adult stick insect size guide:

Adult	Male (mm)	Female (mm)
Goliath Stick Insect	121 – 160	172 – 204
Children's Stick Insect	110 – 124	105 – 142
Spiny Leaf Stick Insect	75 – 115	100 – 160

When you have successfully bred and observed the life cycle of your stick insect, complete the insectarium report and release your stick insect under a suitable gum tree in a safe habitat.





4. What time of the day do stick insects eat?

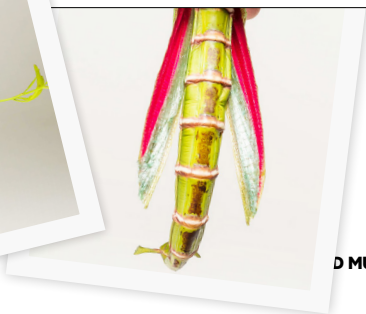
5. When did the nymph grow the fastest?



6. What was the slowest period of growth?

7. What factors do you think would speed up the nymphs growth? Or slow it down?

8. Describe the visual differences between the female and the male Goliath stick insect.



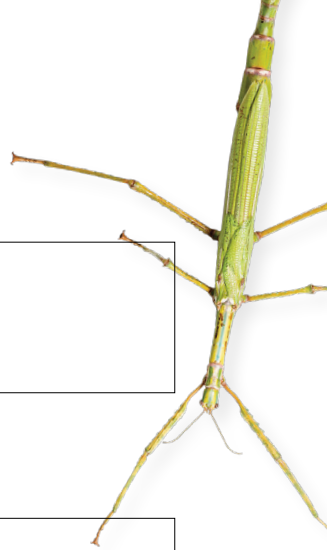
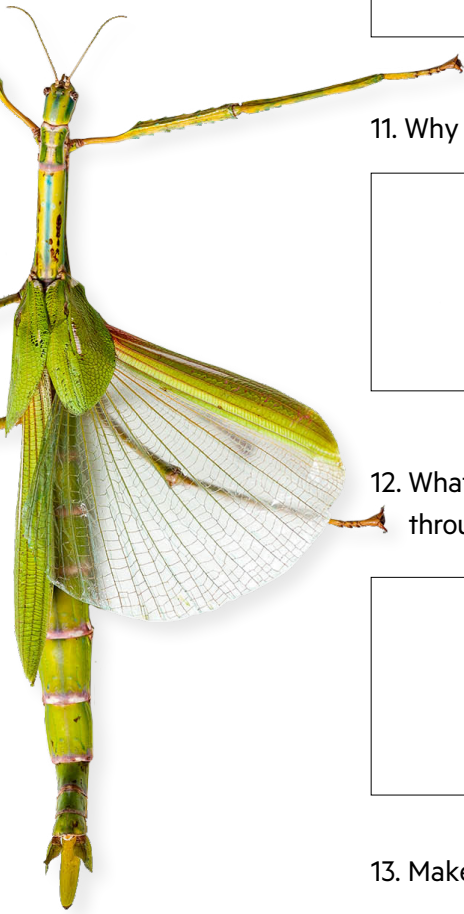
9. What is the lifespan of a female adult stick insect? A male stick insect?

10. How long do stick insect eggs take to hatch?

11. Why do you think animals have these stages in their life cycle?

12. What do you think are some of the factors that influence how quickly these animals go through these stages? Would life cycles always take the same time from egg to adult?

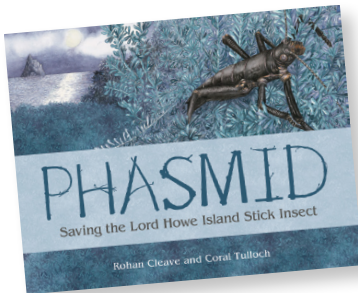
13. Make a list of questions for further research.



Bibliography



Henderson.A, Henderson.D, Sinclair.J (2008)
Bugs Alive: A Guide to Keeping Australian Invertebrates
Museum Victoria: Australia



Cleave. R (2015)
Saving the Lord Howe Island Stick Insect
CSIRO Publishing: South Victoria

(Both books are available from the Queensland Museum shop on level 2, South Brisbane or online)



*Australia's Insect Giants Poster
available from the Queensland Museum*

Queensland Museum Loans Kits

Borrow kits and sets of museum specimens and artefacts from [QM Loans](#) to engage learners in your classroom.