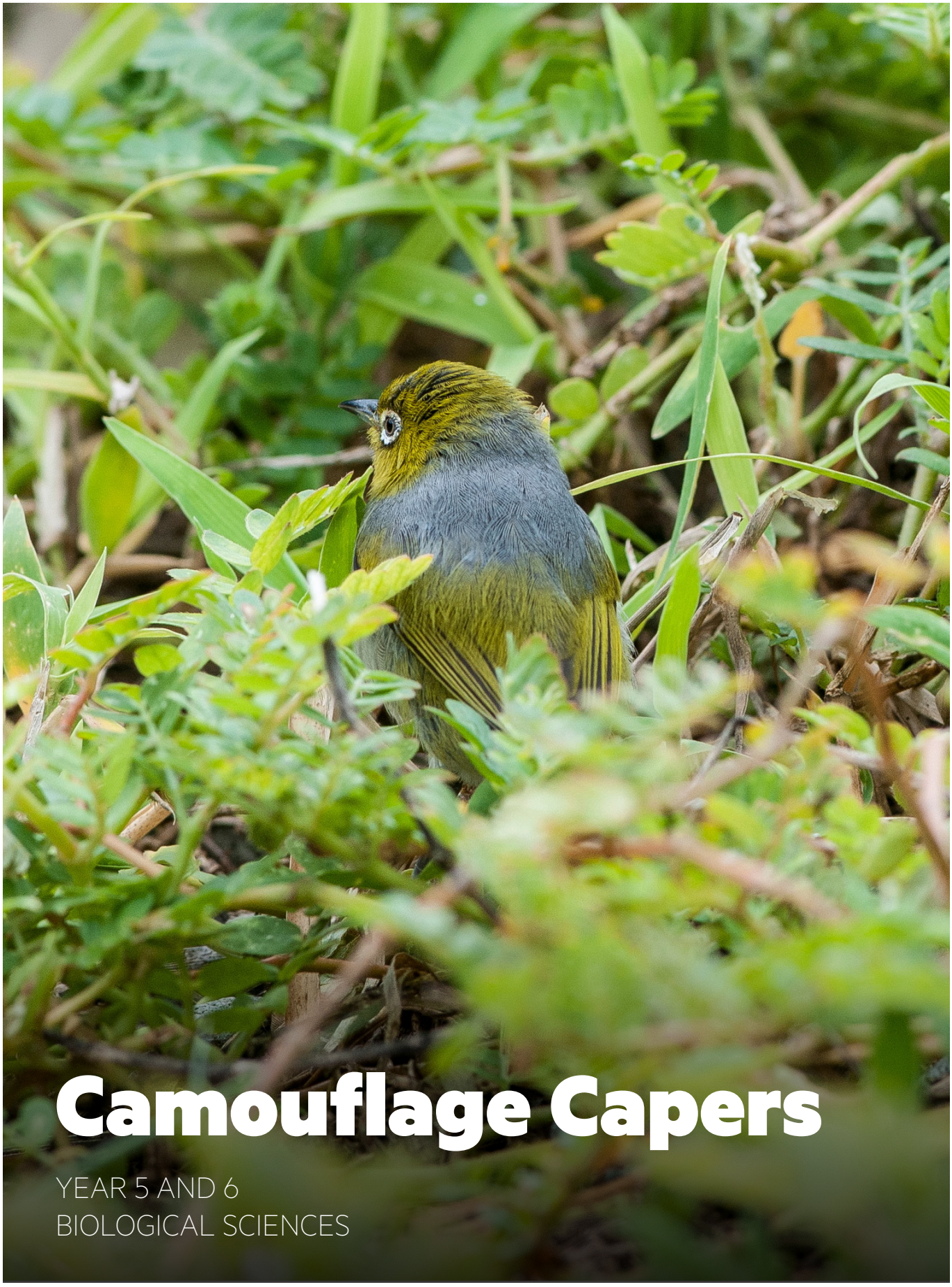

Camouflage Capers

YEAR 5 AND 6
BIOLOGICAL SCIENCES

QGC | FUTUREMAKERS | QUEENSLAND MUSEUM NETWORK | Queensland Government

Future Makers

Future Makers is an innovative partnership between Queensland Museum Network and Shell's QGC business 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.

Cover image: The greenish-yellow and grey plumage of the Capricorn Silvereye, Zosterops lateralis chlorocephalus, provides camouflage against the coastal trees, shrubs and rocks of its habitat. QM, Gary Cranitch.

QUEENSLAND MUSEUM NETWORK

Queensland Government

EXPLORE - EXPLAIN - ELABORATE

Camouflage Capers

Teacher Resource

In this activity, students investigate camouflage and model the effect of colour on the survival of organisms. Year 5 students explore the effects of camouflage on predation, while Year 6 students explore the impact of changing environments on camouflaged organisms.

To introduce, extend or further support learning about camouflage, you and your students could visit *Wild State* at the Queensland Museum. Here, students could work in small groups to tally the colours of animals found in the various habitats of Queensland. Students could represent the data in tables and graphs, identify patterns in the data and then develop explanations for these patterns. If you would like to visit the Queensland Museum with your class, please see the visit as school page to plan, book and prepare for your visit. Bookings are essential for all schools and groups.

Detailed step-by-step instructions for this activity can be seen below. It is recommended that you use these instructions to guide your students through the activity.

1. Print and display the five camouflage images, either at different corners of the classroom or along a wall (see *Teacher Resource: Camouflage Images*). Divide students into five groups. Ask the student groups to stand three to four metres away from one image (or at a greater distance, if space permits). Ask students to observe the image and to describe what they can see in the image with their groups. Then, ask students to take one large step towards their images. Repeat the previous questioning of students. Ask students to continue to take one large step towards their images until they can spot something interesting or unusual about the image (i.e. the camouflaged animal).

2. Ask student groups to share what they saw in their image and when they noticed the animal in the image (i.e. how many centimetres/metres from the image). Inform students that animals use colour in various ways; some animals use colour to blend into their environment. Ask students if they know the scientific word used to describe this ability (camouflage). Ask students to identify this type of adaptation (structural) and to discuss how camouflage can assist survival. Inform students that they will explore how camouflage can assist survival in a scientific investigation.

3. Complete the scientific investigation with students. Year 5 students focus on the importance of camouflage for predators (see *Student Activity: Year 5 Scientific Investigation*). Year 6 students focus on how changing environments may affect the success of camouflage as a physical adaptation (see *Student Activity: Year 6 Scientific Investigation*).

4. Review students' findings and evaluate the investigation.

Curriculum Links

Science

YEAR 5

Science Understanding

Living things have structural features and adaptations that help them to survive in their environment (ACSSU043)

Science Inquiry Skills

With guidance, pose clarifying questions and make predictions about scientific investigations (ACSIS231)

Identify, plan and apply the elements of scientific investigations to answer questions and solve problems using equipment and materials safely and identifying potential risks (ACSIS086)

Decide variables to be changed and measured in fair tests, and observe measure and record data with accuracy using digital technologies as appropriate (ACSIS087)

Construct and use a range of representations, including tables and graphs, to represent and describe observations, patterns or relationships in data using digital technologies as appropriate (ACSIS090)

Compare data with predictions and use as evidence in developing explanations (ACSIS218)

Reflect on and suggest improvements to scientific investigations (ACSIS091)

Communicate ideas, explanations and processes using scientific representations in a variety of ways, including multi-modal texts (ACSIS093)

YEAR 6

Science Understanding

The growth and survival of living things are affected by physical conditions of their environment (ACSSU094)

Science as a Human Endeavour

Science involves testing predictions by gathering data and using evidence to develop explanations of events and phenomena and reflects historical and cultural contributions (ACSHE098)

Scientific knowledge is used to solve problems and inform personal and community decisions (ACSHE100)

Science Inquiry Skills

With guidance, pose clarifying questions and make predictions about scientific investigations (ACSIS232)

Identify, plan and apply the elements of scientific investigations to answer questions and solve problems using equipment and materials safely and identifying potential risks (ACSIS103)

Decide variables to be changed and measured in fair tests, and observe measure and record data with accuracy using digital technologies as appropriate (ACSIS104)

Construct and use a range of representations, including tables and graphs, to represent and describe observations, patterns or relationships in data using digital technologies as appropriate (ACSIS107)

Compare data with predictions and use as evidence in developing explanations (ACSIS221)

Reflect on and suggest improvements to scientific investigations (ACSIS108)

Communicate ideas, explanations and processes using scientific representations in a variety of ways, including multi-modal texts (ACSIS110)

Mathematics

YEAR 5

Number and Algebra

Identify and describe factors and multiples of whole numbers and use them to solve problems (ACMNA098)

Use estimation and rounding to check the reasonableness of answers to calculations (ACMNA099)

Solve problems involving division by a one digit number, including those that result in a remainder (ACMNA101)

Use efficient mental and written strategies and apply appropriate digital technologies to solve problems (ACMNA291)

Recognise that the place value system can be extended beyond hundredths (ACMNA104)

Compare, order and represent decimals (ACMNA105)

Measurement and Geometry

Connect decimal representations to the metric system (ACMMG135)

Convert between common metric units of length, mass and capacity (ACMMG136)

General Capabilities

Literacy

Comprehend texts through listening, reading and viewing

Composing texts through speaking, writing and creating

Numeracy

Estimating and calculating with whole numbers

Using fractions, decimals, percentages, ratios and rates

Interpreting statistical information

Critical and Creative Thinking

Inquiring – identifying, exploring and organising information and ideas

Analysing, synthesising and evaluating reasoning and procedures

Personal and Social Capability

Social management

Camouflage Capers

Teacher Resource

Camouflage Images

Use the following images to introduce the concept of camouflage to students. The animals shown in the images include:

- Spotted Wobbegong, *Orectolobus maculatus*
- Capricorn Silvereye, *Zosterops lateralis chlorocephalus*
- Closed-litter Rainbow Skink, *Carlia longipes*
- Purple-ringed Aeolid, *Flabellina exoptata*

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QM, Gary Cranitch

QM, Gary Cranitch

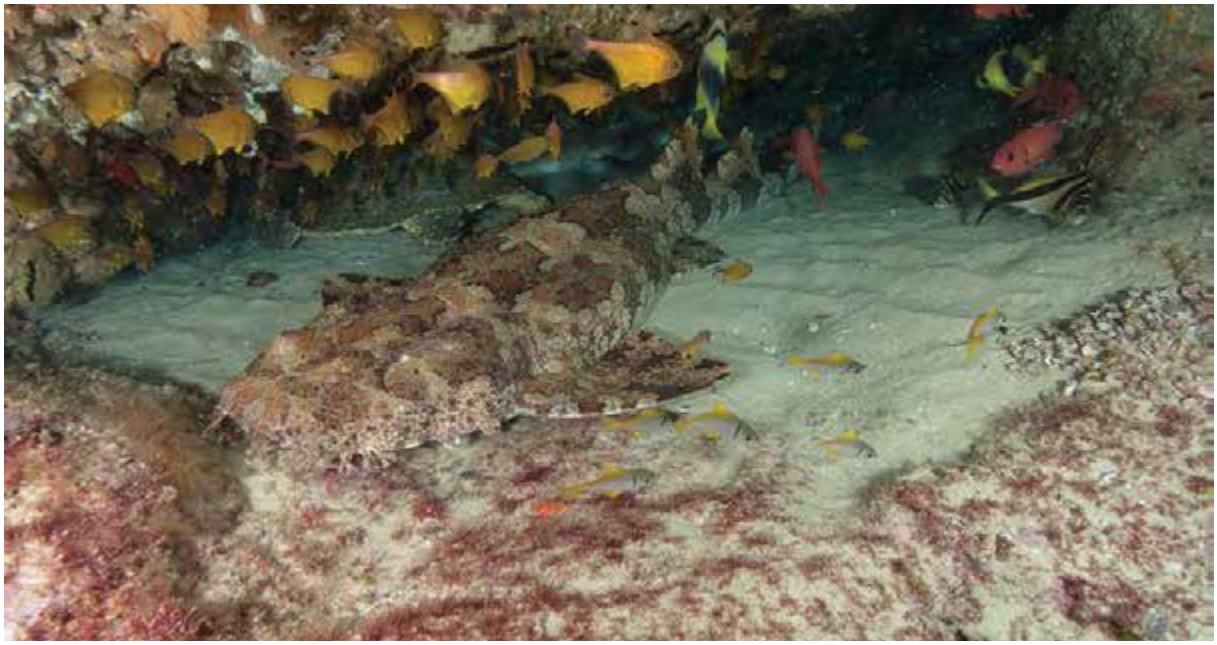
QM, Gary Cranitch

Camouflage Capers

Student Activity

Year 5 Scientific Investigation

Colour in nature serves many purposes, including camouflage, attracting a mate, warning predators, mimicry, physical protection and temperature regulation. Camouflage is a structural adaptation that helps an animal to blend in with its surroundings and survive in its environment. Animals use camouflage to avoid predators and to remain unseen by prey.



Image, top: The colour patterns of the Spotted Wobbegong, Orectolobus maculatus, provides camouflage against the rocky reefs and sand of its habitat. Queensland Museum, Gary Cranitch. Image, bottom: The greenish-yellow and grey plumage of the Capricorn Silvereye, Zosterops lateralis chlorocephalus, provides camouflage against the coastal trees, shrubs and rocks of its habitat.

Dingo, *Canis lupus dingo*

The Dingo is Australia's only native canine (canines include domestic dogs, wolves, foxes and other dog-like mammals). Dingoes are descended from south Asian wolves. Evidence suggests Dingoes arrived in Australia around 3,500 years ago. [1]

Dingoes are found in every habitat and state of Australia, except Tasmania. They live in deserts, dry grasslands, woodlands, rainforests and even in the Australian alps.

Dingoes are carnivores. They hunt many kinds of animals, but generally eat small native mammals, introduced feral animals and some domestic animals.

Dingoes range in colour from white, to sandy-yellow, to ginger, to black and tan. The colour of a Dingo is mostly determined by where it lives.

A Dingo with white fur (left) and a Dingo with ginger fur (right).

In this activity, you will investigate the effect of coat colour on the survival of Dingoes in different habitats. You will conduct a scientific investigation to determine which colours will best camouflage a Dingo at the beach, in the desert and in a rainforest so that they can catch prey undetected. You will use coloured matchsticks to represent the Dingoes. If a Dingo is spotted by its prey, the prey may be able to avoid being caught; this could lead to a Dingo going hungry.

[1] Australian National University. (2018). Research reveals when dingoes first arrived in Australia. https://www.anu.edu.au/news/all-news/research-reveals-when-dingoes-first-arrived-in-australia

Aim

To investigate the effect of Dingo coat colour on their camouflage in different environments.

Materials

- 10 yellow matchsticks
- 10 orange matchsticks
- 10 black and brown matchsticks
- Surfaces and/or materials to represent three different environments (beach, desert, rainforest)
- Ruler or tape measure
- 4 x 1 metre lengths of string
- Stopwatch

Method

1. Paint, colour or use food colouring to dye the matchsticks so that they are the required colours. Let the matchsticks dry.
2. Select at least three different surfaces to represent each of the environments: beach, desert and rainforest. These surfaces could be located inside or outside the classroom. You could also add additional materials to the surface to help represent each environment. Record your chosen surfaces and materials in the table on the next page.
3. Make a prediction. Which coloured matchstick (or Dingo) would have the best chance of surviving in each of the environments? Record and justify your prediction in table on the next page.
4. Read steps 6 to 11. Identify the variables you are going to change (independent variable), measure or observe (dependent variable) and keep the same (control variables). Record these variables in the table on the next page.
5. Identify any potential risks you may encounter before, during and after the investigation. Explain how you will work safely on the following pages.
6. Prepare the first environment. Measure out 1 m^2 on your chosen surface. Use the string to mark out this area. Add any extra materials to the surface to help represent the environment.
7. Ask one person (the 'spotter') to look away while the matchsticks are randomly scattered over the marked area.
8. Start the stopwatch. Ask the spotter to collect as many matchsticks as they can in six seconds using only one hand. Stop the spotter and the stopwatch after six seconds have elapsed.
9. Count the number of coloured matchsticks collected by the spotter. Record the data.
10. Collect all matchsticks and repeat steps 7 to 9.
11. Repeat steps 6 to 10 for the remaining two habitats.

Predicting and Planning

Record the surfaces and materials used to represent each of the environments.

Predict which coloured matchstick (or Dingo) would have the best chance of surviving in each of the environments. Remember to justify your predictions.

Desert	
Surface and Materials:	Prediction:
Beach	
Surface and Materials:	Prediction:
Rainforest	
Surface and Materials:	Prediction:

Identify the variables you are going to change, measure or observe and keep the same

Change? (Independant variable)	**Measure/Observe? (Dependent variable)**	**Keep the same? (Control variables)**

Explain how you will work safely during this investigation.

Recording Results

Record results in the tables below.

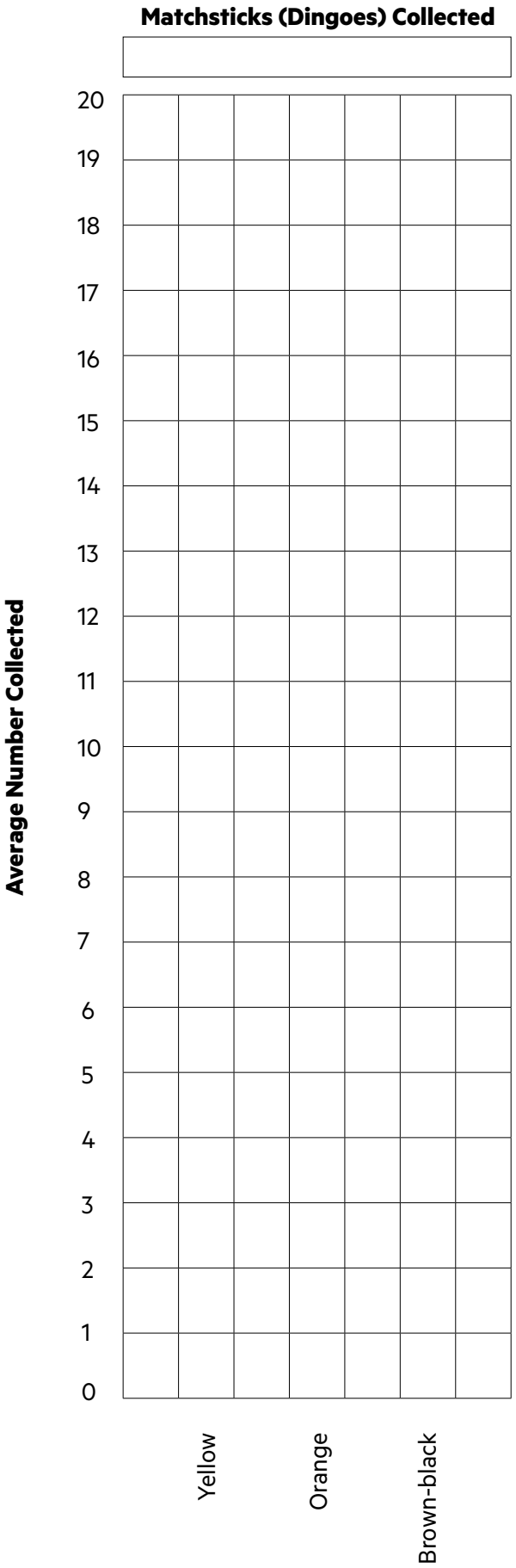
Environment:				
Matchstick colour:	**Number of collected matchsticks**			
	Trial 1	**Trial 2**	**Trial 3**	**Average**
Yellow				
Orange				
Brown-black				

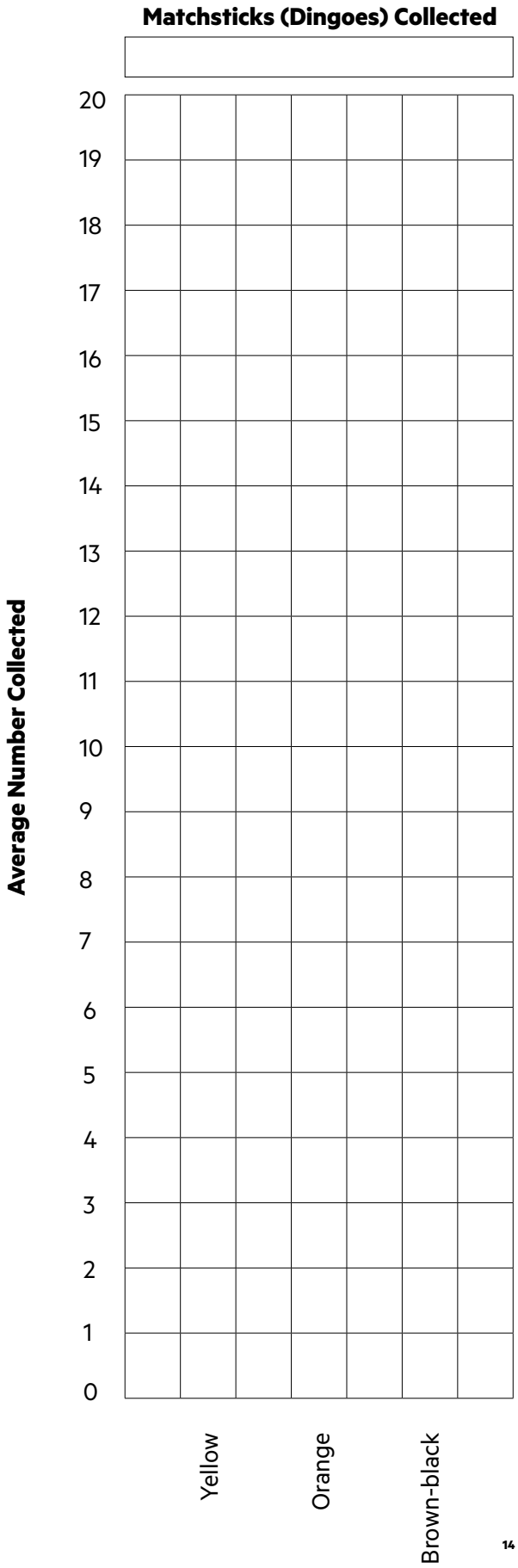
Environment:				
Matchstick colour:	**Number of collected matchsticks**			
	Trial 1	**Trial 2**	**Trial 3**	**Average**
Yellow				
Orange				
Brown-black				

Environment:				
Matchstick colour:	**Number of collected matchsticks**			
	Trial 1	**Trial 2**	**Trial 3**	**Average**
Yellow				
Orange				
Brown-black				

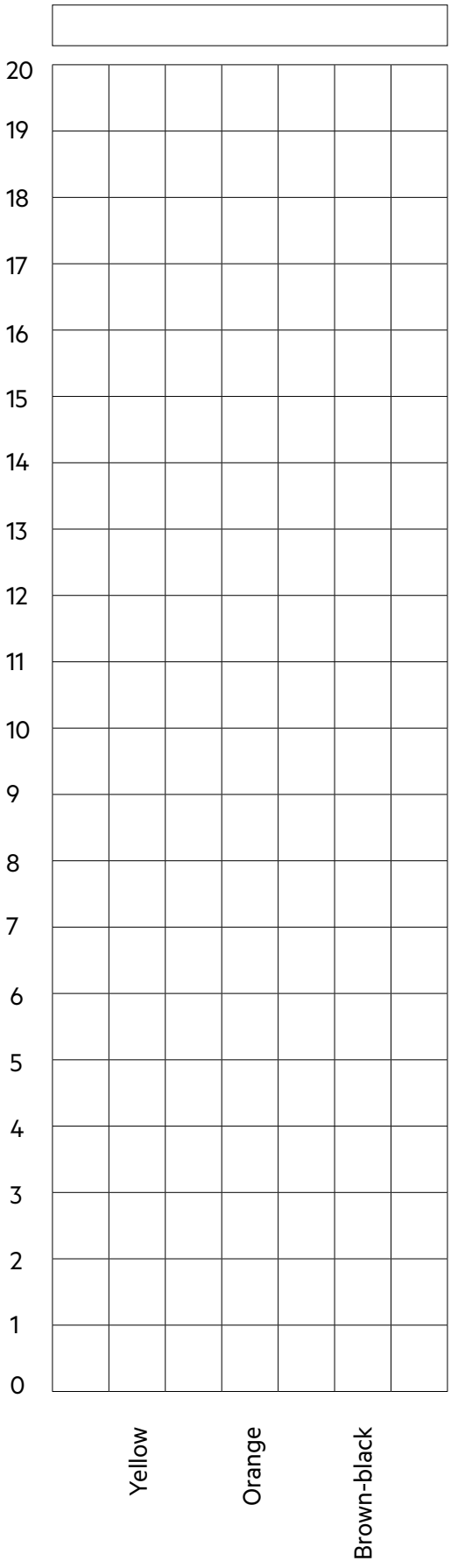
Representing Results

Construct bar graphs to show the number of matchsticks (Dingoes) collected in each environment.





Matchsticks (Dingoes) Collected



Analysing Results

Summarise your results for each environment.

Explain your results for each environment. Use your results to determine which Dingo coat colour - sandy-yellow, ginger (orange) or black and tan - would be best suited to each environment.

Were your original predictions supported by the data collected? Why or why not?

Imagine that the three different coloured matchsticks (Dingoes) were part of one large matchstick (Dingo) population in a rainforest environment. Predict what might happen to this population over a long period of time. Remember to give reasons for your prediction.

Use your results to make a generalisation about the effect of colour on the survival of predators.

Evaluating

Describe any challenges you experienced during the investigation.

Explain how you could improve the investigation.

Conclusion

Summarise the experiment and the results. Was the prediction supported or refuted?

Camouflage Capers

Student Activity

Year 6 Scientific Investigation

Colour in nature serves many purposes, including camouflage, attracting a mate, warning predators, mimicry, physical protection and temperature regulation. Camouflage is a structural adaptation that helps an animal to blend in with its surroundings and survive in its environment. Animals use camouflage to avoid predators and to remain unseen by prey.

Image, top: The colour patterns of the Spotted Wobbegong, Orectolobus maculatus, provides camouflage against the rocky reefs and sand of its habitat. Queensland Museum, Gary Cranitch. Image, bottom: The greenish-yellow and grey plumage of the Capricorn Silvereye, Zosterops lateralis chlorocephalus, provides camouflage against the coastal trees, shrubs and rocks of its habitat.

In this activity, you will investigate the impact of changing environments on camouflaged organisms.

The Effect of Changing Environments

You are an ecologist, studying the relationship between animals and their environment. You have been asked to model the effects of gradual land clearing on two species of ground-dwelling insects. One species is brown in colour, while the other species is green. The land is being cleared for a new housing estate. If approved, the land clearing process will happen over three years.

Aim

To investigate the impact of reduced leaf cover on the survival of two species of ground-dwelling insects.

Hypothesis

How will reduced leaf cover affect the survival of each species? Write a prediction, giving reasons for your response.

Materials

- 10 brown matchsticks
- 10 green matchsticks
- Green poster board or paper, enough to cover a 60 cm x 60 cm surface
- Masking tape
- 2 litres of leaf litter, which could include grass clippings, bark and mulch, soil etc.
- Gloves
- Measuring cup
- Stopwatch
- Dustpan and brush

Method

1. Paint, colour or use food colouring to dye the matchsticks so that they are the required colours. Let the matchsticks dry.
2. Read steps 4 to 19. Identify the variables you are going to change (independent variable), measure or observe (dependent variable) and keep the same (control variables). Record these variables in the table on the following pages.
3. Identify any potential risks you may encounter before, during and after the investigation. Explain how you will work safely on the following pages.

4. Prepare the environment. Measure out a 60 cm x 60 cm square on an outdoor surface (i.e. concrete or outdoor pavers). Use masking tape to mark out the square. Place the green poster card or paper within the marked area. You may also like to tape the card or paper to the ground so it does not move around. Ensure everyone puts on a pair of gloves. Place the leaf litter within the marked area.
5. Ask one person (the 'spotter') to look away while the matchsticks are randomly scattered throughout the marked area. The matchsticks can be placed on top of and within the leaf litter.
6. Start the stopwatch. Ask the spotter to collect as many matchsticks as they can in six seconds using only their gloved hand. Stop the spotter and the stopwatch after six seconds have elapsed.
7. Count the number of coloured matchsticks collected by the spotter. Record this data on the next page.
8. The land clearing has started. Six months have passed since the first trial. Remove one cup of leaf litter. Ensure any matchsticks collected by the cup are removed. Place these matchsticks aside with the matchsticks collected by the spotter - these will be added back to the pile of leaf litter.
9. Ask the spotter to look away. Spread out the remaining leaf litter and matchsticks within the marked area. Randomly scatter any matchsticks removed by the spotter or the cup throughout the marked area. Repeat steps 6 and 7.
10. 1 year has passed since the first trial. Remove one cup of leaf litter. Ensure any matchsticks collected by the cup are removed. Place these matchsticks aside with the matchsticks collected by the spotter - these will be added back to the pile of leaf litter.
11. Repeat step 9.
12. 1.5 years have elapsed since the first trial. Remove one cup of leaf litter. Ensure any matchsticks collected by the cup are removed. Place these matchsticks aside with the matchsticks collected by the spotter - these will be added back to the pile of leaf litter.
13. Repeat step 9.
14. 2 years have elapsed since the first trial. Remove one cup of leaf litter. Ensure any matchsticks collected by the cup are removed. Place these matchsticks aside with the matchsticks collected by the spotter - these will be added back to the pile of leaf litter.
15. Repeat step 9.
16. 2.5 years have elapsed since the first trial. Remove one cup of leaf litter. Ensure any matchsticks collected by the cup are removed. Place these matchsticks aside with the matchsticks collected by the spotter - these will be added back to the pile of leaf litter.
17. Repeat step 9.
18. 3 years have elapsed since the first trial. Remove one cup of leaf litter. Ensure any matchsticks collected by the cup are removed. Place these matchsticks aside with the matchsticks collected by the spotter - these will be added back to the pile of leaf litter.
19. Repeat step 9.

Variables

Record the variables in the table below.

Independant Variable	Dependant Variable	Control Variables

Risk Assessment

Explain how you will work safely during this investigation.

Recording Results

Complete the data table.

Matchstick colour:	Number of collected matchsticks						
	Trial 1 (Start)	Trial 2 (6 months)	Trial 3 (1 year)	Trial 4 (1.5 years)	Trial 5 (2 years)	Trial 6 (2.5 years)	Trial 7 (3 years)
Brown							
Green							

Calculate the percentage of matchsticks (insects) collected in each trial.

Matchstick colour:	Number of collected matchsticks						
	Trial 1 (Start)	Trial 2 (6 months)	Trial 3 (1 year)	Trial 4 (1.5 years)	Trial 5 (2 years)	Trial 6 (2.5 years)	Trial 7 (3 years)
Brown							
Green							

Represent this data in a line graph. You may use Excel to create the graph.

Analysing Results

Summarise your results.

Explain your results. How did the changing environment affect each insect species?

Were your original predictions supported by the data collected? Why or why not?

Predict how this environmental change would affect the growth and survival of these two insect species. You may also like to consider how this change would impact organisms that are eaten by these insect species as well as organisms that eat these insect species.

Write a letter of recommendation to the developer. In your letter, you should state whether the development should proceed based on the evidence gathered during the investigation.

Evaluating

Describe any challenges you experienced during the investigation.

Explain how you could improve the investigation.

Conclusion

Summarise the experiment and the results. Was the hypothesis supported or refuted?

Camouflage Capers

Student Activity

The Colours of a Wild State

Visit the *Wild State* exhibition at Queensland Museum.

Select a habitat to explore. Make a prediction: What colours will the animals who live in this habitat mostly be? Remember to include a reason for your answer.

Tally the different colours of the animals found in the habitat.

Colour	Tally	Total

Represent the data in a graph.

Were your original predictions supported by the data collected? Why or why not?

Identify any patterns in the data, and then develop an explanation for these patterns.
