Teacher Notes

Themes

- Food webs
- Natural cycles
- Conservation

Key learning outcomes

- Living things have physical and behavioural features that help them survive in their environment.
- Animals consume plants or other animals in their environment as sources of energy and nutrition, and can themselves be consumed by other predators.
- Human activities can affect features of an environment in ways that significantly affect an animal's ability to survive.

Key curriculum areas

- **Science:** Science Understanding (Biological sciences, Earth and space sciences)
- **English:** Language; Literature
- **Cross curriculum priority:** Aboriginal and Torres Strait Islander Histories and Cultures
- **Cross curriculum priority:** Sustainability

Publication details

Tiny Possum and the Migrating Moths

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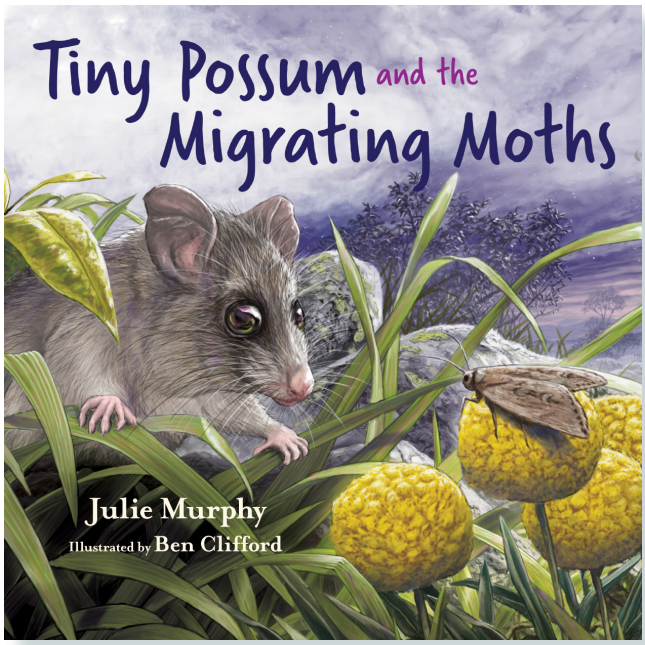
Teacher notes prepared by Mike McRae.

CSIRO Publishing
Locked Bag 10
Clayton South, VIC 3169, Australia

Website: www.publish.csiro.au
Tel: 1300 788 000 (local call in Australia)
Email: publishing.sales@csiro.au



Tiny Possum and the Migrating Moths

Julie Murphy and Ben Clifford

About the book

High in the Australian Alps, Possum needs to find enough food and shelter to survive the harsh alpine winter. She will spend months hibernating under a blanket of snow. Will she last through the year to successfully raise a new family?

The mountain pygmy-possum is small in size but huge in appeal! Once thought to be extinct, there are now around 2500 of these tiny survivors in the wild. They need snow and bogong moths to survive, and also the support of great conservation work.

Recommended for

Readers years 2 to 5 (ages 6 to 9)

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About the author and illustrator

Julie Murphy writes fiction and non-fiction children's books about animals and nature, and has been published in Australia and internationally. Julie is a former zoologist and zookeeper who aims to encourage a love of books and the natural world in her readers.

Ben Clifford was born and raised in Hobart, Tasmania, in a leafy suburb near the bush. After studying graphic design, his first book illustrations were published in 2017. When Ben is not enjoying the outdoors, he can be found writing, painting or exhibiting large-scale paintings.

Pre-reading questions or activities

Today, there are roughly 2500 mountain pygmy-possums living in three populations, covering a total area of just 6 square kilometres in Australia's Southern Alps.

Share this information with students and provide them with a map of Australia, or instruct them to look up Australia on Google Maps. Ask them to find the Southern Alps on either map and locate significant cities or tourist locations nearby. Ask them to identify the following locations that contain significant habitats for the mountain pygmy-possum: Kosciuszko National Park in NSW, and Mount Buller, Mount Bogong and Mount Higginbotham in Victoria.

Work with them to develop an understanding of seasonal changes in climate, including precipitation and temperatures, and variations in vegetation.

Use a local map students are familiar with to give them an idea of what 6 square kilometres might look like.

Discussion questions

Science

1. The mountain pygmy-possum is roughly the size of a mouse, and has a lot of mouse-like characteristics. Yet it is a marsupial. Ask the students what other marsupials they can think of. What features do all marsupials have in common?
2. The Southern Alps are one of the few regions in Australia that experience regular snowfall. People frequent the snowfields each winter to ski, snowboard and play. What do people do to survive the cold temperatures of the snowfields? What behaviours do the mountain pygmy-possums use to survive the winter cold?

3. Ask the students about the diet of mountain pygmy-possums. Two types of food are mentioned in *Tiny Possum and the Migrating Moths*. How does winter affect the mountain pygmy-possum's ability to find food? Discuss how humans deal with changes in the availability of food throughout the year.
4. Being small helps mountain pygmy-possums survive in their environment. What problems might these tiny animals face if they were the size of other possums, such as the brushtail possum or ringtail possum? How might it help if they were bigger? Discuss with students why size gives them an advantage in environments where food is scarce for part of the year.
5. Read the section 'About the mountain pygmy-possum' at the back of the book. Discuss the family structure of the mountain pygmy-possum, and the timing of how quickly babies develop and become independent. Use a calendar to visually demonstrate how long it takes for the babies to mature. Ask the students how mountain pygmy-possum families differ from human families, and why father mountain pygmy-possums might not live close to the mothers, or stay to rear the children.

English

1. Similes are useful ways to describe events or items in a way that relates their characteristics to something similar. Early in *Tiny Possum and the Migrating Moths*, the author describes the huddled bogong moths, saying they 'overlap like roof tiles'. They also describe the mountain pygmy-possum's nest as 'cup-like'. Explain how the use of the word 'like' makes these comparisons similes. Invite students to come up with a list of similes describing other parts of the story, such as the way the mountain pygmy-possum collects food, or the way the bogong moth might be attracted to light.
2. The protagonist in the story is given the name Possum, with a capital P to indicate it's a proper noun. Ask the students why the author gave the character a name and didn't just refer to the animal as 'the mountain pygmy-possum'.

Aboriginal and Torres Strait Islander Histories and Cultures

1. To Aboriginal people who live around the Southern Alps, the bogong moth has traditionally been an important source of nutrition, as well as a reason for diverse communities to come together. For thousands of years people have travelled to collect and eat the migrating moths, which some describe as tasting sweet and nutty. Discuss with the students how food brings together members of their own community at special times of the year.

Sustainability

1. In their yearly journey to the Southern Alps, the bogong moths pass towns and cities with brightly lit houses and illuminated by street lights. Explain to the students how the moths evolved to use the Moon's light to guide their journey, and the bright lights make it harder to navigate. Discuss with the students how bright lights might affect other animals that are active at night, and what they might be able to do to reduce the impact of light pollution.
2. The Southern Alps is one of the few places in Australia high enough, and cold enough, to be regularly covered in snow. Ask students how future climate change might affect this seasonal snow cover, and discuss how it could affect the survival of the few remaining populations of the mountain pygmy-possum.

Activities

Science

Warm and cosy

Safety: This activity uses hot water. Take care to use non-scalding temperatures, and instruct students to take care when touching the water and containers.

This activity also uses scissors. Help less-experienced hands cut the material and cardboard.

You will need

- 3 × empty metal containers (food cans with lids safely removed work well; make sure the lip of the tin is dull and safe to touch)
- Cardboard
- Scissors
- Pen
- 3 × small thermometers (small enough to sit in the tin without it falling over)
- Samples of various materials (wool, cotton, polyester, linen etc.)
- Measuring tape
- 6 × rubber bands
- Jug
- Tap water
- Kettle (optional)
- Stopwatch or clock

What to do

1. Place the tin on the cardboard. Use a pen to trace its circumference.
2. Use the scissors to cut around the outside of the circle, leaving a small gap of a few millimetres.
3. Carefully use the scissors, or a pen, to poke a hole in the middle of the cardboard circle.
4. Insert the thermometer through the hole in the cardboard.
5. Choose three different materials from the selection provided.
6. Measure the circumference and the height of the tin. Use these measurements as a guide for cutting out rectangles of material. (Alternatively, this can be prepared for the students prior to the activity.)
7. Wrap each tin in a portion of fabric. Secure the fabric in place with two rubber bands.
8. Fill a jug with warm to hot water from the tap. Alternatively, boil water in a kettle, add it to a jug and mix in cooler water. Ensure the temperature is relatively warm to the touch, but not scalding.
9. Pour the warm water in each tin and place the thermometer into the water, adjusting the cardboard circle so it functions as a lid.
10. Wait one minute. Note down the temperature on each thermometer.
11. Note down the temperature on each thermometer after another five minutes. Repeat, noting the temperature every five minutes for half an hour in total.
12. Which one cools the fastest?

What's happening?

A material that reduces the rate at which something loses heat to the environment is called an insulator. Some materials, especially those that are dense, conduct heat away easily.

Air conducts heat slowly, so is a good insulator. Its ability to insulate can be improved if the warmed air sitting next to a hot object isn't whisked away constantly. Some materials, like wool, trap tiny pockets of air so they don't flow away easily. Even snow can trap air, making it an insulator as well.

The mountain pygmy-possum takes advantage of natural materials that can trap air easily, like mosses and grasses, and weaves them into a cup-like nest. While it still gets chilly under the snow, the snow and nesting material are enough to stop the tiny marsupial from losing all of its body heat and freezing during the winter.

Food facts

Note: While food awareness is a good way to promote healthy eating, judgements and conversations on body sizes and diets can be a sensitive and challenging topic, even for young students. Keeping discussions light and objective will help all students develop informed values for healthy eating habits.

You will need

- An assortment of empty food packaging (with nutrient tables clearly displayed)

What to do

1. Divide the assorted food packaging among students, individually or in groups.
2. Encourage them to discuss their familiarity and experience with each food. Have they eaten it? What does it taste like? Do they like it? When would each item usually be eaten?
3. Point out an example table containing details on the food item's nutritional values. Emphasise the line displaying 'energy'. Discuss with students the importance of having enough energy to move, function, grow and heal each day.
4. Ask the students to compare the amount of energy in each food. Explain that the number describes a measure of energy called a joule. One thousand joules is a kilojoule. (Note: many items will have total amounts of energy as well as a description of energy per serving. Help students compare each item based on these differences.)
5. Explain how energy can be stored in our body, just as it can with the mountain pygmy-possum. Discuss why this is more important for the possum in the story than it is for us.

What's happening?

Food manufacturers are legally required to display ingredients and nutritional information about their product on the packaging, to help consumers make informed decisions. Energy in foods often takes the form of carbohydrates, both simple 'sweet' kinds (such as glucose) and more complex varieties (such as starch).

For more than a century, scientists have understood that there is a relationship between the measure of chemical energy in a food item and the amount of fat our bodies will store. However, in recent years the exact relationship has proven to be complicated – different foods might be absorbed in different ways, with individual bodies converting the energy contents into body mass in different ways.

Some animals will store chemical energy more easily for use at different times of the year, especially if they are undergoing 'quiet' periods of hibernation or torpor.

English

Time to act

Tiny Possum and the Migrating Moths is full of creative examples of verbs, each describing how something moves.

Ask students to find the following words: flitting, scampering, flutter, curling, swish, squirming, jostle, wing. Read the sentences containing these words out loud, and discuss what kind of movement each word is describing.

Write each word on a card and give it to students to act out. See if the rest of the class can guess what's on the card.

Aboriginal and Torres Strait Islander Histories and Cultures

Seasons' greetings

You will need

- Blank calendars (see printable worksheet at the end of this activity)
- Coloured pencils or highlighters
- Internet and IT technology (computer, laptop or tablet)

What to do

1. Read 'Life in the mountains' at the back of *Tiny Possum and the Migrating Moths*.
2. Divide the calendars into spring, summer, autumn and winter. Decorate each with appropriate symbols.
3. Discuss whether symbols like snow, sun, flowers and coloured leaves are equally appropriate for places all over Australia.
4. Use the blank calendars to come up with a 'birthday' for Possum's babies. Work backwards to work out when Possum might have mated with a male mountain pygmy-possum.
5. Count forward from the birthday to work out when the babies might leave the nest.
6. Add notes or symbols to describe other events during Possum's year, such as when she builds a nest or when she hunts for moths.

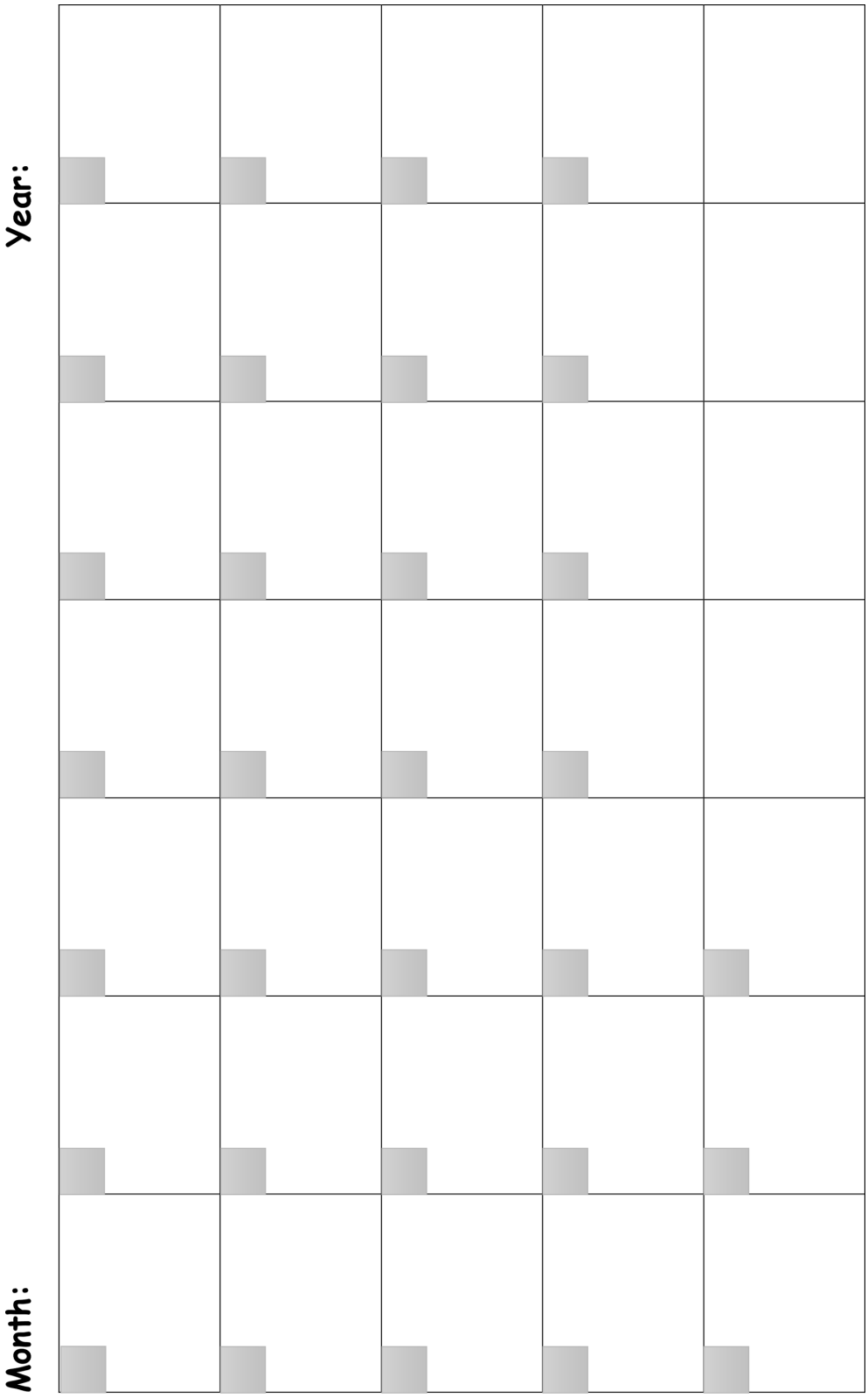
7. Direct students to the Bureau of Meteorology's Indigenous Weather Knowledge web page, bom.gov.au/iwk, and share with them the different ways seasons are defined by Aboriginal and Torres Strait Islander cultures around the land.
8. Nominate an Aboriginal and/or Torres Strait Island language from the website.
9. Use clean calendar templates to describe the different seasons local to that language group.

What's happening?

As our planet orbits the Sun, its tilt exposes the hemispheres to more or less sunlight. These variations in light have a variety of impacts on the environment, from the way plants flower and seed, to animal migrations, length of days, temperature, nature of precipitation and the direction of the wind.

All over the world, cultures have used these variations to divide the year into periods to better predict changes. With tens of thousands of years of culture passed on from generation to generation, many Aboriginal and Torres Strait Islander traditions have unique ways of describing seasons that are far more useful than those imposed by European history.

Teacher Notes



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Sustainability

Possum protection

You will need

- Recycled cardboard (old moving boxes are perfect), cut into rectangles
- Markers or poster paint
- Small lengths of wood (rulers work well)
- Masking tape

What to do

1. Read 'Saving the mountain pygmy-possum' at the back of *Tiny Possum and the Migrating Moths*.
2. Discuss with students the various ways communities are acting to conserve and increase mountain pygmy-possum numbers.
3. Invite students to come up with short messages they might share with others to persuade people in their community to take actions that would help mountain pygmy-possums survive.
4. Instruct students to use markers or paints to write these messages on the cardboard pieces.
5. Attach the signs to the wood using masking tape.
6. Display these around the classroom (or have a 'Save the mountain pygmy-possum' presentation at a school assembly!)

What's happening?

Community action is effective for changing the social conditions that put features of our environment at risk. While not all minds can be easily persuaded, simple messages communicated with emotion can often promote the values necessary for others to see a cause as worthwhile.

Australian Curriculum Links

Year level	Learning area: science	Other learning areas
Year 2	**Science Understanding: Biological sciences** • Living things grow, change and have offspring similar to themselves (ACSSU030)	**English: Language** • Understand that spoken, visual and written forms of language are different modes of communication with different features and their use varies according to the audience, purpose, context and cultural background (ACELA1460) • Understand that nouns represent people, places, concrete objects and abstract concepts; that there are three types of nouns: common, proper and pronouns; and that noun groups/phrases can be expanded using articles and adjectives (ACELA1468)
Year 3	**Science Understanding: Biological sciences** • Living things can be grouped on the basis of observable features and can be distinguished from non-living things (ACSSU044) **Science Understanding: Earth and space sciences** • Earth's rotation on its axis causes regular changes, including night and day (ACSSU048)	**English: Language** • Understand that languages have different written and visual communication systems, different oral traditions and different ways of constructing meaning (ACELA1475) • Identify the effect on audiences of techniques, for example shot size, vertical camera angle and layout in picture books, advertisements and film segments (ACELA1483)
Year 4	**Science Understanding: Biological sciences** • Living things have life cycles (ACSSU072) • Living things depend on each other and the environment to survive (ACSSU073)	**English: Language** • Understand differences between the language of opinion and feeling and the language of factual reporting or recording (ACELA1489) • Understand that the meaning of sentences can be enriched through the use of noun groups/phrases and verb groups/phrases and prepositional phrases (ACELA1493) • Explore the effect of choices when framing an image, placement of elements in the image, and salience on composition of still and moving images in a range of types of texts (ACELA1496)
Year 5	**Science Understanding: Biological sciences** • Living things have structural features and adaptations that help them to survive in their environment (ACSSU043)	**English: Language** • Understand how texts vary in purpose, structure and topic as well as the degree of formality (ACELA1504) • Explain sequences of images in print texts and compare these to the ways hyperlinked digital texts are organised, explaining their effect on viewers' interpretations (ACELA1511)
All		**Cross Curriculum Priority: Aboriginal and Torres Strait Islander Histories and Cultures** • OI.5: Aboriginal and Torres Strait Islander Peoples' ways of life are uniquely expressed through ways of being, knowing, thinking and doing.
All		**Cross Curriculum Priority: Sustainability** • OI.2: All life forms, including human life, are connected through ecosystems on which they depend for their wellbeing and survival.

Related children's books from CSIRO Publishing

A Hollow Is a Home (https://www.publish.csiro.au/book/7729)
Bouncing Back: An Eastern Barred Bandicoot Story (https://www.publish.csiro.au/book/7771)
Hold On! Saving the Spotted Handfish (https://www.publish.csiro.au/book/7903)
One Potoroo: A Story of Survival (https://www.publish.csiro.au/book/8010)

Related information books from CSIRO Publishing

A Bat's End: The Christmas Island Pipistrelle and Extinction in Australia (https://www.publish.csiro.au/book/7791)
Australian Alps: Kosciuszko, Alpine and Namadgi National Parks (https://www.publish.csiro.au/book/7282)
Extinct: Artistic Impressions of Our Lost Wildlife (https://www.publish.csiro.au/book/7976)
Recovering Australian Threatened Species: A Book of Hope (https://www.publish.csiro.au/book/7705)

Other resources

- ABC news article on 'tunnels of love' (https://www.abc.net.au/news/2016-11-16/highway-underpass-helping-pygmy-pypossums-mate/8029284)
- Kiddle Encyclopedia: 'Mountain pygmy possum facts for kids' (https://kids.kiddle.co/Mountain_pygmy_possum)
- Moth Tracker – Citizen Science Project (https://www.swifft.net.au/mothtracker/)
- NSW National Parks and Wildlife Service blog: 'A Day in the Life of a Real Superhero: Dr Linda Broome, a Threatened Species Expert' (https://blog.nationalparks.nsw.gov.au/a-day-in-the-life-of-a-real-superhero-dr-linda-broome-a-threatened-species-expert/)
- Zoos Victoria: 'Mountain Pygmy-possum' (https://www.zoo.org.au/fighting-extinction/local-threatened-species/mountain-pygmy-possum)
- Zoos Victoria: 'A call for lights off to save a species' (https://www.zoo.org.au/healesville/whats-on/news/lights-off-for-the-bogong-moths/)
- Zoos Victoria: 'Lights off for the Bogong Moths' (YouTube animation) (https://www.youtube.com/watch?v=ZAcL4FKPtHw)

Other CSIRO resources

CSIRO has developed and delivered a broad range of high-quality STEM education programs and initiatives for nearly 40 years. Our programs aim to inspire the pursuit of further STEM education among students and the community, to equip the emerging workforce with tomorrow's skill sets, and to strengthen collaboration between industry and classrooms across Australia. For more information visit: https://www.csiro.au/en/Education