INTERNATIONAL INSTITUTE FOR THE STUDY OF EXTREMELY QUESTIONABLE CREATURES

TEACHER'S NOTES

Episode Four: Offence vs Defence –
Nature's Battle for Survival



Case File: #0004
Episode length: Approximately 20 minutes
Recommended levels: Years 3–6
Adaptable for: Years 1–2 with teacher support
Main investigation: Tiger Moth, Micro Bat
Sub-investigation: Zorse / Dung Beetle / wombat
Key question: How do animals use offensive and defensive adaptations to survive in the natural world?

EPISODE OVERVIEW

In nature, survival can be a constant battle of offence versus defence.

Some animals have developed extraordinary ways to capture their prey, while others have evolved equally remarkable ways to avoid becoming somebody else's dinner.

In this episode, Senior Field Researcher Tom Bramble joins biologist and entomologist Dr Georgina Binns to investigate one of nature's most fascinating evolutionary battles: the Microbat versus the Tiger Moth.

Armed with echolocation, the Microbat is an extraordinary nocturnal hunter. But the Tiger Moth has developed remarkable defensive abilities of its own, including detecting the bat's ultrasonic calls and, in some species, producing ultrasonic clicks.

As each side develops ways to counter the other's strategies, an evolutionary arms race unfolds.

Meanwhile, reports arrive of a horse with zebra stripes. Children's author Rebecca Green helps investigate the mysterious Zorse.

Mia embarks on a mission to photograph a Southern Hairy-nosed Wombat, and a Dung Beetle joins the Institute for a rather unusual Real or Not? interview.

Through these investigations, students explore how animals survive, how adaptations develop over generations, and why even the strangest-sounding creatures deserve scientific investigation.

LEARNING INTENTIONS

Students will:

- Identify offensive and defensive adaptations in animals.
- Understand how microbats use echolocation to locate prey.
- Investigate how tiger moths detect and respond to hunting bats.
- Explore the concept of an evolutionary arms race.
- Understand how structural and behavioural adaptations help animals survive and reproduce.
- Investigate animal diversity through zorses, wombats and dung beetles.
- Distinguish between scientific observations, claims and conclusions.
- Develop questions, predictions and evidence-based explanations.

SUCCESS CRITERIA

Students can:

- Explain the difference between an offensive and a defensive strategy.
- Describe how echolocation assists a microbat in hunting.
- Identify at least two defensive strategies used by tiger moths.
- Explain an evolutionary arms race in age-appropriate terms.
- Describe what a zorse is and how it differs from an ordinary horse.
- Identify a remarkable adaptation of the Southern Hairy-nosed Wombat and the Dung Beetle.

- Use evidence to support or challenge a claim about an animal.

BEFORE LISTENING

Introduce the mystery

Ask students:
What if you were being chased by something you couldn't see, but you could hear it coming?
Now imagine you developed a way to escape.
But what if your predator then developed a new way to find you?
And what if you developed another defence?
This is the extraordinary world of predator-prey adaptations.

Opening discussion

1. What is a predator? What is prey?
2. What does offence mean in the natural world?
3. What does defence mean?
4. Can the same animal use both offensive and defensive strategies?
5. What might happen if a predator becomes better at catching its prey?
6. Can you name an animal with an extraordinary defence?

Encourage students to predict how a tiny moth might protect itself from a hunting bat.

DURING LISTENING GUIDE

Suggested listening pauses

After the Microbat's introduction: How can a bat locate a moth in darkness?

During the Tiger Moth's defence: What does the moth detect, and how does it respond?

After Dr George's explanation: Why might scientists describe this relationship as an evolutionary arms race?

During the Zorse investigation: Does an animal have to be familiar to be real?

At the end: Which animal adaptation surprised you most, and why?

CREATURE CASE FILE

Creature case file: Microbat

Classification: REAL
Animal group: Mammal
Habitat: Forests, woodlands, grasslands and other habitats, depending on species
Approximate size: Many microbat species weigh just a few grams
Extraordinary ability: Echolocation
Primary strategy: OFFENCE

WHAT MAKES MICRO BAT EXTRAORDINARY

Four extraordinary claims

1. Microbats can hunt insects in almost complete darkness.
2. Many microbats use high-frequency sounds and returning echoes to locate their prey.
3. Some bats can adjust their echolocation calls during a hunt.
4. Some bats have evolved hunting strategies that help them overcome the defences of their insect prey.

How does echolocation work?

A bat produces high-frequency sound pulses. These sounds travel through the air and bounce off objects, including insects.

The returning echoes provide information about the location, distance and movement of objects.

Many echolocating bats increase the rate of their calls as they close in on prey.

Scientific note: Not all bats use echolocation in the same way, and not all microbats are the same size. The five-gram bat in the episode represents a small insect-eating bat, not every species.

CREATURE CASE FILE

Creature case file: Tiger Moth

Classification: REAL
Animal group: Insect
Family: Erebidae, subfamily Arctiinae
Habitat: Various habitats around the world
Extraordinary ability: Detecting bat calls and, in some species, producing ultrasonic clicks
Primary strategy: DEFENCE

WHAT MAKES TIGER MOTH EXTRAORDINARY

Four extraordinary claims

1. Many tiger moths can detect the ultrasonic calls of hunting bats.
2. Some tiger moths produce ultrasonic clicking sounds using specialised structures called tymbals.
3. Certain tiger moth species can interfere with bat echolocation, making them more difficult to catch.
4. Some tiger moths use their clicks as warning signals associated with chemical defences.

How do tiger moths defend themselves?

Many moths possess hearing organs sensitive to bat echolocation calls. Detecting an approaching bat can trigger evasive flight.

Some tiger moth species go further, producing their own ultrasonic clicks. Depending on the species, these clicks may warn predators about unpleasant chemical defences or interfere with a bat's ability to track them.

Important scientific distinction: Not every tiger moth can jam bat sonar. Different species possess different defensive abilities, and the mechanisms should not be treated as universal.

OFFENCE VS DEFENCE

The evolutionary arms race. How the battle unfolds

1. The bat hunts

Echolocation helps locate flying insects in darkness.

2. The moth detects danger

Ultrasound-sensitive hearing helps some moths detect approaching bats.

3. The moth counters

Some tiger moths produce ultrasonic clicks that can warn or disrupt.

4. The evolutionary battle continues

Predator and prey adaptations influence survival and reproduction over generations.

An evolutionary arms race does not mean individual bats and moths decide to develop new abilities. It describes evolutionary changes occurring in populations over many generations through natural selection.

Students should understand that these changes do not follow a planned sequence or guarantee that one side will always improve.

DISCUSSION QUESTIONS

- Why might better hearing help a moth survive?
- Why might different bat hunting strategies be advantageous?
- Does the bat always win?
- Does the moth always escape?
- How might a change in one population influence the other over many generations?

CREATURE CASE FILE

Zorse



Classification: REAL
Animal type: Zebra and horse hybrid
Parentage: Zebra and domestic horse
Appearance: Horse-like features with variable zebra striping
Main claim: A horse-like animal can have genuine zebra stripes.

A zorse is a hybrid produced when a zebra and a domestic horse reproduce.

Zorses may have stripes across parts of their bodies, particularly their legs. Their appearance depends on their parentage and inherited characteristics.

Zorses are usually infertile because of chromosome differences between their parents.

Four extraordinary claims

1. A zorse is a genuine hybrid of a zebra and a horse.
2. Zorses can inherit visible stripes from their zebra parent.
3. Not all zorses have the same stripe pattern.
4. Most zorses cannot reproduce.

Discussion questions

- Why does a zorse have features of both animals?
- Is a zorse a separate species?
- What is the difference between a hybrid and an adaptation?
- Why might a striped horse be mistaken for something fictional?

Literacy connection: Children's author Rebecca Green joins the investigation to discuss the zorse and her book A Girl. A Boy. A Horse and a Zorse. Students can explore how authors use extraordinary real-world animals as inspiration for stories.

CREATURE CASE FILE

Dung Beetle



Classification: REAL
Animal group: Insect
Food source: Dung, for many species
Habitat: Grasslands, forests, farmland
Extraordinary ability: Some dung beetles navigate using celestial cues.

Four extraordinary claims

1. Many dung beetles eat animal dung.
2. Some dung beetles roll balls of dung many times their own weight.
3. Certain dung beetles navigate using the sun, moon or patterns of light in the night sky.
4. Dung beetles help recycle nutrients and improve soil health.

Discussion questions

- Why would dung be a valuable food source?
- How do dung beetles benefit ecosystems?
- Why is navigation useful when rolling a ball of dung?
- Would all dung beetles behave the same way?

Scientific note: Not every dung beetle rolls dung balls. Some tunnel beneath dung, while others live directly within it.

CREATURE CASE FILE

Southern Hairy-nosed Wombat



Scientific name: Lasiorhinus latifrons
Classification: REAL
Habitat: Semi-arid regions of southern Australia
Extraordinary adaptations: Powerful digging claws, sturdy body and backward-facing pouch

Four extraordinary claims

1. Southern Hairy-nosed Wombats have a nose covered with fine hair.
2. They construct and use extensive underground burrow systems.
3. Female wombats have a backward-facing pouch that helps keep soil away from their young while digging.
4. Wombats produce distinctively cube-shaped droppings.

Wildlife observation discussion

Mia's Wombat Watch provides an opportunity to discuss ethical wildlife research.

Students can investigate how scientists photograph and observe wild animals without disturbing them.

Ask: Why might a wildlife researcher wait quietly rather than approach an animal?

COMPREHENSION QUESTIONS

Remembering

1. What does a microbat use to locate insects in darkness?
2. What is echolocation?
3. What sounds can some tiger moths produce?
4. What is an evolutionary arms race?

5. What two animals are the parents of a zorse?
6. What is unusual about the diet of many dung beetles?
7. Which wombat species is Mia hoping to photograph?
8. Why do zorses have characteristics of both horses and zebras?
9. How do dung beetles benefit the environment?

Teachers Answer Guide

1. Echolocation: emitting sounds and analysing returning echoes
2. Emitting sounds and analysing returning echoes
3. Ultrasonic clicks
4. Evolutionary changes in interacting species that influence each other's survival
5. Zebra and domestic horse
6. Many feed on dung
7. Southern Hairy-nosed Wombat
8. They inherit characteristics from both parents
9. They recycle nutrients, move organic matter and contribute to soil processes

CLASSROOM INVESTIGATIONS AND ACTIVITIES

Activity 1: Echo Detectives

Science · 20–30 minutes

Explore how echoes work using a large hall or suitable outdoor space.

Students make short sounds and listen for reflections from distant surfaces.

Discuss how bats use echoes far more precisely than humans, including ultrasonic frequencies we cannot normally hear.

Activity 2: Offence or Defence?

Science · 20 minutes

Give students adaptation cards: spider web, porcupine quills, bat echolocation, skunk spray, stick insect camouflage, lion's claws and turtle shell.

Students sort each adaptation into offence, defence or both, then justify their decisions.

Activity 3: Design a Super Survivor

Science and Design · 30–40 minutes

Students invent a fictional creature with one offensive and two defensive adaptations. They draw the creature, label its features and explain how each adaptation would help it survive in a chosen habitat.

Ask students to distinguish their fictional inventions from adaptations found in real animals.

Activity 4: The Dung Beetle Navigation Challenge

Science and Mathematics · 25 minutes

Create a simple maze. Students guide a small ball through it using a fixed visual landmark, then try again with the landmark hidden.

Compare the experience with how some dung beetles use celestial information to maintain direction.

Activity 5: Wildlife Watch

Science inquiry · 20–30 minutes

Inspired by Mia, students observe a local outdoor environment quietly and record signs of animal activity: birds, insects, tracks, burrows or feeding evidence.

Students should not disturb nests, burrows or wildlife.

WRITING ACTIVITIES

Scientific explanation:

Write an explanation titled How a Microbat Hunts in Darkness. Include echolocation, ultrasound and prey.

Persuasive writing:

Which adaptation is more extraordinary: the Microbat's echolocation or the Tiger Moth's ultrasonic defence? Support your argument with evidence.

Creative writing:

Write a ringside commentary for a new animal contest, such as Spider vs Fly or Octopus vs Crab. Describe genuine animal adaptations while keeping the commentary entertaining.

Information report:

Research one animal featured in the episode and create a one-page Institute Creature Case File.

Author connection:

After hearing Rebecca Green discuss the zorse, write a story opening featuring an unusual but real animal. Include accurate facts about the animal within the fictional story.

JUNIOR RESEARCHER FIELD ASSIGNMENT

The Great Survival Strategy Search

Your mission: Find an example of offence or defence in the natural world.

Junior Researchers are to investigate their garden, schoolyard, local park or another safe outdoor environment.

Look for a creature that appears to have a special way of finding food or protecting itself.

It might be a spider building a web, an insect hiding among leaves, a bird searching for food or a snail retreating into its shell.

Record your findings:

INSTITUTE FIELD REPORT

Creature observed: _____

Location: _____

Adaptation observed: _____

Offence, defence or both? _____

How might this adaptation help the creature?

What evidence did you collect?

One question for further investigation:

Important: Observe from a safe distance. Do not touch, capture, feed or disturb wildlife.

DIFFERENTIATION

Foundation and younger primary students:
Use picture cards to sort offensive and defensive adaptations.
Focus on identifying predators, prey and visible animal features.
Encourage oral responses and drawings.

Years 3–4:
Explain how a selected adaptation works.
Compare two animals and create labelled diagrams with short explanations.

Years 5–6:
Investigate evolutionary arms races, examine different defensive strategies among tiger moth species, and explain how natural selection acts across generations.

Extension activity:
Research whether ultrasonic clicking in tiger moths is used for warning, sonar interference or both.
Compare evidence from different species.

EXIT TICKET

Before leaving the lesson, students complete:

1. One offensive adaptation I learned about was…
2. One defensive adaptation I learned about was…
3. Echolocation helps bats because…
4. An evolutionary arms race is…
5. One extraordinary animal I would like to investigate further is

TEACHER SUMMARY

Episode 4 introduces students to the extraordinary strategies animals use to survive.

The **Microbat and Tiger Moth** investigation demonstrates how predators and prey can possess interacting adaptations shaped by natural selection over many generations.

The **Zorse** investigation explores inherited characteristics and hybrid animals, while the **Dung Beetle** and **Southern Hairy-nosed Wombat** provide further examples of animal diversity and specialised behaviour.

Across these investigations, students are encouraged to question unusual claims, distinguish fact from fiction and develop evidence-based explanations.

Central learning message:

Every animal faces challenges in its environment. Adaptations can help it find food, avoid danger and reproduce, and interactions between species can influence evolutionary change.

INSTITUTE CLOSING MESSAGE

Congratulations, Junior Researchers!

You've investigated an extraordinary battle between predator and prey, discovered a horse with genuine stripes, encountered an insect with a rather unusual diet and joined Mia on Wombat Watch.

CASE FILE 004: INVESTIGATION FINDINGS
Microbat REAL
Tiger Moth REAL
Zorse REAL
Dung Beetle REAL
Southern Hairy-nosed Wombat REAL
Investigation status: CASE FILE COMPLETE

But remember, Junior Researchers: in nature, the battle for survival is never truly over.

Observe. Question. Imagine. Investigate.