Counting Coppers

PURPOSE: Ākonga will become familiar with New Zealand's butterflies. Students will work as citizen scientists to observe and record sightings of copper butterflies. Ākonga will participate in an action project to help the copper butterflies.

LEVELS: 2, 3, 4	**TIMEFRAME: 1 term**	**TEACHER: Bianca Woyak**

KEY COMPETENCIES:

- **Thinking** – understanding New Zealand has both native and introduced butterflies, and that our native butterflies are harder to see due to habitat loss, virtually unknown, being smaller and not being found in the average garden.
- **Language** – using scientific language related butterfly anatomy, using vocabulary related to the monitoring, observing and recording of copper butterflies.
- **Managing selves** – working alone and together during activities and investigations.
- **Relating to others** – sharing their ideas and understanding of butterflies.
- **Participating and contributing** – becoming part of the school-wide butterfly project and having the opportunity to lead the school in environmental initiatives. Being part of a citizen science project and contributing to scientists' research.

Science Level 1 and 2

Nature of science *Students will:*

Understanding about science

- Appreciate that scientists ask questions about our world that lead to investigations and that open-mindedness is important because there may be more than one explanation.

Investigating in science

- Extend their experiences and personal explanations of the natural world through exploration, play, asking questions, and discussing simple models.

Communicating in science

- Build their language and develop their understanding of the many ways the natural world can be represented.

Participating and contributing

- Explore and act on issues and questions that link their science learning to their daily living.

Living world *Students will:*

Life processes

- Recognise that all living things have certain requirements so they can stay alive.

Ecology

- Recognise that living things are suited to their particular habitat.

Evolution

- Recognise that there are lots of different living things in the world and that they can be grouped in different ways.

Planet Earth and beyond *Students will:*

Earth systems

- Explore and describe natural features and resources.

Interacting systems

- Describe how natural features are changed and resources affected by natural events and human actions.

Science Level 3

Nature of science *Students will:*

Understanding about science

- Appreciate that science is a way of explaining the world and that science knowledge changes over time.
- Identify ways in which scientists work together and provide evidence to support their ideas.

Investigating in science

- Build on prior experiences, working together to share and examine their own and others' knowledge.
- Ask questions, find evidence, explore simple models, and carry out appropriate investigations to develop simple explanations.

Communicating in science

- Begin to use a range of scientific symbols, conventions, and vocabulary.

Participating and contributing

- Use their growing science knowledge when considering issues of concern to them.
- Explore various aspects of an issue and make decisions about possible actions.

Living world *Students will*:

Life processes

- Recognise that there are life processes common to all living things and that these occur in different ways.

Ecology

- Explain how living things are suited to their particular habitat and how they respond to environmental changes, both natural and human-induced.

Evolution

- Begin to group plants, animals, and other living things into science-based classifications.
- Explore how the groups of living things we have in the world have changed over long periods of time and appreciate that some living things in New Zealand are quite different from living things in other areas of the world.

Science Level 4

Nature of science *Students will:*

Understanding about science

- Appreciate that science is a way of explaining the world and that science knowledge changes over time.
- Identify ways in which scientists work together and provide evidence to support their ideas.

Investigating in science

- Build on prior experiences, working together to share and examine their own and others' knowledge.
- Ask questions, find evidence, explore simple models, and carry out appropriate investigations to develop simple explanations.

Communicating in science

- Begin to use a range of scientific symbols, conventions, and vocabulary.
- Engage with a range of science texts and begin to question the purposes for which these texts are constructed.

Participating and contributing

- Use their growing science knowledge when considering issues of concern to them.
- Explore various aspects of an issue and make decisions about possible actions.

Living world *Students will:*

Life processes

- Recognise that there are life processes common to all living things and that these occur in different ways.

Ecology

- Explain how living things are suited to their particular habitat and how they respond to environmental changes, both natural and human-induced.

Evolution

- Begin to group plants, animals, and other living things into science-based classifications.
- Explore how the groups of living things we have in the world have changed over long periods of time and appreciate that some living things in New Zealand are quite different from living things in other areas of the world.

Key Questions:

- Where did butterflies come from in Māori pūrākau/ myths and legends?
- How do scientists sort and order living things?
- What are the characteristics of an insect/ butterfly?
- What is the difference between a butterfly and a moth?
- What is the life cycle of a butterfly?

Bianca Woyak

- What butterflies are native and endemic to Aotearoa/ New Zealand?
- What are the butterflies that can be found in my local area?
- Why can I not see many of the native and endemic species in my area?
- How are the native butterflies suited to their habitat?
- What defence mechanisms do butterflies have?
- Why do we need to identify the different species of copper butterfly?
- How can I help butterflies in my local area?

LESSONS:

Lesson 1- Mātauranga- where did butterflies come from?

What do we already know about butterflies/ want to know?

1. Ākonga watch the Three Baskets of Knowledge by Kiwa Digital.
2. Kaiako brings up the still image from the Three Baskets of Knowledge and asks students: "In the story where did the bugs come from? What impression does the author give of centipedes and wētā? Sandfly and mosquito? How about butterflies?"
3. Teacher asks ākonga questions to gauge their prior knowledge of butterflies. Possible Questions: What butterflies do you know of? Where do they go at night, in the winter? What are their life cycles? What butterfly species are native/ endemic/ introduced? Record their answers so you can do a comparison of current knowledge and knowledge after the unit.
4. What do we want to know about Aotearoa/ New Zealand's butterflies? Record this on a big piece of paper displayed in the class.

Lesson 2- Classification

1. Kaiako puts ākonga into small groups and gives each group a collection of everyday objects (can be anything- pens, pencils, glue sticks, dice, blocks etc.) Kaiako asks students to sort these into groups (students can do this any way they like). Once they are finished get each group to discuss how they sorted their objects (size, shape, purpose etc.)
2. Class discusses how scientists sort living things in order to understand them.
3. Class watch clip on classification;
   Animal Classification for Children: Classifying Vertebrates and Invertebrates for Ki…
4. Kaiako tells students that they are going to be looking at insects. Teacher asks "Are insects classified as animals?"
5. Class looks at the definition of an animal. ***A living organism that feeds on plants or other animals, living or dead.*** Class decided that insects are animals.
6. Teacher tells students that scientists put animals into 2 groups- vertebrates (has a backbone) and invertebrates (no backbone). Check for tamariki understanding of meanings.
7. Invertebrate/ Vertebrate game: The kaiako says an animal (dolphin, jellyfish, monkey, dog, bee etc.) and ākonga have to decide if they think it is an invertebrate or vertebrate. They hold up one finger for an I for invertebrate or two fingers in the shape

of a V for vertebrate. To help the students understand and to get a mental picture, you can search for the animal online, and show them the skeleton if it has one.

Lesson 3- Characteristics of an Insect

1. Kaiako tells students "One group of invertebrates is called insects".
2. Tamariki watch clip on insects :
   All About Insects for Children: Bees, Butterflies, Ladybugs, Ants and Flies for Kids - F…
3. Teacher asks "What are some characteristics of insects?" 6 legs, exoskeleton, antennae, breathe through skin, some can fly, body in three segments, compound eyes etc.
4. Ākonga go on an invertebrate hunt outside using the Bug Hunt resource from Kids Greening Taupo. After- check in with tamariki- "Which are insects, which are not?"
5. Kaiako question: Are butterflies insects? Why or why not - turn and talk. Go through the anatomy of a butterfly picture in resources.
1. Students make a model of a butterfly showing anatomy - see examples in resources. Share pictures of the students' models with us, we would love to see what you come up with! With your permission we will share this in our magazine and social media: b.woyak@burnsideprimary.school.nz, jacqui@nzbutterflies.org.nz.
2. Look at butterflies under the microscope and see if students can identify the different body parts and use the correct vocabulary for them.

Lesson 3- What is the difference between moths and butterflies?

Teacher info- read Brian Patrick's article here.

1. Teacher asks students: What is the difference between a moth and a butterfly? Record answers.
2. Students read the article on the 'Difference Between Butterflies and Moths' in resources. They then search the butterflies and moths named in the article online to see images of them and read more information.
3. Kaiako asks: "What is the difference between a moth and a butterfly?" Look at initial answers and change/ update these based on the new information the students have read.
4. Look at a butterfly and moth under a microscope, specifically at the hair on their bodies and their different antennae. If you don't have any specimens, have a look online at pictures.
5. Play butterfly and moth game. Ākonga are standing up, the teacher says "Moth antennae!" and students put their two hands in the air like antennae, spreading their fingers wide to make feathery antennae. Teacher then says "Butterfly antennae!" and students put their hands straight up like antennae but put their hands into a fist for the club antennae of a butterfly. Teacher repeats commands trying to catch students out.

Add in wings by saying "Butterfly resting wings, moth resting wings." When butterfly - they put their arms straight up above their heads with their hands together, and moth arms straight out behind their backs.

Lesson 4- Butterfly Defence Mechanisms

1. Students watch: Avoiding Predators: How to Avoid Being Eaten
2. Kaiako Question: How do some insects protect themselves from predators?
3. Students look at monarch caterpillars and butterflies if available to see the warning colours, if not have printed pictures.
4. Ākonga look at 'Boulder Copper Butterfly Camouflage' sheet in resources. Students look at pictures of the boulder copper wings closed and open to see how the butterfly uses camouflage.
5. Students in pairs research other animals that use camouflage. They pick one animal and report this to the class.
6. Students read an article on 'Butterfly Defence Mechanisms' from Science Learning Hub.
7. Students look at stinging nettle under the microscope, to understand how the admiral caterpillar uses the leaves to create a tent with the spikes to protect themselves.
8. Students create their own butterflies. They have to describe to the class how it protects itself from predators.

Lesson 5: Butterfly Life Cycle

1. Ākonga watch: Butterfly: A Life | National Geographic on the life cycle of a monarch butterfly.
2. Students complete the worksheet 'Boulder Copper Butterfly Life Cycle' in resources. They can include their own text on what is happening in each stage.
3. Ākonga look at the interactive Monarch Butterfly life cycle from Science Learning Hub on computers.
4. Students watch: What's Inside A Caterpillar 'Cocoon?' on what happens inside a chrysalis.
5. Ākonga look at eggs, caterpillars, chrysalis' and butterflies of various butterflies and compare and contrast. Can use a venn diagram or table to compare and contrast.

Lesson 5- Aotearoa/ New Zealand Butterflies

1. Teacher asks: Name a butterfly you have seen in New Zealand. Is the butterfly native, endemic, introduced? Native - found in New Zealand but also other places as well, for example the yellow admiral. Endemic - Found only in New Zealand and nowhere else in the world like the Canterbury boulder copper. Introduced - brought over to New

Zealand by humans like the cabbage white. List down the species the students identify for evidence of prior knowledge.

2. Look at New Zealand Native Butterflies Slide Show on Science Learning Hub. Get students to note down the butterfly's name, habitat and whether they have seen the butterfly before.
3. Kaiako asks: Is it common to see these butterflies? Why/ why not? (Due to habitat loss and the size of these butterflies we generally don't see them. Also, we usually don't grow their host plants in our gardens.)
4. Students read Our Elusive Native Butterflies article on Science Learning Hub and then do the worksheet.

Lesson 6- What butterflies are native to my area?

1. Students use the slideshow, NZ Butterfly Info website and the Butterfly Breeding Guide by Forest and Bird to research what butterflies should be found in their local area. When doing this they should also note down the caterpillar's host plant.
2. They present their findings to the class and these are collated.

Lesson 7- Case Study- B5 Project- Student Action

1. Ākonga look at the Stuff article and video on Burnside Primary School's B5 project: Christchurch schoolkids helping save butterfly on the verge of extinction | Stuff.co.nz article. KEA Kids News: Endangered butterfly given fighting chance of survival thanks to these kids | Stuff.co.nz news story.
2. Students go and see Burnside Primary School's Boulder Copper Garden and talk to the B5 students- if they are in Canterbury :)
3. Ākonga complete worksheet colouring the difference between a male and female boulder copper, look at the picture comparison in resources for colour difference.

Lesson 8- The Copper Conundrum

Kaiako: please read articles on copper butterflies from MBNZT (Moths and Butterflies NZ Trust) in the resources for background.

1. Watch short clip on copper butterflies Our Butterfly Discovery Project.
2. Read the article Why Givealittle? From Winter 2022 MBNZT.
3. Look at clip on the naming of living things All about Scientific Names.
4. Show the presentation The Copper Conundrum in resources.
5. Students brainstorm - what can we do to help the coppers? Some ideas could include: butterfly free dress day, butterfly bake sale, make posters to raise awareness, create our own butterfly garden/ habitat at school, plant lots of *Muehlenbeckia complexa* and *M. axillaris* around the school and home gardens.

Lesson 9- Counting Coppers- Citizen Science Project

1. If possible go on a field trip to find coppers in your area. Make sure you check on NZ Butterfly Info to see when the butterflies are out and about (usually warmer months are best and sunny days). Also make sure you go by the caterpillars' host plant- *M. complexa* and *M. axillaris.*
2. Record your findings on iNaturalist to help scientists identify all the copper species in Aotearoa/ New Zealand.

Lesson 8- Student Action- What can we do to help our native/endemic butterflies?

1. Plan and complete your student action. Share your action with us, we would love to see what you come up with! With your permission we will share this in our magazine and social media: b.woyak@burnsideprimary.school.nz, jacqui@nzbutterflies.org.nz