EXPRESSIONS WHIRINAKI EDUCATIONAL RESOURCE

Expressions Whirinaki Arts & Entertainment Centre is Upper Hutt's own art hub. We are committed to offering engaging and accessible visual and performing art experiences for local students and have a range of exciting and world class programmes.

INTRODUCTION

Bugs play an important role in our ecosystem, biosecurity and in our own backyards- they are our Backyard Heroes.

This hands-on educational experience brings students face-to-face with some real live mini-monsters - 'Eugene', the giant poisonous centipede, and his friends the tree wētā, stick insects, locusts, crickets, cockroaches and Avondale spiders.

Explore the secret world of bugs and the vital role they play in our lives without us even realising it!

During an educational visit, students will learn about the different native species of bugs in New Zealand and the sometimes precarious position they hold in the ecosystem, due to threats from imported pests and environmental threats. As part of the education visit students will also take part in an art activity in response to the exhibition, as well as an environmentally friendly craft.

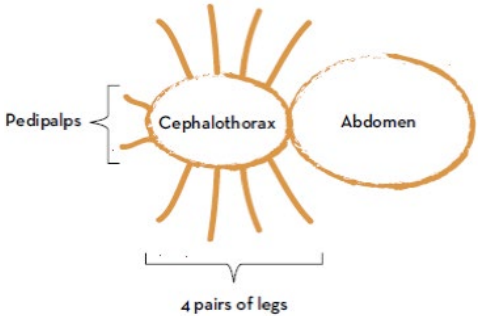
The themes within the exhibition include New Zealand native species, super heroes, bio security, citizen scientists and forensic entomology.

WHAT ARE 'BUGS'?

When people talk about Bugs they usually mean terrestrial arthropods. Terrestrial means they live on land rather than on water.

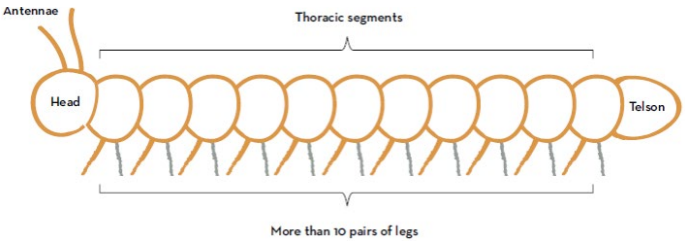
Arthropods are animals with hard exoskeletons and jointed legs that belong to the phylum Arthropoda, which is divided into four subphyla.

- Chelicerata: spiders, scorpions.
- Myriapoda: centipedes and millipedes
- Crustacea: slaters, crabs and lobsters
- Hexapoda: ants, butterflies and beetles



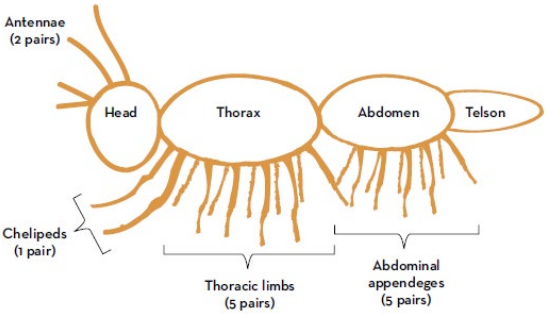
Chelicerata (spiders, scorpions)

- Chelicerata includes arachnids.
- The head and thorax are fused into one body segment: the cephalothorax.
- Arachnids do not have wings or antennae, and most can't eat solid foods.
- The pedipalps of some arachnids are long enough to look like a fifth pair of legs.
- The abdomen of a scorpion is specially adapted to form its striking tail.



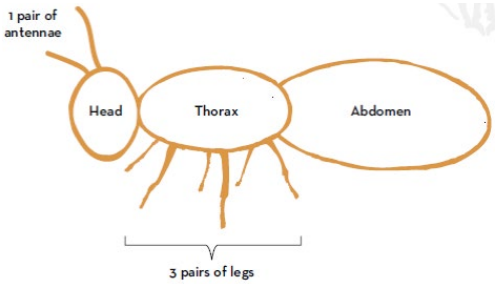
Myriapoda (centipedes and millipedes)

- One millipede species has 750 legs — more than any other animal in the world.
- Millipedes have two pairs of legs on each segment. Centipedes have only one pair on each segment.
- Some prehistoric millipedes grew to over 2 metres long.
- A 30 centimetre long giant centipede from South America can eat lizards, frogs, mice, birds — and even bats that it catches mid-flight.



Crustacea: slaters, crabs and lobsters

- In some crustacean species, the head and thorax are fused into a single cephalothorax.
- Appendages and limbs are often biramous, which means they branch into two parts.
- The cheliped is often a specialised limb, like the claws of lobsters and crabs.
- The telson never has appendages but can form a tail fan that aids swimming.
- The large number of appendages allows crustaceans to be highly specialised. They are the most diverse group of animals after insects.
- Crustacean species dominate the oceans, and some live in the deepest oceanic trenches.



Hexapoda: ants, butterflies and beetles

- Hexapods are named for their most distinctive feature: six legs.
- Hexapoda includes insects as well as three much smaller groups of wingless arthropods.
- Insects are the most diverse group of animals on the planet.
- Insects make up more than half the species of all known living animals.
- Above is the basic body plan of an insect. However, with the addition of wings, pincers, or mouthparts, insects can look quite different from this.
- The largest insect was an extinct relative of the dragonfly that had a wingspan of nearly 70 centimetres.

WHAT LIVE BUGS! WILL YOU SEE?

American cockroach *Periplaneta Americana*

Cockroaches have been around for over 320 million years and are among the most adaptable animals on earth. They are happy in almost any environment, from the freezing Arctic to sweltering tropical cities. There are approximately 4,600 species of cockroach but only 30 come into contact with humans.

The American cockroach was not originally a native of America- it migrated with sailors from Africa as early as 1625 and quickly made itself at home. It is considered one of the fastest- running insects, with a top recorded speed of 5.4km/h- about 50body lengths per second. This is the equivalent of a human running at 330km/hr

American cockroaches will eat almost anything, including glue, dead skin, dead animals, plants, soiled clothing- and even other dead or injured cockroaches. It can survive for a month without eating, two weeks without drinking and up to a week without its head!

Weta *Wellington tree weta - Hemideina crassidens)*

Weta are a group of insects that are native to Aotearoa, with different species endemic to different geographic locations.

They are giant flightless crickets, and some are among the heaviest insects in the world. Generally nocturnal, most small species are carnivores and scavengers while the larger species are herbivorous. Wētā are preyed on by introduced mammals, and some species are now critically endangered. The males are smaller than the females, but have larger heads. Females look like they have a stinger, but this is actually and ovipositor for laying eggs. Weta will give a bite if they feel threatened but are generally harmless.

Maori believe that the giant weta is the the offspring of punga, the god of ugly things. In Legend, Weta were one of the many insects sent by Whiro to attack his younger brother Tane as he ascended into the heavens to retrieve the three baskets of knowledge. Can we look beyond an ugly exterior to find wonder and understanding?

Avondale Spider *Delena Cancerides*

The Avondale spider is a species of huntsman spider, which is typically large and flattened looking. This species is a pale fawn or grey in colour. Occasionally other species, such as the Christchurch huntsman, are found.

An Australian immigrant, the Avondale spider gets its name from the Auckland suburb where it first became established. They have not spread widely, possibly because of a lack of suitable habitat.

Avondale spiders are nocturnal, and by day prefer to hide under the loose bark of trees. They do not use a web to catch prey. Instead, they wait for a potential victim to come close enough to capture with their front pair of legs and pull into their fangs.

These spiders featured in the movie Arachnophobia. Australian regulations prohibited their export from there as they are native wildlife. However, the New Zealand population has no such protection and staff at Landcare Research in Auckland were able to provide enough spiders for the movie.

The Avondale spider is rather docile and shows little inclination to bite anything other than suitably sized prey.

Giant Centipdede *Cormocephalus rubriceps*

Cormocephalus rubriceps is a large centipede of the family Scolopendridae, and is native to Australia and is widespread in the North Island of New Zealand. It grows up to 25 cm in length; it is the largest centipede in New Zealand.

This species can be still found in the North Island, but the full-sized ones are only found on the rat-free offshore islands like the Poor Knights. Found under stones and logs in bush or gardens.

It is large, fast and venomous and can deliver a poisonous bite using its razor sharp, claw-tipped pincers. It is a predacious carnivore feeding on insects, spiders, snails, slugs and worms after killing them with a lethal injection of poison. They also kill small lizards.

In New Zealand, introduced rats have reduced the numbers of these giant centipedes. Predatory ground beetles and large spiders hunt the juveniles. The female centipedes carry their young to protect them.

Migratory Locusts *Locusta migratoria*

Locusts are certain species of short-horned grasshoppers in the family Acrididae that have a swarming phase. These insects are usually solitary, but under certain circumstances they become more abundant and change their behavior and habits, becoming gregarious. No distinction is made between locust and grasshopper species; the basis for the definition is whether a species forms swarms under intermittently suitable conditions. These grasshoppers are innocuous, their numbers are low, and they do not pose a major economic threat to agriculture. However, under

suitable conditions of drought followed by rapid vegetation growth, serotonin in their brains triggers a dramatic set of changes: they start to breed abundantly, becoming migratory when their populations become dense enough. They form bands of wingless nymphs which later become swarms of winged adults. Both the bands and the swarms move around and rapidly strip fields and cause damage to crops. The adults are powerful fliers; they can travel great distances, consuming most of the green vegetation wherever the swarm settles.

Locusts have formed plagues since prehistory. The ancient Egyptians carved them on their tombs and the insects are mentioned in the Iliad, the Bible and the Quran. Swarms have devastated crops and been a contributory cause of famines and human migrations.

They are also edible insects; they have been eaten throughout history and are considered a delicacy in many countries.

Crickets *Gryllidae*

Crickets have a cosmopolitan distribution, being found in all parts of the world with the exception of cold regions at latitudes higher than about 55° North and South. They have colonised many large and small islands, sometimes flying over the sea to reach these locations, or perhaps conveyed on floating timber or by human activity.

Crickets are found in many habitats. Members of several subfamilies are found in the upper tree canopy, in bushes, and among grasses and herbs. They also occur on the ground and in caves, and some are subterranean, excavating shallow or deep burrows. Some make home in rotting wood, and certain beach-dwelling species can run and jump over the surface of water.

Most male crickets make a loud chirping sound by stridulation (scraping two textured limbs together) in the case of crickets this is by rubbing their top wings together.

Several types of cricket songs are in the repertoire of some species. The calling song attracts females and repels other males, and is fairly loud. The courting song is used when a female cricket is near and encourages her to mate with the caller. A triumphal song is produced for a brief period after a successful mating, and may reinforce the mating bond to encourage the female to lay some eggs rather than find another male. An aggressive song detects the presence of another male cricket.

Crickets are efficient at converting their food into body mass, making them a candidate for food production. They are used as food in Southeast Asia, where they are sold deep-fried in markets as snacks. In BUGS Our backyard Heroes students can investigate the possibility of using crickets as an alternative protein source for us going forward.

BIOSECURITY: PROTECTING TO GROW NEW ZEALAND

Queensland fruit fly- a threat on out local agriculture monitored closely by the Ministry for Primary industries

Aotearoa is an island nation. We need to protect our ecosystem and the crops we grow, use and export as a country.

The Maori world view asks of us knowledge of the interconnectedness of all living things, and to develop a sense of guardianship towards our natural environment. This Guardianship is referred to as Kaitiakitanga.

Technology allows humans to have an unprecedented influence over our environment and the bugs that live here. We must learn to live with bugs because we probably wouldn't survive without them. For example, without pollinators such as bees, beetles, flies and butterflies, most flowering plants would disappear. This includes many food crops.

But on the other hand, bugs are often in conflict with human expansion. Large stores of food or crops, the travel of humans and trade, attract insects and enable their distribution. We call bugs pests when we provide them with ample food and a chance to create new habitats, and spend millions of dollars trying to control their numbers.

How do we protect the food we eat without harming the bugs we need? The implementation of this is called Biosecurity. The Ministry for Primary Industries is responsible for the control of pests, including bugs into Aotearoa. The biosecurity system prevents or manages risks from harmful organisms, like pests and diseases.

The biosecurity system helps protect New Zealand's economy, environment, human health, and a range of social and cultural values. It does this by:

- stopping pests and diseases before they arrive
- dealing with any if they do enter the country.

MPI is the lead agency for biosecurity. They administer the Biosecurity Act 1993 and advise the Minister for Biosecurity on biosecurity issues. MPI provide inspectors at the border who manage risks from people, planes, vessels (like ships) and goods coming into the country. They also maintain a system for rapidly responding to detections of new, harmful pests and diseases.

Other groups also play a role in our biosecurity system:

- other government departments may become involved when a pest or disease affects their responsibilities
- industry organisations will sometimes take the lead in managing harmful pests or diseases that affect their members
- regional councils play a major part in pest management within their regions
- iwi or community groups may work with MPI to manage or eradicate harmful organisms that are of concern to them
- landowners and occupiers who have a responsibility to manage pests on their properties.

MPI have many resources online for teaching what they do in the classroom. A link to this can be found in the online resources section.

To discuss this topics further in the classroom use the following enquiry questions

- What can we do to encourage beneficial bugs in our environment? How do we benefit from these bugs?
- What bugs do we need to prohibit from coming to Aotearoa, how might we do this, and why?
- What Bugs have cause problems to our industries in the past, and how was this mitigated?

BIOMIMICRY AND TECHNOLOGY- WHAT CAN WE LEARN FROM BUGS?

Bugs are our backyard heroes. They have been inspiring science, technology and art for centuries.

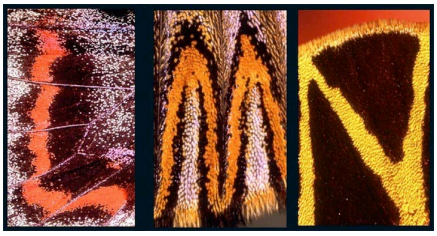
Bio mimicry is the science of copying nature in form, function or strategy. Biomimicry can help solve complex issues and create new ways of thinking about problems. Humans can learn a lot from the process of natural selection in nature, where in efficient ways of doing things are eliminated over many generations.

Humans have an incredible capacity for critical thinking, so we can be inspired by other organisms to create exciting new technologies and solutions to human problems. Exploring biomimicry is an opportunity to dive head first into inspiration, invention, and innovation. Just like the scientists who are creating the technology of the future, we can research bugs and find ways of solving problems. Examples of biomimicry include robots that can leap on water- like the water strider bug, and robots that can build structures, like termites.

Art inspired by Bugs

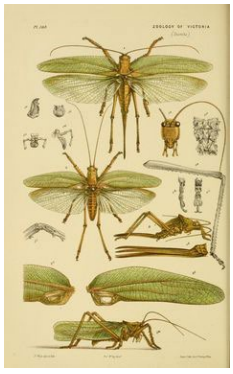
Bugs have been inspiring artists with their color, form and beauty for centuries. Many bugs have spiritual or religious meaning to cultures, and well as being a means to reflect on themes such as life and death, transformation, and the beauty of the natural world.

Members of the Art Nouveau movement used dragonfly and bug motifs (e.g. Tiffany lampshade)



The photographer Kjell Sanded spent 25 years documenting all 26 characters of the Latin alphabet using the wing patterns of butterflies and moths as "The Butterfly Alphabet".

Artist Anna Collette created over 10,000 ceramic insects at Nottingham Castle for her work "Stirring the Swarm."



Victorian trends of scientific drawing, still in mass reproduction today, extended scientific knowledge as well as were beautiful depictions of Bugs in their various forms.

SOME AMAZING BUG SUPER HEROES

Smith's dragonfly *Procordulia smithi*

Dragonflies have been flying for over 300 million years. They are an engineering masterpiece, with extremely good visual processing, strategic hunting, and acrobatic flight capability. This combination of expertise makes that dragonfly one of the most successful hunters in the animal kingdom, with almost 100% of hunts resulting in a meal.

Human aviation is just over a century old and has been primarily powered gliding. But we're doing what we can to catch up with the dragonfly's skill. We're experimenting with micro aerial vehicles (MAVs), to help us understand the limits and potential of the physics of flight.

Bombardier beetle *Carabidae*

Beetles are the most diverse insects group in the world, with over 400,000 species. There are more than 500 species of bombardier beetles worldwide, and they're found on every continent except Antarctica. They're carnivorous and hunt at night for insects.

The defense mechanism that gives the bombardier beetle its name is made up of a complex system of glands in its abdomen. These glands allow the beetle to mix two chemicals to create an explosive reaction that shoots out of its abdomen in a pulsing, high pressure spray. Its abdomen is flexible enough for it to aim this hot, smelly explosion at any attacking insect or spider.

Froghoppers *Cercopoidea*

There are approximately 2400 species of froghoppers around the world, with 15 species found in New Zealand.

Adult froghoppers are ginormous jumpers. Some species can jump up to 70cm high. This is a huge distance for a tiny bug and makes them even more impressive jumpers than fleas, which can on average jump up to 30cm high.

A froghopper jumping 70cm is the equivalent of an average sized human jumping over a building 210m tall.

Leafcutter ant *Alta sexdens*

Leaf cutter ants spend their days collecting leaves on which mould grows to feed their colony. They are found in parts of North and South America.

These ants can lift a lot of weight, compared to their very small bodies. A leafcutter ant can carry up to 50 times its own weight in its jaws. For a 60 kg human this means carrying 3000kg in your mouth each day!

TUIA 250 IN BUGS: OUR BACKYARD HEROES

Students will look at the impact of introducing new species to Aotearoa, specifically at the times of Maori and European settlement. Students will investigate what bugs the settlers and ocean voyagers bought along with them, knowing, or unknowingly, and how this has affected our nation.

They will also look at our intention going forward as a "Clean and Green" nation, and what we might to do preserve and encourage our natural environment as its kaitiaki, or guardians.

Traditional Maori ideas about Bugs

Pre European times, insects and bugs were viewed as a collective in all their forms, larval and fully grown. This collective was known as the "insect people" and were descendants of the Maori gods Tangaroa, and of Tane and Peketua.

Insects most frequently referred to in pre European times had a direct influence on the Maori; e.g., moths, butterflies, blowflies (and related species), sandflies, mosquitoes and spiders figured in his spiritual and mythological interpretations, and in the practice of the magic arts.

On the other hand, caterpillars, grasshoppers, locusts and beetle grubs jeopardized vegetable food supplies, personal comfort was influenced by mosquitoes, sandflies, lice, and by fleas to a less extent; also Maori relished certain beetles, moths, with their larvae, as well as cicadas and earthworms; the cicadas were a symbol of spring and the harvest; from the "vegetable caterpillar" was secured a black tattooing pigment for personal adornment. Huhu grubs were also a food source for Maori.

Enquiry questions

- How and why has food changed over time?
- What impact has human use and settlement had on your area?
- How has our nation changed over time, with regard to habitat for insects?
- What is the impact of introducing new species?
- What can we do to keep New Zealand Beautiful?

European settlement, resulted in the introduction of rats, stoats and cats to New Zealand, and in these days, there was no concern for the effect these introduced species would have on endemic species. The introduced predators did not affect the bug population as much as the bird population, with only one species becoming extinct during this time, a Ground beetle, which was due to habitat clearing rather than introduced predators

In more recent times however, our biosecurity has become important to us, and new voyagers to Aotearoa need to consider our rigorous biosecurity measure when entering the country, which is implemented by Government agencies such as the Ministry of Primary industries, New Zealand customs, and the department of Conservation.

LESSON PLAN

In Gallery (45 minutes)

Introduction by educator (10 minutes)

- What do we mean by "Bugs"?
- Why are bugs amazing?
- What bugs are unique to us in in Aotearoa?

Using a student led model, a Class will be divided into four with adults allocated to each group.
Students will research and present to the group their findings on their allocated section. (20 minutes)

- Biosecurity
- Bugs as food
- New Zealand Habitats
- Bee amazed: kaitiakitanga of our bees and why they are important.

Free time to look about exhibition (10 minutes)

Summary: in Group with Educator (5 minutes)

- Why are bugs important to us?
- How can we be bug heroes?
- What are some activities we could do to encourage bugs in our environment?

Green Room art lesson (60 minutes)

Seed bombs

Using resources provided by Expressions, each student will make their own bee-friendly seed bomb to encourage bees in their local environment.

Collaborative art

Concurrently, students as a class will work on a collaborative artwork reflecting on the theme of bugs, this will be using mixed media, or an ink and paint activity, dependant on resources. Each class will have this project to take back to school

EDUCATIONAL LINKS

Science

This exhibit has string links to the science curriculum. Students will learn about the nature of science, particularly the living world, understanding the processes of life and coming to an appreciation of the diversity of living things. The exhibit enables the students to come to an understanding of the interaction between the living and non-living environment, understand the processes that drive change over a period of time, and be able to discuss the implications of these changes.

Science Achievement objectives

Levels 1-2

Life processes: through viewing BUGS! Our Backyard heroes' students will recognise that all living things have certain requirements so they can stay alive and recognise that living things are suited to their particular habitat.

Planet earth and Beyond: students will describe how natural features are changed and resources affected by natural events.

Levels 3-4

Nature of science: students will, through viewing BUGS Our back yard heroes come to an appreciation that science is a way of explaining the world, and that science knowledge changes over time. They will identify ways in which scientists work together to support their ideas, and begin to use a range of science vocabulary.

Living world: through the exhibition experience, students will recognise that there are life processes common to all living things and that these occur in different ways.

Ecology: students will identify how living things are suited to their habitat and how they respond to environmental changes.

Evolution: students will explore and come to an understanding of the difference between species, and begin to look how plants, animals and other living things are grouped in to science based classifications.

Planet Earth and Beyond: BUGS! Our Backyard heroes will bring students into an appreciation of the resources of our planet, their makeup, and how these resources interact.

Levels 5-6

Nature of Science: students will understand through viewing BUGS! Our Backyard heroes that scientist' investigations are informed by current scientific theories and aim to collect evidence that will be interpreted through processes of logical argument.

Communication in science: students will apply their understanding of science to evaluate popular scientific texts (including visual and numerical literacy)n as well as study live species.

Living world: students will relate key structural feature and functions to the life processes of plants, animals, and microorganisms, and investigate environmental factors that affect these processes.

Eco systems: students will investigate the interdependence of living things in an ecosystem through viewing BUGS! Our Backyard heroes

Level 7-8

Understanding about science: through viewing BUGS! Our Backyard heroes students will understand that scientists have an obligation to connect their new ideas to current and historic scientific knowledge.

Communicating in science: students will use accepted science knowledge, vocabulary, symbols and conventions when evaluating accounts of the natural world, and consider the wider implications and/or representation employed.

Participating and Contributing: students will use relevant information to develop a coherent understanding of socio scientific issues that concern them, to identify possible responses at both personal and societal levels

Living World: ;ife processes, ecology and evolution. Students will understand the relationship between organisms and their environment, through viewing the exhibition. They will explore the evolutionary processes that have resulted in the diversity of life on earth, and appreciate the place and impact of humans within these processes.

The Arts

Education visits to BUGS! Have strong links to the visual arts curriculum, around the learning strands of developing ideas in the Visual arts. Students will explore and describe how different media influence the communication and interpretation of ideas in their own and in others work. They will use critical analysis to inform, interpret, and respond to the photographic and scientific medium used in the exhibit.

Visual Arts Achievement objectives

Levels 1-3

Students will express visual ideas in response to a variety of motivations using imagination, observation, and invention with materials. DI

Students will describe ways in which objects and images can communicate stories and ideas. CI

Level 4

Students will explore and describe how different media influence the communication and interpretation of ideas in their own, and others work. CI

Levels 5-8

Students will investigate, consider, and analyse the relationship between the production of art works and the context in which they are made, viewed and valued. UC

Students will investigate, analyse and evaluate ideas and interpret artists' intentions in an art work. This will lead to critical reflection of the art work, and to research and analysis of selected theories related to visual arts practise. CI

KEY COMPETENCIES

Thinking
Students will use creative and critical thinking to make sense of the information, experiences and ideas explored in the gallery.

Using Language, Symbols and Text
Students will make meaning of the language, symbols, text and specific terminology of the text.

Managing self
At Expressions Whirinaki, students are welcomed into a new learning environment, where they can gain meaning from the exhibit and create artworks in response to it. Students need to act appropriately for the setting to optimise their visit and to meet the challenges of the exhibit environment.

Relating to others
Expressions Whirinaki educational visits rely on small group learning. Groups interact in a new environment discussing, developing and sharing ideas.

Participating and contributing
Students come to an understanding of the role of the gallery in the local and wider community. They will make connections between the exhibit and their relevance to local and global environments.

PRE AND POST VISIT ACTIVITIES

These are attached to this resource as a pdf and available in gallery as a hard copy for students to select.

READING LIST

Which New Zealand Spider
Andrew Crowe

Which New Zealand Insect
Andrew Crowe

Know Your New Zealand Native Insects & Spiders
J.W. Early

A Photographic Guide to Insects of New Zealand
Brian Parkinson

Collins Pocket Guide to New Zealand Mini Beasts
Terence Lindsay

ONLINE RESOURCES

www.thisisus.nz
New Zealand bio security page with links to 2025 goals and mission statements

www.landcareresearch.co.nz/resources/identification/animals/bug-id/what-is-this-bug
Land care research bug identification page

www.thoughtco.com/insects-4133406
Online resources, tools and articles about insects

www.kidzone.ws/animals/arthropod1.htm
Basic information about arthropods

collections.tepapa.govt.nz/topic/9419
Spiders and insects in the collection of Te Papa

PLANNING A VISIT

Getting here

Public Transport: with buses and trains stopping at Upper Hutt Station, Expressions is just a five minute walk down the road.

Bringing your own bus or cars: car parking and bus drop off points are right behind Expressions in the carpark near H20 Xtream swimming pool.

During Your Visit

Lunch & morning tea:
We have an indoor space to enjoy morning and afternoon tea should the weather require (subject to availability)

School bags & jackets:
Yes you can bring your school bags and jackets as we have a space for them while you visit.

For further information or to book a visit please contact

Claire Mepham, Learning Programmes Specialist
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education@expressions.org.nz
www.expressions.org.nz

Claire is also available throughout the year to visit your school and discuss the exhibition programme and the opportunities for your students.
Please contact her to make a time to visit you.