**ACTIVITY: Introducing biodiversity**

**Activity idea**

In this activity, students are introduced to biodiversity. They make models of a marine ecosystem and use their models to explore human impact on ecosystems and biodiversity.

By the end of this activity, students should be able to:

* define biodiversity
* explain why biodiversity is important
* describe one marine ecosystem and how some of its members depend on their habitat
* give an example of how human impact can be harmful to marine ecosystems and biodiversity
* describe some ways we can help sustain our biodiversity.

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**Introduction/background**

In this activity students are introduced to the concept of biodiversity – a concept that is becoming increasingly important in the marine science world. The New Zealand Exclusive Economic Zone (surrounding waters) is the fourth largest biodiversity area in the world and new species are regularly being found. Our biodiversity is still being mapped. Many species we do know about are endemic, which makes our biodiversity unique. Biodiversity shapes our national identity and has an intrinsic value. It has also become valuable economically – besides fishing and tourism, scientists are discovering some species that can generate biological chemicals offering potential for discovery in medicine (anti-cancer drugs) and agriculture (pesticides).

This activity requires students to research a marine ecosystem and build a 3D model or diorama to depict their chosen ecosystem. First, students plan their ecosystem by considering the features it would probably have, such as an estuary having sand and mud, freshwater and seawater. While students may not be able to represent the water, they will need to think about materials they could use for sand and mud. They then need to think about animals and plants for their ecosystem such as algae, mangroves, mud crabs, worms, cockles, pipi, juvenile fish, wading birds and so on. Students will need to research food webs to make sure that all the animals in their habitat have food – students could use an internet search engine to ask, for example, ‘What do pipi eat?’ (see [Examples of food webs](#examples)). They will need to consider adaptive features of the plants and animals to show how they might be protected by their habitat.

Animals and plants should be freestanding so students can move them about as they play out certain scenarios of human impact. Several plants and animals of the same species should be made for the scenarios so that impact on particular species can be explored. For example, the impact on an ecosystem of a species being fished out completely could be compared to sustainable approaches (the animal removed through controlled fishing practices could be replaced by the same species through reproduction).

The models should be used so students can ‘see’ what might happen if their ecosystem was affected by some human impact. First, they could be introduced to what effects the removal of a species might have on the ecosystem (whatever else is dependent on that organism could die off as well) and then they could play out what might happen if there was some human impact on their ecosystem – the cause of a species’ demise.

Students may wish to make models of sediment and types of pollution to show what would happen to the biodiversity if the pollution entered the ecosystem. Coloured dots could be added to animals to represent heavy metals and polycyclic aromatic hydrocarbons (PAHs) ingested by them. One dot could mean the animal is sick and doesn’t feed well, two dots means it doesn’t feed well or reproduce, three dots means the animal is dead. Students could describe these events when they talk about their scenario.

***Examples of food webs***

* Estuarine food web:
<https://niwa.co.nz/education-and-training/schools/students/estuaries#whatenc>
* Rocky shore food web: [www.pathwayz.org/Tree/Plain/ROCKY+SHORE+FOOD+WEB](https://www.pathwayz.org/Tree/Plain/ROCKY%2BSHORE%2BFOOD%2BWEB)
* [Building Science Concepts: Tidal communities](https://www.sciencelearn.org.nz/resources/3072-building-science-concepts-tidal-communities) (includes 3 diagrams of food webs from mudflats, sandy shore and the rocky shore)
* [Marine food webs](https://www.sciencelearn.org.nz/images/380-marine-food-web) (image)

**What you need**

* Access to [Biodiversity in the Bay of Plenty](https://www.sciencelearn.org.nz/resources/1124-biodiversity-in-the-bay-of-plenty), [Habitats in the Bay of Plenty](https://www.sciencelearn.org.nz/resources/1123-habitats-in-the-bay-of-plenty), [Adapting to marine habitats](https://www.sciencelearn.org.nz/resources/1126-adapting-to-marine-habitats), [Human impacts on the Bay of Plenty](https://www.sciencelearn.org.nz/resources/1137-human-impacts-on-the-bay-of-plenty), [Resilience to stress](https://www.sciencelearn.org.nz/resources/1129-resilience-to-stress) and [Pollution from *Rena*](https://www.sciencelearn.org.nz/resources/1138-pollution-from-rena)
* Copies of the student handout [Ecosystem research design brief](#brief)
* Copies of the student handout [Habitat survival](#survival)
* Materials for 3D models or dioramas, such as cardboard, shoeboxes, images of animals and plants, modelling clay, sponge, polystyrene, cloth, sand, paint, coloured pencils, Blu-Tack

**What to do**

1. In pairs, have students work out what biodiversity means by obtaining the dictionary meaning for ‘bio’ and ‘diversity’. As a class, discuss a possible definition for biodiversity.
2. Read [Biodiversity in the Bay of Plenty](https://www.sciencelearn.org.nz/resources/1124-biodiversity-in-the-bay-of-plenty) in pairs or small groups. Discuss the importance of biodiversity as a class.
3. Hand out copies of the student handouts [Ecosystem research design brief](#brief) and [Habitat survival](#survival) (students will need several copies of this) and discuss. Explain that each group needs to create a 3D model or diorama of a selected marine ecosystem (coastal beach, estuary, rocky shore or offshore island):
* The design should show as many features of the ecosystem as possible including appropriate aquatic plants and animals.
* Make sure the animals in your habitat all have something to eat and have some form of protection (for example, they can burrow into the sand to hide). Also be aware of where in your habitat your animal lives (for example, shellfish live in sand or mud on the seafloor).
* Try to make the animals and plants freestanding so that they can be moved around.
* Make several animals and plants of the same species (for example, a number of algae plants and a number of tuatua and so on).
1. Before students start their model, they should:
* read [Habitats in the Bay of Plenty](https://www.sciencelearn.org.nz/resources/1124-biodiversity-in-the-bay-of-plenty) and [Adapting to marine habitats](https://www.sciencelearn.org.nz/resources/1126-adapting-to-marine-habitats)
* use the internet to research their New Zealand marine ecosystem to find out what it might contain and how organisms survive in that ecosystem
* complete the student handout [Ecosystem research design brief](#brief)
* complete the student handout [Habitat survival](#survival) – they need one oval for each animal
* show the teacher their completed handouts.
1. Have students compare their group’s model to a different ecosystem model. How are they different? How are they the same?
2. Read and discuss [Human impacts on the Bay of Plenty](https://www.sciencelearn.org.nz/resources/1137-human-impacts-on-the-bay-of-plenty), [Resilience to stress](https://www.sciencelearn.org.nz/resources/1129-resilience-to-stress) and [Pollution from *Rena*](https://www.sciencelearn.org.nz/resources/1138-pollution-from-rena).
3. Have student groups use their model to play out various scenarios:
* What would happen if all of one species was fished out?
* Remove one species from your ecosystem. How would it affect your ecosystem?
* What happens to the animals that eat the species you have removed?
* Remove another species. What are the effects on the whole ecosystem?
* What would happen if you added something detrimental to your ecosystem such as sediment or pollution – poisons like heavy metals and PAHs or oil from ships? What would this affect immediately? What else might happen to your ecosystem?
* Think of some other scenarios that could impact on your ecosystem.
1. Have each group choose one scenario (a human impact) to show the class. Group members take turns to describe and show events happening in their ecosystem.
2. Discuss in groups or as a class how people could help to protect biodiversity in marine ecosystems.

**Student handout: Ecosystem research design brief**

Research, design and make a 3D model or a diorama of a New Zealand marine ecosystem (an estuary, coastal beach or rocky shore) that can be used to explain biodiversity to people.

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| --- | --- |
| **Features:** What ecosystem features will you include? | **Plants and animals:** What plants and animals will you include? |
| **Materials:** List all the materials that you will use to make your model/diorama. | **Equipment:** List all the equipment that you will use to make your model/diorama. |
| **Using your model:** Describe how you could use your model to promote the importance of biodiversity to people and the importance of caring for our ecosystems. |

**Drawing:** On the next page, sketch your design – label features, animals and plants.

**Drawing:** Sketch your design – label features, animals and plants.

**Student handout: Habitat survival**

It lives in/on

It eats

It is eaten by

It is protected by

The animal is

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It lives in/on

It eats

It is eaten by

It is protected by

The animal is

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

It lives in/on

It eats

It is eaten by

It is protected by

The animal is

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