**ACTIVITY: Prey behaviour: freeze or flee**

**Activity idea**

In this activity, students take on the role of a native frog, native bird or introduced mammalian predator and participate in a physically active simulation. The activity highlights different predator/prey strategies and one aspect of why mammalian predators have had such a dramatic effect in New Zealand.

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

* give examples of different strategies used by predators to capture prey as well as defence strategies used by prey to avoid predation
* describe some of the unique features of New Zealand frogs
* better understand why introduced mammalian predators have had such a dramatic effect in New Zealand.

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**Introduction/background**

***Defence mechanisms***

Prey species have many different adaptations to help them avoid predation. These are commonly called defence mechanisms. The types of defence mechanisms used by prey species vary according to adaptations of the predator, for example, whether the predator hunts using sight or smell.

Some typical defence mechanisms include:

* highly developed sense of sight, smell and hearing to detect predators early (these work particularly well in open spaces)
* living and moving about in large groups (safety in numbers)
* being able to send warning signals to other members of their group or species
* chemical defences (for example, native frogs secrete a substance from their glands that gives them an unpleasant taste)
* being well camouflaged in their habitat
* ‘freezing’ or playing dead and remaining motionless (this is often combined with camouflage)
* specific patterns of behaviour (for example, all our native frogs are nocturnal, which is a good defence strategy when your predators hunt using sight).

***New Zealand’s unique ecology***

New Zealand’s native species evolved in isolation for millions of years after the last land bridge to Gondwana was lost. Birds and insects dominated our ecosystems, and the only native mammals are 2 species of bat. Our native animals and plants evolved without developing defence mechanisms against many large predators. As a result of this unique history, the survival methods of our native reptiles and amphibians are not adapted to predatory animals introduced by Polynesian and European settlers, and these predators have had devastating effects. For example, our native frogs had evolved a ‘freezing’ defence mechanism – this is very effective against birds that hunt using sight but useless against mammals that hunt using smell.

For more information about New Zealand’s native frogs and their conservation, see the article [Native frogs](https://www.sciencelearn.org.nz/resources/1380-native-frogs) and visit the [NZFROG website](http://www.nzfrogs.org/). See [New Zealand’s unique ecology](https://www.sciencelearn.org.nz/resources/1440-new-zealand-s-unique-ecology) for more information about their evolution.

**What you need**

* A large area, for example, a school field, court or hall.
* 3 hula hoops (if none are available, use string or chalk to designate the ‘shelters’).
* Food tokens (poker chips, milk bottle caps etc.) enough for 3 per student.
* Approximately 15 vests, bibs or bandanas to designate predators (2 different colours are required – 1 for birds and 1 for mammalian predators).
* Whistle.

**What to do**

***Introduction***

1. Discuss the terms ‘predator’ and ‘prey’. Come up with a class definition and ask the students to give examples.
2. On one side of the board, brainstorm a list of adaptations that help predators to catch their prey. On the other side of the board, brainstorm a list of defence mechanisms used by prey. How are these two lists related to each other?
3. Watch the video clip [Threats to New Zealand frogs](https://www.sciencelearn.org.nz/videos/621-threats-to-frogs). What defence strategies do our native frogs use? Why do these strategies not work with introduced mammalian predators? This might be a good opportunity to discuss some of the unusual features of our native frogs and our unique ecology.

***Activity***

1. Set up the [activity area as shown](#activity).

1. Explain to the students they are going to take part in a simulation. They will each be taking on a different role.
2. Divide the students into 3 groups. There should be approximately 1 predator for every 6 prey. For example, in a class of 28 students, you should have 2 birds, 2 mammalian predators and 24 frogs.
3. Explain the objective and role for each group.

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| **Frogs**  ***Goal:*** Collect 3 food tokens without being captured | ***Role during the activity:*** Frogs must move between the frog log and insect area to collect food tokens. They can only collect 1 token on each visit and must return to the frog log each time. They can use the temporary shelters for no more than 5 seconds. When the whistle blows, they should freeze on the spot. If captured, they should move to the waiting area. Encourage the frogs to get into character, for example, by lunging to catch their prey or being silent (native frogs do not croak). |
| **Native birds**  ***Goal:*** Capture a frog | ***Role during the activity:*** Move around the activity area. When the whistle blows, they must stop on the spot. Native birds hunt by sight and hearing so they can only catch frogs that are close by. Therefore, if a frog is within arms reach, they can tag this frog and the frog must move to the waiting area. Encourage the native bird predators to get into character, for example, by flapping their wings or making bird-like sounds. |
| **Mammalian predators**  **Goal:** Capture a frog | ***Role during the activity:*** Move around the activity area. When the whistle blows, they must stop on the spot. Mammalian predators use their sense of smell to hunt prey and can therefore detect frogs that are further away. They can tag the closest frog and the frog must move to the waiting area. Encourage the mammalian predators to get into character, for example, by making obvious sniffing sounds as they hunt their prey. |

1. Allow students time to move to their respective starting areas and begin the activity. Allow the students to move around and get into character. Blow the whistle and give captured frogs time to move to the sidelines.
2. Play for 2–3 rounds and then make an announcement that there has been a dramatic increase in mammalian predators. 4 frogs in the waiting area now become mammalian predators. Play the game for 2 more rounds.
3. Start the game again and allow students to try out all roles.
4. Discuss.

***Variations***

1. Introduce the scenario of habitat loss. After the 1st round, remove 2 of the 3 temporary shelters. How does this impact on the activity?
2. Introduce the idea of the frog disease chytridiomycosis. Instead of having students play the role of birds, they become the chytrid fungus (which causes chytridiomycosis). Instead of capturing a frog, if they are able to tag 1 and this represents the spread of the disease, the frog ‘dies’ and must go to the waiting area.

**Discussion questions**

* What sort of food do you think the food tokens represent?
* How do mammalian predators locate their prey?
* How do the native birds locate their prey?
* Which type of predators had the biggest impact on the number of frogs? Why is this the case?
* What factor might lead to an increase in mammalian predators?
* What other factors affect the survival of our native frogs?
* Is there anything we can do to help protect native frogs? What actions could we take?

**Activity area set-up**

