Neighbourly Interactions

Pre-Visit Activities

Prior to their visit, students should have a basic understanding of the differences between food chains, food webs and ecosystems, as well as some of the interactions that occur within an ecosystem. The following activities will help your students develop a clear understanding of these topics so that they are ready to delve into the program on the day!

Activity 1: Food Chains and Food Webs

All living organisms require energy to move and grow. Sharks in the ocean require energy to hunt down their prey – fish require energy to swim away from predators. Where do animals get their energy from? From the food they eat! The process of digestion releases energy.
A **food chain** demonstrates how each living thing obtains its food and generally has no more than four or five links. Yet most animals are part of more than one food chain and eat more than one type of food – a number of food chains can be interconnected to form a **food web**. Energy travels from prey to predator in the form of food and is shown in a food chain/web by an arrow. For example:

Seaweed → Fish → Bigger Fish → Seal

Food chains/webs almost always start with plants. Plants are called **producers** as they use sunlight to produce their own food (photosynthesis – *this would be an appropriate time to teach students this topic)*. Animals are called **consumers** as they cannot make their own food and therefore need to eat plants and/or other animals. Animals that only eat plants are called herbivores; animals that eat other animals are called carnivores; and those that eat both are omnivores. Finally, **decomposers** are living organisms that feed on decaying matter, such as bacteria and fungi.

Option A: Create a food chain and food web

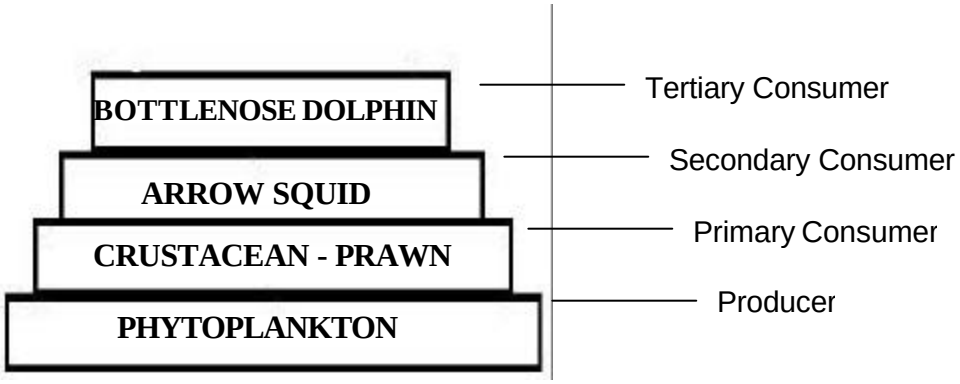
Get the students to design a marine food chain and then a food web. Give them the option of deciding how they would like to create it. For example they could draw a poster or make a model using food or play dough - let them be creative! Your assessment should be based on whether the students understand the difference between a food chain and a food web.

OR

Option B: Create a trophic food chain

Why are there more producers than consumers in an ecosystem? And why are there more herbivores than carnivores? The food chain/food web simply shows that energy passes from one organism to the next. In reality, it is only a fraction of the energy that gets passed onto the next organism - a large amount is lost to the outside environment in the process. This occurs when energy changes form, some of the energy has to be used to make the change. So the most energy efficient organisms are those that get their energy directly from the sun, while the least efficient are carnivores.

Using Worksheet 1, have the students fill in their own trophic pyramid of a marine food chain. Get the students to choose a predator and work down the trophic levels. Students should use books and the internet to find out what their predator eats and then translate that into the trophic pyramid. Their pyramid should look something like the following:



Alternatively students could cut out pictures or draw pictures for each of the different trophic levels.

Activity 2: Studying trophic levels

Why are there more producers than consumers? And why are there more herbivores than carnivores? The food chain/food web shows that energy passes from one organism to the next. In reality only a fraction (approx. 10%) of the energy gets passed onto the next organism (trophic level) as a large amount is lost to the environment. This occurs when energy changes form, some of the energy has to be used to make the change. So the most energy efficient organisms are those that get their energy directly from the sun, and the least efficient are carnivores.

This is a hands-on approach that requires students to use field work to learn about trophic levels.

Materials

- Ruler
- Calculator
- String
- Wooden stakes
- Plant and insect field guide

Safety

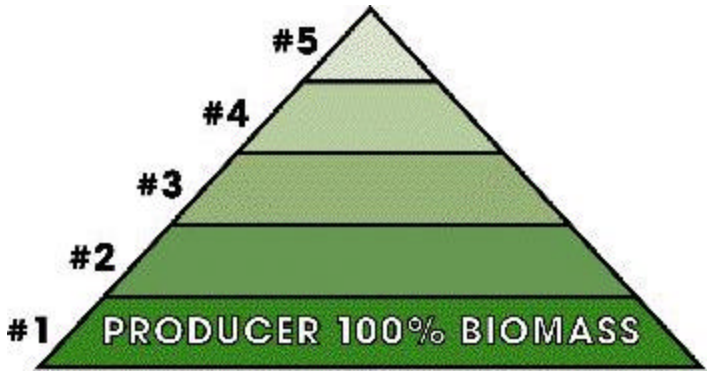
- Be careful of poisonous plants and insects

Choose a large outside area and divide it into smaller sections of equal area, using the wooden stakes and string. Students are divided into pairs, each of which is assigned a section. They need to count and record the number of organisms in each section, using the table on Worksheet 2. It does not matter if they do not know the proper species name, as long as they can distinguish between one species from another (i.e. species 1, species 2, and so on). It is important that each name chosen is consistent amongst all groups. In order for students to correctly number the species you may want to go outside prior to this lesson and have the students identify and label each organism. The same process should be undertaken for plants. The best size for each individual section depends on the relative size of the organisms within that area. For smaller organisms such as insects the section can be small (preferable), whereas for mammals the section would need to be much larger. A semi-completed worksheet would look something like the following:

Names: Kirsty and Bob **Section Number:** 3

Species Number	Total Number in section	Species description
Species 1.	13	Ant
Species 2.	5	Spider
Species 3.	20	Plant

Once the students have completed their tally, obtain a class average for each species by adding the numbers together and then dividing by the total number of sections. Then create an ecological pyramid of organisms found in your area, using the format below:



Students will need to allocate their different species to different levels – it may be necessary to conduct some web research to decide whether they are primary, secondary or tertiary consumers. An impromptu food web might even be in order! For the sake of this exercise assume that decomposers are belong to the herbivore group (primary consumers). Otherwise, leave them out of the exercise from hereon.

Next add the numbers of organisms in each row together. Hopefully the numbers of organisms will decrease with each ascending level.

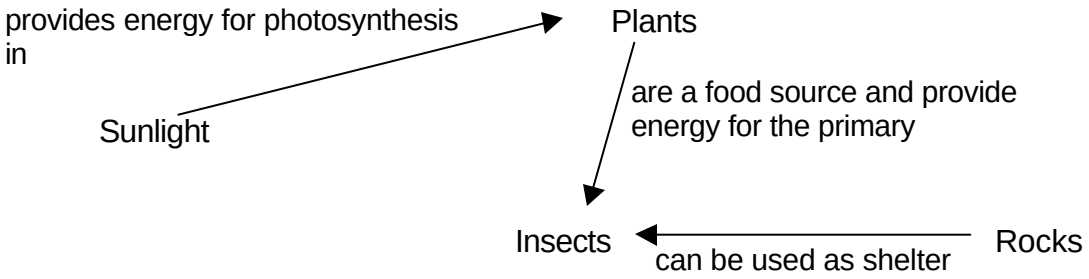
Finally, assuming that the producers' level contains 100% of the original energy, calculate the amount of that energy stored in each successive level using the following rule:

- A consumer retains about 10% of the previous trophic level's biomass.

Activity 3: Ecosystems

Ecosystems have many components that can be broken into two major categories, **abiotic** and **biotic**. Abiotic factors refer to the non-living components, such as the sun, water and rocks. Biotic factors refer to the living components, such as the plants and animals.

Take the students into the schoolyard to explore their local "school" ecosystem. Get the students to make a list of five biotic and five abiotic factors found around their school. Students will then use this list to come up with a concept map to link all these factors together. This will help the students to understand how living and non-living organisms interact. For example:



Activity 4: Pollution of the Ocean

This activity introduces students to water pollution in our oceans, as well as ways that they can make a difference in keeping it clean and healthy.

Materials

- The story (Worksheet 3)
- Two large clear containers (like a fish bowl) half filled with water
- 24 film canisters with labels – Two sets 12 canisters filled with each of the following:

Human Activity	Substance	Quantity
Oil Tanker	Vegetable oil	1 teaspoon
Beaches	Litter	Plastic, Styrofoam
Homes	Yellow water and toilet paper	1 drop yellow food dye & small piece toilet paper in full canister of water
Fishermen	Nylon line	10cm or more
Recreational boats	Litter	Plastic
Commercial fishing vessel	Red water (blood)	1 drop red food dye in full canister of water
Gardens	Baking soda (pesticides)	½ teaspoon
Road	Balsamic vinegar (acid run-off)	½ canister
Factory	Soap water (detergent)	1 drop detergent in full canister of water
Farming country	Baking powder (fertilizer)	½ teaspoon
Dredge	Silt	½ teaspoon dirt in full canister of water
Herd of cattle	Muddy water	¼ canister dirt in full canister of water

Divide the students into two groups of 13 and distribute the canisters to 12 students in each group. The remaining student in each group will act as a narrator. Remind them not to open the canisters until their 'character' emerges in the story, at which point they are to empty their canister's contents into the clear bowl of water – 'the ocean'. Have the two groups read their story in a dramatic way, stopping at the end of each section when a 'character' is mentioned.

When they have completed this exercise, the students can discuss how the different types of human activities impact on the environment and what they might do to help protect the oceans.

Post-Visit Activities

Following their visit students will have the knowledge and skill to explain how different organisms interact with each other in Port Phillip Bay's Ecosystems. They will also have explored how overfishing, pollution and the introduction of exotics can change the components of an ecosystem and how it can affect food webs.

Activity 1: Survival in the Wild

This outdoor game teaches children how delicate ecosystems can be. Each and every species of an ecosystem is reliant on the others for survival. When humans intervene and disrupt this balance then things can get pretty messy.

Materials

- 30 students (you can also work with a larger number)
- A large field
- 17 × 9 green ribbons (represents herbivores, that have 9 lives)
- 9 × 6 blue ribbons (represents omnivores, that have 6 lives)
- 3 × 3 red ribbons (represents carnivores, that have 3 lives)
- 18 × green headbands, 9 × blue headbands, 3 × red headbands, 1 × white headbands
- One survival card for each player
- Ink pads and different stamps to represent vegetation, water and shelter
- Socks

Each student is assigned a role in the ecosystem (herbivore, omnivore or carnivore). Each category is given a number of lives - herbivores have 9 lives, omnivores 6, and carnivores 3.

The coloured headband helps the students to identify the different animals and the coloured ribbon represents a life. When the students loose a life they loose one of these ribbons. Basically, the principle of the game is for the carnivores to chase and eat the herbivores and omnivores; the omnivores are to chase and eat the herbivores and find vegetation to eat; and the herbivores to find vegetation to eat, as well as stay away from the predators.

The other part of the challenge is to have 'vegetation', 'water' and 'shelter' stations that each animal also has to get to in order to survive. These should be randomly hidden around the field. Each student will be given a survival card. The omnivores and herbivores need to get a stamp from all three stations, whereas the predator only needs the 'water' and 'shelter' stamp.

Finally, humans will be introduced to the game. The student with the white headband represents humans. He/She will have a collection of socks that can be thrown, and if any hit a player then he/she (human) gets to decide whether to take away a life away or replenish a life.

When a player has been caught by its predator, it must surrender a life. The predator then must wait 30 seconds before he may catch the same or another victim. Once an animal has run out of lives it can become a human.

Extension: To make it more realistic, you could also add disease and natural disasters to the game.

Make sure you leave time to discuss with the students the interactions that were occurring in the ecosystem and how the balance was changed.

Activity 2: Designing a 'Healthy Bay' brochure

Students use the information they have gathered from the excursion as well as researched material from books and internet to design a brochure about some of the things people can do to maintain a 'Healthy Bay'. Some of the things they may want to include are recycling, don't litter, stick to fishing regulations, etc…

Activity 3: Your local ecosystem

Students can take a look into the history of the school's local community. They can create a timeline and discover how the ecosystem has changed over the years and discuss what may caused these changes.

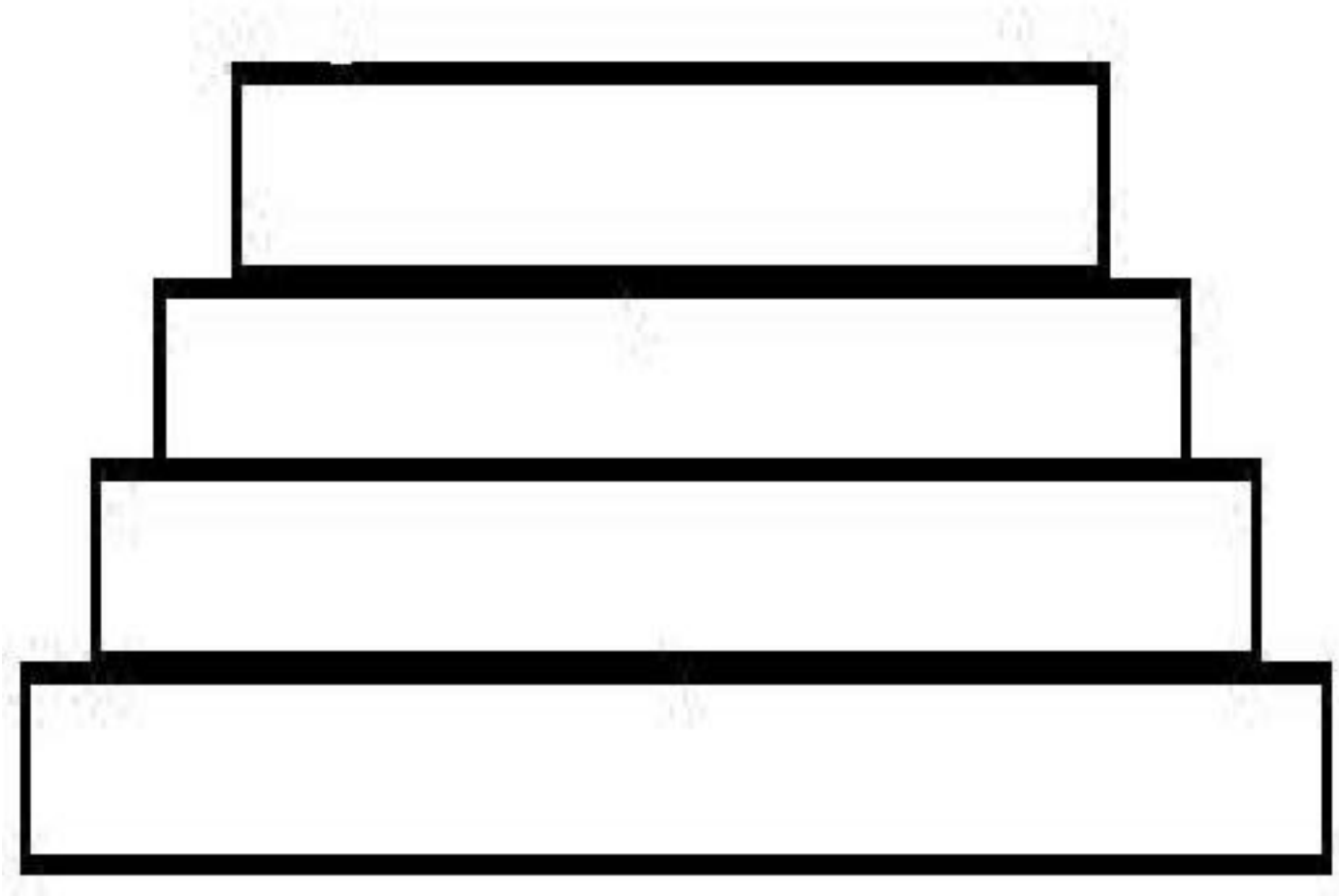
Activity 4: Human intervention

Students choose an ecosystem to explore. Through research they can learn about the different components of their ecosystem. Then introduce some possible human activities to their ecosystems and get them to hypothesise some of the changes that these may have on the ecosystem.

OR

Design a hypothetical ecosystem for your students. Then introduce human activities and get them to hypothesise some of the changes that could occur to the ecosystem.

Worksheet 1: Trophic Levels



Worksheet 2: Organisms in our ecosystems

Species Number	Total Number in section	Species description
Species 1.		
Species 2.		
Species 3.		
Species 4.		
Species 5.		
Species 6.		
Species 7.		
Species 8.		
Species 9.		
Species 10.		

Worksheet 3

The Story of the Ocean

This is the story of a very special ocean. It is a tale that explains how the water from a river reaches the sea. At the start of the river, there is a large **factory**. It uses detergents to keep its production equipment clean. At the end of each day the dirty water is hosed off and washed into the gutter, down the storm water drain, and into the river.

Next to this factory is a busy **road** that the employers travel to and from every day. Oil drips out of many of these cars. Every time it rains these pollutants are washed down into the storm water drains.

Further down, the river weaves its way through **farming country**, where recently the crops were fertilized. They were then watered and the run-off ended up into the river. On this farming land, a **herd of cattle** are feeding on the vegetation surrounding the banks. As there are few tree roots around to support the banks, as the cattle trample over the vegetation it collapses into the river.

The water continues its journey, down the river, carrying all the pollutants that it has picked up along the way. It is now heading through the suburban parts before it arrives at the ocean. Along here most people have **gardens**. To keep their gardens pest free, people use pesticides. When the people water their gardens the pesticides wash off and end up down the storm water drains. People inside their **homes** are busy eating and drinking. After a satisfying meal Tom goes to the toilet. His waste is then flushed down the toilet into the sewage system that also ends up in the river.

At last the river meets the sea, but it is not the end of the journey. Along the side of the ocean families are enjoying themselves on the **beaches**. When they get up to go home, they realise there are no bins around and leave their litter strewn across the beaches. At night when the

tide comes in, it collects these bits of rubbish and carries them out to sea with it. In the middle of the ocean **fishermen** are out late trying to catch a fish for tea. Some of the line gets tangled up and is of no use to them, so they just cut it off and let it wash out to sea.

During the day a number of boats leave a harbour and head out to the ocean - amongst these are **recreational boats**. The people on board are going out to enjoy the lovely sunny day out on the ocean. They bring with them a picnic, but once they have finished eating they toss they're garbage overboard. On the other side of the ocean a **commercial fishing vessel** is making its journey back into the harbour. Along its way it throws left over scraps, over the side of the boat.

A large **oil tanker** is also making its way to the harbour. It is carrying oil. All of a sudden there is a loud bang. Everyone on the bay turn to look in its direction. The ship has hit a rock. The channel was not deep enough for such a large vessel. Oil spills out all over the ocean. Plants and animals are covered in the filthy muck. A penguin suffocates in the mess.

Six months later the government has cleaned up the mess, but has also decided to **dredge** the channel to avoid another mishap like this. The dredge rips apart habitat and changes the environment of the ocean. Sand and silt is stirred up so the animals cannot see or breathe.

Could this really be the end of the story? Is this how you want your ocean to end up?