

LIVING THINGS

The Pond Community



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INTRODUCTION

Living Things is a series that focuses on animals and plants in a variety of natural communities. The series aims to stimulate children's interest in, and understanding of, the living communities around them. It helps them identify members of these communities and provides information about their life cycles and the food chains they are involved in.

This resource, *The Pond Community*, consists of a picture pack containing twenty-five photographs, a copymaster of a sample pond community food web, and these teachers' notes. The notes provide a description of each picture and suggestions for activities.

The picture pack is intended for use with classes from standard three to form four before, during, and after a field study of a local pond environment. Small groups of students could study selected pictures, or base a study around them. Topics for discussion or study could be taken from the section headings in these notes, for example, "Fish" or "Birds". The pictures could be used in many other ways, for example, as part of a class display or for individual work.

The Pond Community could be studied under the achievement objective, "Making Sense of the Living World", in *Science in the New Zealand Curriculum*. It is suitable for students at level three and above.

Pond Study Equipment

One of the most useful pieces of equipment for collecting fishes from the pond is a plastic sieve with a nylon mesh. These are now readily available in most hardware stores, are strong, and do

not rust. Used with an extension handle they can serve a general purpose: a long-handled pond net or a hand-held scoop net. These and a plastic basin are adequate for an introductory pond study.

Maori Terms

Many of the plants and animals which inhabit the pond environment are native, and have Maori names which preceded their European designations. However, these names were, and are, not uniform throughout the country. Nor do all native species have a Maori name. For example, while the general word for shrimp in Maori is *koেকে*, there is no specific word for the freshwater shrimp. Likewise, *pepeke* is the Maori term for frog, including the introduced Golden Bell frog. The native frog, however, is unlike other frogs in that it does not lay eggs. There is, therefore, no Maori term for tadpole.

It would be a worthwhile overall activity for students involved in a pond study to find out the local Maori names for the plants and animals they encounter during their research.

THE POND ENVIRONMENT

Photograph 1 The Pond

A pond may be described as a quiet body of water shallow enough for rooted plants to grow completely across it. Ponds are formed in a number of ways. Some are natural low-lying areas of land that collect water from the surrounding country. Others, called oxbow ponds, form as floods alter the course of rivers, while many ponds are artificially created for water storage. The pond is an exciting world of interesting plants and animals. Many of the smaller pond creatures are easily captured and kept in the classroom in an aquarium or artificial pond made from a plastic sheet.

Activities

- Make some investigations to find out how local ponds have been formed.
- Make a species list of all the living things you can find in a pond.

Photograph 2 Zonation

Zonation is the term given to distinct distribution patterns formed when organisms grow in specific habitats. In this photograph the pond plants fall into three zones. One is along the bank where rushes and grasses are growing. The common name for this grass is floating sweet grass. It grows from damp banks, and where its blades touch the water they float like little canoes. The second zone is in the shelter of the bank where small, free-floating plants have collected. The third consists of underwater plants which grow up from the bottom in deeper water and reach the surface to flower. Collected among these is a mass of light green algae.

Activities

- Try to discover any features that enable plants to grow in their particular zone.
- Find other evidence of zonation in the pond environment.

PLANTS

Photograph 3 Duckweed and Azolla (*Retoreto*)

Several species of plants float freely on the pond surface. They are frequently blown around by the wind and are favourite foods of water fowl, especially ducks. Duckweed is a common example of such plants. These tiny herbs are among the smallest seed plants known. Sometimes they produce little flowers, but reproduction is mainly by division of the plant itself. Another type of floating fern is the Azolla. These plants have leaves that look like fish-scales. Although each plant is only about 1 cm in diameter, many plants clump together to form large reddish-green mats on the surface.

Activities

- Float some duckweeds and floating ferns in a jar and make a drawing of the different parts to show comparisons.
- How many other floating water plants can you discover?

Photograph 4 Attached Floating Plants

Many of the plants in the pond grow up to the surface from the bottom where they have a strong root formation. The plant with the white flower is a milfoil. Just under the surface in the middle

is Elodea (Canadian pondweed), a common aquarium plant, while the larger floating leaves belong to Potamogeton (pondweed).

Activities

- Name the insect in the photograph and try to work out what it might have been doing.
- What other insects or small creatures can be found among the floating plants?

Photograph 5 Underwater Plants

The bottom of the pond is usually covered by an accumulation of decaying plant and animal matter. It is similar to the compost we put on our garden. In fact, in many ways the underwater plants grow just like our home garden except that they are submerged.

Activities

- What special features do underwater plants need to survive?
- What interesting features can you find in this photograph?
- How many underwater plants can you discover in your own pond?

INSECTS

Photograph 6 *Ngā Puene o ngā Waeroa* Midge Larvae

In the debris at the bottom of ponds there are many worm-like creatures. Some of these are true worms which may be either round or flat. The round worms can be either segmented or unsegmented. Not every worm-like creature that lives in the sediments is actually a worm. The red-segmented creatures in the photograph are actually midge larvae. They develop into tiny flies which fly in dense swarms over water areas. Other examples of worm-like creatures are crane fly larvae, mosquito larvae, and the free-living caddis larvae.

Activities

- Try to find out how many different worm-like creatures actually live in the pond until they mature.
- Work out the life cycle of one of these.

Photograph 7 *Tiemiemi* Damselfly

These are two species of damselfly in New Zealand, the red and the blue. The blue species is illustrated in this photograph; however, the red is the more common. During mating, male and female damselflies fly in tandem. In this formation they will often move in under water so that the female can lay her eggs. If there are sufficient floating plants, she will sometimes use her long abdomen to reach under the water and lay eggs on the underneath surface of the plants. Both adults and larvae are carnivorous and prey on smaller animals.

Activities

- How do damselflies differ from the larger dragonfly?
- Draw the life cycle of the damselfly.

Photograph 8 *Ngā Puene o ngā Tiemiemi* Damselfly Larvae

When the damselfly larvae hatch, they are only about 2 mm long. They capture food with a structure called a mask which protrudes backwards below the head. When prey is within range, the mask is shot forward to grasp the prey and drag it into the mouth. Growth occurs through successive moults until the wings form and the adult emerges. Tiny wing buds are just showing on the specimen in the photograph. Damselfly larvae are recognised by three tail gills through which they breathe.

Activities

- Collect some mature damselfly nymphs and keep them in an aquarium with plenty of pond weed. Some will eventually emerge as adults. Make a diary of the developing stages.
- What can you discover about the underwater habits of the damselfly larvae?

Photograph 9 *Kapokapowai* Dragonfly

New Zealand has eleven species of dragonfly. The order to which these insects belong is Odonata. These insects have two pairs of veined wings of approximately the same size. They have narrow bodies and very large eyes. All hunt on the wing. This dragonfly is one of the most common and, with a wing span of up to 12 cm, is also the largest. The larvae are sluggish creatures that live in mud in the bottom of ponds. They may take up to six years to develop.

Activities

- Find out about the order Odonata.
- Compare a damselfly and a dragonfly and make sketches of each.

Photograph 10 Backswimmer

Backswimmers are water bugs. They belong to the order Hemiptera. They have piercing and sucking mouth parts, and prey on small water creatures such as water fleas and tiny fish. The backswimmer is so named because of the way it swims in an upside down position with its legs facing the surface. Its hind legs function as oars. Its other two pairs of legs are used to hold prey and to cling to underwater plants while resting. This is particularly important after the backswimmer has been to the surface for a new air supply which it holds among hairs on the abdomen. This "bubble of air" tends to raise the backswimmer to the surface so it needs to be able to hold fast.

Activities

- Place some backswimmers in a jar of water and make a diary of their movements during a five-minute period.
- Research additional information about backswimmers.

Photograph 11 Waterboatman

The waterboatman lives in ponds along with backswimmers and is also found in quiet areas of rivers and streams. Unlike the backswimmer, this insect swims the right way up. Each pair of legs on the waterboatman is different. The front legs are short and are used to gather food. The middle legs are long and are used to hold the insect in position, as in the photograph. This is important because the waterboatman cannot float in mid-water and so must swim all the time unless anchored. The hind legs are flattened and hairy and are used for swimming. The waterboatman is vegetarian. It feeds on microscopic food particles which are collected either from plants or from the debris on the bottom. It has strong wings and can migrate from pond to pond by flying.

Activities

- Place a few backswimmers and waterboatmen together in a jar and make a list of all the differences you see.
- Find out about other species of water bugs.

Photograph 12 Common Stick Caddis

Caddis flies are small moth-like insects that rest in the vegetation around areas of water. They lay their eggs in the water, and most of the larvae of the different species build shelters for the underwater stage of their life cycle. This stick caddis has chosen a piece of grass stalk as a home, and for camouflage has added pieces of grass and rush which it has nipped off and tied to its home with web. When mature, caddis flies move to the surface quickly, emerge as adults, and fly away. When one fisherman opened the stomach of a trout that he had caught, he found that it contained over 800 caddis fly larvae.

Activities

- Carefully remove a stick caddis larva from its house, and try to observe what it does in preparing a new home.
- Draw the caddis fly's life cycle.

BEETLES

Photograph 13 Diving Beetle

There are more than 300 000 species of beetles worldwide. Of these, just a few live under the water. Several of these aquatic beetles live in New Zealand. The largest is the common diving beetle. It grows to about 12 mm in length. To obtain air for its underwater activities, this beetle collects a large bubble from the surface. The photograph shows the beetle holding the bubble under its wing covers in the tail area. Water beetles are carnivorous and will often take prey larger than themselves. They fly and swim well.

Activities

- Find out about other species of water beetles. There are up to eighteen in New Zealand.
- Place a diving beetle in a jar of water containing some stones and twigs. Study its actions.

CRUSTACEANS

Photograph 14 Koeke Freshwater Shrimp

Shrimps have five pairs of limbs which take the form of walking legs and nippers. Sometimes they are described as "ten-footed crustaceans". Although there are more than 70 species of shrimps and prawns recorded in New Zealand, only this species has so far been found in fresh water. These shrimps usually come out at night to feed on dead organisms. They breathe through a series of gills that is found along the side and under the body.

Activities

- Shrimps can move in three ways. Study them to find out about this.
- How would you describe a crustacean?

MOLLUSCS

Photograph 15 Ngā Pūpū Waimāori Pond Snails

Molluscs are soft-bodied animals without any segmentation. They usually have a hard external shell in which they live. Slugs are common exceptions. Although this large pond snail is one of the most easily found shellfish, it is not the most numerous. There are over ten common freshwater shellfish to be found in New Zealand. This large pond snail was introduced to New Zealand as trout food. It glides along on a muscular foot and is able to find its food and direction by the tentacles and eyes that can be seen at the front. Its mouth is equipped with a radula, a file-like structure that is used to grasp the food from underwater objects.

Activities

- Try to observe some pond snails feeding on slime on the sides of an aquarium. How do they feed and move?
- Find out about the life cycle of pond snails.
- How many freshwater shellfish can you find and describe?

AMPHIBIANS

Photograph 16 Frogs' Eggs

Although, as adults, most amphibians live on the land, they return to the water to breed. Eggs are often laid in the early spring, under logs or in ground cavities, after the frogs have emerged from their winter habitats. Frogs' eggs are surrounded by a jelly which swells quickly on contact with water. This jelly sticks them together, and protects them from injury and attacks from underwater organisms. It also attaches them to foliage. The developing eggs can be seen to change in colour as cells divide and multiply until tiny black tadpoles are obvious within the egg. Sometimes frogs' eggs are called spawn.

Native frogs do not lay eggs. Therefore, there is no Maori term for frogs' eggs or for tadpole.

Activity

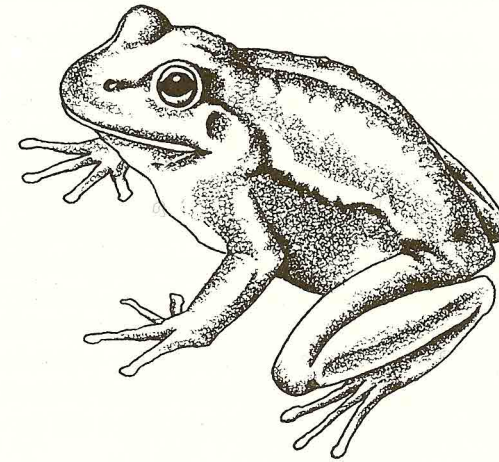
- Find out about frogs and illustrate the changes that take place within them.
- If possible, collect some frog eggs and watch their development in an aquarium. Keep a diary of their progress.

Photograph 17 Tadpole

This tadpole is about six weeks old. It has already undergone several changes after hatching from its egg. For the first few days, tadpoles breathe through tiny external gills. After four or five days, these gills begin to be covered by a fold of skin called an operculum and the tadpole starts swimming vigorously. At about the stage illustrated, the tiny back legs can just be seen, and after three months, the tadpole is nearly ready to leave the water. Breathing changes from relying on gills to lungs and skin, and the tadpole's diet changes from vegetable to animal materials.

Activities

- Collect some tadpoles for study and illustrate the various changes as they develop.
- List some questions about tadpoles to which you would like to find the answers.



Photograph 18 Pepeke Frog

The Golden Bell Frog is one of the largest in New Zealand. It is found throughout the country and gets its name from the golden marking along the sides. However, its colouring is quite variable, and in some localities species may be quite dark, with the golden area not easily seen. This frog can also change its colour to some extent, depending on its surroundings. It was introduced from Australia.

Frogs have a loose-fitting skin which must be kept damp as their breathing is partly through their skin and partly through lungs. All frogs are carnivorous and have powerful hind legs for jumping and swimming. Their eyes, as well as providing excellent vision, are pulled down into the head to help force prey down the throat. Frogs catch their prey either by extending their long sticky tongues or by jumping at their prey with the mouth wide open.

Activities

- What can you find out about the different frog species in New Zealand?
- How many different things will frogs eat? Make a chart that illustrates their diet.

FISH

Photograph 19 *Ngā Tuna Eels*

In New Zealand, eels are our largest freshwater fish. A large specimen can reach 1.5 metres. There are two species, the shortfinned and the longfinned eels. Eels have one pair of fins just behind the gills, and another single continuous fin runs along the back and around the tail.

Eels eat a wide variety of animal matter. They are scavengers in freshwater areas, feeding on dead animals and taking live fish and even ducklings when there is an opportunity. They can travel over wet land on damp nights and so can reach many pond areas. The life cycle of the eel is not yet known in detail but it is known that eggs hatch in the sea, and shoals of tiny eels, called elvers, run up our rivers. Eels may take a long time to mature and will live for twenty or more years.

Activities

- Find out all you can about how the Maori have made use of the eel.
- What additional information can you find about the life cycle of an eel?

Photograph 20 *Giant Kōkopu*

Each spring, large shoals of tiny fish we call whitebait move up our rivers and streams. These shoals contain a mixture of at least five species of fish. A small percentage of these are kōkopu. There are several species of kōkopu, which are also sometimes known as native trout. The species in the photograph is the giant kōkopu. It can grow to over 400 mm in length. These secretive fish are found in quiet rivers and streams and, over time, many have found their way into ponds.

Kōkopu eat a wide range of food. One fish has been observed to eat flies, moths, beetles, bees, wasps, smaller fish, and pieces of meat. Kōkopu, like all “whitebait”, including those known as inanga and kōaro, are recognised by a small dorsal fin close to the tail.

Activities

- How many New Zealand freshwater fish can you describe?
- Keep some kōkopu in an aquarium and observe their habits.

BIRDS — WADERS

Photograph 21 *Poaka Pied Stilt*

Most ponds are visited by waders. These birds have long legs, and usually have long necks and bills that enable them to grasp underwater prey. Pied stilts are one of the most common waders in ponds and are increasing as more and more farmers make dams and ponded areas to provide water for their stock.

Often the pied stilt will build its nest near ponds but where possible it will choose a site on a small island in the pond. This is a deterrent to predators like stoats and cats. The young stilt can run and feed within hours of hatching. During the winter, larger flocks of pied stilts migrate to warmer areas and estuaries but return to widely distributed areas for the breeding season.

Activities

- Try to identify all the waders in the ponds in your own locality.
- What special features enable waders to survive in their water habitat?

BIRDS — DIVERS

Photograph 22 *Kawauwhā Little White-throated Shag*

Shags can fly, swim, and dive with ease. They are experts at catching fish under water and their special bill enables them to hold on to slippery prey until it is eaten. There are over twelve New Zealand species of shags, several of which visit ponds where they feed on fish and tadpoles. Shags commonly nest in trees, cliffs, thick shrubs, and similar habitats.

Activities

- Find out why many fishermen say that shags are pests. Do you agree?
- What features enable shags to be successful underwater hunters?

Photograph 23 Pūtangitangi Paradise Duck

This is a native species. The female, as illustrated in the photograph, has a conspicuous white head. The male is a much darker bird. Paradise ducks often fly into ponds to feed on water weeds. Some nest in the vicinity of ponds and bring their young to water as soon as they are hatched. The paradise duck's nest is hard to find and could well be a kilometre away from the nearest water. Hollow logs, old buildings, haystacks, and so on, are chosen as nesting sites.

Activities

- Find out about the duck species that visit local ponds.
- Arrange a debate on the subject: "Ducks should not be classed as game birds."

Photograph 24 Camouflage

Many pond species are well adapted to exist in their chosen habitat. Their structure, colour, shape, and limbs, coupled with their behaviour, enable species to survive in the pond environment. This photograph shows a well camouflaged cockabully. It demonstrates both structural and behavioural adaptive features. Its colouring is a perfect match for the surroundings and its large fins enable it to accelerate quickly and move to a hiding place when danger threatens.

Activities

- Note the ways in which creatures are adapted to the pond environment.
- Make a picture that contains a number of "hidden animals".

Photograph 25 Drought

Many New Zealand ponds dry out during summer. For some species this is a disaster; for others it provides little difficulty. For example, birds and many of the insect population can migrate to another location. Some juveniles, for example, the tadpole, will die out but the adult frogs can move to another place. It is a different story for fish. Those caught in the drought usually die. Plants frequently survive through their seeds or through their root

systems which remain alive for long periods during droughts. They "spring to life again" when the water returns.

Activities

- Imagine that a pond is drying up. How does each species react?
- Dig out a portion of a dried-up pond bed, place it in an aquarium, and cover it with water to find out about the species that can survive droughts.

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