

LIVING THINGS

The Stream Community

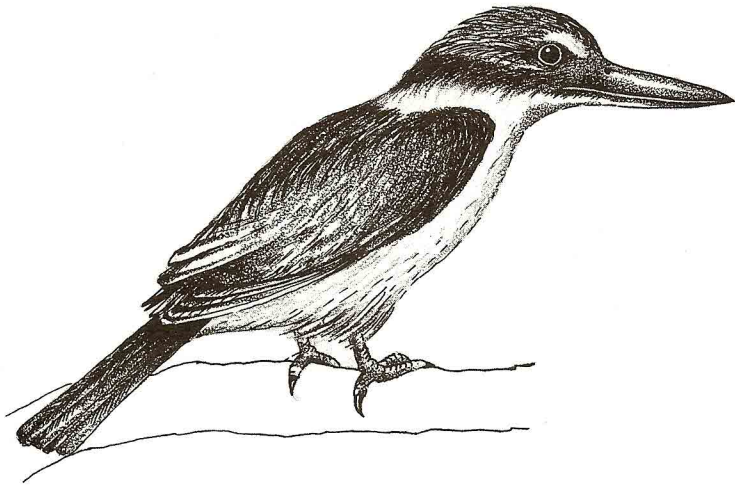
Photographs and Text
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Learning Media
Ministry of Education
Wellington

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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 Stream Community*, consists of a picture pack containing twenty-three photographs, a copymaster of a sample stream 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 stream 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 "Aquatic Insects". The pictures could be used in many other ways, for example, as part of a class display or for individual work.

The Stream 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. Two of the achievement aims of this strand of the syllabus are that, in their study of the living world, students will use their developing scientific knowledge, skills, and attitudes to:

- gain an appreciation of order and pattern in the diversity of living things, and an awareness of the special characteristics of many New Zealand plants and animals;
- investigate local ecosystems and determine the interdependence between living things and their relationship with their physical environment. An important aspect of this investigation is an appreciation of effects people have on other living things.

Acknowledgments

The text and photographs are by Paul Gay.

The food web has been illustrated by Tim Galloway.

First published 1993 by Learning Media, Ministry of Education,
Box 3293, Wellington, New Zealand.

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ISBN 0 478 05878 0

Dewey number 574.5

Item number 93/330

In particular, teachers should encourage students to develop a concern for living things and an understanding of the human role in conservation.

Maori Terms

Many of the plants and animals which inhabit the stream environment are native, and have Maori names which preceded their European ones. However, these names are not necessarily uniform throughout the country. Nor do all native species have a Maori name. For example, while the general word for crayfish is *kōura*, there are several names for the freshwater crayfish: *karawai*, *kēkēwai* or *kēwai*, *koeke*, *kotua*, *kōura waimaori*, and *kōuraura*.

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

Using the Series

Teachers might like to use the Living Things series in ways other than those in which the series is presented. Studies of particular sorts of plants, insects, birds, fish, and so on, could cross over the boundaries of given communities. Likewise, comparisons could be made between different, perhaps neighbouring, communities of living things. The series is designed so that connections can be made between its various parts.

The titles published in the series so far are:

- *The Scrub Community*. Item number 88/134 (slide set)
- *The Gorse Community*. Item number 91/100 (picture pack)
- *The Pine Tree Community*. Item number 92/373 (picture pack)
- *The Pond Community*. Item number 93/235 (picture pack)
- *The Stream Community*. Item number 93/330 (picture pack)

Stream Study Equipment

One of the most useful pieces of equipment for collecting animals and plants from the stream is a net or 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 stream net or a hand-held scoop net. These and a plastic basin are adequate for an introductory stream study.

THE STREAM ENVIRONMENT

Photograph 1 The Stream

Streams are just like small rivers. In fact, they often begin rivers. Streams differ throughout the country, depending on the terrain they are passing through. The water can be either fast-moving, slow-moving, or a combination of both. Often, there are quiet pools and backwaters. Sometimes, there are small rapids and waterfalls which, by tumbling the water, enrich its oxygen content. All this variety provides for a great range of habitats and a surprising number of specimens.

In the stream community, plants and animals interact in interesting ways. Observing just what happens makes for a fascinating and often intriguing study.

Activities

- Try to find out where the stream you are studying starts and where it goes to.
- Make a locality map.

Photograph 2 Habitats

A habitat is the place where organisms or plants live. The specific habitats in streams deserve careful attention. Each one will have animals and plants unique to the area.

In this photograph, animals under the large stones will differ from those in the fast-moving water in the centre. Many of them can be caught by holding a net or sieve downstream and moving the rocks. The deeper, slow-moving water is a likely home for several species of fish and snails.

Other habitats will be found along the stream edge and banks, and among the plant life.

Activities

- Make a "bird's eye" drawing of a length of stream bed and name or draw the habitats.
- Complete a species list for each habitat.

BIRDS — WADERS

Photograph 3 *Mātuku Tai* White-faced Heron

This white-faced heron was photographed as it moved slowly upstream. Every so often it would pause and then, with lightning speed, strike in the water to capture a small fish — probably whitebait.

These long-legged birds also “puddle” in the water by raking the stream bed with one leg while standing on the other. Fish and water life are disturbed in the process and often caught as they dash away.

The white-faced heron probably arrived in New Zealand from Australia. It has become our most common heron.

Activities

- Find out about other waders that feed in the stream.
- What features make waders successful hunters?

BIRDS — NESTS

Photograph 4 White-faced Heron's Nest

This white-faced heron's nest was found near the top of an old pine tree some 30 metres above the ground. The nest was just a rough platform of twigs and branches. It looks flimsy but, in fact, it has been used for several seasons.

Heron's lay three to five eggs from June to December. The young hatch after some twenty-five days, and after about six weeks are ready to fly. During the final weeks of their time in the nest, the rapidly growing young herons consume vast quantities of fish and other aquatic life. This diet is sometimes supplemented with worms and insects from nearby fields.

Activities

- Make a list of all the birds associated with the stream and try to find out where each nests.
- Illustrate some of these birds' nests.

BIRDS — DIVERS

Photograph 5 *Kōtare* Kingfisher

Diving birds have powerful bills. Sometimes they are spear-like, as is the kingfisher's bill, while others are long and equipped with a sharp hooked end for catching fish under water.

Kingfishers capture their food in various ways. Sometimes they swoop rapidly from a vantage point to take such creatures as frogs, insects, and worms. Fish are taken off the water's surface or from just under the water. To do this, the kingfisher folds its wings and becomes submerged for a short time. This is quite remarkable for a bird that does not have webbed feet. They also take young ducklings, mice, small birds, and lizards.

Activity

- Name and describe some diving birds. Draw their heads and bills.

BIRDS — SWIMMERS

Photograph 6 *Rakiraki* Mallard Duck

The mallard is probably the most common wild duck in New Zealand. It eats both animal and vegetable matter and is, therefore, called omnivorous. Like other ducks, the mallard takes its food in several ways. It may “upend” with tail up and head down in search of bottom-dwelling food. Sometimes it “dabbles” in shallow water or will come to land and feed on a range of plants such as clovers and grains.

Mallards frequent streams at night and will often fly in at dusk. When disturbed during the day, they will often fly off rapidly, uttering loud warning quacks. Rakiraki, the Maori name for the mallard, is the equivalent of “quack, quack” in English.

Activities

- Find out all you can about the pārerā, the native grey duck.
- Arrange a debate or discussion on the subject “It is fair enough to shoot ducks in the shooting season.”

MAMMALS

Photograph 7 Stoat

The stoat is a common predator. A predator is an animal that stalks and captures its prey, and the stoat is well equipped for this task in the stream environment. It takes the young of many small birds, including ducklings, blackbirds, and thrushes as well as many native species.

Its forward-looking eyes give it accurate hunting vision and it has a keen sense of hearing and smell. Being long and low to the ground, it can hunt very successfully in dense stream vegetation. It can also climb trees, such as willows, with ease.

Activities

- Find out what you can about the introduction of stoats and similar creatures into New Zealand.
- Draw a food web that shows how stoats fit into the food relationships of the stream community near you.

FISH

Photograph 8 Trout Eggs

During the autumn months, many adult trout move upstream. They travel from larger rivers into smaller streams to breed. Hen trout lay their eggs in what is termed a redd. To make a redd, the trout uses sweeps of her tail fin to excavate underwater depressions in a gravelly stream bed. Into this redd she lays hundreds of eggs which are immediately fertilised by the male or jack trout. The eggs are then covered by a thin layer of gravel and remain hidden until they hatch.

The tiny trout in the photograph have emerged from the egg but are still attached to a yolk sac. They feed from this yolk sac for several days until they are strong enough to swim freely.

Activities

- Draw the life cycle of the trout.
- Find out about the introduction of trout species into New Zealand.

Photograph 9 Young Trout

With its yolk sac almost gone, this young rainbow trout has become an underwater hunter. For a start, it will take mainly tiny aquatic insects and larvae. As it matures, its diet will include small water shellfish, such as snails, and a range of larger specimens, including small fish and a great variety of underwater life.

During a "rise", trout come to the surface to feed on hatching insects. It is at this time that trout fishers using a dry fly are often successful.

Activities

- Draw an underwater picture showing a trout feeding.
- Pollution kills many trout. How can we best care for our streams so that this will not happen?

Photograph 10 Īnanga Whitebait

The term "whitebait" is given to shoals of almost transparent juveniles from at least five species of fish that migrate up our rivers and streams. The most numerous of the species is Īnanga.

Adult whitebait spawn in tidal areas on reeds and vegetation during high spring tides. On emerging, the young are carried to sea where they feed until they move back into estuaries and up into rivers and streams in the late winter. They feed as they move upstream and after some weeks lose their transparent appearance. Many develop into adult fish in streams and reach a length of some ten centimetres. They stay in the headwaters of rivers and streams until they move down again to lay their eggs and begin a new life cycle.

Activities

- What can you find out about whitebaiting?
- Make a wall chart of New Zealand freshwater fish.

Photograph 11 Toitoi Cockabully

Several similar species go under the general name cockabully. Sometimes, the common bully, upland bully, and Maui's bully can be found in the same stream. The cockabully has the ability to change its colour according to the background and may take on green, brown, or even black shadings.

During summer, they spawn, with the female laying her eggs

on submerged plants and debris. During the egg laying and hatching cycle, the male cockabully tends to include this area in a territory which he guards jealously. The males are usually darker fish.

Activities

- Try to keep some cockabullies in an aquarium or artificial stream and make a record of their habits.
- Find out about different species of cockabullies and try to identify those in your local streams.

CRUSTACEANS

Photograph 12 Kōura Waimaori Freshwater Crayfish

Crustaceans have a hard external skeleton and are able to breathe underwater by means of gills. Kōura or crayfish are found in most streams, rivers, and lakes in New Zealand and have long been used for food by both Maori and Pakeha. They are an omnivorous species but tend to favour underwater animals such as the stream snail and aquatic worms.

Notice the large pincers, which are used to capture food, for feeding, and for defence. When disturbed, one flick of the powerful tail propels the crayfish backwards with surprising speed.

Activities

- Capture and keep some small kōura in an aquarium or stream. Study their habits.
- Find out all you can about their interesting life cycle.

AQUATIC INSECTS

Photograph 13 Stoneflies

This photograph shows the stonefly nymph. It is recognised by a pair of tail filaments. There are three pairs of strong walking legs. Nearly always, stoneflies are found only in unpolluted, moving water. They like stony streams and prefer to shelter on the downstream side of submerged stones.

The nymphs are carnivorous and feed on smaller larvae like those of the mayfly. There are more than twenty New Zealand species of stonefly.

Activities

- Find out about the life cycle and about the different species of stonefly.
- Make a drawing, 25 centimetres in length, of a stonefly larva.

Photograph 14 Dobson Flies

The larva of the Dobson fly has two descriptive common names — toe-biter and creeper. This photograph illustrates these names. Notice the strong pincers and the eight pairs of abdominal air tubes. These wave slowly in the water. There are three pairs of true walking legs.

During the day, these larvae hide under rocks and stones. They come out at night to prey on various nymphs and small aquatic creatures. The adults have large, lacy wings which are held tent-like over the body.

Activities

- Draw the life cycle of the Dobson fly and find out what is unusual about egg laying.
- Make a larger-than-lifesize model of an adult Dobson fly.

Photograph 15 Net-building Caddis

The underwater net in between the stones in this photograph has been cleverly constructed by the larva of a caddis fly. Facing upstream is a large opening and into this the current carries tiny plants called algae, dead insects, and a host of other floating creatures. The larva lives in a concealed retreat from which it moves to select its food from the range caught in the net.

To pupate, the larva builds a dome-shaped nest out of tiny stones. Just before changing into an adult, the pupa swims to the surface and crawls out of the water before the adult emerges. As they move to the surface, net-building caddis pupae make great trout food.

Activities

- Make a model of one of these underwater nets. Use it for a classroom display.
- Using an underwater viewing box or similar apparatus, try to find some net-building caddis in fast-moving water.

Photograph 16 Caddis Species

There are over a hundred caddis species in New Zealand waters. The larvae of most build or use a variety of homes. Illustrated in the photograph is one that makes a horny case and covers it with sand, while the other has made its home in a stick and so is called a stick caddis.

Other caddis species are named after the kind of case they live in. Spiral caddis, purse caddis, and axehead caddis are examples.

Activities

- Try to find and draw a variety of caddis larvae homes.
- Some trout flies are designed to look like caddis larvae. Find out about these.

Photograph 17 Caddis Pupa

Adult caddis flies are small moth-like insects which have rather hairy wings as distinguished from moths' wings which are covered in scales. They lay their eggs from dusk on during the summer months. To do this, the females of many species crawl down under the water surface and lay their eggs on rocks and vegetation. On hatching, the young build their various cases and, when mature, pupate in these cases. Caddis larvae without cases are called free living. These pupate in stony homes which they make on rocks. The photograph shows a common variety.

Activities

- Choose one caddis species and draw its life cycle.
- Collect a range of caddis larvae and study them in an aquarium for a short time.

Photograph 18 Mayfly

Mayflies have a rather long scientific name — Ephemeroptera. It is a very descriptive name and illustrates an important aspect of this species. In Greek, *ephemeros* means lasting about a day and *pteron* means a wing. Mayflies are short-lived insects with large graceful wings.

Adult mayflies, like the one in the photo, usually rest quietly in foliage along streams and rivers until evening, then they emerge to fly up and down over the water's surface in what has been termed a mayfly dance. After laying eggs, they die.

Activities

- Research the mayfly's life cycle.
- Draw a 20-centimetre long adult mayfly, showing its beautiful wings.

Photograph 19 Pūene May Fly Larvae

Mayfly larvae are normally found on stones in fast-flowing water. Along the abdomen, they have seven pairs of gills and, as the water passes over these, oxygen is taken in for use in all parts of the body. Most mayfly larvae are shaped in a way that enables them to live in fast water. They have strong legs and are equipped with sharp claws. They grow by moulting, sometimes more than twenty times in their lifetime.

Activities

- Draw a mayfly larva, showing its streamlined shape.
- Interview a trout fisherman to find out about mayflies as trout food.

INSECTS — LEPIDOPTERA

Photograph 20 Small Copper-coloured Butterfly

This small native butterfly is typical of several species that associate with the stream environment. This one is sipping nectar from the tiny flowers of a creeping plant called *Muehlenbeckia* or, more commonly, pohuehue.

Larger and better known butterflies, such as the red admiral and white butterfly, also visit the flowers of plants that grow near streams, while on hot sunny days numerous butterflies can be seen sucking water from damp stones and mud.

Activities

- Find out about three species of native butterflies.
- Collect butterflies and moths and try to find out ways in which they differ from each other.

AQUATIC SPIDERS

Photograph 21 Water Spider

Several species of aquatic spiders, like this one, are hunters. Usually they are quite large and come out at night to capture prey along the stream banks or sometimes on the water's surface. Notice the prominent eyes (there are eight of them) and strong fangs of the spider in this photograph. This one was found under a rotting log. It measured five centimetres across when its legs were spread out.

Water spiders like this one can climb down under the water, taking with them a film of air so that they can breathe while staying submerged for quite some time.

Activities

- Find out how spiders differ from insects.
- Discover and draw several differing spiders' webs from the stream area.

AQUATIC MOLLUSCS

Photograph 22 Bivalves and Univalves

As well as the common larger snails and mussels, there are various tiny but interesting molluscs in the stream habitat. In this photograph, the snail-like mollusc has a light brown lid or operculum which it uses to close the entrance of its shell. Snails with an operculum have gills and so can live under water without having to come to the surface for air. The two tiny bivalves are almost transparent. Their internal organs can clearly be seen between the two thin shells.

Activities

- Make a collection of fresh water mollusc shells.
- Observe fresh water snails eating and find out what they eat.

RESTING INSECTS

Photograph 23 Moth

A large number of insects rest during the day among the plants of the stream environment. Many small creatures seem to choose the stream environment as a place to rest while others breed nearby. This moth was photographed while clinging upside down to a reed.

Activities

- Spread out a sheet, about one metre square, under some bushes or branches near a stream. Shake the foliage and make a collection of the species that fall out.
- Discuss why you think it is that moths choose the stream environment as a place for resting and hiding.