Hoea te Waka, piki te mātau

NGĀ TINI O TE WAITAI: PLANKTON

Literally, the statement Ngā Tini o te Waitai translates as “the multitudes of the sea water”. Waitai refers to salt water or sea water. Tini means crowds or a great number. Tini also connects to Tinirau, who descended from Tangaroa (the god of the sea) and is the father of fishes. The term describes the rich diversity of life found in the sea.

Although it is hard to see, plankton is the most plentiful and important part of our ocean. It forms the basis of the food chain, and produces 50% of the world’s oxygen!

In this module students will discover the importance of plankton, and will collect and look at some. There are three activities - the first can be carried out anywhere, but will need some pre-reading about food webs and plankton. The second activity requires a waka to tow a plankton net, we recommend using a very energetic crew and practicing a bowline knot! The final activity involves making a light trap and leaving it out overnight using a glow stick as a light source. This module includes:

- Plankton foodweb
- Plankton tow
- Light traps

Plankton - background reading

Kia hā ngā meroiti, kia kaingā hoki!
Plankton to breathe and to feed!

What are plankton?

The smallest things in our ocean feed the largest things in our ocean. The word Plankton is greek for ‘drifters of the sea’, this name is given to a diverse range of organisms that float with water currents and are unable to swim against it.

They vary from very tiny plants (that have chlorophyl) to larvae (fish and crabs), jellies, and crustaceans (krill). Some are called Holoplankton because they are permanently in a plankton form, and others are called Meroplankton which are temporarily in a plankton form (e.g. larvae/babies getting bigger!).

They all have important ecological functions, you might already know that plankton feed a lot of different animals in the ocean, but did you know that phytoplankton are responsible for up to 50% of the world’s oxygen production?

They are essential to the ocean foodweb, thus if they were to disappear than there would be a major break down in the structure in the food webs for all sealife, including seabirds.- and many land animals too.

Plankton foodweb - activity

Plankton foodweb

Plankton are important food for larger animals. Phytoplankton is a “primary producer” - finy plants that use the sun for energy. It is called photosynthesis. These in turn provide food for zooplankton, which in turn provide food for larger fish and mammals.

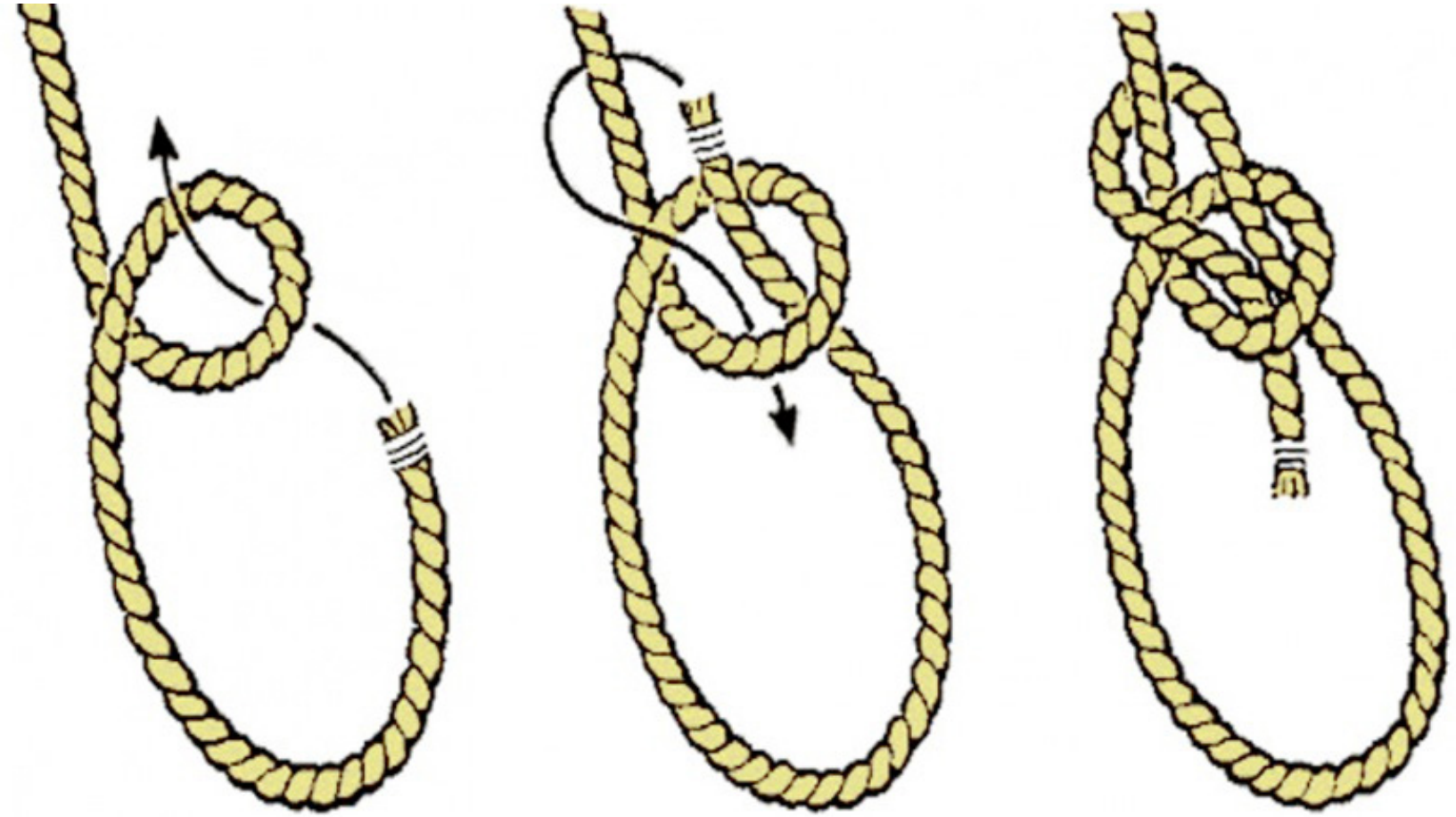
Using the sand and a stick, or the side of the building and some washable chalk, draw a giant food web showing who eats who in the ocean, then see where the plankton sits in among this (for a bit of help see the foodweb illustration).

Pātai – Questions to discuss with your group:

- How can we help to look after the smallest critters in the ocean?
- How could climate change effect plankton? have a quick search, or ask a scientist, think about warmth, breeding, shells, larvae.
- There are heaps of animals that feed on plankton (and bigger ones at that) how much plankton does the ocean need?
- Where do humans fit into the foodweb?
- Apart from eating kaimoana, in what other ways might humans affect the food web?

Waka plankton tow - activity

Plankton is often collected by towing a plankton net behind a boat. Before you do this you must learn how to tie a **bowline knot**. It is important to tie the plankton net securely to the waka as they are very expensive! Practise with this diagram - and if you get stuck there are plenty of youtube videos to show you how to do this)



Waka plankton tow - activity

Plan where you will collect plankton. Try a tow in different types of marine areas, for example; one within a harbour and then one out at sea, or, one from a sandy area, and one from a rocky area. Here is how we recommend carrying out a waka tow:

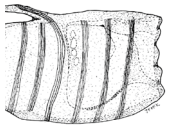
1. Tie a net to the waka using a bowline knot.
2. When the waka is moving put the net into the water. Be sure that hands, finger and legs are not going to get tangled in the rope.
3. Tow the net paddling as hard as your roopu can. A tow time for a good sample is 5-10 minutes.
4. When you are done, stop paddling and pull the net back into the waka being careful not to disturb the cod end (the tube at the end).
5. Unclip the cod end and empty the contents into a container for inspection.
6. Have a close look for plankton. Some might be swimming and some might just look like little dots.
7. If there are still some organisms in the cod end then add a little bit more seawater to loosen them from the sides and pour them into the collection jar.
8. Have a look under a microscope. What can you see?
9. Have a look at the identification guide and make a tally up. Then try and answer the following questions.

Pātai to discuss:

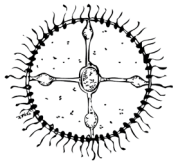
- Were there any interesting finds?
- Is it a baby or an adult?
- If you collected samples, what were the differences between samples and why do you think that might be? Have a think about tide times, breeding times, swell etc.
- How might knowing about different types of plankton be important to science? How does this mahi show kaitiakitanga?

Plankton ID Guide

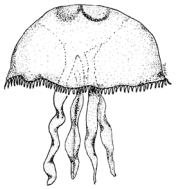
Small Jellies



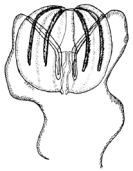
☐ Salp



☐ Jellyfish larva



☐ Jellyfish



☐ Comb Jelly

Squid and Octopus Babies

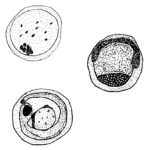
☐ Octopus Paralava

☐ Squid Paralava

☐ Sepiolid Paralava

Fish Eggs and Babies

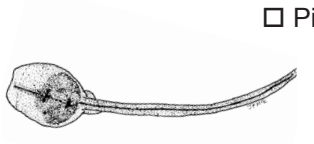
☐ Fish larva



☐ Fish Eggs

☐ Seahorse Juvenile

☐ Pipefish Juvenile



☐ Tunicate Tadpole Larva

Worms

☐ Arrow Worm

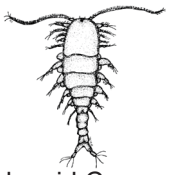
Crustaceans (Krill and Relatives)

☐ Ostracod shrimp

☐ Isopod

☐ Krill

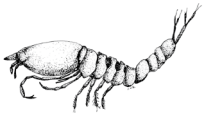
☐ Hyperiid Amphipod



☐ Calanoid Copepod

☐ Munida (zoea)

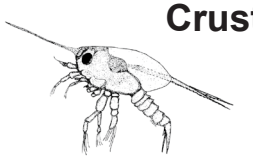
☐ Mysid Shrimp



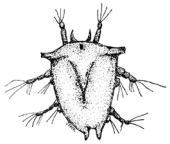
☐ Cumacean Hooded Shrimp

☐ Munida (post larval)

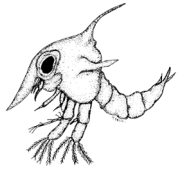
Crustacean Babies



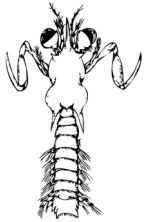
☐ Half Crab Zoea Larva



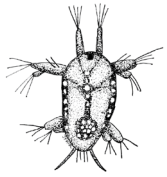
☐ Barnacle Naupliius Larva



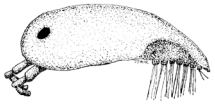
☐ Crab Zoea Larva



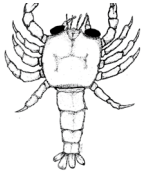
☐ Mantis Shrimp Larva



☐ Copepod Naupliius Larva



☐ Barnacle Cyprid Larva



☐ Crab Megalopa Larva

Plankton Tow Catch Recording Sheet

Name:	Date:
Location:	Net mesh size:
GPS of where tow started:	GPS of where tow ended:

Species name	Description	Abundance			or Count
		Rare	Common	Abundant	

Hoea te Waka, Piki te Mātau

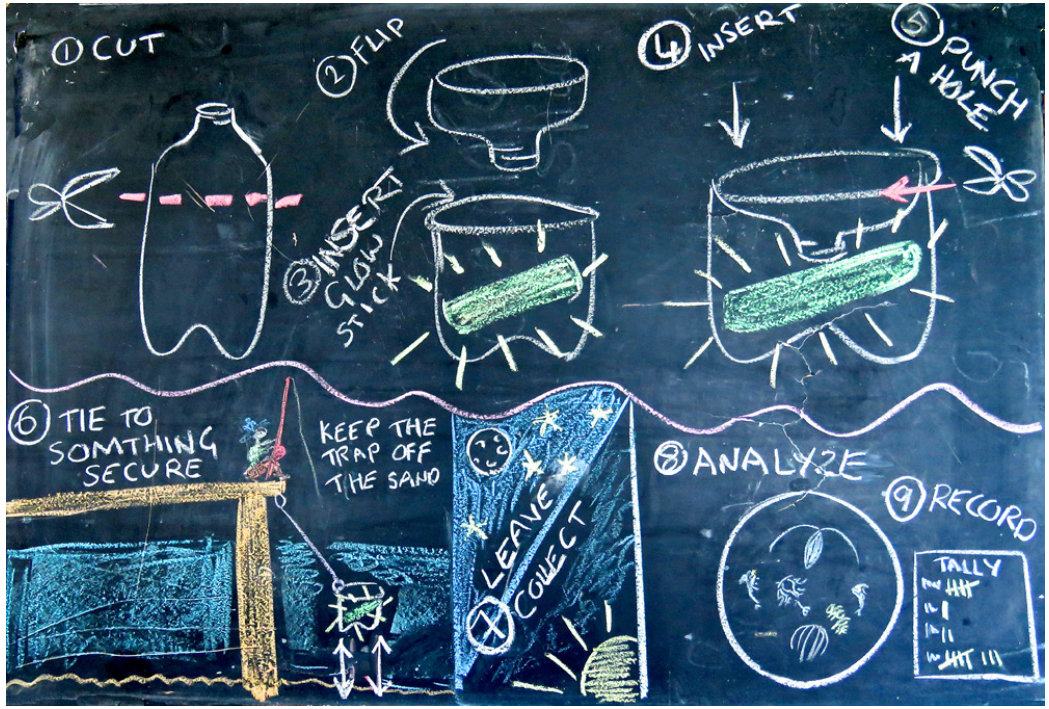
Light trap - background reading

How can we learn more abourt the diversity of life in the sea? One way to discover the diversity of life in the sea is to use a light trap. Many organisms are attracted towards a light source at night and both planktonic and mobile benthic species can be captured in this way. Some are more active at night to avoid fish predation.

The advantages of light trapping as a method are that the traps are portable, simple to make, low cost materials, easy to deploy and retrieve, do not damage the habitat, easily replaced and replicable, and the organisms collected are in good condition. Any large animals, such as fish, that are captured can be examined and returned to the sea unharmed.

Pātai – Questions to discuss with your group:

- What animals are attracted to light?
- Does time of day/night affect the number and type of species caught?
- Does depth affect the number and type of species caught?
- Does location affect the number and type of species caught?
- What would happen if you used the light trap at different times of the year?
- Do we catch the same species in a trap without a glow stick?
- What differences might you see if you used a different coloured light stick?



Light trap - activity

Make a light trap

1. Use a 1 or 1.5 litre fizzy drink bottle
2. Cut off the top and inverted to form a funnel.
3. Inside the bottle is placed a chemical glow stick and a weight of some kind (such as a stone).
4. A string is tied to the bottle to enable it to be more easily found and retrieved.
5. The string may be attached to a wharf, waka or a structure on the seashore above the water line.

Test the light trap

1. Place the trap into the sea for at least 1 hour.
2. You could put multiple traps and the same depth (replicates) or have half in the water column and half on the bottom (ideally resting on their side to collect bottom dwellers).
3. Make sure you also have one or two traps without a light. This will be your control.
4. On retrieval the contents are viewed in a shallow tray and identified using a dissection microscope.
5. Count how many specimens of each species were in your sample and record the data on the data sheet.

Patai – Questions to discuss with your group:

- Do you think the phase and brightness of the moon will affect what you catch?
- Did location, depth or time of day affect your catch? Why?
- Why did you put out a trap with no light? How did the catch compare with the trap with a light?

Light Trap Catch Recording Sheet

Name:	Date:
Time in water:	Time out of water:
Region:	Location:

Sample #	**1**	**2**	**3**	**4**
Depth				
Light stick (colour)				
SPECIES				