

Lesson Plan: Adaptations to Aquatic Habitats

Curriculum links

Science	Key Stage 3/4	Unit 2.5:	Adaptations
		Unit 7C:	Environment and feeding relationships
		Unit 8D:	Ecological relationships

LESSON STRUCTURE

What do animals need to survive in their environment and how they are adapted to achieve this?

All animals are **physiologically adapted** to their particular environments and therefore pond organisms have developed specialised structures to enable them to breathe, move, obtain food and otherwise survive in an aquatic habitat. Adaptations can be identified by observation of behaviours, movement and lifecycles.

Starter Activity

Moving in Water: How do animals living in water move around?

Main Lesson Plan

Obtaining oxygen in water: There isn't much oxygen in water so how to animals respire?

Plenary Activity

Pond Bingo! a quick activity to recall which animals have developed specific adaptations

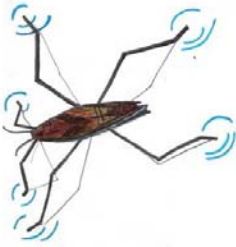
STARTER:Moving in Water

Aquatic organisms move in and through the water in a number of ways. Begin by asking the class to list the pond animals they are familiar with and record suggestions on the board. Using the table below prompt students to think about how some organisms move in the water highlighting the links between habitat, diet and movement. [10 mins]

Organism	Where it lives	What it eats	How it moves	Adaptation
Duck	Above surface	Pondweed, insects, snails, larvae, tadpoles, small fish	Flies, dives, paddles.	Wings, waterproof feathers, webbed feet
Adult dragonfly		Insects	Flies, hovers	Two paired-wings, streamlined shape
Adult mayfly		Insects	Flies, hovers	
Frogs	Pond edge	Insects, snails, slugs, worms	Hops, swims	Amphibious, moist skin, webbed feet, long, strong hind legs, sticky tongue.
Newts		Water fleas, snails, worms	Walks, Swims	Amphibious, moist skin, long muscular tail.
Water vole		Insects, worms, grasses	Walks, swims,	Oily coat, sharp teeth,
Pond snail	Pond surface	Plants, algae, dead matter	Muscle contraction	Shell, muscular foot
Pond skater		Dead plants and animals	Skates across water surface	Long splayed legs, water-repellent hairs
Mosquito larvae		Micro-organisms, detritus	Swims	Breathing tube
Fish	Mid-water	Water fleas, tadpoles, shrimp	Swims	Gills, fins, streamlined body
Tadpole		Insects, plants, dead matter	Swims	Streamlined body, tail
Great diving beetle		Water fleas, snails, water boatmen, larvae, leeches,	Walks, dives, swims	Streamlined body, fringed jointed legs
Water boatman		Shrimp, worms, tadpoles	Rows using legs	Paddling legs, hair-lined body traps air
Leech		Snails, larvae, tadpoles	Swims	Sucker, flattened body
Insect larval stages (Dragonfly/Mayfly)		Fish, water fleas, shrimp, tadpoles, micro-organisms	Swims, crawls	Gills on abdomen,
Freshwater worm	Pond Bottom	Micro-organisms, dead and decaying matter 'detritus'	Swims	Haemoglobin, thin body wall, segmented body
Water Flea			Rows using antennae	Antennae, flattened body
Freshwater shrimp			Swims	Side-flattened body, swimming legs, gills
Water hog louse			Walks	Gills, six paired legs

Finally, use the following three examples to further explain how different physiological adaptations enable these invertebrates to move in an aquatic environment, prompting the class to suggest the unique characteristics that make that organism capable of their particular movement and lifestyle. [15 mins]

1) Pond Skaters



Pond skaters walk on the surface of the water. They have adapted **long, splayed, paddle-like legs** which allow them to spread their weight over a large surface area, their feet are covered with **tiny hairs** which trap air and enable the insect to 'skate' on the surface of the water taking advantage of the **surface tension** that lies between the water and the air. The pond skater's stomach is covered with **water-repellent hairs** to prevent direct contact between their body and the water.

2) Freshwater Shrimp



Freshwater shrimp have a body that is **flattened sideways**. They use their front legs to crawl along the bottom of the pond and swim sideways by moving five pairs of **segmented swimming legs** which propel a stream of water over their gills as they move, allowing them to obtain a constant supply of oxygen.

3) Great Diving Beetle



The great diving beetle is an aggressive predator, it has a **streamlined body** reducing water friction and **fringed jointed legs** allowing it to move very fast through the water to hunt and catch its prey.

*** **EXTENSION:** Discuss how moving in water differs to moving on land? ***

MAIN:

Obtaining Oxygen in Water

Objective:

- I. To understand that even animals in water must find oxygen.
- II. To know the main adaptations that pond organisms have evolved to get oxygen.

The levels of oxygen in water are significantly lower than in the air we breathe and are affected by changes in temperature. Pond organisms exhibit a variety of adaptations which enable them to obtain oxygen from the water and to cope with a variable oxygen supply. [20 mins]

1) Mayfly Nymph



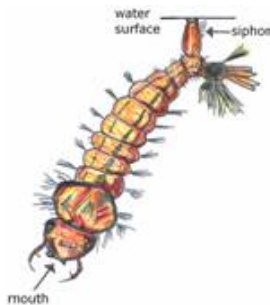
Mayfly nymphs have **gills** on the sides of their abdomen which **vibrate rapidly** to help keep a flow of water over their surface. **Gaseous exchange** takes place between the water and the many small blood vessels in the gills allowing the mayfly nymph to obtain oxygen from the water.

2) Water Boatman



Water boatman **breathe air** when at the surface of the water and are able to breathe under water by **carrying an air bubble** trapped by **hairs** that line their body.

3) Mosquito Larvae



The larvae of mosquito have **feather like structures on their tails** which allow them to hang onto the surface using the **water surface tension**. Mosquito larvae obtain oxygen from the air using a specially adapted **breathing tube** which reaches from the larvae's tail to the water surface and acts like a snorkel.

4) Freshwater Worms



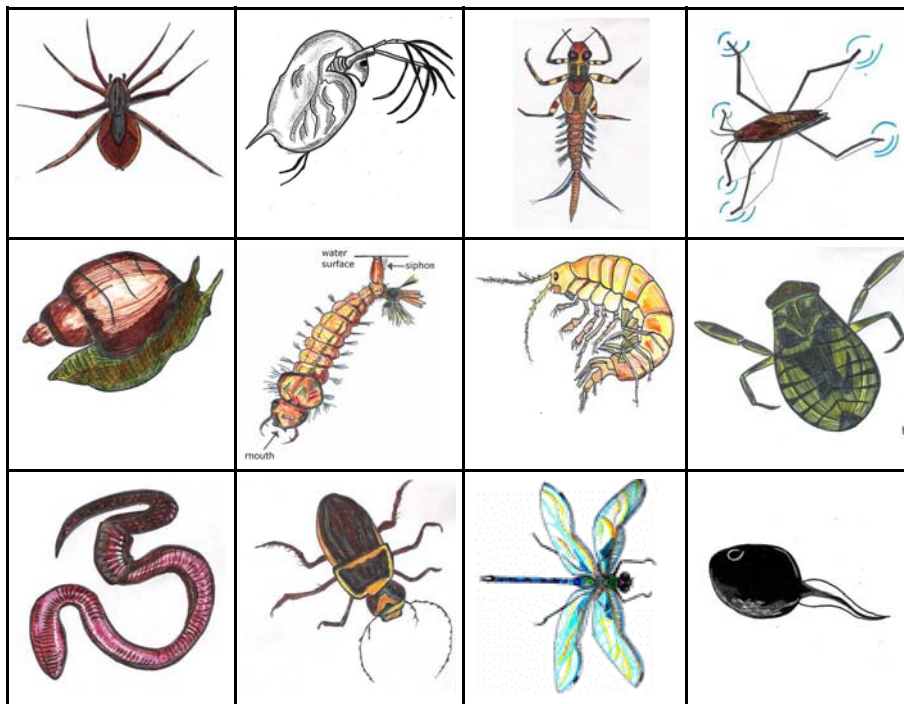
Freshwater worms are bright red due to the **haemoglobin** in their blood which carries oxygen obtained from the water via **diffusion** through their body wall.

PLENARY:

Pond Bingo!

Hand out the bingo cards to students and explain the rules of the game as follows:
The teacher will describe an adaptation of a particular pond animal and how this unique characteristic helps it to survive in an aquatic habitat. Students must cross off the animal described from their card. The first student to get a full row (horizontal *not vertical*) of correctly identified organisms wins. The winner must call out the organisms that make up the winning row to ensure species were matched to their adaptations correctly. [15 mins]

Example of bingo card (please find templates in supporting document, you will need to print and cut out cards prior to the lesson):



Adaptation clues:

- This organism is able to breathe air through a breathing tube attached to its tail which punctures the water surface acting like a snorkel : **Mosquito larvae**
- This organism has long, thin, splayed legs allowing it to walk upon the surface of the water taking advantage of the water surface tension: **Pond skater**
- This organism is red due to the haemoglobin in its blood which carries oxygen transferred across the skin through diffusion: **Freshwater worm**
- This organism has oar-like side swimming legs and breathes underwater by carrying an air bubble trapped by the hairs that line its body: **Water boatman**
- This organism has a side-flattened body and swims on its side using five pairs of swimming legs which propel water across its gills: **Freshwater shrimp**
- This organism has a streamlined body and fringed jointed legs allowing it to move very fast as it dives through the water to hunt its prey: **Great diving beetle**