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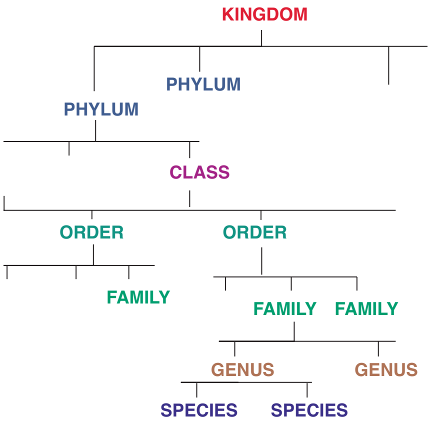

Each KINGDOM is divided into a number of phyla.
Each PHYLUM is divided into a number of classes.
Each CLASS is divided into a number of orders.
Each ORDER is divided into a number of families.
Each FAMILY is divided into a number of genera.
Each GENUS is divided into a number of species.

Bob Moffatt

Figure 6.1 *Rhizophora stylosa*

Classification systems

There are a number of classification systems for marine organisms according to a range of characteristics. For example organisms that live on the sea floor are called benthic organisms and organisms that produce their own food are called autotrophs.

Mangroves are plants and fall into the group that makes their own food using the suns energy.

Levels of classification

The act of classification can be defined as the grouping of individuals so that all the individuals in one group have certain features or properties in common, Classifications should have predictive value, that is, they should tell us something about the object being named and its features.

Common names often seem easier to remember than scientific names, but they are not as precise. Not only can a common name refer to very different plants, conversely a single species can have more than one common name.

This can lead to confusion, and potentially to serious problems if people confuse weedy or poisonous species with harmless species. There are many types of classification, the oldest and simplest is a hierachy beginning with the kingdom, phylum, class, order, family, genus and species.

For example Figure 6.1 shows the red or spider mangrove which is classified as follows

Kingdom: Plantae *(makes its own food using the sun)*

Phylum: Tracheophyta *(has a water transport system)*

Class: Angiospermaes *(has flowers)*

Order: Myrtales

Family: Rhozophoraceae

Linnaean system

After the family level of classification, scientists end up with the two levels - genus and species.

This is called the scientific name as opposed to a common name that can vary from place to place.

Scientists use this system to describe the species accurately so there is no confusion.

So continuing on from our example from above, the stilted mangrove's scientific name is

Rhizophora stylosa

Lab exercise 2.1 Mangrove leaf sections

by John Burnett

The leaves of mangroves are unique in that their structural features vary from species to species, and may include salt secretion cells, hairs or scales on the epidermis, and a range of internal structures.

You will need

- mangrove leaf
- safety razor or scalpel
- petri dish
- microscope
- two microscope slides and coverslips
- copy of the reference books or laptop

What to do

1. Cut a square of leaf and place into a petri dish containing water. Carefully hold the leaf square underwater and make a number of thin cross sections as shown in Figure 60.1
2. Place some of the thinnest sections onto a slide, add a drop of water, and place on a coverslip.
3. Looking at the sections under the microscope, accurately draw what you observe, using a range of different mangroves. Use the drawings like the ones shown in Figure 59.4 on the next page to help.

Analyse your results

1. Identify the leaf you are dissecting.
2. Sketch (or draw) illustrations of the cross sections of mangrove leaves you use.
3. Estimate the size of the different types of cells.
4. Describe the methods used to make the transverse sections.
5. Explain how thin sections of mangrove leaves are prepared and describe how a microscope is used to identify cells.
6. Evaluate the methods used to make thin sections making suggestions for improvements.

Further research

1. Do distinct species of mangrove have distinct leaf structures?
2. Do salt secretion glands limit the distribution of mangrove species?
3. Can the epidermal thickness layer in mangrove leaves be related to adaptation?

Figure 60.1 Cutting mangrove sections in a petri dish

What you may observe

- *Avicennia marina*
  Upper epidermis: crater-like depression with sunken salt gland (Figure 61.1).
  Lower epidermis - raised salt glands, bulbous hairs and stomates (Figure 61.2).
- *Aegiceras corniculatum*
  Salt secreting cells (Figure 61.3).

Other observations you may notice

- *Rhizophora stylosa* - differentiation of hypodermis
- *Heritiera littoralis*- scales on lower epidermis
- *Hibiscus tiliaceus* - hairs on lower epidermis
- *Acrostichum speciosum* - accessory transfusion tissue in the central region of the leaf
- *Acanthus ilicifolius* - lower cuticle absent
- *Bruguiera gymnorrhiza* - several layers of lower hypodermis
- *Excoecaria agallocha*, *Xylocarpus mekongensis* - elongated upper hypodermis
- *Aegialitis annulata* - both spongy mesophyll and hypodermis absent.
- *Ceriops tagal* - has upper and lower hypodermis and enlarged mesophyll cells
- *Sonneratia caseolaris*, *Lumnitzera racemosa* - enlarged water storage cells in mesophyll layer

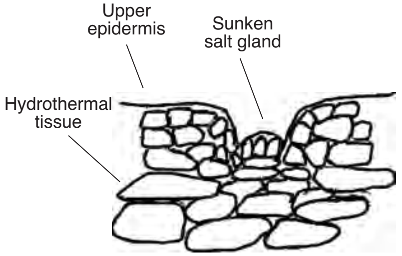

Figure 61.1 Upper epidermis *Avicennia marina* leaf
John Burnett

Figure 61.2 Lower epidermis *Avicennia marina* leaf
John Burnett

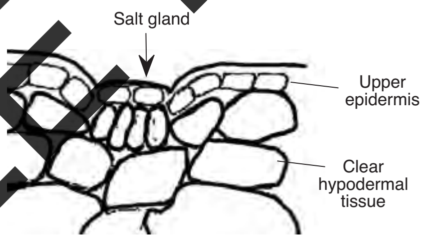

Figure 61.3 Salt secretion cells from upper epidermis of *Aegiceras corniculatum*
John Burnett

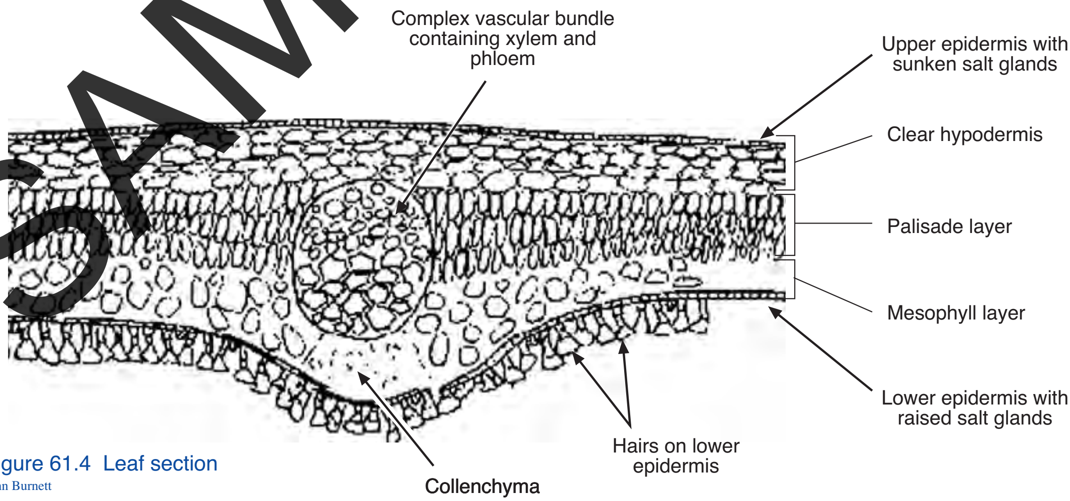

Figure 61.4 Leaf section
John Burnett

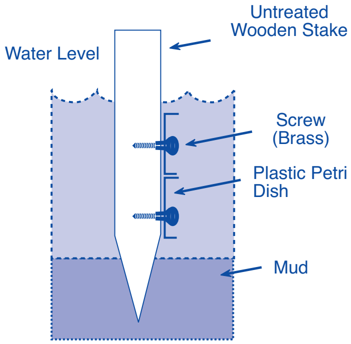

Figure 92.1 Plastic petri dishes can be used to collect organisms for later study
Bob Moffatt

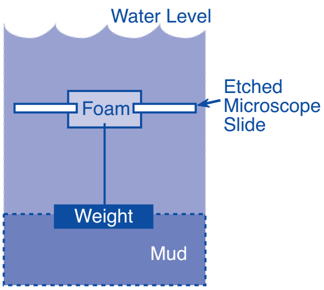

Figure 92.2 Etched microscope slides for easy removal for study later
Bob Moffatt

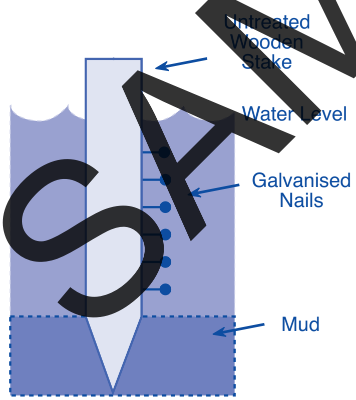

Figure 92.3 Galvanised nails used to collect marine organisms. Based on some ideas by B. Brock
Bob Moffatt.

Project 3.3 Investigating attaching organisms

NOTE: This is a long-term project.

by John Burnett

Many organisms enter the mangrove environment as a planktonic form and then settle onto rocks, logs, mud, tree trunks and branches.

These organisms then grow in this nutrient rich environment, often completely covering the surface they settle on and becoming a major part of the mangrove ecosystem. These same organisms may cover jetties or the bottom of moored boats. They are known as fouling organisms. Examples of organisms found in this ecosystem include algae, bryozoans, barnacles and oysters.

You will need

- sampling equipment as shown in Figures 92.1 - 92.3 and 93.1 over.
- microscope
- cover slips and slides
- petri dishes

What to do

Read the stages of settlement information box on the next page.

1. These organisms can be collected and observed if the sampling apparatus (as shown in Figures 92.1 to 92.2) are left undisturbed at sites in the mangrove environment. The best results occur if the apparatus is left in a permanent water body such as in pools or in creeks within the study area and data recorded every week.
   Turn over two pages to look at other methods of collecting marine organisms.
2. A marked stick can be used to find the zonation within the mangrove area, as can the multi-level sampler. The other devices that are illustrated can be used to collect these organisms at a specific depth or on the bottom of the water body.
3. There are three methods of obtaining samples for microscopic analysis.
   a. Scrape a sample into a cavity slide, add a drop of sea water, place on a cover slip and observe.
   b. If using an etched slide, make a ring of wire (use a paper clip) and place in a petri dish. Place the slide on the wire and cover with sea water. Observe under a microscope.
   c. If using samples collected on a petri dish, plug the hole with 'Blu-tack' and add enough sea water to cover the organisms. Observe under a microscope.