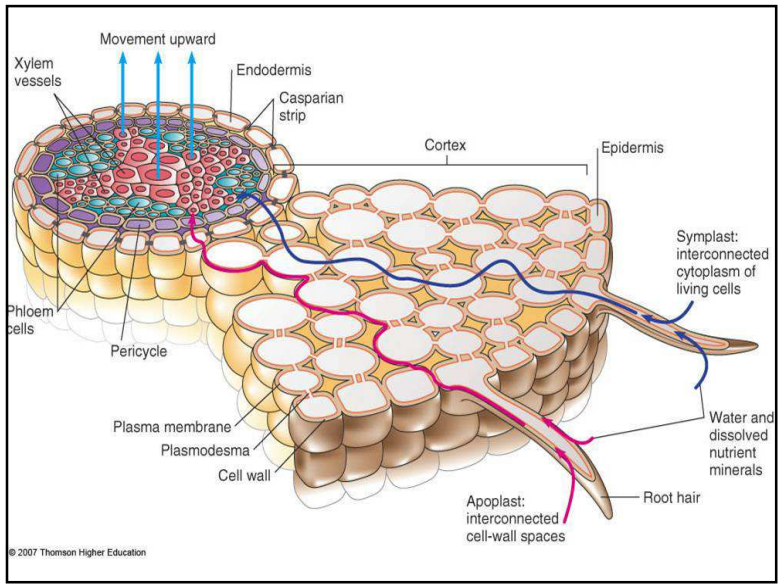
Halophytes – Salt adaptations

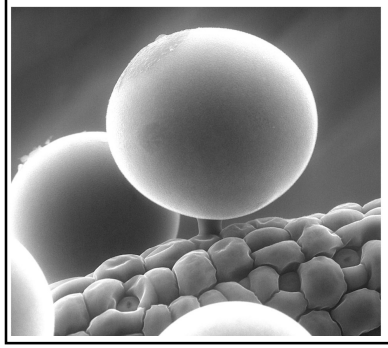
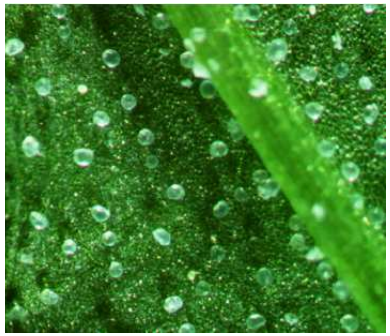
- To fix 1 g C, a plant must transpire 750 g water.
- ~45% organic matter is C therefore 1.7 kg of water must be lost.
- If in seawater, then 58 g salt would accumulate in the plant; too much to survive.
- **Halophytes** (salt-loving plants) can survive in saline environments by having species-specific adaptations to deal with salt.

- Plants are capable, to a point, of restricting ions entering the xylem by **exclusion** between the root surface and xylem.
- A barrier (casparian strip) can prevent **apoplastic** flow from root hair to xylem forcing **symplastic** flow; ions are then "selected" by cell membranes.
- Ions can also be removed (**ion retrieval**) from the xylem sap as it ascends the plant; 90-99.6% of Na^+ can be removed before the sap reaches the leaves.

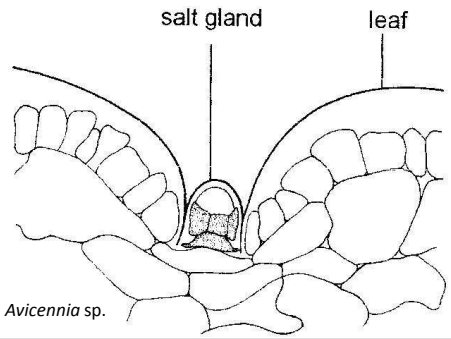


- Ions in xylem sap can be transported to stem, older leaves or leaf cell vacuoles (plant level **compartmentation**).
- **Recretohalophytes** have salt-secreting structures on their leaves that are absent in **glycophytes** (can only tolerate relatively low salt concentrations); salt bladders and salt glands.

- Salt bladders are balloon-like epidermal cells that accumulate large amounts of salt on the leaf surface; often modified trichomes.
- Present in ~50% of halophytes.

- Salt glands are stable structures formed by two or more cells that continuously secrete toxic ions to the plants exterior.
- Not as common as salt bladders.



Living in an estuary

- Fine mud is sticky and generally anoxic so adaptations are needed to survive.
- Clams extend a siphon to get water for food and oxygen.

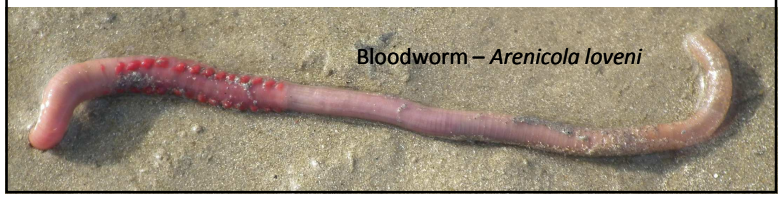


Living in an estuary

- Most organisms tend to be stationary or slow-moving.
- Mud retains water and salts providing a relatively stable environment.
- Some burrowers pump oxygen-rich water through U-shaped burrows (*Upogebia africana* – mud prawn).

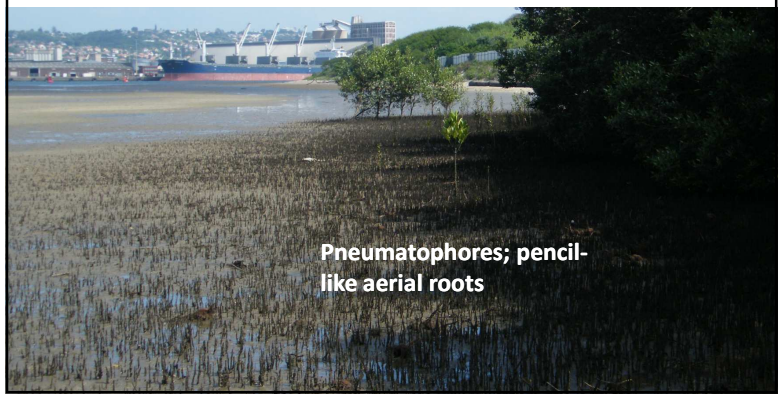
Living in an estuary

- Other non-tube dwelling organisms blood containing haemoglobin; a protein with a high affinity for oxygen.
- Haemoglobin can hold and carry oxygen in oxygen-poor environments.

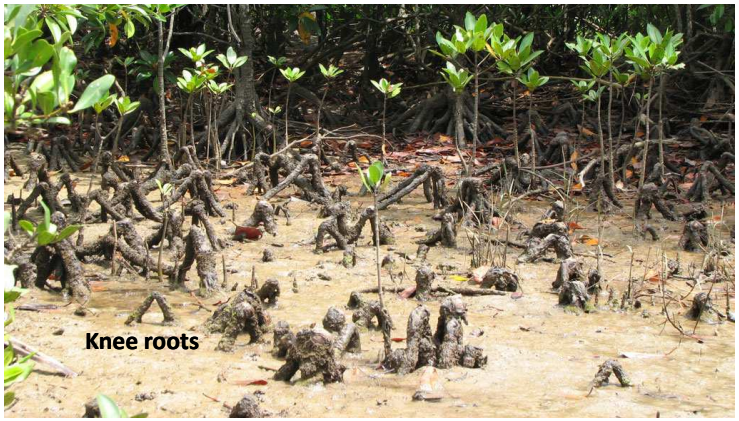


Mangrove trees have adapted to surviving with their roots permanently in anoxic soils.

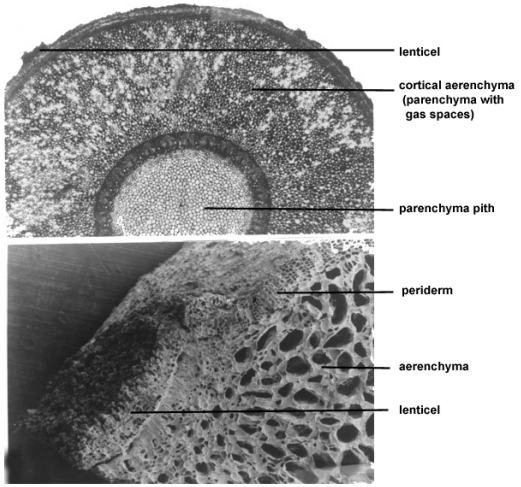
- *Avicennia marina* (white mangrove)



- *Bruguieria gymnorhiza* (black mangrove)



- *Rhizophora mucronata* (red mangrove)



http://bugs.bio.usyd.edu.au/learning/resources/plant_form_function1/plant_form/secondary_growth.html