an operculum. The fish takes in water through its mouth and forces the water over the gills in order to supply fresh water – the water then exits from the operculum.

Counter-current system – blood flows in the opposite direction to the water and this maintains the concentration gradient across the whole gill plate.

Leaves

Waxy cuticle – prevents the leaf from drying out and also gas exchange.

Stomata – on the underside of the leaf (open during sunlight hours)

Guard cells – surround the stomata. If they lose water they collapse and the stomata close to reduce further water loss.

Mesophyll – central tissue has many air spaces to allow gases to circulate.

Palisade cells – elongated cells that contain many chloroplasts. Large syrface area exposed to atmosphere.

Downside to adaptations that increase entry of CO_2 is that it also increases water loss.

Xerophytes

- thick waxy cuticle
- small or needle-shaped leaves – reduce surface area exposed to atmosphere
- few stomata
- stomata sunken into pits
- hairs around stomata – help to reduce air movement
- leave can roll up – water vapour becomes trapped and kept near stomata
- two sets of roots, set that grows sideways to take advantage of occasional heavy showers and a set that grows straight down to obtain water from a low water table.

Leaf curls up:

Special hinge cells at the base of grooves lose water, shrink and pull sides of grooves together – forcing the leaf to curl up.