Adaptations for gas exchange in fish

Cloze Reading Exercise

50%      blood      circulatory system      collapse      countercurrent      diffusion      efficient      energy      gill raker      gills      haemoglobin      increases      mouth      oxygen      particles    same      suffocate      water

1. Support for the gas exchange surface

When  are immersed in water they are constantly separated and kept apart by the dense  flowing through them. This means that the gills do not need a supporting system to prevent  of the gills. The reverse is true, however, when gills are exposed to air. When out of water the gill filaments stick together which greatly reduces the surface area of the gills and the fish  as they cannot extract oxygen from the air.  
  
2. Keeping the gas exchange surface clear of unwanted particles  
Fish take in water through the  in order for it to pass over the gills. This enables them to extract the  from the water. They also use their mouth to feed. Unfortunately this could mean that  of food could find their way from the mouth and into the gills, which could essentially reduce their efficiency by clogging them. In order to prevent this, fish have an adaptation known as a  which is a bony projection that is found along the front edge of the gill arch. These act to catch the particles.  
  
3. Pigment for carrying oxygen in blood  
Fish are too large an organism to rely solely on  to transport oxygen from the respiratory surface to the cells of the body for respiration. This means that they require an adaptation in order to get oxygen to the cells. The adaptation in fishes is the same as that for mammals. Through the use of a  that transports the  and a respiratory pigment known as  the active organism is able to provide itself with oxygen for respiration. The haemoglobin becomes loaded with oxygen at the respiratory surface and unloaded at the site of respiration. The use of a transport system and haemoglobin greatly  the efficiency of the overall system.  
  
4. High efficiency system for a fast moving, energy demanding physiology  
The  flow of blood through the capillaries and the water flowing over them makes the diffusion of oxygen into the capillaries extremely  . This is because diffusion occurs over the entire area in which they are in contact. If the two liquids moved in the  direction diffusion would end when both liquids reached a concentration of  . Fish have a high demand for oxygen due to their high requirement for  , for movement and also to meet the energy demands of the respiratory surface itself.