

Dissection of fish head to show the gas exchange system

Specification reference: 2.3

Adaptations for gas exchange

Introduction

A bony fish takes in water at the mouth. When the fish closes its mouth and raises the floor of the buccal cavity, the volume is decreased, and consequently the pressure is increased. Water is then driven over the gills, where gas exchange takes place, and out through the operculum.

Apparatus

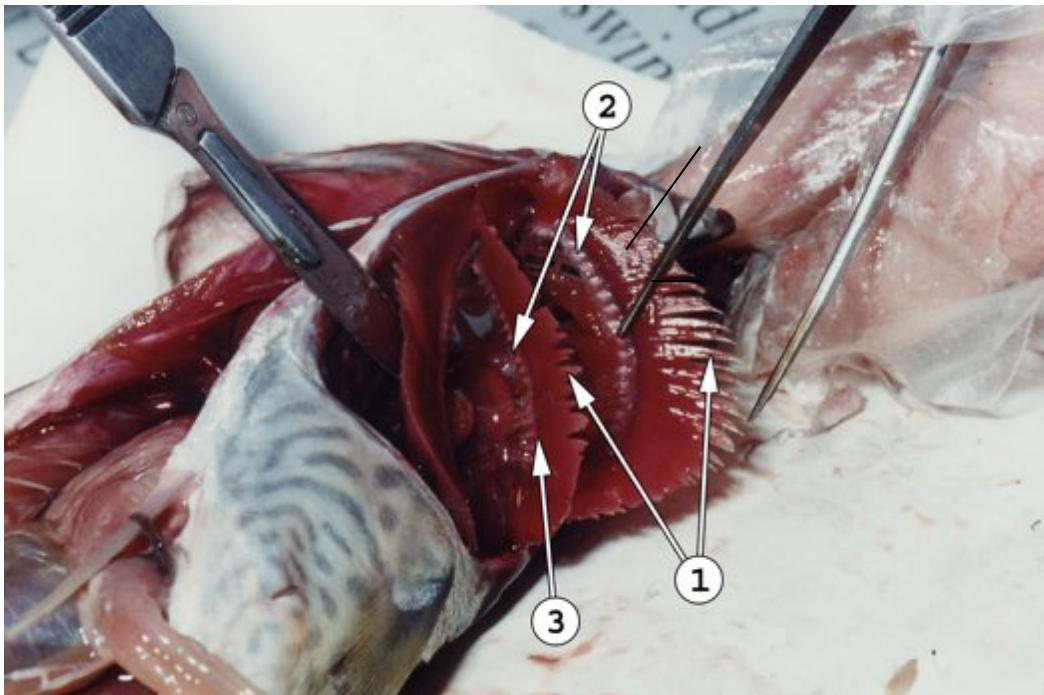
Large fish head	Glass rod
Dissecting board	Microscope slide
Fine scissors	Cover slip
Large scissors	Microscope
Fine forceps	Water
Fine scalpel	Gloves

Method

You should make labelled drawings or take photographs at each stage for your records.

1. Rinse the fish head thoroughly under cold, running water and run water through the gills, to remove mucus. If the salmon is fresh, the gills will be bright red and should not have any mucus on them. Older material is duller and may be covered with mucus.
2. Open the salmon's mouth and note the teeth on both jaws and the tongue, which has taste buds, at the bottom of the mouth. The lower jaw moves up and down to take in water and prey. The salmon does not chew and there is limited sideways movement of the lower jaw.
3. Use forceps to move the operculum in and out, showing how it moves during ventilation. The operculum may be stiff to move, but this is expected because it needs to close very firmly for the ventilation mechanism to be effective in maintaining pressure differences.
4. Lift the operculum and identify the gill filaments and the gill slits, which are the spaces between the gills.

5. Submerge the fish head in cold water. The gills should 'fluff up' - notice the large surface area.
6. Push onto the bottom of the mouth to see the floor of the cavity.
7. Gently push the glass rod into the mouth, through the buccal cavity and through a gill slit to show the pathway of water during ventilation.
8. Use scissors to cut the operculum off where it is attached to the head. This may be hard work as the operculum is a strong structure. You will see four gills, each of which is supported by a bony gill arch.
9. With large scissors, cut through the first gill arch where it attaches to the head at the bottom. As with the operculum, cutting through the gill arch may require considerable strength.
10. Cut through the first gill arch where it attaches to the head at the top.
11. Note the gill rakers attached to the gill arch. They filter solids, preventing damage to the gill filaments.
12. With fine scissors, cut off a few mm from a gill filament and place on a microscope slide. Place 2 drops of water on the material and cover it with a cover slip. Examine it under the microscope using a x4 and then a x10 objective.



1. Gill filaments
2. Gill rakers
3. Gill arches

Risk assessment

Hazard	Risk	Control measure
Dissecting instruments are sharp	can pierce or cut the skin while dissecting fish	Take care with instruments and cut away from body

Teacher/ Technicians notes

Any large fish head would be suitable. Students may also need disposable aprons or lab coats to protect their clothing.

Students should be encouraged to make records of each stage of their dissection either by drawings or photographs which can then be annotated.

More information is available below.

<http://australianmuseum.net.au/image/fish-dissection-blue-mackerel>

Further work

- If whole fish are used, then students could be encouraged to dissect the whole fish and examine other organs such as the heart , kidneys, swim bladder and reproductive organs. A useful guide can be found on the link below

http://www.dec.ny.gov/docs/administration_pdf/ifnyfdlp.pdf

Practical techniques

- safely use instruments for dissection of an animal organ, or plant organs
- produce scientific drawing from observation with annotations