

Lesson: Fish Dissection - Senior Secondary

Phase of learning

Senior Secondary (Years 11-12)

WA Curriculum

SS Biology – ATAR, SS Biology – General, SS Integrated Science – General

Region

North Coast, Gascoyne Coast, West Coast, South Coast, Indian Ocean Territories

Summary

Students will conduct a fish dissection to examine and identify the internal anatomy of a bony fish and learn how these features enable the fish to survive.

Outcomes

- Students will conduct a fish dissection to examine and identify the internal anatomy of a bony fish.
- Students will learn about the function of, and how these features enable fish to survive.
- Students will learn how to extract the otoliths from a bony fish and what information is collected from them to assist in sustainable fisheries management.

Duration

60 - 90 minutes

Preparation

Background information on fish anatomy and fish adaptations can be found in the Fact Sheet: [Fish Anatomy](#).

This activity may be carried out by students either individually, in pairs, or in small groups (3-4 students).

It is recommended that you carry out a demonstration of the dissection with your class before allowing them to dissect their fish.

There are a number of related resources available to you including Virtual Fish Dissection video, interactive anatomy posters and PDF anatomy posters.

Each student, pair or group will require a fish. Source whole fish specimens from your fish

monger. Species that are relatively easy to dissect and determine the internal organs of include:

- Sand or school whiting
- Yellowfin whiting
- Mullet
- Stripey snapper/tropical snapper/brown stripe snapper (no larger than ~22cm)
- Western butterfish
- Striped trumpeters
- Herring

When purchasing your fish, remember to note their name if you are unfamiliar with them.

You can purchase your fish in advance and freeze them, however ensure they are fully defrosted before attempting to dissect them. It is recommended that you keep your fish on ice prior to dissecting them to keep the fish firm.

Each student/pair/group will require a:

- fish to dissect
- Shallow plastic tray, cutting board or mat or newspaper (to protect their work surface)
- pair of sharp, blunt tipped scissors
- pair of sharp, sharp scissors
- pair of sharp tweezers
- pair of blunt tweezers.

In addition, each student will require a:

- Pair of disposable gloves
- Copy of Student Worksheet: [Bony Fish Anatomy – SS](#) for your chosen species (or similar species)
- Copy of Student Worksheet: [Fish Anatomy – SS](#)

Choose the worksheet for the species you have chosen or that exhibits a similar body shape to that you have chosen. The Student Worksheet: [Fish anatomy](#) is a question sheet which is applicable to most species of bony fish. You may also find Teacher Resource Sheet: [Bony Fish Anatomy](#) (for your chosen species or similar species) of assistance.

For clean-up you will require:

- Warm, soapy water for cleaning trays and dissecting equipment
- Heavy duty bin liners for disposing of dissected fish and disposable gloves – we recommend freezing until bin collection day.
- Surface spray
- Air freshener (optional)

Recommended resources

Poster: Bony fish – [external anatomy](#)

Poster: Bony fish – [internal anatomy](#)

Poster: Bony fish – [external anatomy](#) (thinglink)

Poster: Bony fish – [internal anatomy](#) (thinglink)

Additional resources

Australian Museum, Dissection of a Blue Mackerel, <https://australianmuseum.net.au/dissection-of-a-blue-mackerel-scomber-australasicus>

Australian Museum, Dissection of a Blue-spotted Flathead, <https://australianmuseum.net.au/dissection-of-a-bluespotted-flathead>

Australian Museum, Dissection of a Blue Mackerel (PDF), <https://nkieec.eq.edu.au/Supportandresources/Formsanddocuments/Documents/teacher-resources/Powerpoints/dissection-of-a-blue-mackerel.pdf>

Western Australian curriculum

Senior Secondary – Biology Year 11 General

Senior Secondary – Biology Year 11 ATAR

Senior Secondary – Integrated Science Year 11 General

Steps

1. Explain to students the purpose of their fish dissection – e.g. identifying external/internal

organs; comparing external/internal organs with another species previously dissected; identifying adaptations and their purpose.

2. Conduct a demonstration of how you would like students to dissect their fish, identifying all labelling you wish for students to complete.
3. Remind students of laboratory safety and safe use of dissection tools.
4. Distribute equipment and fish to students. Ask students to record the common name of their fish and the total length from the tip of the nose (snout) to the tip of the tail (unstretched, in a relaxed position) on their worksheet.
5. Examine the external features of the fish, including:
 - Dorsal fin
 - Lateral line
 - Caudal fin
 - Anal fin
 - Vent (anus)
 - Ventral (pelvic) fin
 - Pectoral fins
 - Operculum
 - Mouth
 - Nostrils
 - Eyes

Points for discussion:

Use the information provided in the Poster: [Bony fish – external anatomy](#) as discussion material for each of the features. Particular points of interest may be:

Caudal fin shape and what this tells us about the way the fish moves.

Mouth positioning and shape – use tweezers to pull open the mouth to show how widely it can (or cannot) open.

Does the fish have a tongue? Does the species have teeth? What does all of this information tell us about the diet of the fish?

6. Using the sharp, sharp scissors, cut from the vent in an anterior direction, between the pelvic fins and along the isthmus to the gills to open the gut cavity. Ensure that you don't dig your scissors into your fish too deep or you may damage the contents of the gut cavity.
7. Identify the gonads, stomach and intestine in the gut cavity of your fish.

Points for discussion:

Use the information provided in the Poster: [Bony fish – internal anatomy](#) as discussion material for each of these features. Particular points of interest may be:

Can you identify if the fish is male or female? Note – you may not be able to if the fish is

juvenile or spawned just prior to capture.

Can you identify any of the stomach contents?

Is the intestine short or long and coiled?

Are the findings of the stomach and intestine consistent with what you earlier determined about the fish's diet based on its mouth shape and positioning?

8. Remove these organs or pull to the side to expose the swim bladder.

Points for discussion:

Is the swim bladder still intact? If it is, it will appear as an air filled sac.

Explain that swim bladder controls the fish's buoyancy. The amount of gas contained within the bladder is adjusted to allow the fish to move up and down in the water column whilst conserving energy.

9. Locate the liver, heart and kidney.

Points for discussion:

Use the information provided in the Poster: [Bony fish – internal anatomy](#) as discussion material for the liver and kidney.

In fishes, blood is circulated by a 2-chambered heart – deoxygenated blood enters the first chamber of the heart from the body. It is then pumped to the second chamber before passing through the gills where it loses carbon dioxide and receives a fresh supply of oxygen. The oxygenated blood is carried back to the body by blood vessels called arteries. The arteries branch out into capillaries, which then collect into larger vessels, veins, carrying deoxygenated blood and dissolved carbon dioxide back to the heart to complete the cycle.

10. Lift the operculum (gill cover) using tweezers. (optional) Cut and remove the operculum.

11. Carefully (so as to not damage them) remove the gills by cutting through the bone (use sharp, sharp scissors) at either end of the gill arches. Identify the gill rakers and gill filaments.

12. Place the removed gills into a beaker of water to observe their shape in water.

Points for discussion:

The structure of the gills is made up of three components – the gill filaments, gill arches and the gill rakers. Refer to the Poster: [Bony fish – internal anatomy](#).

What is the purpose of the gill filaments?

What is the advantage of having multiple layers of gill filaments?

Also note – in the marine environment, the body fluids of fish are less salty than the surrounding

environment so water diffuses out through the skin and gills. As a result, marine fish have to 'drink' continuously to avoid dehydration. They also only produce a small amount of urine.

To remove the otoliths:

1. Place thumb in cavity where gills were and hold remainder of body firmly with other hand. Gently pull head back (towards fish's dorsal surface) until you feel the spine break. Take care not to pull head off the remainder of the body.
2. Using sharp, blunt scissors, cut the (now separated) first vertebrae parallel to the bone (i.e. scissors facing towards the mouth of the fish), about half way down the depth of the bone.
3. Pull the cut piece of bone upwards to expose the otolith cavities. Sitting inside each cavity (there are 2) will be a single otolith.
4. Using the sharp tweezers, carefully remove the otoliths from each of the cavities, taking care not to push them down into the cavity when you insert the tweezers.

Points for discussion:

The otolith is the fish's inner ear, enabling them to listen to sound waves that travel through the water. Researchers can determine the age of bony fish by studying their otoliths. As a fish grows, tiny white and clear bands of calcified material are laid down in the otolith, similar to growth rings in a tree. The growth bands are counted under a microscope to determine the age of the fish.

Related resources

[Poster: Bony Fish - External Anatomy \(including information\)](#)

[Poster: Bony Fish - Internal Anatomy \(including information\)](#)

[Student Worksheet: Fish anatomy SS](#)

[Student Worksheet: Bony fish anatomy - Australian herring SS](#)

[Student Worksheet: Bony fish anatomy - Brown stripe snapper SS](#)

[Student Worksheet: Bony fish anatomy - Painted sweetlips SS](#)

[Student Worksheet: Bony fish anatomy - Trumpeter SS](#)

[Student Worksheet: Bony fish anatomy - Whiting species SS](#)

[Fact Sheet: Fish Anatomy](#)

[Teacher Resource Sheet: Bony fish anatomy - Australian herring](#)

[Teacher Resource Sheet: Bony fish anatomy - Brown stripe snapper](#)

[Teacher Resource Sheet: Bony fish anatomy - Painted sweetlips](#)

[Teacher Resource Sheet: Bony fish anatomy - Trumpeter](#)

[Teacher Resource Sheet: Bony fish anatomy - Whiting species](#)

[Lesson: Fish Dissection](#)

[Video: Fish Dissection](#)