



## Teacher Resource Kit - Experiment Lesson Plan

### Lionfish Dissection

#### Experiment Summary

This experiment introduces invasive species, using lionfish in the Caribbean as an example, and explains how they can have a negative impact in an ecosystem. Using CCMI's training video and resource kits, teachers will be guided through how to undertake a simple lionfish dissection with their students by a CCMI educator. Background information on invasive species, the causes of the lionfish invasion in the Caribbean and lionfish biology will also be provided in the training video. Teachers undertaking this experiment are encouraged to follow up with a class discussion focusing on what other invasive species are found in the Cayman Islands and how we can reduce their population.

#### Curriculum Aim - Key Stage 2 (Year 4, 5 and 6)

##### Reefs Go Live corresponding broadcast:

- Lionfish: The Perfect Invader (<https://youtu.be/cEAaHi5Ln1w>)

##### Learning objectives

- Define invasive species
- Describe the lionfish invasion in the Caribbean
- Explain lionfish biology
- Observe how to undertake a lionfish dissection
- Recognise and identify invasive species in real-life scenarios

##### The Cayman Islands - Science National Curriculum Alignment

- Recognise that environments can change and that this can sometimes pose dangers to living things (Year 4)
- Describe the life processes of reproduction in some plants and animals (Year 5)
- Identify how animals and plants are adapted to suit their environment in different ways and that adaptation may lead to evolution (Year 6)

##### Ocean Literacy Principles

#5 - The ocean supports a great diversity of life and ecosystems.

#6 - The ocean and humans are inextricably interconnected.

##### Necessary materials

###### Teacher training video

- Internet connection
- YouTube.com classroom account
- computer
- note paper
- pencil or pen



### Experiment

- whole lionfish
- dissection kit
- gloves
- chopping board
- hot water

### Useful resources

- [www.reefresearch.org/reefs-go-live](http://www.reefresearch.org/reefs-go-live)
- [www.projectaware.org](http://www.projectaware.org)
- [www.doe.ky](http://www.doe.ky)
- [www.education.gov.ky/education/curriculum](http://www.education.gov.ky/education/curriculum)
- [www.oceanservice.noaa.gov/kids/](http://www.oceanservice.noaa.gov/kids/)

## **Experiment Instructions**

### **Lionfish Dissection**

1. Prior to this experiment, source a fresh or frozen lionfish. If the lionfish is frozen, place the fish in a container filled with warm water and allow it to defrost (may take several hours). When handling the lionfish, hold it from the mouth and be careful to avoid the venomous spines located on the dorsal (back), anal and pelvic fins
2. Before beginning the dissection, ensure that all staff members know how to treat a lionfish envenomation and that appropriate first aid equipment is nearby. If you are envenomated by a lionfish during the dissection demonstration, remove the visible spines and any constricting items from the affected area (e.g. rings) before submerging the area in hot water (as hot as you can stand) without scalding the skin. Then make your way to see a medical professional. If the lionfish has been frozen previously, the venom is likely to have degraded and will not produce a significant reaction. As a precaution, follow the above protocol and visit a medical professional to clean and disinfect the wound.
3. Define ‘invasive species’ and explain how/why invasive species can harm an ecosystem. Have students list some ways that they think invasive species can reach an environment.
4. Explain that lionfish are an invasive species in the Atlantic/Caribbean and were likely introduced to the region by the aquarium trade. Describe how the population of this fish has significantly increased due to lionfish’s high reproductive rate and a lack of natural predators. Describe how lionfish can survive in a wide variety of environments (e.g. deep and shallow water, hot and cold water, etc.), which has aided their population expansion.
5. Explain that lionfish have a negative impact on coral reefs, as they are generalist predators that eat both small invertebrates and fish, which impacts the food chain on many levels.
6. Begin the dissection by showing students the venomous spines (Dorsal: 13, Pelvic: 2, Anal: 3) on a lionfish, and explain the difference between venomous and poisonous. Cut off the venomous dorsal spines (Fig. A) and separate one spine, then cut off the sharp tip and remove the skin (Fig.



- B). Describe how the venom travels along the outside of the spine through a ridge. You can pass the spine around, allowing students to feel for this ridge. Cut off the venomous pelvic and anal spines (Fig. C and Fig. D).
7. Remove the pectoral fins (Fig. E), explaining how they are used to corral prey into a corner during hunting. Once these fins are removed, place the fish on a surface and measure the length of the fish from the mouth to the tail, using a ruler (ensure the mouth is closed). Ask students to record the length of the fish on their data sheet.
  8. Open the fish by cutting from the anal aperture towards the head. Next, make a perpendicular cut that runs over where the pectoral fins were attached (Fig. F). Open the internal cavity and pin back the triangular section of skin to the main body of the fish, exposing the internal organs of the fish.
  9. Locate the gonads, which are found either side of the white swim bladder at the top of the cavity (Fig. G). Is the fish male or female (male: testes are thin and elongated with edges, female: ovaries are rounded)?
  10. Remove the swim bladder, and explain how it is used to control the buoyancy of the fish. Pass the swim bladder between students so that they can feel its rubbery texture.
  11. Place a finger into the mouth of the lionfish and push it down the throat so that it can be seen inside the oesophagus. Using your other hand, make a cut through the oesophagus, then remove your finger. Pull out the remainder of the internal organs by holding onto the newly cut rear section of the oesophagus. Remove the fatty tissues, liver, and intestines until you are left holding the end of the oesophagus and the stomach (Fig. H).
  12. Cut open the stomach look for any prey items inside (Fig. I). Try to identify the prey using ID books or an internet search engine. Recap with students how lionfish are generalist predators and have a significant impact on the health of coral reefs.
  13. Hold the fish upside down and show students the gills (Fig. J). Make a cut between the two gill openings and cut out a single gill, pass this around the class so the students can see the gill rakers and filaments (Fig. K). Describe how fish extract oxygen from the water using these filaments.
  14. Make a cut parallel to the previous cut made, which is slightly further towards the rear of the head (just behind the last gill), cutting through the cartilaginous tissue. Pull apart this cut, and the heart will be exposed (Fig. L). Remove the heart and ask students if they think it looks in proportion to the size of the fish.
  15. Lie the fish on its side. Taking either a pair of scissors or scalpel, push the blade into the eyeball and remove the lens. The lens is spherical in shape. Ask students to compare the shape of their eye lens to the shape of the lionfish's lens. Discuss why the lenses of humans and lionfish may have adapted to be these shapes.
  16. Finish the dissection with a discussion about how we can prevent the lionfish population from growing. Explain that lionfish can be eaten and are very easy to cook. Additionally, people can cull lionfish once they have undergone training with the Cayman Islands Department of



Environment. Ask students if they think it is a good idea for us to feed lionfish to other predators, such as groupers and sharks. Explain to them that this is illegal; feeding lionfish to other animals in the ocean associates humans with food, nor has it been scientifically proven to teach predators to eat lionfish.

17. Follow the dissection with a discussion about what other invasive species can be found in the Cayman Islands. Have students list some ways that they think people can reduce the population of these invasive species.

## Experiment Glossary

### Lionfish Dissection

**Biodiversity** - all the different living organisms within a given area

**Culling** - removal of an organism from an ecosystem to reduce the population using man-made methods

**Ecosystem** - naturally occurring system made up of organisms and their like environment

**Food web** - representation to show how energy moves from producers to consumers in an ecosystem while also showing how these interactions between organisms in an ecosystem can be multi-faceted

**Habitat** - part of the environment occupied by an animal or plant

**Invasive species** - organisms that are not native to a particular area or ecosystem but have been introduced; it often spreads rapidly in a new area and outcompetes native species

**Opportunistic feeder** - organism which feeds on any food available without preference

**Reproduction** - production of the same type of living thing through sexual or asexual processes

**Swim bladder** - a gas-filled sac present in the body of many bony fish, used to maintain and control buoyancy

**Venomous** - capable of secreting a toxin, which is transmitted by a bite or sting; the venom can harm or kill



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## Student Vocabulary Assessment Lionfish Dissection

Below is a list of 10 vocabulary terms used during your Reefs Go Live Lionfish Dissection. Show the CCMI Educator that you understand coral bleaching and can match the definition on the right with the correct term on the left. Thanks for your help and good luck!

- |                                |   |
|--------------------------------|---|
| 1. Biodiversity: _____         | a) part of the environment occupied by an animal or plant   |
| 2. Culling: _____              | b) production of the same type of living thing through sexual or asexual processes  |
| 3. Ecosystem: _____            | c) removal of an organism from an ecosystem to reduce the population using man-made methods   |
| 4. Food web: _____             | d) a gas-filled sac present in the body of many bony fish, used to maintain and control buoyancy  |
| 5. Habitat: _____              | e) organisms that are not native to a particular area or ecosystem but have been introduced; it often spreads rapidly in a new area and outcompetes native species                      |
| 6. Invasive species: _____     | f) naturally occurring system made up of organisms and their like environment   |
| 7. Opportunistic feeder: _____ | g) all the different living organisms within a given area   |
| 8. Reproduction: _____         | h) capable of secreting a toxin, which is transmitted by a bite or sting; the venom can harm or kill  |
| 9. Swim bladder: _____         | i) representation to show how energy moves from producers to consumers in an ecosystem while also showing how these interactions between organisms in an ecosystem can be multi-faceted |
| 10. Venomous: _____            | j) organism which feeds on any food available without preference  |



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**Reference Figures**  
Lionfish Dissection



Fig. A



Fig. B



Fig. C



Fig. D



Fig. E



Fig. F

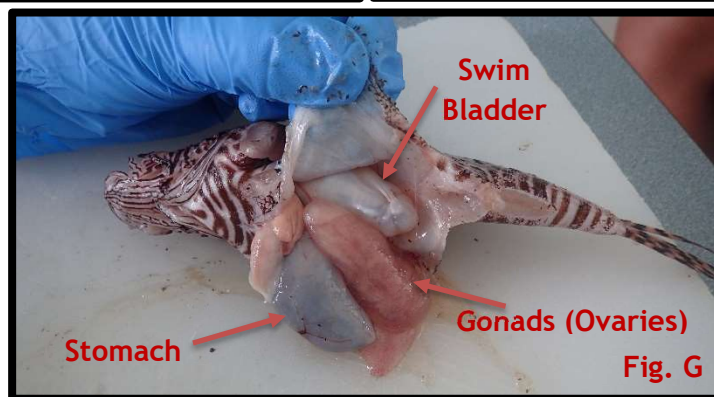


Fig. G



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## Reference Figures Lionfish Dissection

