

Marine Plastics in Fish

a citizen science dissection & analysis protocol



This guide will walk you through how to remove the guts from a fish and analyse them for plastics.

Materials

- Spotter's guide (@ end of this guide)
- Dissecting diagram (@ end of this guide)
- Full sized baking sheet or flat surface that can catch fluids
- Fine mesh strainer
- 1 large or 4 small Coffee/Paper Filters
- Sharp scissors
- Fish knife (or other sharp knife)
- Tweezers
- Water Bottle
- Rubber gloves (optional)
- Garbage bag

If you have any questions, contact Civic Laboratory for Environmental Action Research through our website, or by emailing our director, Dr. Max Liboiron, at mliboiron@mun.ca.

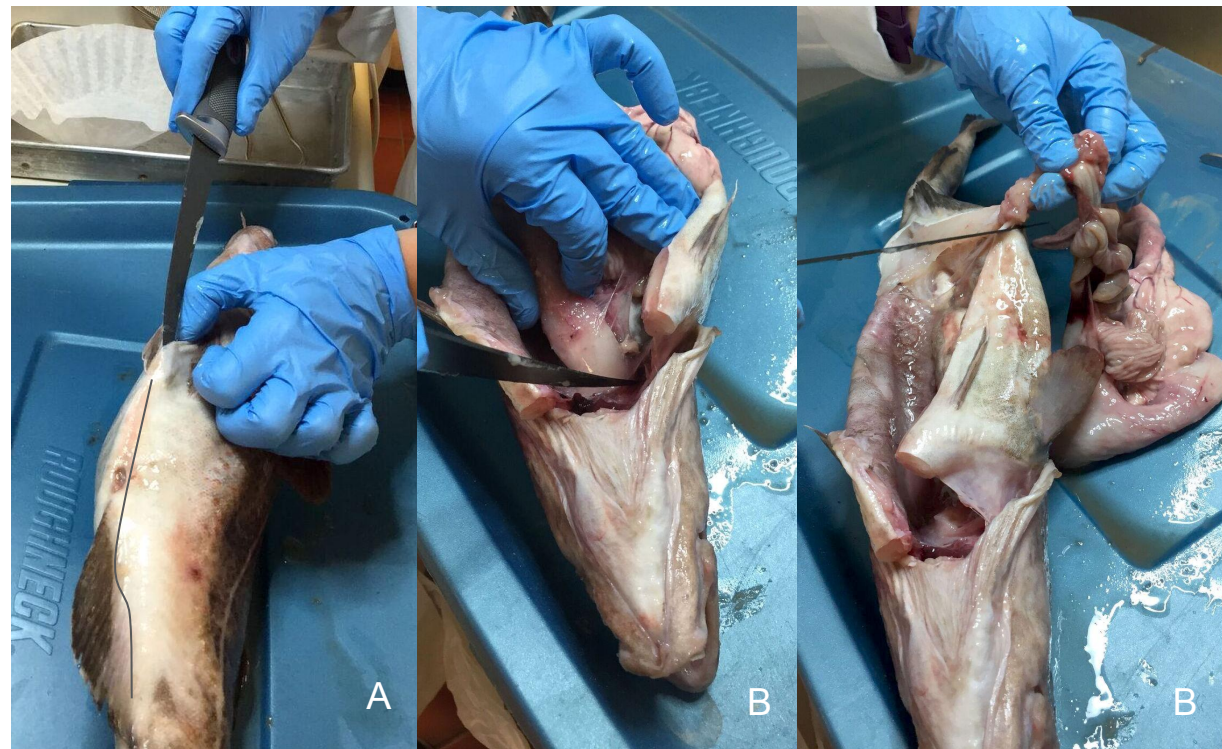
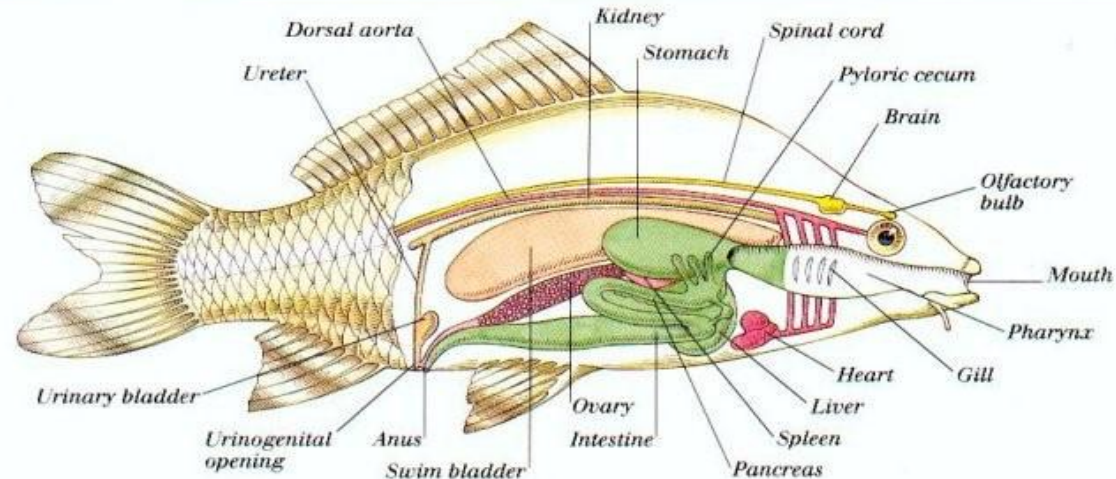
This guide is funded by a grant from the Marine Environmental Observation Prediction and Response Network (MEOPAR).

These are items that you can find at home or at local hardware or general stores. Items can be substituted for others that get the job done.

Children should work with an adult on this project because of the use of knives and other sharp tools.

Setting Up Your Workstation

1. Dissecting station should be on a clean and even surface. Prepare the station by placing the cookie sheet on the table or counter.
2. Place the fish on the cookie sheet or other flat surface (we are using the lid of a rubber maid here).
3. Take out the guts: Following the dissecting diagram, use the scissors to remove the entire GI tract (outlined in green). a) Cut a straight line of the belly of the fish from the mouth to the anus. b) Pinch the end of the intestines by the anus with your fingers so contents are not lost. With your other hand, pull up--the entire GI tract should come up. Still pinching the end of the intestines, cut the guts at each end (mouth and anus). c) Gently place the guts in the paper-lined colander. Try to get it all in one piece with no nicks!



Processing the Stomach

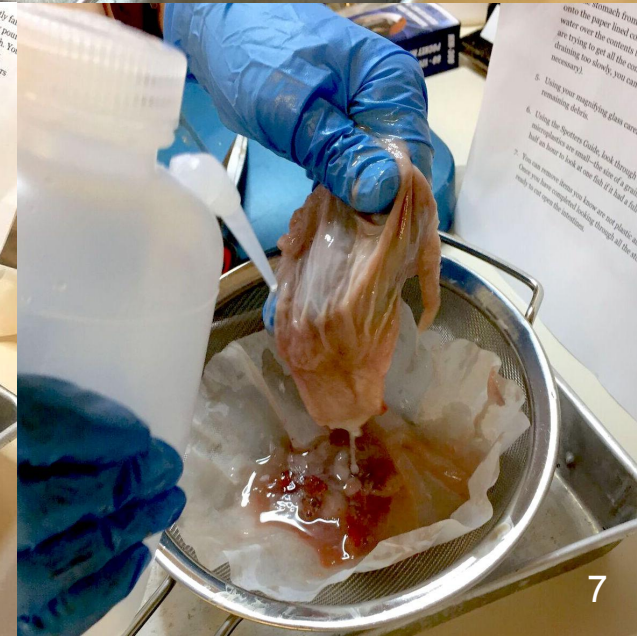
4. Place the coffee filter(s) in the strainer, and then guts in the coffee filter.

5. Using scissors, cut the intestines from the stomach, being sure to keep anything that spills out into the coffee filter. Move intestines to one side of colander; you will dissect them after the stomach.

6. Cut the stomach from one end to the other allowing the contents to gently fall onto the paper lined colander.

7. Using the water bottle carefully and slowly pour water over the contents to separate and remove all debris from the stomach. You are trying to get all the contents into the filter without spilling. If the filter is draining too slowly, you can use a very fine mesh strainer instead (remove the filter-- the filter just makes it easier to see things).

8. Whenever you see a plastic, pick it out and put it aside (in a dish is best, since they can get lost!).



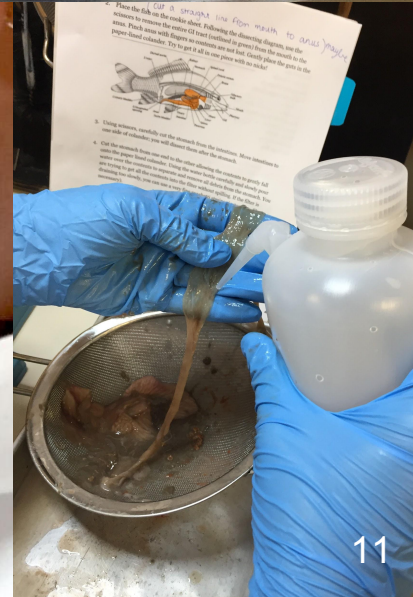
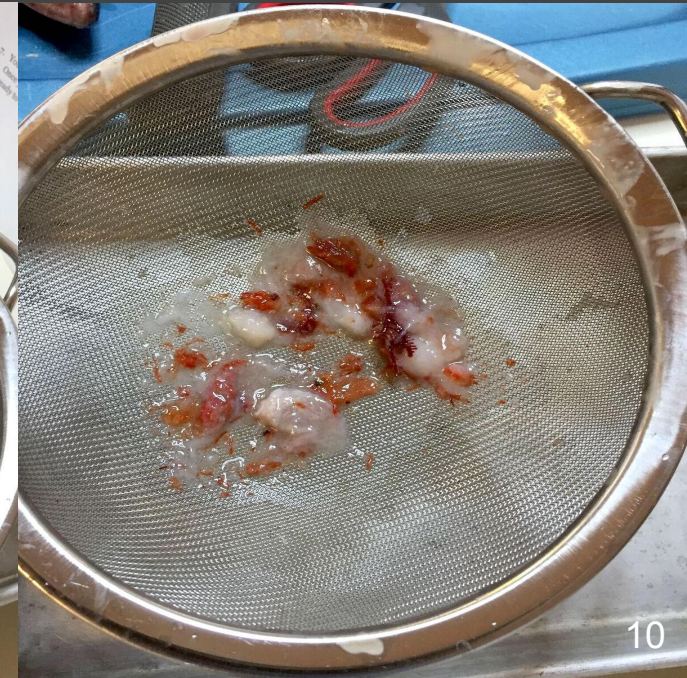
Looking for plastics

9. Inspect the empty stomach lining for any remaining debris.

10. Put aside the stomach, and look through the stomach contents closely for plastics. Use the Spotters Guide. Most plastics are smaller than a grain of rice, so take your time! It usually takes us half an hour to look at one fish if it had a full stomach & intestine.

You can remove items you know are not plastic and place them in a garbage bag.

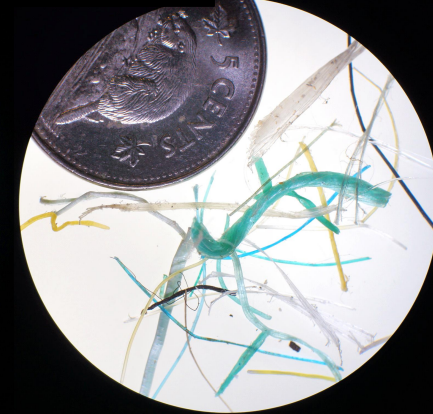
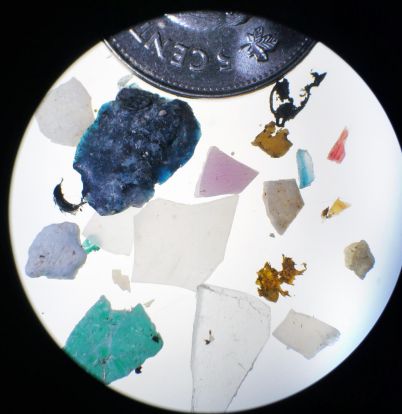
11. Once you have completed looking through all the stomach contents you will be ready to cut open the intestines and repeat cutting, rinsing, and looking. Repeat steps 5-10. The intestines are long and thin, so cutting and rinsing them can take some care & time.



Is it a plastic?

Plastics can be hard to identify because they are so small, and because they can look like other things fish usually eat. Use the Spotter's Guide to help identify plastics from common non-plastics. Other tricks include:

- putting hard-to-identify items into a coffee filter for 48 hours to dry. If it shrinks or twists, it may have been organic and changed form when it lost water.
- Tap it. Does it sound like plastic, or a rock (or something else)?
- If you hold a flame to it, does it melt or flare like plastic, or does it burn like organics (this destroys the sample)
- Use a magnifying glass or microscope to see the underlying structures



Spotter's Guide to Plastic Pollution

Burnt film plastic; edges are uneven and 'stringy' from melting (plastic bag)

Thread plastic; thin with no cellular texture; frays are even (nylon rope)

Microbead; small, perfectly spherical, often found in groups, sometimes brightly coloured (cosmetics/toothpaste)

Green plastic fragment; a 'shaved' piece of a larger item; frays are even, shiny; piece flexes but does not break (fragments can be PET, HDPE, LDPE, PVC, PP, PS plastics or others)

Clear plastic fragment; too even to be a rock; has a duller sound than a rock when tapped

White plastic fragment; with crackle erosion pattern

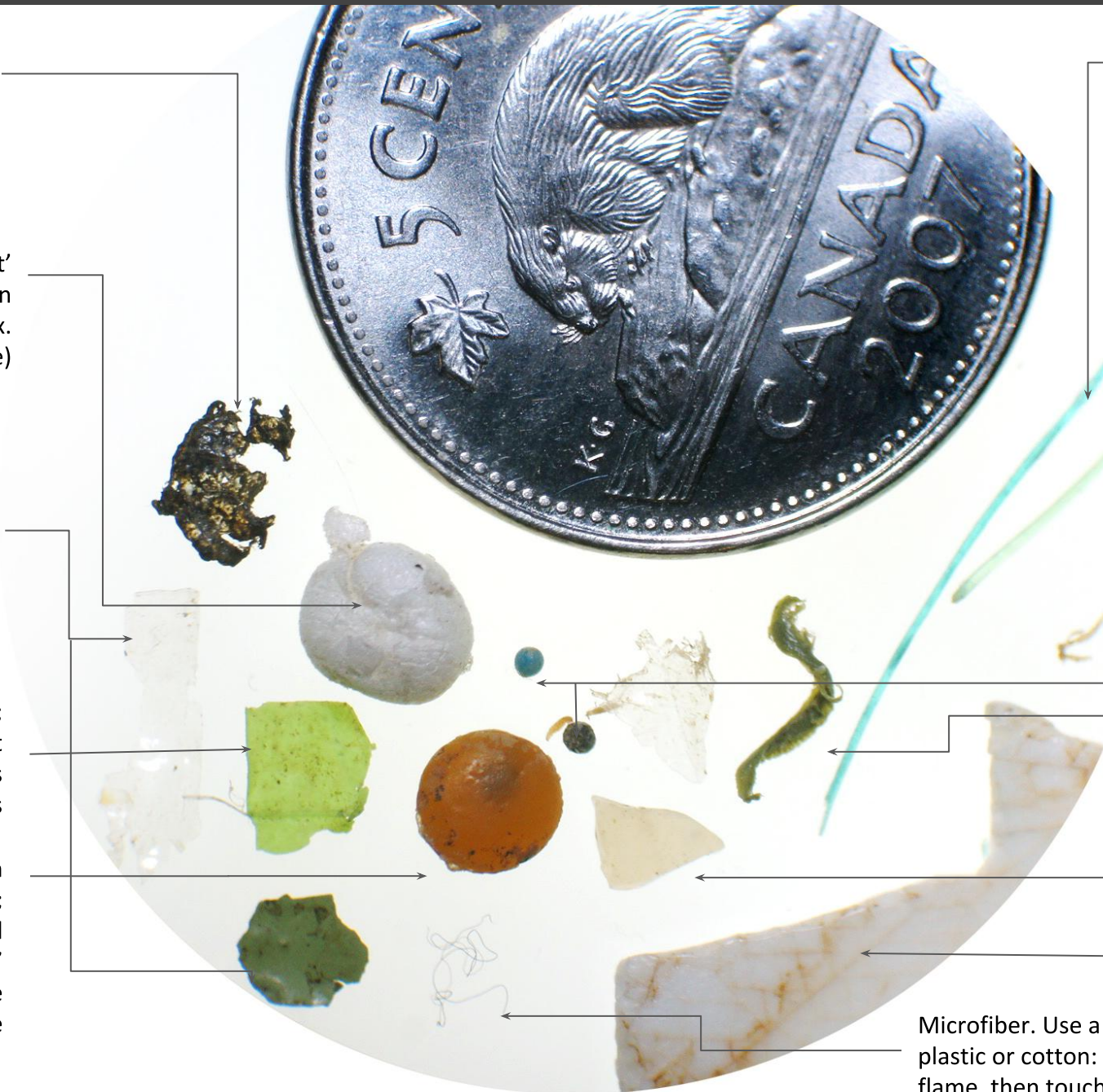
Microfiber. Use a hot needle test to see if it's plastic or cotton: hold a needle under a flame, then touch it to the fiber. Melts/shrinks = plastic, burns = cotton.

Foam plastic; a soft 'pellet' that bounces back when pressed with tweezers (ex. polystyrene, polyethalene)

Clear and green film plastic; bends but doesn't break, has sharp, straight edges (ex. polyethylene or polypropylene)

Green plastic fragment; hard, does not bend but flexes slightly, as hard/straight edges

Industrial production pellet ("nurdle"); spherical like a bead without a hole, 'stained' brown from being in the water for a long time



Spotter's Guide to Plastic Pollution:

non-plastics

Aquatic plant matter: may look like plastic when wet, but dries hard and brittle.

Plant matter: smooth edges, frays are uneven and organic-looking, cellular structure sometimes visible.

Paper: when dry, feels like paper; fibers burn instead of melt, pulls apart when wet.

Shell

Seeds and fish eye lenses: often perfectly round, but have ridges, furrows or linear marks going from pole to pole; has a different center when split open (plastics would be more uniform).

Rocks: Very smooth or light passes through unevenly; sinks in water; sounds different than plastic when tapped

Crab part: two sides are very different, organic patterns on one side.

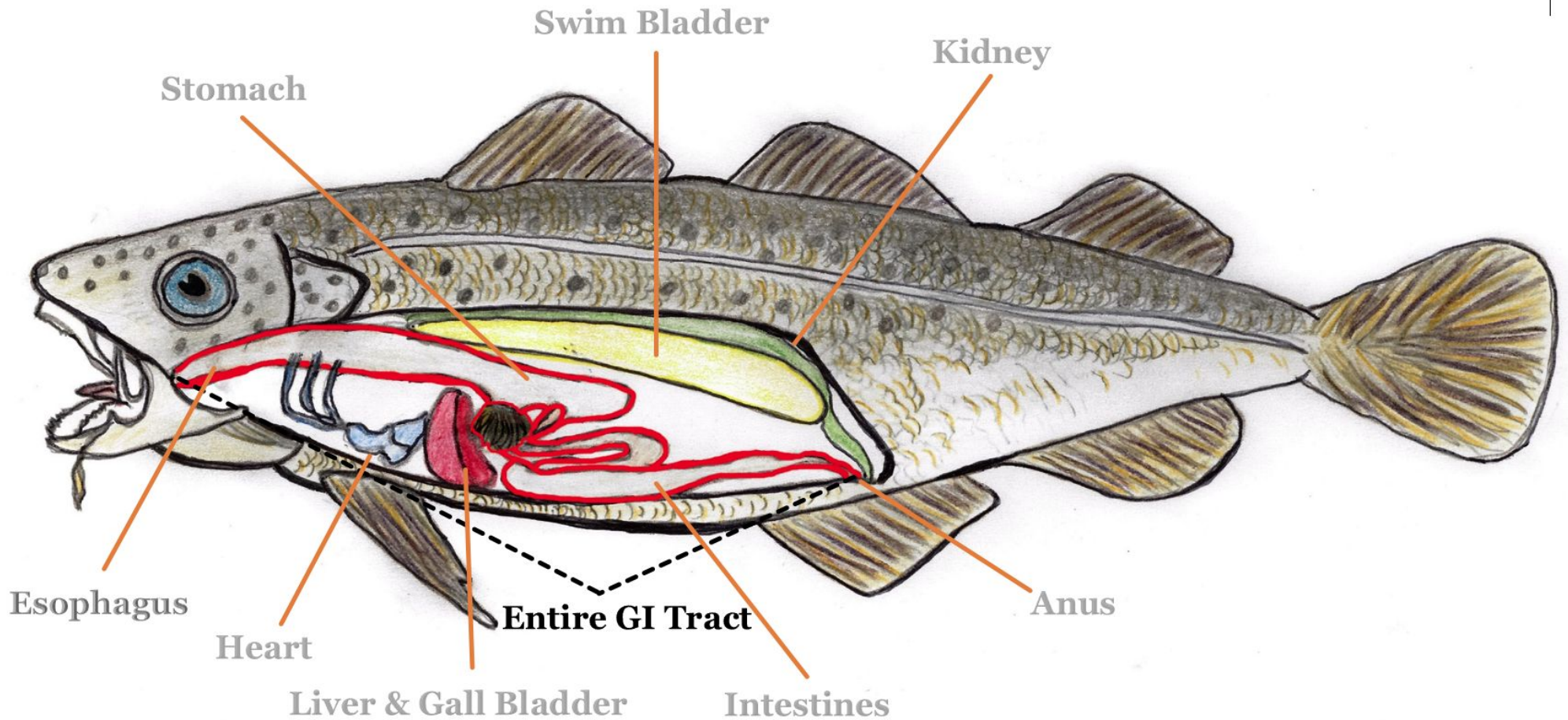
Cotton string: Threads are tiny and uneven; burns instead of shrinks or melts with hot needle test

Shells: smooth without plastic-like facturing or grooves; pitting is regular; two sides often very different; makes a light clinking sound when tapped.

Glass: Has very straight edges; clinks like glass when tapped.



Dissection Diagram



When removing the **Entire GI Tract** cut from the **Esophagus** to the **Anus**
Discard the Heart, Liver, Gall Bladder, Swim Bladder and Kidney