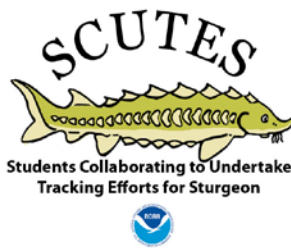


Topic/Lesson:	Sturgeon Sampling Methods
Subject:	Tagging, tissue sampling, and gastric lavage of sturgeon
Author:	Rob Yeomans
Time Duration:	One 90 minute block or two 45 minute classes.
Overview:	Students will become acquainted with some of the methods and procedures researchers use in the field to obtain data on live caught sturgeon.
Objectives:	<p>Students will be able to:</p> <ul style="list-style-type: none"> • Follow directions. • Make measurements. • Identify the pros and cons of various external and internal fish tags. • Explain the importance of tagging sturgeon. • Take tissue samples safely from sturgeon. • Describe why tissue sampling is important in sturgeon research. • Perform and explain the importance of gastric lavage.
Materials:	<ul style="list-style-type: none"> • Copy of lab • Whole, fresh, legally and locally caught fish. Ask a local fishmonger for help in obtaining these. If none are available, preserved species are acceptable. Carolina Biological Supply sells preserved perch. http://www.carolina.com/product/preserved+organisms/preserved+animals+%28non-mammals%29/preserved+perch/preserved+carosafe%26reg-+perch.do?sortBy=ourPicks • Gloves • Hypodermic needle • Metal wire cut into .5 inch pieces to serve as PIT tags • Dissection scissors • Ruler • Large needle • Plastic tags that fit into the large needle • Flexible tubing

	<ul style="list-style-type: none"> • Large syringe to fit into the tubing • Glass watch bowl
<p>Procedures:</p>	<p>Day before lab</p> <p>For the last 10 minutes of class, pass out the lab and, for homework, students are to read the lab's introduction and procedure and come to class the next day prepared to do the lab. They also need to complete the pre lab question.</p> <p>Day of lab</p> <p>Check over and discuss the pre lab question, introduction and procedure with the class. Stress the requirements that sturgeon handled in the wild must have:</p> <ul style="list-style-type: none"> • Plenty of oxygen • Water temperature should remain below 28°C. • Researchers can wear rubber gloves to prevent removal of mucus on fish's skin. • Sturgeon should only be handled for short periods of time to avoid too much stress. • They should be kept out of the sun as their skin can burn and their skin should not be exposed to air during cold periods as they can get frost bite. <p>Go into the lab with the class, get them in their stations and start lab. Remind students that they will be using hypodermic needles that are very sharp. Teacher should watch over lab groups using the needles.</p> <p>When finished, students should clean all materials and bring them back to the front bench. Fish should be disposed of properly by the teacher. Students are to finish the post lab questions for homework.</p>
<p>Conclusion:</p>	<p>At the beginning of the following class</p> <p>Check and go over the post lab questions.</p>



Sampling Methods for Atlantic Sturgeon

Introduction

The once plentiful Atlantic sturgeon that historically populated most major rivers on the eastern seaboard of the United States have been reduced to very small populations in a reduced number of rivers. This is mainly due to pollution, habitat destruction and loss, and overfishing. At this moment, fishing for and retention of Atlantic sturgeon is prohibited. Scientists are now trying to gather as much information concerning this species as possible. This information will be used to set guidelines and future actions to increase the population of sturgeon. Researchers need to get as much information as possible from the few members of this species as possible without harming the fish. Today, you will act as a researcher and perform some of the sampling methods they use on sturgeon, although your species will be a locally, legally caught species of fish.

Pre-Question

What data would you, as a researcher, want from the current Atlantic sturgeon population that could be used learn more about the life history, migration patterns, and threats?

Procedures

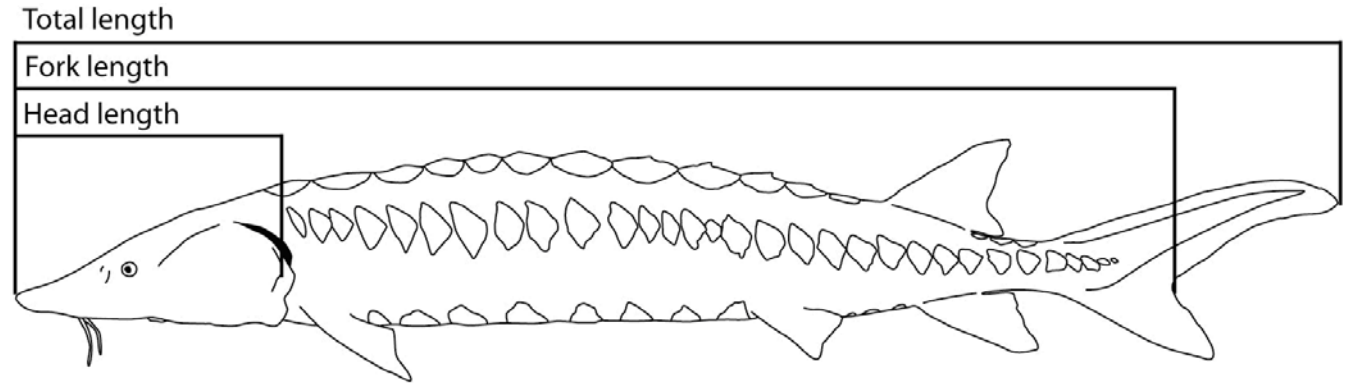
Get a dissection pan and gloves. When set up, get a fish from your teacher and gently lay it in the pan. When you need other materials, go and get them. When finished with them, replace them right away as they will be needed by other students in your class. Do not perform unnecessary procedures on your fish.

What species is your fish?

A. Measurements

When conducting their studies in the field, sturgeon researchers measure and tag all Atlantic sturgeon in order to obtain a baseline.

1. Get a ruler and perform the following measurements. Measurements should be in cm.



From: Damon-Randall et al. *In Press*, Atlantic Sturgeon Research Protocols

Total Length

Fork Length

Head Length

Tags

Tagging any fish for scientific research will reveal much about its behavior when caught a second time and the tag is returned. Collection can occur by local fishermen accidentally catching a sturgeon or by researchers targeting them. In both cases, handling must be done in such a way as to not harm the sturgeon upon release nor impede their daily lives. Also, sturgeon live a long time (60 years or more), so any tag must be built in such a way as to be retained for a long period of time.

B. External Tags

There are many different types of external tags. Some are plastic discs or tubing that are attached externally on the fish to provide a quick way of identifying that the fish has been caught before. Some contain an identification number and phone number so the tag can be returned. Fishermen and researchers can quickly identify a tagged fish; get a weight and length measurement and return the fish to the water in a short amount of time. External tags are used for a wide variety of fish species, including sturgeon, although some may not be retained for a

long period of time. This is due to the fact that sturgeons use the bottom of the river to rub the tag of their bodies and that, over 15 years or more, the tag may become illegible.

C. Internal Tags

There are a number of tags that are inserted into the muscle tissue of sturgeon or the body cavity itself. PIT tag (passive integrated transponder) systems are radio frequency identification devices consisting of transponders (tags) and transceivers (tag readers) coupled with an internal or external antenna. Tags are implanted into host organisms, and readers acquire digital codes from the tags by scanning for them with a short-range electromagnetic field (Fuller et al, 2008). The tag looks like a short section of wire and, once implanted, is permanent and has no negative effects on the host organism. A researcher can identify fish with PIT tags by scanning the body of the fish with a transceiver. The system is somewhat costly and fish cannot be identified by anyone without a tag reader. Also, 50% of sturgeon smaller than 200mm shed their tags due to a lack of muscle tissue at the time of tagging. Finally, some juvenile sturgeon will grow around their tag, making scanning of the fish at the time of recapture difficult or impossible.

1. From the front desk, get a hypodermic needle and PIT tag.
2. Back at your station, have your partner hold the fish by the head so that it is resting its abdomen on the dissection pan. Warning: The syringes are very sharp. To load the syringe safely, use forceps to pick up the tag. Load the syringe with the tag and inject it into the fish behind the dorsal fin, along its dorsal midline.

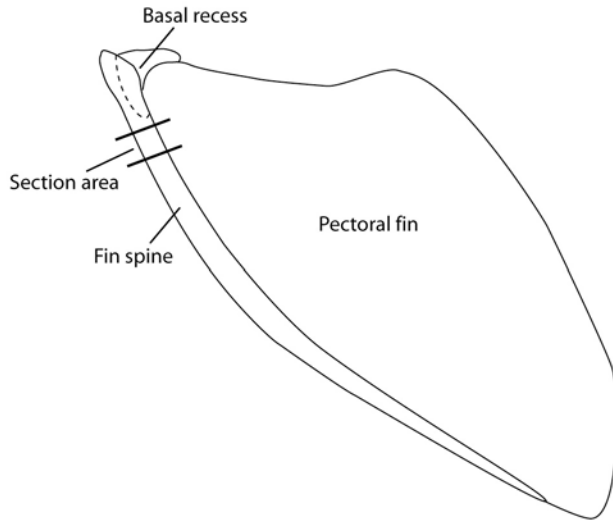
Have the needle positioned almost parallel to the fish and insert the needle just under the skin, about 3 cm in. Once in, depress the plunger to insert the tag. Remove the needle and return to the front bench.

D. Tissue sampling (biopsy)

Tissue sampling is important to obtain information on the age of a fish, any pollutants that may have accumulated in its body tissues and to perform genetic analysis. Muscle tissues can be collected for contaminants analysis. A section of a bony fin ray from the fish's pelvic fin is used for ageing. Once dried, the rings on the cross section can be used to estimate the age of a fish. A section of tissue between fin rays on the fish's pelvic fin is used for genetic analysis.

For ageing:

1. Lay the fish on its side and find its pectoral fin. Have your lab partner get a pair of dissection scissors. Spread out the rays and make two cuts, following the diagram below.



2. Put the sample in a small plastic bag.

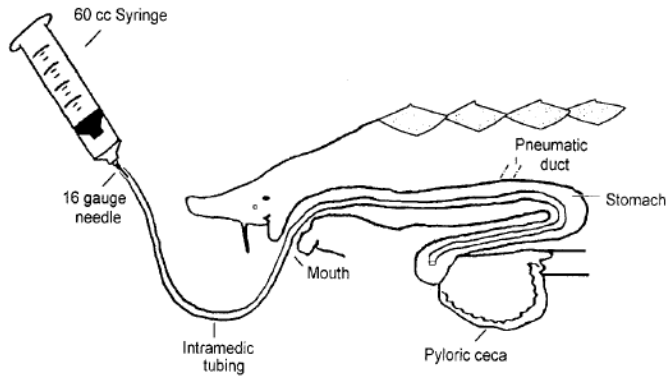
For genetic analysis:

1. Hold the fish so that it is once again resting on its abdomen. Spread the bony fin rays apart on the pelvic fin and, using the scissors; cut a 1 cm square from the trailing edge of the fin's membrane. Put it into the vial of ethyl alcohol.

E. Gastric Lavage

This technique is used to get a sample of the stomach contents of the sturgeon without harming the fish so researchers may understand the local diet of the sturgeon. In order to relax the fish and prevent potential injury, fish are often anesthetized and then its stomach is pumped using the following procedures. Follow these directions carefully as any misplacement of the tubing could rupture the stomach or swim bladder.

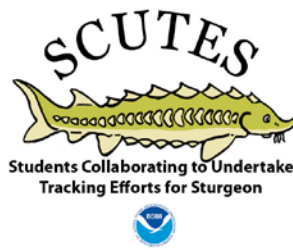
1. Get a length of plastic tubing and a large syringe.
2. At your lab station, lay your fish on its side at an angle, with the tail end propped up and the head angled downward. Place one end of the tubing into your fish's mouth and gently slide it into its alimentary canal (digestive tract) until you feel resistance. Twist the tubing ventrally and gently guide the tube down further into the stomach until the tube can be felt with a hand on the fish's ventral surface.
3. Fill the syringe with tap water and attach the end to the tubing.



4. Have your lab partner hold the fish's head over the glass watch glass as you depress the plunger slowly. The water should be forced into the stomach, dislodging the contents, and passing them back up the alimentary canal, out the mouth and into the glass dish.
5. Once completed, use the hand lens to inspect the stomach contents collected in the bowl and try to identify the organisms your fish ate. List them below. If the stomach is empty, write "empty."

Post questions.

1. While performing some or all of these procedures on a sturgeon, what handling methods (3) should you use to not affect the overall health of the fish?
2. Research and describe two major reasons why the mucus layer of fish is important to them.
3. What information can a researcher obtain from tagging?
4. Would you prefer internal or external tags if you were to conduct a sturgeon study? Explain your reasoning.
5. Research and create a list of 3 different external tag types. What are the pros and cons of each?
6. Research and create a list of 2 other internal tag systems. What are the pros and cons of each?
7. Determine how researchers get a muscle tissue sample from a live organism (not human).
8. What are two benefits of performing gastric lavage on fish? Why do we want to know their diet?



Sampling Methods for Atlantic Sturgeon: Teacher Answer Key

Pre-Question

What data would you, as a researcher, want from the current Atlantic sturgeon population that could be used learn more about the life history, migration patterns, and threats?

Possible Answers: age, length, sex ratio, diet, foraging area, spawning area, spawning rate (# of fertilized eggs per pair of sturgeon, how often they spawn, etc.), affects of human-made factors (fishing, dams, turbines, etc.) on sturgeon, # of recruits/year, temperature preference, dissolved oxygen requirements, prey, age at maturity, overwintering habitats, etc.

Post questions.

1. While performing some or all of these procedures on a sturgeon, what handling methods (3) should you use to not affect the overall health of the fish?

Possible Answers:

- *Keep water running through their gills with adequate dissolved oxygen.*
- *Water temperature should remain below 28°C.*
- *Researchers can wear rubber gloves to prevent removal of mucus on fish's skin.*
- *They should only be handled for short periods of time to avoid too much stress.*
- *They should be kept out of the sun as their skin can burn and their skin should not be exposed to air during cold periods as they can get frost bite.*

2. Research and describe two major reasons why the mucus layer of fish is important to them.

1. *Prevents skin from drying up*
2. *Protects fish from bacteria/ infections*

3. What information can a researcher obtain from tagging?

They can learn more about the behavior of the fish, and migration patterns, temperature, and depth preferences.

4. Would you prefer internal or external tags if you were to conduct a sturgeon study? Explain your reasoning.

This is an opinionated question. Any response is acceptable as long as the student justifies their answer.

5. Research and create a list of 3 different external tag types. What are the pros and cons of each? *Note: Students may find other types.*

1. Plastic discs or tubing (T-bar, Floy tags): *Pro: Quick way of identifying the animal, some contain a number so the tag can be returned. Public can easily identify the fish and collect data. Con: Animal has to be caught again in order to get any useful data. Some animals may never be caught again.*

2. Satellite tags: *Pro: You don't have to recapture the animal to obtain data. Con: The tag eventually falls off, it's expensive, and may cause some drag on the animal.*

3. Acoustic pingers: *Pro: Don't have to recapture the animal. Con: You have to follow the animal to get data, and the tag eventually falls off.*

4. Dataloggers: *Pro: Collects data constantly. Con: You have to recapture the animal to obtain the data.*

6. Research and create a list of 2 other internal tag systems. What are the pros and cons of each?

1. PIT tags: *Pro: Will stay with the animal for life, and has no negative effects on the animal. Con: You have to recapture the animal in order to get the identification number. You need a PIT tag reader which is expensive. Some smaller sturgeon will shed their tags or grow around it making them difficult to read.*

2. Acoustic tags: *Pro: Will stay with the animal for life, and has no negative effects on the animal. You don't have to recapture the animal. Con: It's expensive. You need receivers in the area. The tags may move around in the animal's body, and will remain there even after the tag is no longer communicating with the receiver.*

7. Determine how researchers get a muscle tissue sample from a live organism (not human).

While an animal is fully anesthetized, researchers may cut a small muscle tissue sample using a scalpel, or they may use a biopsy needle depending on the sample size required.

8. What are two benefits of performing gastric lavage on fish? Why do we want to know their diet?

1. You can find out the diet of the fish.

2. It doesn't harm the fish.

We want to know their diet so we know what types of food the fish need in order to survive. It is also a way to see if they are eating foods or objects that could harm them. Knowing what food they are eating can also help determine where they are foraging.