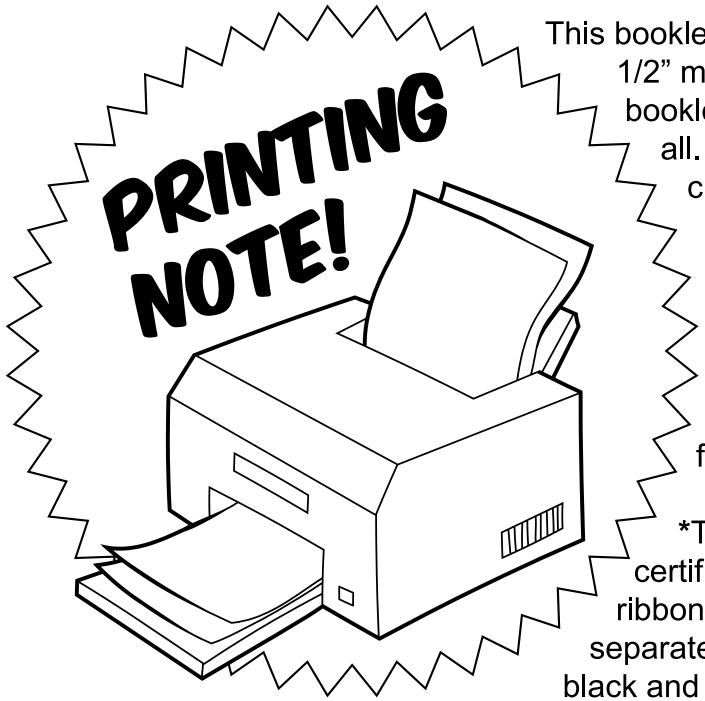
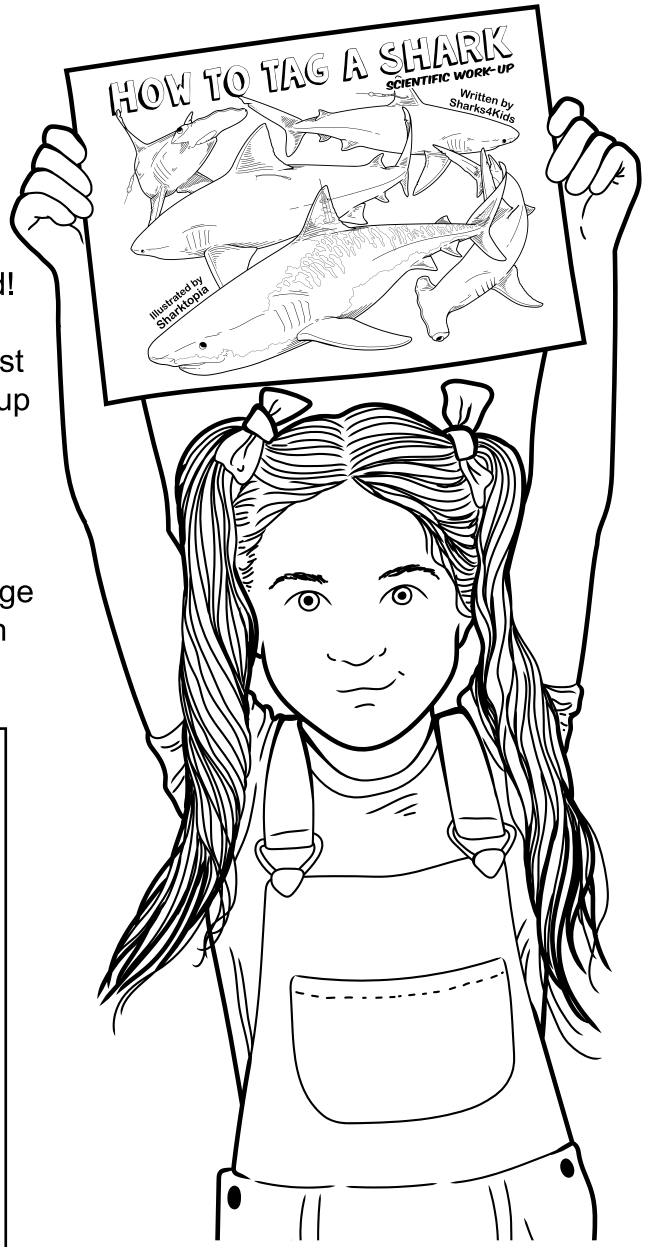


This booklet has been setup at 8.5”x11” with a 1/2” margin. You should be able to print this booklet as-is without adjusting the sizing at all. Please check your printer settings and choose ‘normal’ or ‘do not scale’. You’ll want to ensure the page size is not increased or decreased as that would affect the tape measure that’s included!

Tip: No need to print this page. We just wanted to ensure you’ve got things setup for a fun shark research session!

*The last page of this booklet features a certificate of completion. It does have a gold ribbon on it, so you might want to print that page separately in color (and the rest of the booklet in black and white). Whatever works best for you!



SPECIAL THANKS!

Thanks to Angela Warrior, Dr. Dean Grubbs, and Lindsay Graff for their assistance with this project.

Additional thanks to Duncan Brake and Jillian Morris for their shark research photos (used for reference in this booklet.) The illustrations are a direct result of those photographs!

Special thanks to Caiti (Sharktopia) for bringing this activity booklet to life with her incredible artwork!

Extra thanks need to go out to all of our Sharks4Kids Team Members and Ambassadors. We are able to reach so many people because of everyone’s efforts. We appreciate each of you!

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HOW TO TAG A SHARK

SCIENTIFIC WORK-UP

Written by
Sharks4Kids

Illustrated by
Sharktopia

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SCIENTIFIC WORK-UP

When scientists tag sharks, they also collect other data. This can vary depending on the species, the size of the shark and the questions they are trying to answer. You can think of the work-up as similar to a check up or physical at the doctor's office.

Standard work-ups include:

- 2-3 Length measurements
  - Total Length - From the tip of the snout to the tip of the tail
  - Pre-Caudal Length - From the tip of the snout to the start of the caudal (tail fin)
  - Fork Length - From the tip of the snout to the fork in the tail. Not all sharks have a lower lobe to their caudal fin, so this measurement is not always taken (Nurse sharks for example)

- DNA (genetics) - Scientists take a small clipping of the trailing edge of the dorsal fin to collect a genetic sample. This can be used to determine if they've ever caught the shark's mom, dad or siblings. Think of this as creating a shark family tree.

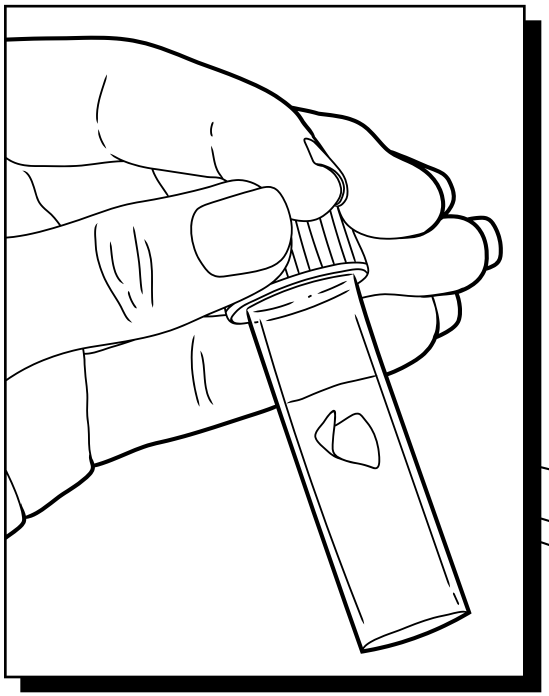
- Male or female

- Health assessment - Check for any injuries, blotchy skin, or noticeable abnormalities

Additional data collected can include:

- Weight - Depending on the size of the shark they can be placed in a measuring trough.
- Girth - Measurement around the shark
- Stable isotope - Small piece of tissue which is analyzed to understand the quality and composition of food (what they eat and where they eat).
- Gill or mouth swabs - To analyze bacteria
- Ultrasound (to determine if pregnant) - Similar to the ones used in humans, ultrasound can show pregnancy and how far along in the gestation period the mother is.
- If the shark has any parasites or copepods present, they are removed for analysis.

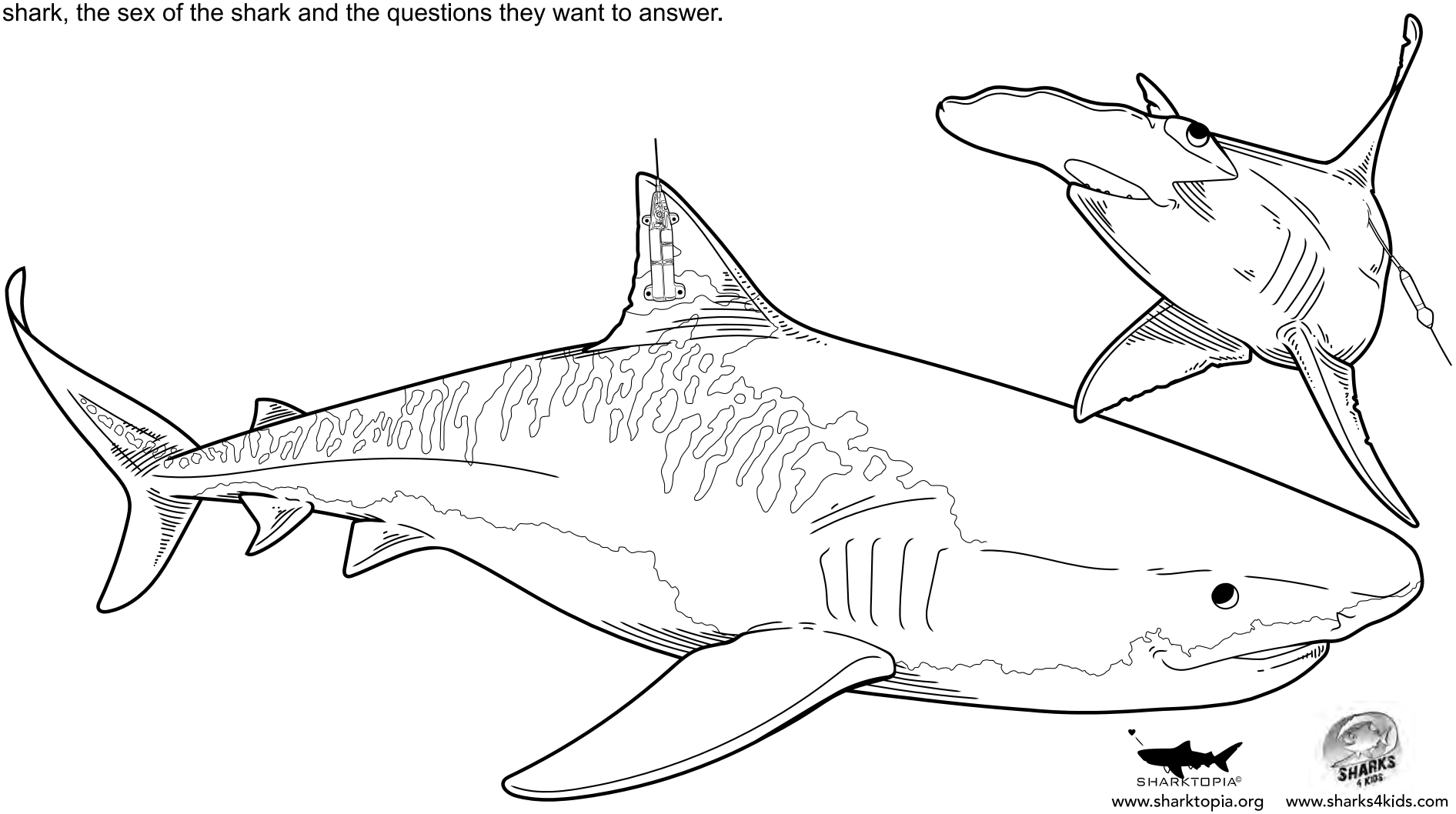
The dorsal fin is selected for the location of most tags because it is made of cartilage. You can think of this as being similar to getting your ears pierced. Sharks have much thicker skin than humans that heals very quickly, but researchers also use specific procedures and tag placements to ensure that the tags don't interfere at all with the shark's ability to live a healthy and normal life. Every part of a shark work-up is designed to minimize stress to the animal and to make the process as efficient as possible, from the equipment used to capture the shark to how quickly the tags can be deployed and the shark is released back into the wild. Ultimately, the data collection and tags provide critical insight for conservation.



A student helps take a small DNA sample for testing (clipping a very small piece on the edge of the dorsal fin).

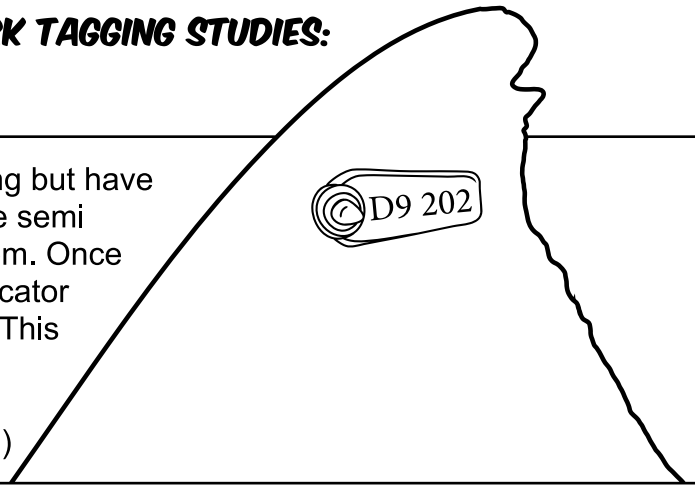
SHARK TAGGING

Tags are used to monitor, track and locate sharks in their natural habitat. Tagging provides us with important information on life histories, population sizes, movement and migratory patterns. Additionally tags can help scientists understand growth rates, survivorship and food webs. Tags can also be used to identify key areas for protection, such as shark nursery and mating grounds, to better understand how climate change is impacting shark movement and distribution, and to determine areas where sharks are more likely to encounter fishing activities. All this information is critical for shark conservation and management. There are several types of tags which range from small numbered tags that identify sharks individually using a unique ID code, to satellite tags that allow us to track the sharks in real time. Scientists use different tags depending on what species they are studying, the size of the shark, the sex of the shark and the questions they want to answer.



THESE EXTERNAL TAGS ARE COMMONLY USED IN SHARK TAGGING STUDIES:

ROTO TAGS were originally manufactured for livestock tagging but have been adapted for marine and wildlife tagging studies. They are semi rectangular in shape and have an identification number on them. Once the shark has been caught, a Roto tag is applied with an applicator through a pre-punched hole at the base of the first dorsal fin. This identification number is added to a database where it can be accessed and used to identify the shark every time it is re-captured. Approx. tag size: 4.4cm (1.75 in) x 1.9cm (0.75 in)



DART TAGS or the National Marine Fisheries Service (NMFS) **M-Type dart tag** are very simple tags made of a dart head, a single piece of mono filament and a capsule which contains an identification number and return instructions.

Each tag has a data card on which data about the shark is documented; date and location of capture, size and sex and the method by which the shark was caught.

The data cards are sent back to NMFS where the information is stored. When a shark is recaptured, the information is recorded again and sent to NMFS, the previous data is then compared to the new data. When analyzed, this data can show the growth and movement of an individual.

Darts are placed at the base of the shark's dorsal fin using a scalpel to make the small incision. The tag is placed into the muscle to ensure a long lasting fit.

Capsule length is approx. 5cm (2 in)

Approx. tag size: 15.2cm (6 in) total length

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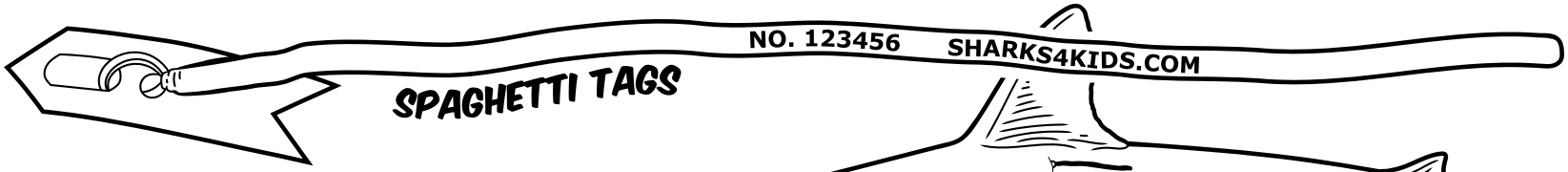
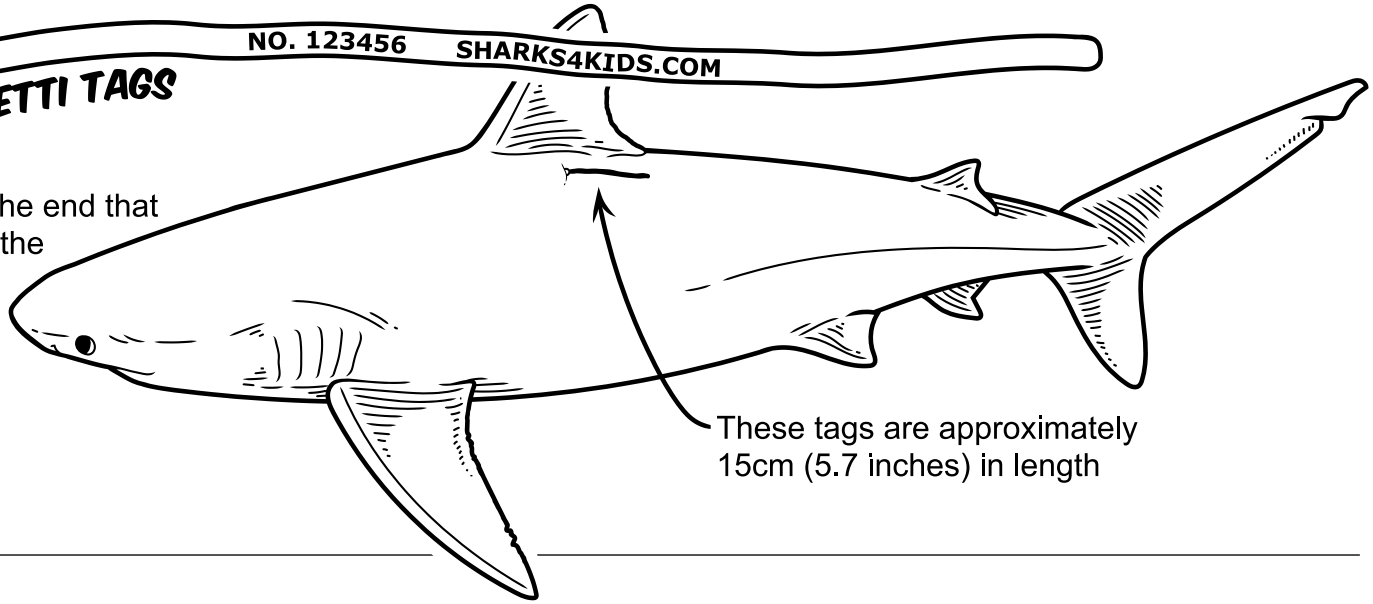
SPAGHETTI TAGS



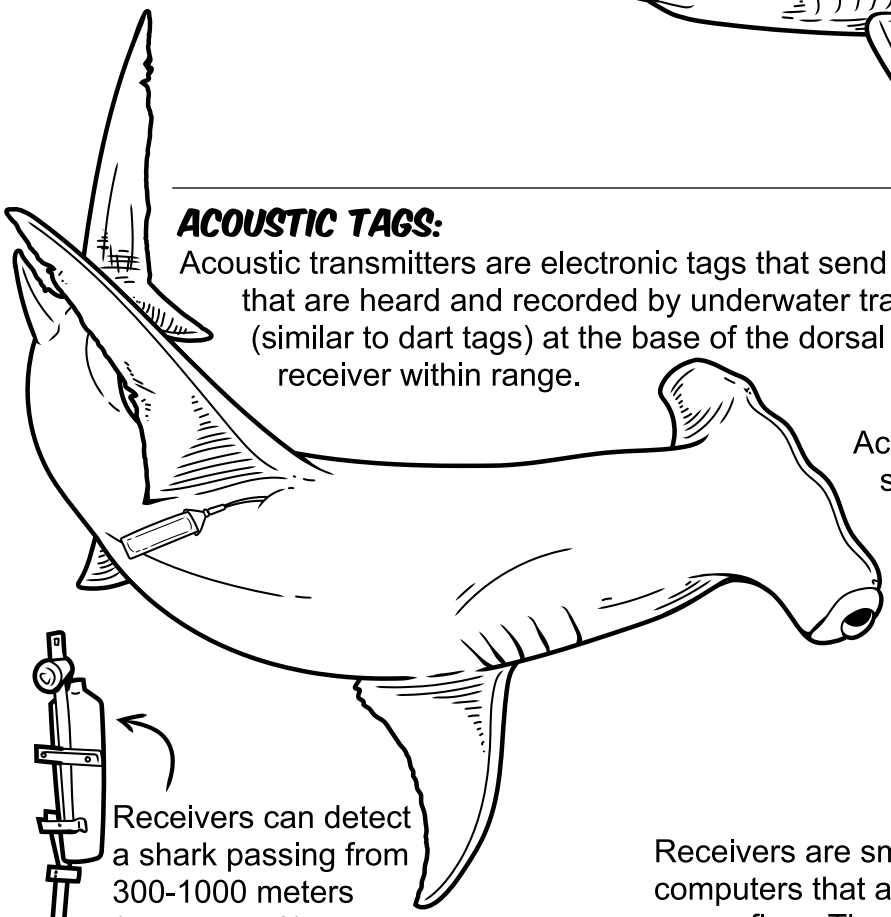
Spaghetti tags have a dart-like tip at the end that is inserted into the muscle just below the dorsal fin. The tag has a unique ID number and contact info written on it.



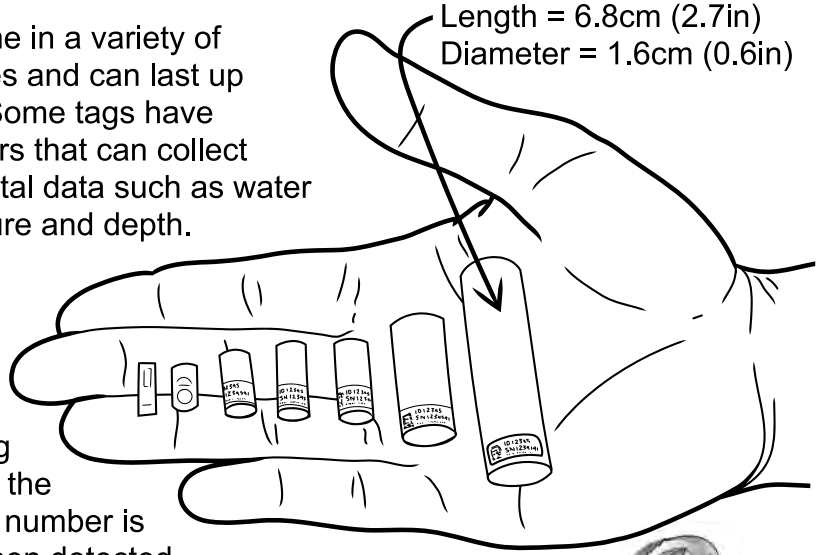
These tags are approximately 15cm (5.7 inches) in length

ACOUSTIC TAGS:

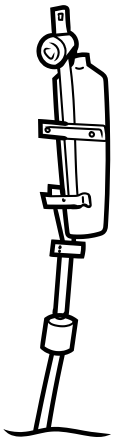
Acoustic transmitters are electronic tags that send out a series of 'pings' (every 1-3 minutes) into the surrounding waters that are heard and recorded by underwater tracking systems (receivers). These tags can be attached with a dart (similar to dart tags) at the base of the dorsal fin so that when a tagged shark is released, it can be heard by any receiver within range.



Acoustic tags come in a variety of shapes and sizes and can last up to a decade. Some tags have added sensors that can collect environmental data such as water temperature and depth.



Length = 6.8cm (2.7in)
Diameter = 1.6cm (0.6in)

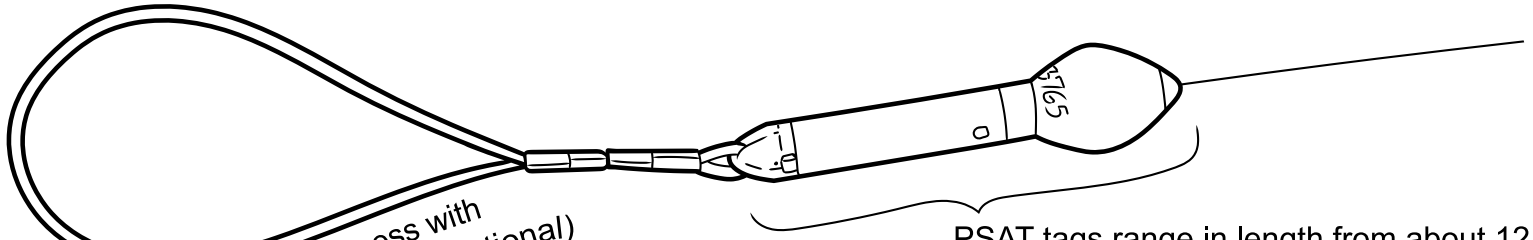


Receivers can detect a shark passing from 300-1000 meters (985- 3280 ft) away. As sharks swim through a network of receivers their movement and behavior patterns are revealed.

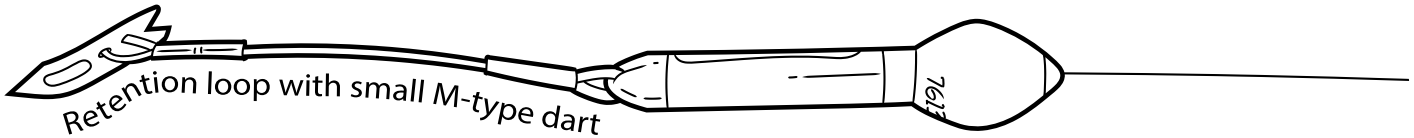
Receivers are small data-logging computers that are anchored on the ocean floor. The tag's unique ID number is stored with the date and time when detected by a receiver. This provides a record of each visit to that location by a tagged shark.

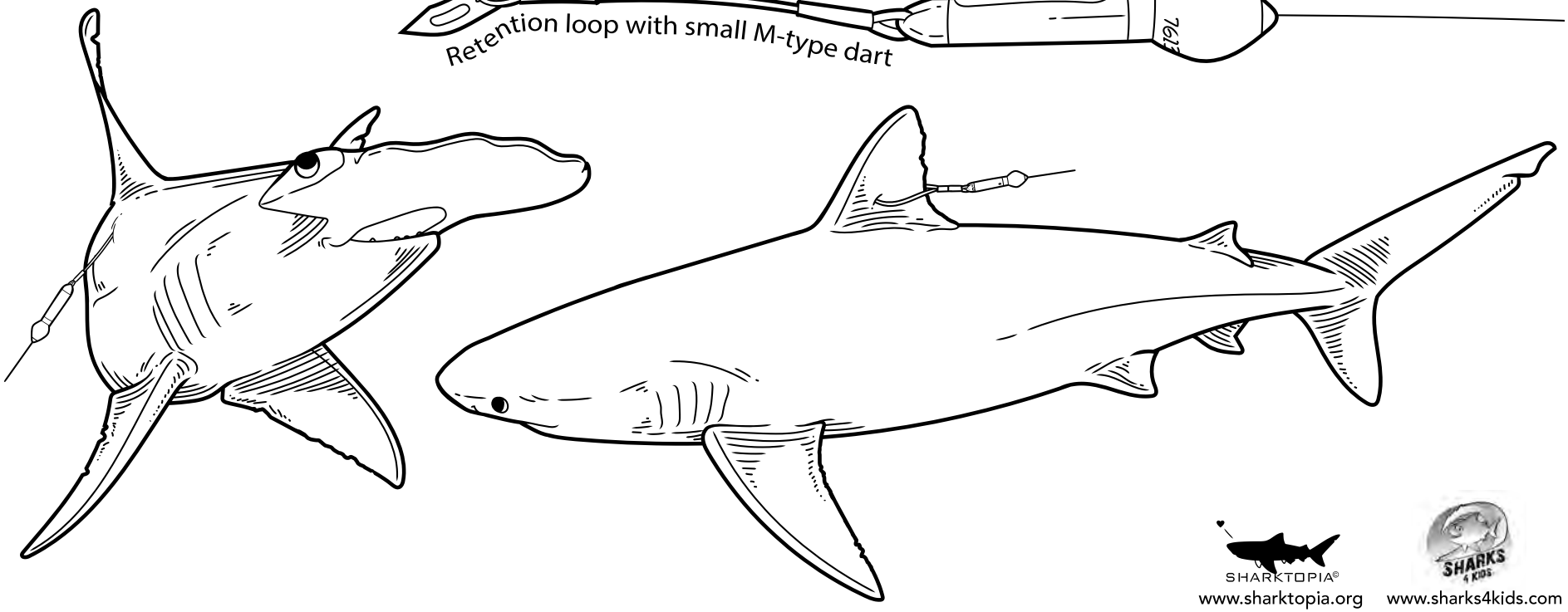
PSAT TAGS

Pop-off Satellite Archival Tags (PSAT or PAT tag) are constructed of several components; a data logger, a float, an antenna and a release section. The tag records temperature, light level, oxygen levels and pressure at specific intervals which provides a greater source of information of the activities of a shark whilst traveling. These tags are placed on the dorsal fin and are pre-programmed with an activation and release date, on the release date they will pop off and float to the surface where they will begin transmitting the data to a satellite. From sea surface temperature and light level data it is possible to estimate the latitude and longitude and recreate the track of the shark. These tags can stay attached from 6 months to 2 years.



PSAT tags range in length from about 12.5–21.5 cm (4.9–8.5 in) and must not weigh more than 3-5% of the total shark weight so as not to interfere with the sharks normal behavior.



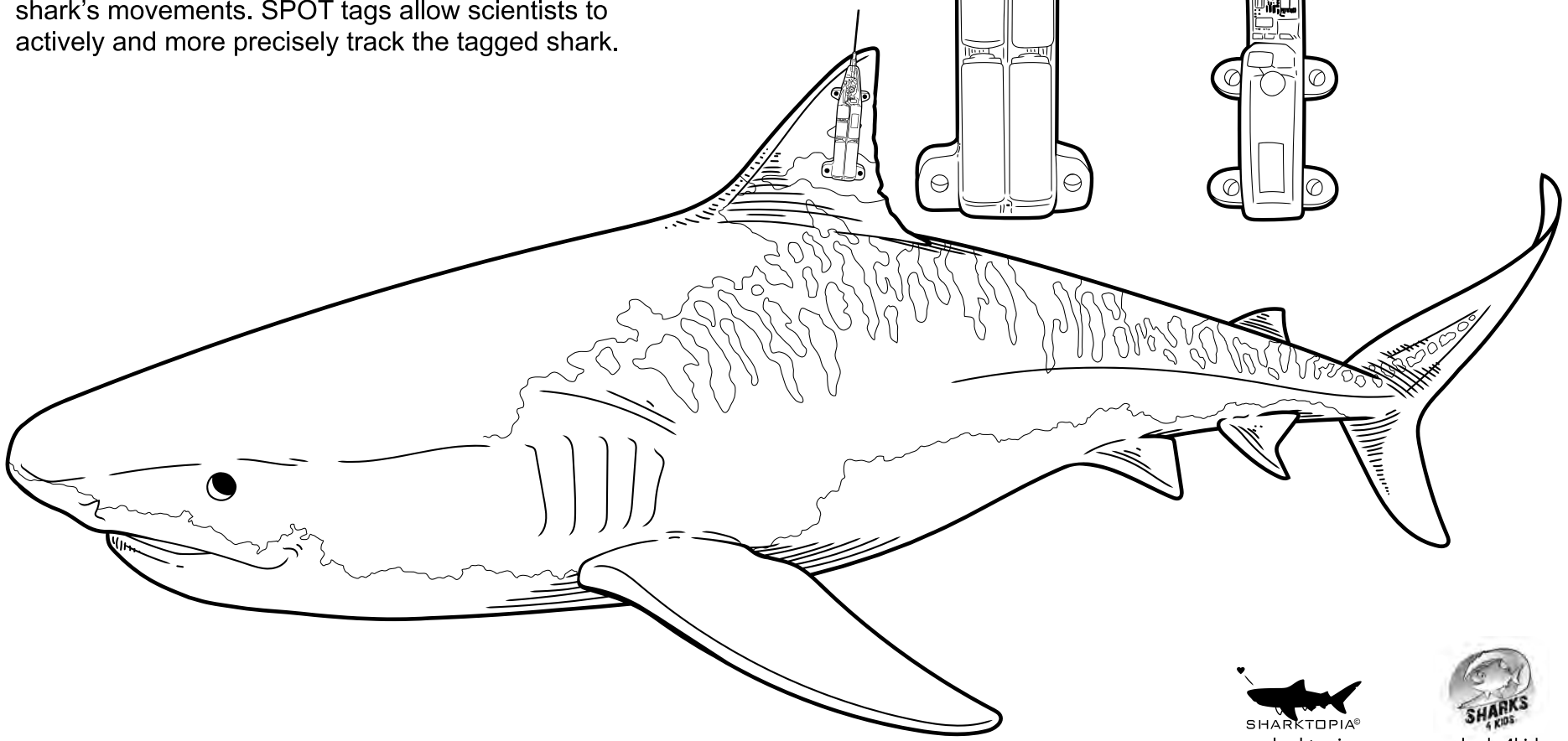


SPOT TAGS

Smart Position and temperature tags (SPOT tags) are secured to the shark with plastic bolts and can stay on the shark for up to five years. They use radio transmission to transmit the shark's location via satellite whenever the shark's fin breaks the surface during a period in which a satellite is overhead. The tags are positioned on the top of the first dorsal fin to ensure contact with the air. There is a wet/dry sensor within the tag that senses when the shark's fin is at the surface and out of the water. The satellite can then locate the precise location of the tag and send the detail to the researchers via email, this enables the researchers to receive daily updates on the shark's movements. SPOT tags allow scientists to actively and more precisely track the tagged shark.

SPOT-257
Length: 16.2cm (6.4 in)
Width: 6.1cm (2.4 in)

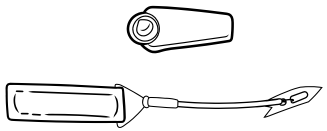
SPOT-258
Length: 11cm (4.3 in)
Width: 4.5cm (1.8 in)

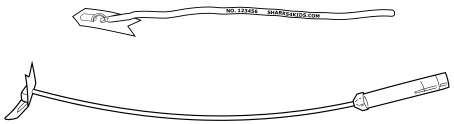


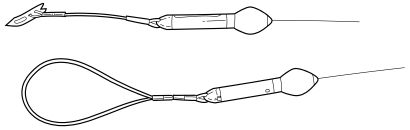
CHALLENGE - DESIGN YOUR OWN SHARK TAG!

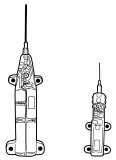
Now that you've read about some of the common external tags used in shark tagging studies, it's time to design your own!

What does your tag look like? What species of shark would you put it on? What data can you collect with it? Draw your tag below!









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ACTIVITY - DATA COLLECTION AND TAGGING!

Note: The tags on this page are not accurately scaled and do not represent real-life sizing.

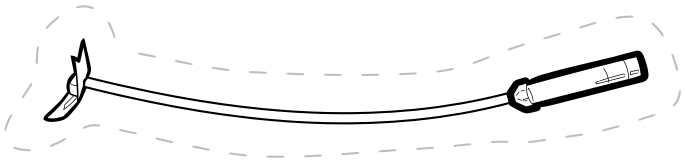
- After this page, you'll find a flexible tape measure, measurement instructions, data sheets, and four different shark species.

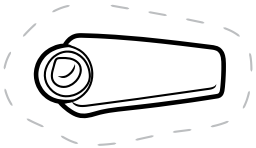
- Data Sheets are included for each shark. Make sure to provide information for each species!

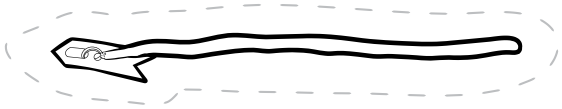
- [Using a ruler or flexible tape measure] Measure each shark! Refer to the measurement pages for instructions on gathering those measurements. Write down your findings on the Data Sheets.

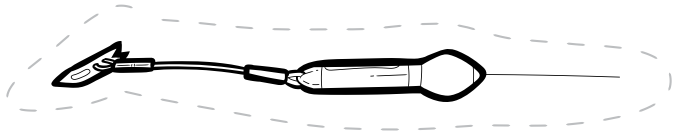
- Cut out the shark tags on this page. Based on everything you've learned so far, place the tags onto the sharks that are included. You can use glue or tape to hold the tags in-place. Add your tag details to the data sheets as well.

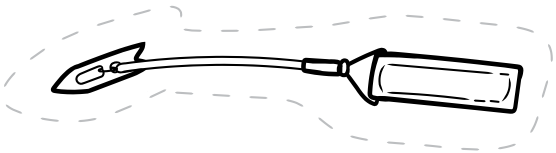
- A bonus challenge is included at the end of this booklet with life-size tags. You can use those tags on a stuffed animal or a large shark that you create. **Example:** Using a large sheet of paper (or newspaper/cardboard), or tape/glue several sheets of paper together - draw the outline of a shark. Once you've created a large shark (or using your stuffed animal), use tape to temporarily place your tag where it should go. Fill out the extra data sheet for the shark you create or the stuffed animal you use!

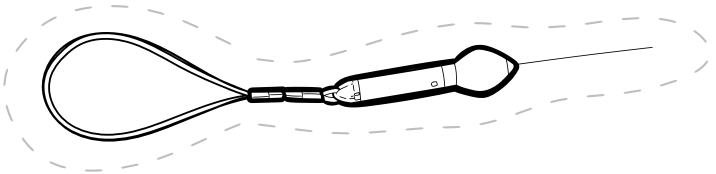












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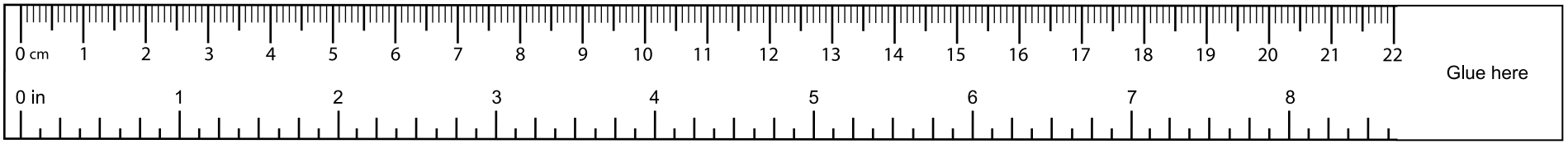
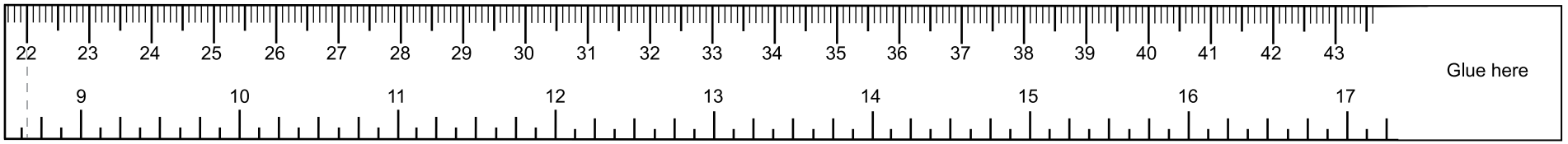
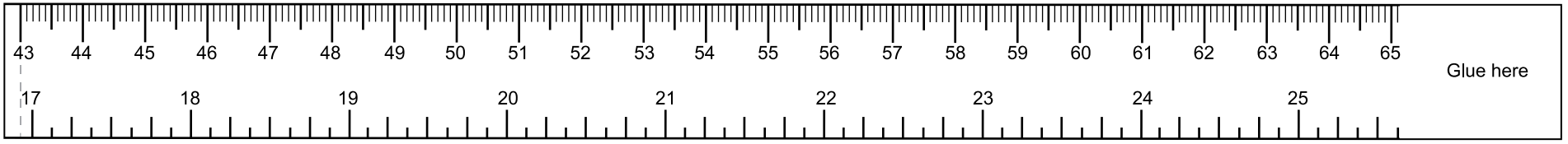
FLEXIBLE TAPE MEASURE

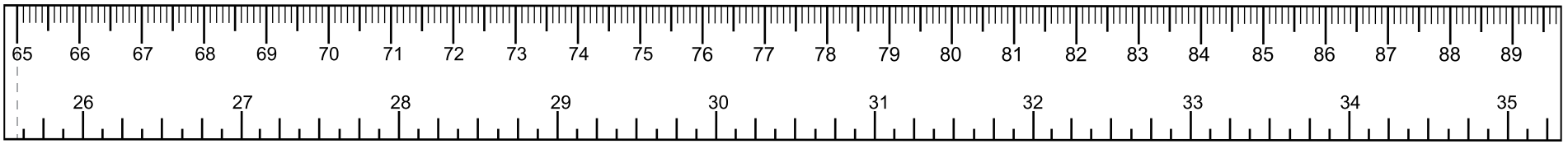
When researchers measure a real shark, they use a flexible tape measure. This allows for a more precise measurement along the shark's body. All of the activities in this booklet can be completed with a standard ruler or the flexible tape measure on this page. Cut-out each piece of the tape measure. Line up the numbers and use tape or glue to hold it together. **Example:** Line up the 22cm of the first piece to the 22cm on the second piece.

Printing note: Make sure this page is printed at '100% scale' so that your flexible tape measure is accurate. Sometimes the printer settings are referred to as 'normal' or 'not scaled'. Check your settings and make sure this page size isn't decreased or enlarged when printing!









You can trim the ruler at the dashed lines to help line up your pieces and match the numbers.

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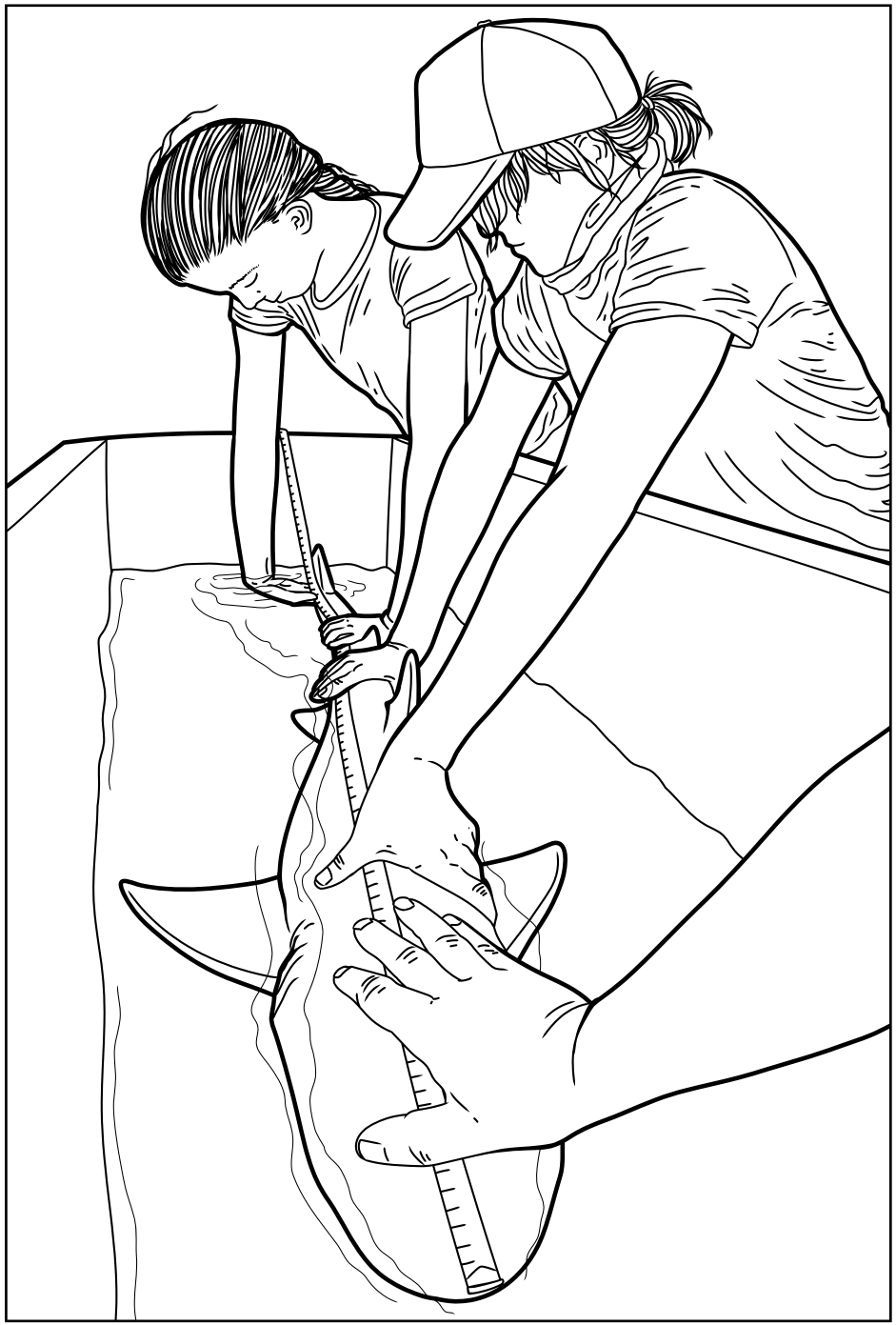
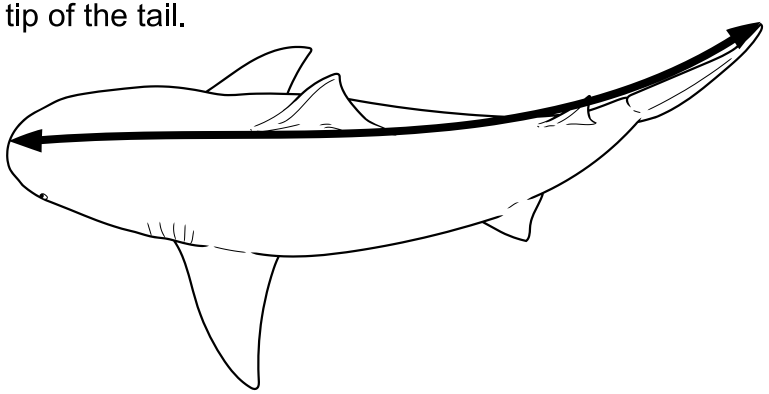
HOW TO TAKE SHARK MEASUREMENTS:

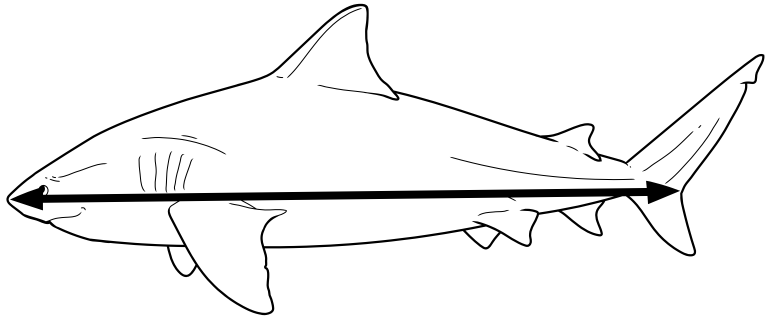


A flexible measuring tape is used to acquire the length of a juvenile lemon shark.

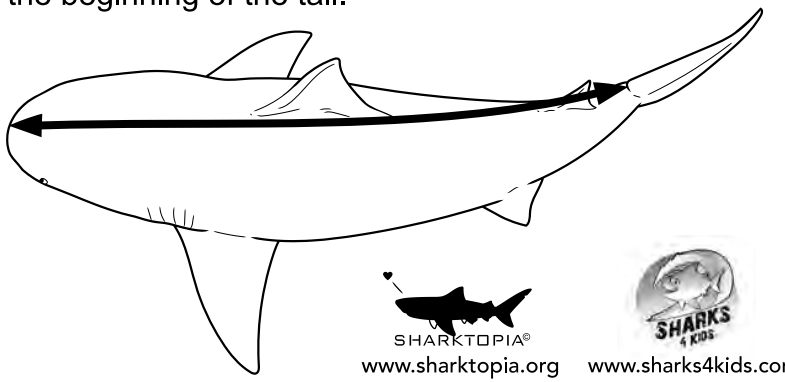
Total Length (TL): Measure from the nose to the top tip of the tail.



Fork Length (FL): Measure from the nose to the end of the fork or "V" of the tail.

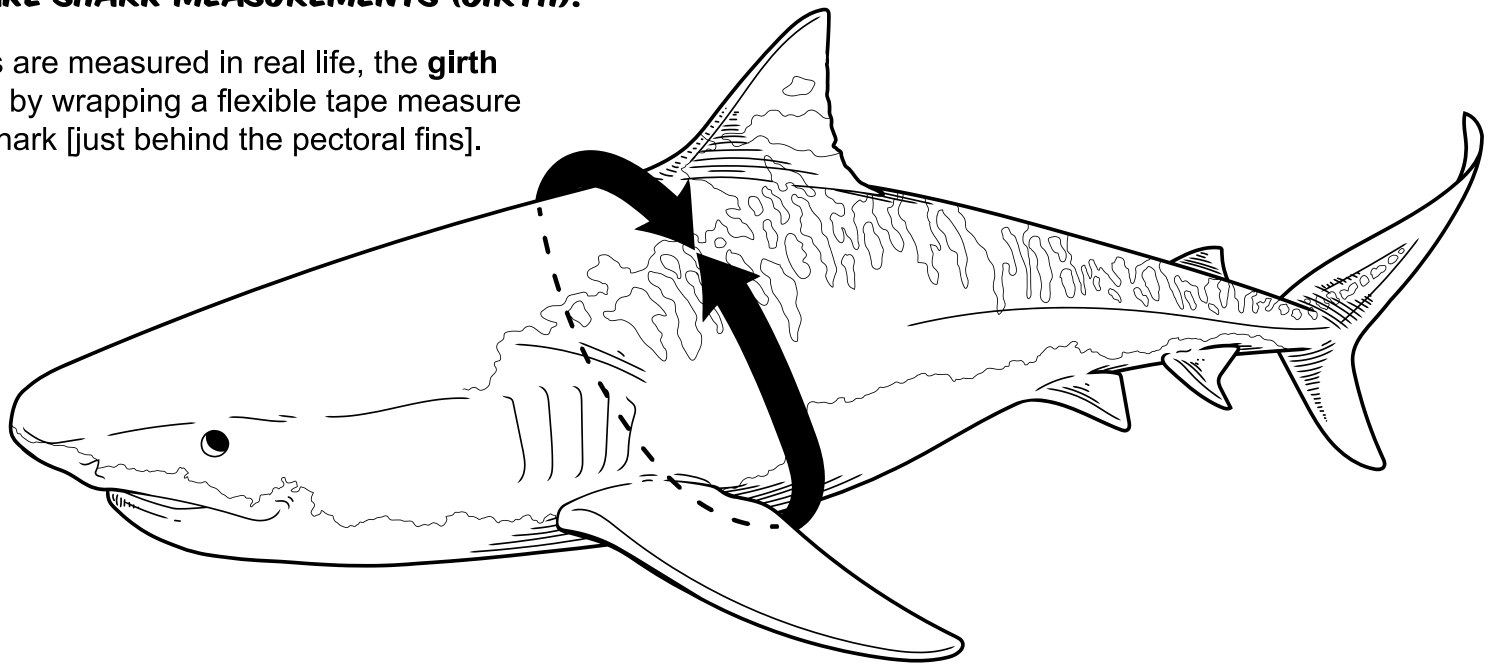


Pre-caudal Length (PCL): Measure from the nose to the beginning of the tail.

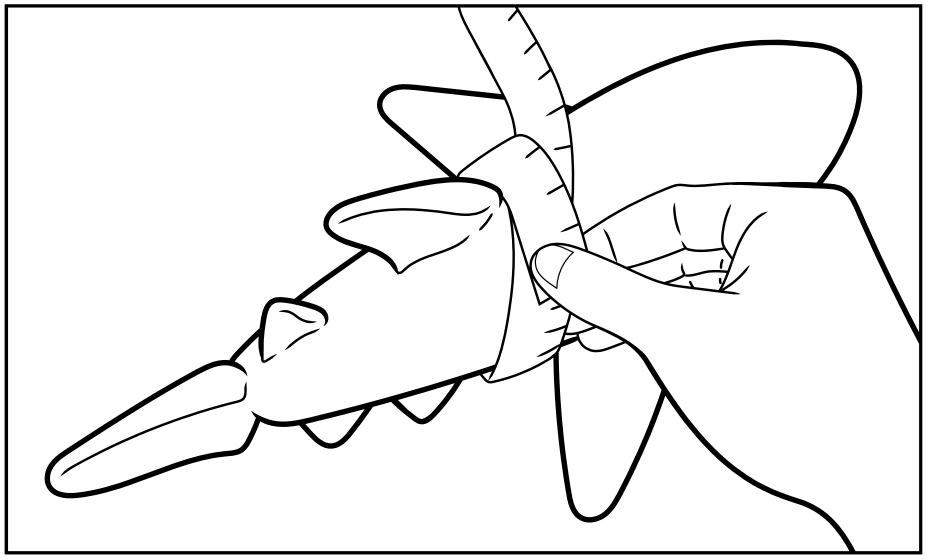


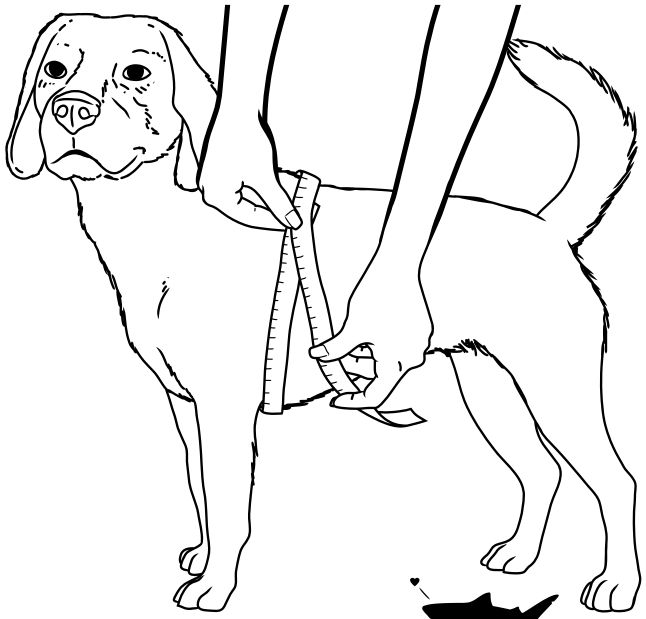
HOW TO TAKE SHARK MEASUREMENTS (GIRTH):

When sharks are measured in real life, the **girth** is figured out by wrapping a flexible tape measure around the shark [just behind the pectoral fins].



You can find out the girth of your stuffed animal with this method. You can also find out the girth of your pet (if you have one), but make sure to be gentle!

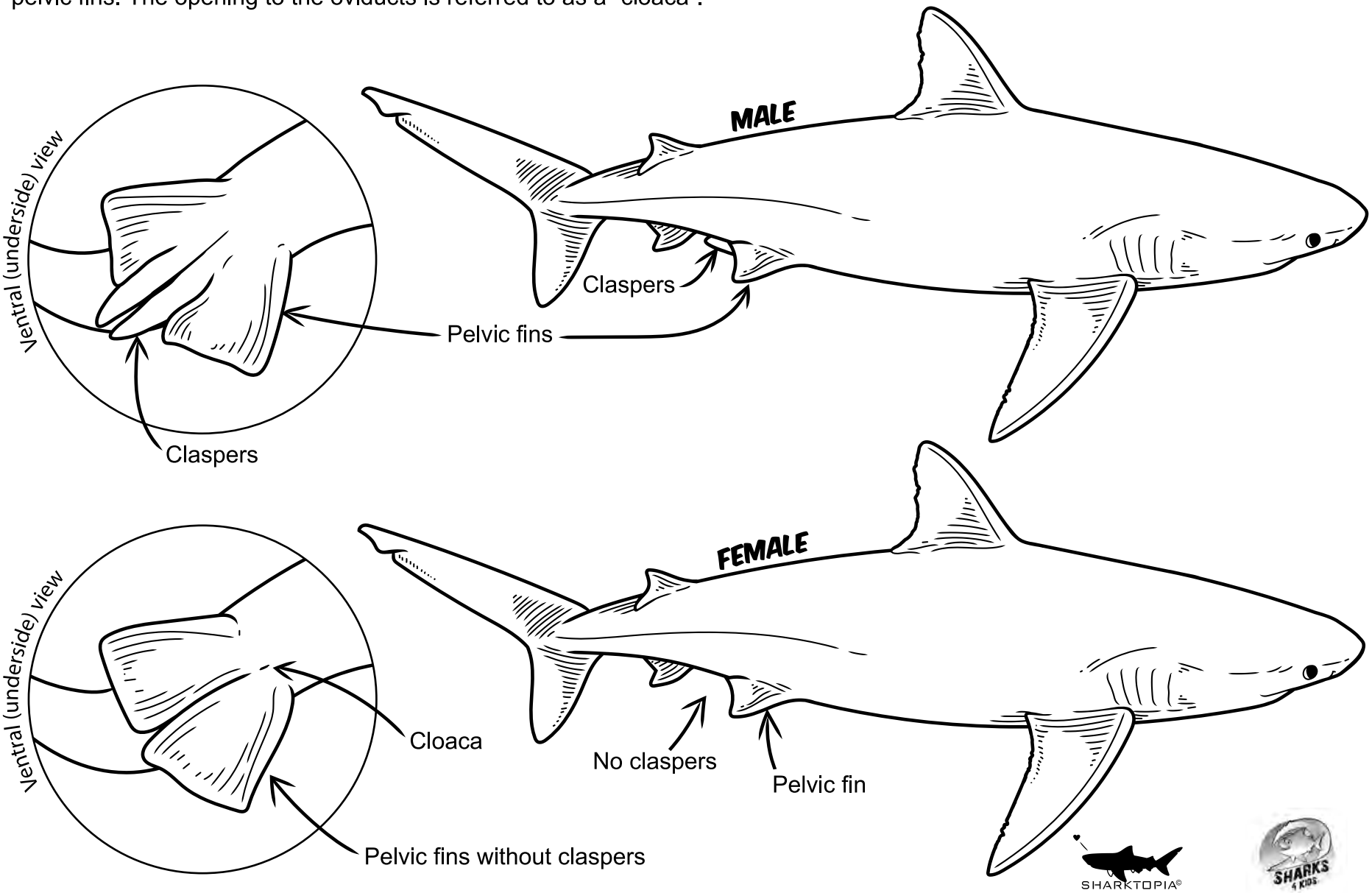




Girth measurements can help scientists assess the health of the shark and get an estimate of the weight.

HOW TO TELL IF A SHARK IS MALE OR FEMALE

The male shark's reproductive organ, called a "clasper" is located on the pelvic fin. They are a modified cartilaginous (cartilage) extension of the pelvic fin. Female sharks have oviducts (a tube leading to the womb) and do not have an appendage near the pelvic fins. The opening to the oviducts is referred to as a "cloaca".



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SHARK WORKUP DATA SHEET

Researcher Name (You): _____ Date: _____

Shark Species: _____

Total Length (TL): _____ Fork Length (FL): _____ Pre-caudal Length (PCL): _____

Girth: _____

Make a note about how you would acquire the girth of the shark - or record the girth measurement if using a stuffed animal, etc.

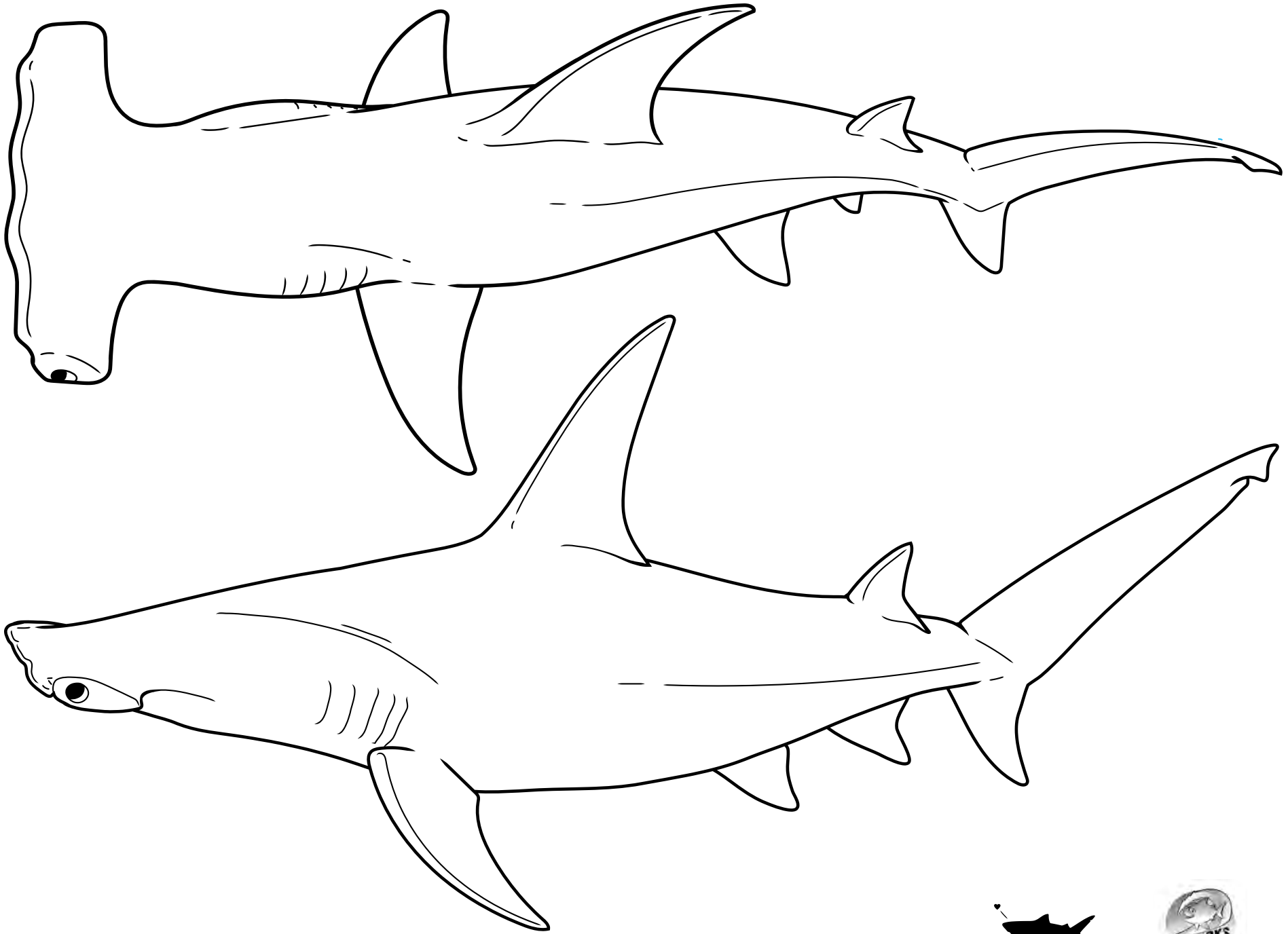
DNA: _____

Make a note about how you would acquire the DNA sample

Tag # _____ Tag type: _____

Male or Female (Circle or underline)

Notes/Observations:



GREAT HAMMERHEAD SHARK

SHARK WORKUP DATA SHEET

Researcher Name (You): _____ Date: _____

Shark Species: _____

Total Length (TL): _____ Fork Length (FL): _____ Pre-caudal Length (PCL): _____

Girth: _____

Make a note about how you would acquire the girth of the shark - or record the girth measurement if using a stuffed animal, etc.

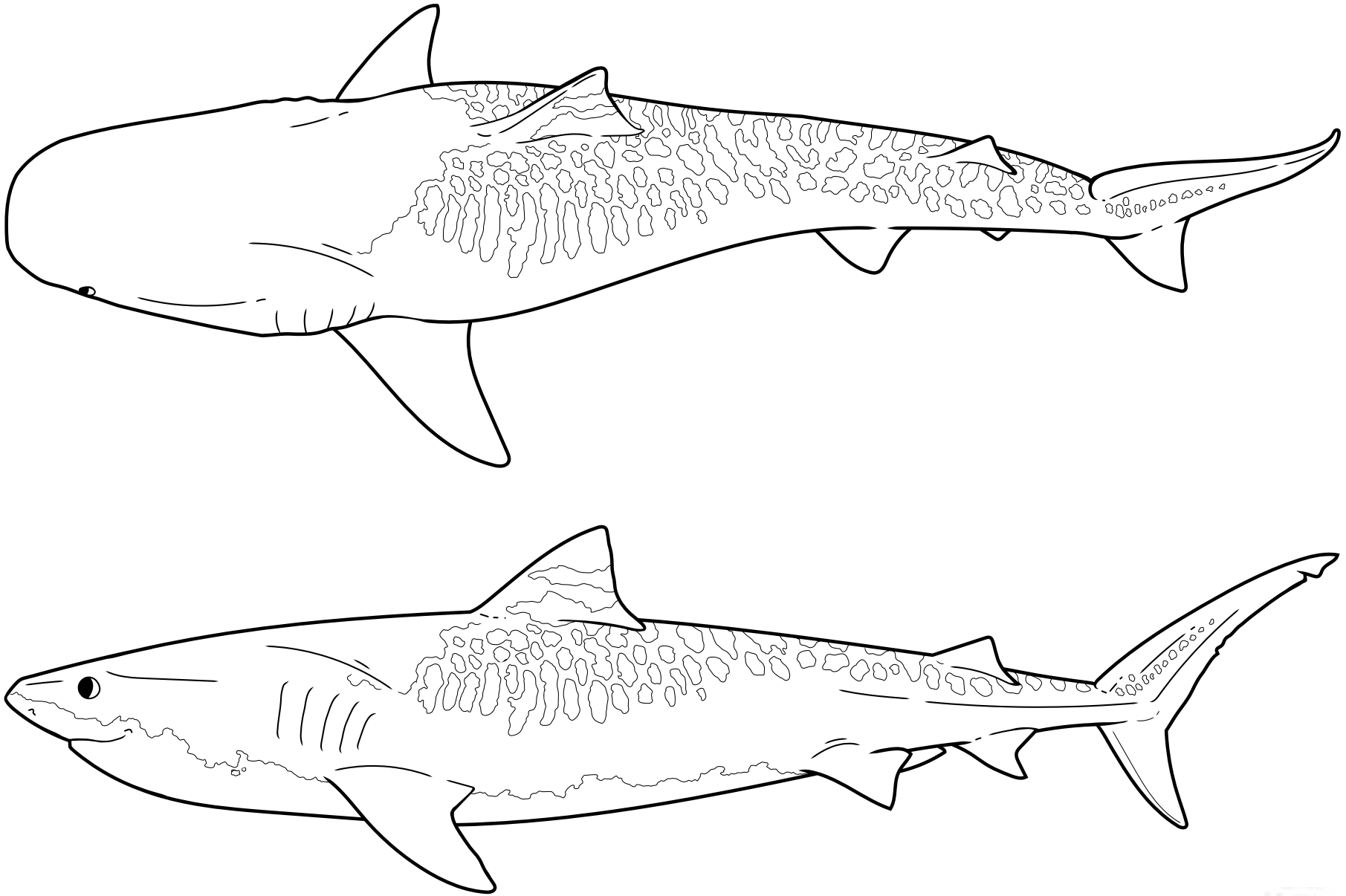
DNA: _____

Make a note about how you would acquire the DNA sample

Tag # _____ Tag type: _____

Male or Female (Circle or underline)

Notes/Observations:



TIGER SHARK

SHARKTOPIA©
www.sharktopia.org

SHARKS 4 KIDS
www.sharks4kids.com

SHARK WORKUP DATA SHEET

Researcher Name (You): _____ Date: _____

Shark Species: _____

Total Length (TL): _____ Fork Length (FL): _____ Pre-caudal Length (PCL): _____

Girth: _____

Make a note about how you would acquire the girth of the shark - or record the girth measurement if using a stuffed animal, etc.

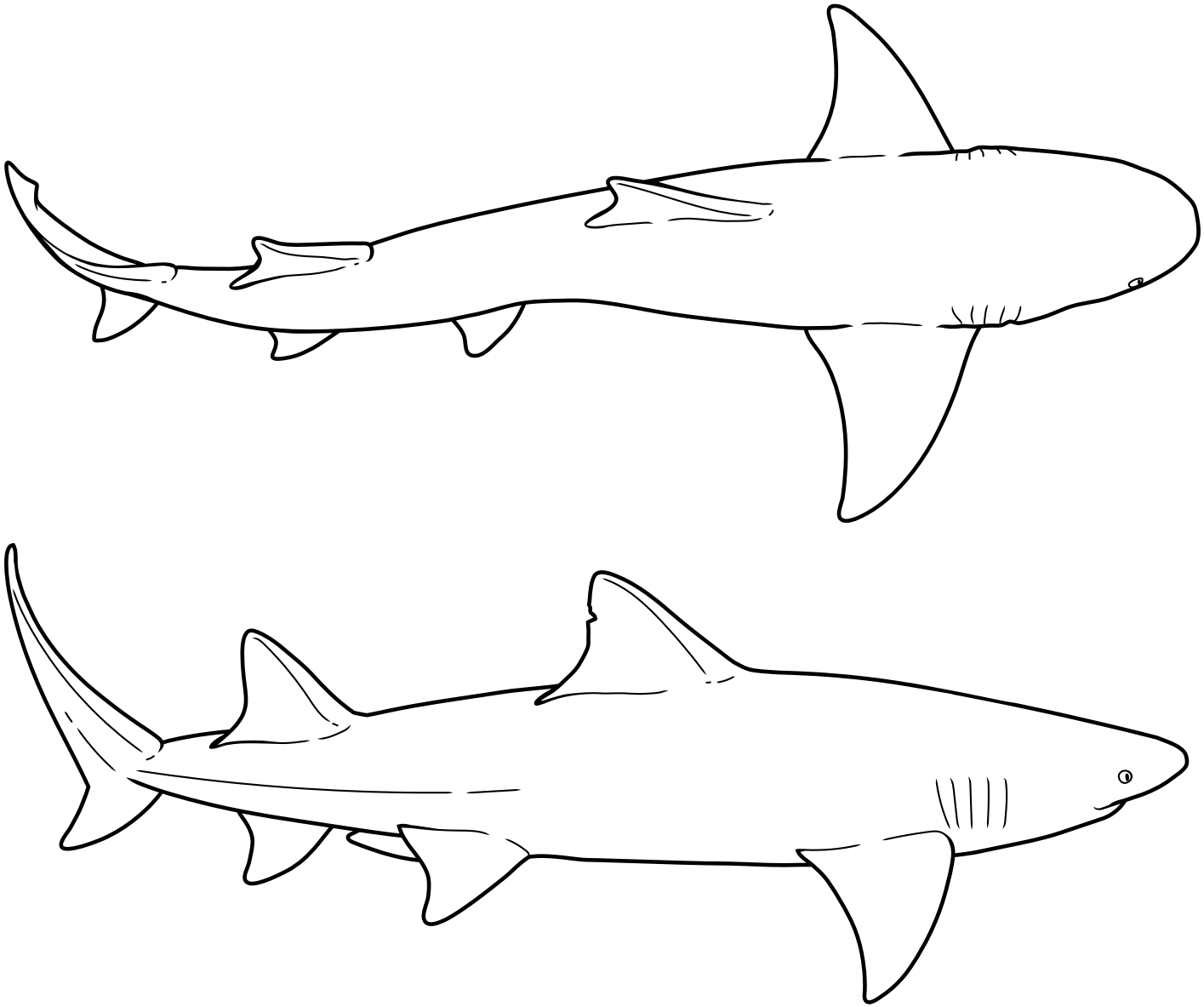
DNA: _____

Make a note about how you would acquire the DNA sample

Tag # _____ Tag type: _____

Male or Female (Circle or underline)

Notes/Observations:



LEMON SHARK

SHARKTOPIA©
www.sharktopia.org

SHARKS 4 KIDS
www.sharks4kids.com

SHARK WORKUP DATA SHEET

Researcher Name (You): _____ Date: _____

Shark Species: _____

Total Length (TL): _____ Fork Length (FL): _____ Pre-caudal Length (PCL): _____

Girth: _____

Make a note about how you would acquire the girth of the shark - or record the girth measurement if using a stuffed animal, etc.

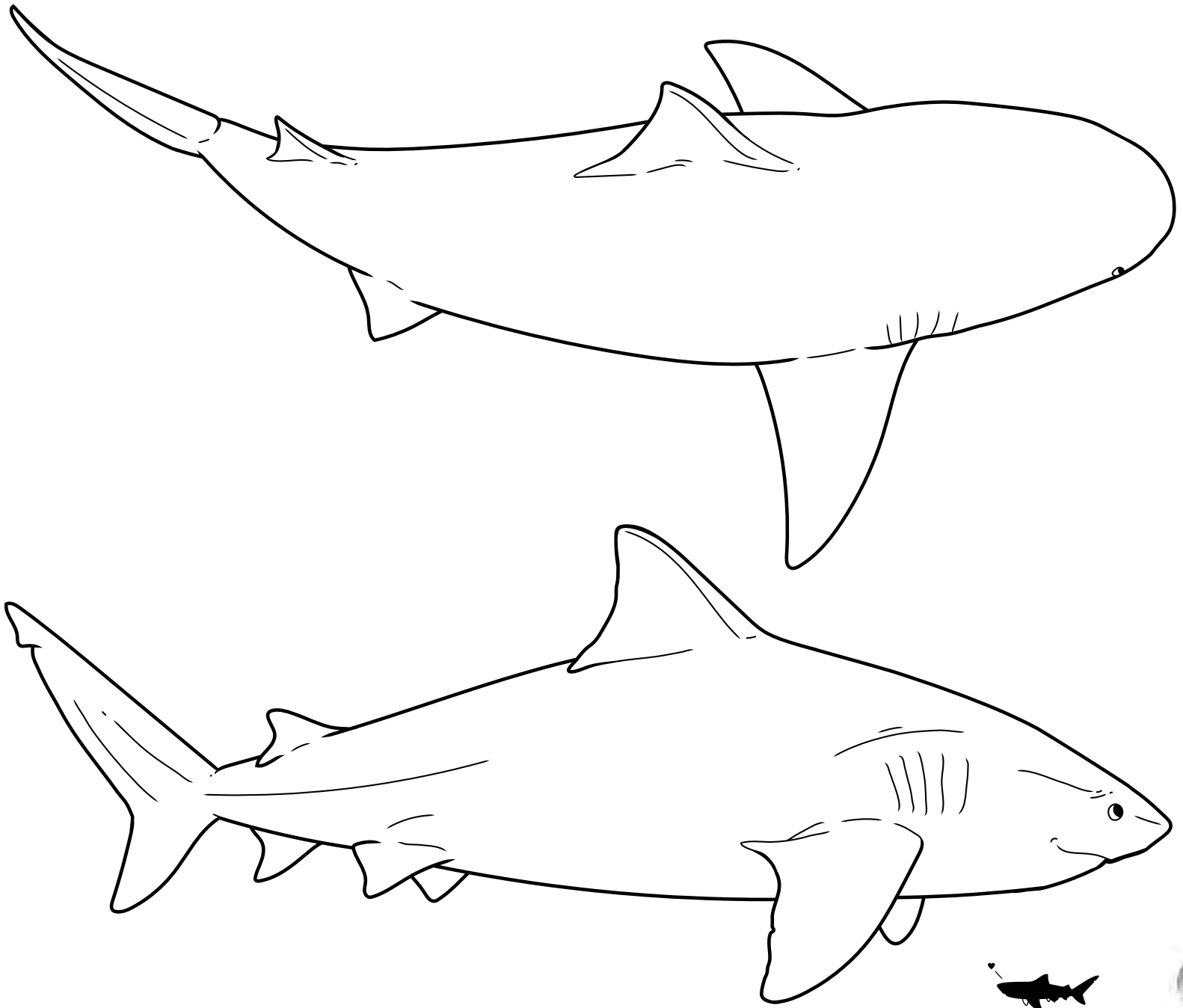
DNA: _____

Make a note about how you would acquire the DNA sample

Tag # _____ Tag type: _____

Male or Female (Circle or underline)

Notes/Observations:



BULL SHARK

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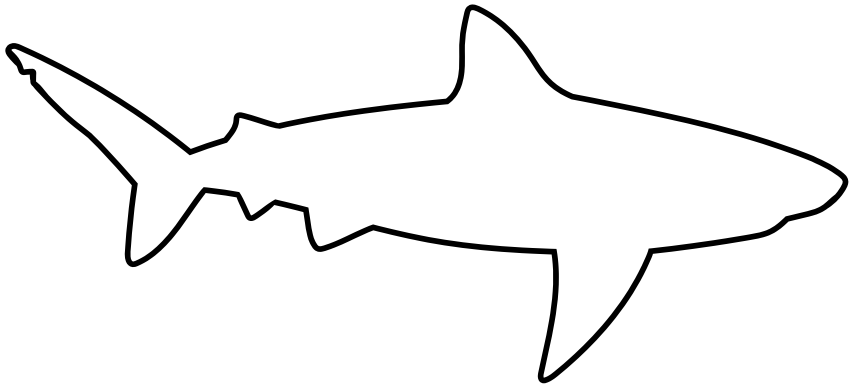
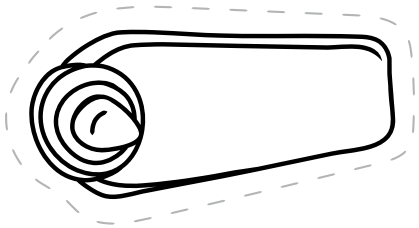
BONUS CHALLENGE - LIFE SIZE SHARK TAGS

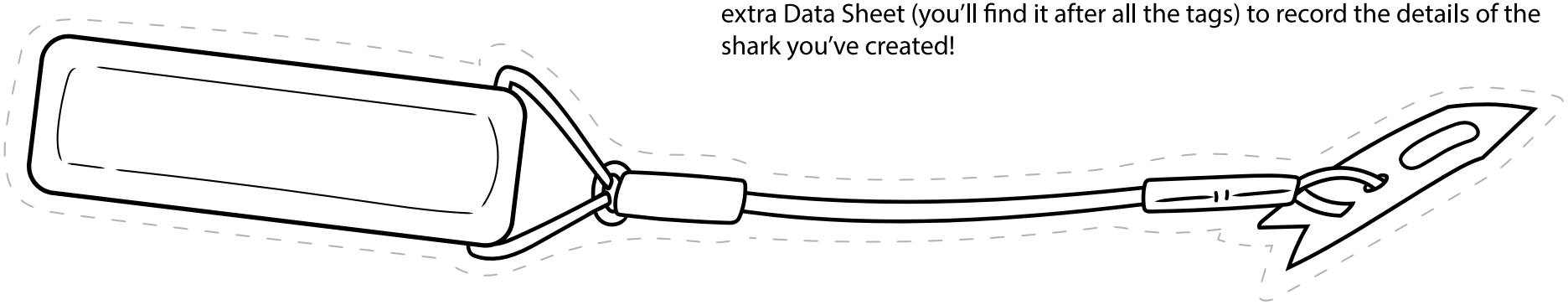
The tags on this page (and the following pages) are life-size! Color and cut-out each tag. You can place these tags on a stuffed animal or create a large shark of your own! Number your tags and record your data just as you did with the sharks in this booklet.

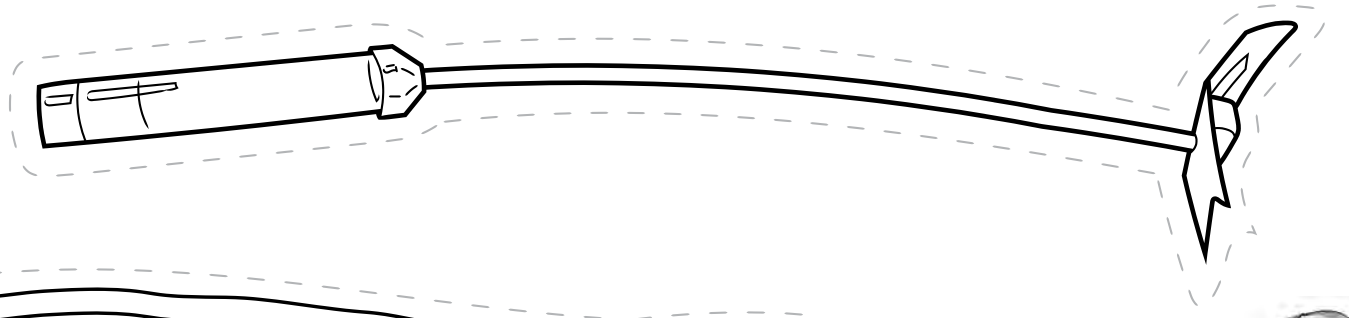


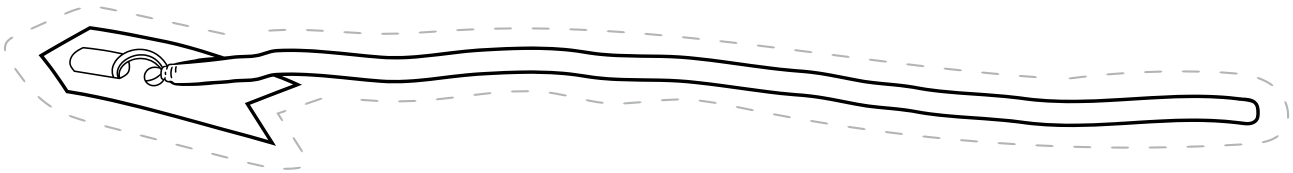


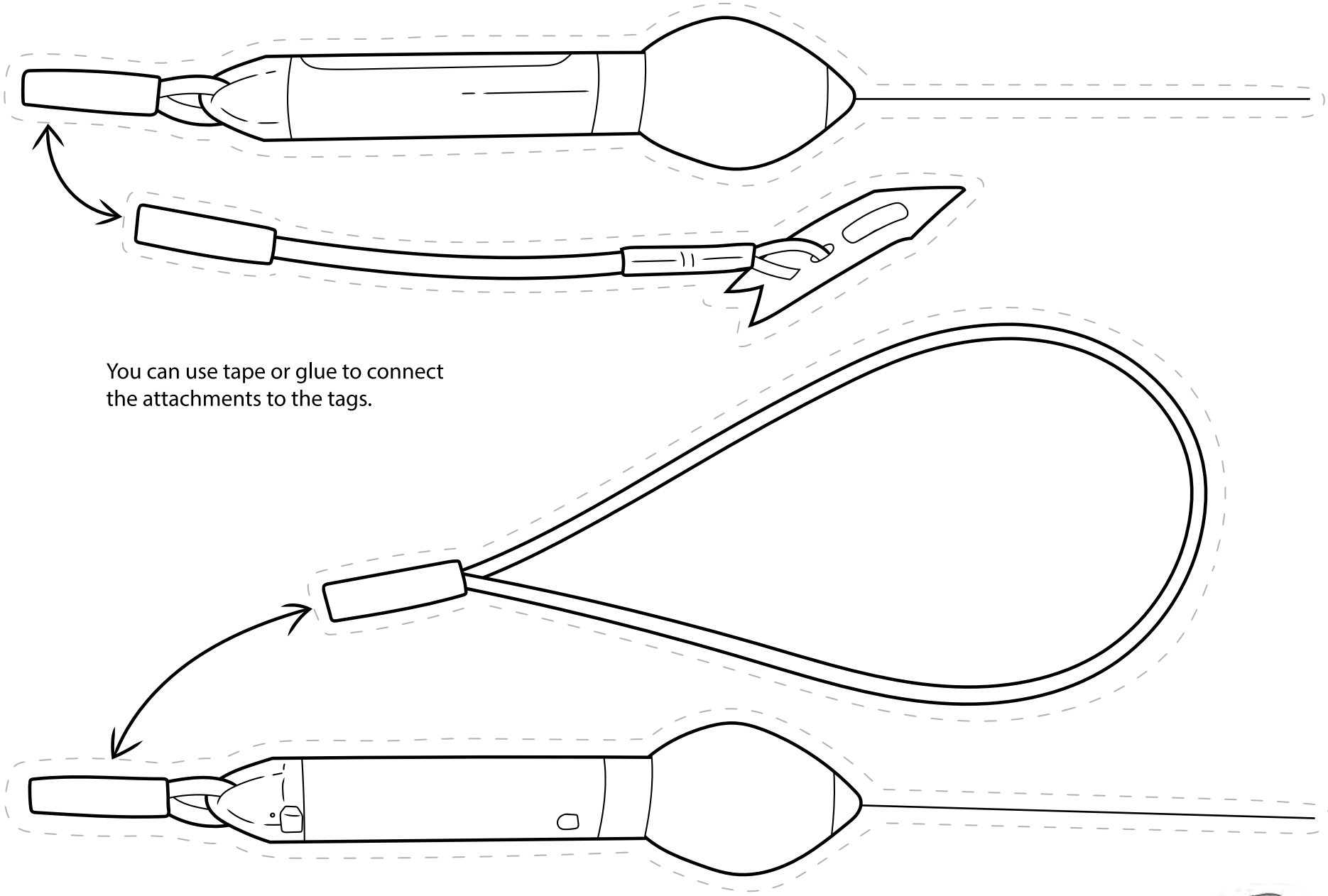
IDEA - CREATE YOUR OWN SHARK!

Use cardboard, newspaper, or tape/glue several sheets of paper together to create a large shark! Draw the outline of the shark on the material you've chosen. You can refer to the silhouette of the shark on this page, or reference a shark you've found elsewhere. How big will the shark be? You can use the extra Data Sheet (you'll find it after all the tags) to record the details of the shark you've created!









You can use tape or glue to connect
the attachments to the tags.

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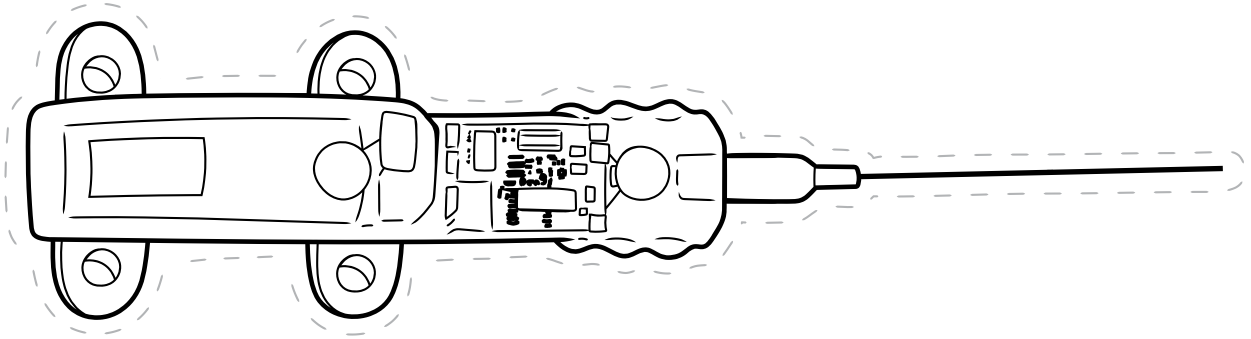

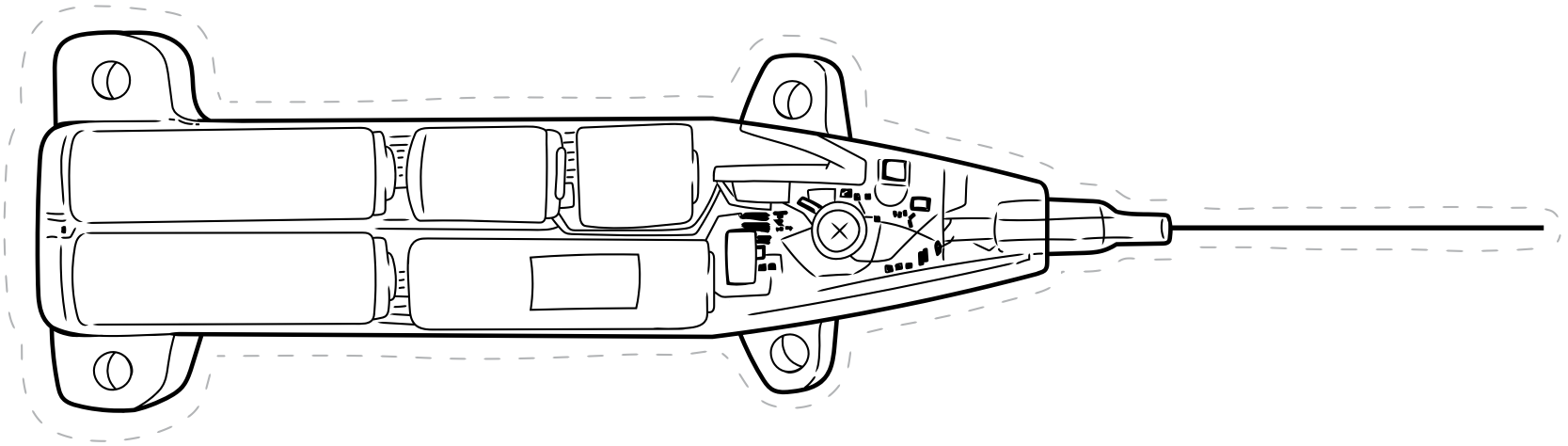

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www.sharks4kids.com

SHARK WORKUP DATA SHEET

Researcher Name (You): _____ Date: _____

Shark Species: _____

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Girth: _____

Make a note about how you would acquire the girth of the shark - or record the girth measurement if using a stuffed animal, etc.

DNA: _____

Make a note about how you would acquire the DNA sample

Tag # _____ Tag type: _____

Male or Female (Circle or underline)

Notes/Observations:

OFFICIAL JUNIOR SHARK SCIENTIST

This certificate is awarded to

_____

for successfully completing the Sharks4Kids Shark Tagging Program.

_____ _____

Date *Signature*

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