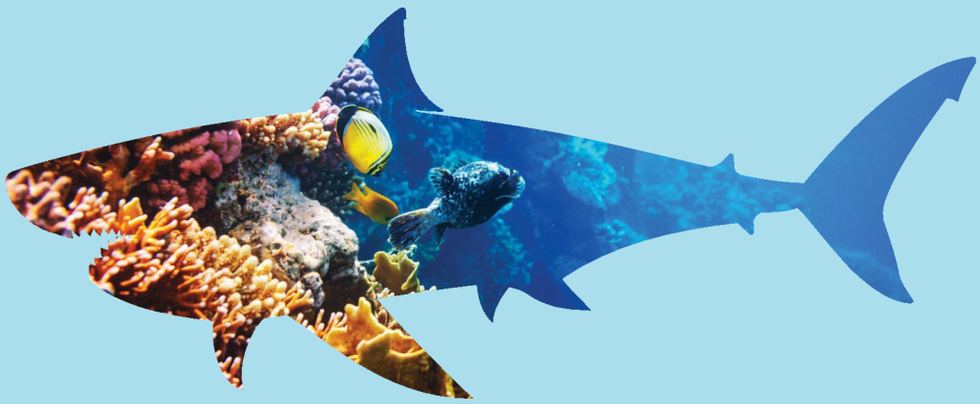
Hot Science

Rethink the Shark



Hot
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Cool Activities

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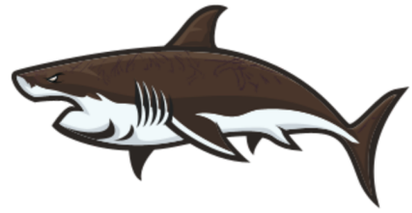
Reference Sheet



Terms to Know

- **Doppler Effect:** When the pitch of a sound or the frequency of electromagnetic waves changes because the source is moving closer to or farther from you.

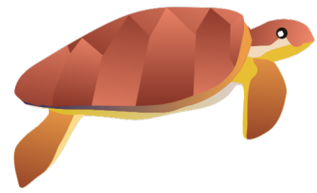
- **Frequency**: How many times something happens in a certain period of time. For sounds, it's how many sound waves pass by each second. Higher frequency means a higher pitch sound, and lower frequency means a lower pitch sound. For electromagnetic waves frequency tells us the color of light or the type of radio signal.

- **Pitch:** How high or low a sound is. A high-pitched sound is like a whistle, and a low-pitched sound is like a drum or a thunder rumble.

- **Sound Waves:** Vibrations that travel through the air (or other materials) and can be heard when they reach our ears. They are like ripples in water but move through air.

- **Electromagnetic Waves**: Waves of energy that travel through space and can include light, radio waves, and X-rays. For animal trackers, the device with an antennae sends a signal (radio wave) to a satellite when it reaches the surface which changes frequency if it moves closer or farther away.

Reference Sheet



What is the Doppler Effect?

Waves more spread out
=
Lower Frequency or Pitch

Waves bunched up
=
Higher Frequency or Pitch

Device is emitting waves, but is not moving. The waves, or frequency, are the same distance apart in all directions. Like ripples in a pond.

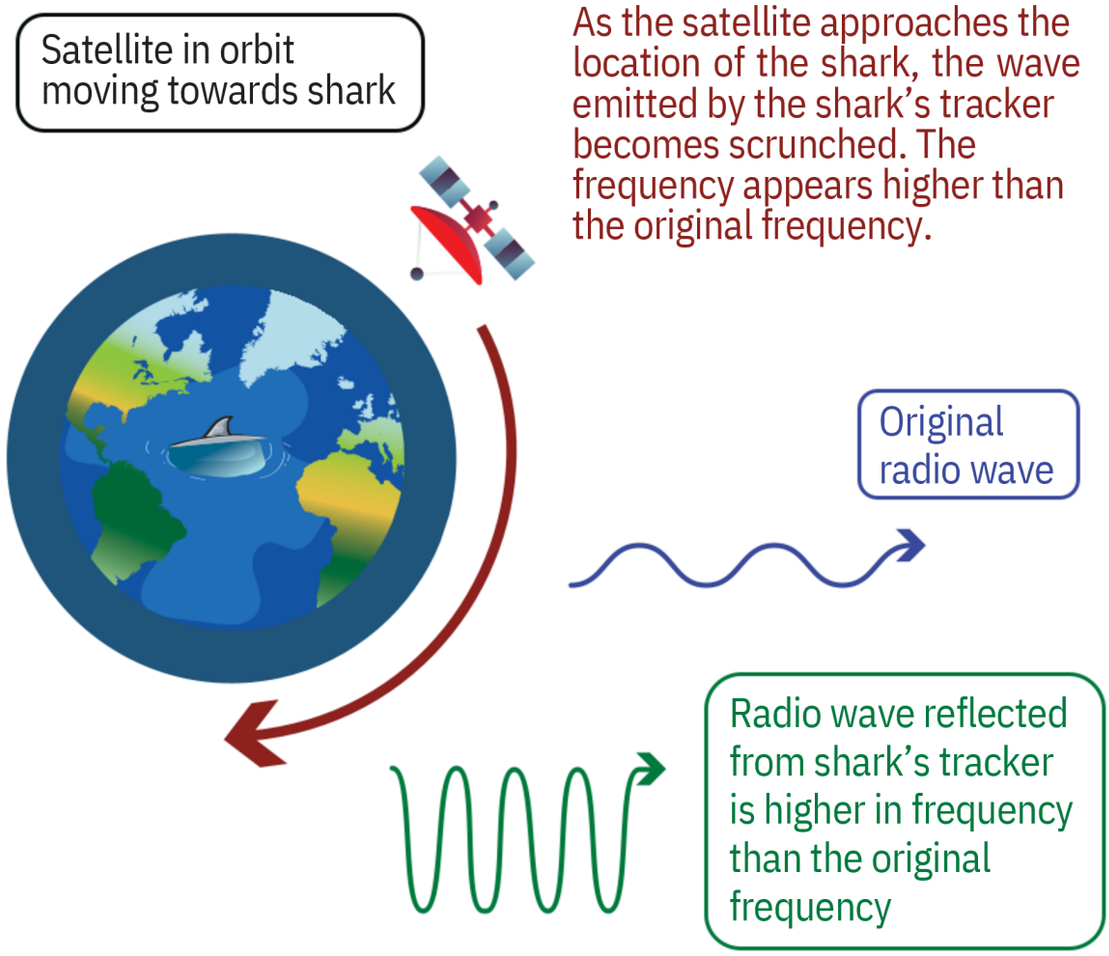
In this example, the device producing the waves is moving to the right.

How does the Doppler Effect work with soundwaves?

In soundwaves, a higher frequency means we hear a higher pitch and a lower frequency means we hear a lower pitch. This is why the pitch of the noise was changing as you spun it around. The sound was a higher frequency when the phone was traveling towards your ear and a lower frequency when it was traveling away from your ear!

Shark Tracking

So how does this tell scientists where a shark is? Well, the tracking tags placed on the shark emit a signal, an electromagnetic wave with a known frequency. This signal is received by the satellite. Depending on the satellite's position, the signal received will appear different when the satellite is moving closer to or further away from the shark.



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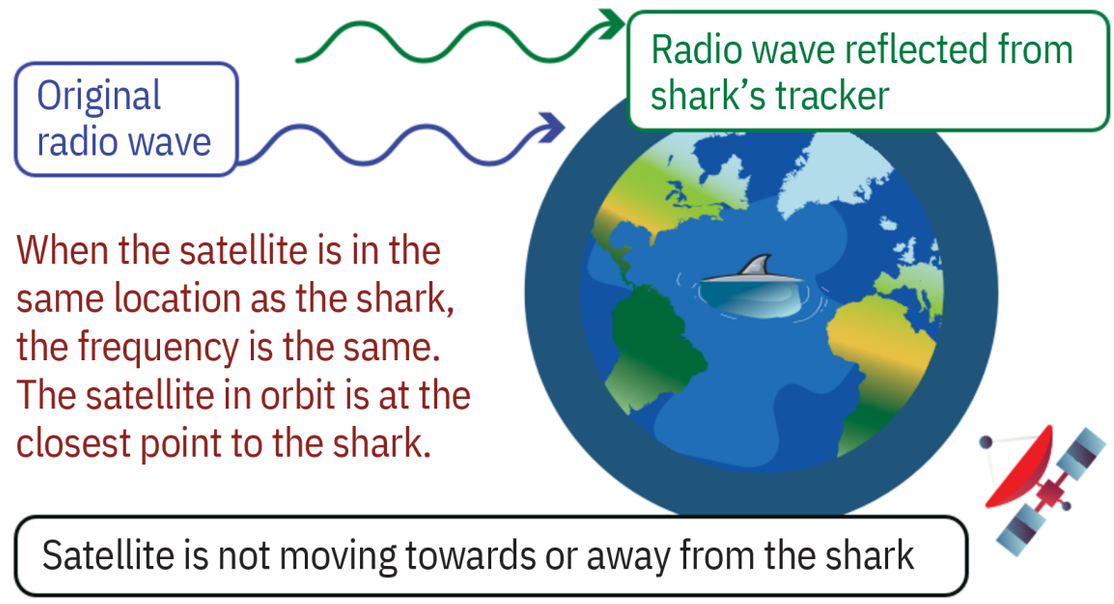
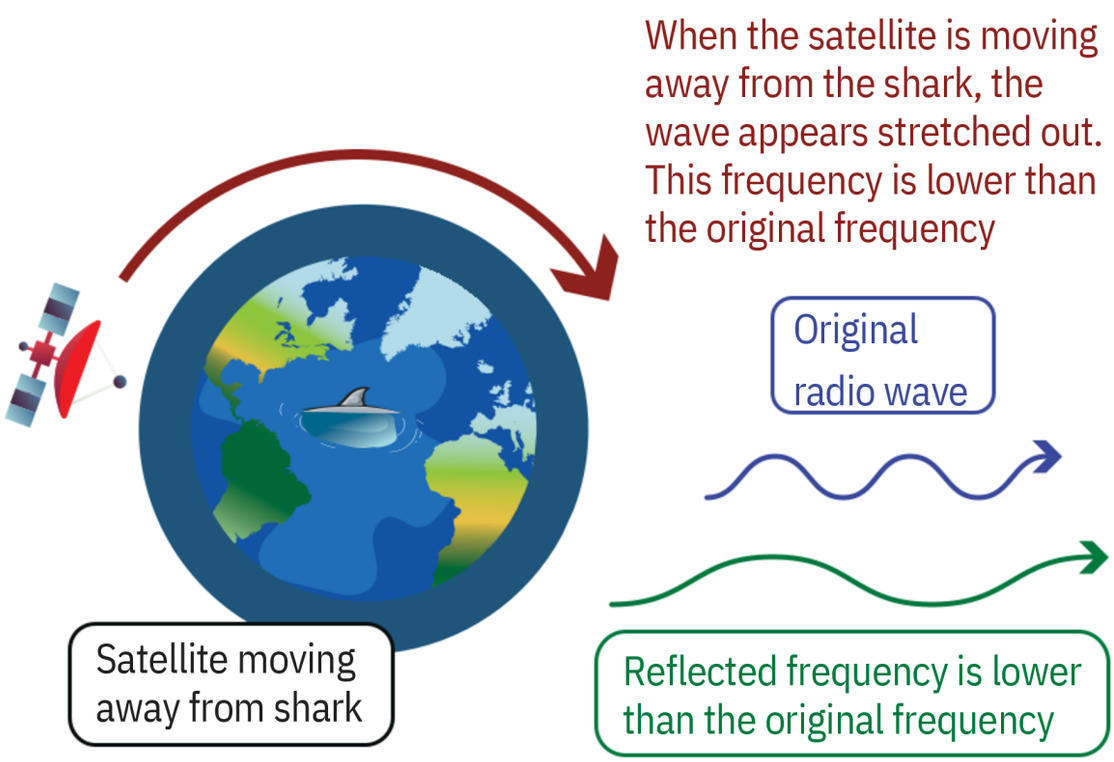
Shark Tracking





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Shark Tracking

Name _____

Date _____

Directions: Use the Shark tracking tool on https://www.ocearch.org/tracker/ to identify three sharks and another animal of your choice (ex. seal, sea turle, whale). Answer the following questions related to your animal of choice.

Table 1: Animal Tracking Data

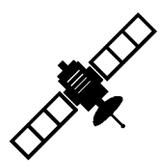
	Name	Species	Date First Tagged	Last Pinged
Shark #1				
Shark #2				
Shark #3				
Animal of your choice!				

Answer
Brainstorm

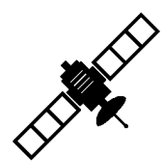
Context Questions:

1. Draw an example of what the radio waves look like when an animal reaches the surface and the satellite is approaching versus when it is moving away. Are they stretched out or scrunched up? Refer to your reference sheet if needed!

Approaching



Same Location (Neutral)



Moving Away

2. Explore the data provided about your chosen animals. What are some of your observations? What do you notice?

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Reflection Question:

How would you explain why certain species or animals may ping more or less than others?