Global Shark Tracker (Optional)

Students can further explore white sharks in the Atlantic by using the Global Shark Tracker http://www.ocearch.org/ as a website or app, to collect and record data about shark behavior. The tracker uses SPOT tags to transmit radio waves to a satellite. Therefore, sharks can only transmit data about their position when their dorsal fin breaks the surface, and they must surface long enough to send data to the satellite.

Ask students to think about (individually) what they know about the relationship between where white sharks travel and their age. Ask them to share their ideas with a partner. Once they have formulated a clear idea, ask them to write about the relationship between where white sharks travel and their age in their Science Notebook.

❏ Open the Global Tracker website or app and demonstrate the Global Shark Tracker:

❯ Give students a few moments to orient themselves to what they are looking at, allowing discussion between partners. Ask a few to share what they notice (*different circles represent different species; there are recent pings highlights on the side; there are control buttons to the left of recent pings,* etc.). Hover your mouse over one of the round objects in the ocean to reveal a pop-up box that describes the species and allows you to see the latest pings (and "like" the animal). Clicking this will open up a larger box with more detail on the animal. Spend a few minutes exploring with students. To check for understanding, ask students to recall what ping means; allow students to discuss before sharing with the whole class. (A ping occurs when the tagged dorsal fin breaks the surface of the water and transmits a signal to a satellite. The transmission sends back an estimated geolocation. Each dot that appears on the map indicates that the shark surfaced and a signal was transmitted to a satellite.)

❯ Narrow the search to just white sharks by using the navigation buttons on the right side of the screen. To filter, click on the icon showing three horizontal lines and enter search criteria. (Suggested: select white shark in the species box and then click the blue track button at the bottom of the box.)

❯ Ask students for a suggestion of how to narrow their search to a specific shark. For example, all shark pings in the last month could be viewed by additionally clicking on the month button under tracking activity and again, clicking the blue track button.

❯ If students do not suggest zooming in to the North Atlantic, ask why it appears as though there is a "clump" of activity there. How can we find out what's going on? Some students may realize there are zoom-in (+) and -out (-) buttons that can be used. In addition, you can drag the map around to focus on that area allowing for more resolution.

❯ Show students that you can hover over a dot on the shark's track to see the date and time of the ping. Ask students to discuss what the lines drawn between the pings are? (Ping data is the only data recorded; therefore, the lines are inferred and that is why you may find lines crossing land masses.)

❯ Ask students to discuss why the water has two different colors. (The continental shelf on the map (light blue) is shallow water, although it appears as if it is far from shore. The darker blue is deeper water, and the lines or cracks in the dark blue represent geologic features/bathymetry of the ocean floor below the water.) Note the path of the shark's track in relation to the continental shelf.

Global Shark Tracker (Optional) (continued)

> Click on several dots and determine the approximate time Albertina spent close to shore (on the continental shelf) or farther from shore.

❑ Ask the class to choose a white shark and predict the following: How old is the shark? (YOY or Adult) What is their reasoning? Once students share their prediction, click on the round button for that shark to open up its full description in the box to the right to confirm/refute the prediction.

❑ Ask students to work in groups of four to collect data on the white sharks on a chart such as this:

Shark Name	Student Name	Time spent close to shore (on continental shelf)	Time spent away from shore (beyond continental shelf)	Predict: How old is the shark? What is your reasoning?	Sex	Stage of Life (immature = YOY or juvenile mature = sub-adult or adult)

> Each person in a group can research 3 or 4 different sharks until data has been collected on all of them (if time permits). Record the information on the chart. To identify which sharks each student has researched, the student's name should be written in the second column. It will take longer to collect data on some sharks than others.

> When students have finished recording data, they should share with their group members, so each person has the entire data set. Alternatively, students can create a shared document for their group and add information from the sharks they research on the spreadsheet.

Global Shark Tracker (Optional) (continued)

> **TEACHER NOTE**
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> In order to find the amount of time spent close to shore or away from shore, students will have to click on several dots indicating the shark surfaced and approximate the length of time.

The goal for students is to explore this tracking technology and look for patterns in the data they collect. They should observe that the YOY and juvenile sharks stay close to shore or only occasionally venture beyond the continental shelf, while the adult sharks swim farther away from shore. Facilitate a class discussion summarizing the data.

›   Ask students to identify patterns they see in these data. What are some reasons young sharks stay closer to shore than adult sharks? Although students do not have evidence for this from this activity, they might connect prior learning and infer; more fish (young white sharks eat fish and it's easier to catch fish in shallower waters); shallow waters are safer and offer more protection; shallow waters have warmer temperatures; they have less endurance to swim long distances.

›   Ask students what these data can tell us about shark populations. (It cannot tell us anything about the population size of white sharks, but it gives us insight into behavior of individuals. Looking for patterns between individuals, it verifies that young sharks stay closer to shore than adult sharks. Because young sharks stay close to shore, since the gillnet ban went into effect, they are no longer caught as bycatch; they have the chance to grow up.)