The Truth About Sharks
Chapter 5: The Senses of Sharks

The Nose Knows

Scientists once thought that 70% of a shark's brain was devoted to identifying scents. We now know that this is probably untrue. However, sharks are able to detect very small amounts of blood in seawater. This fact is one reason for the public's unrealistic perception of sharks as mindless hunting machines.

When blood enters the ocean, it becomes just one of many chemicals carried by the current. Shark noses work when water containing dissolved chemicals flows into the nostrils and comes into contact with receptors in specialized cells lining the nostrils. The receptors signal the brain and the shark "smells" the blood.

Sharks have often been called "swimming noses." This is because people believe they have an almost supernatural sense of smell, making it possible for them to sense even the tiniest amount of blood from across an ocean. Their intricate olfactory system is definitely more acute than that of a human and works well in a watery world where visibility is poor. But can they really smell a single drop of blood in a vast ocean?

Fish Stories

Odors in water spread through diffusion and mixing. This happens slowly in still water. In moving water like the ocean, the odor spreads more rapidly. Currents in the ocean move odors away from the source, so a shark that detects an odor tends to swim into the prevailing current to get closer to the source. The ocean is full of turbulent currents, waves, tides, and storms. Pinpointing the source of an odor can be an easy task for a shark if it is only a quarter of a mile away, but the farther a shark is from an odor source, the harder it is to for the shark to locate the smell. Eventually it becomes impossible.

At Woods Hole Oceanographic Institute, scientists study sharks' sense of smell. In experimental lab tanks that mimic ocean currents, small dogfish are put through their paces. They are placed in the tanks and both a squid-scented plume and a non-scented control plume are pumped into one end. Video cameras monitor the movements of the dogfish. Scientists measure how much odor is needed for a shark to locate the source and how the sharks' noses guide them to it. Recent studies at Woods Hole demonstrate that sharks turn in the direction of the nostril that first detects the odor.
Scientists have not yet confirmed the well-known shark myth that a single drop of blood in an Olympic-sized swimming pool (a concentration of one part per million) would attract

sharks. However, Mythbusters, a television series that uses the scientific method to investigate common myths and legends, has tested the myth. In addition to testing with human blood, Mythbusters also used blood from fish. Interestingly, in their tests the sharks responded to the fish blood and had no response when human blood was added to the water. They concluded that a shark can smell blood in the 660,000 gallons of an Olympic-sized pool, but is not drawn to human blood. It would be much more interested in blood from a whale than in an injured human.

Further Reading

Separating truth from myth isn't easy when sharks are involved. Unfortunately, experiences with sharks are often amplified by fear and bravado, and gathering research on sharks is difficult. Various techniques help researchers answer questions about sharks, such as using passive acoustic telemetry, conducting underwater video-station surveys and studying shark habitat with manned aerial vehicles. You can learn more about sharks by searching the Internet for shark research studies and learning about questions scientists are working to answer. Some of the following websites will get you started:

- Guy Harvey Research Institute Shark Tracking
- Oceans Research
- Western Australia University: Shark deterrent research reveals interesting results
- Mythbusters—Drop of Blood
- Bimini Biological Field Station Foundation, Bahamas

Questions for Discussion

1. What are some questions that you would like to see answered about sharks? How would you go about trying to find the answers?

2. How fast would the odor of your blood get to a shark in the following scenarios?
    - You are injured resulting in losing blood. You are in a slow current of only 2.24 miles per hour (1 meter per second). If a shark is a quarter of a mile away down current, how long before the molecules of your blood drift its way?
    - You are hurt in fast-moving water with current that is reaching a treacherous 16 miles per hour. Miraculously (that is some fast water!), you are rescued immediately, but not before you have lost a significant amount of blood into the water. A shark is down current, a quarter of a mile away. How long would it take for it to sense the blood from your wound?

3. In the scenarios described in Question 2, how likely is it that the shark would attack you? Explain your answer based on information from this course.

4. You are swimming in the ocean, jumping in from a raft about 200 meters from shore. You are jumping, yelling, splashing, and laughing with your friends. You're wearing your favorite silver ankle bracelet and a yellow bathing suit. The sun is beginning to set and the ocean is more beautiful than ever, so you and your friends decide to keep swimming. At any one time, someone is floating on a big black innertube. One cautious friend thinks you all should get back to shore, right now, because of the risk of shark attacks. What do you know about sharks and their senses that supports his argument?