



Ecosystem Engineers

Teacher Resource

The physical environment is central to an organism's survival. At the most basic level, all organisms require food, water, space, and shelter. However, the required quantity and composition of such resources vary significantly amongst animal species. Over the course of centuries, each animal species has adapted to survive in a specific habitat. Outside of their preferred habitat, an organism typically struggles to succeed. Within the habitat, a population will select regions with a low concentration of predators, high abundance of food, and optimal space. To better understand the great variation that exists amongst species' habitats, compare the biology and habitat of a Greenland shark to that of a bull shark.

	Greenland Shark	Bull Shark
Size	21 feet long, 2,000 pounds	7 to 11 feet long, 200 to 500 pounds
Habitat temperature	Freezing, Arctic waters	Warm, coastal waters
Habitat depth	600 - 2,400 feet	Typically 30m, but can swim at depths of 150m
Range	North Atlantic Ocean Baffin Bay to Gulf of St. Lawrence, all the way to the Gulf of Maine and Gulf of Mexico	Atlantic Ocean Massachusetts to Brazil, all the way to Morocco and Angola
Diet	Narwhal and beluga carcasses, marine mammals, large fish	Other sharks, echinoderms, bony fish
Swimming speeds	Slow, sloth-like	High speed, active
Special adaptations	Deep depths void of light and a copepod parasite living on the eyes make the species completely blind	Can live in saltwater, freshwater, or brackish water



Both are species are sharks, but the Greenland shark and bull shark live in almost opposite habitats. While the Greenland shark is a cold water, deep diving, mammoth species, the bull shark is a warm, shallow water, medium-sized species. If a Greenland shark and a bull shark were to be under human care in an aquarium, the habitats developed for each species would be completely different. The ecosystem engineers responsible for developing the habitats of each species would need to consider the following components:

- Habitat width
- Habitat depth
- Habitat temperature
- Type of water in habitat (i.e. saltwater, freshwater, brackish water)
- Quantity of light in each habitat
- Access to and storage of proper diet
- Migratory behaviors
- Energy levels of animals

Only based upon size, the massive Greenland shark requires a much larger habitat than the smaller, bull shark. However, the engineers must remember that both species of sharks can be highly migratory, and may wish to have space to travel throughout the habitat. Greenland sharks dive to depths reaching 2,000 feet, while a bull shark remains in shallow waters. The habitat of a Greenland shark would need to be incredibly deep, while a shallower habitat would suit a bull shark. Another consideration the habitat engineers would make is the rate at which each species of shark swims. The slothy Greenland sharks would be much less active than the fast-swimming, high speed predatory bull shark. Further, the temperature of the water in each species' habitat would differ. The ability to maintain the temperature for each habitat would need to be carefully considered. The variations and complications associated with designing a habitat for a Greenland shark versus a bull shark are endless. Both are sharks, but both species have their own unique adaptations that enable them to inhabit opposite environments.

When designing a habitat for an animal, zoological institutions and aquariums carefully consider the species' biology, physiology, behavior, and natural environment. The comparison between the habitat of a Greenland shark and bull shark demonstrates the vast variety of ecosystems that exist in the world. No two habitats are alike, just as no two species are alike. Students will have the opportunity to further explore this concept and to design a habitat for a marine species during their visit at Marineland Dolphin Adventure!

Sources:

<https://www.sharksider.com/greenland-shark/>

<https://www.nationalgeographic.com/animals/fish/b/bull-shark/>