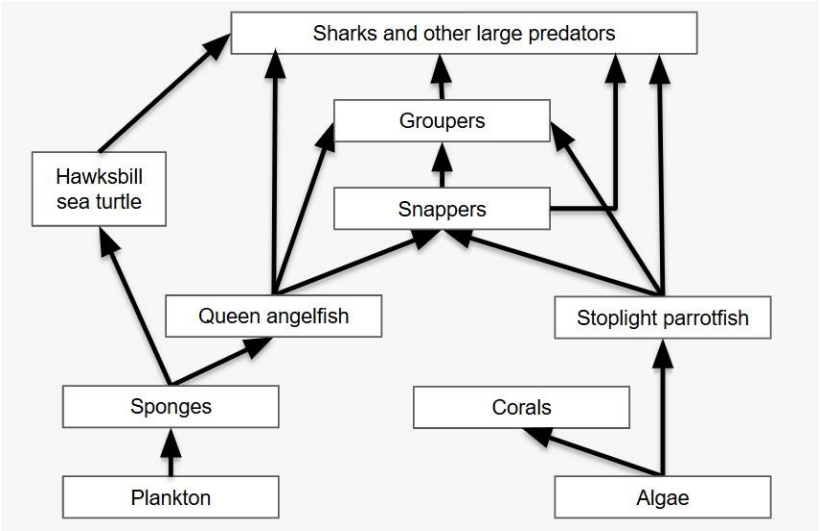
Scientific Background

Coral Reef Ecology: Coral Reef Food Web—Scientific Background

Coral reef ecosystems are known for their biodiversity, or variety of living things. Scientists consider biodiversity an important measure of ecosystem health and stability.

Coral reef organisms that are featured in this Investigation include staghorn and boulder star corals, algae, sponges, hawksbill sea turtles, queen angelfish, stoplight parrotfish, yellowtail snapper, and Nassau grouper. Corals are tiny invertebrates that live in large groups; a single coral organism is called a polyp. Over time, the hard exoskeletons of some types of corals accumulate to form large reefs. The bright colors of a coral reef come from the photosynthetic algae living inside the corals in a type of symbiosis called mutualism, in which both species benefit from living together in a close relationship. Corals provide algae with a place to live, and algae provide energy for corals.

A food web is a diagram that shows how energy is transferred through an ecosystem from one organism to another. It consists of multiple overlapping food chains. Each food chain begins with a producer and consists of a series of interactions in which one organism eats another to obtain energy. In food chains and food webs, arrows show the direction of energy flow.



Sponges are filter feeders that consume plankton suspended in the water. Hawksbill sea turtles are large turtles that feed primarily on sponges. Groupers are large predatory fish that feed on many reef fish, including snappers, angelfish, and parrotfish. Snappers eat smaller fish, shrimp,

crabs, and worms. Queen angelfish mainly eat sponges, while stoplight parrotfish and long-spine sea urchins feed on algae.

Biotic factors are the living things in an ecosystem—like fish, coral, algae, plants, and sponges. Predators and prey are biotic factors. Abiotic factors are the nonliving parts of an ecosystem—like sunlight, water, air, nutrients, sand, temperature, storms, and other environmental conditions.

Human activities impact biotic and abiotic factors in ecosystems. For example, people tend to catch larger fish, like grouper and snapper, more than smaller ones, like queen angelfish and stoplight parrotfish, but some types of fishing result in bycatch, when other organisms are caught by accident. Overfishing disrupts aquatic food webs, and some types of fishing also damage habitats.

Invasive species can also disrupt ecosystems because they have no natural predators. The red lionfish is native to the Pacific Ocean and is a voracious predator of small fish. It has no natural predators in Biscayne Bay, Florida. To reduce red lionfish populations and mitigate disruption to the coral reef food web, people construct habitats to attract, catch, and remove them. Some restaurants offer red lionfish on their menus.