

# Nekton - Whales, Fish, and More - Tutorial Script

As you'll recall from the Marine Classification video tutorial, there are two types of whales. How does each feed? Toothed whales are predators. Baleen whales are filter feeders that employ a rather ingenious hunting method known as **bubble netting**. These humpback whales in Alaska are demonstrating. Whales locate large schools of fish, dive down below them, and release bubbles in a curtain around the school. Those bubbles effectively trap the school in a cylinder surrounded by a bubble curtain. One of the whales can then rise up the center of the cylinder with their mouths open. Their distensible grooved throats expand as they gulp up all the water and the fish within it. When they reach the surface, the whales close their jaws. The baleen plates that hang from their top jaw act as a sieve and they squeeze their throats tight to spit all the water out through the baleen sieve. The larger organisms are trapped on the inside of the baleen, and the whale uses its large tongue to wipe off the edibles and swallow them.

There is one special type of baleen whale, the California Gray Whale, that employs one more method - it is also a deposit feeder, as these whales will swim right up to the shore and use their baleen to sift crustaceans out of the sand. These images and video show that feeding method in action.

**Echolocation** is a process used mostly by toothed whales to gather information about objects found in the water around them, including their distance away and their density. For example, a dolphin can see not only how far away a fish is, but what kind of fish - its size and whether it's got bones or cartilage inside. Sound waves are produced by blowholes, reflected off the front of the skull, and focused by a melon or spermaceti organ that acts as a lens. These directed sound waves bounce off objects in the water, return to the whale, which then picks up the reflected sound in its jaw. Vibrations of the jaw are interpreted by the brain and an image of the surroundings is provided.

Most whales are **migrants**, which means they travel large distances seasonally. Most will migrate to the polar seas during the highly productive summer months to feast on krill and then migrate elsewhere during the winter months to wait until the next summer. Humpback whales winter in Hawaii and travel there from Alaska. This picture shows the migration route of the California Gray Whale, which goes as far north as the Arctic Ocean during summer and then spends its winter in lagoons in Baja, California - a state of Mexico. Tourists who travel to these lagoons in January, February, and March will see thousands of these whales cavorting in the shallow waters and giving birth. Generally they do not feed, but live off the reserves they built over the summer. Because these whales also like to feed through sieving bottom sediment near shore as discussed earlier, they are a common sight along the California coastline during their migrations - April travels north and December travels south.

Pause now.

Other marine migrants include Pacific Salmon, who spend their first year of life as juveniles in freshwater rivers, leaving at the end of the year and heading into the ocean. They then spend 2-4 years migrating around the northern Pacific before returning to the rivers where they started life. Here they spawn and die in freshwater creeks. These migrations create a spectacular sight of thousands of returning salmon pushing their way upriver to their spawning grounds.

European and American Eels have the opposite migration - they breed in the center of the North Atlantic Ocean. Juveniles then make their way towards the coasts and up the rivers to live the rest of their lives in freshwater, until it's breeding time again, and they return back to the oceans.

Other migrants include birds - the Arctic Tern has the longest migration. Along with a few other species of bird, they fly from pole to pole twice a year to catch the summer polar high-productivity waters at both poles. San Francisco Bay is one of their stopping points during the migration. Lobster migrate each season, spending the summer, with the low wave energy in the shallows in nests and retreating to the greater depths in winter when the larger storm waves appear. Seals and sea lions have rookeries where they head during mating season. The

rest of the year they feed, either coastally or at sea, like elephant seals. The Deep Scattering Layer migrates every day from below the pycnocline to above the compensation depth to feed at night and return to the depths for protection during the day, as discussed in previous lectures.

Pause now.

Why does the Deep Scattering Layer go to the surface to eat? Food is scarce in the deep sea. Light is minimal and motion is limited by the low oxygen. Mostly fish that live at these depths and that don't join the nightly migration to the surface wait patiently for a meal to happen by. They have a number of characteristics that have evolved to meet the needs of rare meals of any size at any time, including jaws that unhinge, so they can ingest food larger than their mouths, distensible stomachs to allow larger meals to be accommodated and digested rapidly. Razor sharp teeth that often are larger than their mouths (they can't even close their mouths), so they can be prepared to attack larger fish, transparent bodies or black or red pigments to allow camouflage where there's no light, extra-sensitive lateral lines and barbels that can detect the faintest motion in the water, and photophores to produce countershading or lure in prey. One particularly interesting adaptation developed to improve reproduction is used by the Angler Fish. In addition to its lure, the female, which is an order of magnitude larger than the male, emits a hormone into the water that attracts the male. Once the male finds a female, it bites at the female's belly until it has stuck itself permanently onto the female. Then the male becomes an extra organ for the female, providing sperm as needed and having the female's blood and gases and nutrients pump through its own body, providing sustenance. And there the male stays until the end of its life.

Although deep-sea fish have a particularly sensitive lateral line, most fish have some kind of this **lateral-line system**. Cartilaginous fish generally have more sensitive ones than most bony fish (deep-sea fish excluded). These lines detect low-frequency vibrations.

Often you will find fish living and moving around within a much larger group called a **school**. What are the benefits to hanging out in schools? There are many. It's easier to find a mate. There's safety in numbers - increases the likelihood that if a predator comes by it will either a) be confused and think the school is a larger organism or b) give each fish a greater chance of escape than if it were found solo. That escape plan is possible because the other fish will act as a distraction and can confuse the predator. Some animals, such as whales, will hunt in schools or pods, thus taking advantage of the group as a means for corralling prey. The bubble netting described earlier is a perfect example.

For more information and more detail, continue on to the next video in the series.

### **Nekton: Whales, Fish, and More**

Produced by Katryn Wiese

City College of San Francisco

### **Nekton & Benthos Series:**

Nekton: Whales, Fish, and More

Benthos: Intertidal Zone

Benthos: Crabs, Corals, and More

Deep Sea Vent & Seep Communities

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