

Life in the Oceans

INTRODUCTION

- The average depth of oceans is about 3,800 meters, which means that they represent 99 percent of the living space on the planet.
- Despite having 99 percent of the planet's living space, only 250,000 of approximately 1.8 million described living species (14 percent) are marine.
- While the oceans lack diversity at the level of species, they are home to members of thirty-one of the thirty-four animal phyla, about twice the number of phyla that are found on land or in freshwater.
- Because of its vastness and humans' inability to easily visit deep waters, the oceans remain the least studied habitats on earth.

The organisms of these marine habitats are generally divided into pelagic and benthic organisms based on their selection of habitats.

Pelagic organisms

- living in the water column .
- The pelagic zone can be divided into photic and aphotic zones.
- **The photic zone** is the shallow part of the ocean that receives enough sunlight to support photosynthesis, which is about two hundred meters deep in the clearest waters, and as shallow as three meters in turbid coastal waters.
- **The aphotic zone** is where there is no light to support photosynthesis, and extends from the bottom of the photic zone to the ocean floor.
- Pelagic organisms include plankton, which float along with currents, and nekton, which are active swimmers.

Plankton

Plankton are divided into two types

Phytoplankton: which include photosynthesizing species such as algae.

zooplankton: which are consumer species. Zooplankton consist largely of copepods (tiny crustaceans).

- Although plankton generally drift with ocean currents, some plankton have limited mobility.
- For example, certain zooplankton species move towards the water surface at night to feed, when there is less danger of predation, and return to deeper waters during the day. This type of migration is termed vertical migration.
- Although most planktonic species are small, some are large, such as Sargassum and jellyfish.

NEKTON

- Nekton are active swimmers that use diverse means to propel themselves through the water.
- Some species swim using fins, tails, or flippers.
- Other species, such as cephalopods, move by shooting out jets of water, known as jet propulsion.
- Nektonic species include fish, octopus, sea turtles, whales, seals, penguins, and many others.

- Many nektonic species eat high in the food chain, although there are plankton-eating species (e.g., some fish) and herbivorous species (e.g., sea turtles) in addition to carnivorous ones (e.g., seals and killer whales)..
- It is common for sea creatures (especially animals live at the intermediate depths) to house luminescent bacteria within their tissues, which are able to produce light for communication, as a lure to attract prey, or to light their bottom surface to conceal their silhouette against the dimly lighted background from above.

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- Anglerfish are deep-sea predators that attract prey near their mouths by dangling a bioluminescent lure in front of their head.
 - The density of organisms in the deep sea is low.
 - Because of this low density, a long period of time can pass between meals, or between encounters with the opposite sex.

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- To deal with the problem of infrequent meals, deep-sea creatures are often gigantic compared to shallow-water relatives.
 - Large size allows for storage of food reserves that sustain the animals between meals.
 - Predatory fish also have large mouths and stomachs that allow them to take full advantage of any meal, regardless of size.

BENTHOS

- Organisms that live in, on, or near the ocean floor are appropriately called benthic organisms, and represent 98 percent of all marine creatures.
- They occur in such familiar marine habitats as intertidal rocky shores, mud flats, sandy beaches, coral reefs, and kelp forests.
- The main primary producers in benthic habitats are macroscopic seaweeds that grow attached to the bottom or microscopic algae that grow within the tissues of animals such as corals, sponges, and bryozoans.

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- Benthic animals include mobile creatures such as fish, crabs, shrimp, snails, urchins, sea stars, and slugs
 - Additionally, there are numerous animals that never move around as adults.
 - These sessile animals include barnacles, sponges, oysters, mussels, corals, gorgonians, crinoids, hydroids, and bryozoans.

- These animals' lifestyle combines facets of plant and animal lifestyles.
- Sessile invertebrates are plant like in that they obtain some of their energy from sunlight (the animals themselves do not photosynthesize, but they house photosynthetic symbionts), they are anchored in place, and they grow in a modular fashion just as the branches of a tree do.
- They are animal-like in that they capture and digest prey and they undergo embryonic development, often involving metamorphosis. I

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- In fact, nearly all benthic animals start life in the pelagic realm, drifting around as planktonic larva, dispersing to new habitats as they develop and feed.
 - After a few hours to weeks of pelagic living, they sink to the ocean floor to complete life as adults.
 - Being stuck in one place presents special challenges for sessile animals, including food acquisition, predator avoidance, and mating.

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- Sessile animals feed by having symbiotic algae and by filtering organic particles from passing water currents.
 - Like plants, sessile animals use structural and chemical defenses against predators, and have tremendous regenerative abilities to recover from partial predation events.

- Most benthic animals reproduce via external fertilization.
- Sperm and eggs are spawned into the water column and fertilization occurs outside the body of the female.
- Certain deep-sea habitats can be highly diverse. In the deep-sea vents, for example, chemosynthetic bacteria (rather than photosynthetic species) form the basis of the food chain.
- These bacteria obtain energy from chemical sources such as hydrogen sulfide instead of from sunlight.