EXPLORING THE OCEANS AND OCEANOGRAPHY

The oceans are highly complex environments. The oceans consist of different zones and habitats. As one moves deeper, the amount of light decreases, water temperature decreases and water pressure increases. These changing factors determine the zones and habitats and which organisms can live in each.

The Ocean Floor

Sonar studies and deep sea submersible water craft have revealed the details of the shape and depth of the ocean floor.

The region of the ocean floor that begins at the shoreline and gradually deepens toward the open ocean is called the **continental shelf.**

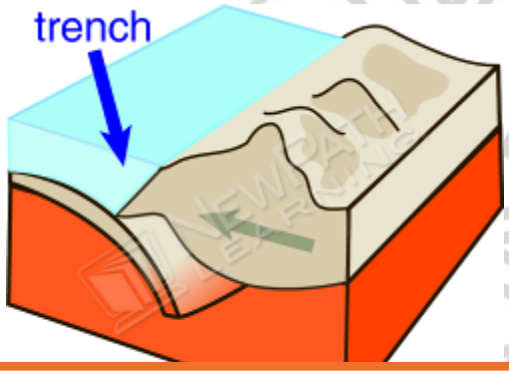
The e at the edge of the continental shelf. This portion of the ocean floor is known as the **continental slope.** At the base of the continental slope, the ocean floor continues to deepen, but at a much more gentle slope. This portion is called the **continental rise**. In the Atlantic Ocean, the deep ocean floor levels into the **abyssal plain** and then rises into a long mountain chain that runs down the middle of the Atlantic Ocean basin. This is the **mid-ocean ridge** and is the place where basaltic lava pours out onto the ocean floor as the tectonic plates pull apart. New oceanic crust is formed here at the mid-ocean ridge.

Lesson Checkpoint:
What is the abyssal plain and where is it?

At the mid-ocean ridge, super-heated waters that move through the ocean crust where they dissolve minerals and elements. When this hot water hits the cold ocean water, the minerals precipitate out and are seen as "smoke" pouring out of these holes in the ocean floor.

Geologists refer to them as **black smokers**. Deep water organisms cluster around these hot-water vents.

In some situations, ocean crust is **subducted** under the edge of the continental crust. The Pacific plate, for example, is subducted under South America. Extremely deep trenches form at these plate boundaries. They are known as **deep ocean trenches**.



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Biologists recognize different zones in the ocean based on the varieties of organisms living in each zone. Their depth below the surface determines the zones and the organisms living in them.

The marine environment that refers to the entire volume of ocean water in the world is referred to as the **Pelagic environment**. There are two zones in the Pelagic Environment**,** the **Neritic Zone** and the **Oceanic Zone**. It is common to find dolphins, whales and fish in the Neritic Zone. The Oceanic zone is the deepest portion of the ocean that has the highest water pressures, lowest temperatures and little to no light. Rare organisms that have adapted to such conditions inhabit the Oceanic zone (water that is deeper than 200 m). The Neritic Zone is the uppermost zone of the Pelagic Environment and, therefore, has higher temperatures, lower pressures and more sunlight.

The marine environment that refers to the ocean floor and all the marine organisms that live on it is sometimes referred to as the ”bottom environment.” The technical name for this environment is the **benthic environment**.

The shallowest of the zones of the Benthic Environment is called the **Intertidal Zone**. This zone is characterized by exposure to air when the tide goes out. A depression in ocean sediments in the Intertidal Zone which holds ocean water and supports life, even when the tide goes out, is known as a **tidal pool**.

The sublittoral zone begins at the limit of the low tide and extends into the ocean to the edge of the continental shelf. The amount of sunlight, the temperature and the water pressure remain fairly constant in this zone. This zone contains expanses of coral and the wide variety of animal life that lives from and with the coral.

Lesson Checkpoint: What is the Benthic Environment?

Resources from the Ocean

The oceans are rich sources of animal, plant, and mineral resources. Fish, shellfish, and seaweed are harvested for food. Significant
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In addition to the resources found *in* the oceans, ocean water itself is a valuable resource. There are a number of countries that **desalinate** ocean water (that is, remove the salt) because their annual rainfall and other fresh water resources are too low to meet demand. A number of middle-eastern countries desalinate ocean water.

Wave energy and **tidal energy** could potentially be significant sources of electricity. One concept is as the tide comes in, the water is stored in large retaining pools. After the tide goes out, the water is released through turbines to create electricity. At the present time, however, such technologies that can produce economically viable amounts of electricity are not widely available.

Ocean Pollution Considerations

Because of the vastness of the oceans, they have been treated (or *mis*treated) as a good place to dispose of waste and trash. For decades, solid trash and garbage has been hauled out to sea and dumped. It was originally thought that it would sink to the bottom, disintegrate or float out of sight and forever be away from land. The same was assumed for **sludge** and other sewage that is pumped, both treated and untreated, into the oceans. Unfortunately, but not surprisingly, such naïve assumptions have proven to be false.

Various national and international laws attempt to control the pumping of sewage and sludge into the oceans. It does still occur, however. It is estimated that the United States dumped over 35 trillion liters of sludge into the oceans by 1990. This sludge could end up on beaches and become a public health hazard.

Hazardous waste, such as used hypodermic needles, also can, and is, washing up on beaches around the world. In addition, fish and other organisms are ingesting and/or absorbing chemical and elemental pollutants. For example, fish are absorbing mercury in dangerous [illegible]at is liquid at rc[illegible]ed into the oceans for [illegible]y over 60 countries a[illegible]s into the oceans. W[illegible]uming the mercury a[illegible]g.

Oil s[illegible]the oceans. O[illegible]any species of animals and plants, can permanently damage if not destroy the local fishing industry, and cause permanent damage to the physical appearance and ecosystems of the affected coastline.