# Chapter X: The Marine World

## Introduction

 Over two thirds of the Earth is covered with saltwater and teeming with life. While humans cannot live within its waters, we benefit from the products of its ecosystem. All types of life are found in only this environment and nowhere else. Decades ago, we didn’t understand the impacts we could have on this environment. Such a vast expanse, reaching depths hardly imaginable, couldn’t be harmed by us… right? This line of thinking led to overfishing, pollution, and immense damage that only showed itself many years later. The ocean is a delicate balance of life and death, open waters and crevasses, light and dark. In this chapter, we will only scratch the surface of its complexity.

## The Layers of the Ocean

 Over decades of research, scientists have slowly discovered more and more of the previously unreachable ocean floor. These discoveries led to the necessity of classifying different layers of the ocean that are dependent upon the depth from the surface. There’s the Epipelagic Zone (the Sunlight Zone), then the Mesopelagic Zone (the Twilight Zone), followed by the Bathypelagic Zone (the Midnight Zone), with the Abyssopelagic Zone (The Abyss) below it, and even below that is the final layer called the Hadalpelagic Zone (The Trenches). Defining these zones is important because some forms of life are only found in one and nowhere else in the ocean. One defining characteristic of each zone is the amount of light that travels through the water to reach it. For example, the uppermost layer is called the Sunlight Zone because almost all of the light is conserved at that depth. The common names, meaning the ones that don’t end in ‘–pelagic’, are almost self-explanatory in that regard. Another important aspect of each zone is the pressure the water exerts on the objects within it. The deeper you go, the more water there is above you, and all that mass is pressing down on you. For example, the pressure in the Midnight Zone can reach almost 6,000 pounds per square inch! In the following sections of this chapter, we’ll go more in-depth about each specific layer and some of the creatures that dwell within them.

## The Epipelagic Zone, or The Sunlight Zone

 The first layer of the ocean stretches from the surface to a depth of 200 meters, or a little over 656 feet. All the light that fills this layer gives it warmth and variability. During the day, it can get quite warm, but then when the sun sets, the temperature drops. This layer only makes up about 5% of the oceans total volume. The density of water and the density of particulates generated by erosion or by living things makes it hard for light to penetrate very far. Some creatures found in this area include photosynthetic organisms and many common ocean creatures like sea turtles and reef-dwelling fish.

 Photosynthetic organisms, as you most likely already know, are those that can convert the energy found in sunlight into food to sustain themselves. On land this ecosystem niche is filled mainly by plants, which the ocean builds upon. Aside from plants like algae and seaweed, the ocean contains tiny living creatures that are also photosynthetic called phytoplankton. These microscopic creatures, along with the algae and such, makes up the lowest tier of the ecosystem: the producers. The entire ocean’s life cycle is based on this critical tier.

 If you’ve ever seen the popular Disney movie where an orange fish tries to find his son, you’ve seen a lot of the rest of the larger creatures that inhabit the Sunlight Zone. Some of these creatures live their entire lives in this zone while some traverse deeper depths in search of food. All of the living creatures in this zone create a lot of nutrients in the form of decaying organic matter or dietary bi-products that are able to drift into the deeper zones and sustain those living in darker waters.

## The Mesopelagic Zone, or The Twilight Zone

 The Twilight Zone is sadly not named after the classic television show but instead for the fact that the waters are incredibly murky at this depth as much visible light cannot manage to penetrate this deeply. This zone extends from about 200 meters to a depth of 1000 meters. At this depth and level of darkness, one of the most amazing features of ocean life becomes apparent: bioluminescence. This ability to produce colorful lights is amazing to see and a way to communicate with surrounding animals when there isn’t enough sunlight to fully see their forms. Two creatures that utilize this and are common in this oceanic layer are cuttlefish and squid. There’s even a giant squid that was only videotaped for the first time in the last couple of decades. There are also some sharks that inhabit this area. Creatures that live here often have large eyes so as to detect even the slightest glimmer of light that may indicate the presence of prey or a mate. It is a fish-eat-fish world down here, and those species that have survived the millennia are highly specialized to overcome the limitations of their environment. That being said, it isn’t as daunting of a zone as the ones found beneath it.

## The Bathypelagic Zone, or The Midnight Zone

 This zone extends from 1000 meters to 4000 meters. No light penetrates to this depth. The creatures in this layer, unless they are of the brave few that travel into higher levels in search of food, have never seen light or felt its warmth. It is a cold and high-pressure environment that these creatures inhabit. They often have simple eyes that aren’t very big and are not very colorful. Some creatures, such as the giant squid, travel to this layer frequently to find food and hide in the dark. Many people know the angler fish that inhabits this depth, but few know of the gulper eel. This eerie creature has a monstrously huge mouth that dramatically tapers to a whip-like body, making it look like a caricature rather than a real living thing. It is made in this strange fashion in order for it to not only be able to survive on tiny creatures that dwell on the ocean floor but to also be able to partake in any larger fish it may come across or the rare corpse that may land on the ocean floor.

Much of this layer reaches the ocean floor and that surface is teeming with creatures that feed off of dead things or microscopic nutrients from above. For example, a single whale carcass can be fed off of for months by starfish, sea urchins, or hagfish. Even some slow-moving sharks exist in this zone, and a single meal can keep them going for months on account of their slow metabolism and chill life style. One wild-looking shark is the swell shark, so-called because it can engorge itself with water to expand to almost twice its size, and that isn’t even their most surprising characteristic. They are able to absorb the undetectable-to-the-human-eye level of light that penetrates this deeply, and they use it as a sort of bioluminescence that is imperceptible to the human eye without the use of specialized cameras.

## The Abyssopelagic Zone, or The Abyssal Zone

 The Abyssal Zone reaches from 4000 meters to 6000 meters. It contains over 80 percent of the ocean’s area within it and makes up almost all of the ocean floor as the coasts of the continents has completely sloped away by this depth. Although it makes up such a large portion of the ocean and the Earth overall, it is almost entirely unexplored, but recently more research has begun to scratch the surface. Just as with the zone above it, much of the animals in this zone make a life off of the carcasses and dead matter that sink down from higher layers. In this layer, there is also an impressive new form of biodiversity in the form of chemosynthetic organisms, or those that use only chemical processes to generate energy. Creatures of this type can be found huddled around the thermal vents that often belch out continuous smoky columns of chemicals that would kill any other sort of life unfortunate enough to encounter them. And yet there is life here. For example, archaea (ancient) bacteria can utilize methane gas alone to generate chemical energy within themselves.

## The Hadalpelagic Zone, or The Trenches

 These zones exist in the deep crevasses carved into the ocean floor by the movement on tectonic plates, almost like inverted mountains. The deepest of these trenches is found at the bottom of the wider Mariana Trench and is called the Challenger Deep. The creatures that inhabit these extreme regions are bereft of bodily structures, like bones or lungs, which could be crushed by the tremendous pressure. Examples of this are such things as jellies, sea cucumbers, and squids. Aside from this particular unique adaptation trend, many of the ecosystem elements from the Abyssal Zone continue into these depths: detritivores and chemosynthetic organisms reign. Very little research has been done on these extremely hard to reach areas, with only a handful of people ever venturing into their depths.

## Conclusion

 The ocean contains an incredible myriad of organisms that stretch the boundaries of scientific knowledge. As more research is done, there with undoubtedly be many more discoveries that expand our understanding of what life can be so far from our own sun-lit surface world. The disparate layers of the ocean come together to create an incredibly diverse biome, teeming with life. Each layer presents its own challenges that nature has managed to overcome across the millennia, and perhaps these adaptations could lend valuable insight into other areas of science. Maybe life on other seemingly barren planets could resemble the archaea bacteria found in the lowest reaches of the sea. Overall, the ocean is a great source of examples of how ecosystems tie into one another, and individual animals play a part in the greater biome they reside in.

**Resources**

<http://www.seasky.org/deep-sea/ocean-layers.html>

<https://www.enchantedlearning.com/biomes/ocean/sunlit/>

<https://www.aquarium.co.za/blog/entry/welcome-to-the-midnight-zone-a-deep-sea-learning-experience>

<https://sciencestruck.com/interesting-facts-about-abyssal-zone>

<http://mentalfloss.com/article/90259/6-bizarre-sharks-live-deep-ocean>

<https://www.nationalgeographic.org/encyclopedia/ocean-trench/>