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## The Marine Environment

### Introduction

The fact that open ocean covers two-thirds of the surface of our planet dramatically illustrates the importance of the marine environment to life on Earth. But the importance of the oceans goes far beyond their sheer size for it is the oceans that largely determine our climate for the weather around the world is heavily influenced by what happens in our seas.

*'Weather patterns are primarily controlled by ocean currents which are influenced by surface winds, temperature, salinity, the Earth's rotation and ocean tides....Ocean currents bring warm water and rain from the equator to the poles and cold water from the poles towards the equator' (www.greentumble.com, 2016).*

Every schoolchild knows that the sun evaporates water from the sea which then become clouds that then produces almost all of the rain and snow which falls on every land mass in the world. The oceans also absorb heat from the sun and from human activities; this heat is then carried to the land in those places where the prevailing winds blow from the sea to the land. At the same time, the oceans play a vital role in the carbon cycle by absorbing carbon dioxide that is in the air.

Our oceans, of course, are also a major source of food for people on every inhabited continent with fish being an important source of protein. It is also seen as a very healthy food, being low in fat and an excellent source of Omega 3. This, of course, has led to the problem of over-fishing, while dishes such as shark's fin soup have contributed to the depletion of shark populations in some parts of the world.

Increasingly our oceans are also being exploited because of the resources found in the seabed, resources that are currently essential pre-requisites for modern economies including oil, natural gas and minerals.

Of course, the seas of the world continue to be the main conduit for the transportation of the goods which consumers demand, whether that be consumers in

the USA who want to buy German cars or the European consumer who buys ‘summer fruits’ from New Zealand or South Africa when it is winter in Europe. The oceans also play a role in the transportation of people and are particularly important in the life of island communities.

And lastly, there is the role of our seas in the modern industry of tourism. It is hard to imagine what tourism would be like without the sea. The sea means beaches and sunbathing, a place to go swimming or scuba-diving and wildlife-watching. In recent years it has also become highly fashionable to take your whole vacation on the ocean, on a cruise ship, being pampered.

So, it is clear that marine environments play a crucial role in the life of virtually everyone on Planet Earth. But what are they and how much do we know about them? This chapter will try to answer these two questions, at least in part. We will also look at the relationship between marine environments and tourism but this time from the point of view of the oceans.

## Key definitions

As you would expect there are a myriad of definitions of the term ‘marine environment’ so let’s begin with a simple one which seems to capture its essence.

The **marine environment** consists of *‘the oceans, seas, bays, and estuaries, and other major water bodies, including their surface interface and interaction, with the atmosphere and with the land seaward of the high water mark’* (www.definitions.net, 2019)

The UK government Joint Nature Conservation Committee, quoting Connor et al. in 2002, states that *‘the marine environment can be described or characterised at a number of different scales, ranging from ocean-level processes through to those that occur at species and genetic level’*. They go on to describe these three elements in a little more detail as follows:

- *Species provide the globally accepted classification of biological diversity, with well established rules of taxonomy, to distinguish between different types. Their classification is arranged in a hierarchy of genera, families, orders, classes and phyla.*
- *Habitats comprise suites of species communities or assemblages that consistently occur together, but which are derived from different parts of the taxonomic hierarchy (e.g. kelps, molluscs and fish in a kelp forest habitat). Their classification can also be structured in a hierarchy (biotopes, biotope complexes, broad habitat) reflecting degrees of similarity.*
- *Marine landscapes comprise suites of habitats that consistently occur together, but which are often derived from different parts of the habitat classification hierarchy (e.g. saltmarsh, intertidal mudflats, rocky shores and subtidal mussel beds in an estuary).*

The term 'marine habitat' is clearly an important one in this context and the same source goes on to define this word as a term which encompasses '*the substratum rock (rock, sediment or biogenic reefs such as mussels), its topography, and the particular conditions of wave exposure, salinity, tidal currents and other water quality characteristics (e.g. turbidity and oxygenation) which contribute to the overall nature of a place on the shore or seabed.*' (www.jncc.defra.gov.uk, 2007)

There are other key concepts that we need to discuss before we go any further, starting with **marine ecosystems**. This term covers the interaction of plants, animals and the marine environment, in other words in bodies of water where the water is saline. For the planet these ecosystems are vitally important given that seas cover some 70% of the surface of the Earth.

In 2017 the online Biological Dictionary made several points about marine ecosystems that the reader may find of interest in the context of this book, including:

- *Marine ecosystems are easily the most diverse of all the ecosystems on the planet. Coral reefs alone are home to over 25% of all marine life, despite occupying less than 1% of the ocean floor*
- *Like all ecosystems, marine ecosystems are finely balanced and highly complex. There are many different parts that make up an ecosystem, and each part plays a role in maintaining balance within the system. Organisms depend on, and are highly influenced by, the physiochemical environmental conditions in their ecosystem*
- *The marine environment ... can be divided into smaller, distinct ecosystems upon closer inspection.* (www.biologydictionary.net, 2017)

This final point is important as it reinforces the idea that we must not think about the marine environment as a single homogenous entity but rather recognise that there are many different and diverse marine environments around the world.

## Typologies of marine environments

This point about the heterogeneity of marine environments will now be explored further as we look at typologies of marine environments, under three main headings namely, scientific, geographical and tourism usage.

Scientists have developed numerous typologies and classifications of marine environments over a period of many decades, including important contributions such as the work of Joel Hedgbeth in the 1950s. The most basic typology divides ocean environments into two types, *Benthic* and *Pelagic*. *Benthic* includes everything on the ocean floor while *Pelagic* includes all of the mass of water.

Scientists also sub-divide marine environments based upon the depth of water as this obviously has a major impact on marine ecosystems due to variations in temperature, pressure and the amount of light which permeates the environment.