ENVIRONMENT

The grasses of the seas

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TWO weeks ago I looked at the importance of the simple plant - grass, to the terrestrial ecosystems on our planet.

This week I would like to extend that treatment to our marine ecosystems. Just as their terrestrial counterparts, grasses or in this case seaweeds are actually marine algae and can be defined as "simple photosynthetic organisms not included among the mosses, liverworts (and other bryophytes) or the vascular plants". Seaweeds have a wide distribution being found in tropical, temperate and polar waters and are a source of food to both marine organisms and humans and are also important in reef development. They provide a wealth of chemicals that are used in a variety of products for industrial, pharmaceutical and agricultural uses, and as a source of alternative energy.

Although seaweeds have wide distribution, they need at least two conditions to be present in an area and these are; the presence of seawater or brackish water and enough sunlight for photosynthesis. Therefore they are commonly found in the littoral zone of coasts. However, the elevation at which these organisms are found is limited to areas kept wet by sea spray.

Seaweeds also appear simple in their structure and function, but they are quite complex organisms, more complex than terrestrial plants. The entire seaweed is called a thallus and is comprised of four main parts; the lamina, stipe, holdfast and haptera. The lamina is a flat structure that is leaf-like in appearance and resembles the blades of grasses in terrestrial ecosystems; however, they do not possess veins. It is the lamina that contains chlorophyll and thus carries out photosynthesis. Some variations of this structure include a spore cluster or sorus, gas-filled bladders or pneumatocysts which keep the blades floating in the water and accessible to where sunlight can penetrate the water column for use in photosynthesis, or float assist organs found between the lamina and stipe. The second structure, the stipe, is the equivalent of a stem in seaweeds and is quite flexible. Because seaweeds grow in areas that encounter strong currents or in the case of terrestrial ecosystems, strong winds, they have developed structures at their bases called holdfasts that allow them to attach themselves to substrates. Finally, the haptera are finger-like projections of the holdfast that anchor it to the substrate.

However, there are thousands of seaweed species in the world therefore there must be some way of classifying them. The simplest ways of classifying seaweeds are by colour and morphology or physical structure.

According to colour, seaweeds can be placed into three main categories based on their colour; green, brown and red. The red algae get their colour from the presence of a red pigment called phycobilin, the concentration of which is so great that it hides the green chlorophyll present. But this type of algae is not always red, and comes in a variety of colours ranging from pink to red to metallic purple. This colour variation is due to how much light they get and thus how much chlorophyll is produced. While with brown seaweeds, their colour is produced when a yellow pigment is present in greater amounts than the green chlorophyll. However, the red and brown types are almost exclusively found in marine ecosystems, while the green type are also found in bodies of freshwater, like rivers and lakes.

In addition to colours, seaweeds have a variety of shapes and this is another way they can be classified. There are six main groups; sheet-like, filamentous, coarsely branched, thick-leathery, crustose and jointed calcareous. The latter two types may take some explaining. Crustose forms as the name suggests form a crust over the structure it is on as it grows, while jointed-calcareous types have flexible joints but the segments between the joints are upright and hard. However, green seaweed is the least structurally complex are often small.

When it comes to what function seaweeds play in marine ecosystems, they act as primary producers, as they gather energy in the form of sunlight and incorporate it via photosynthesis. This energy is passed on to other organisms in the ecosystem as they feed on the seaweed and in turn get consumed by other larger organisms. Some are involved in coral reef development like some species of red algae that are also found on corals actually contain calcium carbonate deposits, comprising up to about 30% of the reef while other species provide shelter and protection to some marine animals from predators.

Seaweed also act as food for many marine animals, for example, the small animals found in floating concentrations of seaweed provide food for some species of young sea turtles. In turn, these turtles provide an important ecological function by keeping the amount of prey species in check. They also provide food for large predators. In recent times they have become very important to the ecotourism industry, and in turn the economy of countries where marine turtles are known to nest. Other species that feed on seaweeds include amphipods and isopods, detritus feeders such as, fiddler crabs that live in important wetland ecosystems like mangrove woodlands.

When it comes to human consumption of seaweed, some of us are only familiar with seaweed by using the type called seamoss to make a delicious and nutritious local drink of the same name or to wrap sushi.

This makes a good food sources as so far no species of seaweeds have been found to be poisonous to humans, and the use of seaweed as food is popular in the Eastern regions, in countries, such as, Japan, China and Korea to the point where seaweed is cultivated for this purpose and are made into noodles. Seaweed is also a source of iodine which is necessary for thyroid function and to prevent goitre. However, consumption of too much seaweed can result in an iodine level of toxic concentration in the body.

Certain chemicals and industrial gums are extracted from seaweed for a variety of industrial and medical uses. These chemicals are also components of a wide range of products used everyday from, ice-cream to cosmetics to fabric dyes. For instance, carrageenan is a vegetarian alternative to gelatine, used in toothpaste, shampoo, shoe polish, and in deserts just to name a few. Another substance is agar, in this case is extracted from red seaweed and is used to make dental impressions, for use example in to make dentures. Another use is as a medium to culture bacteria and other micro organisms for research. For agriculture, seaweed can be used as a fertilizer, soil conditioner and as a source of feed for livestock. Also more and more research is being done on using seaweed is also as a biofuel in an effort to find alternative sources of energy as opposed to using fossil fuels.

Therefore just like their terrestrial counterparts, seaweeds are vital for the functioning of the ecosystems they are found in, such as food for marine animals and coral reef development. They also provide a multitude of uses for humans, including food, chemicals used in a variety of household, cosmetic products, as a fertilizer and an alternative fuel.