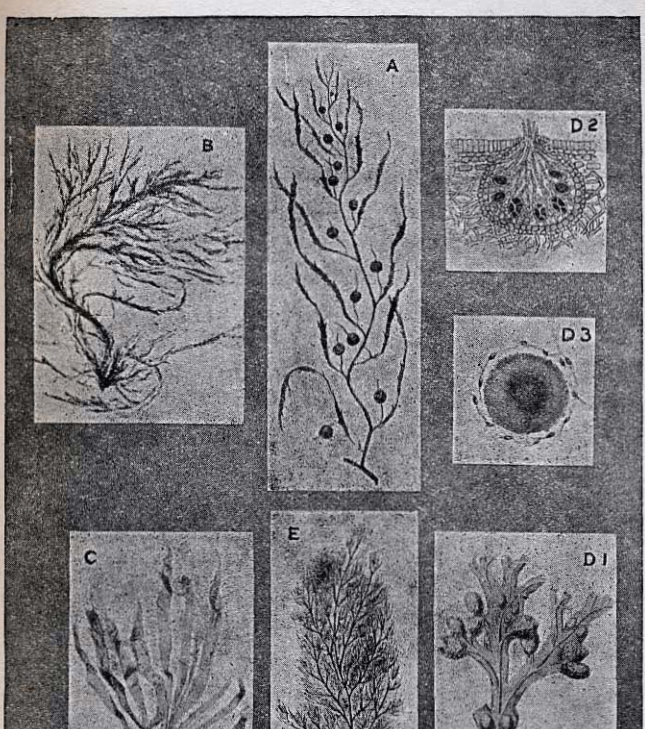
COMMON SEAWEEDS.

A SEVERE storm has been raging for several days on our shores, and no ship has dared to cross the Pentland. To-day a great calm has fallen upon the face of the waters, and the sun shines clear in the sky. A walk by the seashore on such a morning will afford an excellent opportunity for collecting specimens of our seaweeds, and for studying their life-history.

Here they lie in all their varied colours, strewn on the beach like autumn leaves in a forest. Now is our chance to secure some of those rare and beautiful weeds that grow in the deeper water, and have been torn off and driven ashore by the waves. If pressed and dried with care, they will remain things of beauty for long. For this purpose we use squares of stiff paper or card, on which we spread them out carefully under water. When pressed, they will adhere to the paper by means of the mucilage which they contain.

The delicate fern-like or feathery fronds of those red seaweeds will compare in beauty with the best of our flowering plants. This is all the more wonder-



Common seaweeds.—I.

A, *Sargassum* (Gulf-weed). B, *Cladophora.* C, *Enteromorpha.* D 1, *Fucus vesiculosus.* D 2, Receptacle of same, with eggs and sperms. D 3, Egg, with sperms. E, *Polysiphonia.*

ful when we consider their lowly origin. For the family of the *Algæ*, to which the seaweeds belong, is the oldest and most primitive of all the families

of plants. To the Algæ most likely belonged the first forms of life which appeared on the earth.

If we are fortunate to-day we may find a specimen of the famous Gulf-weed (*Sargassum*), which gives its name to the Sargasso Sea, and which is said to have cheered Columbus on his celebrated voyage of discovery. In the tropical Atlantic it covers immense areas of the ocean, and it is occasionally cast ashore on the Orkney coasts, drifted hither by the Gulf Stream and the westerly winds. It is easily recognized by its numerous little round air-bladders, each on a separate branch.

Now let us turn our attention to the seaweeds which we find growing on the beach around us. In many a rock pool in the "ebb" we may see a miniature forest of tiny weeds of beautiful colours and forms, a veritable ocean garden. Near high-water mark we find here and there in the pools pretty green algæ, some with broad, flat fronds, such as the sea-lettuce (*Ulva*), and others with slender branching feathery filaments (*Cladophora*). Many of the green algæ, however, prefer to live in fresh water. If you make an aquarium, you will find the sea-lettuce and the sea-grass (*Enteromorpha*) of great value in keeping the water pure, owing to the amount of oxygen which they give out.

Farther down on the beach the rocks are covered thickly with algæ of an olive-brown colour. The rocks, indeed, would fare much worse in a storm if the seaweeds were not there to protect them, as the grass protects the soil of the fields.

Look more closely at those big brown sea-wracks and you will notice that the most common kind

(*Fucus vesiculosus*) has little globular air-bladders arranged in pairs along its flat, smooth-edged fronds. Each blade has a distinct midrib, and where it divides, like all the Fucus group, it splits into two equal branches. On some of the little end branches you may see a yellowish swelling dotted over with minute knobs and pores. These swellings are receptacles for holding the eggs and sperms, which are contained in tiny cavities under each projecting knob. Many seaweeds produce their fruit in winter, when the land plants are sleeping and the fields are bare.

The microscopic sperms correspond to the pollen and the eggs to the ovules of the flowering plants. But there is one wonderful difference. The sperms of the Fucus can move about freely by means of two little projecting threads or cilia. When the tide is out, both eggs and sperms come to the door of their little houses by the help of the mucilage in which they float; and when the sea comes back swarms of these sperms swim away and wriggle about, till one of them comes in contact with an egg. It adheres to and fuses with the egg, which thus becomes fertilized, and is then able to give rise to a young plant. A similar process goes on in all the plants of the Fucus group.

Here is one with notched or serrated edges (*Fucus serratus*), and without air-bladders; there another well known to every schoolboy as the "bell tang" (*Fucus nodosus*), with large air-bladders in the centre line of the frond, and yellow fruit-bodies each on a branch of its own, without any trace of midrib.

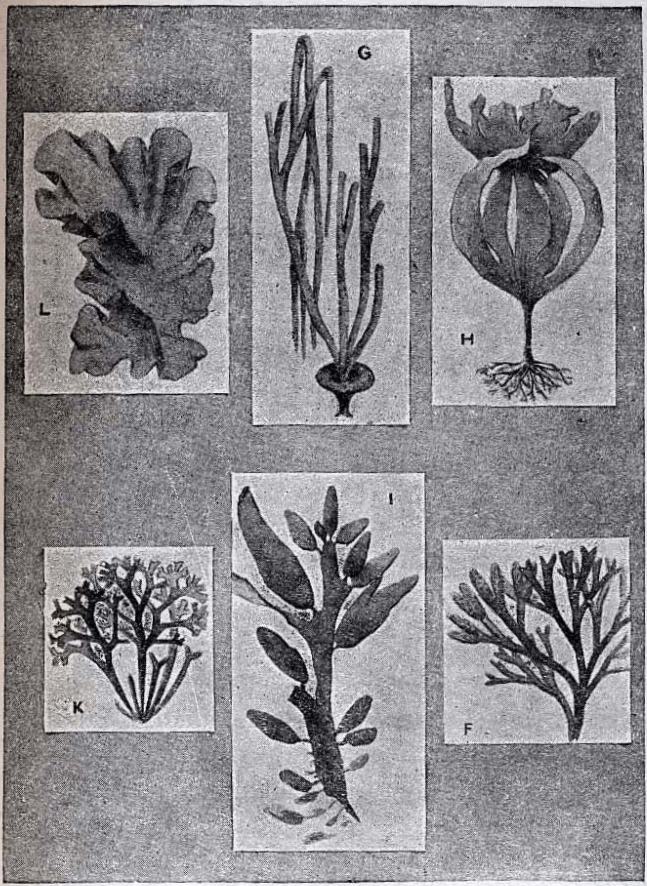
The air-bladders of the seaweeds are natural buoys,

by means of which the plants are kept erect in the water. The mucilage which makes them so slippery to walk over is of the utmost importance, as it protects them from drought when they are left uncovered by the tide. Seaweeds are very simple in their structure, and have no true roots, stems, or leaves. They do not need such organs, for every part of their body is in contact with the water which contains their food-supply.

What are those tufts of reddish-brown threads growing all over the fronds of this Fucus? That is a red seaweed (*Polysiphonia*), which often makes its home under the shelter of a more hardy plant. In the red algæ the sperms have no cilia, and cannot move about of themselves, but the eggs have each a long thread, corresponding to the stigma of the higher plants, and against this thread the sperms are driven by currents of water.

The little Fucus known as "teeting tang" (*Fucus canaliculatus*) ought not to be passed unheeded. It is often much relished by sheep and cattle. You may know it by its greenish-brown colour and by the distinct groove on one side all along its length. It is found only in the upper part of the "ebb." Another interesting plant of this group may be found on the large rocks nearer low-water mark. It is called the "sea-thong" (*Himanthalia lorea*), because its fructification grows out from a button-shaped base into long, forked, thong-like branches.

If the tide is far out, we shall be able to see the tops of the "red-ware" standing out of the water, and some of the tangles will be quite dry. These tangles belong to the *Laminaria* group, the giants



Common seaweeds.—II.

F, *Fucus canaliculatus.* G, *Himanthalia lorea.* H, *Laminaria digitata.* I, *Rhodymenia.* K, *Chondrus crispus.* L, *Porphyra.*

among the seaweeds. They contain a large amount of iodine in their composition, and that is why they are used for the manufacture of kelp. Notice how

firmly they cling to the sea-bottom by their strong holdfasts, which have weathered many a storm.

An interesting feature in this group is their manner of growth. The growing region lies at the junction of the stalk with the blade. You will often find a specimen in which the old blade is being pushed away on the end of the young one, ready to be broken off and cast adrift by the waves. The stalk itself is perennial, but in some kinds of Laminaria (*Laminaria digitata*, for example) the blade is usually torn into shreds before it is thrown off.

A well-known ally of the tangles is the "merkal," also called "honey-ware." You can tell it by the prominent midrib and the broad, thin wing on each side, running all its length. This is one of the edible seaweeds. Do you see this bright red palmate plant growing under the shelter of the tangles? It is the common dulse (*Rhodymenia palmata*), which may often be seen for sale on the streets of our cities. Examine it well and taste it, and you will be able to recognize it in future, however much it may vary in form or colour. But do not eat too much of it, for it is said to be somewhat indigestible.

Another edible seaweed which has been widely used as an invalid food may be found in the lower part of the "ebb," often under the shelter of larger plants. This is the Irish moss or carrageen (*Chondrus crispus*). It is fleshy and pink in colour. A jelly is made from it which is considered a great delicacy.

The purple laver (*Porphyra*) is perhaps the most valuable of the seaweeds as a food, and is said to sell at a high price in Yokohama. In form it

resembles the sea-lettuce. Many other marine algæ have been used as food, and none of them are poisonous. In North Ronaldsay the sheep seem to esteem them highly as food.

The most important use of seaweed is to serve as food for various kinds of molluscs, crustaceans, and fishes. The "plankton" of the sea-surface—minute one-celled algæ—are very important in this way. What grass is to the land animals, the marine algæ are to the living creatures of the sea. When driven ashore by the waves, or when cut down by the once familiar "hook," the larger seaweeds are much used as manure for field crops. They thus repay the debt they owe for any portion of their food that may have come originally from the dry land.

Before returning from our walk let us haul down this small boat from its "noust" and take a bird's-eye view of the seaweeds in their natural habitat. Through the clear water beneath us we can see the strange shapes of the submerged vegetation, dense and tangled, with here and there a lazy sea-urchin on the broad red-ware, and the sillocks actively swimming around. But our oars are entangled in the "drew" (*Chorda filum*), so full of annoyance and even of danger to the swimmer. Look at one of those long threads. It is covered with hairs; it tapers towards both ends, and its fructification extends along its whole surface. In structure it is a hollow tube divided into many chambers.

What a variety of colours and shades we see as we look down on this wonderful submarine scenery! We notice that near high-water mark green is the

predominant colour, and that the lower belt is mostly brown, while here at low-water mark and beyond it, as well as under the shelter of the sea-wracks and tangles, shades of red prevail. Beyond the depth of thirty or forty fathoms seaweeds are extremely rare, owing to the want of light at the sea-bottom: seaweeds, like other plants, cannot take in their food in darkness.

Notwithstanding their varied tints, the fundamental colour of all seaweeds is green, as you can prove for yourselves by boiling a few brown specimens, or soaking them for some time in fresh water. You will find that the other colouring matters are dissolved out, and only the green is left. The red or brown pigments are probably of use in aiding or in protecting the green colouring matter, chlorophyll, in its important work of assimilating the food material.