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MARGATE.

A

BOOK FOR THE SEA-SIDE.

Beautiful, sublime, and glorious ;
Mild, majestic, foaming, free ;—
Over time itself victorious,
Image of Eternity.

Such art thou, stupendous Ocean !
But, if overwhelm'd by thee,
Can we think without emotion,
What must thy Creator be ?

BARTON.

With Numerous Engravings.

L O N D O N :

THE RELIGIOUS TRACT SOCIETY ;

DEPOSITORY, 56, PATERNOSTER ROW, AND 65, ST. PAUL'S CHURCHYARD ;

AND SOLD BY THE BOOKSELLERS.

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A BOOK FOR THE SEA-SIDE.

CHAPTER I.

THE SEA AND SEA-CLIFFS.

THE noonday sun is shining out upon the sea in all its lustre, and the small waves come rippling up on the pebbles so peacefully, that the melody of their motion is heard only by those who wander in silence on the shore. The old cliffs towering up so boldly are gleaming in its light, and contrasting beautifully with that

deep blue sky above them, and with the golden flowers whose seeds were scattered there by the wild wind, making each crevice a spot of fertility and brightness.

That great and wide sea ! With what earnest and solemn thoughts did the psalmist look upon it, as he pondered on the things innumerable, both small and great, which dwell among its depths ; as he saw the white sails of the ships, and mused on the stormy wind which lifteth up the waters ; and remembered, with solemn confidence and joy, that word of power which “maketh the storm a calm, so that the waves thereof are still !”

The old ocean rolls on yet, as mightily and as musically as it did then, bearing to us all the same recollections as it brought to Israel of old ; fraught, too, with other associations of power and sweetness. We look on its waves, to remember how the Saviour himself walked upon the waters, in the calm majesty of the Godhead, and with the loving spirit of human sympathy. For us are written the words of pity and encouragement which he spoke, when, though the disciples had but little faith, he could yet save and cheer them with the assurance, “It is I ; be not afraid.” For us, too, is recorded a description of that haven of rest upon which the believer shall one day enter, where no storm shall terrify, no wave shall roll its sorrow ; for there shall be “no more sea.”

That sea told, to by-gone ages, of the “Eternal Power and Godhead ;” and the greater revelations still which it has made to the men of modern days, have taught us this as impressively as the waves themselves could utter it, had they voices to tell the truth. Succeeding generations have learned more thoroughly to read the handwriting of God on the page of nature, as one thoughtful mind has bequeathed to another something of the results of its own researches ; and the flowers of the fields, and the stars of the sky, and the wonders of the deep, are now so much better known and understood, that nature should bear to us a still

more impressive lesson of Deity than it conveyed to our fathers.

That deep, independently of its vast stores of life, is in itself a wonder, and has a wonderful influence on the earth and its inhabitants. Three-fifths of the entire surface of our globe are surrounded with water,—a proportion so absolutely necessary for maintaining the productive powers of the land, that were any change to take place in these relations, a barren and withered condition would quickly succeed to its present fertility. It is by means of the vapours perpetually arising from so vast a body of water, that the atmosphere is rendered sufficiently moist for the use both of animals and vegetables. The presence of this moisture renders the neighbourhood of the sea favourable to a luxuriant vegetation ; and although on many parts of our coast this is not to be seen, and the trees on the shore are few and stunted, it is because the land there is generally very much exposed to high winds ; the soil is rocky, sandy, or chalky ; and the constituents of sea air, though absolutely necessary to the growth of many plants, are unfavourable to others. Still, notwithstanding the aspect of sterility of a large portion of the coast, there are sheltered places, and better soils, which are well wooded, and have luxuriant flowers. The great beauty of the natural productions of the Channel Islands is often attributed to their lying in the midst of the waters. The environs and neighbourhood of the town of St. Helier's, in Jersey, built immediately in front of the sea, are remarkable for their fertility, for their cabbages seven feet high, for their flowering shrubs down close to the shore, and for their beautiful myrtles ; while the banks of Guernsey are gay with their daffodils and primroses, sweet with their woodbine scents, and tuneful with their singing birds. Ivy grows about the rocks near the sea, in Jersey, so as to make the sea-cliffs seem like ruins ; and nowhere are flowers, both of wood and garden, finer than in the Channel Isles.

Even on our own southern shores there is a general appearance of luxuriance, and many plants of tropical lands will flourish by the sea, which would not thrive so well away from its influence. It is a generally acknowledged fact, that the climate of a place on the shore is not so cold as that of an inland district in the same latitude. The atmosphere near the sea is never heated, during the day, to the same degree as in a place of that latitude far from the coast; but it is, in the same proportion, less cooled through the night; and the result is, not a colder, but a warmer climate than an inland place near it. The absence, also, of the extremes of daily heat and cold diminish the annual extremes of summer and winter; and thus a climate is produced which is favourable to the growth of these plants of warmer countries. The myrtle thrives in Ireland, almost as well as in Portugal; and so, too, on the coast of Devonshire,

“The meek unshelter’d myrtle sweetly blooms.”

At Salcombe, this plant and the aloe attain remarkable perfection. Several houses in Mary Church, and, indeed, of almost every village on the southern coast of Devon, are profusely adorned with the former plant. Even on more exposed and colder coasts, as at Dover, in gardens sheltered by the cliffs, may be seen the rich orange fruits of the common passion-flower, looking, as they hang from the green bough, scarcely less beautiful than the starry blossoms which hung among those festoons in the summer.

That this sea air, with its peculiarities, is favourable to the health of man, and exceedingly beneficial in many cases of disease, all experience has proved. Most of our sea-side towns are the gathering places of thousands during summer; while others afford a sheltered asylum to the invalid in the cold of winter. There the patient breathes an atmosphere impregnated with a profusion of common salt, and a lesser degree of bromine and iodine; substances which, if inhaled into the system,

have a singular and restorative power. So favourable to the health of the lungs is the salt air, that in Alexandria, which is at all times damp, but the atmosphere of which is surcharged with muriate of ammonia and muriate of soda, disease of the lungs is unknown. The saline particles are so abundant there, that it is quite impossible to keep iron from rust, and they condense on the walls and furniture of the houses in small crystals.

The constant agitation of the waves has also a most important influence on the neighbourhood of the ocean. It is by means of their incessant motion that the air is purified. Those deep waters contain, not only the living, but the dead. Vast masses of decomposing animal and vegetable matters, the refuse of the sea itself, and the refuse also of the land, lie beneath the waves. The mineral ingredients of the waters themselves possess a foetid, slimy matter, of which we are made conscious by their bitter and nauseous flavour, which is probably induced by the decomposition going on in the ocean. So great is the amount of this, that if sea-water remain long without agitation, it passes into a state of putrefaction ; and on some low tropical coasts, where long calms are experienced, it exhales very unpleasant odours, which are noxious also in their effects on the health of man. Much of the decomposing matter is devoured by living creatures, to whom God has given a voracious appetite, that they may prey on dead things ; much is assimilated to the nutrition of the sea-weeds ; and the brine preserves much from decay : yet, after all, we need those ever-rolling waves to render the air perfectly healthful.

Besides the physical influences of the sea air on the visitors to our shores, there are various mental ones, which go to aid in the restoration of lost health. We live in days of peculiar mental excitement, in days of great contrasts of religious opinions, of great competition in all departments of the business of life, and when even the hours of recreation are but too often occupied with pleasures of an exciting nature. The

very facilities of travelling afforded to the men of our times, and the various other methods of dispatch so general now, have given to the present age a restless activity, which, favourable as it is to progress, is, doubtless, often unfavourable to bodily health. Never was there a time when repose of mind was more desirable, and when the occasional relaxation of a sea-side visit was more commonly needed. Here, free alike from the cares of life and from household anxieties, from the stimulating pleasures of fashion, and even from the more reasonable restraints of society, the wanderer by the shore may find repose ; while, if he have a mind at leisure to contemplate nature, he may behold himself surrounded by all that is sublime and soothing. Here are no temptations to linger within doors. The shining sun, and the rolling sea, and the fresh pure breezes, encourage him to bodily exercise. Even the mind of the listless or idle can find some amusement in watching the coming and going of the vessels, the mirth of the glad companies of children, and the playful merriment of older people, who, in the glad buoyancy inspired by the air, are wisely forgetting that they are no longer children, as they play with the advancing waves. To the reflective mind, however,—to the lover of nature and of knowledge,—what a field is here for thought and interest ! Those who already know something of marine productions, and are longing to know more, have only to wander on with observing eyes, and proofs of the skill and power of God shall be brought by the waters to their very hand. Even those, who without thinking further of these things, but who have a love of beauty and grace, find their gratification here among the most common objects around them ; while the sea itself, in its grandeur of storm or its smoothness of calm, amidst the glowing hues of the rising or setting sun, or by the light of the silver moon and the stars, is a never-failing source of admiration.

The fitness of those waters for the purposes of civilization and of moral and religious progress, cannot fail

to interest the considering man. To cast the eye on a map of the world, and see how islands, continents, and other portions of land are separated by the sea, one might think that it would prove a barrier to the intercourse of nations. But the God who spake those seas into existence gave to man the skill to traverse them, and to make them the silent and pathless highway, over which, in safety and comparative speed, those ships should be borne which go so often to carry, from land to land, the necessities and luxuries of life, and to awaken to thought and feeling, to light and to devotion, the people who have long dwelt in moral darkness.

We know but little of the depths of seas. Our English Channel, at the east of the Eddystone lighthouse, is not more than fifty fathoms deep, and its depth increases but slowly to the west. The Irish Channel is some thirty or forty fathoms deeper than this, but the depth of the main body of the sea is far greater; and in some parts of the Atlantic no bottom was found in soundings which reached 300 fathoms, while in soundings made in several places between Spitzbergen and Greenland, with from 780 to 1200 fathoms, no base was reached.

As we walk on the shore, looking on the sea, we remark how variously it seems coloured at different parts. Here a long line of darkly tinted sea-weeds, growing on rocks just covered with water, and which at low tide form a margin to the shore, gives to the waters above them a blackish hue. Now a passing cloud tinges the surface with a bright sea-green, or a line glitters like gold in the sunlight. It is not, however, till we have quitted the shore and sailed away into greater depths, that we come into what the sailor terms blue water, and see the beautiful ultramarine tint of the sea. This was long supposed to be caused by reflection from the atmosphere; but as it is often of a far deeper blue than the sky itself, and as it is blue still when murky clouds obscure the azure, its cause must yet be sought. Some changes occur in this blue colour owing to the

material and hue of the soil beneath the waves, and it is modified by the presence of shoals. The Greenland sea has long been known to vary more than most others, changing its tint from ultramarine to olive-green, and passing from the most perfect clearness to deep opacity. Mr. Scoresby ascertained that in this case the green colour and opaqueness were caused by innumerable animals of the tribe of jelly-fishes, which, when examined, seemed like little crystal drops or air-bubbles, being semi-transparent globular substances, about one-twentieth or one-thirtieth part of an inch in diameter. These exist, but in far less quantity, in the bluish-green water ; but so innumerable are they in the olive-green part of the sea, that Mr. Scoresby calculated that a cubic fathom of this water would contain twenty-three millions eight hundred and eighty-seven thousand eight hundred and seventy-two individuals.

How regular are many of the operations of nature ! We lie down at night after seeing the sun apparently sink in the waves of the west, knowing confidently that it will again to-morrow gild the eastern gates of the heavens. So it is with the flowers and fruits in their appointed seasons : so it is with death itself ; for however human life may be prolonged, we know that the threescore years and ten shall have few to succeed them. Constant as any law of nature, is that which regulates the rise and ebb of the tide. Every mariner can calculate upon it ; yet as we daily mark this regularity, we know not how it is to be accounted for. We are aware of the fact that the alternate ebb and flow are caused by the attraction of the sun and moon ; but when the philosopher is asked to explain that attraction, he declares it to be inexplicable—he only knows it by its results. Like electricity, like life itself, like the eternity revealed by the Scripture, it cannot be explained ; and the mind of the Christian, while contemplating such subjects, is compelled, amidst the feeling of his own finite understanding, to think on the infinite nature of God.

The difference made by the winds in the surface of

the sea is not only useful in changing all the air about us, but it gives it its various aspects of beauty or sublimity. Now the margin of the ocean is scarcely rippled into a wave, and is falling gently on the shore. Now it is somewhat rougher, and far away over the blue distance we see those breaking surges, which the sailor calls white heads or white horses. Again the wind sweeps sullenly over the sea, and rising higher and higher, strikes the face of the water in an oblique direction, driving a portion on the surface over that which is near; and, raising it thus so far above the ordinary level, accumulates so much water as that the wind cannot maintain it in that position, and thus again it dashes downwards. Every wave presents to the windward a gently ascending surface, and to the leeward a nearly perpendicular descent; while the size of the wave is greatly determined by the strength of the wind which raises it, though varying in some measure according to the depth and extent of the sea. The waves on our own shores seldom rise to a height of more than six or eight feet above the level of the water; but stronger gales and deeper seas have waves far more terrible to the sailor. Nor do the waves subside always immediately as the wind lowers; for when the gale is over they still keep raging on awhile, bringing up to us as we wander by them many a treasure which winds and waters have torn from the deep below.

Amidst all the changes effected by winds and waves, few thoughtful persons look upon the sea without feeling the truth of the words of the poet, who, in describing the tide, says—

“Its everlasting changes bring no change;”

and who refers to

“The ocean’s face immutable as heaven’s.”

Something like these are the thoughts which arise within us as we look upon the cliffs. Numerous ages

have rolled away since they were in the course of formation. Even since the period when our land received its name from the white cliffs about our shore, more than sixty generations have lived and died. Could the men of those times revisit earth, how great would be the alterations which they would see in things around ! Nothing, perhaps, would seem familiar to them save that unchanging sea and those everlasting hills. "One generation passeth away, and another generation cometh ; but the earth abideth for ever."

What revelations of older ages lie embedded among the mass of which our cliffs are composed ! The chalk is entirely a marine deposit. That white substance is composed of lime and carbonic acid, and may have been precipitated from water holding lime in solution, from which an excess of carbonic acid was expelled. But a large proportion of our purest chalk is evidently chiefly, if not wholly, composed of the remains of corals, zoophytes, shells, star-fishes, and other animal substances ; and in some portions of chalk, relics of seaweeds appear in great abundance. We can at any time find remains of large shells in the chalk ; but never till the microscope was brought to bear upon the crushed or perfect shells which form the grains of this material, could we imagine how many myriads of these lay hidden to the human eye. Ehrenberg ascertained the wonderful fact, that a cubic inch of chalk contains upwards of a million of the fossil remains of perfect shells and corals. Little does the thoughtless wanderer on the shore think to what small animals he is indebted for the portion of earth on which he is walking. That chalk too will, if burned, make as good lime as the hardest marble. Many buildings have been made of chalk. Thus the abbey of Hurley, in Berkshire, and its parish church, anciently a chapel, are said to be made of chalk, and the remains of these are as fresh and unimpaired as if the builders had been men of the last century. The same may be said of the abbey at St. Omer's, which was ruined during the French Revolution, but which still

retains its beautiful Gothic ornaments in great perfection. Many other deposits besides the chalk consist largely of marine remains, and, like these hills, sometimes stand far away from the present boundaries of ocean, containing still traditions of the sea. But the extensive and magnificent range of chalk cliffs along our southern coasts, and the remarkable features and perfectly distinctive characters of this rock, render it more especially a fitting subject for our remarks.

Among those patriarchal cliffs some of the commonest fossils may be found at any time, but we may chance too to find some of the rarest; for however carefully any portion of cliffs may have been examined, the frequent fracture, and constant wearing of the surface, leave fresh parts yet unstudied. The shells contained in the chalk are often somewhat similar to those which are now washed up by the waves, and are at once recognised as resembling familiar things; but they are found to be different species from those now in our seas. Oysters, scallops, tellens, and various other common genera abound there; while there are also many, which even at a glance we know to be different from the shells of the present times. The shells found in the chalk are chiefly two-valved species. The most numerous kinds of shells which we shall find are the different species of terebratula, which are two-valved shells, sometimes quite smooth, in other kinds furrowed; various shells belong to the oyster tribe, one of which is exceedingly similar to our oyster, and several scallop-shells, well known by the ridges, which run like rays from the top of the shell to the base. But perhaps the shells most easily described to a reader unacquainted with these objects, are those of the nautilus and ammonite. The ammonite is altogether extinct in our seas, yet it must once have abounded there, for in some limestone districts the marble is almost wholly composed

TEREBRATULA
TRUNCATA.

of its shells; and at low water on some parts of the Sussex coast, where the chalk forms the basis, enormous specimens are often seen embedded. The

SECTION OF AN AMMONITE.

ammonite (*Cornu Ammonis*,) was so named from its fancied resemblance to the horn of Jupiter Ammon, and it varies in size from a most minute shell to one of twelve, or even fourteen feet in circumference. This coiled shell is well known in geological collections by the name of snake-stone. Old superstitions relate that—

“Of a thousand snakes each one
Was turn'd into a coil of stone
When holy Hilda pray'd.”

And some similar traditions yet linger in the north of England, where these shells abound. The species of the nautilus found in chalk will be easily distinguished from other shells, because although the exact forms are extinct, yet the nautilus still spreads its gauzy sail to the zephyrs of tropical seas, and its clear and beautifully formed shell is so commonly used as an ornament that we are all familiar with it. The nautilus and its congeners are among the earliest traces of the animal kingdom, and must once have been very numerous. Mrs. Howitt's lines to this fossil shell are very appropriate:—

“Thou didst laugh at sun and breeze,
In the new-created seas;
Thou wast with the reptile broods
In the old sea solitudes;

Sailing in the new-made light
 With the curl'd-up ammonite.
 Thou surviv'd'st the awful shock
 Which turn'd the ocean-bed to rock,
 And changed the myriad living swarms
 To the marble's vein'd forms."

It is not always the shells themselves which we find as fossil relics, sometimes it is but the cast of the ammonite or the nautilus. The same may be said of those spiral species, the tower shells, (*Turritiles*), which occur in the chalk in great abundance, and the largest specimens of which are found in the cliffs of Dover, and in the chalk marl at Ringmer, near Lewes, in Sussex.

Everybody familiar with chalk cliffs has seen there those common fossils the belemnites, which form almost the entire substance of some limestones on the continent. They are long cylindrical stones, terminating in a point, and having at the uppermost and largest end, a conical cavity. In perfect specimens a shell is situated in the hollow, but this is rarely found in the chalk fossil. These belemnites are commonly called thunder-stones, and the writer has heard children term them slate-pencils, and seen them used for writing on slates. Sometimes they are dark brown, sometimes clear as amber, and though usually about the size of a common lead-pencil, yet they are occasionally twelve inches long.

BELEMNITE.

But as chalk cliffs are not found on every shore, we must not linger over their contents. Star-fishes and various kinds of sea eggs, or echinites, as the geologist calls them, are plentiful there; the last equalling in number all the other shells found in this deposit, one entire genus being peculiar to it. Helmet-shaped, conical, heart-shaped, and spheroidal sea eggs may all be easily distinguished, sometimes having on them the remains of their spiny covering, sometimes presenting on their surfaces the traces whence the spines have been detached.

Perhaps a wanderer, in striking some ledge of that

old chalk cliff, may bring to light a fossil fish, more or less perfect in form, and lying there as if it had been moulded in plaster of Paris, with fins, scales, head, teeth, and sometimes even with the capsule of the eye, all plainly visible. Each geological formation exhibits groups of fossil fishes, but those found in the chalk are evidently the representatives of species which have now no existence in our seas.

These fossil remains not only reveal absolute facts to the man of science, but enable him often to deduce valuable inferences of a less obvious character. We will adduce one simple mode of reasoning from an isolated fact, in order to show this to the reader. Those common fossils, the trilobites, are found to have the compound eyes belonging to existing insects, and to animals of the crab and lobster kind—crustaceous, as the naturalist terms them. This construction proves that the mutual relations of light to the eye, and of the eye to light, were the same in the periods when the trilobites flourished as at the present day; and that the condition of the waters of the sea and of the atmosphere, and the relation of both to light, have undergone no change during the years which, minute by minute, have been since then rolling onwards to eternity. This will show how much may be learned of the past by thoughtful inquiry into its relics. The steps in the progress in any department of science may be slow, but when once made, the knowledge becomes, as has been well observed, “a mighty instrument of thought, enabling us to link together the phenomena of past and future times, and gives the mind a domination over many parts of the natural world, by teaching it to comprehend the laws by which the Creator has ordained that the actions of material things shall be governed.”

Beds of flint in the upper chalk are too obvious not to be seen by all; and often, embedded in the chalk, or lying at its base, or mingling with the pebbles of the beach, we may find masses of iron pyrites. This is sometimes called copperas, and round pieces of it are known on

some parts of our coast by the name of potatoe-stones or thunderbolts, and are common articles of sale among the fossils in sea-side places. These masses are often bronzed on the surface, but in some cases they have glittering small knobs. Many of them are no larger than a pea, occurring from that size to pieces several inches in diameter. They are mostly crystalline, and on being broken generally exhibit a fibrous and diverging structure of glittering rays. Beautiful little crystals of this mineral are often found filling the cavities of shells. Sometimes the chalk is stained of rich rust colour by this iron, thus contrasting with its pure whiteness. Fossil fish, too, are often marked with most brilliant tints, their bones, scales, etc. having a rich bronzed hue. This is owing to the circumstance that during the process of their decomposition they emitted sulphuretted hydrogen, and this sulphur entering into combination with the surrounding water, sulphuret of iron was formed by the chemical action.

DOVER.

CHAPTER II.

PLANTS OF THE CLIFFS.

OF whatever geological formation our cliffs may be, they contain hidden objects of great interest. But this is not all. There is an outward beauty conferred on many; and soft green grasses, and flowering shrubs, and blossoms of the richest hue, are studding their slopes and summits. The wild sea-bird looks down on many a lovely floweret, blooming far from the eye of man; and plants which we should search for in vain on inland meadows or banks, have their home

here, and are sending their roots down in that soil, consolidating it by their fibres. To see how small a portion of earth is lodged in the crevices, and what a shallow ridge of land crowns the height—to hear the roaring gales of winter rushing round the cliffs—one would think that this was no place for flowers. But if gales blow there, the high cliff forms on the other side a shelter, and the sun shines out in all its glory there as elsewhere; and plants suited to barren places and sea airs spring up and thrive, and green leaves wave to the morning gale or sparkle with the evening dewdrops.

“ Man who, panting, toils
O’er slippery steeps, or, trembling, treads the verge
Of yawning gulfs, o’er which the headlong plunge
Is to eternity, looks shuddering up,
And marks you in your placid loveliness—
Fearless, yet frail.”

Not to tell of white knots of squinancy wort, looking like patches of snow; or blossoms of the eyebright, almost hidden among the grass; of golden rock-roses and wallflowers; of clumps of honey-scented bedstraw, and wide-spread masses of bugloss, blue as the heaven above—we must describe such flowers, and such only, as belong to the sea-side; and if found at all away from the melody of Ocean’s music, are only to be seen clustering on the mountain heights of lands distant from the sea. Some of them, indeed, are found nowhere save on the sea-coast.

Such a plant is the samphire (*Crithmum maritimum*), whose green tufts hang high up on several of our sea-side cliffs, always beyond the reach of even the highest tide, though not so far removed as that a dashing surf may not sometimes send up its spray upon them. Sometimes this plant grows within the reach of the passer-by; but more often the eye of the flower-lover detects it far away from his grasp, knowing it easily from all other plants by its clumps of sea-green foliage, varied in August by clusters of little pale yellow flowers. The tallest stalks are usually about a foot in length,

and it is very succulent in its nature. It belongs to the umbelliferous tribe of plants, and its clusters grow in rays from a central point, like the spokes of an

SAMPHIRE.

umbrella. This is the sampier, or sampire, of our older writers, mentioned in so many ballads and poems, and referred to by Shakspeare. It is decidedly the best fitted of all our wild plants for pickling; for it does not, like the saltwort, which is often sold as its substitute, depend wholly for its excellence on vinegar and spices. It is pungent and agreeable in flavour, though not often in our days used as a salad, as it was formerly. It would, however, be no bad addition to this dish; and some who have studied various subjects connected with the diet of past and present times, are of opinion that the modern salad is very inferior to that served up two hundred years ago. The samphire is still pickled at sea-side places, and may, in its season, be procured in the London market; but were John Evelyn living, he might complain now, with even more justice than he

did in the days of the second Charles, of the general neglect of this herb. This writer remarks that, for its "aromatic and other excellent vertues," and effects against the spleen, for sharpening the appetite and various good purposes, it is "so far preferable to most of our hotter herbs and sallet ingredients," that he says, "I have often wondered it has not been propagated in the *potagère*, as it is in France, from whence I have frequently received the seeds, which have prospered better and more kindly with me than what comes from our coasts. It does not, indeed, pickle so well, as being of a more tender stalk and leaf; but in all other respects, for composing sallets, it has nothing like it." Gardeners of our days have cultivated it for pickling with great success; but a large quantity of it dies ungathered every summer on many of our sea-side rocks and cliffs, or remains half through the winter, to enliven them with its greenness. The French call it *creste-marin*, or *la bacile*; but long before the time of John Evelyn, it was called by them *herbe de St. Pierre*, of which our modern name seems the corruption. It is the *critmo* of the Italians, and the *meer-fenchel* of the Germans.

Hanging like tresses down the rocky sides, we may often see the green trailing stalks of that little plant, the sea spurrey sandwort (*Arenaria marina*). It is very succulent, its stems about as thick as twine, its leaves of semi-cylindrical form, as sharp pointed as a needle, and scarcely thicker than that little implement. Small, reddish lilac, star-shaped flowers grow here and there between the leaf and stem; and when the blossom is over, seed-vessels hang down on the flower stalks, and are plucked in autumn by the robin or sparrow, or any other bird which may wing its way from inland haunts to take a look at the sea. Nor does our sandwort confine itself to the rocky height. It grows on the sandy shore, among the pebbles of the beach, beyond the reach of the waves; and spreads its clumps over the ground of many a yard by the sea, where

boats and ships are being built and repaired, seeming to need but the saline air to call it into existence. It is always, however, a far more elegant plant when growing up the cliff than on the ground.

Round about the base of the cliff, where the sand lies scattered, or is trodden into a firm soil, we may often gather the prickly saltwort, or sea-grape, (*Salsola kali*), with its prostrate angular stems, bearing a single flower of pale greenish hue, with three little leaves, or bracteas, as the botanist calls them, at the base of each floweret. This genus was named from *sals*, salt, because an alkaline salt is obtained from it, and this exists especially in our British species. The soda contained in some of them was in former times of so much value, that large quantities were cultivated in the south of Europe.

A much prettier plant than the saltwort is the common thrift (*Statice armeria*), often called sea-pink, or sea-gilliflower, and which is not only ornamental to the maritime cliffs, but also to the marshes at some distance from the sea. During winter, its foliage seems like tufts of grass among the crevices of the slopes; but in some of these quiet nooks, where a projecting ledge shelters it from the keen north and east winds, it blooms there even in December, lingering on with many an autumnal or summer flower, as if it had forgotten that winter had come. On the marsh, its large round heads of pale rose-coloured or purple flowers are more conspicuous, as they form bright patches among the short grasses and taller rushes, or, in July and August, are so numerous as to make it seem one sheet of white. Little gardens, rescued from the beach itself, and enclosed around with the pale green feathery boughs of the tamarisk, exhibit richly coloured rows of this pretty flower around their beds; and high up on the mountain, far away from the sea-shore, the thrift is sometimes seen.

Here the wanderer might think of him described by Mrs. Sigourney, who

“ Blesses their pencill'd beauty. 'Mid the pomp
Of mountain summits, rushing on the sky,
And charming the rapt soul in breathless awe,
He bows to bind them drooping to his breast ;
Inhales their spirit from the frost-wing'd gale,
And freer dreams of heaven.”

But when the thrift grows on the inland hills, though no outward change marks it, yet it is changed in its properties. Here, on our cliffs and marshes, it contains in some abundance both iodine and soda. These are greatly lessened in the mountain flower, while, on the other hand, this increases to quantities of potash.

It is only of late years that iodine has been proved to exist in maritime plants, though it has long been procured from those of the sea itself. Chemical investigation has, however, proved that it occurs in the sea-side feverfew; in the sea grimmia, a dull-looking green moss, which in spring and autumn grows in rounded tufts on the rocks about our shores; and in that yellowish grey lichen, called the ivory ramalina (*Ramalina scopulorum*), which often hangs in loose tufts beside it. A chemical analysis was made of these three plants, and of the little olive-coloured tuft which, being washed by the spray at high tide, is by some writers considered a sea-weed, by others a lichen, and called the lesser lichina (*Lichina confinis*). All these were growing near together, and were during storms occasionally washed by the sea spray; and all except the lichina were found to contain iodine. As the specimens were carefully washed previously to analysis, the iodine could not have been derived from saline incrustation. All these vegetables were healthy; and Mr. Brand, who made this experiment, has thence concluded that the marine algæ—the sea-weeds—“are not the only plants which possess the power of separating from sea-water the compounds of iodine, and of condensing them in their tissues, and this without any detriment to their healthy functions.”

Look up, and see how the grass, far above, is speckled

with yellow flowers of dandelions and hawkweeds, or with pink tufts of the centaury, while the red sorrel and the pellitory of the wall stand above them. How glad are the butterflies of the numerous blossoms which hang about the spiny boughs of the furze (*Ulex Europæus*), so plentiful on many banks by the sea, and bearing well the winds there, and receiving no harm from an occasional dash of salt spray. Well may the French call it *jonc marin*—sea-rush—for it seems to rejoice in saline airs, and to grow quite as well there as on the inland common. It is not so useful on the cliff as on the village green, for it is not so accessible to those who would gather it for domestic purposes. It is well, however, that it is not, for it is of no small service in holding together the loose soil, and it gives a beauty in summer and winter to our shores, which have usually but few shrubs and trees to grace them.

“ Mountain gorses, ever golden,
 Canker'd not the whole year long;
 Do ye teach us to be strong,
 Howsoever pinch'd and holden,
 Like your thornèd blooms? and so,
 Trodden on by rain and snow,
 Along the hill-side of this life, as bleak as where ye grow.”

On cliffs and banks by the sea which are not too precipitous for the peasant boy, we may see him sometimes gathering the furze for fuel, or for heating the oven, for it burns with rapidity, and with a great degree of heat. In the olden times, the peasant collected the boughs for burning lime; but improved roads and canals have brought coals so much more within reach, that it is less used now. Yet the young shoots are good food for cattle, and, if rolled, are greatly relished by horses. Furze is said always to contain salt, so that it is not only nutritious and agreeable to cattle, but is a valuable preventive and remedy for some of their maladies.

But we must turn to a plant to be found on no place away from the sea, and which is quite peculiar to our maritime cliffs. This is the seaside or cliff cabbage

(*Brassica oleracea*) ; and if we tell our reader that its young clumps of leaves are very similar to the young garden cabbage plants, he will know it at once in its

SEA CABBAGE.

wild state. The flowers, which come in May and June, are very large and very handsome, shaped like those of the wallflower, but of a pale yellow. They make a very conspicuous figure on the heights, for in favourable seasons the stem attains two or even three feet in length, and is branched like a shrub ; while in the winter the woody stems, stripped of flowers, rattle to the roaring winds, and drop the icicles from their boughs. Even then, however, the leaves are very pretty. Waved and lobed, and thicker than those of the garden cabbage, they are, like them, of a rich green, with a sea-green bloom upon them ; and many of them, in autumn and winter, are most richly tinted with hues of delicate

lilac or deep violet, and, covered with powdery bloom, are of the colour of the ripest plum.

This plant is the origin of our garden cabbages, in all their endless varieties; though we may ask with Beckmann, "Who knows how many steps and gradations were necessary before cabbages, savoys, and cauliflowers were produced from our common colewort?" Yet a similarity is certainly apparent between our cliff cabbage and the leaves of all those varieties which furnish our vegetable diet. As this learned author humorously remarks, "With a little ingenuity, one might form a genealogical tree of them, as Buffon has done of the race of dogs; but a genealogical tree, without proofs, is of as little value in natural history as in claims for hereditary titles or estates."

Some species of cabbage were used by the Romans. Their brassica very evidently belonged to the cabbage genus, though which kinds were included under it, it would now be impossible to define. No doubt, in the course of ages, some varieties have been lost, as we know several have been obtained by long-continued culture. It is therefore probable that the cabbage which the ancients, to prevent intoxication, ate in a raw state, like a salad, is not now in existence; though we know that our common cabbage is sometimes dressed in this way. The ancients were in the habit of eating a curled cabbage, which was probably some kind of brocoli. But Beckmann observes, that we can nowhere find traces of that "excellent preparation of cabbage," called by the Germans *sour kraut*, though the ancients dressed turnips in the same manner. He adds, "I should have been inclined to consider sour kraut as a German invention, first made in Lower Saxony, which our neighbours learned from us in modern times, had not Bellon related that the Turks are accustomed to pickle cabbage for winter food."

Sometimes our cliff cabbage is eaten, and even carried about for sale, in places near the sea; but the little expense of garden vegetables renders it of slight service

to us. It requires long washing previously to cooking, and is then, as the writer knows by experience, as good as a dish of garden greens. Perhaps, in long remote periods of our country, it may have been prized by those who lived among the old hills where it flourishes; but it is not likely that it ever was so welcomed as was the sea-side cabbage of the Kerguelen Island, when it was gathered from that dreary land by the crews of the *Erebus* and *Terror*. This plant is described by Sir James Ross as abounding near the sea, ascending to the very summits of the hills on the shores. The leaves and heads were of the size of a good cabbage-lettuce, "and," says our Antarctic voyager, "the plant possesses all the good qualities of its English namesake; while, from its containing a great abundance of essential oil, it never produces any heartburn, or any of those unpleasant sensations which some of our vegetables are apt to do." The roots have the flavour of horseradish, and the young leaves or hearts that of mustard-and-cress. How welcome was this plant to our countrymen in those inhospitable regions where vegetables are so few, and after their long confinement to a diet consisting wholly of salt provisions! For one hundred and thirty days the crews of the ships required no other vegetable food than this, and for nine weeks it was regularly served out with the salt beef and pork of the vessel, during which time there was no sickness on board. Nor was this the only service rendered by this maritime plant. The ducks of the island fed chiefly on the seeds, and these birds formed a delicious addition to the table of the mariners.

Our cliff cabbage is not to be found on all our shores. On the sea-cliffs of Dover it is very abundant; it is so also on many cliffs of Devonshire, Cornwall, Yorkshire, and other counties; and it is common on many parts of the shore of Wales, and on the rocks of the Frith of Forth. In some seasons it is devoured into shreds, during summer, by the caterpillars; for as the insectivorous birds delight in woods and gardens, and are

singing their songs to the music of silver rivulets, and not to the loud roar of ocean, these insects revel on, unpursued by the race which are elsewhere their destroyers.

The sea-side cabbage grows all up the cliffs, even to the very summit; but when the sea kale (*Crambe maritima*) grows on cliffs, as it sometimes does, it is generally lower down, and is more often seen on the sandy soils below, or among the beach stones, than on the cliff itself. No plant, however, is more beautiful there,—not from its white cross-shaped flowers, but from its wavy leaves, which vary from sea-green into all the shades of pinkish purple, down to a deep rich violet tint. So showy are these leaves, that the writer once passing some cliffs on which they were abundant, and going rapidly by in the train, at first thought that the foliage was a clump of bright flowers, till a better opportunity of viewing them showed the mistake. The blossoms have a strong scent of honey; and the seed-vessels are pouches about the size of black currants. Country people, at the west of England, watch for the young shoots and leaf-stalks pushing up through the sand, when they cut them off underground, and boil them. It is often planted in gardens, sometimes for its beauty, sometimes that it may be blanched under sand or garden-pots for a culinary vegetable. It is, indeed, almost as general in our kitchen gardens as the asparagus, and, like it, may be easily forced; but unlike that plant, it yields its produce the first spring after being raised from seed. Its flavour, when cooked, is like that of the cauliflower.

On many a cliff, and under the hedges of lanes a little way from the sea, or scattered in clumps over the salt marshes, we find the alexander (*Smyrniolum olusatrum*), which pleases our eye by its bright foliage, and its thick cluster of small flowers of yellowish green. In the seventeenth century, this plant was in common use for the same purposes for which we now employ the garden celery, and was boiled with other vegetables

in soups. Long before that period, it had been used as salad; and our ancestors were well pleased with their water cresses, and their winter cresses, and the common alexanders; while they flavoured their "cool tankard" with the blue flowers of the borage, and put the marigold petals into their ragouts, and gathered the goosefoots from the salt marshes, and raised the sprout kales—which were but a variety of our cliff cabbage—for their daily dish of greens. It is possible that cultivation somewhat altered the flavour of this plant; or, perhaps, in this, as in many cases, the general taste has changed. Whatever the boiled alexanders may be, neither the odour nor the flavour of the raw plant is at all agreeable. Pennant, however, says that it is boiled and eaten with avidity by sailors who, on their return from long voyages, happen to land at the southwestern coast of Anglesey; and Dr. Withering, who remarks that it is the principal produce of the Isle of Steep Holmes, in the Severn, says that it is well worthy the attention of mariners.

All up the cliff are

" Hill flowers running wild,
In pink and purple chequers."

There is a pink centaury, scarcely differing from the common centaury, (*Erythraea centaurium*), so frequent in our pastures; and there is a sea carrot (*Daucus maritimus*) so like the carrot of field or garden, not only in its white cluster of flowers and its elegant feathery leaf, but also in its strongly-scented root, that we need not stay to describe it. Rising above them, and bearing as pretty a blossom as either, is the upright spiked thrift (*Statice spathulata*), which, on some cliffs and rocks—as on those near Holyhead, and on the coast of Dover—is, during August and September, beautiful with its numerous panicles of small lilac blooms; while, if we wander by the sea-shore of Norfolk, we may gather a rarer species, called the matted thrift (*Statice reticulata*). But the muddy

shores about almost all parts of our coasts, and the salt marshes too, abound with the larger and more showy kind, the spreading spiked thrift, or sea lavender, (*Statice limonium*), that has flowers which in colour are much like the plant of our gardens, whence it takes its English name ; but it is, after all, but

“ The sea-lavender, which lacks perfume.”

It is, however, a great addition to the nosegay of wild flowers gathered in the sea-side walk ; and on summer evenings, many a visitor from inland places may be seen wending his way homewards, with bunches of this and the yellow poppy, and other plants to which his eye is unaccustomed.

So, too, the hoary shrubby sea stock (*Matthiola incana*) is a favourite flower with those who can gather it from the cliffs. It is, however, very rare, and perhaps after all is not truly wild, though the great sea stock (*Matthiola sinuata*), which grows on the sands, is apparently really so. The former plant is the origin of the stock gillyflower of our gardens. Both have purple flowers. Delightful it is to wander along the sands where the great sea stock is growing on a midsummer evening, when the flowers are sleeping, and the quiet stars are reflected in the soft blue of the waters, which are murmuring their gentle welcome to the coming night ; for sweet indeed is the scent which this flower then floats upon the air, delicious as any which we can inhale, even from those sweetest of inland spots, the fragrant field of beans, or of flowering hops. These perfumes are the more cherished because we do not expect them, and when they mingle, as they sometimes do, with the night odours of the Nottingham catchfly (*Silene nutans*), which grows on limestone rocks, not only by the shore, but by the side of inland lanes and meads, we pause to ask if even the scents of tropical flowers can be stronger and richer than these.

There is a common species of the catchfly frequent

by our sea-shores, both among rocks and also on the sand, called sea campion (*Silene maritima*), but which neither by night nor day delights us with its fragrance. Any one who knows the common bladder campion of our hedges, with its clusters of white blossoms, set on flower-cups inflated like bladders, and veined with a net-work, will at once recognise the sea-side species ; for, excepting that it is of humbler growth, it scarcely differs from it. There is a variety on the shores of Devonshire, which bears handsome double flowers.

How dark and rich is the green tint of those leaves which, on their long stalks, lie about the root of the sea beet (*Beta maritima*), and how well does the deep green hue contrast with the pale sea-green leaves of the perfoliate yellow wort, and of many other plants of the rock ! Pull up that strong root and taste it, and you will find it sweet as sugar itself, for, like all the beets, this possesses the saccharine principle in great abundance.

The common beet (*Beta vulgaris*) has been extensively planted in France and Belgium, for making sugar. Our sea beet, if little fitted for this, may yet be esteemed a very useful plant, and it is often gathered and sold by the poor who live near the sea, to be boiled as spinach. It is quite as good as the cultivated spinach, and is a most plentiful vegetable, frequently growing all about the cliffs, and even on the sea-beach and salt marshes, in great masses ; many of the leaves in winter assuming a rich purple or crimson hue. The flower is but a tall spike of pale-green blooms, arrayed in little groups of two or three together, up the stem, having a small leaf at the base of each. It appears in August. The leaves of another species of beet, called the cicla (*Beta hortensis*), are among the most common cooked vegetables, used by labourers and small farmers for spinach, in France and Germany ; while the Swiss have a variety which they call *chard*, the succulent leaves of which are used instead of greens, and the leaf stalk and middle vein are stripped and boiled as asparagus. It does not appear that the beet so commonly used as

spinach on the continent is at all superior to that which grows on our cliffs, hanging out there sometimes its long spikes of blossoms two or three feet from the surface ; and Dr. Mackay says, "that the sea beet is often cultivated on the coast of Cork, as well as in other places, as an edible vegetable."

Another plant, whose dark green foliage often contrasts beautifully with the surface of the rocky cliff, or the bank on which it grows, is the common fennel (*Foenicula vulgaris*), and, from its size, it also makes a conspicuous figure on the marshes, or by the road-side, where some salt river is running onwards to the sea. It has a hollow stem, often three feet high, numerous leaves which are divided into soft hair-like segments, and its flowers, which appear in July and August, are large clusters of small yellow blossoms ; its tender stalks were formerly much eaten as salad, and the plant had the old name of finckle. The leaves are still used to form a garnish for dishes, and, cut up and boiled in butter, are served up as a sauce for fish. They have a strong odour, and a sweet flavour. The blanched stalks of a dwarf variety, called finocchio, are eaten with vinegar, oil, and pepper as a salad, and are also sometimes boiled in soups. This variety is marked by a tendency in the stalks to swell to considerable thickness. The thickest part is then earthed up, and acquires a very pleasant flavour and a tender substance. It is a good deal cultivated in Italy. Our common fennel is a very elegant plant, when the wind sways its light branches up and down, and carries afar their sweet scents.

While recounting the plants of our sea rocks and banks which furnish food to the present generation, or which have been prized among the vegetables of olden days, we must not forget the broad-leaved pepperwort (*Lepidium latifolium*), which sometimes grows on the maritime rocks of our shores, or in the salt marshes near them. "When pepper was so dear," says Beckmann, "that to promise a saint, yearly, a pound of it, was considered a liberal bequest ; economical house-

wives seasoned their dishes with the leaves of pepperwort, which on this account is called at present, in England, 'poor man's pepper.'" Poor man's pepper is also the name of another flower, the yarrow, which has the Latin name of *Achillea*, because Achilles is said to have discovered its healing virtues. This, though common enough on our cliffs, has no pretensions to be called a sea-side plant, as it grows everywhere ; though the annalist of the life of Henri de Larochejaquelin, who fell in La Vendée, mentions as a remarkable circumstance, that the flower of Achilles should have sprung up on the grave of the deceased warrior. There are few churchyards or other grassy spots in our land where it could not be found, so that they who wanted it for seasoning their dishes had not far to seek ; but it has less pungency than our pepperwort. The flowers of the latter plant appear in July ; they are small, white, and numerous, and are crowded in leafy clusters.

Then we have a sea radish (*Raphanus maritimus*), and though its roots are too tough to contribute to our salads, yet its white or straw-coloured flowers, veined with purple, are very pretty. The wild celery (*Apium graveolens*), too, is common on our shores, though not peculiar to them. Dr. Hooker, in his *Flora Antarctica*, mentions this and some other of our maritime plants, among those of Tierra del Fuego. "It is always interesting," says this writer, "to meet with familiar objects when they are least expected, and to recognise in the productions of a strange land, the same, or similar to those which we have seen elsewhere. Tierra del Fuego possesses, in common with Britain, the sea pink, or thrift, a primrose so like our *primula farinosa*, that they are scarcely distinguishable, and the wild celery, which, though a rank weed when it grows wild in England, is so mild and wholesome in Fuegia, probably from the absence of the sun's direct rays, that it affords an excellent salad." In our land, death has been caused by eating a quantity of this wild plant which grew on the banks of a salt-water river. The primrose to which

Dr. Hooker refers, is the bird's-eye primrose, a lovely lilac-purple flower of our mountains; but there is a primrose often found blooming on the sandy sea-shores of the Orkney Isles, and which grows too on those of Sutherland, called the Scottish primrose (*Primula Scotica*), a deep bluish purple, so pretty that we lament that it cannot be found on the southern coast of our island.

A curious plant called the red broom-rape (*Orobanche rubra*), belongs to the sea-side flowers, though it is by no means frequent on our English cliffs, abundant as it is on the basaltic rocks of the Hebrides. It grows, too, on the shores of Ireland, and on the magnesian rock of the Lizard Point, Cornwall. It is, like all the broom-rapes, truly parasitic, and this particular species seems to prefer the wild thyme, as the plant on whose roots it shall affix itself, though any one, to look at the stout plant which springs from the lowly flower, would hardly suspect that it was parasitic there.

The broom-rapes are a singular tribe of plants, but all our native species have a general similarity to each other—they have stout succulent stems, usually of a reddish brown hue, with no leaves, but scales on the stem; and this stem, at the base, swells into a knob, which is thickly covered with scales. The flowers are large and dull-looking, often so much so that one might take them for blossoms scorched into brownness by the summer sun; the plant altogether resembling, especially when the flowers are hardly expanded, a head of asparagus. The blossoms are pale brown or yellowish lilac, and several of the species grow on cliffs, because there grow the flowers on which they are parasitic, such as the furze and bed-straw. But besides the red broom-rape there is another peculiar to the shores, called the blue broom-rape (*Orobanche cærulea*), but this does not grow on the rocks, but on the grassy pastures near the sea. All the species are acrid, and so destructive to the plants to which they attach themselves, that their name, made of *orobus*, a vetch, and *ancho*, to strangle, is well merited.

A graceful plant, which, when growing in any quantity, is swept up and down into undulating waves, is the tamarisk, or sea cypress (*Tamarix Gallica*). The latter English name it owes to the shape of its foliage, for it wears no funereal green, but in summer and autumn is of rich verdant hue, and its rich red stems and branches add much to the beauty of the shrub. "This elegant plant," says Gerard Edwards Smith, "forms the ornament of Sandgate, flourishing upon its sandy banks, and flowering there twice within the year. Planted inland, it has many times succeeded. The elegance of its beaded flower-buds, and light feathery blossoms, accompanied by delicate foliage, commends this hardy tempter of the sea-breezes and spray to more general cultivation upon such spots."

TAMARISK.

Yes, there are lovely flowers all around our pathways,

" And when the breeze was in the veil
Of verdure on the Tamarisk,
And seemed for very sport to whisk
The wildered boughs, so lithe and frail.

" I thought how oft the gentle mind
Is fretted sore with cross and care,
And wearied with the restless air,
And bent to snapping in the wind."

Not less beautiful, though very different in appearance, is the sea tree-mallow (*Lavatera arborea*), which grows on maritime, always on insulated rocks, in the south and west of England, and rears its handsome shining mallow-like, purplish-pink flowers, on the coasts

of Teignmouth, Plymouth, some parts of the Isle of Wight, the shores of Anglesey, and on various parts of the Scottish islands and mainland. It is a great ornament to sea-side gardens, even in places where it is not found wild, and grows too in the inland shrubbery or flower-bed, where, if it is allowed to scatter its seeds, it will spring up for many successive years, and frequently attain a large size. Young plants will occasionally survive a winter or two, but when once it has blossomed it perishes.

This beautiful shrub grows on the island of Steep Holmes, in the Severn, a spot remarkable for being the only place of growth of our wild peony.

But there are flowers on the cliff to which our space will not permit us even a notice, for they do not belong peculiarly to the sea-shore.

“ Here and there the bed-straw yellow
Carpet it with golden thread.”

Here and there too,

“ Along this solitary ridge,—
Where smiles, but rare, the blue campanula,
Among the thistles and grey stones that peep
Through the thin herbage—from the highest point
Of elevation o'er the vale below.”

Here we may find among ferns, which grow also in the quiet retreats far away from the sea, one which is peculiar to its shores. The sea spleenwort (*Asplenium marinum*) has a very elegant spray, with which to deck their slope, and to hide the crevices which time has rent among the rocks; while little dark brown cushions of the sea grimmia (*Grimmia maritima*), grow not only far above on the cliffs, but, fearless of the tide spray, gather too at its base. Succulent stems of the pretty yellow stonecrop (*Sedum acre*), the golden chain, as country people call it, mingle in tufts with the species which is much more common on the sea-rock than on the barren inland soil. This is the English stonecrop (*Sedum Anglicum*), with its fleshy egg-shaped leaves, small, thick, and tinged with red, the

beautiful clusters of star-like flowers, having white petals spotted with red and crowned with purple anthers. During June and July our rocky and sandy shores have few flowers more lovely and attractive than this stonecrop.

It is gratifying to the geologist to observe in the structure of our earth, that nearly all its materials are such as afford, by their decomposition, a soil fit for the support of vegetable life. Thus those rocks, formed either wholly or partly of the remains of animals, furnish a soil whereon the free winds may scatter the seeds of shrubs and flowers, whose beauty, and odour, and utility call for the praise of man to his Maker. We would not look carelessly at the flower which his hand has fashioned with skill and beauty. We would not forget the lilies which our blessed Saviour, when he dwelt on earth, pointed out as a lesson for hope and faith. Look only at the structure of that stonecrop, and you may see how God has cared for the lowliest things. It belongs to a class of plants growing in the driest situations ; in some cases, as on the sands of Southern Africa, where not a blade of grass, not a tuft of moss could thrive. Some of these plants grow on naked rocks, on old walls, on sandy plains, exposed to scorching sunbeams by day, and to heavy dews by night. What nourishment can they derive by their roots from a soil so sterile ? Scarcely any ; but myriads of little mouths, in the form of pores, are scattered on those fleshy leaves and stems, and the dew and moisture from the atmosphere enter the plant and are slowly evaporated again from the juicy structure. The common orpine (*Sedum telephium*), or livelong, will grow for some months if only suspended by a string from the ceiling of a room, and never supplied with water. An African species will not only grow under such circumstances, but if its leaves be gathered and laid on the ground, they will send out young shoots from the notches of their margin, every way resembling their parent plants.

CHAPTER III.

FISHES.

How interesting is it to remember, as we watch the magnificent waves, that all that wide-spread ocean is full of life and enjoyment. It is so in great measure with earth and air, but the waters are apparently yet more crowded with living creatures. Room is wanted on the land for the green fields on which the cattle may browse, for wide deserts on which the lion may roam, for forests where birds may sing their songs of praise to their Creator, and for great cities and small hamlets, where man should live to his own good and God's glory. Even on the land, myriads of insects unseen by us are living in the air; plants of the fungus tribe, only to be seen by the microscope, are insinuating themselves everywhere; and living creatures are lurking near every leaf and flower. But in the waters life seems even more abundant. This element abounds, too, in the extremes of minuteness and of bulk, from the monads

which can be seen only by the most powerful microscope, to the whale, which is twenty times larger than our largest terrestrial animal — that great leviathan, whom Job describes as making a path to shine after him, so that one would think the deep to be hoary, and declares to be a king above all the children of pride.

As the air seems given especially to the birds, which are fitted to skim through it, and to find much of their food among its insect multitudes, so the waters are the domain of the fishes, to whom the smaller living creatures form food, while each in its turn feeds on some inferior tribe. Comparatively few have the opportunity of examining the tiniest creatures of the sea, creatures which teem in myriads in but a drop of that briny water ; but all can mark the fishes as they glide near the shore, or in the shallow pools among the rocks, gleaming with tints which may vie with those of the richest plumage of the bird, or with the gauzy gold or silver wing of the gayest insect. The brilliance of every metal, the splendour of every gem, the tints of the sky and the rainbow, are there reflected in stripes, and bands, and angles, and undulations. As the light falls on the surface we see it, now purple, or green, or gold, or silver ; while some fishes are so brilliant in colour, that, like the rare band-fish, they deserve the name of flame and red riband, by which name the people of Nice call it, from its resemblance to those objects as it glides through the waters. Take but one of the scales and place it beneath a microscope, and you may dream that you are looking at a diamond ; while without the aid of the instrument you can see it rivalling the tints which are reflected by the pearl.

“ Full many a gem of purest ray serene
The dark unfathom'd caves of ocean bear ;”

and the words of our poet might refer to the shells, or the pearls lying within them, to the fishes, or sea-jellies, or to the sea-weeds, or the coral structures of beautiful insects, or to those gems of the mine which

lie entombed in the deep with the loved and the lost. The fishes are eminently beautiful, not only in colour, but in grace and symmetry, and are fitted by their structure for their dwellings and purpose in life ; while their scales form a coat of mail, so that the description of the patriarch is very appropriate to many : “ His scales are his pride, shut up together as with a close seal.”

The form of fishes admits of great variety. The most frequent is that of a cylindrical body, pointed at each end, and compressed at the sides, as the mackerel. Some fish, however, are short and round ; others elongated. like the eel, or remarkably compressed, as the dory ; and some, like the skates and flat-fishes, are quite flat. The fins, which are useful to them in gliding through the waters, serve also as characteristics of orders and families. Fish breathe chiefly by means of their gills, and are capable of receiving the influence of oxygen, not only from such portions of atmospheric air as are mixed with the water, but from the atmosphere itself. They are the very opposite of birds, for as those joyous creatures were made for air they inhale a vast amount, and have their whole system full of it ; but the consumption of the oxygen by the fishes is very small, and they have but a low degree of respiration. Such fishes as swim near the bottom of the sea are found to have this so low, that their temperature rarely exceeds by more than two or three degrees that of the water at the surface ; though those which swim nearer the top have a somewhat higher standard of respiration. We wonder not therefore that they are, in comparison with the joyous creatures of air, of a slow and dull nature.

The gill-flap, which assists in covering the gills, is movable, like a fin, independently of the gill-lid. On raising this part we see beneath it the gills, of a beautiful red colour, composed of arches, varying in different species, and fringed with a series of fibrils, set like the plumelets composing the vane of a feather.

When these are minutely examined, they appear covered with a velvet-like membrane, over which myriads of wonderfully minute blood-vessels are spread

HEAD OF THE HERRING. *a*, the gill-lid ; *b*, the gill-flap.

HEAD OF THE HERRING, WITH THE GILL-COVER ENTIRELY REMOVED.

a, the gill fringes, on the posterior margin of the arch ; *b*, the anterior slender spines directed forwards ; *c*, position of the heart.

like a delicate net-work. There are commonly four of these fringed arches: they are movable, and allow the currents of water, driven down by the action of the mouth, to flow freely through them, so as to lave every fibril. The concave margin of each arch is always more or less studded with tooth-like projections; and these in the herring, and some others, are lengthened

into slender spines. Their use appears to be to prevent food taken into the mouth from being forced out through the gills with the streams of water sent through them.*

Every part of the sea has its tribes of fishes; and there are, besides, flying fish, which can sustain themselves for a time in the air; while others, by the strength of the saw-like serrated bony ray on each pectoral fin, are enabled to transport themselves even over the land from one pool to another. Their eyes, which in different species vary somewhat as to situation, are always so placed as to meet especially the conditions of the kind. They are most frequently placed on the flattened side of the head, but in some species are higher up. Their structure, adapted as it is to the dense medium which they inhabit, affords a good power of vision, at moderate distances, and when the breeze scarcely ruffles the waves, and the water is clear, the sight of fish is, as the angler well knows, very acute. Nor is that beautiful creature of the waves destitute of the sense of hearing; and violently loud sounds, as the ringing of bells, or discharge of cannon, have been known so to terrify the shoals of salmon, when making their course to the river where they spend the summer, that they will all turn back and retreat to the sea which they were leaving.

Those deep waters are almost a world of silence, save when the wind makes loud music among the billows. Few of the living creatures have voices to tell even of their own emotions to their fellows; yet there are fishes of our own shores which utter cries when the fisherman captures them, and some of the fishes of other seas give forth loud and continuous sounds. A large fish, called the drum, is described by Dr. Mitchell as making a dull hollow sound when taken out of the water. Various instances of sounds emitted by fishes are recorded by the editor of Cuvier's "*Règne Animal*." Mr. White relates, in his

* Wonders of the Waters, p. 16.

voyages in the seas of China, that being at the mouth of the river Cambodia, his crew and himself were astonished at sounds heard around the bottom of their vessel, which he describes as resembling a mingling of the bass of the organ, the ringing of bells, the guttural cries of a large frog, and the tones of a powerful harp. These voices, from a low murmur, gradually increased, and were heard all over the length of the vessel and the two sides. As the voyagers sailed onward the tones diminished, and were gradually lost in the distance. A man who was their interpreter, said that these sounds were made by fishes, which he described. M. Humboldt heard similar sounds in the South Seas. On February 28, 1803, towards seven in the evening, "the whole crew," says this writer, "were astonished by an extraordinary noise, which resembled that of drums beating in the air." It was at first attributed to the breakers. Speedily it was heard in the vessel, and especially towards the poop. It then seemed like the noise of a boiling, the sound of the air which escapes from a fluid in the state of ebullition. The mariners began to fear then that there might be a leak in the vessel. It was heard unceasingly over every part of the ship, until about nine o'clock in the evening, when it ceased altogether."

Beautiful as fishes are, and useful as they are to man, yet they are not capable of exciting much individual attachment; and were it not that we want them for food, they would mostly swim on to the end of their days free from molestation. We can tame the bird of the air and teach it to love us, sometimes even to imitate our language. Its instincts are usually affectionate, and its ways winning and loveable; and the same may be said of many of the lower animals of the earth. But fishes are usually unimpressible creatures, and, save the cravings of a natural voracity, usually give small evidence of any feeling. But though fishes in general have little attachment, and no language by which to express it, yet instances are recorded both in

ancient and modern times, in which they have exhibited affection towards their young, and have learned to know and obey those who trained them. Pliny and Martial believed that they could not only be taught to recognise their master, but to come at his bidding when he uttered their names. The Chinese, who keep large numbers of gold fishes, call them by a whistle to receive their food. Sir Joseph Banks used to assemble his fish by ringing a bell : and Carew, the historian of Cornwall, brought his grey mullets together by striking two sticks.

Among other instances related by Mr. Yarrell, of the attachment of fishes to each other, he mentions that a person who had kept two small fishes in a glass vessel, gave one of them away : the other refused all food, and showed evident symptoms of unhappiness, till his companion was restored to him.

The food of the greater number of fishes appears to be of an animal nature. They prowl the seas as the beast does the forests, devouring the creatures smaller than themselves, and apparently to a great extent feeding on each other indiscriminately, acting on the principle that might is right. The great Creator, when he filled that vast world of water so full, gave to his creatures there a very voracious appetite, that as numbers are increasing every moment, so too the means of lessening numbers should be in constant operation. A war of extermination is perpetually going on beneath those calm summer waters, or rolling billows ; while an immense number of fishes are devoted to the food of man. So constant are the operations of these two means, that probably few fishes die a natural death. The inhabitants of our sea-coast towns consume many, and send many away inland to remote parts of the country. But there are, in other countries, tribes of men who live wholly on the produce of the waters. Many of our fishermen are engaged in procuring for us the ocean fish, for all are not in season at one period ; and therefore there is at all times of the year food and

employment, arising from the prevalence of one species or another. The wanderer on our shores, as he sees their bronzed faces, is reminded of the time when the Lord of all chose from among the fishermen of Galilee some who should live and die in his service. Peter the warm-hearted apostle, and James and John, were taken, as our Lord said, that they should be fishers of men ; drawing them by cords of love to that Saviour, who loved the humblest, the poorest, and the guiltiest with a love of compassion even unto death. On other shores, not only the net is plied, but the women and children go among the rocks to get the fish which hide in the pools ; and the ship sails its way among the waters of distant regions, bearing men who will attack and capture shoals of fish far out in the ocean. In all ages, fish have been a great source of food ; and so often are they mentioned in the Scriptures, that the very sight of a fishing-boat or net often serves to recal some incident of Holy Writ. The ancient Romans, in their latter days of luxury, expended immense sums of money on such fishes as their epicures deemed the most delicious : digging ponds for preserves in which they might keep those of the sea or of the fresh waters. One of the fishes of our seas, the *maigre*, was in great request among epicures ; and as on account of its large size it was always sold in pieces, the fishermen of Rome were in the habit of presenting the head, which was considered the finest part, as a sort of tribute to their local magistrates, who acted for a time as the conservators of the city.

The knowledge of the habits of fish, as well as of other natural objects, was formerly very limited, and the ancients appear to have known about one hundred and fifty species, which composed nearly all the fish of the Mediterranean fit for eating. In the present day, there are above eight thousand living species of fish enumerated, while the fossil remains have been identified of upwards of one thousand and five hundred. Numerous tribes of this class of animated beings are found in the oldest fossiliferous strata, and

the same type of organization, variously modified, has continued through the whole series of subsequent deposits, up to the present time. Every geological formation has its groups of fishes ; and all the fossil fishes, anterior to the chalk, are of species no longer existing in our seas.

Little can be known of the habits of these animals, compared with what we can learn of the inhabitants of earth or air. It is ascertained, however, that some are solitary ; some live more or less in companionship with numbers ; some remain nearly in one place ; others traverse the seas to great distances. Some species prefer pools or holes in the sand or mud, and many migrate periodically to far distant seas or to rivers ; some tribes advancing at regular seasons from the polar and temperate latitudes towards the waters of the hotter regions, and some arriving from the equatorial seas to those of the temperate zones. We know not at what depth the ocean is inhabited by various tribes—nor, indeed, is it yet ascertained at what depth life may exist at all. Reasoning from the analogy of animals similarly constituted, and which belong to our upper world, we infer that life under a continually increasing pressure must at a given point reach the limit where eternal darkness would reign, did not phosphorescent animals make that world luminous and enable the fish to seize its prey or avoid the dangers of the rocks below. Hitherto philosophers have believed that in a lower depth no living creatures can exist, since no power of gravity would draw the animal matter downwards. The natural residence of fishes has been believed to be in all probability not far below one hundred fathoms from the surface. No nets, say the editors of the “*Règne Animal*,” exceeding half that depth, are anywhere in use ; and the fish which are sometimes caught at fifty fathoms below the surface, are in general of species provided with eyes of such magnitude as to indicate the probability that their enlarged organs of sight are necessary in a medium so dense and remote from the light.

However this may be as to the tribe of fish, the observations made by Captain Sir James Ross in the Antarctic Expedition, prove that coral insects, shell-fish, and other marine animals, live in a depth far below that which has long been assigned as their utmost limit. Referring to the contents of the dredge which was put over in two hundred and seventy fathoms of water, and found to contain various things, this navigator says :—"But the most remarkable circumstance was drawing up from so great a depth beautiful specimens of living coral, which naturalists and geologists have hitherto concurred in believing unable to work beyond the pressure of a few fathoms below the surface. Corallines, sea mats, and a variety of marine invertebrate animals, also came up in the net, showing an abundance and great variety of animal life.

In another part of the work, Captain Ross says :—"Although, contrary to the general belief of naturalists, I have no doubt that, from however great a depth we may be able to bring up the mud and stones of the bed of ocean, we shall find them teeming with animal life ; the extreme pressure of the greatest depth does not appear to affect these creatures. Hitherto we have not been able to determine beyond a thousand fathoms, but from that depth several shell-fish have been brought up with the mud." Alluding to some marine invertebrate animals, he says that it will be difficult to get naturalists and philosophers to believe that these fragile creatures could possibly exist at the depth of nearly two thousand fathoms below the surface ; though he asks the question : As we know that they can bear the pressure of one thousand fathoms, why may they not bear that of two thousand ?

A few only of those fishes which are most frequent on our shores, or are any way remarkable, can be mentioned in this little book. One of them, the common mackerel (*Scomber scombrus*), is among the most beautiful of fishes, and is so well known that we need not attempt to describe its silvery surface, or its fine green

stripes, varied with rich blue colours. Next to the herring, it contributes most to the lucrative and valuable fisheries of our seas. It appears to inhabit all the seas of Europe, and, like many other fishes, it comes, when in full season and most fitted for food, into the shallower waters to deposit its spawn, guided there by the hand of Him who thus ordains that it shall be brought at the appointed time within reach of our fishermen. Swimming along near the coast in immense shoals, the mackerel becomes an easy prey; and while millions are caught, there are yet left untold numbers, to furnish food for future seasons.

There is not a month in the year in which, at some part or other of our coast, the mackerel may not be taken; but the summer is the season when it is most abundant, appearing on some part of our shores in great numbers in March, but offering the "great harvest" to the fishermen in April and May. It is a most voracious animal, and seems to live chiefly on the small fry of other fishes.

Every one knows the flavour of the mackerel, and eaten, as it often is, with fennel or gooseberry sauce, it is an article of luxury, as well as a supply to the necessitous. So plentiful is the fish, that the poor of our fishing-towns have indeed reason to thank God for it. Mr. Yarrell mentions that in 1808 this fish abounded to such a degree on the shores of Dover, that sixty were sold for a shilling; and that in the June of the same year, at Brighton, the shoal of mackerel was so great, that one of the boats had the meshes of her nets so completely filled with them, that it was impossible to bring them in; and the poor fishermen had to see their boat and its contents sink into the waves. The name of the mackerel is apparently derived from the Latin *macularius*, in allusion to its chequered appearance; and it is known in most European countries by names significant of this peculiarity. That common fish on all our shores, called the horse mackerel, is very inferior in flavour to this species. A grand resource

for the sea birds in summer, is the young fry of the mackerel, and we may watch them hovering in the waves, and pouncing with great skill upon them, while the little fish, termed the mackerel midge (*Motella glauca*), is as much prized as the young fish of the

MACKEREL MIDGE.

former species. This is one of the smallest of fishes, (the engraving representing its natural size,) and on some shores is, during May, very abundant. It is about an inch and a quarter long, bluish green on the upper part of its body, and of silvery hue beneath. It is a beautiful little fish, and if we put our hand into the water to dash out a handful of these tiny creatures, they look like a shower of glittering silver as we scatter them in again. We must not, however, keep them long out of the sea, for unless they are returned the next minute, they will die. So crowded are the waters near our shore, during May, with these little fish, that sometimes there seems scarcely room to put a thin piece of paper between them. The very surface is darkened by their numbers. They have no room here for the gambols in which they delight, but if we can see them further out at sea, or watch them in the rocky pool, or on the very crest of the wave, we shall see that even the dull fishes, as we think them, have their times and places for making merry, and that a bright eye too may be found in some of the race. When a sudden storm

arises, and the surf is thrown by the wind into the boats, these little fishes are often brought with it, for they are so small and light, that they are the sport of the waves. They appear to live in deep water until the season for swarming to our shores arrives. The author has heard fishermen call the fish the mid, and smid. It does not seem to be used as food, probably on account of its small size; yet a little fish, scarcely larger than this, and called at Naples the bloodless fish, is a very common article of diet there, numbers of them being fried together, and forming a mass when cooked.

Not inferior to the mackerel in value is the herring (*Clupea harengus*), for although it is not, like that fish, a delicacy for the rich, yet it furnishes by its numbers a most important article of food to the poor, and is valuable to them, not only in its fresh, but in its dried state.

The herring fishery is the means of employment of many hardy men, men from whose ranks some of our best and bravest seamen are taken; for the fisherman has learned from his very boyhood to brave the dangers of the sea, and to remember the places of rocks and shallows, and the direction of tides and currents. The herring is a beautiful silvery fish when fresh taken from the water, and as it is turned in different directions, shows the green and blue tints so prevalent among our fishes, reflecting besides other hues in a less degree. It inhabits the deep waters all round our island, coming in to the shores in shoals to deposit its spawn, and generally leaving them afterwards, although a few stray herrings may be fished up at any season. The wonderful accounts given by older writers, of the regular migration of this fish in immense numbers from the northern seas, is no longer believed; and Mr. Yarrell says that the herring has never been seen, so far as he is aware, at all in the Arctic seas. It seems to be a very uncertain fish, being sometimes most abundant on various coasts, and differing both as to numbers and to its period of arrival. "Ordinary philo-

sophy," says Dr. M'Culloch, "is never satisfied unless it can find a solution for everything; and is satisfied, for this reason, with imaginary ones. Thus in Long Island, one of the Hebrides, it was asserted that the fish had been driven away by the manufacture of kelp; some imaginary coincidence having been found between their disappearance and the establishment of that business. But the kelp fires did not drive them away from other shores, which they frequent and abandon indifferently, without regard to this work. It has been a still more favourite and popular fancy, that they were driven away by the firing of guns; and hence this is not allowed during the fishing season. A gun has scarcely been fired in the western islands, or on the west coast, since the days of Cromwell; yet they have changed their places many times in the interval. In a similar manner, and with equal truth, it was said that they had been driven from the Baltic by the battle of Copenhagen. It is amusing to see how old theories are revived. This is a very ancient Highland hypothesis, with the necessary modification. Before the days of guns and gunpowder, the Highlanders held that they quitted coasts where blood had been shed; and thus ancient philosophy is renovated. Steamboats are now supposed to be the culprits, since a reason must be found. To prove their effect, Loch Fyne, visited by a steamboat daily, is now their favourite haunt, and they have deserted other lochs where steamboats have never yet smoked." The herring is known to feed upon shrimps, small jelly fish, and the young, not only of other fish, but of its own species. It swarms among the Orkney and Shetland Isles all the summer long; but on our shores the herrings are most plentiful by the end of August, and for a month or two later. They are beautifully phosphorescent.

The herrings are an invaluable resource to the poor of the Scottish islands, nor are they the only fish on which the hardy inhabitants subsist.

The coal-fish (*Merlangus carbonarius*) swarms on

the shores of the Orkneys, and forms the grand support during summer and autumn to the poor. Dr. Neill, during his tour of the islands of Orkney and Shetland, saw on almost every projecting rock an old man, or one or two lads, holding in each hand a wand or fishing-rod, and catching the young coal-fish as fast as they could bait their hooks. It is better food when young than when full grown. They call it by several names, as sillock, piltock, cooth, and grey lord ; and Mr. Yarrell says this fish has more provincial names than any other. It dwells in the seas more or less all round our shores. The ling (*Lota molva*), though not so generally distributed, is scarcely less valuable in the western islands and the Orkneys than the coal-fish ; and, cut open, salted, and dried in the sun, forms an article of commerce, which was in former days more profitable than now. The air bladders, or, as they are commonly called, the sounds of this fish are also pickled, and form an article of food ; and the roes are salted and eaten. The oil taken from the liver has been found, like the cod liver oil, a useful medicine in cases of debility and emaciation ; and by the light of a lamp supplied with it, the Scottish islander sits by his fireside, mending his nets or reading his Bible. The fisheries of the ling occur early in the summer, and the prayer of the poor Shetlander, as he returns from them to his work in the harvest field, is, " God open the mouth of the gray fish (the sillocks), and haud (hold) his hand about the corn," that is, preserve the grain from tempests.

Another important British fishery is that of the pilchard, or, as the Scotch call it, the gipsey. herring (*Clupea pilchardus*) ; but the abundance of this fish is confined to different parts of the coast ; a few pilchards only rarely visiting any but the south-western shores of England. Cornwall is the most celebrated part of our country for the pilchard fisheries, and on some parts of the Irish coast the fishing stations are no less important. An immense number of these fish are sometimes taken ; an instance is recorded in

which ten thousand hogshheads have been caught in one port on a single day : “thus,” says Mr. Yarrell, “providing the enormous multitude of twenty-five millions of living creatures, drawn at once from the ocean for human sustenance.”

The voracity of the pilchard is very great. Mr. Couch says that he has found their stomachs crammed, each with thousands of a minute species of shrimp, not larger than a flea. The number of these minute creatures must be enormous, if, as Mr. Couch says, all the pilchards were as well fed as the one he examined ; for so numerous are the fishes themselves, that this valuable writer describes an assemblage of them, when near the coast, as assuming the arrangement of a mighty army, with its wings stretching parallel to the land. “There are,” he says, “three stations assumed by this great body, that have their separate influence on the success of the fishery. One is to the eastward of the Lizard, the most eastern extremity reaching to the Start Point in Devonshire, beyond which no fishery is carried on, except that rarely it extends to Dartmouth ; a second station is included between the Lizard and Land’s End, and the third is on the north coast of the county. It is not an uncommon thing for one of these districts to be full of pilchards, while in the others none are to be seen. The length of this fish is nine or ten inches, and in form it somewhat resembles the herring.

The pilchard fishery, though interesting to the Cornish men, and affording employment to a large number of people, is not very lucrative. Probably, in this respect, none are equal to those of the salmon in value ; but as this fish spends a great part of its life in rivers, and is little seen by visitors to the sea, we must not dwell upon it. That common little fish the sprat (*Clupea sprattus*) is sure to be seen by those who are resident near our shores late in the autumn, or during winter. We have often thought, when seeing a boat land with its cargo of sprats, that those who

saw these fish only lying on the fishmonger's stall had little idea of their beauty. Glittering in the net in many a pale and delicate tint, they look like a mass of silver on which the rainbow is faintly reflected. Cloudy weather is the time for the fishermen, and after a few days of this kind we find in our walks on the pier, long rows of network, hung there to dry. Fine nets of several yards long are made by the fisherman in the winter's evening, or by his wife or children, for the purpose of catching these fish. This is a very useful species to the poor of our sea-coast towns, nor is an occasional dish of sprats unwelcome to the rich, while the fish pickled in brine is often sold in our inland cities, and is very good in flavour. Sprats, too, are laid on the fields for manure, and most of those who have spent some time near the sea, have seen them borne away in carts and waggons for this purpose, or perhaps had their country ramble spoiled by their odour on the land while they were in the process of decomposition.

But as we watch the contents of the fishing-boats, we are often delighted by the beauty of some of the mullets contained in the trawling-net. The striped red mullet (*Mullus surmuletus*) is abundant on our southern coasts, from Cornwall to Sussex, and is often brought up in the mackerel net. It is extremely beautiful, exhibiting every tint of orange, red, and yellow, in most vivid brilliancy; though, to see its hues in perfection, we should observe it during the summer, for though caught at all seasons it is not always equally bright. In some years it is much more plentiful on our shores than in others, for these fish change their places, and, swimming miles away from their old haunts, are sometimes long undiscovered by the fishermen. The mullets were much prized by the Romans, and their generic name is said to refer to the scarlet colour of the sandal or shoe worn by the Roman consuls, and afterwards by the emperors. They were also consecrated to Diana, the goddess of hunting; because they were believed in those days to pursue and attack large and

dangerous fish. The red mullet (*Mullus barbatus*) is not only rare on our shores, but is also a much less abundant fish in all seas than the striped variety, and excels it not only in flavour, but in richness of colour. It is connected with such records of cruelty and folly, that one blushes for human beings as we peruse the details; and we are reminded how much the refinement of arts and of science can exist, while their cultivators have hearts as hard as those of the untaught savage. Poetry, and painting, and sculpture had shed their influence over the ancients; but the mild light of revelation had not yet dawned upon them; and thus their land, with all its advantages, was but as the dark places of the earth, which are full of the habitations of cruelty. The beautiful mullet was brought before the Roman to die; and as the rich epicures sat around the table, their luxurious repast acquired a new zest, as they looked on the fish, and saw its bright red colours gradually passing into various shades of purple, violet, bluish, and white; till one convulsive throb of agony put an end to its pain. More cruel practices still were used towards these poor fish; and the luxurious and wealthy Roman delighted in exhibiting his ponds or vivaria containing the mullets, which afforded undoubted evidence of the wealth of their owner, since, according to Martial, a fish of four pounds and a half cost a ruinous price; and mullets of extreme size, one weighing six pounds, are recorded to have been purchased at a sum equal to 48*l.*, while a still larger fish was paid for at the value of 64*l.*

The food of the mullet consists of the soft crustaceous and molluscous animals, and cirrhi are arranged around the mouth of this, as of some other fish. Mr. Yarrell, who dissected them, remarks: "They are, I have no doubt, delicate organs of touch, by which all the species provided with them are enabled to ascertain, to a certain extent, the qualities of the various substances with which they are brought in contact; and are analogous in function to the beak, with its distribution

of nerves, among certain swimming and wading birds which probe for food beyond their sight ; and may be considered another instance among the many beautiful provisions of nature, by which, in the case of fishes finding at great depths their light deficient, compensation is made for consequent imperfect vision.

The grey mullet is a pretty little fish, with its rich blue tints ; and several species of gurnard are extremely beautiful, and are besides useful and delicate articles of food. October is their especial season, and to see them in full beauty, we should look at them when just taken from the water. The red gurnard (*Trigla cuculus*) is the most frequent of the nine British species, and though chiefly found in deep water, yet it sometimes frequents the rocky pools, which we find at low tide full of beautiful and living creatures, and adorned with our loveliest sea plants. The red hue of the upper portion of the fish seems to mingle imperceptibly with the silver whiteness which distinguishes the lower portion, and which glitters in the sunshine. Like several of our fishes, it utters a sound when taken out of the sea ; and this is so similar to that of the bird of our summer woods, that the fish is familiarly named the cuckoo gurnard ; while the grey gurnard (*Trigla gurnardus*), a common fish, especially on the southern shores of England, and very abundant on the west of Scotland, is on the latter shore called crooner, because of the dull croak or croon which is its lament for its native sea.

But without waiting till the fishing-boats have brought their stores for our inspection, we may wander away to the tide-pools, and find among the rocks, covered with their dark sprays of olive-green, or fringed with grass-green leaves and ribands, some of our common fishes. What a scene of life and animation is here ! Here are crabs running along by thousands ; star-fishes twisting their limbs in strange contortions ; shrimps darting by as if every motion were one of gladness ; limpets, and barnacles, and

periwinkles holding the rock tightly; and mussels moored to it safely by their silken threads; and red-looking worm-like creatures with many feet gliding in the clear water, and feather-like plumes emerging from shells, and bending there most gracefully. Many a pretty fish seems hiding from our view among the entangling weeds; and then, perchance, that ill-looking little fish with its long wide head, the father lasher, or long-spined cottus (*Cottus bubalis*), looks up at us with such unamiable aspect, as if it only wanted strength to use its threatening spiny head as a weapon of warfare against us, and to punish us for intruding into its domain. There are few parts of our coast where it may not be seen during the greater part of the year, and

THE FATHER LASHER.

if we only touch it with a finger, it distends its gill covers, and setting out its numerous spines, as if, like the Scottish thistle, it would claim the motto, "*Nemo me impunè lacessit*," which, Baxter says, means in plain Scotch, "Ye maunt meddle wi' me." This bold and voracious fish has tints of a beautifully vivid red, green,

and brown. It is not eaten in our country ; but in Greenland, where it is much larger, it is the chief food of many people, and the soup made of it is described by travellers as good in flavour. The Norwegians also extract oil from the liver of this fish. The Scotch call it the lucky proach. It is on our shores often termed toad-fish, and well named, for its large head would remind one of a toad. Its name of father lasher is probably given because, in its active darting progress, it strikes the water with its broad tail fin. Several of these fish may often be found hid beneath a bed of sea-weeds.

Crantz, in his History of Greenland, says of it, "Next to augmarsett (capelin), the Greenlanders eat most of the ulkes, what we call toad-fish, or in Newfoundland, scolpings ; it lives all the year round in the little and large bays near the land, yet in deep water. It is caught, especially in winter, by poor women and children, with a line of whalebone or bird's feathers, thirty or forty fathoms long. At the end, a blue longish stone is fastened, to sink it. Instead of a bait, they put on the hook a white bone, a glass bead, or a bit of red cloth. The fish is commonly a foot long, and full of bones. The skin is quite smooth, and spotted with yellow, green, red, and black spots, like a lizard. It has a very large thick round head, and a wide mouth, and its fins, especially on its back, are broad and prickly. Though this fish hath a very ugly look, yet its flesh and the soup that is made of it taste extremely agreeable, and are very wholesome, and the sick may eat of them."

The short-spined cottus, or sea scorpion (*Cottus scorpius*), a fish about four or five inches long, often lurks among the sea-weeds, or swims into our harbours. Like the father lasher, it is so common all round our coasts, as that every haul of the dredge will bring up one or the other, though seldom both, for they do not frequent the same spots. The body of this fish is mottled with dark purple, brown, or reddish brown :

the under part being white, and sometimes it is of bright scarlet.

Some of these pools are at times half filled with little fishes left there by the tide. Several species of the wrasse glide about among the rocks, glittering in red, orange, and green; and here the gilt head or golden maid (*Crenilabrus melops*), sometimes finds its way into the crab creels, which the fisherman places there; eating the shrimps and little crabs, so numerous among the sea plants, and giving a decided preference to such rocks as are only reached at unusually high tides, and thus only moistened in general by the spray. And now as we look about among the waters and the rocks, a little lower down, we may chance to see the spotted gunnel, or butterfish (*Murcenoides guttata*), or the swordick, as it is often called from its sword-like shape. But the very sound of our footsteps, or the sight of our shadow, will send it to hide under the stones or weeds, and if with some difficulty we succeed in capturing it, it is no easy matter to hold it for a minute; for the slimy substance upon it, from which it takes its name of butterfish, as well as its rapid movements, facilitate its escape. It is generally about five or six inches long. It is only used in our country for bait, but in Greenland it is dried and eaten.

It is in these pools also that we shall find a little fish, well known to all who observe the living creatures either of sea or river, abounding as it does both in our salt and fresh waters. Many a time have we, by means of a gauze net tied to the end of a stick, caught the stickleback or barnstickle, that tiniest of British fishes, and kept it for a while in a vase of water. Most persons accustomed to our sea-side have seen the rough-tailed stickleback (*Gasterosteus trachurus*), hiding among stones or weeds, or darting out and pursuing its prey, devouring it with voracity, and having nothing to fear, even from fishes much larger than itself, because it is so well defended by its spines. We can readily believe the assertion of Henry Backer, that the sticklebacks

leap vertically out of the water to the height of more than a foot ; and that in an oblique direction they will make springs to a greater distance, where stones or other obstacles tempt them to try their agility and strength. They are most fierce little creatures, and a bite from one of them is by no means to be coveted by the wanderer by the sea ; while to its companions in the pool it often proves fatal. A writer in Loudon's Magazine of Natural History gives an interesting account of some of these sticklebacks which he had placed in a large vessel of water. "When," says this writer, "a few are first turned in, they swim about in a shoal, apparently exploring their new habitation. Suddenly one will take possession of a corner of the tub, or, as it will sometimes happen, of the bottom, and will instantly commence an attack upon his companions ; and if any one of them ventures to oppose his sway, a regular and most furious battle ensues, the two combatants swim round and round with the greatest rapidity, biting and endeavouring to pierce each other with their spines, which on these occasions are projected. I have witnessed a battle of this sort, which lasted several minutes before either gave way ; and when one does submit, imagination can hardly conceive the vindictive fury of the conqueror, who, in the most persevering and unrelenting way, chases his rival from one part of the tub to another, until fairly exhausted with fatigue. They also use their lateral spines with such fatal effect, that, incredible as it may appear, I have seen one during a battle absolutely rip his opponent quite open, so that he sank to the bottom and died. I have occasionally known three or four parts of the tub taken possession of by as many other little tyrants, who guard their territories with the strictest vigilance, and the slightest invasion immediately brings on a battle. When a fish is conquered it loses all its gay colours, as if these depended on the health and spirits of the wearer, though previously to death it regains them, but with less clearness and distinction than when proud and happy."

Our stickleback is little used as food, but, about Dantzic, oil has been extracted from these fish ; and they were, in former days, caught by myriads in the river Cam, for the purposes of manure. They are included in the list of fishes of every country of Europe.

Another little fish, which is very common on all parts of our coast, though not haunting our pools, is the freckled or spotted goby (*Gobius minutus*). It is seldom more than three inches long, has a large head, and is of a pale yellowish white, freckled and barred with brown. It very often comes up with the crabs in the shrimping nets, for it lurks among the sands, sometimes completely hiding itself in them. Both this and some others of the goby tribe are said to deceive their prey by approaching them slowly, while their bodies are so covered with the sand and mud which adheres to their slimy surface, that they are not discovered to be enemies by the smaller marine animals on which they feed. They, in their turn, supply a considerable source of food to the larger fishes and sea birds.

It is in the sandy bay that the less frequent fish, the gemmeous dragonet, or yellow skulpin (*Callionymus lyra*), is to be found. It has a singular appearance, being shaped like what one would fancy a dragon to be, and remarkable also for its colours, which glitter like rubies and emeralds and diamonds, the most conspicuous tint being the yellow. It is, in the north, called gowdie, from *gowd*, gold.

One of the most remarkably formed British fishes is not unfrequent on some coasts, though not universally distributed. This is the fishing frog, or angler (*Lophius piscatorius*), that has many ill names among the fishermen, which we would not repeat. It is generally about three feet long, and really resembles a frog in its tadpole condition. It well merits its name of angler, for it has long thread-like appendages attached to the head, which serve as its fishing lines. When lying in the mud or sand, it, by means of its fins, stirs up this

so as to becloud the water, and while thus concealed, it raises its long filaments, and moves them about. The lesser fishes, probably mistaking them for small worms

THE FISHING FROG, OR ANGLER.

fitted for their food, advance towards it, and are entangled and captured. When in a net with other fishes, this voracious angler seems nothing daunted at its own danger ; but immediately swallows some of its companions in misfortune, which are afterwards taken alive from its stomach, so that though its own flesh is not eaten, it may furnish food to man by this means.

Little intelligence as fishes in general possess, we find them endowed with instincts fitted to the requirements of their condition ; and when food cannot be provided easily, several, like the fishing frog, have recourse to artifices. Thus the lesser weever, sometimes called the otter pike, or sting fish (*Trachinus vipera*), very ingeniously provides its own meal. This fish, which is common on all the sandy shores of Scotland, and frequently caught by fishers and shrimpers, feeds on small crustaceans and insects, and in order to entrap them, it hides itself in loose sand at the base of the water, leaving

only its head above, and here its open mouth serves as a trap, into which the unheeding animals may glide.

This beautiful and brilliant fish was anciently called the sea-dragon, for the same reason that we, in modern times, call it the sting-fish. It has great power for mischief, and can inflict a severe wound with its fin spines, which will cause considerable inflammation. Pennant remarks, that the fish knows how to dart its blows with as much judgment as a fighting cock. The larger species, called the great weever, or sea-cat (*Trachinus draco*), is also termed sting-bull by the fishermen of some of our coasts. It is less frequent than the smaller kind, living in very deep water, but its sting is no less severe; and so injurious is it that the fishermen immediately deprive it of its spiny fin, before it has power to harm any one. The laws of France and Spain both enjoin this practice on their fishermen. Unlovely as are its actions, however, it is eagerly seized, for its flesh is a great delicacy. It is about twelve inches in length.

THE WOLF-FISH.

The wolf-fish (*Anarrhicas lupus*) is another fish marked by a savage character, which may easily be traced in its physiognomy. It is confined to the

northern parts of our island, but is not unfrequent there ; and though its flesh is well flavoured, its appearance is so unprepossessing, that few like to eat it. The people of the Orkney Isles call it swine-fish, but its name of wolf is very suitable to its voracious and fierce habits ; while it possesses teeth so formidable that it can crush the hardest substance. It fights its enemy with desperate fury. The fisherman's net stands no chance from its wild rage, and his hand receives a severe wound if extended near it, while it battles with the large fishes, and devours the smaller ones, making little account of a whole host of crabs and lobsters, which may be with it in the meshes.

There is a singular looking fish called the gar-fish, or sea-pike (*Belone vulgaris*), common on the coasts of Cornwall, Kent, Sussex, and some other counties. It is very slender, and about twenty-four inches long, with very long mandibles, much like the beak of a bird. Its vivacity is so great that Mr. Couch says it will spring out of its element, or for a long time play around a floating straw, leaping over it again and again. As it is often taken in the mackerel season, our fishermen call it the mackerel guide : it has, besides, the familiar names of horn-fish, long-nose, and sea-needle ; and in Kent is well known by the name of gorebill. Its flesh is not very well flavoured, but its bones are of a most beautiful grass-green colour.

The common sea-bream (*Pagellus centrodontus*) is a well-known fish on our southern shores, and ladies living in our sea-coast towns make much use of its scales for fancy-work. Pearly white roses and other flowers arrayed on coloured velvet, and formed of these scales, are exceedingly ornamental and well adapted for bags, fire-screens, and various other purposes. The bream is a yellowish red fish, and it is the young of this species which are so well known as chads, and which occur so frequently in our rocky pools. Neither this, nor the equally common black sea-bream, is much valued as food.

The dory, or john dory as it is commonly called, the *zeus faber* of the naturalist, is not one of our common fishes, though often found, even in profusion, on the shores of Cornwall or Devon. Yet this flat oval fish is

THE JOHN DORY.

well known, because many are brought to London from Plymouth and other parts of the Devonshire coast. It is remarkable for its high repute among epicures, and for the absurd legends which are attached to it. The large spot which is seen on each side of the fish, is supposed to have been originated by St. Christopher, who left the marks of his fingers on its body. Hence the Greeks call it St. Christopher's fish. In France, however, it is known as *poisson St. Pierre*, and in that country the tradition relates that this dory was the fish taken up by the apostle Peter, with the money in its mouth for the payment of the tribute. It is also commonly known in France as the *forgeron*, or blacksmith, because of its somewhat smoky appearance; but its traditionary names are very general, for the Italians

call it *il janitore*, or gatekeeper, in allusion to the unscriptural notion of the keys which were supposed to be held by the apostle Peter. The flesh of the fish is excellent, and its name of John, though of uncertain origin, is said to have been given by Quin, who has the not very enviable repute of being one of the best judges in matters of eating and drinking which some centuries have produced.

Many a man who is waiting for full employment in the fishing work, goes down and spends some hours in catching the fish with a line from some pier head or jutting rock. The atherine, or sand smelt (*Atherina presbyter*), is often taken thus, and is a delicate little fish of silvery hue, speckled with black. Sometimes the visitor at the sea-side, who is fond of angling, sits patiently on the rocks of our southern shores, dreaming away in the sunshine, while from time to time he takes from his hook this sand smelt, and is rewarded for his patience by carrying away a basket full of them.

The grey mullet (*Mugil capito*) may be seen near the margin of the shore, revelling in warm sunny weather, and getting into water so shallow that we can almost take it with the hand. Mr. Couch observes of this species: "Carew, the Cornish historian, had a pond of salt water in which these fish were kept; and he says that having been accustomed to feed them at a certain place every evening, they became so tame, that a noise like that of chopping wood could certainly cause them to assemble. The intelligence which this argues, may be also inferred from the skill and vigilance which this fish displays in avoiding danger, more especially in effecting its escape in circumstances of great peril. When enclosed within a ground-scan, or sweep-net, as soon as the danger is seen, and before the limits of its range are straitened, and when even the end of the net might be passed, it is its common habit to prefer the shorter course, and throw itself over the head-line, and so escape: and when one of the company passes, all immediately follow."

Several fishes, as the cod or keeling, the haddock, the whiting, and the sole, contribute very largely to the portion of food yielded by the waters. Those common and plentiful flat species, the plaice (*Platessa vulgaris*), the flounder (*Platessa flesus*), and the dab (*Platessa limanda*), are also deservedly valued for their abundance, and good qualities as food. They cannot be called handsome fishes, but the flat form of these, and other species, admirably adapts them for inhabiting low places; and as they are not furnished, like most of their race, with air bladders, with which to buoy themselves up, their destined place is near the ground. Here on the sandy or muddy shore, the plaice hides horizontally among the loose soil, with the head slightly elevated above it. The eyes being both on the upper surface, the fish has a wide range of view, in which to secure its prey. Mr. Yarrell notices one of those adaptations, so observable whenever we look into nature. Referring to the plaice, he says: "Light, one great cause of colour, strikes on the upper surface only; the under surface, like that of most other fishes, remains perfectly colourless. Having little or no means of defence, had their colour been placed above the lateral line on each side, in whatever position they moved, their piebald appearance would have rendered them conspicuous to all their enemies." The flounder is sometimes called flook, or mayock fleuke; while the Edinburgh fishermen call it the bull.

The turbot (*Rhombus maximus*) is common on the sand-banks, at the east of our island, and considerable numbers are taken at various parts of our coast. Though voracious it is somewhat dainty, and will not touch a bait that is not quite fresh, being best attracted by such little fish as the sea-scorpion and father lasher. The brill (*Rhombus vulgaris*) is often the companion of the turbot in sandy places, residing however not alone in the deep waters, but coming into more shallow parts. It is abundant on the sandy shores.

There are several species called sucking-fishes, from

their power of attaching themselves firmly to the bottoms of vessels, or to their companions in the sea. This they do by means of a flattened adhesive disk on the top of the head; but whether they thus attach themselves for the purpose of the shelter or protection thus afforded, or whether it is in order that they may be carried onwards without any effort of their own, is not apparent. The common remora (*Echeneis remora*) is the species known to the ancients, and was the subject of

HEAD OF THE SUCKER-FISH.

many wild fancies in other times. It has been found at Swansea, adhering to a cod, but is very rare on our shores. This little fish was once believed to have the power of stopping the sailing of the largest vessel, by fastening itself upon it.

“The sucking-fish beneath, with secret chains
Clung to the keel, the swiftest ship detains;
Such sudden force the floating captive binds,
Though beat by waves and urged by driving winds.”

None of the sucking-fishes are among those universally distributed on the shores; but some, as the lump sucker (*Cyclopterus lumpus*), a most grotesque looking figure of a fish, is taken on various parts of our coasts, especially on the north of our island. It is often exhibited in the fishmongers' shops in London, and is looked at with wonder, because of the singular and

thick form, and the rich shades of blue, purple, and orange which appear on its surface. It seems to be common in the Orkneys, and is there called cock-paidle. Pennant says of this fish, that on placing one into a pail of water, it fixed itself so firmly to the bottom, that in taking it by the tail, the whole pail was lifted up by that means without removing the fish from its hold, though it contained some gallons.

If we walk along the upper part of the beach where the waves have left long lines of the refuse of the deep, and where sea-weed, corallines, and shells engage our attention, we are almost sure to find those little things called fairy purses, or mermaids' purses, lying in the heap. There are two kinds of these. The prettiest are of a pale horn colour, semi-transparent, having at their four corners a tendril not quite so thick as that on a grape-vine, but usually much larger, and with more numerous curls. These tendrils cling about pieces of wood or the stems of large sea-weeds, or creep over stones, and hold fast to them. They are the egg cases of the small spotted dog-fish (*Scillium canicula*), a fish sometimes called on our coast the robin huss. It is a species of shark; and though not having the strength of those formidable monsters of tropical seas, yet it has the true spirit of a shark in its voracity and fierceness. The fishermen dislike it exceedingly, and give to it many a familiar name expressive of their disgust; for it not only devours large numbers of the smaller fishes, but tears their nets by its determined fighting, often coming up in numbers only to be thrown away.

As we might easily infer from the numbers of these purses lying on our shores, this robin huss is one of the most common fishes, and still more numerous are the egg cases deposited by the long-nosed skate, or ray (*Raia mucronata*). During winter and spring we cannot take a walk by the shore without seeing them. They are oblong horny cases of a dark olive-green, and having at each corner a projecting piece which looks

like a handle ; they resemble in form that very common object, a butcher's tray. Sometimes they are inflated, either by being filled with air or sea-water, or by enclosing the young fish, but at others are empty and flattened. Ladies frequently cut this case into narrow strips, and putting them awhile in warm water, use them as shields to the forefinger when at needlework, and they answer the purpose very well, as they clasp tightly round the finger. Sometimes the lover of seaweeds finds some very pretty ones attached to these purses, making a little silky fringe at both ends, and various beautiful little corallines cluster on and creep over them. When the young fish is matured, it glides through the opening at either end, and is at home in the world of waters. This long-nosed skate, like some other species of the genus, is a good fish for the table, and when taken by the hook shakes itself with so much violence that it needs care to secure it. All the skates are very voracious, and will eat great numbers of smaller fishes, crushing up the crabs and little shell-fish with great ease by means of their powerful jaws. They are all flat and have long tails.

The thornback (*Raia clavata*) is another of these flat fishes, and as useful as it is frequent, affording when salted a good meal for sea-side people. It is a dangerous fish if carelessly handled, for, besides that it is covered on all the upper part of its body with small rough points, it has large tubercular spines distributed here and there among them. Often while examining the things on the sea-shore we find pieces of the skin of this common fish, the spines themselves having been torn away by the action of the waters, but the oval bony base from which they sprang left there still, and puzzling the sea-side visitor to tell what it can be. But the limits of our little work forbid us to linger longer over the fishes, or to describe some, which, like the sun-fish, are so singular in form that few who had seen them would ever forget them. This strange looking fish, though occurring but occasionally, "may," Mr.

Yarrell says, "be said to have been taken from John o' Groat's to the Land's End. It is almost circular in shape, and when observed in our seas, seems either dead or asleep, floating along sideways, and of so insensible and dull a nature that it does not even attempt

THE SUN-FISH.

to escape, but lets the sailor take it in his hand into the boat. They are said to be phosphorescent.

Isaac Walton quotes an "ingenious Spaniard," who says, "that rivers, and the inhabitants of the watery element, were made for wise men to contemplate, and fools to pass by without consideration." Assuredly the waters which wash our island might serve as food for thought, did we even confine our meditations to the largest of their inhabitants. "These," said the psalmist, "these all wait upon thee; that thou mayest give them their meat in due season." When the great Creator commanded into being "every living creature that moveth, which the waters brought forth, after

their kind," he was mercifully providing stores of food, which we around this island are constantly enjoying, and by means of which a large number of our community subsist. Nor should we forget that from those hardy men who are now casting out the net or line, have sprung some of our most able pilots, some of our bravest seamen, and that even in our own days many of those who go out to succour the shipwrecked, braving the storm at the peril of their own lives, and with little prospect of reward, are men whose early days were spent on the shores, among its rocks and shallows, its waters and their inhabitants.

CHAPTER IV.

THE BEACH—ITS STONES, FLOWERS, MOLLUSCOUS ANIMALS, AND SHELLS.

THERE is good exercise in walking, for those who are strong enough to traverse a few miles of beach. Such a walk may be tiring, but it has great charms to those who love to hear all the variety of melody which nature offers to the listening ear. Now the wave dashes with force on the mass of stones, drawing up as it retreats large numbers of them, but to scatter them again with a music all its own : now it ripples more softly among the pebbles, so gently that we can close

our eyes, and dream that we are lying by the borders of some pebbly rill, till the loud scream of the seagull above us, so unlike the sweet songs of the minstrel of the meadow or wood, recalls us to the remembrance that the ocean is rolling there.

Countless numbers of pebbles, long since rounded by the action of the water, constitute the shingly margin on which we are treading. We pick up one or another, fancying, while wetted by the waves, that it is a piece of jasper, or agate, or some other treasure, but see, as it dries, that it is nothing uncommon. Dr. Mantell has told us that those green false emeralds and aquamarines which are sought with such eagerness by visitors on the Brighton and other coasts, are nothing but water-worn fragments of common green glass bottles; and that the moss-agates, jaspers, and other stones sold by the lapidaries and jewellers of the Isle of Wight and of Brighton, are in fact of Scotch or German origin.

But though the wanderer on our shores may never find one gem of worth sufficient to encircle with gold for an ornament, he may find at every step some wonderful stone, with a history well worth his attention. Those pebbles, rounded now by the long action of the waters into shingle, are on many beaches mostly flints. They were originally moulded in the chalk, and, like that chalk, contain the remains of marine animals embedded among them. They are not, however, like the chalk itself, entirely composed of an aggregate of fossil bodies. This pebble, hard as it is now, must have been at one time soft and fluid, for on the surface we may often trace the markings of various marine objects, as a sponge, or the spine of a sea-egg; and on breaking it, the scales of fishes, fragments of coral, perhaps a sea anemone or tiny shell, are perceptible. These little objects are the centres around which the flinty material gradually accumulated, while it was in a fluid condition in water. In this state it was precipitated into the chalk before the latter was consolidated, these marine

objects all the while forming nuclei, around which the siliceous earth hardened. A great proportion of the pebble therefore, consisting of the siliceous earth, is composed of the fossil skeletons of animalcules, "so minute," says Dr. Mantell, "as to elude our unassisted vision, but which the magic power of the microscope reveals, preserved like flies in amber, in all their original sharpness of outline and delicacy of structure."

It is evident that it was in a deep sea that many of those pebbles had their origin, or they would not have enclosed species now unknown, but well ascertained to have lived in such a sea only. It was then that they became embedded and hardened in the chalk, till the chalk bed of ocean was upheaved by volcanic agencies, and thus the line of sea cliffs was raised above the waters; then came further elevations of land, bringing up the fragments gradually worn away from the chalk, and the sea beach was raised to the place which it now occupies, several feet above the level of the sea. Mingled with the pebbles lie pieces of limestone, or cement-stone, or iron pyrites, while traces of human art and industry, brought there by the tide, show that our sea washes a shore inhabited by civilized and intelligent man.

That sea-side poppy, (*Glaucium luteum*,) or horned poppy, as we sometimes call it, because of the long seed vessels, which, being often a foot in length, may be seen afar off, like a horn, is a great and frequent ornament to the beach. Every rough wind flutters its golden petals, but they will not fall for the wind, but will wait till their time of withering comes. This flower is as large as the poppy of the corn-field, and as shining in its gold as is that flower in its scarlet. A large mass of leaves, of most beautiful sea-green tint, grow around the root, the upper ones clasping the stem, and the lower leaves having so many prickles on them, that when young, or when glittering with dew, they seem as if silver were sprinkled there. All the winter they may

be seen on the beach, washed by the surf which is scattered from the wave, or which, if the wind sets in on the shore, covers them over as with little heaps of froth, till the next gust blows it onward again. This yellow poppy grows too on the base of the cliff, or on the sand below the beach. It is an acrid plant, and its

YELLOW-HORNED POPPY.

root, which is of the colour of the carrot, is so much so, that if the juice is tasted, it long leaves an unpleasant and burning sensation on the tongue. Its name refers to its sea-green or glaucous tint, but like many a flower whose beauty had been marked by the ancients, the old fables of the Greek mythology derived it from a fisherman, who jumped into the sea and became a god; a tale of little worth, save to remind us of the advantages which we derive, who have received no cunningly devised fables, but have the word of truth in our hearts and homes.

“ And wandering still beside the wave,
And culling flowers and fancies wild.
I saw the hornèd poppy gild
The heights with blossoms rich and brave :
“ I saw its pods, like scimeters,
So fiercely battling 'gainst the breeze
That bloweth freshly o'er the seas,
And wafteth songs of mariners.”

Some very pretty trefoils flourish exceedingly well on our sea-beaches, and tufts of sea-side plantain (*Plantago maritima*) help to bind the stones together; and many a clump of the buckshorn plantain (*Plantago coronopus*) is there, though we shall not go out, as the housewives of old did, to gather it for salads. Starry sea-side camomile (*Anthemis maritimus*), with its cream-coloured rays surrounding a yellow centre, gives its strong scent to the wind, and, but for its odour, might, by one who was not a botanist, be confounded with the sea-side feverfew (*Pyrethrum maritimum*): this plant exactly resembles the mayweed of our corn-fields, and grows all about the cliffs and shingle. Vetches are there, too, with their tangling stems, and in some places that pretty and graceful plant, the sea-pea (*Lathyrus pisiformis*), creeps about the pebbly beach. It is common on those of the counties of Lincolnshire and Suffolk, and it grows in abundance near Walmer castle, in Kent, making the spot quite beautiful in the month of July, with its handsome but scentless flowers.

But we must wander over these sea-beaches, fearless of wetting our feet at their margin, if we would see some of the wonders which the sea is throwing up. We are no believers in the statement so often made by people on the coast, that salt water cannot cause cold. We know it to be a popular fallacy; but with a good amount of exercise, and by changing the shoes previously to sitting, we believe we may venture on some dangers which we could not brave amid the less invigorating air of an inland region. Taking for our present consideration one tribe of the inhabitants of the waters, the mollusks and their shells, we have a

large field for observation and inquiry. A mollusk may be described as a soft-bodied animal, with no legs, no jointed members of any kind. These animals either crawl or swim by means of extended portions of their skins, which are rarely so enlarged as to deserve the name of fins. They are sometimes covered with shells, either composed of one piece or valve, or of two or more valves ; but some mollusks, like our garden slug, have no covering ; and some, like the ascidians, which we are about to mention, have only a thick leathery mantle or tunic.

The greater number of marine mollusks live on sea-shores, on rocks, on sand, in eddies, or the mouths of rivers, and are hence called littoral species ; but there are many kinds which live at great depths, and are only thrown on the shore by storms. They feed on animal or vegetable substances, in all conditions, living or dead ; but the several families confine themselves either to one or the other kind of food. Those which feed on living animals of the larger kind, pierce holes in their shells by means of a proboscis armed with hooks, and those which feed on the animalcules so abundant in the waters, or on the small jelly-fish, or other microscopic objects suspended in the fluid, can produce in the water an almost circulatory movement, by means of which these small creatures are hurried, as in a whirlpool, within the reach of the mollusk.

The ascidians are shell-less mollusca, some of which are simple, and others compound. Some of the former animals are very common among our rocks and weeds on the shore, adhering at low tide to the under surfaces of rough stones, and hanging like " bunches of semi-transparent fruit " to the sea-weeds, clinging with a tenacity which renders it impossible to shake them off. So common are they, that the dredge is rarely brought up from any sea-bed, without containing some of them. They are irregularly shaped bodies, fixed at one side to the rock, weed, or shell, while the other end is free. Two or more openings are visible, and most persons

who, while wandering on the shore, have picked up one of these animals, have been saluted with a shower of water, which the ascidian ejects with great force from these apertures on the slightest pressure. They have not, usually, any beauty of form,—grace and symmetry are not their attributes; but the colours of some species are exquisitely beautiful. Their leathery tunic is sometimes crowded with small stones, or pretty little shells, which completely burrow into the substance of some of them. Often long graceful stems of horn-coloured corallines hang like waving boughs about them, or some tuft of sea-weed is like a silky cushion on their surface.

That inactive apathetic mass, showing no signs of life, save when it sends up a jet of water into our faces from a distance of two, or even three feet,—that apparently lifeless lump, is a creature well fitted by its organization for its part in life. Its organs of circulation, respiration, etc. are beautifully arranged, and it is of great value as food to fishes and other marine animals, while some of the ascidians furnish food for the human species. Late observations have proved that some of these, as well as some other living creatures of the deep, enjoyed, in earlier stages of life, a greater degree of freedom and activity. The ascidian, while yet in a tadpole state, is able to swim through the waters by means of a rapidly vibrating tail. At a further stage of its existence, however, the tail disappears, the animal affixes itself by its arms to the stone or sea-weed, the part which appeared to be the head sends forth roots, the orifices become visible, and finally the strange tough gelatinous mass seems to have lost the will and power of motion, and to be dependent for its very existence on the tangle to which it hangs.

Several of the species, like that common pale-green or yellow kind, the intestinal ascidia (*Ascidia intestinalis*), lie about our shore after a storm, or abound among the rocks. One species (*Molgula oculata*) is described by

professor Forbes as having a space in the midst of its encrusted tunic, of a bluish or purple tint, mottled with orange, with similarly coloured orifices, which look like little dark eyes within a spectacle-formed frame. This was

THE ASCIDIA.

found adhering to a scallop-shell. Another kind resembles at first a little ball of sand on a sea-weed, and when we rub away the sand we find that this was merely a crust to an object resembling a small globe of ice. Some are of greyish white, or ashy red, or brownish colour; some of deep crimson, or brighter scarlet; another is tawny coloured speckled with regular dashes of purple. One species taken on an oyster by Mr. Alder, is described as very like a raspberry, while a very common species on the sea-weeds, at

most parts of our coast (*Cynthia rustica*), is white and smooth. Ascidians coloured like the china rose of our gardens, or of bright orange and palest straw-colour, sometimes scarlet within, lie unheeded among our sea-weeds, and are often so covered with sand that we never see their colours, while their internal structure is known only to the anatomist. The most common size of these animals is about an inch, or an inch and a half, but many are three inches long.

We have spoken only of the simple form of ascidia, but various compound species are also among the

common objects of our beaches and rocks. Few things indeed are more frequent, and we know of none more beautiful, than some of the larger kinds. If, as we walk along at low tide, we turn up some of the loose rough stones at the edges of the pools, or grasp at some root of sea-weed which has been severed from its hold, we see them looking like clusters of stars of silver, but tinted with deep crimson or paler rose colour, with orange, yellow, blue grey, brightest green or deepest violet. All hues of beauty are seen on them, as they are too on some which, instead of stars, seem as if they were icicles hung on the weed by the hand of winter. "If," say professor Forbes and Mr. Hanley, "we keep some of these bodies alive in a vessel of sea water, we find them lie there as apathetic as sponges, giving few signs of vitality, beyond the slightly pouting out of tube-like membranes around apertures which become visible on their surfaces; though a closer and microscopic examination will show us currents in active motion in the water around those apertures, streams ejected and whirlpools rushing in, indicating that however torpid the creature may externally appear, all the machinery of life, the respiratory wheels and circulatory pumps, are hard at work in its inmost recesses. In the course of our examination, especially if we cut up the mass, we find that it is not a single animal which lies before us, but a commonwealth of beings, bound together by common and vital ties. Each star is a family, each group of stars a community. Individuals are linked together in systems, systems combined into masses. Each member of the commonwealth has its own peculiar duties, but shares also in operations which relate to the interest and well-being of the mass. Anatomical investigation shows us the details of these curious structures and arrangements, beautiful as wise. Indeed, few bodies among the lower forms of life exhibit such exquisite and kaleidoscopic figures as those which are displayed in the combination of the compound ascidians."

Several kinds of botryllus are very common on our weeds, and our engraving will serve to give a general idea of their structure,—*a* being the natural size, and *b* a single group magnified. These compound ascidi-

BOTRYLLUS.

dians, however, vary much in appearance ; one is described as similar to a number of heads of madre-pore ; others are little orange-coloured masses, fixed by a stalk to the rock. One, which is very common on all our coasts (*Leptoclinum maculosum*), is a thin hard leathery crust, surrounding the root of the olive-coloured tangle, and is variegated with white and blue. Our common serrated fucus, a sea-weed hereafter to be described, has often in abundance a whitish yellow species investing it. Some of them, as the species called the sea fig (*Aplidium ficus*), have a most disagreeable odour. Some kinds of ascidians are linked together in chains.

Perhaps while lingering about among jetties, piers, and other wood-work, the reader may have seen many of the piles which are at times under water, pierced into numerous holes, long worm-eaten looking cavities. This destruction has been all effected by a long worm-like mollusk, called the teredo, of which we have several British species. Immense mischief is done by these worms, undermining as they often do maritime works, which a few years since have cost much labour and money, piercing holes in ships, unfitting them for service, and sometimes causing them to sink beneath the

overwhelming billows, while they even make holes in the roots and stems of submerged living trees, which grow on the sea-shore of some of the hotter regions of the earth.

Mr. Thompson mentions that a piece of pine wood, nine inches in diameter, after having been for five years and a half used as a pile, was so reduced by the perforations of the teredines, as not to contain more

TEREDO NAVALIS.

than an inch of solid timber in any part; while at several places it was completely bored through. This pole was placed fifteen feet below high-water mark, and was only left uncovered during low water at spring tides. Often before some sea pier or break-water is finished, the piles are so worm-eaten that repairs are required for the first portion of the work. The very existence of Holland was once endangered by the ravages made by the shipworms in the embankments so industriously and judiciously employed for the protection of that country, when all at once they left the spot, without any reason having appeared for their doing so. Creosote and various kinds of varnish have been employed to arrest their ravages, but nothing seems more effectual than placing in the wood a number of iron-headed nails, which rusting in consequence of the moisture, seem to be unpalatable or injurious to the teredines, and this drives them away from the spot. But these shipworms have their uses too. Every one living near the sea knows how often large pieces of wood float in the waters, sometimes the remains of shipwrecks, sometimes washed in from the trees on the shore, which winds and storms have brought low. Some of these piles, borne from climes where vegetation is luxuriant, would hinder the ship in,

its way over the waters, and cause danger to the mariner, did not the shipworms break them into small fragments, and scatter them, leaving the smaller pieces for firewood to the fisherman and other sailor. Many perhaps, as well as the poet, have watched the blue flames which hovered about the salt drift wood,—

“ And as their splendour flash’d and fail’d,
Have thought of wrecks upon the main;
Of ships dismasted that were hail’d,
And sent no answer back again; ”

and while winds were blowing without, have lifted up an anxious and prayerful thought, that He who holdeth the water in the hollow of his hand would protect the sailor.

The common shipworm (*Teredo navalis*) has a long tube, generally white and firm as thin porcelain, but sometimes little more than a film; at times it is altogether absent. The head is enclosed in a sharp and hard two-valved shell, and this is the instrument which, guided by powerful muscles, is employed in its work. Not only naturalists, but political writers, have occupied themselves in tracing the history of this mollusk. Sellius, a native of Dantzic, wrote a book of three hundred and sixty pages, in which he cited nearly two hundred authors, and quotes lines of Ovid alluding to it. Messrs. Forbes and Hanley give an imitation of the classic lines, adding, that they were singularly applicable to the history of Sellius himself.

“ For as the ship by hidden shipworm spoil’d;
Or as the rock by briny wavelet mined;
Or as the rusted sword by rust is soil’d;
Or book unused, the tiny moths unbind;
So gnaw’d and nibbled, without hope of rest,
By cares unceasing, is my tortured breast.”

But the different species of teredo are not the only miners, for we have about our shores and lying there before our eyes, every day, numbers of little excavators, not only in wood but in stone. We have several species of pholades, but the one which is most common,

and is to be seen on all our rocky shores, is the prickly stone-piercer, or stone pidduck (*Pholas dactylus*), the *dail commun* of the French. The shells of these piercers are all white, more or less thin and delicate, and consist of two long valves, of an oval form, which

PHOLAS DACTYLUS.

are open at one end. Several small and curious valves are placed near the hinge, and just inside each of the large valves is a little piece shaped like a spoon. The outside of the valves is marked with ridges of prickles.

We cannot observe without wonder the caves made by this little creature, in wood, chalk, limestone, or other hard substances; some species of pholas preferring one, and some another; but all selecting this dark hiding-place. Not that this shell-fish is quite a hermit. Apparently, it likes the companionship of its kind, for the holes often open into one another, like little galleries, unlike the cavities made by the teredo, which are quite separated, though sometimes by a partition no thicker than a film. Rocks of chalk, or red sandstone, or lias, perforated all over by the common species, often stand up from the water, at low tide, and shells then may be seen sometimes five or six inches in length, and one inch and a half broad. This

species lives in all the seas of Europe, and in France is in great request as food, though with us it is only used for bait. Boys may often be seen searching for these animals for this purpose. They call them clams. All the species might be eaten, and one large West Indian kind is commonly sold in the markets of Havannah.

The mode by which the pholades make these cavities has never been satisfactorily explained ; but it seems probable that they act with the notched edge of the shell, as with a saw, as they have been observed to exhibit a rotatory motion while boring. The animal, too, has, like many of the inhabitants of the sea, small cilia (so called, because resembling an eyelash), and these are used for creating currents in the water around them, which may aid in clearing away the already loosened particles. Some writers think that they are aided by a solvent, but as Messrs. Forbes and Hanley can find no secretion of this kind, they remark, that if the mollusk is assisted by any chemical action, it must be by the carbonic acid gas set free during the process of respiration. It is remarkable that our common snail (*Helix nemorosa*) has been known to bore similar cavities in masses of carboniferous limestone. Some other species of marine shell-fish also make the rocks look like honeycomb by their labours. Such are some of the gastrochæna ; but they are less frequent than the pholades ; and such also are the saxicavæ, some of which, as the rough saxicava (*Saxicava rugosa*), are abundant on some parts of the coast. The shells of these species are not so well adapted for rasping as those of the stone-piercers, and both these animals and the land snails are thought to effect their purpose by means of a weak secretion of acid.

The stone-piercers are remarkably phosphorescent, especially when fresh, though some remains of the luminous property are exhibited, even when dried, and it may be revived by the application of water. A

solution of sea water always increases its power, while brandy immediately extinguishes the light. This is also slightly decreased by sal ammoniae, and entirely destroyed by acid. The luminous water becomes more vivid when poured upon fresh calcined gypsum, rock crystal, or sugar. Milk may be rendered phosphorescent by the pholas; but if mixed with sulphuric acid, it loses its light, acquiring it anew if oil of tartar be applied. Coloured substances are differently and actively affected by it. Thus, white appears to receive and emit the greatest quantity, while yellow and green do so in a less degree; red emits a very faint light, and violet still less. One single pholas will render seven ounces of milk so beautifully luminous, that all around is clearly to be seen by its light. If the milk is excluded from the air, the light disappears, reviving again on exposure to the atmosphere; and in the exhausted receiver of an air-pump the animal loses its light altogether.

The rocks have their cavities made by mollusks, and their surface, on the other hand, is often roughened by the adherence of other tribes. Sometimes one of these well-pierced rocks has almost every unbroken portion crowded with barnacles. The sessile barnacle or balanus, of which there are many kinds, is known to every one on the shore, for it encrusts our piers as with a stony covering, crowds on the oyster shells, the scallops, the rocks, the drift wood, and stones, either in the sea or just out of it, often encrusting vessels, especially about the helm. This is commonly called the sea acorn, and the shell is composed of several pieces, altogether forming a cone. Our common specimens are small, but sometimes we find this an inch long. The other kind of barnacle is not so frequent, though often covering masses of wood which the storm brings. It is called the stalked or duck barnacle (*Pentelasmis anatifera*), and its shell of five pieces is at the end of a long stalk of a reddish colour. The shell itself is very pretty and clear, with a bluish tint. These bar-

nacles are often seen in clusters, not only on floating wood, but also on the keels of ships. In China, a delicious dish is made of these shell-fish, which in boiling, turn from red to white. They are described as resem-

THE BARNACLE.

bling the lobster in flavour. The animals which make these shells are very beautifully formed, and have arms like little feathers, which they put out between the valves of their shells when they catch their food. No one, to look at any of these barnacles, could imagine that they were once active creatures, swimming vigorously and freely about in the waters, instead of being fixed to wood or stone. But in their first period of existence, they were covered only with a thin crust, and had limbs and tails which adapted them for

making their way in the watery world, in which they were for a period to find their residence.

The shells which we have hitherto described are, though beautifully formed, almost colourless; but we know that shells are often as gaily tinted as the most glowing flowers, and much do we prize many which are gathered from far off seas. Shells are secreted by the mollusks which dwell within them. The little

animal has, when first hatched, some small beginning of a shell, quite colourless and simple, which, in the course of time, it moulds into the shape which all its species make, and adorns with brilliance like to theirs. The shell is formed upon a basis of membrane, which, when by a chemical process it is exposed to view, shows itself to be either a network of cells, or a series of wrinkled layers. This membrane is scarcely thicker than such as the spider would weave ; but it is consolidated by a mixture of carbonate of lime, which the mollusk secretes from its food, and which, mingled with a living gelatine, exudes from the glands of the skin. Doubtless, its life is pleasantly employed in making this little cell, and adorning it with pink, or green, or purple, or any other brilliant tint, or with the various shades of fawn or brown, which seem those most usually preferred by the little painter.

Shells, in an early or rude state of society, have various uses of which, in our age and country, we know little. We make from them some beautiful gems of art, and the shell has long formed the substitute for the hard, flinty stones of which the cameos were formed by the ancients. Shells are selected which afford the necessary distinction of colour, and which, while they are soft enough to be worked with ease, have yet sufficient hardness to resist wear. The shells usually employed are univalves ; and the bull's mouth, the black helmet, the horned helmet, and the queen's conch, afford the material in greatest perfection. About twenty years since, an Italian commenced the manufacture of these cameos in Paris, and now about three hundred persons are employed in that city in cutting them. Mr. Gray, who read to the Society of Arts a paper detailing the history of the manufacture of cameos, states,—“ The number of shells used annually thirty years ago, was about three hundred, the whole of which were sent from England ; the value of each shell in Rome being thirty shillings.” He adds the prices of various shells used in 1847 in Paris, and observes,—“ The average value of the

large cameos made there is about six francs each, giving a sterling value of 32,000*l.* ; and the value of the small cameos is about 8,000*l.*—giving a total value of the cameos produced in Paris for that year of 40,000*l.* ; while in England not more than six persons are employed in this trade.”

Various ornaments and beautiful pieces of inlaid work are made of the nacre, or mother-of-pearl ; and several bivalve shells furnish us with the pearl for feminine attire. Some large pearls have been procured from British species, but no shell of our land yields any to be compared to the oriental pearls, or to that large one called the globe of light, which is found in the *avicula* of the Pacific Ocean.

But in many an island of the distant seas, dishes, drinking-cups, spoons, knives, razors, and fishing-hooks, are all furnished by the waters which lave their shores ; and the very instruments of music are made of the sea-shell. It has indeed a music of a softer nature for us—a music which reminds us of rolling waters, and which tempts us to lay our ear to its cavity, that we may listen to its sounds.

“ Pleased it remembers its august abode,
And murmurs as the ocean murmurs there.”

But little like to this plaintive tone is the loud, sonorous voice which the shell is made to echo by the savage, or to the terrible war-cry which sometimes is uttered through its spiral coils. That old writer, Pietro Martire, is quoted by Southey as thus describing a custom of the native Americans :—“ The doors of their houses and chambers were full of diverse kinds of shells, hanging loose by small cordes, that being shaken by the wind they make a certaine rattelling, and also a whistling noise, by gathering the winde in their holowe places ; for herein they have a great delight, and impute this for a goodly ornament.” In “*Madoc*,” the poet describes a Festival of the Dead, in which he refers to this practice :—

“Not a sound is heard,
But of the crackling brand, or mouldering fire,
Or when, amid yon pendent string of shells,
The slow wind makes a shrill and feeble sound,
A sound of sorrow to the mind attuned
By sights of woe.”

The negro girl yet decks herself in the nose-jewel and earring made of the shell ; and so beautifully do some tribes form their shells into wreaths and bracelets, that the European traveller looks on them with admiration. “Some years ago,” says a writer in the “Magazine of Natural History,” “I saw in the museum of Mr. Bullock a very magnificent piece of dress of this kind. It was the chief mourning dress of ceremony at the funerals of Otaheite. The part worn over the face was made of large plates of mother-of-pearl shell, fastened together with fibres of the cocoa-nut ; and the elaborate drapery stretched across the breast was composed of several thousands of pieces of mother-of-pearl, each separately drilled and fastened together, in a manner that would be found difficult for a European artist to copy.” Necklaces and other ornaments, made of shells, are also preserved in the British Museum.

The inner layers of some large flat shells are polished and used, as glass is for windows, in China and India ; the flat shells of various species are used to skim milk ; and in Zetland an elegant lamp is made of the spindle-shell (*Fusus antiquorus*), hung horizontally, the cavity being filled with oil, and the canal serving as a place for the wick.

Shells are found to form an excellent manure for the land, and are, even in our country, sometimes used for this purpose ; and in China, India, and Africa, where there is no stone for the lime burner, shells are used instead. So pure is the lime procured from them, that even the ladies in India, who are accustomed to chew the leaf of the betel and the nut of the areka, commonly mingle this with them to improve their pungent flavour.

But important as are some of these uses of shells, yet they are not to be compared to the service which they

render in forming extensive portions of land. Chalk, marl, and limestone are composed of marine relics, in which shells largely mingle ; and millions and millions, far beyond our computation, must have gone to make up the substance of a single cliff. The mollusks die, and the wave comes, with its broad sweep, and rolls onward the empty shells, and dashing them against pieces of rock, or projections of soil, reduces them to fragments, which gradually become more crushed and broken as the work is repeated. Then these masses are drawn along in the direction of currents, and driven in accumulated heaps along the shores. The strata which result from this action of the waves are mainly composed of broken shells, of which the asperities have been rounded into smoothness. It is also a circumstance worthy of remark, that in strata of this character the fragments are usually deposited according to the law of specific gravity, and that they are scarcely ever mingled with mud or other foreign matters, such shells as remain unbroken being filled with shelly sand. Many instances of this increase of land are to be seen on our coast. Such are the depositions, which being in the course of long years pressed down by superior strata, and having in themselves a tendency to crystallize, become more and more compact, and, finally hardening into solid rocks, leave few traces of their origin visible to the naked eye.

But we must return to our account of some of the shells which the wanderer by the sea may be likely to find there. Several species belonging to the gaper tribe are common. They are oblong shells, and somewhat rude in appearance, always more or less gaping very widely at the two extremities ; both the shell and the animal within are often covered with a coarse, wrinkled, thin skin. The species all bury themselves in sand, mud, or gravel. They have long siphons or tubes, and when buried they remain in an erect position under the mud, so that we may discover their retreats by holes which correspond with the extremities of their tubes.

The truncated mya (*Mya truncata*) is a very plentiful and widely opened shell, in the wet sand of our coast. In Zetland, it is boiled and eaten, and it is there called smurslin, and several of the species are good for food. It is abundant on the coast of Newfoundland, and said to be the favourite food of the codfish.

Some shells which are deemed very rare by naturalists, who seek for them on shores only, are very common species in the deeper part of the sea. This is the case with the triangular shell of the gibbous tellina (*Tellina gibba*), which is so extremely prevalent as to be a great annoyance to the habitual dredger. Other species, which we do not often find on the land, are brought to us in the stomachs of cods, halibuts, and other fishes. "The haddock," says professor Forbes, "is a great conchologist: in his travels through the countries of the mermaids, he picks up many curiosities in the shell way. Not a few rare species have been discovered by him, and the ungrateful zoologist too frequently describes novelties without an allusion to the original discoverer. As haddocks are not in the habit of writing pamphlets or papers, the fraud remains undiscovered, greatly to the detriment of science, for had the describer stated to whom he was indebted for his specimen, we could form some idea of its habitat and history." The cod is also said by this writer to be a great naturalist in this way, though, apparently, he is not so much devoted to the study of the mollusca, as to the inhabitant of the sea-eggs, and to the star-fishes.

The razor fishes, though but a small tribe, are important bivalve mollusks, and are remarkable for their long narrow shells, which might remind us of a pod or seed-vessel of a plant. They are longer and narrower than any other shells, and they and their inmates were well known to Aristotle, who describes the habits of one of the species. He says that it buries itself in the sand at the distance of about two feet; that it does not leave its hole, though it can sink or raise itself at will ;

that it is alarmed by noise, and when frightened, buries itself very rapidly.

This description agrees with the habits of our British species, two of which are very common. The pod razor shell (*Solen siliqua*) is a long shell covered with a thin skin of a light brown or olive green, which when rubbed off shows the shell beneath to be white, with a few bands of dull purple. It is the largest British species, varying in length from three or four to eight inches. The animal is good for food, and much sought for on various parts of our coast, but particularly prized in Ireland. Women and children take many razor fishes by a very simple process. They have a long wire sharpened at one end, and bent. Searching in the sand for the holes made by these animals, they put down the wire and easily force them out of their hiding-places. The

SOLENSIS.

French call the solen, *manche de couteau*, and it is, indeed, very similar to a knife-handle. On the coast of Normandy some of the species are very abundant.

The sabre razor shell (*Solen ensis*) is as plentiful on sandy places as the other species, and very similar to it, though more slender. It also inhabits deeper water.

Much more beautiful in colour are the shells of the tellen tribe, some of which are strewn upon all our sandy shores, and occur with the common kinds of scallop in all the baskets carried about beaches for sale. They are mostly thin, delicate shells, beautifully sculptured and painted with most rich and glowing hues, though the little creature which makes the gay dwelling-place is pale and colourless. The genus *psammobia* belongs to this tribe, and it contains some very elegant and beautiful shells. One of these (*Psammobia vespertina*), which, though rather a local species, is abundant in some parts of the coast, is so beautifully rayed with rosy hues, that it well deserves its name of the setting sun. It sometimes is collected in great numbers on our sands after stormy weather, and it dwells near the shore, burrowing at a slight depth beneath the sands at low water.

PSAMMOBIA FERROENSIS.

The faroe psammobia (*Psammobia ferroensis*) is well known all round our shores, and is of an oblong figure, tolerably strong and thick, with the valves somewhat unequal. When fresh from the water it is usually covered with a thin olive-coloured skin, and

when this is rubbed away we find it rayed with white and delicate rose colour, or marbled with pink on a whitish ground. Indented lines run closely from the hinge to the edge, which are crossed by others extending the whole breadth of the shell, and the edges are slightly notched. The highly polished interior is white or purplish lilac.

The tellens are very numerous, not less than two hundred species of the genus tellina alone being enumerated. They are to be found in every sea, though abounding most in the tropics; and some or other of them are, like our British kinds, among the most frequent shells strewn by storms upon shores. The tropic species are highly coloured and beautiful in form, and much valued as chimney ornaments. The animals all burrow in the sand.

TELLINA TENUIS AND ROCK LIMPETS.

Shells are so difficult to describe that we cannot enumerate many species, but one of the very commonest bivalves all round our coast must be mentioned. This is the pretty thin tellina (*Tellina tenuis*), a sub-oval shell, with a smooth surface, which differs in hue

in different individuals, being sometimes of pale crimson or delicate rose tint, at others, of orange or pale yellow, or yellowish white. It is often shaded with darker zones of the same colour, but is never marbled nor spotted. It is about one inch in length, and five-eighths of an inch in breadth. The pearly white thin shell is sometimes iridescent, though now and then stained with orange or rose colour.

An oval-shaped bivalve shell, called the white mactra (*Mactra alba*), is very abundant in most sandy and muddy places round our coast. It is very thin and

GROUP OF MACTRA.

brittle, but not clear ; and its white surface is covered with a thin glossy yellowish skin. It is about two-thirds of an inch in size. Several other species of mactra are cast ashore by the waves on our sandy margins, and the solid mactra (*Mactra solida*) is a thick shell, covered with an olive-green skin. It is sometimes deeply furrowed or veined with grey or slate colour, and sometimes of a dull yellow. A very similar species

is common on the shores of the isle of Arran, and is there collected as food for pigs.

The donax is another large family, whose strong shells are well known and abundant, and scarcely any bivalve is more general on our shores than the truncated donax (*Donax trunculus*). It is oblong wedge-shaped, firm and glossy, one inch and a quarter broad, and marked both from the hinge to the edge and from

DONAX TRUNCULUS.

side to side with close deep lines, banded with purple, and having small notches at the edge. The animal within is usually of a dull white, but is sometimes of pale orange colour, and the form of its shell is admirably adapted to

its habit of burrowing in the sand. The name of donax is from the Greek word for reed, and a flying reed is used by the ancients for an arrow. The shape of the shell is very similar to the head of a javelin, being thick at one end, and gradually tapering towards the other.

The truncated mya abounds on the sand, and its shell looks as if one end had been cut off; and several species of lutraria are common shells. One of the many species of Venus, the striated species (*Venus striatula*), is more easily described, and is found everywhere on sandy tracts. It is triangular and heart-shaped, often painted with delicate zigzag lines of a brown or purplish brown colour, nearly an inch and a half in length. Several of the species are common, and some are more gaily painted than this, and are justly admired for their brilliancy and smoothness of surface. It was the beauty of some of these which led to the fable that Venus selected one of these shells for her car, and they are used everywhere as decorations. The North American Indians cover their dancing shoes

with them, and their movements produce a tinkling sound. There are one hundred and fifteen species of Venus enumerated.

The island cyprina (*Cyprina islandica*) may claim a passing notice as being one of our largest native shells. It is not rare on any part of our coast, though essentially it is a northern species. It has been known to measure four inches and a half in breadth, and more than an inch in length, but its ordinary size is somewhat less.

A singular and handsome shell is the heart isocardia (*Isocardia cordata*). Its name would enable the reader to identify it, for it is truly heart-shaped. It is of a dull white colour, marked with fawn or dingy red. The animal within appears to be insensible either to sound or light. It fixes itself, by means of its foot, on the margin of a sand-bank, at too great a distance to be disturbed by storms. "There," says the Rev. Jas. Bulwer, "the isocardia of our Irish Sea patiently collects its food from the surrounding element, assisted in its choice by the current which it is capable of creating by the alternate opening and closing of its valves." It is chiefly obtained off the Dublin coast.

The last named shell is better known to those who are in the habit of examining collections of shells, than to the wanderer by the sea-side. Not so the common cockle (*Cardium edule*), whose strong ribbed shell is familiar to everybody, being found all round our coast wherever there is any sand. The shell is still used in the Hebrides for skimming milk; and in the feast of shells in the days of Fingal, that of the cockle was, according to Macpherson, the heroes' cup of festivity, being known by the name of sliga-crechin, or the drinking shell. Large heaps of the empty shells, strewed by the doors of cottages, often serve to show how agreeable a food to the labourer are the small globose animals which once occupied them; and the cockle is certainly one of the best flavoured of the mollusca. Though we cannot agree with those who prefer it to the oyster, as some do, yet it is no despicable food when roasted or

boiled, serving also for a good fish sauce when prepared with butter. Many cockles are gathered on the sandy shore by children, and eaten raw, and in some places numbers of them are pickled. During a great failure of the potato crop in the Orkney Islands, many of the poorer people subsisted almost entirely on these shell-fish. To the poor of other lands they are more valuable than to us. The people of Tierra del Fuego live almost entirely on sea eggs and various mollusks ; and captain Cook remarked in Australia, that wherever marks of fire were observed, there lay around the empty shells of oysters, cockles, mussels, and various bivalves, sometimes in numbers almost incredible.

There is another frequent species of this genus, the spiny cockle (*Cardium echinatum*), the shell of which is larger than the common kind, and is even firmer and more thickly ribbed, the ribs being covered with numerous short spines. It is a very handsome shell, varying from whitish to shades of reddish, or yellowish brown. The animal differs too from the common cockle in having some bright tints about it. It is of yellowish white, and some of its minute thread-like feelers are white with yellow points at their bases ; and some are dotted with red ; while the foot is of pale rose colour, and deeper red. The foot, in this and other mollusca, is a fleshy piece somewhat resembling that part of the human frame. In the common cockle it is remarkably strong, and the animal can, by its means, emerge from the sand, re-enter it, raise itself briskly, or advance or go back as it pleases. If desirous of sinking in the mud or sand, it can lengthen this foot and hook itself to any object by its extremity ; it can then shorten it and bring the shell to its point, cutting the sand with the edge. It can curve it into an arch when it chooses to spring, then quickly straighten it again, and thus raise the whole body with much agility. When above the soil, a similar manœuvre enables it to jump to a considerable height.

There are many edible species of cockle. Mr. Couch,

speaking of the large, solid, coarsely wrinkled shell, called at Torbay the red nose (*Cardium rusticum*), says that they are much eaten in that neighbourhood. They may be seen at spring tides with their fringed tubes appearing just above the surface. The people gather them in baskets and panniers, and after placing them in cold spring water for a few hours, they fry the mollusks in a batter made of crumbs of bread, "producing," as this naturalist observes, "a wholesome and savoury dish." The loose valves lie in considerable numbers on the Cornish shore, but the species is rather a local than a general one.

The common mussel (*Mytilus edulis*) is universally diffused round our shores at the edge of low water, or a little beyond it, and often cast up by the waves. In many lands, as well as in ours, these shell-fish form a valuable supply of food. We need not describe at any length the dark opaque bluish shell, covered with its thin skin of yellowish brown, or the sand-coloured animal within, nor tell how the mussel moors itself by silken cables to the rock, or rides at anchor among the shallows. The valves of the mussel-shell fit very closely together, and are opened or closed by means of a reddish coloured fleshy protuberance. This is divided into two lobes, and when the animal chooses to remove from its station, it gradually opens the shell, and pushing forth this fleshy foot, it makes a furrow in the sand, and draws its shell in this in a vertical posture. Wholesome as the mussel is in general, yet, as is well known, it seems greatly to disagree with some, causing eruptions on the skin, swelling of the limbs, difficulty of swallowing, delirium, and even death. People thus injured by them, are at sea-coast towns said to be muselled; but all inquiry has failed to discover the cause of their occasional poisonous influence. Neither chemist nor anatomist can account for it, and all theories assigning it to the season of the year, the fresh or stale condition of the fish, to its having fed on poisonous matters, have in some instance or other proved falla-

cious, and have left the question as they found it. Fortunately, however, illness arising from this cause is very rare, and so valuable a source of food are the mussels, that small portions of the sea-shore between the tide-marks are, in some places, surrounded by stones, and called mussel gardens, and carefully watched by their proprietors. The fishermen of Northumberland were seen by Mr. Alder employed in piling up stones among the rocks to secure their mussels.

Professor Forbes and Mr. Hanley quote, in the valuable "History of the British Mollusca," a communication made by Dr. Knapp of Edinburgh, as to the number of these shell-fish consumed in the neighbourhood of that city. "As an article of food," he says, "there cannot be used fewer than ten bushels per week in Edinburgh and Leith, say for forty weeks in the year; in all, 400 bushels annually. Each bushel of mussels, when shelled and freed from all refuse, will probably contain from three to four pints of the animals, or about 900 or 1,000, according to their size. Taking the latter number, there will be consumed in Edinburgh and Leith about 400,000 mussels." This, he adds, is a mere trifle compared with the enormous numbers used in bait for all kinds of fish. At Newhaven alone, he calculates that the annual consumption of mussels for this purpose only may be reckoned at 4,320,000; and as there are nearly as many used at Musselburgh, and various other places in the Frith of Forth, he estimates the annual use of them by the fishermen of that district, for bait only, to be thirty or forty millions in each year.

The larger shell of the horse mussel (*Mytilus modiola*) may be picked up at various parts of our coast, and in some places this shell-fish is collected for food. All the mussel tribe can spin a strong and silky hair, called byssus, by which they attach themselves to rocks so securely that winds and waves cannot rend them from their moorings. The animal of that common shell, the discordant crenella (*Crenella discors*), a species nearly

allied to the mussel, fastens itself by this silk to the roots of the tangle, or the stems of corallines. This mollusk can move with much quickness when it pleases, but Mr. Alder remarks that it prefers a stationary life, and so forms for itself a kind of little nest or case, by fastening together with its silky cables a number of the small sea-weeds and corallines. Here it lies waiting for such food as the water shall convey to it. This shell, which is found at all parts of our coast, is sometimes to be seen enveloped in nests formed of little pieces of the hornwrack and small masses of sand glued together and wound about by these threads.

A considerable number of bivalves are furnished with this bundle of threads, more or less loosely connected, and issuing from the base of the foot of their inmate. This foot is used to direct the threads, and to glue the

PINNÆ.

extremities to the point of attachment. The largest two-valved shell that our British seas produce, the pectinated pinna (*Pinna pectinata*), which is sometimes twelve inches long, has a byssus of this kind, consisting of numerous silky fibres of a dark purplish colour, and often two or three inches in length. These silky tufts

are called by the Sicilian fishermen *lana penna*, and the inhabitants both of Sicily and Calabria prepare the byssus for making a kind of stuff; but this is expensive, and consequently the manufacture has gradually dwindled. The threads, when broken away, are sold to women, who, after washing them in soap and water, drying them in the shade, and combing them, card the silk, which by means of these processes is reduced to about three ounces. The fabric when manufactured is of a beautiful yellowish brown, resembling bronze, and it never loses its colour. A manufactory of this stuff has long been established at Palermo, and there gloves, stockings, caps, and waistcoats are made of it. In 1754, a pair of stockings, made of the pinna silk, was presented to pope Boniface xv., which were so fine that they were enclosed in a case no larger than a snuff-box.

The shell of the pinna is thin and horn-coloured, and is something like a fan in shape. Beds of these sometimes entangle the line of the Cornish fishermen, and they can only be removed by forcibly tearing the byssus, or by breaking up the ground to which they are fastened; in the latter case a large number of the shell-fish are brought away. The animal is eaten, but it needs many hours stewing before it is digestible. The ancients considered it to be good food.

The two valves of the shell cannot be closed by art, but the animal can close it; and Mr. Couch, who has long observed the pinna, is convinced that it is by this means that it secures its food. The valves stand upright, with the wider end about an inch above the surface, and the lower part attached by the moorings. In its ordinary position, the upper end of the shell is open about two inches, exposing the animal within, which seems thus to offer itself a prey to the first creature that may choose to devour it. "Some fish," observes the naturalist referred to, "is thus tempted to enter it, but the first touch within is a signal for its destruction. The shell closes, not only at the side

but the top, the latter action being effected by the separation of the pointed ends, and the captive is either crushed to death or soon perishes from the close confinement." A little crab is often found inhabiting this shell with the pinna. The friendship between them will be described in a future page.

But there is an interesting little animal enclosed in a white shell, which works unseen beneath the waters, and constructs so beautiful a nest, that not even a goldfinch could plan a dwelling better fitted for peace or comfort. Mr. Landsborough, in his "Excursion to Arran," describes how he found the *lima tenera* in Lamlash bay, snug in its nest; and the description is so graphic, that long as it is we must quote it. "The coral nest is curiously constructed, and remarkably well fitted to be a safe residence for this beautiful animal. The fragile shell does not nearly cover the mollusk, the most delicate part of it, a beautiful orange fringe-work, being altogether out of the shell. Had it no extra protection, the half-exposed animal would be a tempting mouthful, quite a *bonne bouche* to some prowling haddock or whiting; but He who tempers the wind to the shorn lamb teaches this little creature, which he has so elegantly formed, curious arts of self-preservation. It is not content with hiding itself among the loose coral, for the first rude wind might lay it naked and bare—it becomes a marine mason, and builds a place of abode; it chooses to dwell in a coral grotto, but in constructing this grotto, it shows that it is not only a mason, but a rope spinner, and a tapestry weaver, and a plasterer. Were it merely a mason, it would be no easy matter to cause the polymorphous coral to cohere. Cordage then is necessary to bind together the angular fragments of the coral, and this cordage it spins; but its mode of spinning is one of the secrets of the deep. Somehow or another, though it has no hands, it contrives to intertwine this yarn which it forms among the numerous bits of coral, so as firmly to bind a handful of it together. Externally this habitation is

rough, and therefore the better fitted to elude or to ward off enemies; but though rough externally, all is smooth and lubricous within, for the yarn is woven into a lining of tapestry, and the interstices are filled up with fine slime, so that it is smooth plaster work, not unlike the patent intonaco of my ingenious friend Mrs. Marshall. Not being intended, however, like her valuable composition, to keep out damp, or to bid defiance to fire, while the intertwining cordage keeps the coral walls together, the fine tapestry, mixed with smooth and soft plaster, covers all asperities, so that there is nothing to injure the delicate fringed appendages of the enclosed animal. Tapestry, as a covering for walls, was once the proud and costly ornament of regal apartments; but ancient though the art was, I shall answer for it that our little marine artisan took no hint from the Gobelins, or from the workmen of Arras, or from those of Athens, or even from the earliest tapissiers of the east. I doubt not that from the time that Noah's ark rested on the mountain of Ararat, the forefathers of these beautiful little limas have been constructing their coral cottages, and lining them with well wrought tapestry in the peaceful bay of Lamdash.

“ When the lima is taken out of its nest, and put into a jar of sea-water, it is one of the most beautiful marine animals you can look upon. The shell is elegant, the animal within the shell is beautiful, and the orange fringe-work outside of the shell is highly ornamental. Instead of being sluggish, it swims about with great vigour. Its mode of swimming is the same as that of the scallop; it opens its valves, and suddenly shutting them, expels the water, so that it is impelled onwards or upwards, and when the impulse thus given is spent, it repeats the operation, and thus moves forwards by a succession of jerks or jumps. When moving through the water in this way, the reddish fringe-work is like the tail of a fiery comet. The filaments of the fringe may, for anything we know, be useful in catching

their prey ; they are very easily broken off, and it is remarkable that they seem to live for many hours after they are detached, twisting themselves about in a vermicular manner."

Thus beneath the waters the little mollusks work in silence, building the house with neatness and elegance. It is comparatively seldom that the structure meets the eye of man, but God has scattered loveliness everywhere, and the traces of his pencil have wrought rainbow tints even in the lowest deeps.

Some of the commonest shells on our coast, and certainly some of the most beautiful, are the scallops. Everybody knows them, coloured as they are with their rich hues of brown and orange. The speckled scallop (*Pecten varius*) is so frequent that we can never walk far over the sand without seeing it. Its tints vary in different individuals, but they are most frequently of reddish-brown, or deeper orange hue, the older specimens mottled with white ; the valves are slightly convex, rather more than two inches long, and marked with about twelve ribs.

The upper valve of the scallops is generally more vivid than the lower one, as is the case with many bivalve shells, which permanently keep the lower valve downwards. Light acts much in influencing colour, as we see in our own seas, where all the objects are less brilliant in tint than in the seas of tropical climates. So, too, shells which are enveloped in sponges, or which burrow in the sand, or even live constantly in shady places, are much paler than those which cover animals that crawl about, and are exposed to light.

Every sea teems with some of the numerous species of scallop. One of the most highly-coloured of our own common kinds is the tiger scallop (*Pecten tigrinus*), which is streaked with every variety of markings, of brownish-red, lilac, chocolate, yellow, and white. It is a favourite food of flat-fish. The lid-scallop (*Pecten opercularis*), which is so abundant among the oyster-beds, is a handsome shell, well known for its uses in

making pincushions and watch-pockets, and the mollusk is often cooked in its shell with bread crumbs, or fried for the table. So too is the larger shell-fish of the great scallop (*Pecten maximus*), while its shell serves the fisherman also for a lamp. The pilgrims who in former days travelled to the Holy Land, and

“Fix’d the scallop in their hats before,”

as a sign of their pilgrimage, appear to have used this species, and they found it lying in plenty by the shores of Palestine.

The French call the shells *peignes*, but in Scotland they are often called clams. The Rev. David Landsborough, describing a number of beautiful corallines and sea-weeds which grew on some which he dredged up from the bay of Lamlash, laments that the scallops have disappeared from that place. “The fishermen,” he says, “finding that they made excellent bait, had, in their

PECTEN OPERCULARIS.

greed, I suppose, exhausted the bed.”

The same author describes the scallops as dancing so merrily, that when he first saw them he thought they were young fishes; this they did by opening and shutting their valves.

Who that listens to the old proverb, “As dull as an oyster,” would imagine that the oyster dances in the waters too? Yet so it is; the young ones dart about with the greatest rapidity, and have admirable powers of swimming quickly, though, as they increase in years, they seem to do so in sedateness. The oyster, like the goose, is a misjudged animal; so far from being stupid, it shows unusual resources in emergencies. When

choosing to remove from its place, it can raise itself up on one side, so as to stand nearly upright, and thus, awaiting the flowing of the tide, opens the shell, and is turned over by the force of the water. The very slightest touch will cause it to close its valves. When the proboscis of some whelk or other enemy is attempting to make a hole in its shell, in order to suck the animal forth, it can dart at it a quantity of water which it has in reserve between its valves. Exposed as it is to insects, which pierce its shell in all directions, it will sometimes thicken its substance by an addition of nacre, and the pearl which we prize so much is but the plug which the oyster has ingeniously wrought to stop the cavity made by the intruder. True it is, that the poor shell-fish has more enemies sometimes than even his skill can enable him to resist ; and besides being pierced all over by living creatures, a parasitic sponge (*Cliona perforata*) makes holes there too. Little forests of corallines spring up on the surface, and barnacles, and dead men's fingers, and sea-weeds, ornamental as they are, yet encumber the dwelling. The very inside of the cell of our oyster is not free from the incursions of animalcules and worms, the former of which are phosphorescent, and are, perhaps, after all, too small to injure, and may, indeed, rather serve as a store of food.

Our "native oyster" (*Ostrea edulis*), reared in an artificial bed, is a well-known animal. But those who watch the fishing-boats which are about our coasts are more familiar with that most handsome variety called the rock-oyster, the flavour of which is, however, inferior to that of the native, though the animal is larger. The rough layers of the shell are usually crowded with marine weeds, and other stores from the sea. This, which is usually about four inches wide, is also dashed and streaked with lilac or reddish purple.

Most of our coasts produce oysters naturally, and nowhere do they attain so much perfection as in the

British seas. The ancient Romans gathered them from our shores, and placed them in artificial beds in the Lucrine Lake. The oyster-shells still lie in abundance about the shores of Richborough in Kent, the Ritupæ of the Romans, and the spot whence they fetched their best kind. To be a good judge of the flavour of an oyster was the characteristic of the Roman epicure, and Messrs. Forbes and Hanley thus render the well-known passage of Juvenal on this subject :—

“ Who at first bite each oyster’s birthplace knew ;
Whether a Lucrine or Circæan he’d bitten,
Or one from Ritupinian deeps in Britain.”

The native and the rock-oyster are but varieties of the same species, and the valuable supply of food yielded by these abundant shell-fish is chiefly furnished by the beds of Kent and Essex. The beds are made in rivers, and some care is required in tending and replenishing them from the sea, as well as in keeping the oysters clear of the barnacles, sea-weeds, and even fishes, which would encumber or molest them. The depth of bays is sometimes somewhat lessened by the great numbers of oysters. The refuse shells are useful for manure, and when calcined are of some worth as absorbents. There is a species of oyster so like a withered leaf, as to elude, by this resemblance, the pursuit of birds of prey.

ANOMIA EPHIPPIUM.

The anomia, or pearly oyster, as it is called, has a thin shell, with unequal valves, and is attached to various bodies, shaping itself upon them. Two kinds are very commonly thrown up by the waves on all parts of the shore, often adhering either to the common oyster, or the large scallop, and when moulded on the latter, becoming ribbed like it. The waved anomia

(*Anomia undulata*), and the saddle anomia (*Anomia ephippium*), are much alike, having green, purple, violet, or yellow tints reflected on their changing surfaces. One of the valves is usually more flat than the other, and has often a hole through the base, which was, when in the sea, occupied by a shelly plug, that adhered to one of the muscles of the animal, and passed through the perforation.

There is a very singular mollusk, the three-spined hyalea (*Hyalea trispinosa*), the minute frail shell of which has been found on our shores, and may, perhaps, have been often wafted there to be broken by the wave that brings it. The description given of it by Messrs. Forbes and Hanley is so graphic, that it is better to quote it for the reader:—"In warmer seas than those which encircle our island, the surface of the water, when the weather is calm, and the sun is shining, glistens with glassy needles or shelly bubbles. These, upon close examination, prove to belong to curious mollusks, which, instead of creeping over submarine rocks and weeds, or burying in the soft mud and sand of the sea-bed, aspire to a gayer and more sportive life, and play the part of Neptune's bees and butterflies. From our less congenial waves they are almost altogether absent; only a few stragglers, and these, with one exception, of microscopic dimensions, have met even the scrutinizing eyes of practised naturalists."

Some very pretty little bivalves belonging to the ark family, are so called because some of the true ark shells are much like that curious boat, which has long been figured as the home of the family who floated on the waters of the deluge. That common shell, the silvery ark (*Arca nucleus*), though an inhabitant of deep waters, and abundant in dredges, is besides often found in a broken condition on our shores. It is quite white, but when fresh from the waters is covered with a thin olive-coloured skin. In some places we might soon gather a basketful of these little shells, as they are in such great numbers. The different species chiefly lie

among the crevices of rocks, and in the cavities of other shells, fastening themselves to these objects by means of their byssus.

But the tide is out, and we may wander among the wet rocks, slippery with green sea-weeds, and peep into the salt water rivulets, which are running in among them. The rocks are so thickly covered with barnacles, canoe-shells, and limpets, that they have escaped the injuries of the stone-piercers ; as these could hardly find an inch of surface unoccupied.

Large numbers of the grey canoe-shell (*Chiton cine-reus*) are clinging close to the rocks, some of them of an orange brown colour, some varieties nearly black, and most of olive green marked with brown patches. We turn up a spray of sea-weed, and there lie a number of canoe-shells richly dressed in crimson, marked with white ; while altogether they so ornament the rock that it looks as if decorated with mosaic work. The animal within is, as we can easily see if we detach the shell from the rock, of a dull flesh colour.

Several of these canoe-shells are common on our rocky shores. They are oblong, composed of eight transverse plates, so that the animal resembles the common wood-louse in its powers of rolling up like a ball. It adheres, not by any foot or disk, but by means of a clammy fluid which it exudes from the under surface of its body.

The limpet, crowding these, holds itself so tightly by another means. If we only give it warning of our intent to take it, its removal becomes almost impossible. The strong muscles of its foot enable it to cling thus, while the cavity in which some of the shells are fixed, is thought to be excavated by means of the action of the carbonic acid gas which escapes in the process of respiration. Wordsworth has described it :—

“ At distance view’d it seems to lie
On its rough bed so carelessly,
That ’t would an infant’s hand obey,
Stretch’d forth to seize it in its play ;
But let that infant’s hand draw near,
It shrinks with quick instinctive fear,
And clings as close as though the stone
It rests upon, and it, were one :

And should the strongest arm endeavour
The limpet from the rock to sever,
'Tis seen its loved support to clasp
With such tenacity of grasp,
We wonder that such strength should dwell
In such a small and simple shell."

The poet proceeds to draw from this the important lesson, that we too should cling to Him who is called the Rock of ages. Surely amidst the changes of time the Christian may rejoice in the stability of the Saviour, and turning from the weaknesses of his own heart, may cling with firm confidence and joyful thanksgiving to Him who is the same yesterday, to-day, and for ever ; whom no clouds shall hide, no billow rend from him ; but on whom the soul may rest either in life, or death, or eternity.

The shell of our common limpet (*Patella vulgata*) is nearly round and conical, and on account of its form the Latins distinguished the animal by the suitable name of *patella*, which was their term for a small deep dish, used for the purposes of sacrifice. It is usually of an olive or yellowish colour, but is never white. No mollusk is more common than this, for no sooner is a sea-wall reared, which is washed at high tide, than thousands of limpets come to take possession of it. Many of us have, in the days of childhood, made a hearty luncheon of the somewhat tough shell-fish, and needed no culinary art to deem them agreeable. They are also eaten by the poor on sea-coast towns, but their chief value as food is to the savage natives of distant lands. In the north of Ireland, they are, however, a common article of food, and the limpet-gatherers at Larne, in Antrim, thirty in number, are stated to have earned, in one season of four months, no less than one hundred pounds sterling, by collecting them. They are also eaten by birds, and much relished by poultry ; while, like many other mollusks, they are of great value as bait. Dr. Johnston, of Berwick, calculates that there is an annual consumption of 11,880,000 limpets for this purpose ; and in consequence of this perpetual demand, the limpets of his

neighbourhood have so decreased in number, that the employment of collecting them is now a tedious work.

The limpet can, when it chooses, crawl over the rocks, and its long riband-like tongue is provided with a rasp, with which it probably tears the sea-weeds ; but when it remains stationary, its food doubtless consists of the microscopic animals present in every drop of water, and which are swept into its very mouth. Another species is called the horse-limpet, and is known to the Berwick fishermen as the yarod. A beautiful little kind is also common in the long leaf of the tangle, which is clear and thin, of dark olive, rayed with brilliant blue. All sea-weed gatherers know it, for it lives on this plant. It is the pellucid limpet.

There is a shell found on most of our shores, though not in great numbers, except on some parts of the southern coast, which is called the fool's-cap limpet, or Torbay bonnet. It is the *Pileopsis ungarica* of the conchologist, and it is shaped like a little cap of liberty. Then there are key-hole limpets, so called because of an oblong aperture at their summit, which in some of the species is shaped like a keyhole. The animal of the netted key-hole limpet is sometimes of a creamy white colour ; but in other specimens, taken from the surface of scallops, which were incrustated with a crimson sponge, it has been found to be of a rich orange approaching scarlet.

One or two tooth shells are common. The toothed dentalium (*Dentalium entalis*) is especially so. It is like a horn, slightly curved and hollow, of white or yellowish colour, about an inch and a half long. The fluted shell of one of the species is said to have suggested the idea of the shaft of the Doric column.

Among the shells which we use as ornaments, scarcely any, except the cowries, are more generally prized than the top shells, which are brought from foreign seas. Often of most elegant spiral form, somewhat resembling the toy whence they take their name, they exhibit

the richest hues of pink and emerald and blue upon their pearly surfaces. Our more soberly tinted species cannot rival the foreign kinds, though some of the common specimens of the muddy red trochus (*Trochus ziziphynus*) are very pretty shells, sometimes measuring an inch from the base to the pointed summit, and marked with wavy dashes of pinkish red, or dark claret, or reddish flesh colour, on

MUDDY RED TROCHUS.

a ground of reddish or bluish hue. A beautiful creature is the mollusk inhabiting this shell, being of a bright reddish brown, speckled at various parts with other bright tints. All the trochus genus have eyes, like the snail, placed on stalks ; and this common kind has greenish blue eyes, with a black point in the centre.

Other species are common, but not easily described ; but that small grey top-shell, of an ash colour, with grey markings, is well known. It is sometimes called the dog-periwinkle (*Trochus cinerarius*), and is very abundant among the sea-weeds near the shore.

But the most beautiful of our native species is the large top-shell (*Trochus majus*), which is found all round our island, and which is sometimes painted with most vivid hues. The upper layers are frequently removed, so as to show the mother-of-pearl beneath ; and very pretty bracelets, brooches, and other ornaments, are made of this material. Not inferior in brilliance to the shell itself, is the animal which constructs it. Bright orange, scarlet, straw colour, white, and purple, are among the hues which adorn it ; and it is besides a blue-eyed beauty, its eyes being of most vivid azure. The shell is varied with reddish and liver-coloured tints, on a ground of dull white.

The magnificent cowries from the tropics, which so often embellish drawing-rooms, have but a homely representative in our seas ; our only native kinds being small white-ribbed shells, found on all our sandy coasts, and known to children as the pig cowries.

Among the most frequent shells of our shore is that large rough covering of the common whelk (*Buccinum undatum*), often called by fishermen whelk-tingle, or sting-winkle, which is frequently four inches long. The Latin name is significant of the ancient use of some species of this shell as a trumpet; though the word apparently included all shells of the spiral form. A large species of the shell is still in use in Italy, where the herdsmen employ it in making a number of loud and somewhat musical sounds, by which they direct their herds. "They are also common," says Miss Roberts, "in North Wales, where I have heard their deep and hollow sounds, breaking on the silence of those alpine districts, when used by the farmers in calling to their labourers. Triton, Neptune's trumpeter, is generally pictured with a shell of this description in his hand, with which ancient poets fabled that he convened the river deities around their monarch. It is wreathed like those called sikanos, or sea-horn, common to India, Africa, and the Mediterranean, and still used as trumpets for blowing alarms and giving signals." Shells of a similar kind are also applied to pastoral purposes in Muscovy and Lithuania; and no sooner does the morning sun redden on the hill or valley, than the long sounding shelly trumpet of the herdsmen awakes the echoes, and sheep, horses, mules, and goats, attend to the well-known summons. Then the shepherd heads his flock, and advancing into such pasturage as he thinks best suited for them, he guides them on their way: a further signal is given when he will lead them to the river; and another when they are to be taken homeward. Who could observe the habit of the shepherd, or even hear the far-off signal, without thinking of the words of our Lord—"My sheep hear my voice, and I know them, and they follow me?" Who could fail to appreciate the beauty of that image, addressed originally to a pastoral people, but designed to guide and cheer every true believer in Jesus Christ to the end of time? "The Lord is my shepherd; I shall not want.

He maketh me to lie down in green pastures : he leadeth me beside the still waters." Glorious promise to the pilgrims through a desert land, who are walking onwards to their home, and who, like the sheep of the wilderness, can only go safely or happily while following the guidance of their leader.

Miss Roberts, in her "Elements of Conchology," has recorded a pastoral usage of simple piety. "A sort of speaking-trumpet," says this writer, "made either of the *buccinum* or the bark of the cherry-tree, is also in much request among the inhabitants of alpine districts. When the last rays of the setting sun appear on the horizon, the shepherd who dwells highest upon the mountain blows his horn, and calls aloud, 'Praised be the Lord.' The neighbouring shepherds then leave their huts, and repeat the words ; the sound lasts for several minutes, while every cave and mountain echo repeats the name of God." The herdsmen then bend their knees in prayer ; and thus God is adored in the sublime scenes of his own workmanship, and "Glory to God in the highest" goes up from the voice of assembled shepherds now, as it was once proclaimed to shepherds by the heavenly host, when the angel came to tell the glad tidings to man of the birth of the Redeemer.

But we must return to our common whelk, whose spiral shell led to this digression. This animal is a valuable article of bait, and is also much eaten, but only by those who cannot procure better food ; for it has not any excellence of flavour, and is hard and tough. Large balls of the eggs of the whelk lie everywhere about the beach, sometimes of the size of an orange, at others as if two or three balls were clinging together. The sailors call them bladder-chain, and fisherman's soap ; the former name is very appropriate, as the balls look as if chains of yellow bladders were wound round and round. At one stage they only contain a white liquid, but later in the season we may find the little whelk within. They are used by men about the coast for washing their hands ; not because of any cleansing

property which they have in them, but because their somewhat rough surface may serve to remove the tar from the hands of toil, as effectually as a coarse rough towel could do.

Another kind of whelk, almost equally common, is the stone or dog-whelk (*Buccinum lapillus*), which has yellow zones around it, and is interesting as having been one of the shells which furnished the valuable Tyrian dye, of which we read in Scripture and in ancient history. The truncated murex, or rock-shell (*Murex trunculus*), is the other shell-fish from which this costly dye was procured, and it appears to be the species called the *pur-pura*; or purple. Michaelis thinks that Solomon alluded to the spiral form of these shells, when he says, "The hair of their head is like purple," meaning that the tresses were tied up in a spiral or pyramidal form on the top. The royal purple was highly prized for robes and various decorations. Parchments and vellums were coloured with this brilliant hue, in order to set off the golden or silver letters traced upon them. Biblical manuscripts, copies of the parables of our Lord, and various religious books, were, in olden days, richly adorned with this purple. Many of the monks spent great parts of their lives in writing and illuminating these manuscripts; and half a century was not deemed too long to devote to the work of copying in beautiful writing the words either of the apostles or saints, and enriching their margins and capital letters with devices on a deep blue or scarlet ground.

The blue which we find in Scripture so frequently associated with the purple, is supposed to have been derived from another shell-fish, which sometimes sails in considerable numbers into our seas. This is the common ianthina (*Ianthina communis*), in shape something like that of the snail, but looking as if cut out of thin, purplish porcelain. On such of our shores as are washed by the Atlantic it is often seen, and the fishermen's wives call it the bullhorn. The little mollusk is slightly tinged with purple, and emits a purple fluid which will stain

paper. Its fragile bark sails securely in the deepest seas ; and when the waters are unrippled by winds, it floats along with its foot upwards, upheld by a little organ resembling a bubble of foam. It is blown hither and thither, at the light breath of the summer wind ; but if a rougher breeze arise, the tiny animal withdraws its head within its shell, takes in its float of bubbles, and sinks into the bottom of the sea. This sea-snail is remarkably phosphorescent. It serves as food to the fishes and sea-birds.

A deep and rich violet colour is emitted by a very common naked mollusk of our shores, called the sea-hare (*Aplysia depilans*). This liquid will stain a cambric handkerchief of a brilliant tint, but the dye is not permanent. The water, too, is tinged to a great extent, if any alarm causes the animal to discharge the colour. Pliny, and other old writers, described the sea-hare as so venomous that it was unsafe even to look at it, while the mere touch of its acrid fluid would cause the hair to fall off. Our poor little sea-hare, however, is perfectly inoffensive, save that it has an unpleasant odour ; though Darwin found that a large species, which he saw on the shores of St. Domingo, emitted a secretion that stung the person who touched it rather sharply. This animal is a purple lump of fleshy substance, but would at once remind one of a hare, from having two thick feelers, which are scooped out, and very similar to the ears of that animal. It does not resemble the fleet creature, however, in its motion ; for on looking down through the clear water of the rocky pool, we may see it slowly wending its way over the ground much as a slug would travel over a cabbage leaf. It eats the small sea-weeds.

The periwinkle (*Turbo littoreus*) is too well known at our sea-side places to need any description. Though hanging to the rock, it does not fix itself firmly like the limpet ; but its light hold is often its means of safety, for no sooner do we touch it than it rolls down among the brown sea-weeds, so like itself in colour, that it often thus escapes us. At low water, the periwinkles may be seen as

if they were crawling after the waves, anxious to regain their native element, moving on steadily, though slowly. The mollusk is little eaten in our land, save by children; but it is very valuable to the poor of some countries.

Several species of turbo have very ornamental shells; but there is hardly any British shell more beautiful in colour than the little oblong kind, called the childish phasianella (*Phasianella pullus*), spotted and waved, as its highly polished surface is, with purplish red, crimson, chocolate, and brown, on a whitish ground. It is plentiful on many parts of our coast, but not so on those of the north and east of Britain.

Few shells are more similar to those of our land-snails in form than is the pretty glossy brown species, called the sea-snail (*Nautica monolifera*). It is very abundant on our sandy shores.

The false-wentletrap (*Scalaria pretiosa*), a very long spiral shell, of a whitish colour, and thickly ribbed, is another frequent species. Then there are parasitic shell-fish, which infest living animals. One of these, the styliifer, is among mollusks what the ichneumon is among insects; dwelling within the fleshy substance of the star-fish, almost hidden from sight, but, like the parasitic insect, avoiding the vital parts of its victim. It is never found except in the rays, and it looks like a little glass bubble.

But as the thoughts revert to bygone rambles on the shore, many shells which we have found there recur to mind, but must be left undescribed. Most of the common and remarkable species are here mentioned, yet we feel as Spenser did, when of old he said,—

“ Oh what an endlesse work have I in hand,
To count the sea's abundant progeny!
Whose fruitfull seede far passeth those on land,
And also those which wonne in the azure sky!”

Some of the eggs of the mollusks frequently attract our attention on the shore, and often puzzle those unacquainted with them. There are those of the sea-snail, looking much like pieces of dried biscuit; and the rock-oyster is sometimes covered with crowds of little straw-

coloured vase-like objects, which are the eggs of the dog-whelk. Many shell-bearing mollusks place their eggs in a nidus, something like a sponge, where the young remain for a time. Some hide them in holes in the rocks ; some fasten them to sea-weeds ; but to all the Great Creator has appointed some safe means of depositing them.

One of the most remarkable clusters of eggs is that of the common cuttle-fish (*Sepia officinalis*). Lying on many sandy shores we may find during the summer an object which looks like a bunch of purple grapes. If we examine it we see that the covering of these grapes is tough and leathery. Within is a quantity of white slime ; or perhaps the young cuttle-fish, just ready to emerge from it, with eyes much larger in proportion than they are when it is fully grown, lies within the egg. Perchance, on looking further, we may find the grown cuttle-fish itself, or we may find its bone in the shape of a white oblong substance, composed of layers. We all know this substance, because the white layers are reduced to powder for pounce, or given to caged birds, to supply the absence of such particles of lime or flint as they would swallow when in their wild state. The animal itself is about a foot long, of a fleshy nature, white, and with very large eyes. Like all the sepia tribe, its head is surrounded with numerous arms, or tentacles, covered with suckers. It walks with the head downwards, and by means of these flexible limbs, it can either swim or crawl, the suckers acting like cupping-glasses, and enabling it to hold with great tenacity. The long, white, bony substance is its internal framework ; and we find it on our shores much more frequently than the cuttle-fish itself ; for though the storm brings the animal there occasionally, yet it is more often procured by the dredge, as its home is in the deeper waters. It is not possible to keep it long alive in a vessel of salt water, nor is it a pleasing animal to look at ; its large eyes and parrot-like beak indicating that it possesses the fierce nature which characterizes all the species.

The cuttle-fishes were described, by the old writers, as very cunning animals ; and though the accounts were exaggerated, yet they certainly seem no way deficient in art. Darwin, in his "Journal of Researches," says : " I was much amused by the various arts to escape detection used by one individual which seemed fully aware that I was watching it. Remaining for some time motionless, it would then stealthily advance an inch or two, like a cat after a mouse ; sometimes changing its colour. It thus proceeded, till having gained a deeper part, it darted away, leaving its dusky train of ink to hide the hole into which it had crawled."

" While looking for marine animals, with my head about two feet above the rocky shore, I was more than once saluted by a jet of water, accompanied by a slightly grating noise. At first I could not think what it was, but afterwards I found that it was this cuttle-fish, which, though concealed in a hole, thus often led me to its discovery. That it possesses the power of ejecting water there is no doubt, and it appeared to me that it could take good aim, by directing the tube or siphon on the under side of its body. From the difficulty which these animals have of carrying their heads, they cannot crawl with ease when placed on the ground. I observed that one which I kept in the cabin was slightly phosphorescent in the dark."

The inky fluid which some of the species can eject into the water, was once thought to be the material of which the Indian ink was composed ; but this is doubtful, though several kinds, like our common cuttle-fish, yield a brown pigment, used by artists, and well known as sepia. Unpleasing as is their appearance, they are in some countries much prized as food, while they are of great value to fishermen as bait.

The poulpe or preke (*Octopus vulgaris*), which is very nearly allied to the common cuttle-fish, is a much more unpleasing looking animal, with long limbs around its head, which it twirls about in every direction. If we put our hand within their reach, we

are made conscious of the touch by a tingling sensation, and a redness on the skin. They are thought to eat many crabs and oysters, and the fishermen, who believe that they frighten away those which they do not kill

OCTOPUS VULGARIS.

have a great enmity to these poulpes. Pliny, who relates great marvels of their cunning, tells us that they place a little stone between the valves of an oyster, and thus suck it out; adding, "Such is the wonderful intelligence of animals even the most stupid!" But it would seem that the oysters of modern days have grown wiser, or the cuttle-fish cannot so cleverly deposit the stones, for no one ever finds them now wedging the shell-fish in his own dwelling.

We have not in our seas any animals which can properly be called monsters of the deep; but we know of none which might have so good a claim to this character, not only by fierceness and voracity, but by repulsive appearances, as the poulpe. Yet our British species is very inferior, both in size and in terrific power, to the octopi of other seas. Among the islands of the Meia-co-shimah group, Sir Edward Belcher saw one of these creatures, which some men were carrying on a pole, and which he measured. He found that each arm was two feet in length, thus enabling the animal to reach over an area of more than twelve feet in circum-

ference. He saw also both these octopi, and some of the sepia tribe, walking about so quickly, that it seemed almost impossible to secure them. They might be seen down in the clear waters, darting about from side to side, or holding so tightly to the stones and large sea-roots, by means of their suckers, that it required the greatest force to detach them: even when caught and thrown up on the sandy shore, they shuffled along quickly over the ground, extending their long arms, and throwing out sudden streams of ink, staring about fiercely all the time with their large glaring eyes. At night these eyes are luminous, and then the creature has a still more menacing aspect as it turns them round and round in the same way as the chameleon.

The ancients, whose love of the marvellous is always evident when they speak of objects of natural history, related how some of these octopi climbed trees and palisades, and could only be resisted by the united efforts of dogs and men. They prized their flesh highly, and great numbers of octopi are still consumed in the isles of Greece by sailors; but the flesh is beaten with sticks for more than half an hour previously to cooking it.

A less indigestible food is yielded by the flesh of the sea-leaf or calamary (*Loligo vulgaris*); but this, though used in Greece, is insipid, and is not eaten in our land. The animal is often found on our shore, as it lives in the sea at a little distance from it, and it is something like the cuttle-fish in substance, but narrower in form. It swims in the sea with great rapidity. The word calamary is derived from *calamarium*, which, in low Latinity, signifies a portable writing desk, with ink, pens, and a penknife. This was given because the form of its body is not unlike an escritoire of this kind, and the long cartilaginous lance in its back, and the fluid which it ejects, are the pen and ink. The eggs are in an oval mass, first of a yellowish colour, and finally dark blue. A zoologist who once counted a cluster of them, found it to contain 39,760 eggs.

PEVENSEY BAY.

CHAPTER V.

SAND AND SAND-RIPPLES, PLANTS OF SANDS AND MARSHES,
STAR-FISHES, SEA-URCHINS, SEA-JELLIES, PHOSPHOR-
ESCENCE OF THE SEA.

How often we have been struck with the love which all classes and all ages appear to entertain for the sea-side! The robust and the sickly, the rich and poor, the child and the old man, all seem to meet before the ocean strand as friends and equals; all seem to drink in deep draughts of enjoyment which the sea, the dear old ocean of our love, is calculated to inspire. How

quickly, how kindly an acquaintance is made there—an acquaintance sometimes ripening into a lasting friendship! How gently intrusive are our attempts at conversation deemed—if indeed they are characterized as intrusive at all—the great ocean rolling placidly before us, the sea-bird skimming its clear surface, the smooth stones of the beach shining with light beneath the little wavelets, and glittering with the sunlit spray which the friendly rippling intruders sprinkle on them so prettily; the towering cliff behind us, the shipping, the fishermen engaged at their pleasant toil, all cast a spell upon us, all entrance our feelings; and while they help us to good humour, tend, too, to weaken the formalities and conventionalities of society, and make us feel for a time free and gladsome as the winds and waters. Our dispositions become more genial, our thoughts more elevated; and to the Christian, while reflecting on the wondrous works of God which lie hidden in the deep sea, the remembrance is present that God is not only the Creator, but the Father of all; that not one of the group assembling here is uninteresting to him; that the humblest there is one for whom the Saviour died. And as purer and holier thoughts come crowding on the mind, the Christian heart beats responsive to them, and the hand, perhaps hitherto kept bound to a cold breast, is held forth to clasp warmly that of another, or to give the little succour which the sick or the friendless may require, or the word of sympathy or of gentle remonstrance is uttered to any who may need it. Well! give me these moments—some of the happiest, perhaps some of the best of our existence, for it is here, at this place and hour, that the child of God is often stimulated, under the guidance of the Holy Spirit, to fulfil the behest of Him who bade us love our neighbour as ourselves; and it is here, that amidst the grand and beautiful of God's works, he is fulfilling the command and loving his fellow-creatures, because he has learned to love God.

How smooth is that broad ridge of sand, and how

does its smoothness enable the invalid to walk over its length, and yet return untired. Now we come upon a portion over which the waves have passed, and the sand is rippled too, for they have left their markings there. Who can tell whether the sand-ripples of to-day may not unfold to men of future ages some of those truths which the ripples of bygone years reveal to us? Many an undulating ripple has left its traces on the surface of some of our marine stratified rocks, and the geologist finds them still preserving their pristine form. He walks with eye intent on the sandy margin of the sea now, and sees that these small ripples leave their mark on the sand at only a small depth, while larger waves impress it more deeply. Then when he finds the ripple mark on the sandstone or other rock but slightly raised, he readily infers that these deposits were formed when the shallow waters alone washed over them. Again, when, as is often the case, they are seen to be covered by deposits of hundreds or thousands of feet in thickness, here is clear evidence that on that spot the ancient sea-shore underwent a great lowering, or the level of ocean a great rise, since those buried ripple marks were impressed by the waves on the sand. And thus, by careful investigation of these tide traces, he can infer the depth and other circumstances of the water which made them; and learn how by a gradual depression the base of that sea was lowered, in relation to the ocean level, hundreds, perhaps thousands of feet, so as to admit of the successive accumulation of new sediments, containing the remains of new races of marine animals and land plants.

High up from the shore we have, on some parts of our coast, sand-hills, or levels of a wide extent, and though, in some measure, they are held down by the roots of plants, yet on a windy day clouds of light sand come sweeping into our faces, and almost blind us. How well can we remember, when a little party of friends landed on such a shore to search for shells, how the sand swept upon us so unexpectedly that all

the refreshment brought for the day was at once spoiled. Happily all there had light hearts and good tempers, and the loss of the dinner did not check the enthusiastic pursuit of marine curiosities. But this is little compared to the occasional drifting of these sand-hills. In the county of Norfolk, as well as on others of our shores, the sand would overwhelm the neighbouring soil, were not the sea-lyme grass (*Elymus arenarius*), and the sea-reed (*Ammophila arundinacea*), planted to keep it firm by their long roots. On many parts of our coast these plants, especially the sea-reed, grow wild, establishing themselves on the loose soil, and gradually disappearing as that soil becomes consolidated; and it is a great relief to the eye, tired with looking on the wide expanse of sand, to repose itself on the waves which are made by the wind-swept grasses. Many a flower of the sandy shore springs up among them, and there the great sharp sea-rush (*Juncus acutus*), the noblest of its species, and the sharpest too, rises in tufts or in solitary grandeur on the wide waste. Very beautiful are the polished chestnut capsules which cluster upon it; and many an eager hand stretched forth to grasp them, has been drawn back as if pierced by a spear. A little further on, where the salt marsh meets the sand, the long flat leaves of the salt marsh club-rush (*Scirpus maritimus*) are waving around its angular stem, while the creeping knobbed root below is helping to form a firmer soil. The owner of the marsh land who may wish to send his cattle for pasture, will not be pleased to find it there, because it occupies so much room; but it is relished by the animals, and the roots themselves have been eaten by man in times of scarcity, when dried and ground into flour. The marsh has but a lonely appearance, though the little sea-milkwort, Newton's knot-grass as it is sometimes called (*Glaux maritima*), with its small pink clusters and thick leaves, grows all among the grass. And the thrift nods to every passing wind; and large patches of the different species of orache glisten as if covered with drops of ice, or redden into

their summer hue. There is little that is bright on the moist green sward—little to tempt us to try its dangerous footing, except the tall Michaelmas daisy (*Aster tripolium*); the tripoly star, and blue daisy of older writers, which has lilac clusters of starry blossoms, and juicy pale-green leaves and stems. How it is that people who live near these marshes persuade themselves into the idea that it is the samphire, we know not; yet as it is carried about in baskets for sale, it is probably pickled, and doubtless is quite innoxious, though of itself tasteless. The glasswort (*Salicornia herbacea*), growing in such quantities near it, with its juicy jointed stems so like a horn, is certainly better adapted for pickling; while the soda which its ashes yield made it valuable in former times to the glass manufacturer. The white flowers of the scurvy grass (*Cochlearia officinalis*) grow on the muddy shore below, and their pale, pointed, green juicy leaves are gathered there to make some vegetable drink for the invalid.

But we will leave the marshes, and go down nearer to the ever musical, ever beautiful sea, and there we shall find flowers too, though not in great abundance; flowers which we can find on the sea-sand only. Such is the sea-holly (*Eryngium maritimum*), with its large, veined, prickly leaf, so like that of the shrub whence it has its name, that any one may know it. It has a compact head of blue flowers, which might remind one of a small teasel. Gerard said of its roots, that they were “good for such as are bitten of any wild beast;” the young shoots are eaten as asparagus.

The pretty sea-side convolvulus (*Convolvulus soldanella*) is one of the loveliest flowers of the sand, and, though not to be found on all parts of our coast, is very plentiful on some. On the sand-hills of Swansea it is very abundant, and a friend of the author's wrote some lines on the flowers there.

“ All before me stretcheth ocean,
 All behind me, yet not near,
 Swelling hills that seem in motion
 When thick fogs begin to clear:—
 July sunbeams smile before.

But among these sands of Swansea
Few the pleasant flowers I find,
Wild horse-radish, wormwood, pansy,
Bent-grass rustling in the wind;
And the pretty pink convolvulus,
That scenteth all the shore.

CONVOLVULUS SOLDANELLA. (*Sea Convolvulus*.)

Some very beautiful plants of this flower flourish on the Scottish shores, and one of the finest specimens which the author ever saw, was gathered near the Cave of Borrowdale, in the Hebrides, remarkable for having, on one occasion, sheltered prince Charles Stuart. The flower is of a purplish pink, with yellow plaits.

Growing there on the sandy mound afar from the waves, is that little thorny shrub called the sallow thorn, or sea-buckthorn (*Hippophae rhamnoides*), with narrow leaves, which, as the wind blows, "turn up their silver lining to the light," and which are far more conspicuous than its minute flowers. The autumnal fruits, with their orange tint, are not only lovely to look upon, but pleasant to taste, though rather acid. A yellow dye abounds in the whole plant.

Then, on some of the shores of Cornwall and Dorsetshire, we may gather some few plants of wild asparagus; the sparrow-grass, as even learned writers called it a few centuries ago. The conspicuous though dull white flowers of the mountain garlic (*Allium carinatum*) also are to be found on sea-sands, sending their unpleasant odour on the dews and zephyrs. Old writers said that no plant would flourish near it. It is of little use to us, but the Kamschatdales gather and store it for winter use.

More common than this, and assuredly more welcome to the rambler on the sands, is the sweet odour of the little burnet-rose (*Rosa spinosissima*), and all are glad to see its dark green spray of small leaflets, and to gather its cream-coloured flowers, spite of the immense number of prickles which guard them by crowding every stem and branch. Who does not love the rose? Who can wonder that the ancients chose it to deck the tomb of the departed friend, though we may not enter into the notion of one of the classic poets, "This is the amulet whereby no ills their tombs molest." "The rose," says a learned writer, "is the essential part of all the ornaments of the earlier Christian architecture; even the shape of the windows, doors, and towers may be traced to it, as well as the accompanying decorations of flowers and leaves." Another kind of rose, called the dwarf-fruited rose (*Rosa rubella*), sometimes shares with the burnet-leaved species the maritime sands; and patches of the sea-side pimpernel (*Arenaria peploides*) are often conspicuous there, by their rich green, juicy leaves, though the small white flowers closing early in the day are little seen among the mass.

But the tide has left behind it large stores of living things, some of which are hurrying onwards or creeping slowly to regain the sea. Many of the common star-fishes are wonderfully constructed, and any one who wishes to be acquainted with them should read the valuable work of professor Forbes on the subject. To the geologist this tribe of animals is remarkably inte-

resting, because the stalked star-fishes, crinoideæ, were in long past years among the most numerous of the inhabitants of the seas. "So numerous," says this learned writer, "that the remains of their skeletons constitute great tracts of the dry land as it now appears. For miles and miles we may walk over the stony fragments of the crinoideæ—fragments which were once built up in animated forms, encased in living flesh, and obeying the will of creatures among the loveliest of the inhabitants of the ocean. Even in their present disjointed and petrified state, they excite the admiration, not only of the naturalist, but of the common gazer; and the name of stone lily, popularly applied to them, indicates a popular appreciation of their beauty." These lily stars, these graceful waving creatures, which in all probability passed their lives fixed to one spot by their stems, in the depths of the ocean, are now almost gone. Scarcely a dozen kinds of these beautiful animals are known to exist in modern seas, and even these, so far as the present knowledge extends, are only affixed to the stem at an early period of life, acquiring afterwards their freedom. He therefore who would see the old form in its exactness, must look at the stone-lily, the beautiful encrinite which the geologist places in his museum, from the encrinite marble of Derbyshire or of similar districts.

Over the seas where these graceful animals lived and died, man has come to dwell, and the ancient castle and cathedral spire rise above the cottage home; or the mansion, and waving fields, and green meads, and embowering woods catch the gleams of sunshine, or the shadows of the clouds. But star-fishes dwell in our seas, which were in the earliest periods of life affixed to stalks, though they were not known to dwell there until the year 1823. The rosy feather-star (*Comatula rosacea*) is a small animal, having five arms or rays, which being double, look like ten. It is of a deep rose colour, dotted with brown, and is about three-fourths of an inch in height, its stalk being pentangular. The dis-

covery of this animal was made by Mr. J. V. Thompson, and zoologists of all nations were greatly interested about it. It was taken in the Cove of Cork, attached to the stems of some zoophytes. The young star-fishes waving on their stalks, have since been found on seaweeds in great numbers. They are active little creatures, even in their fixed condition, and when older are able

COMATULA ROSACEA.

to swim with great freedom. When a newly caught feather-star is put into fresh water, it usually contracts and dies, and if not killed thus, or by the application of spirits, it breaks itself into pieces, and dies, giving out, in its last moments, a rich purple colour, which tinges the water.

Although this beautiful animal abounds among the sea-weeds of rocky places, and may be procured by dredging, yet it is not always to be seen by those who stray along our shores. Not so, however, is it with some of the common star-fishes, which we may find almost anywhere, and at any time, thrown on the beach, or moving about in the shallow pools with great rapidity. In many places, especially on the eastern

coasts of England, numbers of the common brittle star-fish (*Ophiocoma rosula*) are twisting their long, slender arms incessantly; and though we feel little inclination to touch them, because of the strange contortions of their limbs, yet the colours of some of them are very beautiful, the disk being of white or dull rose colour, marked sometimes with a red or yellow star. Should we overcome our dislike to its strange attitudes, and take it up to look at it, one arm after another separates itself, and we find ourselves holding nothing but the disk around which they grew.

All the brittle stars have these threatening actions, and this strange power of breaking themselves up. Of the more slender and rare species, called the thread-rayed brittle-star, professor Forbes relates, that when dredging in the Bay of Rothsay, he found at first one of the thread-like arms of the animal, winding in the mud. "Arm after arm," says this writer, "occurred, but no body; at length the skeleton of a body was found, and when I had begun almost to despair of finding anything like a disk, an almost perfect specimen occurred. A few days after, dredging in similar ground in the Gair Loch opposite Greenock, I was astonished by the sight of masses of interlacing arms of the same animal, as large as a man's fist, coming up in the dredge. They were all alive and twisting in every direction; yet strange to say, there were no more than seven or eight disks secured." In this case the arms being so easily separated, had been broken away by the dredge. Another species had arms so thread-like and fragile, that the only perfect specimens were such as had been dried in a heap of sand, as it was impossible to kill them without breaking them into innumerable fragments.

But we must not dwell upon rare species. Common ones lie on the shores, and deserve our notice, by their remarkable structure. The common star-fish, or cross-fish, or five-fingered Jack (*Uraster rubens*), is known to all who visit the sea occasionally. It is yellow or

orange, or perhaps of deeper red or purple, and its skin is tough and leathery; a full-grown specimen being often about nine inches across, and its rays five or six in number, tapering to a point. The mouth is on the under surface of the body, and a deep groove runs from it, along each arm, to the point. In these grooves are

URASTER RUBENS.

a number of suckers, which are capable of adhering even to the smoothest surfaces, and by means of which the animal can walk with great facility. The star-fish should be kept for a while in a vessel of salt water, if we would observe its remarkable structure, and the manner in which its hundreds of little feet can work. Any one who should look at them, and see them coiling and feeling about would think they were numerous worms, each independent of the other. Touch one of these suckers, and immediately several around it draw themselves in, changing from a little stalk-like organ, to a small knob of flesh. This cross-fish is so abundant on some shores as to serve the purpose of manure, and while living it clears the shore and the sea of various decomposing

matters, eating an immense quantity of food, and holding it down with its suckers. It is so destructive to the oyster fisheries by insinuating itself between the valves of the oyster-shell, and swallowing the animal, that the fishermen of Newhaven tear these star-fishes open, when they come up in the net, before returning them to the sea. On almost all parts of our shores the people have a superstitious dread of some or other of the star-fishes, and dislike to touch them. With the notion common among the superstitious, they think that several strange-looking creatures are in some alliance with the great enemy of man. Dr. Drummond, while drying specimens of these star-fishes in his garden at Bangor, heard children saying on the other side of the hedge, "What's the gentleman doing with the bad man's hands? Is he ganging to eat the bad man's hands, do ye think?"

Voracious creatures as the star-fishes are, none seems more so than another common species called the sun-star, and in former days termed the sun-fish (*Solaster papposa*). This being a native of deeper seas than the cross-fish, is not so general, though sometimes after a rough wind numbers are thrown on the shore; and if we go down to see the fisherman empty his nets, we shall often observe this among the living things which he rejects. Its name will serve well to characterize it, for surrounded by its rays, twelve or thirteen in number, and bright in its hues of yellow, and especially of red, it is not unlike those representations of the sun which beam from the sign-boards of the inn, or which adorn the children's books of older times. It is, sometimes, however, of purplish hue. Like all the species it furnishes food for fishes and other marine animals.

Then there are cushion-stars, and bird's-foot-stars, and sand-stars, which last have long worm-like arms, ever twisting and twirling. These prefer sandy places, though certainly not for the reason assigned by Reaumur, that they are too frail to encounter the rough edges of rocks; for, as professor Forbes remarks,

had he only walked along the sea-shore he would have seen plenty of the far more delicate brittle stars, moving in the midst of rocks with perfect safety. It is quite

OPHIURA TEXTURATA.

amusing to watch a number of the common sand-stars (*Ophiura texturata*), which the receding tide has left behind. They sometimes seem as if seized with a unanimous desire to overtake the wave. On they go, never interfering with each other's progress, but the points of their arms touching each other, so as to make a good representation of a piece of what ladies term crochet work. They will find their way into the sea too, if no one hinders them, now and then leaving behind them an arm, which in coiling about probably came in the way of a stone, or became entangled in a mass of sea-weeds.

One of the most elegant of our star-fishes, the butt-horn (*Asteria aurantiaca*), is said by Mr. Bean to owe its name to an odd notion of the fishermen. The first star-fish of the species which the Cornish fisherman takes, is carefully made a prisoner, and placed on the

stern of the boat. When he hooks a halibut, which is here termed a but, he immediately sets the poor star-fish at liberty; but if the fishery is unsuccessful, he ignorantly attributes it to this animal, and it is left to perish far from its native element.

There is a star-fish of a rare kind, which has arms so branched and curled in among each other, that the animal looks like a mass of entangling tendrils. This is called the Shetland argus (*Astrophyton scutatum*), and it no sooner perceives its prey, than, stretching out these arms, it seizes them as in a net. So singular an animal has long been noticed; and Bradley, in his Wonders of Nature, well remarks, "So odd a creature as this is well worth the contemplation of such curious persons as live near the sea, where every day they have subjects enow to employ their curiosity, and improve their understanding."

The engraving will represent to any one used to the shore, a crust or shell, which he has often seen rolling over the sand as the wind stirs the sea-weeds. It will be known at once as that of the common sea-egg or urchin (*Echinus sphaera*), in the state in which we often find it on the shore, with all the spines rubbed off, or in which we frequently see similar species extracted from the chalk or other cliffs. This shell or box is

SHELL OF GLOBULAR ECHINUS.

of most curious construction, and its parts jointed together with such marvellous compactness, that the little ball can remain unbroken when tossed by winds and waves; while extinct species are found as perfect after ages have rolled away, as if they were made but yesterday by the living urchin. "There are," says professor Forbes, "above 300 plates of one kind, and nearly as many of another, all dove-tailed together with the greatest nicety, and regularly bearing on their sur-

faces above 4,000 spines, each spine perfect in itself, and of a complicated structure, and having a free movement in its socket." Have we not here a remarkable evidence of the skill of the great Creator, and shall not these calcareous crusts, which the rough wind drives before it, be to us like the stars on which our thought dwells at eventide, uttering some tidings of God, even though they have no speech nor language, and though their voice is not heard?

The sea-eggs are little eaten in our country, though the larger kinds of other seas are often a valuable source of food, and many a mariner stranded on an inhospitable shore, has gladly fed on this and other species. It is eaten too by fishermen on some parts of our own coasts, and the roe, which is of an agreeable flavour, is esteemed a great delicacy in the southern countries of Europe. The animal within has a no less beautiful structure than the shell; nay, its structure is higher, for it is endowed too with the mysterious principle of life. Without entering into minute anatomical details, we will notice such only as are obvious to every one who picks up a sea-egg, and looks at the animal and its crust. There is a little aperture at the top of the shell, and without any microscope we may see around it the five ivory teeth which belong to a most minute and complicated dental apparatus. Placing the animal in water, and taking care not to frighten it, we may offer it a piece of coralline. The teeth soon fasten on this with so tight a hold, that we may swing the sea-egg backwards and forwards, and unless our coralline snap with the weight, the animal will hold on thus for an hour, and at length, if we will permit it to do so, will nibble it with great contentment. Then that little urchin, encased in its sphere, is no bad walker, and it can not only travel along the bottom of the pool, but can clamber the sides of the rugged rocky precipices, and anchor itself at will. Even the smooth sides of a glass vessel form no hindrance to its progress. Hundreds of spines, all jointed on to the animal within, are

put in motion as it walks ; and besides these, an immense number of little suckers or feet, just like those of the common star-fish, come through the pores and aid in the progress. No wonder that with 4,000 spines, and more than 1,800 suckers, our little urchin can wander over the rocks, munching as it goes the tiny corallines, with all the little polypes which their cells contain ; or can hold on tightly with teeth and suckers, when it chooses to be still, and to lie in wait till the crab, with sideways motion, comes near, and is seized by its suckers, or till the fish, gliding on in the tranquil water, is pounced on and paralysed by their touch, and being brought to the mouth and speedily digested, serves to allay the appetite of the hungry creature. We have not been made conscious of any stinging power possessed by this species, but some sea-urchins of other shores are well known to have the power of giving severe pain by the touch of their suckers. Instances are recorded in which the sea-urchin has darted these spines into the hand, and left them there ; and those who have been thus wounded have found their presence as painful, and their removal as difficult, as if they had filled their hands with thorns by grasping a bramble.

Do not imagine, if you find one of these sea-urchins clinging to a rock, that it will yield its hold to your slightest touch—you must use considerable effort to remove it. One of the species can actually bore its way into the rocks, making little circular cavities deep enough to hold more than two-thirds of the animal ; and in order to make itself more comfortable, or to gratify its taste, or perhaps to preserve its spines from injury, it lines the cavity with corallines. The purple-egg urchin (*Echinus lividus*), which has long purple spines, has been seen thus occupying cliffs where the rock projected into the sea, so as to make the ledges accessible at low water, and which were never left entirely dry. These ledges were full of holes perforated by the animals, and thousands were lying, each one in a cavity fitted to its size, the little ones in small holes, and the full-grown

echini in larger ones. Mr. W. Thompson, who saw a group of them, says that their purple spines and regular forms presented a most beautiful appearance, studding the pools which lay among the grey limestone rocks.

Several other species may be found in abundance about our coast; there is the green pea-urchin, whose spines, when the animal is living, are of green and gold, very frequent among shell-sand; and the pretty little purple-tipped sea-urchin, which seems to like the company of oysters and scallops, and is often dredged up with them, or cast by the wave ashore.

The piper, a large and singular species, is the most elegant of all, but it is rare, and apparently confined to the Zetland seas. In museums in sea-coast towns, we sometimes see it with thick spines, sometimes an inch and a half long, which the fishermen compare to the drones of a bagpipe, and it is also called king of the sea eggs.

But besides the globular sea-eggs, there are some termed head-urchins, and some flattened species termed pancake-urchins, which, when the spines are rubbed away, are seen to have their calcareous shells deeply indented with a star. The same form is also observable on the fiddle-urchins, which have this familiar name because of their form, which resembles that of the musical instrument. One of these head-urchins, called the mermaid's head, is very common on our coast.

It is surely an encouragement to us to love and cultivate in our own minds a sense of the beautiful, when we see that beauty marks the works of the great Creator. He has made everything beautiful in its season. Not a moment can be spent on the shore without perceiving it. There are those jelly-fishes, dancing in the sunny waters. Has mortal man, even the most gifted, ever made forms, or colours, or motions, which could at all compare with them? They lie among those curling waves, pure as crystal, reflecting, as a soap bubble might do, every brilliant hue of light. We see them there in numbers; but only those who have

examined that world of waters before us, can form any conception of the multitudes which are never in their individual forms seen by human eye. There they sail, beheld only by Him who created them. The larger living creatures of the waves find their food in their innumerable multitudes, and though we see them not individually, they yet in their numbers lend their light at night to the brilliant phosphorescence of the sea, a phosphorescence charming with its beauty those who frequent our shores. The moon shines out on the still waters, and the gentle ripple of the wave, and the faint sound of the plashing oar, perhaps the song of the sailor boy, bids us linger. Wherever that gentle wave falls, wherever that oar breaks the water, there myriads of little lights come sparkling up, or a line of green and silvery light seems left in the train of the boat.

A still brighter light invests the seas of the tropics, which are

“ Spangled with phosphoric power,
As though the lightnings there had spent their shafts,
And left the fragments glittering in the field.”

When we think how many marine animals, both living and dead, are made to emit this phosphorescent light, we are almost ready to believe that the depths below must have a light as clear as that we enjoy who owe our light to the sun. Various crabs, cuttle-fish, shell-fish, nereides, star-fish, zoophytes, and others, whose names are unknown to any but zoologists, aid with jelly-fishes, and innumerable little gelatinous worms, in giving light, while we know that fishes just dead also emit phosphorescence. The knowledge of this latter fact is practically serviceable, sometimes, to people near the sea ; and the writer knew a body of workmen who always hung dead fish in a dark passage through which they had occasionally to pass, that their gleaming lamp might direct them.

But though larger animals diffuse their light in the depths, yet that portion which reaches us is doubtless chiefly caused by microscopic jelly-fishes and infusoria.

Dr. Poeppig, in his recent voyage to Chili, thus describes some of the animals which cause the phosphorescence of the sea. From the topmast the sea appeared, as far as the eye could reach, to be of a dark red colour, and this in a streak the breadth of which was estimated at six English miles. "As we sailed slowly along," observes this writer, "we found that the colour changed into brilliant purple, so that even the foam which is seen at the stern of a ship under sail was of a rose colour. The sight was very striking, because this purple streak was marked by a very distinct line from the blue waters of the sea, a circumstance which we the more easily observed, because our course lay directly through the midst of this streak, which extended from south-east to north-west. The water taken up in a bucket appeared indeed quite transparent; but a faint tinge of purple was perceptible when a few drops were placed in a piece of white china in the sunshine. A moderate magnifying glass showed that these little red dots, which only with great attention could be discerned by the naked eye, consisted of infusoria which were of a spherical form, entirely destitute of external organs of motion." This writer calculates that the space covered with the colour was about one hundred and sixty-eight square miles; and as these animals may have been equally distributed in the upper stratum of water, their numbers must infinitely surpass all that human calculations can measure.

Some of our writers who have given most attention to the subject, agree with Dr. Baird in thinking that a luminous property is given to all the marine animalcules, and that the little creatures of various tribes, each no larger than a grain of sand, possess this faculty as a defence, and also as a means of procuring their food in the deep and fathomless waters. That the medusæ, or sea-jellies, give out light, has been proved beyond all dispute. Several of the hemispherical species were put in a spoon with a small quantity of sea-water, and held over a burning candle. As soon as the water

was hot they appeared like burning wheels, the spots at the margins and centres alone emitting light, in which manner they shone uninterruptedly and vividly for about twenty seconds, when they shrank and died, losing their luminousness with their lives. Various other experiments proved that these minute animals, like the polypes in the coralline, emit the light chiefly under irritation.

Sailors, who row us in the boat by the shore to look at this phosphorescence, tell how such sights have, in other days, foretold of storms; but many a billow rages, and many a wild wind utters its solemn chant, which were never foretold by this light on the wave. So far from this, Dr.*Baird observed, that these little animals, with quick perception of the coming storm, take refuge from the agitation of the sea, in its stiller depths. From long observation this gentleman believes that the phosphorescence is more brilliant, and more generally diffused over the surface of the water, immediately before or during a light rain; and when, as it does occasionally happen, the sea is particularly luminous in bad weather, it is produced by the larger jelly-fish, and not by these minute creatures.

The study of these medusæ is very difficult, because of their extreme delicacy, and in most cases it is impossible to preserve them. Until recently a few fragmentary accounts of them was all that could be procured, and even yet much remains to be learned. To professor Forbes, all who would study the marine animals are much indebted. Few, like that great zoologist, will, from among other labours, bestow so much time in observing them; few have his extent of knowledge and power of description, and still fewer that patient and persevering determination by which alone the minute can be seen and understood. The form of the greater number of jelly-fish is that of an umbrella, more or less convex, and in some cases more like those round glass-shades which are placed as a protection over statuettes. The margin is usually a little raised, and is

provided with numerous feelers, the bases of which are like little knobs, often of a deep colour, or marked with a brilliant spot; while other jelly-like organs of variable form and dimensions depend from the centre, at the extremity of which is the mouth leading to the stomach beyond.

A beautiful little species, common around the Isle of Wight, and gleaming there like a scarlet berry, is described in so simple and interesting a manner by Dr. J. F. Davis, that we will quote it for our reader from professor Forbes's monograph on the naked-eyed medusæ. This species is called the scarlet cyanea (*Cyanea coccinea*). "Having been discovered," says the doctor, "by Mrs. Davis, who had likewise the best opportunity of watching its motions during several weeks that she kept it in a glass of sea-water at Tenby, and afterwards here, (Bath,) whither it was conveyed in a phial of the same, and lived three weeks after its arrival; I will state the history of this thing of life and light in her own words:—'One morning while pouring some sea-water into the vessel containing the sea-anemones, I observed two small objects, which I took for the young of these animals, and as quickly as possible raised them in a spoon out of the basin, and placed them in a tumbler of clear sea-water. They resembled tiny bell-glasses; four transverse rays were perceptible on their sides, and a minute red body with four white arms forming a cross was suspended in the water. Around the edge of the bell or disk appeared a delicate white fringe, which was lengthened or shortened at the pleasure of the animal. The contraction was sometimes so great as to give the fringe the appearance of being knotted up to the edge of the bell or disk. It was highly interesting to watch their movements in the water as they ascended from the bottom, the bell or disk contracting and dilating alternately, until the animal arrived near the surface of the water. This motion was particularly conspicuous at the edge of the disk, and the fringe or tentacula became shortened as the animal rose in the

water; but when they descended again, the tentacula lengthened sometimes to a great degree, after which the animal sank gradually without any visible effort.' This lady adds that after a fortnight one of her pets turned itself inside outwards and died, leaving, as all the jelly-fishes do, only a few particles of fibre; the other lived more than two months, and even bore a journey to Bath in a closed phial of sea-water, when it shrank and died, though without performing the feat of turning itself outwards."

Another very elegant little creature (*Oceania episcopalis*) has been seen, with multitudes of its companions, on the great fishing-banks of the sea near the Zetland Isles, swimming close to the surface of the water, with a central portion of a rich mulberry colour, hanging down from its crystal bell; another is described by Mr. Landsborough, and as so few of us have had the opportunity of examining these minute creatures, we do not hesitate in quoting the description from the learned work in which they occur. "The transparent bell," says this writer, "which rose above its body, was so very pellucid that it was a good while before I observed it at all. It rose to a considerable height above the buff-coloured body of the animal; and it was elegantly shaped, like the fine crystalline shades often placed over stuffed birds or artificial flowers, or miniature figures formed of pure alabaster—the finest crystal vase was clumsiness itself compared with it. It was as fine as the transparent soap-bubble blown out of a pipe; and we doubt not that, like this bubble, it would have been iridescent, had it been so placed as that the sun could have shone upon it. Delicate as its fabric was, the vigour of the little creature was very remarkable, and has been well compared to the efforts of a strong swimmer, as it alternately contracted and expanded its pellucid organization. The margin of its mouth had a close fringe of brownish tentacula. By aid of the lens I could observe that they were drawn in when the body was contracted, but that at every stroke

they were protruded like forked lightnings, or like feathered serpents, darting and flashing forth till they were longer than the body of the animal."

Such are the minute and exquisite creatures which contribute to the light upon the waves. Who can think of their number and their beauty without exclaiming with one of old, "Thy way is in the sea, and thy path in the great waters, and thy footsteps are not known?"

We may not linger among these interesting creatures, or stay to describe one like a little balloon, moored by fine silken cables, or another with black spots on the little knobs of its fringe, which are conspicuous as it glides in the water; or of a third which wears such countless numbers of these dots, which are supposed to be organs of sight, that, as professor Forbes says, "Argus, the hundred-eyed, must yield to it." There are species shaped like a Chinese hat. Many are vividly coloured with pink, purple, orange, red, lilac, green, or blue; while the species which is the most phosphorescent of all the British medusæ, is nearly colourless, and is about an inch or an inch and a half in size. Zoologists term it *Geryonia appendiculata*.

Who could think that creatures delicate as air-bubbles could digest the well-coated crab or shrimp? Yet beautiful little jellies, of about a quarter of an inch in length, can devour animals larger and more highly organized than themselves, seizing them and eating them with great eagerness, and apparent enjoyment. An individual has often been observed to seize and swallow a jelly-fish quite as large as itself; and yet to look at them one would think them types of fragility and delicacy, and never believe that their food could be other than the animalcules which lie around them. It is not always, however, in the contest between the jelly-fish and the crustacean that the former is victorious. A friend of the writer's once placed a beautiful medusa in a jar of sea-water, and having procured for its food some living shrimps, left it to its enjoyment. A few hours afterwards this naturalist went to look at his

crystal friend, when, lo! the shrimps had feasted on the jelly-fish, instead of the jelly-fish on the shrimps.

Let not the reader think that these small medusæ are inaccessible, and must be left altogether to the observations of the scientific. Some of them are very general, and in great plenty around our shores, and if, on a summer or autumn evening, he will take a little muslin bag attached to a metal ring, place it at the end of a stick, and sail slowly over the water, holding his net there, it will soon be filled with small jelly-fishes, some of which he may see without the aid of a microscope, while others may be carried home in a phial for closer observation. Let him not be disappointed, if when brought out of the water they seem to have lost all their beauty; a few minutes' gliding in a basin will restore it, although they will need the reflection of a bright sunshine or of a strong lamp, to exhibit it vividly.

But without giving ourselves any further trouble than to stoop down on the shore to pick up what the storms have brought, we may see some of the larger tribes of jelly-fishes. Blubber-fish, jelly-stangers, starch-fish, and other names are commonly given to them by the fishermen, and the name of sea-nettles (*Acalephæ*), though deserved by few, is given to them all.

We do not wonder that any one who was ever stung by that common species, the hairy cyanea (*Cyanea capillata*), is rather careful how he touches a jelly-fish. We have sometimes felt its pricking, tingling touch during bathing, and borne a remembrance of it on the skin for an hour or two. Yet it is a lovely creature, marking its track through the water by a long tail of threads, while its flat mass of jelly flaps about very gracefully. It is these threads which form a fringe around the animal, that have the stinging property, and which render it a true nettle; nor is the stinging power less when they are cut off from the jelly.

Two other British species are considered by professor Forbes to possess also stinging properties; but though,

as he says, he has endeavoured by various means of irritating other kinds, to elicit "nettling proofs of rage," and has rubbed hundreds of them together, and grasped them and stirred them, yet they were harmless. This naturalist thinks, however, that it may be found, that either at particular seasons, or under particular circumstances, other species may sting. He adds that Dicquemare has stated that some species of ocellaria sting slightly only when they touch any sensitive part, as the eyes. Our author humorously remarks, "that not being ambitious of suffering stone-blindness, he has not ventured to repeat the worthy abbé's experiments, as he prefers keeping his eyes intact, to poking medusæ into them."

There is a poor inoffensive jelly-fish which the wave brings to every part of our shore. Gentle reader, if it is swept to your feet, after you have well looked at it, throw it into the sea as far as you can, for it will soon, if away from its native element, shrivel to a few fibres: not all your skill will avail to preserve it alive, unless you have with you a vessel in which to plunge it at once. It is the golden aurelia (*Aurelia aurita*). If you have walked by the sea in summer you must have seen it; it is hemispherical in form, translucent, and of the colour of starch; sometimes nearly a foot across, but more generally about the size of a tea-saucer. It is bordered by a close fringe of jelly-like tentacles, and has four purple crescents, which, though internal, shine through its clear substance, and render it in the water a very beautiful object.

There is another pretty jelly-fish, which often lies in numbers among our sea-weeds, entangling them by means of long threads, one of which is at each side of its body. The body itself is usually about the size of a small walnut, and the filaments about four or five inches long. It is the globular beroe (*Cydroppe pileus*), and when we say that it looks like an oval ball of ice, we shall enable the reader to know it at once from any other common kind.

CRICKIETH CASTLE, COAST OF WALES.—GATHERING SEA-WEED.

CHAPTER VI.

SEA-WEEDS.

THERE is a rough wind over the sea, making wild music there. Far away in the distance the white surf on the waves is dazzling and splashing, and the sailor who marks them there points them out to the children, and elicits long questionings from the wondering group. The vessels are coming into harbour, for hollow sounds and screaming birds foretel a storm, and we think of bygone shipwrecks, and thank God that there is a haven of retreat for the mariner. And then the thought naturally leads us to the remembrance of life's billows and storms: to moments of anguish which we may have

known ; to cares and anxieties which others dear to us may have shared, while their bark has been braving the tempestuous ocean of life. Yes, the Christian's heart responds to the promise, that there is a rest to the people of God, where the billow shall never roll, where sin shall never cause sorrow. There is a house of peace and light and love, bought by the Saviour's death for all who love him. And if a wave of anxious thought should roll upon them, yet still every believer in him can with humble prayer ask of this Guide, either, as of old, to still the sea, or to bid us come forth to meet him in that stormy water, upholding us with his hand lest we sink by the way.

Mournful as is the sound of the hollow wind, yet the wild magnificence of the stormy sea has its charms for us ; and were all as safe as we from its dangers, we could love to listen to those rich, deep tones. Those winds and waves will tear away many a thick-stemmed sea-plant, and scatter many a feathery and delicate tuft around us ; for a vast field of vegetation lies far beneath these curling surges. As these roll on in their fury, lashing with tremendous force the rocks near the shore, they sever the weeds from their attachments, and dash their fragments around, their uprooted masses giving us some conception of the nature of the world below. And yet, with the exception of the long, cord-like weed, the sea whiplash, the largest fronds of our marine plants are not more than four feet long. How different are these from the palm-like plants which rise beneath the waves of the great Pacific, or from the everlasting bladder-thread of that sea, which, being fifteen hundred feet long, exceeds in dimensions any other plant of land or waters. In the Antarctic seas, too, marine plants of prodigious size are most abundant ; and enormous masses lie about the shores of some of the islands there. On the Falkland Isles, great heaps, wrenched from the rocks, were seen by Captain Ross, twisted together by rolling in the heavy surf, and so encumbering the beach that walking became quite laborious, the pedestrian sinking to the

knees in masses of decomposing vegetation, while marine animals entangled there, as in a net, were adding, by their decaying bodies, to the sickening odour. Yet, here was a field for the naturalist intent on studying the plants of the sea ; for growing on these large weeds were tufts of rare and delicate plants, waving in silky luxuriance to the slightest wind, some of them being just such sea-weeds as the voyager has seen on his native rocks, and recalling remembrances of the sea-girt island of his affection. One gigantic sea-weed, surpassing all others in bulk, is particularly abundant about the Falkland Islands, and altogether resembles a tree in its manner of growth. This plant, called the *lessonia*, is eight or ten feet in height, and its stem as thick as a man's thigh. It grows in an erect direction ; and at the end of its branches, leaves, two or three feet long and only three inches broad, hang in the sea like the boughs of the weeping-willow, presenting a mass of green foliage to him who looks down into the clear water. Then comes the raging wind, and bears away the huge trunk to the strand ; and this looks so like a mass of drifted wood that many would be deceived by it. No arguments urged by our voyagers could dissuade the captain of a merchant brig from taking boat-loads of these trunks on board his vessel. He was strong in his belief that they would, when dried, afford excellent fuel. The only use, however, of which these trunks are to man is, that when hardened, the people make them into knife handles. But, to the world of marine animals, of what service are they ? The worms, and crabs, and zoophytes, and shell-fish, the sponges and sea-mats, and the entangled fishes, with the clustering eggs on their stems, all attest that the vegetation of the deep has its uses, and that a larger number of living creatures probably are dependent upon it than are upon the leaves, stems, and fruits and flowers of any forest tree of our upper earth.

But if our sea-weeds cannot rival these in size, yet in minuteness, and exquisite delicacy of structure, some of

them need not yield to any of the marine plants of other lands. We have sea-plants, of which it would take hundreds of fibres to make the thickness of sewing silk ; some which are fine as the powdery plumage on a butterfly's wing ; others so wondrously small, as that hundreds might lie in a drop of water ; some branched out like a lace embroidery ; others like balls of silky hair ; some are only globules, consisting of a single cellule of colouring matter ; some which seem mere dots, are found, by the application of the microscope, to look like branching trees.

In order that the reader unacquainted with this subject may form some idea of the minute beauty of one of them, we will extract from the Rev. D. Landsborough's " Popular Introduction to British Sea-weeds," a description given by this admirable naturalist, in his own picturesque manner. The plant is called the fan-shaped *licmophora* ; and though rare, is found on sea-weeds at various parts of our coast. " Though minute," says this writer, " it well deserves the name of splendid ; it is like an assemblage of hundreds of beautiful little fans. Had I believed in the existence of fairies as firmly as I did in my childish years, I could have imagined that some marine Queen Mab, and all the ladies of her court, were congregated amid the branchlets and filaments of the little alga. '*Materiam superabat opus* : ' every fan was of exquisite workmanship. Raised on a little stem, they were spread out so as to form, in some cases, more than a semicircle, the rays numbering from ten to twenty-six. Each ray was wedge-shaped, a little denticulated at the top ; the upper part was amber-coloured, and as each ray had a lighter coloured dot in the middle of this portion, these bright dots formed a crescent of sea-gems, adorning the fan. Under this amber-coloured portion there was a pellucid band, the lower part of the fan being amber-coloured like the upper. Aided by a microscope, the whole was so beautiful, that a lady to whom I showed a portion of *licmophora*, thus magnified, said she could not fall asleep for a long time that night, as

the lovely fans seemed ever before her eyes ; and when she did sleep she dreamed of them." Such are the exquisite forms lying on rocks or sea-weeds, seeming to the naked eye but scattered grains of green powder, but, in fact, being partly formed of flint ; thus remaining indestructible, and in the course of ages, minute as they are, forming masses of the mineral, which, during their period of growth, they extracted from the waters.

As there is no part of the soil of earth where some grass or moss will not find power to creep, so there is no sea, nor river, nor stream without its weeds, *algæ*, as all flowerless aquatic vegetables are termed. And as on the land we have the region of the vine and the myrtle, of the oak and the cedar, so there are portions of the watery world where peculiar sea-weeds cover the soil ; depth and currents influencing, in some degree, their form and structure, as latitude and elevation do the land plants. They are not, however, quite so distinctly marked in this respect as is the vegetation of the land ; and some sea-weeds, like our water-cress and meadow-grass, are world-wide ; but even our own island exhibits considerable difference in the species common on the northern and southern coasts, while many sea-weeds on the limestone rocks of Ireland attain a size and luxuriance far greater than those of the Scotch or English shores. So numerous are the species of *algæ* that they cannot be enumerated. The crystal rivulet, the navigable river, the salt sea, the sulphureous streams of Italy, the eternal snows of polar regions, the wet rock, the lonely sea-cave, the sides of the waterfall, the damp garden-path, each has species peculiar to itself ; each wears a tracery which tells, by unquestionable evidence, that it was wrought by the finger of God.

But besides the sea-weeds which are attached to rocks, and ocean depths, and larger plants, there are floating weeds, lying in masses in the sea, looking so entangled and numerous, that the inexperienced voyager almost fancies that he could walk lightly over them ; but not so ; they would yield to his tread, and carry him down

to join the many who lie in that vast cemetery, over which the waves murmur their perpetual dirge. That bladder-chain (*Macrocystis pyrifera*) has its long fronds, of many hundred feet, sustained by numerous air-bladders ; and so, too, has the gulf-weed, which sometimes reaches our shores, though it is native only to the seas within forty degrees of the equator. It still entangles the ship, as it did the vessel of the undaunted Columbus ; still forms such vast meadows in certain parts of ocean, that these are said to enable the pilots to rectify their longitude. It is often called the tropic grape. Then there are species which are attached to shells, or even to crabs, or other animals, and are carried about at the pleasure of their living wearer, and often brought to us ; when, were it not for these agents, we should not have looked upon them. Sea-weeds evidently grow much faster than do land plants ; and even those which grow about our shores, increasing continually, as they do, must cover the rock below with a thicker and softer cushion than was ever sat on by woodland wanderer who rested on the mossy trunk or stone of earth.

Marine botanists have divided the sea-weeds into three divisions, a classification which, though with respect to a few individuals it may not be very obvious, yet is so very general. These are the olivaceous, the grass-green, and the red. The olive-brown or olive-green sea-weeds are generally larger than those of the other tribes, and are the most perfect in form. Old Ocean scatters some of them on the strand with every rolling wave ; and we are often reminded of their presence by the long black ridges which mark that wave's progress over the shore, and by the strong odour of the salt weed which reaches us. These plants usually grow at about half-tide level, becoming less abundant at the low-water mark. Long lines of rocks stretch by the margin of our sea-shores, darkened by these heaps, and their summits emerge from the waters, like black rocks, even at high tide. Sometimes these olive plants grow far out

in deeper water, and then their colour is usually darker than even those which flourish near the shore.

The grass-green sea-weeds are of very simple structure; and our readers will at once recal how the sea-rocks are covered with the silky verdure of some kinds, and how their glossy transparent leaves wave about in the clear pools. Our fresh waters exhibit many grass-green weeds, and the marine species prevail in shallow water, and are more often seen near the shore than dredged from the deeper parts of the sea. Far different is it with the red sea-weeds. Though many lie on the sand or pebbles, pleasing us by their glowing tints and elegant forms, they are brought there by the ever-restless waves, which rooted them up from the depths. Many of them are finer than the finest silk ever spun by the worm, and need the microscope to inform us of their beauty; and some of the most delicate of these grow just at the extreme of low-water mark.

The largest of our common marine plants is that olive species called the knobbed fucus (*Fucus nodosus*), and known in some places as yellow tang, because it is often of a dull yellow colour. Its thick, leathery stems are frequently six, or even eight feet long, and they are sustained in the water by the large air-vessels which occur at intervals. So well are these bladders filled with air, that we have only to hold one in a candle, and it will explode with a loud noise, and extinguish the light. This plant always turns quite black in drying, and it varies much in luxuriance, according to the depth at which it grows; the specimens found near high-water mark being low and tufted, becoming longer as they reach the point of low tide. The engraving represents this plant and a parasitic species, which is so frequent on the fucus that it would be almost impossible to find a large piece free from it. Sometimes these dark tufts grow on the spaces between the knobs; sometimes they cover the knobs all over with their bushy fibres. It is the fastigate polysiphonia (*Polysiphonia fastigiata*); but though most frequent on this fucus, it is not confined to it, for it

grows occasionally around the roots of the bladder fucus.

This sea-weed is sometimes used by fishermen to cover their oysters, and the children, not only on the Scottish

FUCUS NODOSUS, WITH POLYSIPHONIA PARASITICA UPON IT.

coast, but also on that of England, call it sea-whistle, and make whistles with the bladders. It attaches itself to rocks and stones by means of a conical root, and when in fructification it has orange-coloured pods, on green stalks, which give the dark weed a more lively appearance than usual.

The commonest of all our sea-weeds is the bladder fucus (*Fucus vesiculosus*). Walk for five minutes where you will on ocean's margin, and there lies its dark spray

with bladders in its very substance, and a strongly marked vein running through its midst. When in fruit it has ovate receptacles, and the spores, as the seeds are called, are contained in this, as in most other

FUCUS VESICULOSUS.

marine plants, in a thick, jelly-like substance, which is well fitted to glue the seed on the rocks, washed over by restless waves. This mucus is also considered by many surgeons as a valuable remedy in glandular swellings, and many a suffering child has them daily bound about it, apparently with good success. The plant also is nutritious and useful in feeding pigs, on which account it is called in Gothland, swine-tang. Lightfoot tells how, when the snow-storm descends on the Highlands, covering up their scanty herbage, the red deer come from the mountains in troops, to feed on this sea-weed.

Both these species, as well as several others, yield kelp and iodine. This kelp was formerly used largely in the manufacture of soap and glass, but improvements in chemistry have rendered other materials available for this purpose ; and the kelp trade has suffered from

them, though there is still a considerable demand, from the iodine procured from sea-weeds. The Rev. D. Landsborough says, that from July, 1845, to July, 1846, it is calculated that upwards of 10,000 tons of kelp were manufactured on our British shores, which, on an average of 5*l.* per ton, would amount in value to 50,000*l.* Besides the use of iodine in medicine and surgery, it is also of service in the arts; and neither the wondrous results of daguerreotype nor of calotype could be produced without the aid of vapours from iodine, which iodine the sea-plants have gathered to themselves from the sea water.

These are some of the various uses to which sea-weeds may be applied; and who can tell but that in coming days they may be made to aid in the manufacture of sugar? Several of them have been found by Dr. Stenhouse to yield mannite, a substance which, though not equalling in sweetness the sugar of the cane, is similar to that of the grape, and it is pure and white, and abundant in many sea-weeds, especially in that long leaf called the sea-belt. In many countries where coals are dear, or people are poor, sea-weeds are stacked as fuel, and they are occasionally used for manure in England. Little heaps of decomposing sea-weeds lie sometimes nearer to the sea-coast cottage than the laws of health would sanction; but the garden crop of the coming year shall tell of their use to the land. In Ireland they are far more valued, and form the chief manure for thousands of acres of potato ground, which but for their aid would furnish no store to the peasant; for on the west coast of Ireland the poor are almost dependent on this source, and they bring the plants several miles from the sea. Even on the Ayrshire coast, when a good breeze has brought in a quantity of weeds, men, women, and children may be seen conveying them to the land, in baskets, barrows, and little carts, or dragging away the long, thick stem of the tangle, while its bunch of leaves sweeps the ground as it passes. Kelp has been found to make an excellent manure for grass lands, and

has also been used with other materials as a top-dressing for corn, potatoes, and other crops, with great success.

As we proceed to notice various sea-plants, other uses which they offer to man will be named ; but it must not be forgotten that the great mass which the mortal eye never looks upon is working unseen in the waters below, purifying them by their means, and rendering the breezes which blow over them healthful instead of noxious. Many dead things lie in the deep, and the great city pours its refuse into its tide ; but the sea-plant gathers from this evil a nutriment to itself, and waves in healthful action for us. Vast multitudes of fishes and other animals repose and hide among the branches and the mossy couches which lie there. The “worthless sea-weed” Horace called it, while Virgil deemed it “viler than the sea, and cast out on the shore ;” but homely men of our times have disproved the notions of the elegant poets, and have learned to bless God that the sea has brought them its weeds.

Almost equally abundant during winter and spring is the serrated fucus (*Fucus serratus*), whose brown spray contains no bladders, and may at once be known from all others by its saw-like edges. It covers piers, stones, rocks, in dark, thick masses, like the bladder fucus, its sprays being from six to ten feet long. It is used for all the same purposes as that plant ; while fishermen prefer it for packing their fish, because, containing little mucus, it is less likely to ferment. When in fruit, it has yellowish receptacles, usually situated at the end of its spray.

There is one very wonderful circumstance connected with these yellow, flat, pod-like vessels. In some specimens these contain a number of oblong grains, each of which finally separates into eight distinct particles, and each of these becomes surrounded with minute hairs. But in other specimens of the plant, still more strange changes occur ; and instead of little grains, there are numerous tufts of much-branched, jointed, delicate threads, which produce a number of little bags, filled

with many orange, vivacious atoms, which eventually issue from their cases, and swim about with a rapid motion, resembling the voluntary movements of animalcules. These atoms are supposed to be similar to the powder which is on the stamens of flowers, and which, if we stoop to inhale the odour of the lily, tinges our cheek with yellow. Dr. Harvey, in his learned and valuable "Phycologia Britannica," directs us how to observe, with a microscope, these atoms in motion. Fresh specimens should, he says, be collected in winter or early spring, and being removed from the water, should be left till partially dry. As the surface dries, there will exude from the pores of the receptacle drops of a thick orange-coloured fluid, which, on being placed under a microscope, and moistened with salt water, will be found to be composed of innumerable cellules, from which will issue troops of these atoms, that are no sooner liberated, than they commence those singular motions which the naturalist finds it so difficult to reconcile with vegetable life.

The only other fucus, which is a common plant, is the channelled species (*Fucus canaliculatus*). This is a lighter coloured and much smaller sea-weed, rarely exceeding six inches in height. Like the other it is tough and leathery, and is characterized by the channel or furrow down its stems. It begins to grow on the very edge of high-water mark, and often on spots where the wave cannot reach it, except to scatter from a distance some white drops of foam. It never, however, in this situation, attains its full size, but increases in luxuriance to about half-tide level, when it usually ceases. Its close and tough texture fits it well for enduring drought, and for resisting the drying effects of sun and air, to which it is exposed during a great part of every day. Dry and hard as it sometimes becomes in hot weather, yet no sooner does the wave reach it than its softness and flexibility are regained. It is a very favourite food of cattle, which will leave the other species untouched to search for this. We

shall not find it easy to convey to the reader so clear a description of many sea-weeds as we can give of the different species of fucus, but the engravings will help to the knowledge of some. The different kinds of bladder-chain which are on our shores are much more delicately formed than those of the last-named genus, and their branches are often not thicker than twine. The fennel-like bladder-chain, and especially the fibrous bladder-chain, are very frequent on rocks, near low-water mark, as well as in the tide-pools. The

CYSOSTEIRA ERICOIDES.

main stem of the latter plant is as thick as a swan's quill, from six inches to a foot long, and strung with small bladders as with beads. It always turns of an ebony black in drying. It is a pretty sea-weed, but not so much so as is the heath-like bladder-chain (*Cysosteira ericoides*). When taken out of the water this is of a yellowish olive, but when waving in the sea-pool it is an exquisitely beautiful plant. It then has all the richest hues of emerald and blue upon it; and these are, Dr. Harvey remarks, more like those phosphorescent gleams which

flash from the marine animals, than any vegetable colour. "As each twig," says this writer, "waves to and fro in the water, the hues vary; and sometimes when the light falls partially on a branch, some portions seem covered with sky-blue flowers, while others remain

dark." Its name alludes both to the shrub-like form of the plant covered with little branches like the heath, and to its beautiful colours.

The granulated bladder-chain (*Cysosteira granulata*) is not an unfrequent sea-weed, and this species may be known by the cluster of olive-green knobs at the base of its branches. Like the others it abounds in air bladders, and it would seem a favourite plant with marine animals. Pick it up where you will, a clean specimen can rarely be found. Sponges gather round it, corallines and little shell-fish and their eggs hang about it, so that a branch of this plant often supplies an excellent store for him who examines these things with a microscope.

But if the reader should fail in identifying any of these plants, there is a sea-weed which he can easily know by our description, and which he can find on almost any of our shores in rough weather. During autumn and winter we often see masses of a long strap-shaped, yellowish olive sea-weed lying on the sand or beach. It is the sea-thongs (*Himanthalia lorea*), and though less valued now, was formerly of much worth for the rich salt which it yielded to the kelp manufacturer. If we chance to see this growing on the rock, we perceive that this strap proceeds from a cup. Numbers of these cups grow together, and the strap comes out of the centre. As it increases in size, after attaining some length, it divides into two portions, and then each of these portions divides again into two, and so continues until the specimens which we find on the shore, often three or four yards in length, are divided again and again. The wave which tore them up, also brings away the cup from which they spring, and we find that this is the true frond of the sea-weed, the long straps being merely pods or seed-vessels. They are covered with an orange-coloured slime which stains the hands. The fruit consists of tubercles, which are seated in the straps, and these tubercles discharge their seeds by means of pores. The cup, which is not unlike

a plant of the mushroom tribe, is in Ireland made into a kind of sauce for fish.

The representation of the podded halidrys, or sea-shrub (*Halidrys siliquosa*), will at once remind the reader of a very common sea-plant whose fronds, three or four feet long, branch in all directions, and bear an

HALIDRYS SILIQUOSA.

immense number of these flat pods on slender stalks. When young it is of greenish olive, and as it grows older is of a rich brown. It adheres by means of an expanded disk so firmly to the rock, that we cannot easily tear it away. Mr. Landsborough found dark impressions on a limestone rock at Ardrossan, of a seaweed much resembling this species.

Perhaps, however, no sea-weed is more conspicuous or better known than are one or two of the species of oarweed. The common sea-belt, or sea-girdle (*Laminaria saccharina*), is like a long narrow leaf with a curled margin, attached to a stem as thick as a man's

finger, and terminated by a cluster of very strong fibres. This leaf is often hung up to warn by its increased moisture of approaching damp; and the author knew a person who had kept one for twenty years, and still found it faithful to its office. It contains a greater store of iodine than any of our sea-plants, except its allied species the fingered oarweed. A large quantity of white sugary substance lies upon it when dry, and the plant is sometimes boiled and eaten, but it is not either nutritious or agreeable. Numbers of these plants float above our rocks when the receding tide leaves them uncovered; and specimens, six or seven feet long, borne from deeper water, often lie on the shore, while we may sometimes find one ten feet in length. Dr. Harvey remarks, that on many parts of the shore on the west of Ireland and Scotland, where the water is clear as crystal, these beautiful leaves may be seen growing in great luxuriance several fathoms below the boat which is sailing there. When the plant is well grown, rows of little projections, about as large as peas, may be seen, and then the leaf reminds us of those long leaves of the east, on which oriental characters are inscribed in the middle.

Growing in just the same kind of spots, and on many shores as plentiful, though not quite so universally diffused, is the bulbous oarweed (*Laminaria bulbosa*), the largest of our British species. It is a long broad leaf, cut into several segments, which stream in the waters or before the wind off the shore. It has a flat stem, which has one twist in it, and which has a waved margin so like a lady's flounce, that the plant is commonly called furbelows.

A third species is known to every visitor of the sea-coast. It lies about everywhere by the sea, sometimes in sufficient quantities to diffuse an unpleasant odour there, and the half-dried masses of this and similar plants often form a seat by the sea for him who needs repose. Such resting-places are fraught with dangers, however, to persons of delicate health, for the sun and

air do not always penetrate the heap, and on turning it up we find an amount of moisture which is slowly evaporating. Medical men resident on sea-coast towns are very familiar with cases of pain and illness, brought on by sitting on damp places and heaps of sea-weeds on the beach.

The sea-weed to which we were referring is commonly called the tangle, or sea-girdle, or sea-staff (*Laminaria digitata*); and if we tell our readers that it is like a number of olive-brown ribbons at the end of a thick and tough stem, he will recall it to memory; or if he is near the shore and will walk down to look for it, we can venture to predict that he will find it. He may stop, too, and examine its root; for among its strong fibres he will probably find the little pellucid limpet-shell, marked with its blue rays, and it will be a great wonder if he do not find, too, the blue limpet hiding there like a hermit in a little cave which he has dug for himself. Gerarde told how this plant, boiled and dressed with pepper, vinegar, and butter, might be eaten; and it was formerly sold in Scotland for food; but we can say nothing in its favour in this respect, though useful for kelp, iodine, and manure. Mr. Landsborough remarks: "Were it converted into peat, we should not be unwilling to use it, and we have seen it thus metamorphosed, but on too small a scale to be useful. This was amongst the sand-hills on the coast of Ayrshire, where it had been drifted a considerable way inland by some unusually high tide; and having been deeply covered with driven sand, it had lain, it may be, for many ages, and had become a layer of peat, about two inches thick, in which the stout tubular rind of the tangle stem in a compressed state was quite distinguishable. There is a variety of this sea-weed not sufficiently distinct to be perceived, perhaps, by those unaccustomed to marine plants, but which is well known to the kelp burners. This variety they call *cury*, and the stalks stand up firmly like little sticks, only bending slightly at top with the weight of the

leaves. The stalk has a rough bark as thick as pasteboard, which may be stripped off. This kind is particularly infested by parasitic plants. The common tangle, as we may easily see, is so flexible as to lie prostrate along the rocks. The fronds of the tangle often become quite white, and we may find numbers of their ribbons dried thus on the beach. Children often eat them when fresh from the water, and they are not unpleasing, having the flavour of half-cooked shreds of isinglass.

The esculent alaria (*Alaria esculenta*) is a long narrow leaf as graceful as any of the oarweeds, and having a much prettier green colour, besides being altogether thinner and more delicate. It is clearly marked by the long vein or mid-rib which runs through it. It is little known on our southern coasts, but is abundant on all the Atlantic shores of the British islands, attaining the greatest luxuriance on some of the most exposed parts of the western coasts. It would seem strange that so delicate a leaf should grow best in roughest waters; yet so it is, though we seldom find it free from a few rents. The stem is about as thick as a goose-quill, and has on it a number of narrow leaflets. This plant is eaten in the Feroe Isles, and in Iceland, and also in some parts of Ireland and Scotland, but only the mid-rib is taken, the rest being stripped off. The Irish call the plant murlins, and the Scotch term it henware and badderlocks.

There are some pretty pale-green plants belonging to the laminariæ, as well as some gigantic species found in other lands. A beautiful kind which abounds along the shore of North America, has a leaf frequently as large as a moderately sized tablecloth. Others have stems which the inhabitants of the shores, where they abound, use as they might do poles of wood.

A slimy cord-like plant entwines itself about our rocks and stones, growing in the still pools, and thirty or forty of the cords often springing from one root. It is the sea-laces (*Chorda filum*), and when dry is not

unlike the round leather cord with which a fisherman would fasten his boots. These cords taper at the base, increase in thickness, and again are pointed at the end. This sea-weed is also called whiplash, catgut, and Lucky Minny's lines. Who Lucky Minny may be we know

CHORDA FILUM.

not, but many a fisherman has used the plant for lines in fishing. Another name which it bears, of dead men's ropes, tells a sad and true tale of the plant, which has proved fatal to many a swimmer, who breasted the waters in the quiet land-locked bay in fearless pleasure, little dreaming that its entangling cords should wind about him so fast that all efforts to break the coil would be useless. Yes! these ropes have wound about many a dead or dying man, and, doubtless, often awaken touching regrets and heart-rending memories to the wanderers on the shore. In bays where the bottom is sandy or muddy, the plant increases to such a degree, that it seriously impedes the course of vessels. It is found more or less about all our shores, and is sometimes forty feet long. When young it is thickly clothed with slender gelatinous threads, which disappear as it becomes older. It is also much infested by a parasite, the small litophison, which covers the cord for several feet with little tufts

of olive-green threads as thick as a hog's bristle, and two or three inches long. Some of the older cords look, when about the end of summer, like so many shaggy ropes which are soft and slippery to the touch.

Besides this there is a jointed whiplash (*Chordalomentaria*), another plant, like a cord, but small and slender, and looking as if tied at intervals with a tight thread; and there are the long entangling cords of the corded whiplash, (*Chordaria flagelliformis*), consisting of closely congregated long threads, and sending out numerous slender branches; its colour is a dark brown, and it is very slimy to the touch.

A very beautiful sea-weed belonging to the olivaceous series, is called the peacock's tail padina (*Padina pavonia*). It is found in rocks or shallow pools at half-tide level. It is not unfrequent on various parts of the southern coast, and is very abundant at Torquay. It grows in many pools along the shores of the Mediterranean Sea, and the waves of the tropical oceans bring up plants of this kind very frequently, but they are no way superior either in size or beauty of colour to our British specimens. Should the wanderer by the sea behold this beautiful plant waving in the clear water of the tide pool, he will have no hesitation in pronouncing on its name, for it is in form much like the expanded tail of a peacock, and it has iridescent hues almost as bright as those of that bird. Some of the earliest writers on the sea and its contents noticed this elegant sea-weed; and when in the pool, the fringes of thread-like fibres which adorn it give to the surface the loveliest of colours. It generally grows in fan-shaped fronds, several of which are clustered together. Its margin is rolled inwards, and the outer surface is covered with a fine chalky powder, which comes off to the touch. It has also zones of olive, reddish, and bright green upon it, and its substance is thick and tough.

The rocks which are dashed by the spray at high tide, are sometimes protected from its action by means

of numerous lichens of greenish, or grey, or yellow hue ; and an olive-green plant, called lichina, grows on all our sea-side rocks within reach of the foam, but a little way above the ordinary level of the high tide. Some writers call it a lichen, some term it a sea-weed. It is a tuft of a leathery nature, dark and crisp when exposed to sun and air, but acquiring its pliability when the wave brings its moisture.

We have enumerated the most marked of the olive-green sea-plants—those which if not already known to every frequenter of the shore, may easily become so. There are, however, several kinds very common, but which we should fail in any attempt to describe in simple terms. Many species are parasitic on larger sea-weeds, and others cluster closely down on the surface of the rocks. Some are like leathery cups ; some heaped on rocks like crowded tubercles ; many spreading over the marine stones in flat or curled patches ; others are brush-like tufts ; some so small that though formed of numerous threads, they look like nothing more than small downy semicircular spots, about as large as half a pea. Some, like one which very often infests the sea thongs, form a kind of knob or swelling on the seaweed ; others cover the pebbles at half-tide level with a thin purple crust ; while some are so beautiful that their delicate branches remind one of the feathery ferns of the green lane. Some are in dense pencillate tufts, one or two inches long.

No one can possibly imagine the wonders which exist in the sea both in its plants and minute animals, who has not been accustomed to the use of a microscope. There are comparatively few who can enjoy the advantage of possessing one of the best of these instruments, but we have often thought that the parents of families who regularly spend a portion of the year at the sea-side, would do well to procure a less expensive one for the use of the children. Young persons are so easily interested in natural history, if its details are at all pointed out to them. They are always great collectors of sea-weeds,

shells, and other marine curiosities, always anxious to know their names. And when we point out to them the wonderful proofs of design, the fitness for their condition so evident in all that God has wrought, how naturally may their minds be led to the consideration of God's goodness. The teachable, listening, loving spirit of a little child—that very spirit which God enjoins upon us all—considers these things with simple wonder and delight. Who shall say that when we teach the child to love the works of God, this may not by the gracious aid of the Holy Spirit be the means of leading him to believe and trust in the Saviour? The God who made these things is the very God to whom he is taught to pray, the very Lord on whom he is told he should rest in humble faith; the God who by the hands of prophets and apostles wrote the Bible; the Saviour who died for his salvation; the Holy Spirit who sanctifies every true believer in it. Even should this not be the result of our teaching, yet is it well to encourage the habit of observation, to inculcate the love of simple and elevating pursuits, and the enjoyment of calm pleasures. It is well to cherish a love of the grace and beauty in the natural world, to stimulate the mind to active inquiry and to patient thought.

If the olive-green sea-weeds often need the aid of the microscope in their investigation, still more do the red series require it. To this division belong our smallest and most delicate species. So fine are some of them, that the faintest touch of the artist's pencil exaggerates their size. Most of these minute ones, wonderful as they are, must be passed over in this limited work. The genus *polysiphonia*, of which no less than twenty-five species are enumerated by Dr. Harvey, are chiefly composed of tufts of threads, and their name indicates the many siphons. Few of these plants are larger than common sewing-threads; many far finer; yet these are among the most frequent of our sea-weeds, several of them being parasitic on other plants. Some of the sea-weeds of the *ceramium* family are fine and delicate

beyond description, for we know of no work of nature or art delicate enough to afford a comparison.

Some of the common polysiphonia to which we have alluded are very rich in tint, exhibiting various shades of crimson, red, and orange, or of purple or pale amethyst, some of them varying in colour in the different seasons of the year, as much as do the emerald or golden leaves of the oak in its spring or autumnal livery. Many of them are pale brownish or straw-coloured; and some, like that common species the fastigate polysiphonia, which we have before mentioned as growing on the knobbed fucus, have the hue of the olive-brown sea-weeds, the colour being probably influenced by exposure for many hours at low tide to the air, while at other times they are covered with water. At one period of the year, however, this plant assumes a dull orange hue. The common lobster-horn polysiphonia is quite red, and being ringed like the horn of the animal whence it takes its name, may perhaps be recognised by the reader. It is usually about as stout as a common packthread, much branched, of a lively crimson, and very abundant. We may find among our common red sea-weeds some species which can be simply described, but these are chiefly of the larger kind. Almost every one who has been in the habit of looking for marine plants in summer, among the rocky pools, has seen floating there richly coloured sprays of pink leaves, which having a vein up the middle resemble in shape the leaves of a tree. These form the plant called the scarlet, or dock-leaved delesseria (*Delesseria sanguinea*). These leaves, which are on short stalks of the same light colour, are from four to eight inches long, and two or three broad; being when young nearly flat like a willow leaf, but having, when older, a waved margin. This, which is the most beautiful of all our red sea-weeds, is common on all shores from Orkney to Cornwall. It grows best on the shady sides of the pool, and beneath the ledges of rocks, and indeed there is a peculiarity in the colouring of sea-weeds which renders them very unlike the plants of land. We know

that our flowers need light to make them beautiful, but the most gorgeously tinted marine plant has usually acquired its beauty in the deepest shadow. Few would look at a fine specimen of this sea-weed without admiration, and it was selected as worthy to bear the name of the great botanist, the Baron B. Delessert, who not only laboured himself in the investigation of plants, but encouraged many others in this pursuit.

DELESSERIA SINUOSA.

The species figured on our pages is scarcely less beautiful or less common. The oak-leaved delesseria (*Delesseria sinuosa*) is chiefly parasitical on the tangle, and when we can see both plants in perfection, the contrast of its bright tint with the rich olive of the larger plant is extremely beautiful. The indented edges resemble those of the oak leaf, and sometimes the notches are much more deep than are even those of the tree. The species called the winged delesseria lies every-

where about our shores, and is of a much darker red, but it cannot be described without the use of scientific terms.

The esculent iridæa (*Iridæa edulis*) is a sea-weed known almost all round our coasts, growing on marine rocks at low water mark, but it is not universally abundant. It consists of a large flat dull reddish leaf, without any veins, rounded at the top, and tapering at the base, being thus pear-shaped. Several of these thick fleshy leaves grow together from the same root. Dr. Withering bestowed on the plant the specific name of *edulis*; but, as Dr. Hooker remarks, this is to be regretted, because it is of little value as human food, though marine worms may make a meal of it. He adds that he has never seen it eaten; but Dr. Stackhouse says, that in Cornwall it sometimes is used by the fishermen as food, after being crisped over the fire, and the Scottish peasants of the western coast eat it after pinching it with hot irons. A fine ruby-coloured dye may also be extracted from it by simple maceration; and every one who has prepared sea-weeds for the herbarium, is aware that this is far from being the only plant which dyes the fresh water. Dr. Harvey thinks, however, that these dyes would not be of a permanent character.

This sea-weed is often called dulse by fishermen, but it is not the true dulse of the Scottish Highlander. This is the palmate rhodymenia (*Rhodymenia palmata*), and it is by far the most nutritious of our native sea plants. Sir William Hooker describes his having seen it gathered from the rocks by women and children, and eaten with avidity. The author is also acquainted with a Highland gentleman, who would eat a plateful at a time with much relish, though to those unused to it there is something unpleasing in its very odour. On being asked if a crude and somewhat hard vegetable like this would digest, he replied that so good were its medicinal properties, that none need ever fear that it would prove indigestible; that he had eaten it daily in

early life, when his home was in the Highlands, and that in late years of ill health, he had often regretted the necessity of discontinuing the practice. The Highlanders regard it as an antidote to disease in general, but especially to glandular affection, and as it contains iodine they are probably in the right. The Icelanders, too, use it extensively for food, but they eat it more in

RHODYMENIA PALMATA.

a dried than in a raw state. Like many other sea-plants, mannite exudes from it while drying ; and when in this condition, the Icelfander either boils it or mixes it with dry flour for his meal. He also preserves it in casks for future use, and when eaten uncooked it is a vegetable addition to fish. In the Mediterranean islands too, it is much used in cookery, forming an important part of the ragouts and made dishes ; and it is one of the chief ingredients in a soup called by M. Soyer, St. Patrick's soup, and recommended by him to the poor peasantry of Ireland. The Irish consume a great deal

of this sea-weed, after having merely dried it on the beach or in the cottage yard in the sun. It is eaten raw, and the flavour is obtained by long chewing. It is not agreeable to all palates, however, for the author has tried this plant as food; but neither raw, nor fresh, nor dried, nor cooked in any way, except in soup, was it pleasant. Dr. Harvey says that on many parts of the west coast of Ireland it forms the only addition to potatoes, in the meals of the poorest class. The variety which grows on mussel-shells, between the tide marks, is thought the best, being less tough than the other dulse; and the minute mussels, and other small shell-fish, which adhere to its folds, are, he adds, "no ways displeasing to the consumers of this simple luxury, who rather seem to enjoy the additional gout imparted by the encased mussels." Until recently it was carried about for sale in Edinburgh.

Besides being used as food, this plant, after having been dried in the sun, is rolled up and smoked both by the Scotch and Irish as tobacco, though it has apparently no stimulating or sedative powers, and its only odour is a faint scent like violets, which it yields on an infusion in water. The author of this little work was some years since residing in a sea-coast town in which an Irish regiment was stationed. At almost any part of the day, men, women, or boys were to be seen on the beach gathering the dulse and carrying it away in baskets, or even pails. The people collecting it said that the soldiers wanted it for smoking, and the boys engaged in picking it might be seen munching it with great glee. After the departure of the regiment, a person living in the neighbourhood offered to send a cask of dulse to some soldier friend; but unfortunately in her desire to prepare it rightly she washed it thoroughly in fresh water before packing it, and thus deprived it of its virtues. The people of Kamtschatka make a fermented vinegar of the dulse, which on account of the quantity of sugar contained in the plant is easily produced.

This species is distinguished as the palmate, because its form is often, like the palm of the hand, terminated by long fingers. It grows on rocks or on other sea-weeds, several of the fronds being grouped together; and though varying much in shape, it is always easily detected by one familiar with either of its forms by its flavour. Dr. Harvey remarks, that he has often observed that when the dulse grows upon rocks it is broad and slightly divided: while when growing on the serrated fucus, even on the same rock, it is separated into numerous divisions. The colour varies from a deep purplish red to a pinkish hue, but its tint is never very vivid.

“ Pour forth thy waifs of weed and whispering shell,
 Thou rounded ocean, on the golden strand;
 Flowers of the deep! to tempt the cager hand
 And eye of wanderers by thy foamy swell.
 Hither, bear hither, many a dark green weed
 From wave-tost forests in thy pathless ways,
 Where the green arching lobster darts and plays.
 Bring dulse, that o'er the crags, where sea-birds speed
 Nest-ward, its crimson mantle flings; and those
 Rich emerald fronds the glossy ulva bears,
 Bright as the earliest verdure spring-time wears,
 And bring thou also many a shell that glows
 With pearly lustre; for thy waifs are fraught
 With tints of beauty and rich veins of thought.”

Several species of *rhodymenia* are well known, and one other is as frequent as the dulse, and so resembles it in colour and flavour, that probably the two plants are used indiscriminately as food. This ciliated *rhodymenia* (*Rhodymenia ciliata*) is marked by a fringe of little segments around its margin, and its colour is generally redder than that of dulse; while another species, the laciniated *rhodymenia*, is sometimes of as rich a crimson as can be imagined, many specimens vying with the reddest of roses. Its form, too, is pretty, and its flavour very dissimilar to that of the palmate kind. Several very pale pink species are also lovely sea-weeds.

Mr. Landsborough, referring to the word dulse, which appears to owe its origin to the *duillisg* of the Highlanders, remarks that the latter, as we learn from good authority, is composed of two Gaelic words, *duillé*, or

leaf, and *uisgé*, water, that is, the leaf of the water. “From *uisgé*,” he adds, “is derived the word whisky, and with the addition of *baugh*, life, we have the usquebaugh of the Irish (*aqua vitæ*), the water of life;” with how much more propriety might it be called the water of death! In some parts of Ireland the dulse is still called dillesk, which means still the leaf of the water, for esk means water; hence we have so many rivers in Scotland named Esk, such as North Esk, and South Esk; that is, North Water, and South Water.

Another of the red sea-weeds which was formerly eaten, though few now seem inclined to use it as food, is

LAURENCIA PINNATIFIDA.

the pepper dulse (*Laurencia pinnatifida*). The young plants are slightly pungent, but those which are not so are very disagreeable in smell and flavour. This species is very plentiful, and often a sea-wall is

scarcely completed before little tufts spring up upon it, covering it as the mossy clump would an inland rock, though it will not give so rich a tint as will the moss, for it is generally of a lurid brown, though sometimes varying in green and brown ; but it rarely exhibits any bright tint, pale yellow being its gayest. It grows on rocks from the extreme of high water mark, and it is as plentiful on other shores as on ours, growing along the coasts of the Atlantic and Pacific Oceans, and in tropical seas, and as far south as Cape Horn. Several allied species are well-known plants.

A sea-weed, which even when fresh from the waves has none of that unpleasant flavour common to many, is the Irish moss, so called because it was first made into a jelly in Ireland. It is the well known carrageen moss of the shops (*Chondrus crispus*), and is not only

CHONDRUS CRISPUS.

very nutritious, but when properly prepared with milk, makes a truly delicious food. Clusters of this tough but flexible sea-weed, with its fringed and curled

edges, brought in by the waves, lying in crisped and bleached masses far above their reach, are everywhere common. Its preparation for use is very simple, and the mere drying in the sun is all that is necessary, and it is still sold for a jelly for the invalid. Like many other remedies which have been at one time overrated, it is now valued less than it deserves. Some years since, the poor inhabitants of the west coast of Ireland carried on a trade with the carrageen, which was of much importance to a people so poor; and the collecting and drying this plant, and packing it for sale, afforded much employment. At one period it was sold at as high a price as two and sixpence per pound, but its fashion is now gone. It is still used instead of isinglass for blancmanges; and by the house painters for size. Another species equally fitted for these purposes, and included under the name of carrageen, is the tubercled moss (*Chondrus mamillosus*). It is usually of a lighter colour than the other kind, and its frond is channelled and dotted with little knobs which, as they may be seen by the naked eye, serve as an easily recognised distinction. If this plant is placed for awhile in fresh water, it turns from a dull purple to a lively pink colour.

What numbers of small silky red weeds are growing beneath the shadow of the large dark species, or are streaming before the soft ripples which wash the rocks! It is here that we may find some handsome specimens of that ruby-coloured weed, the phyllophora (*Phyllophora rubens*), the frond of which is flat, from three to eight or nine inches long, its primary leaf being wedge-shaped, and many smaller wedge-shaped leaflets growing out of it. Its glossy surface and clear colour would render this a lovely plant, were it not for the parasites which infest it, and which in some cases almost hide it from our view. Red sea-weeds with calcareous coverings cluster upon it; and masses of little cells, the homes of polypes, spread over it as if they were patches of sand; nor can we remove

these objects without tearing the thin and delicate plant.

Other species of the same genus lie hidden there too ; and here we may find a common plant easily known from any other by its fine wiry stiff fronds looking like a tangling tuft of horse-hair, save that their colour is a lurid purple. This is the entangled gigartina, known now to the marine botanist as the *Gymnogongrus plicata*. Here, too, as well as among the heaps of weeds strewn over the beach, we may see a quantity of the purplish brown fronds of the forked furcellaria (*Furcellaria fastigiata*), which is formed of a number of little forks, that cannot fail to remind us of the implement used by the haymaker.

A beautiful feather-like sea-weed often serves as a fringe to the tangle stem, or is blown from it by the wind, and left on the sand for the collector. This is the feathery ptilota (*Ptilota plumosa*), and it is not known to grow on any other plant save this. Very pretty, too, are the pink shrub-like pieces of that common plant, the red ceramium, which is one of the sea-weeds seen everywhere on the coast. Several species of ceramium, of exquisite delicacy, and finer than any thread spun by the spider in its embroidery, are parasitic on our smaller sea-weeds ; and by a powerful microscope may be seen to exhibit most graceful structure. Of one of these (*Ceramium diaphanum*) Dr. Harvey remarks: "When growing, few algæ are more delicately beautiful ; and even in a dry state it forms a very handsome object, the brilliancy and regularity of the dot-like joints, connected by hyaline glistening spaces, having the effect of a fine tracery." Some species of this family are formed of threads so slender, so flaccid, and so densely matted together, that it is almost impossible to display them on paper in anything but a tangled mass, for any attempt to remove the fibres from each other would destroy the specimen. They are not nearly so thick as the finest hair of the head.

There are several species of a genus named in honour

of a lady who has made many discoveries in marine botany; this is the griffithsia, so called after Mrs. Griffiths of Torquay. All the species have the remarkable property, when put into fresh water, of projecting very small drops of fluid to the distance of several inches. When removed from the water, the membrane of their cells bursts with violence, and making a sound in the explosion, discharges the colouring matter of the plant. That very common species, the bristly griffithsia (*Griffithsia setacea*), which grows on the

GRIFFITHSIA SETACEA.

perpendicular sides of deep rocky pools, or under the shade of large plants, is extremely pretty, and the form of its dense pink tufts is well preserved in drying. Its colouring matter, however, very soon discharges itself, and it is found to be a powder of so rich a carmine tint, that there is no doubt it might be used for a pigment, could a sufficient quantity be obtained. The brilliant hue which it leaves on the paper stained by it, remains vivid for years. Dr. Harvey says, that delicate as this sea-weed is, no other is more patient of confinement, or can be more easily domesticated. A tuft placed in a closed bottle of sea water was, he

observes, after more than two years' imprisonment apparently as fresh and healthy as when taken from the sea. The water had not been changed, and it had remained clear and pure. The plant had not grown much, as the bottle was a small one, but its threads reached nearly to the surface of the water, and at that time no symptom of decay was manifest.

The common hair-flag (*Plocamium coccineum*), both

THE HAIR-FLAG.

in summer and winter, lies on the sand or pebbles, and cannot fail to attract the attention of any who roam the shore, with eye intent on the sea treasures there. It is in great request for scrap-books and ornamental groups of sea-plants, placed on embossed cards. Its colour is a fine transparent red, between crimson and scarlet. So widely dispersed is this plant, that it is found in every sea from the North Cape to Cape Horn. Mingling in the group with it, we commonly see another almost equally diffused sea-plant, which grows on larger weeds, in most of our rock pools. This is the scarlet dasya (*Dasya coccinea*).

So lovely are the red sea-weeds, so graceful and so

rich in hue, that as the memory recalls them one by one, we would fain linger over the attempt to portray something of their grace to the reader. But description fails, and we must urge on all who visit the sea to examine and study these wonderful productions for themselves. But before quitting these plants, we must endeavour to depict some which are common on the shore, and which none but those acquainted with marine botany would discover to be plants at all. They are encrusted with a calcareous covering; so that they would be taken for small corals. The investigations which have proved that they are not so, are but recent.

CORALLINA OFFICINALIS.

A very frequent kind is here figured, the common strong-jointed coralline (*Corallina officinalis*), which is too abundant in rocky pools, especially during the autumnal and winter seasons, to have escaped the observation of any one familiar with marine rocks. Even those who never saw it growing there, have seen its tufts scattered in the wind, and bleached by the sun, and they are then like a spray of delicate white coral, though

when growing, the plant is of a reddish lilac colour. Place it between the teeth, and you feel as if you were crunching a piece of chalk; and take it home and hold it in a candle, and you shall see a clear white light, which will remind you by its power of a miniature bude light. Though we often find it quite white, yet

it has taken various hues in the process of bleaching, becoming first of a dull red, then yellow, and finally of the tint of milk. When the plant is placed in an acid, the chalky covering dissolves, leaving a red tissue.

By similar experiments several stony-looking crusts on our marine rocks, pebbles, and shells, which to the rambler there would seem to be corals, are proved to be of vegetable nature, presenting a structure precisely similar to that of our red sea-weeds. One of these nullipores is found all about our coast, appearing at first on the surface of stones, rocks, or shells, like a little stony knob, which, by degrees, spreads so as to form uneven crusts, resembling some of those lichens which are the time-stains of the old wall or tower. The crust gradually becomes thicker by successive thin coats of calcareous substance deposited on its surface; and its irregular form, while in some specimens reminding us of the lichen, would, in others, look like stony lumps or masses. The colour varies from lurid purple to chalky white. The species here described is the many-formed melobesia, which the marine botanist calls *Melobesia polymorpha*.

Other nullipores are in the form of shrub-like masses, composed of stony branches, three or four inches in diameter, of a deep crimson colour while fresh, but, like all the species, bleaching by exposure to the sun. Of one of these, the calcareous melobesia (*Melobesia calcarea*), which is found on many parts of the coast in great abundance, Dr. Harvey remarks, "It forms extensive banks, on which the fronds are heaped together without order, and appear to be kept from drifting merely by their weight. The specimens at the top of the banks are alone living; those underneath, as may at once be known by their faded colour and offensive smell, are always found dead. In the west of England, where this species abounds, it has been used as manure with success, being particularly suited to a peaty soil; but as it requires to be dredged up,

its weight and the depth at which it vegetates preventing its being drifted in any quantity ashore, the full use is not made of it by the peasantry, which its value would seem to call for. In many districts where lime is scarce, a considerable quantity might be obtained by burning this plant. The 'coral sand,' so abundantly employed on the shores of Bantry Bay, owes its fertilizing properties to the remains of cellepores and other zoophytes of whose débris it chiefly consists."

Some of these stony plants are thin as paper and very brittle ; while some form globular masses, also of light and papery texture, crumbling to powder very soon when dried. Others are nothing more to look at than tiny stony dots or patches on other sea-weeds.

A very curious little calcareous plant was discovered recently, by professor Allman, and is figured and described in the "Phycologia Britannica." Dr. Harvey says, that the way in which his friend discovered this, was a good exemplification of that habit of observation inculcated in the little well-known paper, called "Eyes and No Eyes." "My friend," he says, "who omits no opportunity of adding an unobserved fact or a new member to biological science, noticed that an oyster-shell found on a supper table was infested by some animal and vegetable parasites, among others by some poor little specimens of the dotted chrysmenia. On looking a little closer at these latter, he spied what few but an observer so lynx-eyed would have discovered—some minute white dots, irregularly placed on the surface of the fronds. These he deemed worthy of examination, and laid aside the oyster-shell for that purpose. On submitting a fragment of the chrysmenia to the microscope the following day, the first trial rewarded him with a sight of the delicate glossy fan." This is copied from his drawing, and is a coloured plate in Dr. Harvey's work.

This newly discovered plant is called *Lithocistis Allmanni*, and is fully described by the professor. It appears to the naked eye like small dots scattered over

the vegetable to which it has attached itself. Under the microscope, each dot is seen to consist of one or more, frequently of a cluster of transparent fan-shaped fronds. It is brittle and crumbles under the touch, its frond being chiefly composed of carbonate of lime which is not a mere incrustation, but is intimately incorporated with its tissues. The mineral matter is entirely dissolved under the action of dilute acid, and nothing is left save a small film in which the original form can with difficulty be detected. The "*Phycologia Britannica*" is, from the cost of the work, consequent on its valuable illustrations, a book for the few and not for the many; but such of our readers as may have an opportunity of seeing the plates contained in it, would receive great pleasure from examining the beautiful symmetry and structure of this small plant: and he must have a heart singularly unwilling to admit a thought of God, who would not recognise here the proof of the Divine skill.

But the grass-green division of sea-plants has its beauties and its wonders, its graces and its uses too. These marine weeds may be generally known by their bright verdant tint and delicacy, though a few contain a tinge of purple in their hue. Many are expanded into glossy leaves, others are like a pile of velvet on the marine rocks. Our sea-pools have their green weeds waving there like plumes, or flagging down their verdant tufts when the water is off, as if mourning its absence; or they are clustered into little spongy balls. Many of them grow on other sea-weeds, as does the prettiest of them all, the feathery bryopsis, which when in the water is like a green silky plume; while another, not uncommon species, the mossy bryopsis, is of a peculiarly rich green, and grows in dense tufts on the stems of some sea-plants. It bursts its cells when placed in fresh water, and discharges a green powder. In sheltered bays on the west of Ireland it is very abundant.

We have all seen our rocks and shores at low water

covered with a green sward, too slippery, perhaps, for our footing, but looking as if a meadow bordered the sea. The plant, whose filaments afford this verdure, is the rock cladophora (*Cladophora rupestris*), which is so abundant everywhere, and so ornamental to the rocks as to have been noticed by some of the earliest Greek naturalists, and small as are its fibres, it is sometimes gathered and carted for manure. Several species of similar structure form the green thread-like tufts on our rocks; and one which in Roundstone Bay, Cunnemara, infests every object on which it can lay hold, and is frequent on the tangle and other similar sea-weeds, is an exceedingly beautiful plant when young, though when old it gets drawn out into long slimy ropes.

The rock cladophora has long been known as the rock conferva, a great number of thread-like sea-weeds and plants of the fresh water having been included until lately in the genus *Conferva*. Some of these thread-like weeds are found in all seas. Darwin describes one species which he saw when sailing from Bahia, which gave the sea a reddish appearance. On applying a magnifying glass of small power to the water containing the plants, this naturalist found that the whole surface seemed as if covered by chopped pieces of hay, with their ends jagged. These proved to be minute cylindrical confervæ, in bundles of from twenty to sixty threads each. He adds that he was informed by Mr. Berkely that they were the same species (*Trichodesmium erythræum*) as that found over large spaces in the Red Sea, and from which that sea is said to derive its name. "Their numbers," he says, "must be infinite; the ship passed through several bands of them, one of which was ten yards wide, and judging from the colour of the water, at least two miles and a half long. In almost every long voyage some account is given of these confervæ. They appear especially common in the sea near Australia, and off Cape Leeuwin I found an allied and apparently different species. Captain Cook, in his third voyage,

remarks that the sailors give to this appearance the name of sea sawdust."

But returning to the plants of our own seas and their shores, we shall find that one of the most common on shores, rocks, and in pools, is the compressed enteromorpha (*Enteromorpha compressa*). It is sometimes as fine as hair; at others, half an inch broad and a foot long. It is distributed to every explored sea, and may be known from another similar and frequent species by being branched. Long unbranched ribbon-like leaves characterize the intestine-like enteromorpha, and it is hollow like a green transparent tube. This plant is also found in every part of the known world, and is thought to be the species which the inhabitants of Japan use in soup in the same way that we use macaroni. They appear to employ several of the grass-green and other sea-weeds for this purpose, first clearing them from the salt, then bleaching them. This plant forms an article of commerce with the Javanese.

ULVA LATISSIMA.

There is a marine weed well known to all who frequent the coast, which floats up and down in the pools

like a bright flag. It is the broad green laver (*Ulva latissima*), and is a wide and long leaf, puckered at the edges, free from veins, and clear and glossy. This plant is found on all shores, except on the extreme antarctic coast, where the vegetable kingdom has no representative, save in the forms of the *Diatomaceæ*, a tribe of minute plants to be described hereafter. The laver appears from the accounts of Lightfoot and Sir J. E. Smith, to have been formerly stewed and eaten; but it is not apparently so used now. It was called oyster green, because placed in the baskets of oysters; and Lightfoot says that the Highlanders ascribe to it an anodyne virtue, and bind the leaves about the forehead and temples. "But," he adds, "the use of it in these intentions is supported by no good authority."

The lettuce-like ulva (*Ulva lactuca*), though a common species, is not so universal as this. It is smaller, thinner, and of even brighter green, and is far longer and more slender. The ribbon laver (*Ulva linza*), though the most beautiful of the genus, is not very common. It is sometimes one or two feet long, about an inch or two wide, tapering at each end, and puckered at the edges.

There is a frequent and very beautiful glossy sea-plant, the true laver (*Porphyra laciniata*), which the reader can easily distinguish from the species of ulva. It is called sea-silk, and it is very thin and glossy, like silk gauze, its long waving leaves growing in clusters, and being of a rich purple or bright amethyst. This is when the plant is full grown, for when young it is, though thin and clear, of a dull olive colour. It is always extremely frail, tearing at the least touch, and clinging round our fingers as we gather it. It is found in most seas, extending almost to the extreme of vegetation at the poles. This and an allied species are sometimes cooked and brought to English tables, under the name of laver; while in Scotland, where it is an article of luxury, it is called sloke, slouk, or sloukawn. The plant requires boiling for many hours, when it is

reduced to a dark slimy-looking pulp, which is eaten with pepper, vinegar, and lemon juice. The Scotch are very fond of this dish, and if any one can overcome the dislike excited by its muddy disagreeable appearance, it is really very good food. The author has known it to be often eaten in England with roasted mutton, and much relished. There are few, however, who did not learn to like it during childhood, who become very fond of it afterwards. Mr. Landsborough, referring to its seasonings, says, "So far as our experience goes, it requires them all; with these appliances, however, it is tolerable, verifying the good Scottish proverb, 'If you boil stanes in butter, you may sup the broo.'"

Dr. Harvey thinks that the laver might become a valuable article of diet, in the absence of other vegetables, to the mariners in our whaling vessels, cruising in high latitudes, where every marine rock at half tide produces it in abundance. He adds that in its prepared state it may be preserved for an indefinite time in closed tin vessels. The common porphyra (*Porphyra vulgaris*) is much like it in its delicate texture and tints, but it always preserves the form of a long, slender, undivided leaf, whereas the other species is cut into lobes, and its colour is generally more vivid. Wide spaces of rock are sometimes covered with its purple ribbons, or they hang on sea-walls, or rocks and stones, nearly throughout the year. This kind may be eaten like the true laver.

We have before had occasion to notice the existence in some sea-weeds of minute particles which exhibited singular movements. This approach to animal life is seen also in some green sea-plants, and in none more remarkably than in the large class of plants called *Oscillatoria*. These singular vegetables are found not in the sea only, but in rivers, on moist stones and rocks, or corallines and sea-weeds, sometimes being a green slime on the surface, or, as in the warm springs of Bath, forming large velvet-like patches of a dark green colour. Many species are found on our sea-rocks, some of them

at about high-water mark, or in spots only occasionally overflowed by salt water ; but none of these oscillating plants are found in dry places. Some have filaments long enough to look like little tufts of silk, others are in flat masses, others again like crusts, while their slimy patches often render the sea-rock slippery to the foot. Some beautiful species of a verdigris colour have threads an inch in length. Such are the plants of the largest kind of the *oscillatoria*, which form crisp tufts of threads twisting into entangled masses of dark green shaggy coats. They mostly cover rocks to a great distance along the shore, or hang like silken beards to sea-weeds.

Any attempt to describe even the commonest species without the aid of coloured plates and scientific terms would be useless, yet we can give the reader some general idea of the singular structure of these plants. They are all composed of thread-like tubes, some of them looking, under the microscope, like a succession of rings, such as we see in the earth-worm. Each tube is found to be double, the outer one transparent like a pipe of glass. Within this is a jointed tube filled with colouring material, which is at some times scarcely perceptible ; at others, intensely green, or purple, or yellowish. These threads wind and twist in the most active manner like little worms, with a motion so apparently determined by their own will, that if not distinctly animal, it is singularly like it. Not only do they bend and curl right and left, but they will in a few hours actually remove to distances of ten times their own length, in this respect exhibiting a motion without parallel in the vegetable kingdom. None of the various causes which have been assigned for these movements are quite satisfactory. There are accurate observers who conclude that the motions are entirely vegetable, accounting for them by their remarkable rapidity of growth, by the action of light upon the fibres, or by the agitation of the water in which they are immersed ; when under the microscope, the slightest

and most imperceptible currents having the power to influence fibres so delicate. But naturalists, of equal sagacity and experience, cannot receive this opinion. They have surrounded the watch-glass in which they placed their specimens with a piece of talc, to prevent any motion in the liquid ; but the singular contortions were active as ever. They have also left a mass of these filaments all night in utter darkness, but on examining them next morning, many of the tubes had during the interval entirely separated themselves from the heap. Rapidity of growth will only account for the increased length of the filaments, and not for their turning to the right or left, or for their removing to a distance from the other tubes.

Mungo Park, when he looked on the little moss in the dreary desert, took comfort as he thought of God's care of the small plants ; and it has always seemed to us that faith and hope could even more easily gain fresh strength in the contemplation of the smaller objects than of the vast in God's creation. When David looked up into the blue arch of the midnight heaven, it seems the natural result of his gaze that he should have felt his own littleness ; and many a heart has responded to his utterance, " When I consider thy heavens, the work of thine hand, the moon and the stars, which thou hast ordained ; what is man, that thou art mindful of him ? or the son of man, that thou visitest him ? " But as we look upon the care and skill shown in the structure and preservation of a little thread-like plant, which, perfect as it is, does not exceed an eight or ten-thousandth part of an inch, the result is the opposite—the inference natural, that we are of more value than many such plants. God's word, which he has magnified above all his name, has told us so in words which can never be mistaken—words which can assure the feeblest faith by their mighty power. The world and all that is beautiful is but for a season, it shall all pass away ; but the undying spirit within him who gazes upon it has a glorious destiny. It is im-

perishable, it shall live somewhere for ever ; and having been enabled, even here, by God's Spirit to believe in that Saviour by whom light and immortality are brought to light, it may rejoice, every moment, in the calm conviction that its eternity of joy is already begun ; and though the clouds of life may be shadowing for awhile its beginning, yet at "evening time it shall be light."

THE NEEDLES, ISLE OF WIGHT.

FISHING OFF YARMOUTH.

CHAPTER VII.

SEA-BIRDS.

WE cannot complain of want of music on the sea-shore, for wind and waves make there a constant melody; but we rarely listen, when near the sea, to the voice of a singing-bird; such birds are uttering their joy far away over the corn-fields, or among the leafy boughs of the deep green woodland, or in the stillness of the meadow, or among the water sedges. Now and then a robin comes in the autumn, with a plaintive farewell for the

passing brightness; or a lark soars over the cliff to pour out its loud song of praise and gladness. One or two singing-birds, like the shore-pipit, sing their best songs here, and nestling in the clefts and crevices of the rocks, or flying near the blue sky far above them, utter the sweet tune, which is often all the sweeter, because it is the only song which is to be heard. But if the voices of our sea-birds are not in themselves musical, they please us by their association with the rude and wild scenes around us, and by their fitness to their haunts. Of little use to the sea-bird would be the sweet clear tones of the nightingale or the lark. Loud as these seem to us when uttered amid the stillness of the country, they would hardly be heard over the sea, and would be of small service as a language to the winged creatures whose homes are rocky precipices, ever dashed against by loud-sounding waves. To these the screaming hoarse voices of the sea-gulls are far better attuned, and these are indeed the only utterances which could avail them amidst the storm. He who cares for the young ravens when they cry, and for the sparrow when it falls to the ground, has better fitted the sea-birds for their native haunts than had he endowed them with the gift of melody. Buffon remarked that a bird which can make itself heard, like a wild goose, a league high in the air, and produce sounds in a medium which considerably diminishes their intensity, must possess a voice of four times the strength of men, or even of the quadrupeds, which can only be heard half a league at furthest from the surface of the earth. And so those loud screams, which when uttered by the multitudes of birds on some parts of our shores are almost deafening to our ears, have their meaning and their adaptation, if not their melody.

Nor is this powerful voice of the sea-bird the only fitness for its haunts which is presented to our minds as we look and listen. Besides that it possesses, in common with all birds, that wonderful power of vision without which it could neither direct its flight with

safety, nor gain any idea of distance or motion, it has immense strength of wing ; and such species as the sea-gulls, which are destined to live on water rather than land, have small legs and feet ; while such as are made, like the curlew, to roam the marshes, have long legs, adapted for walking and wading in among them. The sea-birds, like most of the creatures which find their food in the waves, are exceedingly voracious ; for animal life is so abundant there, that the larger tribes must consume much in order to preserve some proportion in the numbers. If on some cold afternoon we hear the tribe of gabbling wild geese which are hovering over our shores on their way to the marshes, we may, on looking up, see them arranged in a triangular form. This is the most favourable mode for cutting through the air, and that foremost bird, which serves as a point to the triangular array, will soon be more fatigued than any of the others, for he has a greater resistance to overcome than they. Others, however, will succeed in their turns to the point of difficulty, while the foremost will fall back on the rear for rest from fatigue. In the same way the fishes make their long migratory journeys through the waters. In this case, however, the strongest male fish takes the precedence, then come the other males, while the triangle is completed by a line of female fishes.

Living ever in the air, experiencing all its influences and variations, birds are very sensitive to atmospheric changes, and presage with much certainty coming changes of seasons or of weather. And when the divers and sea-gulls come on rapid wing to the rocks, and scream in loud tones on our shores, as if to warn their far-off companions that the storm is on its way ; or when the cranes come away from marshes to soar high in air, the mariner lowers his sails, and the wanderer by the sea, who may have ventured far from home, knows that he must now hasten back, lest winds and waves drive him before them.

The thick downy covering of the sea-bird is moistened

with an oily secretion, so that the bird can shake the water from his wings, while his skin is dry beneath. All birds have an oil for keeping their plumage soft and flexible, but in the aquatic bird a greater supply is given, so that the wave may come over it, and rolling off, leave it unwetted. It is this abundance of oil which makes the flesh of the sea-fowl so strong in flavour, for it not only insinuates itself through the entire plumage, but is even imbibed by the skin.

No bird is better known on most parts of our coast than the common gull (*Larus canus*), which is in some places called the winter-mew. Active and restless as it may seem on the wing, it has, when in repose, little that would remind us of the frequent comparison "blithe as a bird." We often see it in gardens near the

SEA-GULLS.

coast, with clipped wings, wandering in solitude over the paths with a dejected and melancholy air, as if

pinning for its native sea and its companions. When free its manners seem almost agitated as it darts eagerly on its prey, swallowing it so impetuously that it sometimes seizes the hook and bait which the fisherman has put out to take the fish, and thus wounds itself and becomes a captive. Buffon called the clamorous and voracious gulls the vultures of the sea ; they not only feed on fish, molluscous and other living animals, but seize on dead and putrid matter of every description, either floating on the waters, or spread on the shore. When food is not plentiful near the ocean this bird goes away inland, and will sometimes follow the plough over the field in search of the insects, its silvery plumage rendering it conspicuous among the dark furrows, or by the side of the black rook, which is there too. Gulls do not dive into the water for food, but they dip now and then to seize it. They have also a faculty of existing a long time without food ; and a gull kept by a naturalist was known to pass nine days without eating. They have been found by voyagers in all latitudes, and are very numerous in northern regions, where the carcasses of whales and of large fish offer them an abundant store of nourishment. Hard and tough as their flesh is, yet it may be eaten, and the eggs, which are placed in large nests made of grass and sea-weeds, are very good. This gull generally builds in crevices among the high rocks on the shore, or when the coast is of a more level description, in salt marshes.

Quite as common is the black-headed gull (*Larus ridibundus*), which is, like this, of an ash-grey colour, but is easily known from it in summer by its dark-brown head and neck, and its red beak and eyelids, though in winter the plumage on the head is paler. We may see it hanging in air on any winter's day above the sea, and hear its wild scream mingling with the hoarse murmurs of the waters. Suddenly it espies a fish, and down our bird dashes with strong wing to the surface, seizing its powerless prey in a moment. Their

number and the perpetual movements of these birds at this season will often give an appearance of life and animation to the scene, and delight us as we watch their

LARUS RIDIBUNDUS.

elegant forms and graceful movements. In the spring, parties of them assemble and repair to the marshes to build their nests, gathering the sedges and the tops of the reeds for this purpose; and as soon as the young are hatched, both the parents and their young ones fly away to the sea, to hover there perpetually.

Many people dwelling on the coast eat the eggs of the gulls, and far up in the ledges of the tall cliffs we may sometimes see boys collecting those of another species, the kittiwake gull (*Larus tridactylus*). A perilous work it seems as we look up from the shore, and tremble to think how one false step might hurry them downwards, or how easily the rope sometimes suspended around them might snap and drop them. This kittiwake is not so general as the other species here named, and it never builds in marshes. It is sometimes a valuable bird to our mariners. Captain Ross says that it inhabits the highest latitudes yet reached by man, and that it congregates in innumerable multitudes along the west coast of Prince Regent's Inlet, where his party killed enough to supply them with several excellent meals, which he describes as delicious,

and perfectly free from any rancid flavour. Its common name is given from the resemblance of its cry to the word kittiwake. Bishop Mant's description of our sea-gulls is very graphic :—

“ More fleet, on nimble wing, the gull
Sweeps booming by, intent to eull
Voracious, from the billow's breast,
Mark'd far away, his destined feast :
Behold him now deep plunging dip
His sunny pinion's sable tip
In the green wave ; now lightly skim
With wheeling flight the water's brim,
Wave in blue sky his silver sail
Aloft, and frolic with the gale,
Or sink again his breast to lave,
And float upon the foaming wave :
Oft o'er his form your eyes may roam
Nor know him from the feathery foam,
Or 'mid the rolling waves, your ear
On yelling blast, his clamour hear.”

The feathers of some of our sea-birds are very useful. The fine elastic down of the eider-duck is a well known and costly article of luxury, and the collecting it a source of maintenance to many. The bird is called St. Cuthbert's duck, because numbers build on a rock called St. Cuthbert's Isle ; but it is also a native of some of the northern coasts of England, and of various Scottish islands. It is only a rare visitor to our southern shores, and the quantity of down on its body enables it to brave the coldest countries. Its nest is made of fine sea-weed among the stones of the shore, and so abundant is the down on this duck, that it can spare a portion with which to line its nest. As it sits, day by day on the nest, the bird strips from its breast a quantity of this soft material, so that the eggs are at length quite enveloped in it. The elasticity of the down is so great, that two or three pounds, which may by pressure of the hand be reduced to a small ball, will dilate to such a degree as to fill a large quilt. The flesh of the bird is good for food, but its life is too valuable to be sacrificed for this purpose, for it is only the down of which the bird robs herself that is valuable ; such as is gathered after her death soon becoming

matted and spoiled. There are rocky places in Norway and Sweden where hundreds of the nests of the eider-duck are to be found every season, and they descend by inheritance to the proprietors, and are a source of much wealth to them.

Several of the duck tribe are winter visitants to our shores, and the sea seems quite alive with them as they flutter from place to place, just letting us see their forms, then in a moment disappearing beneath the waves. They not only flutter above the water, but are most unwearied swimmers, and most clever and successful divers after fish. With the wild gull, and some other birds, they unite in making in the air, when they come to us, a most strange unearthly sound, which if heard in the darkness may startle the wanderer on the shore, reminding him of those wild legends of horsemen and hounds, whose shouts were fancied to resound in the air, when those who uttered them were invisible to mortal eye.

“ And now the wintry coast along
The assembled flocks of ocean throng,
Some native birds perennial; some
From inland moor or freshet come,
To winter on the fishy shore:
And some from far-off regions frore,
Where reigns uncheer'd a dayless night,
Have hither sped their annual flight.”

Such a bird is the scaup-duck, (*Anas marina*), which on some shores comes with the rough and strong gales of the late autumnal months, to pass its winter with us, diving after the small fish, and finding a vegetable diet in the sea-weeds about the shore, or scooping with its broad beak along the mud or sand, and swallowing such small worms or insects as it may find. Mr. Yarrell thinks that to this habit of scooping it owes its name of scaup duck; but Mr. Willoughby says that the broken shells among which it feeds are called scaup, and infers this to be the origin of its name. Its flesh is dark, and has a fishy flavour, but it is sometimes eaten by those who cannot procure other food. In the spring this duck forsakes our shores, and numbers of

them may again be seen streaming over the waters on their way to the countries north of the Orkney and Shetland Isles, where they rear their young. The tufted duck (*Anas fuligula*) is often the companion of this species on our coast, and is more generally distributed, being a well known visitor in company with the golden eye, the pochard, and other oceanic ducks. This species is also an excellent diver, and though it feeds on the same substances as the other, is good for eating, and has so excellent a flavour that it is sometimes called the black wigeon.

The flesh of the pochard or dun-bird (*Anas ferina*) is, however, superior to this, and is said even to be better than that of the celebrated canvass-backed duck of the United States, though this is only when it resorts to inland lakes and rivers, and not when it feeds on the fishy animals near the sea. When about the shore it is very fond of two of the marine vegetables, which are not sea-weeds, but which grow in salt-water pools and sea-dikes. We have only two native plants of this kind, and neither of them is universally diffused. The long riband-like green plant called the grass-wrack (*Zostera marina*), has long cord-like stems, while its flowers are like little rows of green beads which grow in the leaves, these serving as a kind of sheath to them. When these stems and leaves are dried, they are sold under the name of alga marina, for filling mattresses, and they are also used in packing glass for removal. This plant grows quite in the sea, but the sea-ruppia (*Ruppia maritima*), or tassel-grass, sometimes called eel-grass, grows in salt-water ditches, and may be easily known by its flowers, which are on a curling flower-stalk, and by its long narrow leaves. These two plants the pochard tears up by the roots, which have not a firm hold in the soil, and these it eagerly devours, throwing away the remainder of the plants. It is often called the red-headed poker, and red-eyed poker, from the prevailing colour of the head, which is a rich chestnut red. Its low whistling tones

are heard on our shores about the month of October, and if the bird is alarmed it croaks as hoarsely as a raven.

We have several other winter ducks, as the pintail, commonly called, on the Hampshire coast, the sea-pheasant, on account of its length of tail; and the wigeon, which, besides being like this duck, a species prized for the table, is one of our common kinds, being found all round our shores, and frequenting, as several others do, the rivers, fens, and marshes. It makes, both by night and day, a strange whistling noise, which obtained for it in our country the name of whew-duck, and in France that of *canard siffleur*. Then there are the velvet duck, which comes to some of our shores to eat our mussels, razor-bills, and other shell-fish; and the golden eyes, so well known on our coast, which are wary birds, and have one or two sentinels always on the look out, to warn the party of approaching danger.

But by far the handsomest of the ducks which frequent the sea-side, is the shell-drake, or shield-drake, or burrow-duck (*Anas tadorna*), whose pure and brilliant plumage gleams in the sunshine of the winter or summer day, for it is found all the year long on the coast. It prefers flat and sandy places, and builds sometimes in rabbits' burrows, or other spots where the soil is soft, frightening the rabbits by its loud shrill whistle. It hunts in the sand for those little active insects, the sand-hoppers, which look like tiny shrimps, skipping about there; or it drags up the sea-worms or shell-fish. It appears to prefer the latter kind of food, and hence its name of shell-drake. That of shield-drake, Mr. Yarrell thinks may have originated in the frequent use made of this bird in heraldry: the family of Brassey, in Hertfordshire, as well as several others of this country, having in their arms this duck on their shield, and sometimes as a crest.

The geese, as well as the ducks, are chiefly winter visitants to our coasts.

“ Now o’er our heads compact they fly,
See, as we speak, careering high,
A flock of wild ducks clouds the air
In wedge-like shape triangular;
And grey geese there outstretch’d, combine
Their troop in one unbroken line.
Now in small bands dispersed, or each
His prey pursuing o’er the beach
On their strong legs they wade; divide
Deep down the gulfy flood, and glide
Afar unseen; or rising meet
The breasting wave with oary feet;
Their strokes alternately advance,
And cleave secure the deep expanse.”

As the geese come to us, and the air is filled with their wild shrill cries and noisy gabblings, they give to all the dwellers of the coast warning of coming cold and frost, of wintry winds and roaring waves. Yet it is impossible to contemplate their coming without admiration of their order and arrangement. The goose is a maligned bird. There is no music in its gabbling utterance; and its outstretched neck and gaping mouth would not be good external indications of sense; and so the goose has become a type of stupidity. Yet the mode of flight of these birds is one which enables each individual to take its proper place, and shows no small degree of intelligent instinct. Sometimes, as has been said, this is performed in a triangular arrangement; but when the troop is not very large, it moves through the air in one unbroken line. By either means the foremost bird cuts the air, enabling the whole party to proceed with less fatigue.

The goose has an acute vision, and a fine faculty of hearing; and so guarded is it, that whether eating or sleeping, one of the party always acts as a sentinel, and with outstretched neck and head raised high in air, gives timely notice of the smallest cause of alarm. From the great height in the air at which the flocks fly, the fowler’s aim is almost useless; hence the old familiar comparison, of “a wild-geese chase.”

The most frequent species of goose about our shores is the brent-geese (*Anas bernicla*), the smallest of its kind, and a most true marine bird; for it passes a great portion of its days, and even of the night, out at sea, and seldom resorts to inland waters. It may sometimes

be seen in great numbers on the shore at low tide, when the waters have left their store of sea-weeds, and the numerous living creatures which lie among them ; then these geese hunt for their prey, turning over the weeds, and eagerly devouring the worms and shell-fish, or seizing from the pool its beautiful fringes of bright green laver leaves, and eating large quantities of the plant at a meal. The geese are clever enough to well understand that when the mud hardens so as that a human foot may tread it in safety, it is no longer a secure place for them ; and then away they wander into the sea, betaking themselves to the waters, and finishing their meal in peace among the floating sea-weeds, or peering among those which blacken the tops of the rocks that are emerging from the water. As these birds afford good food, they are often shot, and great numbers may be seen in the winter season in the London markets and the poulterers' shops. On the Northumbrian coast they are called ware-geese, because they eat the sea-weeds. Our readers will remember, that several species of sea-plants are called ware, as the hen-ware ; and in some places all the larger brown sea-weeds seem included in this name, while on other coasts sea-weeds in general are termed chaff, no doubt from a mistaken notion of their worthlessness.

The bernicle goose (*Anas erythropus*) comes to us also from the north of Europe at this period, and is seen on some of our shores in great numbers during severe weather, especially at the west of our island ; but it is less truly a maritime species, being as often in the salt marshes as immediately by the sea. This, too, is the case with the smew (*Mergus albellus*), which is very similar in appearance and manners to the oceanic ducks, and is often seen about the sea-side, as well as on the shores of the salt rivers. It feeds on small fish, crustaceans, and insects ; is a shy bird, an excellent diver, but a poor walker : it seems, indeed, as if the smallest distance over land was performed only by great effort, but it plunges far down in the water at its pleasure.

The mergansers, the largest kind of which is the goosander, are also very common birds on some parts of our coast, but not universally distributed there; and, like the various species of grebe, can find their home in the sea, or spend their time in hunting among the reeds and rushes for their food. This is not the case with those birds known to us especially as the divers, for they live out on the wide sea, only coming to the shore to rear their young ones, and taking the brood off with them to the waters as soon as the feathers on their wings and bodies fit them for the sea. These birds are most indefatigable divers; and it is most amusing to sit on the rocks or shore, and observe their performances. Look at a number of these birds on a foggy day, late in the year, when shoals of sprats are streaming in the sea, and darkening its surface by their multitude. Down goes the diver in the midst of them, and one would think that he stayed there to eat a meal at his leisure beneath the waters, so long is it ere he emerges from them. Not only the sprats, but the herrings, and other small fish, have reason to dread these birds; and their peculiar croaking might serve as a warning, for it is loud, though somewhat resembling in its tones the cooing of the wood-pigeon, and seeming rather the plaintive note of sorrow than the utterance of joy. The sprat-loon, or red-throated diver (*Colymbus septentrionalis*), is the most frequent of the three British species, and it is so eager in the pursuit of its prey, that it is often captured by the fisherman in his sprat net. The term loom, or loon, is thought by Mr. Yarrell to be a modification of the name which it bears among the Laplanders. They call it the lumme, which is said to mean the lame, on account of the hobbling mode of walking which the diver has. In the Orkneys it is called also the rain-goose, because its croaking tones are said to be loudest before rain. Its nest is generally placed very near the water, so that the bird may slip out of it into its native element, for it can neither stand nor walk with ease. It can, however, fly very well, and at a good height too,

and make its way quickly over the sea, heedless of storm or wave. The fowler seldom tries to get at it, for, by dint of quick swimming and good diving, the attempt to escape is so successful, that his labour would be lost. During the time when these birds are rearing their young, their mournful cry is oft repeated, the utterance sounding like the words kakera, kakera, by which name this diver is called in many parts of Scandinavia.

The grebes, too, can fly and dive well, but they make little use of their wings. They are almost constantly on the water, swimming against the wind, yet sometimes the wave will drive them on to the shore, where they will be easily taken before they can settle themselves to the water. If you attempt to touch them they make great resistance, striking at you with the bill, and when once fairly afloat, they will soon escape by diving. Their feathers are elastic, and form so close and glossy a down, that the bird is well protected both from wet and cold. The covering of the breast is white ; and this silvery plumage never becomes moist, and unites the elasticity of feathers to the brilliancy of silk and the softness of down. Muffs are often made of this part of the skin of the grebe ; and Pallas relates that in the southern parts of Siberia these birds are so numerous as to afford a very lucrative trade among the Barabynsk Tartars, for this glossy skin.

Much of that loud, wild screaming which resounds among the cliffs, and which sometimes rises shrill and

HEAD OF GUILLEMOT.

hoarse, even above the wildest roar of the sea, is made by some of those birds which look like the diver, and which can also both swim and dive exceedingly well. The common guillemot (*Uria troile*) is com-

monly called the foolish guillemot, or foolish Willie, or wild Willie ; though why it should be deemed inferior to other sea-birds in sense is not very apparent,

as it seems to surpass many of them in this respect. It may be that because when on shore the bird has an awkward appearance, as the legs are placed so far back beneath the body that they walk badly, and their wings are so short and narrow, that they can scarcely flutter. Let our bird, however, but get upon the face of the waters, and we shall see it swim with grace and ease, while the very position of its legs, which renders it a bad walker, is suited to facilitate its diving. It dives very low, even far under the ice, and the wings aid its progress as it rises to the surface when some tempting crab, or fish, or marine insect, induces it to urge onwards with great rapidity. It is by means of these short wings, too, that the guillemots clear the projecting ledges of rocks and cliffs, and jump from point to point, till they reach those high, and to us inaccessible spots, where they often build. These birds can bear a great degree of cold, and are often seen on the ice ; but as they can only find their food in the open seas, they leave the colder regions of the inhospitable north, and come, during complete frosts, to our shores ; whole families residing there, and congregating by thousands among the rocks.

So far from being stupid and insensible, the guillemots evince great contrivance and affection in planning the welfare of their young. Mr. Waterton, referring to these birds in the neighbourhood of Flamborough Head, says, "The men there assured me that when the young guillemot gets to a certain size, it manages to climb upon the back of the old bird, which conveys it down to the ocean. Having carried a good telescope with me, through it I saw numbers of young guillemots diving and sporting on the sea, quite unable to fly ; and I observed others on the ledges of the rocks, as I went down among them, in such situations, that had they attempted to fall into the waves beneath, they would have been killed by striking against the projecting points of the intervening sharp and rugged rocks : wherefore I concluded that the information of the rock-

climbers was to be depended upon." Mr. Yarrell, in further proof of this, says that he has seen on the sea, at the very base of the high cliffs of the Isle of Wight, the young, both of the guillemot and the razor-bill, so small that they could not have made the descent by themselves from their lofty birth-places without destruction. Yet he adds, that these little birds knew perfectly well how to take care of themselves, and at the approach of a boat, would swim away, and dive in all directions. By the month of September, the birds, both old and young, leave the rocks, and make their dwelling, both by night and day, on that wide world of waters for which they are so admirably fitted.

Our great ornithologist, Mr. Yarrell, remarks also, that about the beginning of May, the common guillemot, with many other species of birds frequenting the sea-rocks, come to particular points, where, from the numbers which congregate, and the bustle apparent among them, one would think that a confusion of interests and of localities would be likely to ensue. "On the contrary," says our author, "it will be found that the guillemots occupy one station, or line of ledges on the rocks ; the razor-bills another ; the puffins a third ; kittiwake gulls a fourth ; whilst the inaccessible pinnacles seem to be left for the use of the lesser black-backed and herring gulls. Two distinct species scarcely ever breed close by the side of each other." Who could have believed that the sea-birds had so good an idea of political science, and so rigid notions of justice, as to share their kingdom so definitely and wisely ? The common guillemot is distributed all round our coasts, and in some places has the name also of willock, or turker-shire. Its single egg is placed on the bare rock, and though varying much in hue, is generally of a bluish green, dashed with dark brown. The black guillemot (*Uria grylle*) is a dull, black-hued bird, with scarlet feet and legs, while these parts in the common guillemot are black ; but the former is not a common bird on any of our shores.

Associating with the guillemot, in great numbers, wherever our shores are precipitous, we may find the razor-bill auk (*Alca torda*), which is so like its companion in appearance, manners, and habits, that only an ornithologist would detect any difference between them. The little auk (*Alca alle*), which is more often seen on our northern than southern coast, is also half oceanic in habits, rarely appearing on land save during the period of incubation, or when driven in by the violence of winds and waves. It is provincially called the rotche.

HEAD OF RAZOR-BILL AUK.

Any one who has once seen a puffin or coulter-neb (*Alca arctica*), will ever again know this bird from all others. A strange-looking bird it is, and strange too is the grave sound which the puffin makes, seeming, as it sits perched on the ledge of the sea-rock, as if it were announcing some very solemn fact to its companions, looking at you with its sharp eyes, if you glance upwards, as if to say, 'I am not afraid of you, but shall proceed with my oration,' and letting you approach pretty near without indicating any emotion. Immense numbers of these birds are to be found among the cliffs of our shores, as on those of the Isle of Wight, during the summer, or they may be seen running over the downs at the top of the cliff, contending with the rabbits for the proprietorship of the burrows, pecking most unscrupulously the rightful owners, and generally succeeding in securing possession. Not that the puffin always resorts to ready-made dwelling-places. Sometimes no rabbit holes are to be found, and the male puffin either excavates burrows very cleverly, or they all content themselves with crevices of the rocks. When burrows are made

HEAD OF PUFFIN.

by these birds, the very summit of the cliff is chosen, and the hole dug is sometimes several feet deep. Such earnest workers are they, that they will, while thus occupied, allow themselves to be taken by the hand; and Mr. Selby says that he has frequently obtained specimens of the bird by thrusting his arm into the burrow, though at the risk of receiving a severe bite from the sharp and strong bill of the puffin. The egg, which is as large as that of a pullet, is in the month of June placed at the very end of the burrow, and as it is good for eating, it is often taken by people in the neighbourhood. This bird dives exceedingly well. We may often see it far up on some rocky point, peering into the waters. Presently it dashes down, hides for a moment beneath the surface, then emerges with several sprats or other small fish hanging from the bill by their heads, sweeps actively upwards, and bears the meal to its family. From the form of its bill it is often called the sea-parrot, and it can insert this like a wedge between the valves of the shell-fish. The natives of the Kurile Isles make ornaments of these bills, and those of Oonalaska use the skin and plumage for vestments.

On almost every part of our rocky shores we may see and hear too that large bird, the black cormorant (*Pelecanus carbo*). The range of this bird is very extensive, as it is found on the Ganges of India, over the greater part of Europe, and also in North America. Great numbers rear their young among the cliffs of the Isle of Wight, and large flocks are often to be seen on the sand-downs of the southern coast, as well as on isolated sea-rocks about our shores. We all know that the cormorant has a great reputation for voracity, and being both a good diver and swimmer, and a most dexterous fisher, it has abundant means of supplying its appetite. When it has caught a young fish beneath the surface, it will come up, and tossing its victim in the air, will catch it head foremost, so that the fins and scales may not interfere with the throat while swallowing it. This would be less necessary did the cormorant confine its

food to its favourite fish the eel, or even to small fish in general ; but as it does not hesitate to seize a fish so large as that we should deem its passage down the throat almost impossible, this instinctive precaution is very necessary. It is wonderful how many fish a cormorant will consume in the course of an hour's fishing, and it

THE CORMORANT.

pursues its prey, not only with such address, but also with such determined perseverance, that it rarely escapes; even if a young bird, only half fledged, is thrown into the water, it instantly dives and helps itself to its food.

This cormorant is remarkably intelligent and may easily be tamed, when it becomes much attached to its owner. Colonel Montagu had one which was so domesticated, that it would come to him and dress its feathers with the greatest composure by the fireside where he sat. It is in its wild state a friendly, social bird, living in great harmony with its congeners ; and here, when

away from its native haunts, it associated with perfect good temper with geese, ducks, and other fowls, though when it saw a pool it would become excited and restless, and perhaps yearnings for the sea would come to it. So docile is the nature of the bird, that both in England and Holland, as well as in some eastern lands, it has been trained to catch fish, and disgorge them for its owner, only receiving a few afterwards, as a reward for its efforts. Whitelock mentions that he had a cast of them, which, like hawks, would come to his hand, and tells how the best he ever had were given to him by Mr. Wood, master of the cormorants to king Charles the First. Sir George Staunton saw a similar species thus employed in China, and referring to the southern branch of the canal on his journey to Han-choo-foo, he says, "On a large lake close to this part of the canal and to the eastward of it, are thousands of small boats and rafts built entirely for this species of fishery. On each boat or raft are ten or a dozen birds, which at a sign from the owner plunge into the water, and it is astonishing to see the enormous size of the fish with which they return, grasped between their bills." The cormorant generally builds on the very summits of the rocks, making its nest of dried sea-weeds, and these are in some instances two feet in height. The eggs, like the flesh of the bird, have so high a flavour that they are of no value.

Many thousands of the gannet or solan goose (*Pelecanus bassanus*), "intelligent of seasons," come during spring and autumn to various parts of our shores. Their young are the strangest looking little birds, resembling powder puffs, and they are often taken for their down, which is appropriated to many useful purposes, as well as for their flesh. This, though somewhat oily in flavour, is esteemed a delicacy in many parts of Scotland, large numbers of these young gannets being sold in the Edinburgh markets. The eggs too are very highly prized, and the spots which are the annual resorts of these birds become of much value to the proprietors.

The Bass Rock at the entrance of the Frith of Forth, the Isle of Ailsa at the mouth of the Frith of Clyde, St. Kilda, and the Skelig Isles on the Irish coast, as well as some others, are all celebrated for their solan geese. Mr. Selby says, that the precipitous Bass Rock is rented from the proprietor at sixty or seventy pounds per year, entirely on account of the worth of these birds and their eggs. "Great care," says this writer, "is taken to protect the old birds, which the tenant is enabled to do from the privilege possessed by the proprietor of preventing any person from shooting or otherwise destroying them within a certain limited distance of the island. From the accounts I have received from the resident there, it appears that the gannet is a very long-lived bird, as he has recognised, by particular and well known marks, certain individuals for upwards of forty years, that invariably returned to the same spots."

These birds become very tame during incubation, even allowing themselves to be stroked by the hand without resistance, nor even appearing displeased, and merely uttering a low cry of grog grog. During May and June the nests, young, and eggs are so numerous on the surface of the Bass Island, that the rambler there can hardly avoid treading on numbers of them as he passes on, while the sea all round about it is so covered with them, that they can be compared only to swarms of bees. The herrings so plentiful in our seas, and so valuable a resource to man, are also the chief food of the gannet ; and the bird sees them from afar, plunges in, and seizes them with great address. It has been calculated by Buchanan, that the gannets of St. Kilda, alone, destroy annually one hundred and five millions of herrings. When autumn arrives, the gannets betake themselves to milder climates, and many are found on the shores of the Mediterranean and the Bay of Biscay. The French term this bird *fou de bassan*.

The most graceful of all our sea-birds are the sea swallows, or terns. Skimming lightly through the air, they, like the land-birds after which they are named,

are ever on the wing, and their slender bodies, their long pointed wings and forked tails, would immediately remind us of our swallow, that welcome herald of flowers and sunshine, that useful destroyer of the insect race, which else would overrun our gardens and fields. Over the water skims the light tern, never diving, but picking up some store of food while on the wing, now and then perching on some floating drift-wood, or buoy or other sea mark, and looking out on the watery world about it. But the bird needs little rest, and is soon off again, uttering loud shrill cries, as if rejoicing in its strength, and excited by its own rapidity of motion. If the air is clear and the sea calm, it often flies at a great height, and then sometimes descending suddenly, it pauses a minute and darts upon a small fish, and wings again its way onward.

The terns are a numerous genus, and the species are very similar to each other ; they are all summer visitants from the north of Europe. The common tern (*Sternus hirundo*) builds its nest occasionally on beaches, or on the ledges of the rocks, but the greater number of these are generally found on salt marshes, or on low sandy islands near the sea. All its movements are very restless, and accompanied by noisy cries. It is very careful of its young, but like most sea-birds is not so patient in sitting in the nest as are our sweet woodland songsters, rarely going near them during day, but protecting them from the cold of night by its presence. When the young terns begin to fly, it seems to be a joyful and exciting day for the whole family ; the attempt is made amid much clamour, and any approach of man towards them is resented by the parent birds, which will swoop around the head of the intruder with shrill screams. That pretty bird the lesser tern (*Sterna minuta*), is often seen near the sea, for it is distributed all round our coasts, and is abundant during the summer on the low and sandy districts, placing its eggs on the bare sand, in May ; while associating with it, or assembling in great numbers with its own species only, may be seen

the arctic tern (*Sterna arctica*), which is the most common kind of the family. It may be known by the pearl-grey plumage of its under parts, as this is in the lesser tern of a dull white. Though these birds do not swim, they are all web-footed.

THE STORMY PETREL.

The smallest of all our web-footed birds is the stormy petrel (*Procellaria pelagica*), a bird far more familiar to us by the poetic fictions so often related of it, than by any personal acquaintance. Now and then, indeed, these birds come in large flocks to our shores, but this is a rare event, though after severe gales a stray bird or two may occasionally be seen as if coming to repose from the storm. It is most truly an oceanic bird.

“ Up and down, up and down,
From the base of the wave to the billow's crown,
Amidst the flashing and feathery foam
The stormy petrel finds a home ;
A home, if such a place can be
For her who lives on the wide, wide sea,
On the craggy ice, in the frozen air ;
And only seeketh her rocky lair
To warn her young and teach them to spring
At once o'er the waves on her stormy wing.”

The wing of the petrel seems indeed untiring, and it must be a strange change from the usual habits of the bird, when its young require its patient care. In some of the outmost rocks which form the Atlantic boundaries of our island, it places its eggs in the crevice of the cliff, or perchance in the burrow of the rat or the rabbit, and there the mother bird sits uttering a low purring noise, as if singing to cheer her solitude. Mr. Hewitson gives an interesting account of these petrels as he has seen them in some of the Shetland Isles at this season. "During the day," says this writer, "the old birds remain within their holes, and when most other birds are gone to rest, issue forth in great numbers, spreading themselves far over the surface of the sea : the fishermen then meet with them very numerous, and though they had not previously seen one, are sure to be surrounded by them upon throwing pieces of fish overboard."

We have been accustomed from our childhood to hear of these birds by the name which they have among the sailors of Mother Carey's chickens, and have heard the notion, so popular among our mariners, that these poor birds are associated with storm and tempest, and are therefore birds of ill omen. Our sailors, brave men as they are, men to whom Englishmen owe so much, yet are, as a race, very superstitious, and quite willing to believe the romantic tales connected with this innocent bird ; while the French, Germans, and Italians appear to believe them too, for they have names synonymous with our common one of storm-finch. The petrels follow the ship for many days together, and sometimes a courageous heart, that would not quail in the encounter with mortal foe, sinks at the sight of this bird. Yet it comes in the wake of the ship, sometimes for shelter, but more generally for food. As the vessel sails on, cleaving the waters, many a small marine insect, a shrimp, a tiny crab, a store of shell-fish, or other source of food is brought within its reach ; or the piece of biscuit, or fat, or other refuse is thrown into the waves and affords it a meal. These

birds paddle along on the surface, so as to seem to walk on the water, and hence, says Mr. Yarrell, their name of petrel, from this similarity to the act of the apostle Peter. Some of the petrels are to be seen in every sea, and are the inseparable companions of the mariner in the long voyage, flying in the face of the very strongest winds, without having their course impeded by them. They are not, however, terrified by storm and tempest, for they seek those seas where the violent agitation of the waters brings to the surface the marine objects which constitute their food. Though they cannot dive, and are never wholly submerged, yet they will dash on their prey with the greatest promptitude, and if it is a little below the surface, they will plunge in a great part of the body, in order to seize it. The sound which these birds utter when out at sea, has been compared to the croaking of a frog. During storms they will shelter themselves between the rolling waves, and remain there some instants, notwithstanding the incessant agitation of the sea, running along the movable furrows of ocean, as larks would do among those of the corn-field, and balancing their wings so as to skim over the water, striking it rapidly with their feet.

But besides those birds, which by their webbed feet seem particularly adapted for swimming, we have several others which are common on our shores. Some of the plovers habitually frequent the sea-coast, and with their numerous young broods may be seen running along our flat coasts, feeding by the margin of the water, and picking up from the sand or from the mass of sea-weeds, the shrimps, little crabs, and shell-fish, on which they subsist. The grey plover (*Squatarola cinerea*) is common in small flocks by the sea, in autumn, winter, and spring; and still more so is that handsome bird the turnstone (*Streptilas interpres*), which is well named from its constant habit of turning over the pebbles of the beach to procure the marine insects and worms lying hidden beneath them. Their shrill cry has a melancholy sound, during the low

piping winds of the autumnal months. In winter, we also often see great numbers of the ring-plover (*Charadrius hiaticula*). The French call our plovers *pluviers*, because their migration mostly occurs about the rainy season.

What merry little birds are the sanderlings (*Calidris arenaria*), and how blithely, in company with the sand-pipers, do they run along the moist sandy margin of the sea. It gives one a fresh feeling of gladness, only to look at them as they go glancing past us, stopping now and then to probe the sand, by inserting their bills in it in an oblique direction. The marine insects and worms have no chance of escape, for the bill will penetrate a quarter of an inch; and the action is so rapid, that their prey have no warning. Off runs the sanderling again to another spot, and digs up a fresh stone with so hurried a motion, that you would think the bird had been startled; or it will wade up to the middle after the wave in merry play, and when that tide has ebbed, we shall see the traces of these birds in the hollows made in the sands, rows of twenty or more holes being very conspicuous there.

The sanderling is a well known bird, but not so general as is the dunlin or purre (*Tringa variabilis*). With others of the sand-pipers, this bird may be seen running by the very edge of the water with the greatest celerity, fearless of the surge or the rippling wave, which often washes it up to its knees. Immense flocks sometimes collect on the sand, dotting it here and there, or rising in numbers, and often wheeling about for a minute, alighting on some fresh spot; pleasing us by alternately showing us their dark ashy grey upper plumage, and the silvery white beneath their bodies. This bird remains on the shore all the year, except at the period when it goes to build its grassy nest on the inland moors of Scotland, or of the Hebrides; where in a loosely constructed little home it places four eggs. The purple sand-piper (*Tringa maritima*), easily known by its bluish plumage, may sometimes be seen with it, but is not, like it, a common bird.

The knot (*Tringa Canutus*), with its brown and white hues, appears in considerable numbers in winter on our shores, but it retreats to pass the summer season in the higher latitudes. The movements of these birds, as they wheel round on the wing, are exceedingly interesting and graceful, and sometimes make us, as we linger on the shore, long for the ready wing which serves them so well. Their chief food seems to be small bivalve shell-fish, which they pick up from the muddy, oozy shores. The flesh is esteemed a delicacy, and Pennant thought that our bird was probably a favourite article of food to the Danish king, though others consider that its name of *Canutus* may be merely a remembrance of the narrative which records that the monarch sat by the waves till they came around his feet.

That shrill loud whistle which startles the wanderer on the shore and annoys the sportsman, is uttered by one of the most common of our wading birds, the redshank (*Totanus calidris*), which in its dusky brown plumage is coming in large parties, but which will in spring retire to the inland marshes to place its nest beneath some low bush on that bleak spot. How ingenious the bird is in procuring its food! This consists of the worms and shell-fish buried in the soft mud. Down darts the beak into the soil up to the very forehead, while at the same moment the bird jumps so that the weight of his body in descending may increase the depth of the stroke, and now we see that it comes up with its mouth full of worms.

All the birds of this genus are very pleasing and amusing in their habits, running along the shore with the greatest quickness, bobbing the head and tail up and down with incessant motions, and when rising in the air, uttering a loud piping note. The common sand-piper (*Totanus hypoleucos*) is a very frequent species near the sea, and is one of the liveliest little birds of its race.

" Along the salt sea's oozy verge,
 When wafted high the ebbing surge
 Unshelter'd leaves the shelly fry,
 Hark! the curlew's tumultuous cry:
 Not as, remote from human sight,
 In lonely pairs their vernal flight
 They speed o'er heathy mountain rude,
 Or some waste marsh's solitude,
 To the tall grass or bristling reed
 Their wild unnestled young to breed:
 But now along the peopled coast,
 In densely congregated host,
 Yet heedful of the thundering gun,
 Aloft on bluish legs, they run,
 Or delve with slender bill and bow'd
 The yielding sand; or shouting loud,
 To warn their comrades of the way,
 Lest darkling from the line they stray,
 Wake the dull night with startling sounds;
 Well might you deem the deep-mouth'd hounds
 Raised in full cry, the huntsman's peal,
 Or clamour'd for their morning meal."

Thus has Bishop Mant well described the habits of our common curlew (*Numenius arquata*). The sound of courlie, courlie, from which the bird takes its name, is chiefly to be heard in the marshes during the spring, when it is intent on protecting and rearing its young. The French also call it *courlis*, and the Italians *chiurle maggiore*, from its well-known cry. While on the wing it utters a shrill whistle as the assembled birds wheel round in the air in circles.

Flocks of these birds, arrayed in the wedge-shaped mode of travelling which our migratory sea-birds usually assume, come about the middle of autumn to every part of our coasts, frequenting the low oozy shores which they perforate by their bills, wheeling round several times before they descend and settle to their employment. Everybody who knows the curlew must have remarked its long bill; and in Scotland and the Scottish Isles the bird is called a whaap or whaup, which is the name of a goblin supposed to go about under the eaves of houses after nightfall, the highlander having an especial dread of "witches, warlocks, and long-nebbed things." The flesh of the curlew is in great request. Its manners are very shy and wary, and its walk remarkably grave and measured, as it makes its way into the shallows

after its food, or proceeds along the shore. It can swim exceedingly well.

“ And what are they, who roam the shore
Alert on active foot; explore
With wedge-like bill the oyster-shell;
Scoop from his rock encrusting cell
The adhesive limpet; and upheave
Where worms and sea-born insects cleave
The weed-clad stone? The varied vest,
Sable and white; and oft the breast
With gorget white adorn'd; the bill
Of orange, with instinctive skill
Inform'd; and legs of sanguine dye,
Bespeak the ocean-haunting pie.”

The oyster-catcher, or sea-magpie (*Hæmatopus ostralegus*), is a beautiful bird, the black portion of its plumage being a most glossy jet, and contrasting well with the pure white which marks the lower part of the back and the base of the tail; while in winter it has the additional ornaments of a white gorget around its throat. It is very common on the low flat shores of our island, and acquired the name of sea-pie as much from its chattering clamour as from its varied dress. It has also those of pianet, olive, sea-woodcock, and chalder. When a number of these birds are together on the sands at low tide, their actions and movements are well worth our notice. They will hunt up the periwinkle-shell from among the weeds, or take it from the rock, and soon swallow the mollusk within; and they will pick away the mussel from the rock, notwithstanding the strong silky cables by which it has moored itself there; while they can scoop out the limpet from its cavity with as much ease as if it only lay lightly on the surface of the stone. Larger bivalve-shells, such as the oyster, make some resistance to our bird. Even this, however, it is enabled to overcome by means of its powerful bill, which has a sharp vertical edge like a chisel. If the shell of the oyster is only open ever so little, this is suddenly thrust between the valves, and when once inserted, the beak, with one sudden wrench, opens it fully, and its owner soon devours the contents. The rocks full of holes in which the stone-piercers lie

in numbers, are delightful spots for the oyster-catcher. It is astonishing how many of these a single bird will consume, and when a party surrounds the spot, they must almost exterminate the whole colony. The shells are dug out from the caves with great address and ease, and are generally broken ere they reach the light and air of the outer world. Many shell-fish are consumed by ducks and geese and gulls. Several kinds of crows prey upon them, letting them fall upon the stones with some force, and thus breaking them when the shells might prove too hard for their bills; the different species of walrus eat them, and the preacher-monkeys of other lands, come down to the shores to feed upon the oysters and other bivalves. But no other bird or animal can take so good an advantage of their helplessness as can the oyster-catcher, whose strong beak seems made for the very purpose of seizing upon the mollusk in its house. Even the nets of the fishermen are not safe from the plunders of this bird, for it will pounce upon the fish, and dragging it out, will tear it open to help itself to any shell-fish which its stomach may contain.

Few sea-birds are more courageous or earnest in the defence of their young than this. The eggs are placed on the bare ground, amidst the shingle; and while the mother-bird is sitting upon them, her companion watches over her, uttering a loud shrill cry, as a note of alarm, at the least appearance of danger. The flesh of the oyster-catcher is too hard and fishy to tempt the sportsman to pursue the bird.

BRADING HARBOUR, ISLE OF WIGHT.

CHAPTER VIII.

SEA-MOUSE AND OTHER ANNELIDES—VARIOUS CRUSTACEANS.

READER, did you ever behold a sea-mouse? Perhaps you will say that, from your acquaintance with the animal of that name which visits your dwellings, you have no desire to know it. But our sea-mouse will not nibble your cheese or pastry, and will require nothing for its nourishment beyond a draught of salt water, and a spray of sea-weed. It is probable, however, that if you have never searched for it, you have never looked on it; for though a common animal, it is wont to hide among the weeds, and under the sides of rocks, and seldom lies quite in our way. But if you have an hour to spare, it will not be lost if you spend it in turning over the weeds. You may find there many a beautiful living thing, which you may see described in books; and you may perhaps discover some as yet un-

described. The wonderful animals and plants of the sea are probably not half known yet. They are not like the flowers of the field, which are all so well understood and portrayed, that a botanist of Britain can hardly hope to find a flower growing wild which is not known by others to be a plant of our island. Not so with the contents of the deep. Few naturalists of modern days, who have given any attention to the sea and its treasures, have failed to bring to light not only new facts respecting long-known objects, but also some animal hitherto unknown. Why may not we add our stock of information to the general knowledge? Why should we not search out for ourselves, and see with our own eyes the beauty and the fitness of all the works of God? Myriads lie in that depth—ay, and many on those shores too, which, if mortal eye has looked upon, it is perhaps with nought but a careless gaze. Even of those who know the most on this subject, we may yet ask, in the words of Job, “Hast thou entered into the springs of the sea, or hast thou walked in the search of the depth?”

But to return to our sea-mouse, which is a very singular and a very beautiful animal in some respects,

PRICKLY SEA-MOUSE.

though it has neither grace of form, nor, as far as we can see, any remarkable elegance of motion. The prickly sea-mouse (*Aphrodita aculeata*) is of an oval

shape, about six or eight inches in length. It has scales, or plates, upon its back ; but these are covered by a filmy substance, which resembles tow, and arises from the sides of the animal. Strong spines are also there, which pierce through this tow ; and a number of flexible bristles, which are irradiated with gold, purple, green, and every rainbow hue, grow in great numbers upon the surface, rivalling in lustre the richest tint of the humming-bird or the peacock, and having a remarkably metallic appearance. Our sea-mouse will not live long in the house,—at least we have found it so, having tried to preserve several in basins of salt water, but without much success. The brilliant tint, however, will long remain uninjured, if the animal be preserved, after death, in spirits, or in that chemical preparation now generally used for similar purposes. Every mode of drying will destroy the brilliancy ; for we have removed from the dead animal all the internal portion, and spread it out in various ways ; but the bright tints soon yielded to a dull-coloured brown.

The sea-mouse belongs to the class of the annelides, and is the largest of this tribe of animals to be found on our native shores. The annelides differ a good deal in external appearance, in manners and habits ; but they may be generally described as having an elongated form, always marked by rings, at certain distances, round the body. These cartilaginous rings are united to each other by strong muscles, enabling the animal to twist in various directions ; and the moist skin with which it is covered, shows the marks of the rings more or less plainly. The common earthworm is a familiar instance of an annelide.

Turn up any of the sea-weeds or stones on the shore on a summer-day, or look for awhile into the salt-water pools, and you will probably see some of the nereids. These are little worm-like animals, with many feet, looking, but for these, like tiny eels or serpents, or perhaps reminding us of the centipedes of hot countries, as they move in the water with an undulating

motion. They are sometimes of most brilliant blue or green, but the greater number are red or flesh-coloured. Many of them have a fierce aspect, as if they would dart at us. One common kind, when seen under a microscope, looks as if it had the head of a dog on its ever-twisting body. They are phosphorescent, and Linnæus termed one, which is especially so, the night-shining Nereis; and M. Viviani describes one kind as contributing greatly to the phosphorescence of the sea at Genoa.

Many of the annelides are seen to be extremely beautiful when viewed beneath the microscope. They form, doubtless, a great store of food to the larger animals of the sea, as well as to the birds of the ocean and its shores. To man, some of the largest kinds are useful as bait for fish, especially for whiting and mackerel. They even constitute a small article of commerce to the inhabitants of the shores of the Mediterranean and Atlantic. That little animal found everywhere by the sea, the lug-worm (*Arenicola piscatoria*), is very useful in this respect; and fishermen may often be seen digging a good way with their spades into the sand to procure it. This long reddish worm, which changes into a dark green, has no particular beauty of colour or form to attract us; and we must watch it, ere we shall perceive the extreme grace and symmetry of its gills, or breathing apparatus, which change continually into most beautiful colours. These gills separate around the head of the worm, like the radii of a circle, all gently curving inwards. Each stalk of this feathery crown supports small plumed branches, which are subdivided into branchlets again and again. This lovely coronal can never be seen for more than a moment. It is extended in every direction, and is of a fine red colour, often changing, as we glance at it, to a still richer and deeper hue. We have hardly had time to look at it, however, before it is lost to us, and folded up; but in another minute it is expanded again, and bright as ever. So long as the lug-worm continues in

good health, these two conditions alternate with each other. If we take up the animal in our fingers, it emits a liquid which stains them with a deep yellow ; nor will soap and water remove the tinge, which remains till time shall have worn it away.

There is a very common annelide which any wanderer by the shore may find, but which will exhibit scarcely any beauty to the naked eye. It is well worth examining under a microscope ; and then he who loves the graceful and elegant, will find his taste abundantly gratified in the structure of a tiny creature, not larger than the smallest pearl. We pass by it on every sea-side walk ; we crush it under our footstep daily : but if we would know its structure, we must stand still and consider the wondrous works of God. Gather from the rock a spray of that large olive-green sea-plant, the serrated fucus, or pick up a dried piece from the beach, and you will probably see on its surface hundreds of small white dots. On looking closer into it, you will easily perceive that these dots are little coiled shells, quite white. These are the homes of the nautilus-like spirorbis (*Spirorbis nautioides*). This is all which is revealed to the unassisted eye ; but put one of these shells in a little sea water in a watch-glass beneath the microscope, and what beauty is there displayed. Every one knows the shell of the pearly nautilus of the tropic seas, and this little coil is now seen exactly to resemble it in form, while its material is glossy as mother-of-pearl. But the living wonder, the inmate of that dwelling, is more exquisitely beautiful than we could conceive. It will not always emerge at our bidding ; but wait with patience, and we shall see, coming from the shell, a little crown of feathers, all moving about gracefully, and being studded with small barbs, producing little currents in the water around. This action, so incessant, and so pleasing to our eye, is of great use to the animal in its native element ; for by these means the animalcules on which it subsists are swept to the very entrance of its house, and enter into its mouth.

Many other annelides, as well as molluscou animals enclosed in shells or tubes, gather nutriment in this way. The genera of sabella and terebella, which live in the sand all around our coasts, have a very similar breathing apparatus to that of the spirorbis, and can also effect similar currents in the water around them. On sandy shores, our way on the smooth margin is sometimes quite strewed with the tubes of these animals. Those of the sabella are a sort of membrane thickly covered with grains of sand, so that they look like thin sandy tubes, with no firmness, and easily torn ; but the deserted dwellings of the terebellæ are much prettier objects, because they are more thickly studded with pieces of shells, mingled with the sand, and making, by their various forms and colours, quite a piece of mosaic work. These tubes are, when the animal is living, inserted in the sand, with the upper part above the surface ; and when the tide washes over them, the little worms doubtless put forth their starry crowns of plumes, and seize their food. The long

TEREBELLA VARIABILIS.

thread-like rays which are placed on the head can be lengthened or shortened at the will of the animal, and are long enough to be seen by the unassisted eye, though they need the aid of the microscope to exhibit

their full beauty. They shrink up at the slightest touch ; but, when fearless and happy, they move about incessantly, now up, now down, or twisting in all manner of contortions. It is by means of these feelers that the little animal constructs its dwelling-place, the base of the tube being a glutinous membrane, on which the small stones and pieces of shell are laid, and to which they immediately adhere. Sometimes we find little pieces of the ridged cockle-shell, now a piece of purple mussel, now a scrap of the silvery

TEREBELLA MEDUSA.

anomia, interspersed with gay fragments of orange or brown scallop-shells ; while here and there some glittering stone, clear as crystal, or white as milk, or of dark brown, varies the materials. If we deprive the terebella of its tube, it loses no time in forming another ; and it will do this in a few hours, even in a vase of sea-water, if we supply it with some shell-sand and small stones. It is amusing to watch it at this employment, as it takes up the sand with its feelers, and moves its head in all directions. If much irritated, the terebella will forsake its tube, and go twisting along over the sand like a worm, showing very plainly its ringed structure.

Among the most frequent instances of these annelides we may mention some species of *serpula*, which form shelly white rugged tubes, on different objects. If we can look in the fishermen's nets we see great numbers of them, but every walk on the shore will also furnish us with some specimens. These white hollow

tubes lie in clusters on oyster, or scallop, or other large shells, or coil upon stones, pieces of brick, or any other object which may have lain at the bottom of the sea. The species which we find most frequently is the worm-like serpula (*Serpula vermicularis*), which lies in groups variously intertwined, its tube being white, cylindrical, tapering to a point, and irregularly twisted. But a larger species, the many-twisted serpula (*Serpula contortuplicata*), is also often dredged up. Sometimes these tubes occur in clusters, and unattached to any shell or other material, and are several inches long. The animal within the tube is extremely beautiful and graceful, with the coronal of plumes, which, as we have seen, adorns so many of the annelides, and which, in this case, are most richly coloured. When the worm is at all alarmed it retreats entirely into its tube, but when at ease it is the liveliest of creatures, and waves its feathers of red, or yellow, or violet hue, up and down and round about, as if it delighted in motion. In the other species these plumed rays are blue, and no tint of earth or sky can exceed the richness and depth of their azure. The serpulæ exist in all seas, but in those of the tropics are far larger than in ours, and fragments of shells and other bodies are there speedily covered with large masses of these twisted tubes, from whence proceed the crowns of graceful and richly tinted feelers, needing no microscope to display them perfectly.

There is a curious little worm-like annelide called the shell-bearing sipunculus (*Sipunculus bernhardus*), which sometimes buries itself in the sand, sometimes hides under the shadow of a sea-rock, or a tuft of marine plants. It apparently has no skill with which to plan, or no material with which to construct a dwelling, yet its instinct enables it to turn to account the labours of others. Plenty of empty shells lie about the sandy shores,—those of the periwinkle are everywhere, and one of these will serve it for a house if the owner be dead, or have for any reason left his shell untenanted. Better adapted still to its long worm-shaped body is the

horn-like tooth-shell (*Dentalium entalis*), and as these shells are frequent enough, our annelide is at no loss for a home. Nor does it change its dwelling after it has once adopted it, but there it remains till it dies, altering it in some measure to suit its convenience, and securing the entrance of the shell by a plaster-work of sand. In the centre of this it leaves a small circular hole, just large enough to protrude its trunk, and this it sends out to a great distance, and moves about with ease in search of food. This curious animal is found on most parts of the British coast.

Ah, what wonders lie in that sea, which human eye has never witnessed! and to how many do the raving waves of winter sound like a mournful dirge! It is painful to remember how many a stately bark has sunk in that ocean, freighted with all its loves and cares, and how much shorter is the average of life among sailors than among landsmen; yet it is well to remember it, if it lead us to think kindly of those hardy men ever to be seen in our seaport towns. Washed as our island is by the sea, and dependent as we are for comfort, for necessities, for luxuries, on the exertions of the fisherman and the mariner, surely the sailor has a claim on every British heart. Who is so fearless of life as that boatman on the beach, when the wrecked ship is lying afar, and waves threatening every moment to engulf it in the deep? What boatman of Deal, for example, ever asked if there was a prospect of reward or payment, when in his boat he strove with the wind and the surge to rescue those who were ready to perish? What British sailor would leave the sinking or burning ship while there was the least hope of rescuing the woman or child from the peril of the fire and the waves? Our sailors are brave and generous, but, alas! many of them are thoughtless,—perhaps no race of men more so. Shall we see them ever on the very verge of death and danger, and be indifferent as to their safety for this world and the next? Happily, in almost every town of our coast there are

now people who are trying to benefit them, some by providing them with the necessities of life, others by striving to relieve their spiritual wants. Let not the annual visit to the sea-side be a useless one to the sailor. The Christian has ever a work to do for God, and his work generally lies before him; and the town in which he has dwelt for months should leave on the hearts and minds of some of its people some traces of his moral and spiritual influence—some token of his active labours. So long as there is a sailor in our ports without a Bible, so long as there is one who never goes up to the house of God, or otherwise shows that he knows not or cares not for the Saviour of sinners; so long as there is one who is destitute, or sick, or dying, there is a work to do which should be dear to the heart of every Christian man and woman of Britain.

But we must turn to the consideration of some of the contents of the waters, and then the numerous crustaceans will engage our attention. These are a very serviceable class of animals, and furnish a considerable amount of food to man, both in his savage and civilized conditions. This, however, is far from being the only purpose of their numbers in the sea, for so much refuse do they consume, that we may regard it as their especial office to cleanse the deep of its putrifying remains. The crabs and lobsters, like the star-fishes, are endowed with a great appetite for food, and the power of digesting it in large quantities, besides that they have a preference for such substances as are in the process of decomposition; and possessing the carnivorous principle, they devour great multitudes of the living and the dead of the sea.

The animals termed crustaceans are covered with a brittle crust, like that of the crab and lobster, or, as in the shrimp, with a horny covering. The crust of these first-named animals is far less firm than the covering of the shell-fish; but like that, it is made of materials gathered from the waters, mingled with a secretion from

the living animal. Both coverings contain gelatine and calcareous earth, but in the shell of the mollusk there is a larger proportion of this earth than in the covering of the crustacean. Crabs abound on our shores, and lobsters may sometimes be found in the pools, or hidden among the sea-weeds on the rocks; but these are less terrestrial in their habits than the former animals, some of those indeed in other climates being land-crabs, and going far inland. Wherever crabs abound they soon clear away the refuse of the shore. Their claws are remarkably strong, enabling them to hold firmly, and to tear quickly, any substance with which they come in contact, and they will soon rend away the flesh, and leave the exposed skeleton of any deceased animal. Most persons who have frequented the sea-side have felt how strong is their grasp, and how successfully they can pinch the finger of an assailant. Rather than relinquish their hold, they will leave the claw in the hand, and make their escape; and the member, like the arm of the star-fish, is parted with without pain, and quickly renewed. Though their sideway movements are somewhat contrary to our ideas of graceful motion, yet they can, on the approach of danger, run with a velocity which surpasses that of a horse, and their quick movements obtained for one of the species the old name of cavalier or knight. Only throw a tiny pebble at a crab, and away it runs till it reaches the cleft of a rock under which it can hide, or attains a safe retreat beneath the branches of the large sea-weeds. The usual haunts of these crustaceans are rocky places, where, though the sea reaches them, they are secure from the rough waves. Here they remain till the tide advances, when they come to the shore, and seize and devour all that they can find. They have a strong sense of smell, and if some dead sea-bird or other animal is lying on the sand, great numbers of crabs assemble around it; and they are said to clear away more refuse from the coast in the night than in the daytime. Sometimes a party of crabs will linger

so long over their repast, that they cannot regain the sea in time, and as they are unable to swim, they are liable to be stranded in the shallow waters. If no hole of a rock, no tangling shelter of weeds offers a retreat, they contract their limbs under their bodies, and await as contentedly as may be the returning tide. It is while thus situated that numbers of our crabs are caught, for though many are taken in the creels or crab-baskets, yet this gives the fishermen more trouble. When first seized they fight very courageously, advancing their claws very firmly, and some of them uttering loud cries as they snap them together. As to any inferior enemies which the crabs may have, they are so skilled in that running away, which is jocosely called the better part of valour, and are so cunning and dexterous in reaching a retreat which is inaccessible to their pursuers, that they have little to dread from any foe but man. Something of this skill in adapting themselves to circumstances is manifested in species which make their habitual dwelling within the valves of the shell-fish. Thus there is one little crab, which being fully conscious of the insufficient protection afforded by its thin and fragile crust, makes for itself a home between the valves of the pinna or the mussel. This is the pea-crab (*Pinnotheres pisum*), which is often found in its lodging when mussels are opened. Old legends termed this little crustacean the guardian of the pinna, and related that it warned its hospitable host of the coming danger by knocking against the shell, on which the mussel closed its valves against the incursion of the cuttle-fish or other enemy. What ears ever heard the knocking of the crab, or what eye ever saw the movement, the old naturalists do not record; but even a century back the statement seems to have been generally believed, though the defencelessness of the crab, rather than its friendship for the mussel, is doubtless the cause of the companionship.

Crab-fishing is often a serviceable means of maintenance to a fisherman, for although these animals are

sold at little price, yet the mode of catching them enables the fisher to take other prey at nearly the same time. The men take in their boats crab-pots or creels, and also fishing-lines. The creels, which being made of wicker-work are a kind of basket, contain bait of little pieces of the thornback, or skate, which are attached to the bottom, and some stones being placed in the creel to secure its descent, it is let down, sometimes twenty fathoms deep, the fisherman being guided by his knowledge of the ground as to the spot and its depth, and preferring a rocky bottom, as the known haunt of these animals. The creel is formed upon the same principle as some mouse-traps, which renders the process of getting in much easier than that of getting out; and as many creels are placed together, and the bait can be seen and smelt too, large numbers of these devouring creatures enter the baskets, and shrimps, prawns, and lobsters are often found in their company. Meantime the fishermen, having well marked the spot where they have placed their creels, can proceed to a distance, and pursue their fishing with lines or nets. In a few hours the owner of the creels returns, and taking them up, the crabs are either boiled and sold, or carried about for sale in the condition in which they are brought up from the sea.

At one period of the year the crustaceans lose their covering, and a new one gradually forms in its stead. This is at first but a thin skin; and at this period the animal would be easily injured, did it not, for a while, keep well hid among the rocks. The large edible crab (*Cancer pagurus*) is well known, and its flesh is very good, and perhaps the best in flavour of any of our British species; though just at the time when it is changing its coat, it is soft and watery. This, however, is not the case with all crabs, for some of those of the West Indian and American shores are then in greatest perfection. A writer in the American Cyclopædia observes, "Myriads of crabs are caught on the shores of the rivers and creeks of the Chesapeake Bay, when in

their soft state, and sold to great advantage. The epicure who has never tasted soft crabs, should hasten to Baltimore, Annapolis, or Euston in Maryland, in July and August, to make himself acquainted with one of the highest luxuries of the table."

Our large edible crab is taken, on rocky shores, all round this island; and another common species is a much handsomer crab, though inferior to it in flavour. This is the velvet crab (*Portunus puber*), which is about two inches and a half long, and is common on our coasts as well as on those of the continent. The French call it *crâbe à laine*, or *crâbe espagnol*; and the common shore-crab (*Carcinus maenas*), the least esteemed of all the kinds which are taken by our fishermen, is abundant almost everywhere, and is sometimes sold, but is more often used for bait.

There are some strange-looking crabs, called spider crabs, which are too much like the animal after which they are named to be very attractive. This kind is very common on the shores of the Mediterranean, and is called the sea-spider. It is the *maia* of the Greeks. It is among the largest of this kind of crustacean, and the ancients attributed to it a great degree of wisdom, and believed it to be sensible to the charms of music.

One of the most frequent species on our shores is that called the hermit, or soldier crab (*Pagurus Bernhardus*). This animal has for its covering a very soft thin crust, unfitting it for moving about among rocks or stones, and rendering it constantly liable to outward injury. With a singular instinct, implanted in the defenceless creature by its Maker, it encases itself in some empty shell, which it may find lying on the shore. It always selects a spiral shell, like that of the whelk or sea-snail, and pushing itself into it backwards, holds itself in among the coils. It is most amusing to watch one of these crabs which has outgrown its house. It cannot make this larger, and has no resource but to look out, as any other housekeeper might do, in search of a new dwelling. Our crab is not easily suited. One is too large,

and another too small ; until after having pushed itself into several, and emerged as duly from each, it finds one to which it can adjust itself. Sometimes two of these crabs will fight vigorously for the possession of an untenanted shell, and then the conqueror becomes a true hermit, never leaving his cave until his increased size requires a further change. It is almost impossible to drag one of these little creatures from its habitation ; for when menaced with danger it retreats far into the shell, and will sooner part with a claw than come forth ; so that it is only after its death that we can examine it. It is said to utter a cry when tormented. It walks along the shore, or at the bottom of the sea, with a slow motion ; and, by means of its strong claws, either tears the sea-weeds for food, or seizes the small living things of the waters which are its destined prey. It is chiefly to be seen during the summer or autumnal season.

The lobster, like the crabs, is a great devourer of putrid substances, and is therefore very useful in the waters, as well as a great source of food to man. It fights very courageously before it will suffer itself to be taken ; and it has such wonderful celerity of movement, that even if we are fortunate enough to find a lobster among the rocks, it requires much address to secure the prey. It can move either backward or forward in the water, and dart into a hole smaller, as it would seem, than its body. This animal is supposed to be very long-lived, and it was said in the days of Pliny, that its life sometimes exceeds in length that of a man. M. Latreille saw a lobster nearly six feet long from one extremity to another, and thence inferred that its age was very great. It subsists on small fish, sea-worms, mollusks, and everything drowned in the sea ; and in times of scarcity, especially during its change of skin, the lobster will devour its fellow. When near the shore it keeps very close to the rocks. It is much more alert in summer than at other seasons, and fishermen have seen these animals spring very long distances at this time. They usually catch them in nets ; but unless the water

is very thick they can take none in the daytime, nor will the lobster enter the nets on nights when the sea is remarkably phosphorescent. Occasionally on a wintry day, we find a poor lobster lying among the rocks, so benumbed with cold that it cannot raise a claw against us.

Three species of shrimp are pretty general on our shores. They are often taken on the sands by nets, fastened to the end of a stick, carried by barefooted boys, who wade into the water, pushing it before them. The common shrimp (*Crangon vulgaris*), the *Crevette* of the French, is very frequent and abundant; and so is the white shrimp (*Palæmon squilla*). The prawn (*Palæmon serratus*) is a great delicacy, and a common article of the breakfast table at the sea-coast, and the wave often brings a fine specimen to the beach, or leaves it to finish its days among the rocks. The flesh of this crustacean is considered less indigestible than that of most of the tribe, and has even been recommended by physicians as a suitable food to persons in a state of debility. In the Levant prawns are salted, and preserved in large baskets, constructed chiefly of the leaves of the palm-tree. In this state they are forwarded to Constantinople, Smyrna, and various towns of Turkey, where great numbers of them are consumed during Lent and other seasons appropriated to fasting by the Greek church. Several fish show a great predilection for a dinner of prawns, and come near to the shore to devour them; but they, like the lobster, are gifted with such amazing quickness of movement, that they often escape from their enemies. They usually swim forward in the water, using their feet under the tail as they might do fins; but when danger seems nigh, and they wish to quicken their speed, they can alter their course, and move backwards or sideways, by means chiefly of the extremities of their fan-like tails, which strike the water in front and carry the body backwards.

SCARBOROUGH.

CHAPTER IX.

SEA-ANEMONES, CORALLINES, AND OTHER ZOOPHYTES.

How beautiful is the sea to-day, and smooth even as a sea of glass ! with only one small ridge of foam at its very edge, sounding, too, as it falls, like a low murmur of sweet music. It must have been just on such a day as this that the poet penned that comparison :—

“Lovely to look on, as the tranquil main,
When in his noonward track the unclouded sun
Tints the green wave with every hue of heaven.”

The few pillowy clouds which float over the blue sky seem all passing onwards and away, and the thin vapour

which shimmers over the beach tells of the heated atmosphere. Many little groups, and some few solitary ones, are sitting on the rocks, or beneath the shadow of the boats, with books, or needlework, or pencil, or are lounging in an attitude of dreamy repose, with eyes fixed on the waters. Children, busy, restless, laughing children, are toiling unweariedly, spite of the sunshine, digging trenches in the sand or raising it into mounds, which the afternoon tide shall sweep before it, as ruthlessly as Time will level many a castle which some dreamers yonder are building in the air.

This is a good day for the invalid to lie on the beach, or to be drawn over the sands in an easy chair ; and as we who have frames free from pain, and strength of limb for motion, look on the pallid and weak one, we would not only thank God for our exemption from suffering, but breathe a prayer of intercession for the sick stranger or friend. Nor would the time be ill employed, if, laying aside book or pencil, we could, with gentle tone and look of kindness, strive to give an hour of amusement to one whose usual place may be the couch of pain and the chamber of solitude. No sufferer should seem to us as a stranger. A pale face should ever awaken sympathy. Those who are much alone are glad to listen to the tones of a cheerful voice ; those much in pain, to be beguiled of sadness. And who knows but that on a heart made susceptible by sickness, and thoughtful by isolation from the cares and vanities of life, we may not, as friendship and confidence increase, speak some word that may, through God's grace, fall like a seed into a moistened soil, and spring up into a plant of grace to bear fruits of holiness ? That seed has fallen in the heart under all circumstances. Sometimes, when its owner was in the midst of youth, and joy, and hope ; sometimes in the sunshine ; sometimes in the storm ; yet, perhaps, under no circumstances has it come to the heart more frequently, and more deeply, than in the hour of pain, and when something more than human sympathy was needed by the sufferer.

Though a day like this may render a long walk undesirable, yet it is exactly suited for strolling to the rocks, to see those wonderful and beautiful things, the sea-anemones. Look at those rocks on a cloudless

SEA-ANEMONES AND OTHER ACTINIE.

morning, and what a scene of beauty lies before us ! Those craggy masses, from whose points hang large sea-plants which the high tide will cover, are all exposed now, and the barnacles and the limpets lie in their shelly caves in multitudes before us. The little channels at the base of the rocks are clear as crystal, and gleaming like silver ; while the bright green lavers and the silky-tufted plants of deep red, or rosy pink, or grassy green, are making it look like a fairy forest. But what other garden shall display such wealth of gorgeous flowers ? The tulips and anemones, with all their varied and brilliant hues ; the sunflowers, with their starry forms and golden tints, are outrivalled by these sea-flowers ; and purple, and orange, and blue, and amethyst, and green, and yellow, are brighter on this rock than they are on any flower-bed : for those who have looked

on the plants of even tropical lands, tell how far richer in colouring than those are these lovely flowers of the sea.

And yet, though they look so like flowers, they are not really so. Can we doubt that they live and feel, that they have instincts and longings, when we see those starry petals moving up and down, till some shrimp comes within the grasp and is quickly swallowed, or some crab, or even shell-fish is devoured. The shrimp is lively and agile, and the anemone is rooted to the spot ; yet the little crustacean is no match for the soft flower-like animal, which, low as it is in the scale of life and feeling, yet seems almost endowed with cunning, when seizing its food. Like many another delicate creature of the sea, it has poison in its touch, and whenever those rays shall meet the shrimp or crab, he must die.

But the anemone cannot wound us very severely, so we may venture to place the finger within its rays. If we do this ever so slightly, the animal will resent the impertinence, and will hold the finger with much tenacity, and perchance leave a tingling sensation in its point even after it is withdrawn. When clouds are gathering over the sky the anemones will fold up all their beauty, and long anticipate the coming rain or nightly cold, by shrinking up into a dull-looking conical lump of flesh of a reddish or olive brown colour. When we see our rocks covered with these fleshy lumps, which refuse to open into flowers to a passing sunbeam, it is likely that ere to-morrow's sun has set some storm will come over the waves. Even when half contracted, and just opening wide enough to enable us to see something of their rays, we must not expect a smooth sea, as this is foretold only by their opening wide to the sunlight. The Abbé Dicquemare, who kept them long in vessels of sea water, says that they serve as excellent barometers, though when preserved for this purpose they must not be fed, as the amount of food might, one way or other, influence their predictions. There would be no cruelty

in this, as they do not seem to require more food than they can receive from the salt water, which is full of microscopic animals, both palatable and nutritious to them. The vessel in which they are contained should not be allowed to be sullied by any slime or sediment, and these should be carefully removed with a camel's hair pencil, in such a manner as to avoid giving any shock to the sensitive anemones.

Although these flower-like animals are to be looked for chiefly on the rocks which are washed by the sea at high tide, yet we find them also adhering to shells, stones, and similar substances. They attach themselves so firmly to these, that we can with difficulty remove them; and the safest way of doing so is by cutting, where it is possible, a piece of the surface to which they adhere. This strong hold is effected by means of a glutinous secretion from the base of the anemones; but when they choose to remove to a distance, they can do so by gliding slowly along, using their flower-like rays instead of feet, and moving perhaps at the rate of half an inch in five minutes, or they can at will inflate their bodies, and thus rendering them buoyant, cast themselves uncontrolled to the movements of the waves.

There is one species of these animals, the spotted sea-anemone, which is often said to be in a kind of friendly alliance with the hermit-crab, fixing itself on the lip of the shell which is its dwelling-place, and making there a horny membrane to which it attaches its base. Dr. Coldstream remarks that the case thus formed on the old shell by the horny membrane, and covered by the anemone, he has invariably found to be inhabited by the hermit crab. The Rev. D. Landsborough says, "I have kept one of these pretty sea-anemones for some days in sea water. It had fastened itself to a little fragment of a screw shell (*Turritella*), but its co-tenant in the inside was not a hermit crab, but a pretty red annelide. Be this as it may, certain it is, that on this occasion we found that the spotted anemone had fastened itself to the outer lip of many of the large

roaring buckies (common whelks) brought up ; and wherever there was an anemone without, there we found a hermit within. In all likelihood they in various ways did each other good. The hermit has strong claws, and while he is feasting on the prey he has caught, many spare crumbs may fall to the share of his gentle-looking companion. But soft and gentle-looking though the anemone be, she has a hundred hands ; and woe to the wandering wight who comes within the reach of one of them, for all the other hands are instantly brought to its aid, and the hermit may soon find that he is more than compensated for the crumbs that fall from his own booty."

Thousands of that most common species the fig marigold sea-anemone (*Actinia mesembryanthemum*) may sometimes be seen adorning a line of our rocky shore between the tide-marks. It is of a liver or olive-green colour, with a broad margin around its base, which margin is edged with a narrow rim of brightest blue, and around the central opening at the upper part of the animal there is a little circle of blue spots, not quite so large as an ordinary pearl. This anemone is a very cleanly animal, liking best the purest water. And when the tide comes rippling in, and filling all the pools about the shore, then these animals, which before seemed only so many knobs of dark flesh, open to the sun their starry rays, and when mingling with other species look more beautiful than flowers which our conservatories can show ; the water over them just serving as a crystal veil, through which we discern their clear rays of olive, or liver colour ; while the rays of some of their gayer companions are purple, or scarlet, or straw-colour, or green, or pink, or of snow-like whiteness. One pretty grass-green species (the green corynactis), described by professor Allman as growing on the shores of Ireland, and which has since been found on the Cornish coast, is so changeable in its form that it perpetually exhibits itself under some new shape. Now it is like an hour-glass, and again it resembles a

round leaf on a stalk, assuming too all sorts of positions though its favourite attitude seems that of hanging from the rock in the form of a daisy. "*Corynactis viridis*," says the professor, "is a charming little animal, and by no means rare in the locality where I discovered it; the brilliancy of its colours, and the great elegance of its flower-like rays, when fully expanded, render it eminently attractive; hundreds may often be seen in a single pool, and few sights will be retained with greater pleasure by the naturalist than that presented by these little zoophytes, as they spread abroad their green and rosy crowns, amid the sea-weeds and millepores, and plummy corals, co-tenants of their rocky vases."

It is very interesting to watch these animals for a length of time, and by so doing we shall discover that several species have habits of their own, not partaken by other kinds. Thus some of them collect small pieces of broken shells, or perfect minute ones, or clusters of sand and little stones, placing them on their soft bodies as if they designed them for a coat of armour; and a very pretty small kind, the cave-loving anemone (*Actinia troglodytes*), is really a dweller in cells, for it lives in a hole in the soft slaty rock, exactly fitted to the size of its body; and when the water reaches it, it puts forth its daisy-like feelers and displays its loveliness. Touch it, however, even most gently, and the beautiful flower is in a moment safely ensconced in its cavity, so as to be almost lost to sight. Sometimes when a little colony of these sea-anemones have established themselves among the rocks, the tide washes up a thin layer of sand, covering the surface all over. But the God who bade these little creatures find their homes in the rocks, left them not unprovided with instincts to meet the emergencies of their condition. The anemone knows how to rid itself of the annoyance; and setting to work with its petal-like feelers, and at the same time pouring out currents of water from its mouth, it soon makes a hole through the sand, and when the tide flows, its crown is as

plainly to be seen as ever. And when again the water is off the rocks, and the animal retreats into the cavity and can be seen no longer, its dwelling-place would hardly be betrayed by the hole in the sand which it has made, for it is only such as the common lugworm would have pierced in its twisting progress through the mass. Rocks already made like honeycombs by the stone-piercers are very excellent places for these animals; and our little anchorites do not fail to use them, by colonizing there to a great extent in the ready-made caves.

The prettiest of all our common species, and one very often to be seen on our rocky shores, is the purple sea-anemone (*Actinia crassicornis*). It is also one of the largest; though the one which exceeds all the British species in this particular is the *Anthea tuedia*, which, when relaxed, measures about three inches in length, and the same in diameter. Nothing can exceed the vividness of the tints of the species called the purple anemone, though they are not always of the colour by which they are called. There are several varieties, so that sometimes when we find a large group of these animals, we may, on a single sea-rock, see every colour of the rainbow, and every modification of these colours. One is of a rich scarlet, thickly studded with pale warts, like so many beads; and some are described as having "jackets red as a Kentish cherry." Cream-coloured or white kinds we are sure to see among them; and rich, though delicate yellow; and olive green, with orange stripes, "borrowing," as Dr. Johnston says, the "hue of the wild rose," are not unfrequent. Again, we find one reminding us of the purple silky garden anemone in its colour; or, by its still deeper hue, of the violet of the wood; while the brightest of tulips is neither gayer nor more varied than others. No description can convey an idea of their beauty—a beauty too to be seen in sunshine, almost wherever there are rocks a little way in the sea, at high tide. This species, also, is eaten, and it appears, from the Abbé Dicquemare, that

several kinds combine, after being boiled in sea-water, to form a dish for the epicure. Dr. Johnston remarks on the Abbé's description of this diet, "I dare to say that sea-anemones are not less a luxury than the sea-urchins of the tasteful Greeks, or the snails of the Roman epicures; but I have not been tempted to test its truth. Rondeletius having, as I think, the purple sea-anemone in view, is an older witness to its daintiness; and he tells us that it brings a good price at Bourdeaux:—'*Ils la lavent fort é souvent, puis la fricassent légèrement en la poêle.*' 'It is well and frequently washed, and then fried lightly.' '*Actinia dianthus* also is good to eat,' quoth Dicquemare; and Plancus directs the cook to dress this after the manner of dressing oysters, with which it is frequently eaten. Even the hot and peppery anthea has its praise; from it they prepare the dish called rastegna, which is a favourite in Provence."

Sometimes, when these animals are offended by our touch, they will, like the ascidians, retaliate by jerking a fountain of water in our face as we are stooping over them; and some species will, under irritation, give out flashes of green phosphorescent light in the dark. If put into fresh water they will, like many other marine animals, die instantly. Yet the tenacity of life which is usually exhibited by these creatures is extraordinary. They have been immersed in water so hot as to blister the skin; yet lived on; in so far as could be discovered, in enjoyment of their strange drowsy existence. They have been frozen in a mass of ice, and afterwards thawed; have been placed within the exhausted receiver of an air-pump; have been cut in halves and quarters; been deprived of their rays,—and yet lived; in the latter cases reproducing the mutilated portion, or gradually forming into two or four separate anemones instead of one, or if cut exactly in halves, sometimes reuniting.

More than twenty species are described as British sea-anemones, but several others have been recently

discovered. The French call them *orties de mer*, (sea-nettles,) as some of them on being touched sting, or rather tingle the flesh; while this power is the means by which they destroy prey which, like the crab and the oyster, are so much larger than themselves, and apparently so well defended.

The sea-anemones are zoophytes, a word which signifies that they are animal plants; yet they are in no respect plants, only resembling them in their flower-like forms and colours, and in the rooted condition of some of the species. They are true animals, though with a low organization. Zoophytes appear to have little life, and yet mere worms of this tribe have exerted a singular and powerful influence on the condition of man—an influence greater than that of any other animal, or indeed of all other animals together; while they have executed works compared to which man's proudest monuments of art are frail indeed. The coral isles of the tropical seas have all been reared by the incessant toil of little worms in infinite numbers—busy workers, which, with “subtle chemistry,” have drawn from the sea, as from a quarry, the lime with which to construct these works. Countless generations have thus toiled on, and are toiling still, bringing up new islands which seem as if they would turn the equatorial seas into dry land. Dr. Macculloch eloquently describes their labours:—“Their plants are made of stone, and they build dwellings. Dwellings!—they construct islands and continents for the habitation of man. The labours of a worm which man can barely see, form mountains like the Apennines, and regions to which Britain is as nothing. The invisible, insensible toil of an ephemeral point conspiring with others in one great design, working unseen, unheard, but for ever guided by volition—that one volition which cannot err—converts the liquid water into the solid rock, the deep ocean into dry land, and extends the dominion of man, who sees it not, and knows it not, over regions which even his ships had scarcely traversed. This is

the great Pacific Ocean, destined, perhaps, at some future day, to be a world ! That same power which has thus wrought by means which blind man would have despised as inadequate, by means which he has but just discovered, here, too, shows the versatility, the contrast of its resources. In one hour it lets loose the raging engines, not of its wrath, but of its benevolence ; and the volcano and the earthquake lift up to the clouds the prop and foundation of new worlds, that from those clouds they may draw down the sources of the river, the waters of fertility and plenty."

But though we have some small corals, yet we have no coral reefs, needing the skilful pilotage of the vessel to escape their dangers. Yet we have animals very similar to those of the coral structures, and of exactly the same race of beings, doing a like work in gathering from the ocean the materials of stony or horny fabrics. Some of these are so frequent that every one who has visited the shore must have seen them ; and yet so little are zoophytes generally known, that few are aware of their existence on every strand. Nor need we wonder that even the well educated are not acquainted with them. It is but of recent years that they have been known to the scientific man, and none who had not carefully examined them with a microscope could possibly suspect their animal origin. Few even now have seen the polypes, which, united by one line to each other, dwell in the horny spray, that horny spray being itself a part of them, as much as our nails are a part of us. Well may we ask, as we look at these zoophytes, What is an individual ? Now as we see the polypes beneath the microscope, each one a living, moving, sensitive worm, we pronounce them a number of individuals ; but when we examine the little cord which binds them all into one, we call them and their skeleton or horny case a single zoophyte. Not a wave beats upon the shore, but there may lie one of these beautiful and singular creatures. The plant-like sprays hang like elegant little bushes or trees from the sea-weed ; gather

on every oyster and scallop, and many another shells ; cluster in groups on the mermaid's purses ; cover the stones with tangling masses ; or, detached from the rocks beneath the waves, lie among the pebbles, to be blown hither and thither by the breeze. Pity it is that objects so beautiful and graceful should lie around us all unknown and unconsidered. Would that we could induce, not the few, but the many, to search them out, and examine—to derive from them that joy which we ourselves have experienced while observing their marvellous motions and structure, till the spirit has been bowed with reverence before the Creator whose skill designed and formed them, and faith has taken a fresh hold on God the Saviour from the proofs of his power and love.

Some of the commonest zoophytes equal in grace and symmetry any of the objects of earth or sea. We would describe them to the reader who may not know them, as sprays of a sand or horn colour, looking much like sea-weeds, but never, like them, tough and leathery, having always, when dry, a brittle nature. They are never smooth and glossy, but are rough to the touch ; and many, when fresh from the water, look clear and like fine branches made of amber. The form of zoophyte which we are now describing is better known to those who have not studied them, by the name of coralline—a name, as we have seen, also belonging to some branched sea-weeds encrusted with lime, which were long believed to be zoophytes. Many of our horn-coloured corallines grow on any object indifferently ; but some seem especially to prefer various sea-weeds or shells. Thus a species, called the bottle brush coralline, clusters in long sprays on old valves of shells ; another seems always to prefer such shells as have only one valve ; a third grows on sand or rock ; some cover the whole frond of the tangle or other sea-weed ; and some wind like tangling threads about larger corallines. Many grow only down deep in the sea, deeper than even the sea-weeds themselves can vegetate ; and though

we find them in scattered tufts, were doubtless affixed to shells and stones below.

Now there is nothing about these corallines which would at a glance at all identify them with the sea-flowers which grow on the rock, or with those which make the corals. But the reason is, that when we see these sprays, the polypes which reside there are either dead from having long lain out of the water, or they have shrunk up into the cells which are on each side of those tiny branches. Not even the cells, in each of which a worm resides, can be traced by the naked eye. But place one of the sprays beneath even an ordinary microscope, and they are evident enough, and wonderful and beautiful too. All down the branches of this horny skeleton we may see little cups, some looking like bells or vases. But to see the living zoophyte our specimen must be fresh and our microscope a powerful one. This will show us that each little worm which puts its feelers out of the cell, is shaped like a lovely starry flower, such as a daisy or marigold; while each feeler, representing the petal of the flower, is covered with minute hairs, which as the feelers move up and down in ever restless motion, make small currents in the water, bringing the animalcules which it contains to the mouth of the polype.

The author of this book was once residing in a sea-coast town, when a lecture on zoophytes was announced as about to be given by an intelligent naturalist who lived there. The lecturer promised to exhibit these flower-like creatures to the audience, and many assembled to see what living zoophytes could be like. When one of these horny corallines was held up to the assembled hearers, a murmur of surprise went round the room. "Was that a zoophyte?" Every one had seen it before, and all knew that in five minutes' walk on the neighbouring beach he could assuredly find many such. Most had thought it a pretty, graceful sea-weed. The polypes were unfortunately rather languid on that evening. They would not come out of their cells.

The spray was shaken and struck in order to irritate them, and the light brought to bear right upon them, but they lingered yet. Suddenly the lecturer exclaimed, with all the joyous simplicity and enthusiasm of a man of science, "Here they are! oh, here they are!" and it was well for the reputation of the science that they did appear, for some there were actually denying the possibility of their existence. But these men were little used to hidden wonders, and had not walked the world with eyes open as had the lecturer. And now with the help of the microscope many gazed at these elegant and active little creatures, looking, as the gas-light shone down upon them, like living flowers of pure silver; their threadlike rays surrounding the top of their exquisitely formed cells, and moving on, moving ever, in restless motion.

When a number of the zoophytes have been dredged from the sea, and been afterwards looked at in a dark place, they have been seen to be beautifully illuminated, putting forth little lamps all down the branches, so that each notch which we see there, and know to be a cell, has, at its summit, a small star of bright light. One of these, the knotted-thread coralline (*Laomedea gelatinosa*), is described by the Rev. D. Landsborough as "very luminous, every cell for a few minutes being a star; and as each polype had a will of its own, they lighted and extinguished their little lamps, not simultaneously, but with rapid irregularity; so that this running fire had a very lively appearance." In other experiments these corallines were briskly handled and scattered about; and the little polypes not only emitted the most brilliant lights, but also a strong odour of phosphorus. Nothing can exceed the beauty of a sight like this, when a great number of these corallines, entangled among each other by their branches, are shaken in a mass, and the starry lights come sparkling forth, either as tokens of their own alarm, or as endeavours to frighten their enemies. Some such cause seems necessary to account for their lights, which are never

exhibited to the naturalist, save when the polypes are irritated; though down in the deep sea they are, perhaps, an important addition to the light; and they may also contribute to the phosphorescence of the wave which sparkles on the shore.

Crabbe had evidently marked a circumstance at that time little known :—

“ While thus with pleasing wonder you inspect
Treasures, the vulgar in their scorn reject,
See, as they float along, the entangled weeds
Slowly approach, upborne by bladdery beads ;
Wait till they land, and you shall then behold
The fiery sparks those tangled fronds enfold ;
Myriads of living points; the unaided eye
Can but the fire and not the form descry.”

The difficulty of describing these corallines in familiar terms will preclude our referring to many species ;

SERTULARIA ABIETINA, OR SEA-FIR.

but our engravings, by representing a few, will, it is hoped, enable the reader to gain some idea of the

general appearance of these zoophytes. Scarcely any is more often presented to our view than that elegant species called the sea-fir (*Sertularia abietina*), which grows in tufts on many shells, and is so common on the rock-oyster, that it would be impossible to see a number of these shell-fish without it. It is like a

MAGNIFIED PORTION OF THE
SEA-FIR.

little horn-coloured tree, of the shape of a fir-branch, is flat, and has a somewhat zigzag stem. It varies in height from four to twelve inches, and the cells have the appearance, to the naked eye, of small notches, or teeth, on both sides of the branches. Under the microscope these may be seen to be of the shape of a Florence flask; and when the zoophyte is living, little daisy-like flowers appear on the summit, moving their rays or feelers with great quickness, lengthening or shortening them with amazing celerity; and, when they choose, withdrawing themselves entirely from our gaze within their little vases.

Several species of the sertularia are to be found among our most common corallines; and one which might be gathered up from any pebbly or sandy margin of the sea is well named, sea-hair (*Sertularia operculata*). It appears to the eye like a tuft of delicate threads, from two to four, or sometimes to twelve inches high. Every wanderer by the shore admires this lovely little plant-like object. Children collect it, and keep it among their stores; and many besides children carry away these corallines to place among the shells on the mantelpiece. The corallines preserve

SERTULARIA OPERCULATA, OR SEA-HAIR,
(*natural size.*)

MAGNIFIED PORTION OF SEA-HAIR.

their form and general appearance much better than the sea-weeds; and in those little collections sold in the shops at sea-port towns, either in groups or on the successive pages of small books, this zoophyte takes a conspicuous part. As has been observed, had it been called the nereid's hair, its name would not have been inappropriate; for a more elegant object never waved in that watery world which the nereids were of old believed to haunt; and no festoon wreathed about sea-cave or sea-plant with more graceful garlands. Darwin's lines addressed to these supposed nereids, refer to the corallines:—

“ You chase the warrior shark, and cumbrous whale,
And guard the mermaid in her briny vale;
Feed the live petals of her insect flowers,
Her shell-wrack gardens, and her sea-fan bowers;
With ores and gems, adorn her coral cell,
And drop a pearl in every gaping shell.”

At one time of the year, little silver-looking pods, scarcely larger than a pin's point, yet easily seen by the naked eye, grow in abundance on this coralline, each having a little lid or valve. The small notches down both sides of the stems and branches are the dwelling-places of the polypes, and are seen by means of the microscope to have great elegance of form. Sometimes this coralline grows in such quantities on some of our larger sea-weeds, as quite to hide them with its tufts; and the author has seen a thick stem of the tangle so entirely covered with it as to resemble the tail of a fox.

Many of our corallines have familiar names given them, from their resemblance to the common objects which they resemble. Thus one is called sickle-beard, because of its curled form. There are others known by the names of bottle-brush, herringbone, squirrel's tail, sea-tamarisk, sea-oak, sea-cypress. We have besides snail-trefoil corallines, and podded corallines; sea-spleenwort, sea-bristles, sea-thread, and the knotted-thread corallines. Several are distinguished by the forms which are exhibited by their vesicles, or their

cells, under a microscope. Thus we have the small climbing coralline, with bell-shaped cups ; the creeping bell - coralline ; the lily, or pomegranate-flowering coralline, the cells of which have an exact resemblance to a bell-flower, or to the half-expanded blossoms after which they are called.

The common sickle-beard (*Plumularia falcata*), which is here represented, both in its natural and magnified conditions, is common everywhere, in its detached state on the beach, and grows on stones, sea - weeds, shells, and various

PLUMULARIA FALCATA, OR SICKLE-BEARD,
(natural size.)

marine objects. A common-sized specimen is here represented, but it is often much larger than this.

Some of the species of plumularia are much prettier in form than even this kind ; but they are less frequent. The Rev. D. Landsborough describes the impression made by their beauty on some of the men who went with him on a dredging excursion to Lamlash bay. "Our boatmen," he says, "were surprised at the avidity with which we grasped at whatever was growing upon the scallops. Among other things, there were beautiful specimens of *plumularia catharina*, and *plumularia pinnata* ; zoophytes which certainly have nothing in their appearance to recommend them in their state of collapse, when removed from their native element. Taking one of the finest fronds of the

pinnate plumularia, I dipped it in water, and told them to look at it now. It had spread out into an elegant white plume; and, regarding it with surprise, they

MAGNIFIED PORTION OF THE SICKLE-BEARD.

said they 'did not think that there was anything so bonnie to be got in the bay.' Another Arran fisherman, however, having brought up from the deep a fine specimen of the pheasant's-tail coralline, took it home as a curiosity to his wife; and she, being no less tasteful than her husband, planted it in earth in an old tea-pot, and, carefully watering it each day with fresh water, had the satisfaction of imagining that it grew every day beneath her fostering care." "Be that as it may," adds this delightful writer, "it came unwithered into my possession, and its vesicles are embalmed in my friend Dr. Johnston's 'History of British Zoophytes,' as being the first vesicles of this species that had ever been observed."

A very common zoophyte, called the tubular coralline (*Tubularia indivisa*), is composed of a number of tubes large enough to be well seen ; each tube being usually about the size of a grass stem. These are all entangled at the base, twisting among each other, so as to give this zoophyte the appearance of being the root of a sea-weed. They grow in an erect position on stones, or sponges, or other marine things, and when first brought up by the waves, we may see in each tube a small pink knob. If we happen to have a bottle of sea-water near, this knob is soon seen to be but an unfolded star-like polype, clearly discernible by the naked eye, its small feelers moving about in all directions. In a few days these flowers fall off into the water, but they often retain life and movement for some hours after their fall, while new ones soon succeed them on the top of the tubes. A naturalist who saw this tubular coralline in a clear but deep rocky pool, says that the beauty of the little pink starry flowers, when seen in great numbers, and perpetual motion, is beyond all description. The tuft of empty tubes is one of the commonest objects on the beach after stormy weather. It is horn-coloured, and the tubes are usually about three or four inches high, though they sometimes attain the height of twelve inches.

There are zoophytes far less universally diffused than these, though found in some parts of our seas, which are of a firmer structure, and much larger than the corallines. They are called sea-fans, and look like flat branches of a stony tree. Many are brought to our museums and houses by mariners who have visited far distant oceans, and they are very generally known in their dried condition.

The zoophytes called sea-pens are less uncommon on some parts of our shores, but are more frequently brought up from deep water, sticking in the fishermen's lines. So like quills are these, that, as Lamarck observed, "It seems as if nature in producing this compound animal wished to copy the exterior form of

a bird's feather." Nor is this the only instance in which the great Designer of nature has given external resemblance to objects very different in themselves. If the zoophyte resembles a flower or a plume, so does the flower resemble an animal; and the bee and fly-orchis, with their fragile petals, would remind us of the humming or buzzing insects which are flying near them.

The sea-pens are very luminous, the polypes all down their sides giving out, while in a state of vivacity, most brilliant sparks of light. "A more singular and beautiful spectacle," says Dr. Grant, cannot be imagined, "than that of a deep purple sea-pen (*Pennatula phosphorea*), with all its delicate transparent polypi expanded and emitting their usual brilliant phosphorescent light, sailing through the still and dark abyss by the regular and synchronous pulsations of the minute fringed arms of the whole polypi."

Darwin, in his "Journal of Researches," describes a sea-pen found in South America. He says that it consists of a thin, straight, fleshy stem, with alternate rows of polypi on each side, and surrounding an elastic stony axis. This is the case with all the sea-pens, as the framework or skeleton of these zoophytes is internal, and the fleshy portion outside; their structure being the very reverse of that of the corallines. At low water he saw hundreds of these zoophytes, projecting like stubble a few inches above the surface of the sand, and this too is just the position in which our British species are found. "When touched or pulled," says this writer, "they suddenly draw themselves in with force, so as nearly or quite to disappear. By this action the highly elastic axis must be bent at the lower extremity, where it is naturally slightly curved; and I imagine it is by this elasticity alone, that the zoophyte is enabled to rise again through the mud. Each polypus, though closely united to its brethren, has a distinct mouth, body, and tentacula. Of these polypi, in a large specimen there must be many thousands; yet we see that they act by one movement; they have

also one central axis, connected with a system of obscure circulation." He adds, "It is always interesting to discover the foundations of the strange tales of old voyagers, and I have no doubt but the habits of the sea-pen explain one in such a case. Captain Lancaster, in his voyage in 1601, narrates that in the island of Sombrero in the East Indies, he found 'a small twig, growing up like a tree; and on offering to pluck it up, it shrinks down to the ground, unless held very hard. On being plucked up a great worm is found to be its root, and as the tree groweth in greatness, so doth the worm diminish; and as soon as the worm is entirely turned into a tree, it rooteth in the earth, and so becomes great. This transformation is one of the strangest wonders that I saw in all my travels; for if this tree is plucked up while young, and the leaves and bark stripped off, it becomes a hard stone, when dry, much like white coral: thus is the worm twice transformed into different natures. Of these we gathered and brought home many." Such are the glimpses of truth bequeathed to us by early naturalists.

The sea-fans have the skeleton within the polypes, and when alive and bending before the waves are very beautiful, especially in the waters of tropical seas, where the mariner can see the ground far below him. We prize them as curiosities, though we do not attach to them any of that superstitious veneration which is given to a nearly allied species of zoophyte. This is the sea-tree (*Primnoa lepadifera*), and the fishermen keep it as a protection against storms. When fishing for the red fish (*Perca marina*), which is found in great plenty where the sea-trees grow, the line and net of the fishermen are often entangled by being wound about these branches by the fish. When the line is drawn up, it brings with it the branch which tore it. The fishermen say that these trees grow as large as those in our forests, but this is doubtful. This species is found on the coasts of the Shetland Isles and of Aberdeenshire.

But we must return to some of the zoophytes which are strewn over the shores, so as to be observed by us all. All have seen on old shells and stones brought up from the sea, especially if they have been present at the coming in of a fishing-boat, some curious half fleshy, half spongy substances, called by the fishermen dead man's fingers, or dead man's hands, and which a French fisherman would tell you were *mains de mer*. This zoophyte is the *Alcyonium digitatum* of the naturalist, and is most frequently composed of a number of lobes like fingers, though often it is of a single piece, not larger than a thumb. Indeed it assumes a variety of forms. These zoophytes are by no means, like the corallines or sea-anemones, attractive objects. We might turn from them with disgust, if unaware of their interesting and singular structure. Their tough leathery skins are studded all over with little starry figures, which, if we look closely, are evident to the unaided eye. They are formed of eight rays, in the midst of which there is a little aperture, scarcely larger than a needle's point, but easily seen. When the zoophyte is living, the eight somewhat thick arms of the polypus emerge from each of these openings, looking like so many flowers. This zoophyte is a beautiful object, and it is one which may be seen by any one who will take home a specimen freshly brought up from the sea, and will place it in a vessel of water.

We have some zoophytes which make their cells in a snow-white calcareous crust, which is spread over some of the sea-weeds; others, called the sea-scurfs, encrust some sea-plants with a sand-coloured net-work, so as to spoil them as specimens for the herbarium, though in themselves these clustered cells and polypi are most beautiful and graceful creatures. In different species the cells are variously formed, and the outward appearance, too, differs materially. Thus some look like silvery patches on the objects to which they are attached; and some are greyish white; others brown and glittering. One not unfrequent species (*Lepralia pediosstoma*) resembles

a delicate gauze-work, spread over stones and shells, forming large patches of a light crimson, or sometimes of a pure white, with glassy lustre; another is of a beautiful orange red, and some of a fine lilac purple. Some look like webs of lace, and in several kinds the cells are discoverable by the naked eye.

There is not a more frequent zoophyte, nor indeed a more common marine object of any kind, than the great hornwrack (*Flustra foliacea*). Every one who ever spent a day on the shore has seen it there. It is called lemon weed, because when burnt it has the odour of that fruit; and, when fresh from the sea, has often the scent of violets, though this disappears in drying, and many specimens are scentless. An immense number of polypes reside in one of these sea-mats, and Mr. Landsborough, speaking of another kind of hornwrack, the membranaceous sea-mat (*Flustra membranacea*), which forms a beautiful gauze-like incrustation on marine weeds, says, that the light which proceeds from it is very beautiful, for as the cells are so closely and regularly arranged, it exhibits when shaken a simultaneous blaze, and becomes for a little while like a sheet of fire. The common hornwrack looks something like a crisp sand-coloured leaf, cut into many rounded lobes, and is brittle and rough to the touch. The wind blows hundreds of specimens on the beach every day; and if, reader, you have brought from the sea-side any little heap of sea-plants and coralines, you may go and look at them, for be assured you will find

FLUSTRA CARBACEA (natural size.)

among them the broad-leaved hornwrack. Old writers called it the "curious sea-weed."

MAGNIFIED PORTION OF THE
SEA-MAT.

We have selected for our engraving a specimen of the carbacea sea-mat (*Flustra carbacea*), which, though less general than the broad-leaved kind, is shaped somewhat like it, and the cells here represented will also help to give the reader some idea of the structure as seen under the microscope. It is frequent on some shores. An ordinary specimen presents about ten square inches of surface, and Dr. Grant calculates that this is the home of more than 18,000 polypi. Like the polypi so often described, they are living flowers, with their slender rays ever active, and each ray having, down its side, minute little processes like hairs.

Linnaeus named the genus *flustra*, from *flustro*, to weave ; and they are commonly known on the coast as sea-mats. No one unacquainted with natural history would believe them to be animal productions. Some of the smaller sea-mats are prettier than the large ones, looking like little tufts cut out of ivory, or tinted with a pale yellow colour. One very frequent kind, called the paper sea-mat (*Flustra chartacea*), is about the substance of a thin pasteboard ; very slender, semi-transparent, and shining, and of a pale straw colour, sometimes tinged with pink.

Wonderful is it to think that little plantlike objects should be the home of so many living creatures, that they contain a larger population than London or Paris, while each one is as perfect and beautifully

formed as is the larger animal of the desert or the wood.

There is a soft pellucid substance thicker than a jelly, and more nearly resembling a wet sponge, though retaining its form even when cast on the pebbles. This is a common zoophyte, and it was termed by the old writers, who supposed it to be a plant, the knotty spongy fucus. The modern naturalist calls it the *Alcyonidium gelatinosum*. It grows in deep water, attached to old shells and stones, but the waves often throw it up from the sea. It is usually from six to twelve inches long, but occasionally a specimen is found which attains the length of two feet. It is often irregularly branched and knobbed, varying in hue from the colour of wet sand to a clear yellow, when it looks as if made of barley sugar. Little dots appear on the surface, which are produced by the polypes just beneath, and which, when they emerge, have the usual appearance of these starry animals. Johnson, the editor of *Gerard's Herbal*, thus describes it :—"This is a very succulent and fungous plant, of the thicknesse of one's thumbe ; it is of a dark yellowish colour, and buncheth forth on everie side with many unequal tuberosities or knots ; whereupon Mr. Thomas Hickes, being in our companie, did fitly name it ragged sea staffe." And this homely description is very accurate, save that the object is an animal.

As in many other departments of the science, marine discoveries are continually being made of new species of zoophytes. For many centuries such as were common were described as sea-weeds ; and naturalists never suspected that living polypes nestled in their tubes and cells. It is scarcely more than a century since they have been found to have any affinity to the sea-anemones. These were long described as a link between the animal and vegetable kingdoms—half plant, half animal. Several naturalists, however, had begun to doubt whether they were at all of a vegetable nature, when

John Ellis, a London merchant, and a great lover of natural history, felt convinced, by his own observation, that the corallines were animal productions; and with the true modesty of science, he stated what he called his "suspicions" to the Royal Society. This was in June 1752; and later in the same year these suspicions were confirmed into certainty, and he stated his conviction that "these apparent plants were ramified animals in their proper skins and cases, fixed to shells, oysters, mussels, and others." Then followed his admirable treatise on the corallines and other marine productions of our shores; a work well illustrated by engravings of the corallines, both in their natural and magnified conditions. To him we owe most of those familiar names, which liken them to well-known things. Dr. Johnston, a worthy successor of Ellis in this study, referring to this book, says, "It is a work so complete and accurate that it remains an unscarred monument of his well-earned reputation as a philosophical inquirer; and is, even to this day, the principal source of our knowledge in this department."

Those whose love of grace and elegance induces them to group sea-weeds and corallines on paper, may be pleased to know that John Ellis had a great fondness for this amusement, and that it is to the pleasure which he took in it that we are indebted for the discovery of the animal nature of the corallines. He was induced to examine their beautiful sprays with a microscope, and saw the cells and their flower-like inhabitants, and found that these were all united into one by "a tender thready line" to the fleshy part which occupies the centre of the spray. The presumed plant he ascertained to be the skin or covering, and as much an animal structure as the horn of the beast, the shell of the tortoise, or the nail of the human hand.

The skeletons, or cases, whether strong or calcareous, membro-calcareous, or horny and flexible, are all composed of the same materials—lime, and a gelatinous

or membranous substance, the peculiar character of each depending on the different proportions in which these are mixed.

Low in the scale of animal life as the zoophytes must be, rooted as many are to one place, susceptible of division by the knife, and yet preserving vitality, still we have in our seas a yet lower form of life. This is the sponge. John Ellis it was who also proved the sponge to be an animal. We have many native sponges, chiefly of a branched form, but growing sometimes in little mounds, tufts, and crests upon rocks, or lying about the shore at the roots of the sea-weeds, or coral-lines, which have been forced by the sea from their attachments on the rocks. Many of our native species grow at about the point of low-water mark, where though washed by the tide, yet they are daily left uncovered. A common sort, the branched sponge (*Halichondria oculata*), may be seen frequently on our shore among the refuse of the waves. It is composed of branches about the size of a goose-quill, usually on a stem a little thicker, and is often a foot long. Its colour is that of a light sand. Few of our native kinds have any bright tints, but those of hot climates are often remarkably beautiful in form and brilliant in hue. Backhouse, in his "Travels in Van Diemen's Land," describes a remarkable bank of sponges on the shores of the bay at Circular Head, which was several hundred yards long, and more than a yard thick. He also observed several banks of smaller dimensions and of numerous and curious species. "Sponges, as we see them in England," says this writer, "are merely skeletons. In their living state, those upon this coast are filled with a scarlet, crimson, or bright yellow pulp, and covered with a thin skin. They are of great beauty when seen in clear water."

The sponges of our toilette, as well as the British species which we find lying on the beach, are indeed mere frameworks; and few readers, unless they be

naturalists, have seen a living sponge, for it is not a very frequent sight, and must be looked for if found. The canals and pores of a sponge while living are filled with a thin jelly-like fluid, which is seen by the aid of the microscope to be entirely formed of minute grains with some moisture. That portion of the sponge which we generally find on the shore is simply the skeleton, the animal having died on exposure to air. This framework in some species consists of horny and elastic fibres, in others it is of a firm unbending tissue, full of little crystallized sharp points. These abound in most of our British sponges, rendering them unfit for domestic purposes.

It would be impossible here to describe sponges. In the higher forms of animal life, the individuals of one species have all resemblances which may be stated, but sponges, even of the same kind, differ from each other in figure and development too much to admit of popular description. Most wonderful processes take place in the living animal. Dr. Grant once, while observing one under a microscope in some sea-water, perceived an inward motion in the opaque particles floating through the water. He brought one of the apertures of the sponge immediately into view, and thus describes the wonderful spectacle which it presented. "I beheld," he says, "for the first time, this living fountain giving forth, from a circular cavity, an impetuous torrent of liquid matter, and hurling along, in rapid succession, opaque masses which it strewed everywhere around. The beauty and novelty of such a scene in the animal kingdom long arrested my attention, but after twenty-five minutes of constant observation, I was obliged to withdraw my eye, from fatigue, without having seen the torrent for one instant change its direction, or diminish in the slightest degree the rapidity of its course." Our engraving represents the action of a living sponge, discharging the water downwards; and many naturalists have since beheld a

sight seldom seen by the unscientific observer. When the animal of the sponge dies, of course this action ceases entirely.

ACTION OF A LIVING SPONGE.

But we have come to the lowest known form of animal life—a form of which we know little. We cannot judge how far such an animal can suffer or enjoy ; but we see that the Great Creator has fitted it for existence, and adapted it to its condition. Well might Job, in contemplating the wonders of his hand, exclaim, “He bindeth the floods from overflowing ; and the thing that is hid bringeth he forth to light. But where shall wisdom be found ? and where is the place of understanding ? the depth says, It is not in me : and the sea says, It is not with me.” Yes ! we may love and admire the wonders of the sea, yet never gain that fear of the Lord which is understanding. Strange that careful, considering men can look on the marvellous things of the deep, and never trace the marks of the hand that wrought them ; nor is it less strange, that having traced and acknowledged them, they can doubt whether God has given a higher revelation of himself to the inquiring spirit. Were it so, we could but feel that the adaptation of the sponge to its circumstances is far greater than of us to ours. We have longings for immortality ; yet what does earth promise ? Sickness and death. We have, more or less, a consciousness of

guilt ; yet what does nature tell of pardon and hope ? Nothing, absolutely nothing ! Our friends, like those creatures of the sea, are making the earth, like its waters, one vast burial place : but nature, with all its teachings, reveals no haven of rest for the weary spirit ; breathes no promise of reunion with the beloved. Oh ! if there were no higher manifestation of God than even his glorious works of earth, and sea, and sky, well might the heart sink at life's trials ; well might we fear to live, and fear to die. But he has magnified his word above all his name ; and while the written record represents the Lord that created the heavens, God himself that formed the earth and made it—"a just God and a Saviour," as saying, "Look unto me, and be ye saved, all the ends of the earth," and while the declaration rests, that "Christ died even for the ungodly," there may be hope, there may be joy in every lot of human life ; and all who by the grace of the Holy Spirit have come to that Divine Saviour with a lowly but confident faith, may live on in calm hopefulness, and commit their parting spirits to him.

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