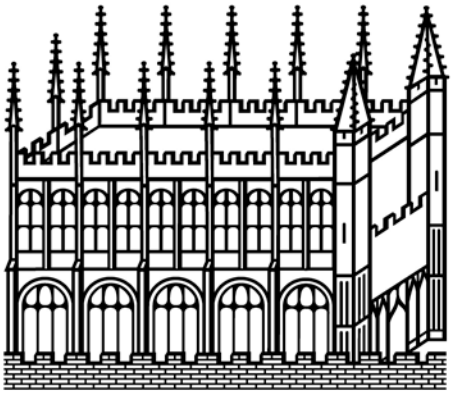

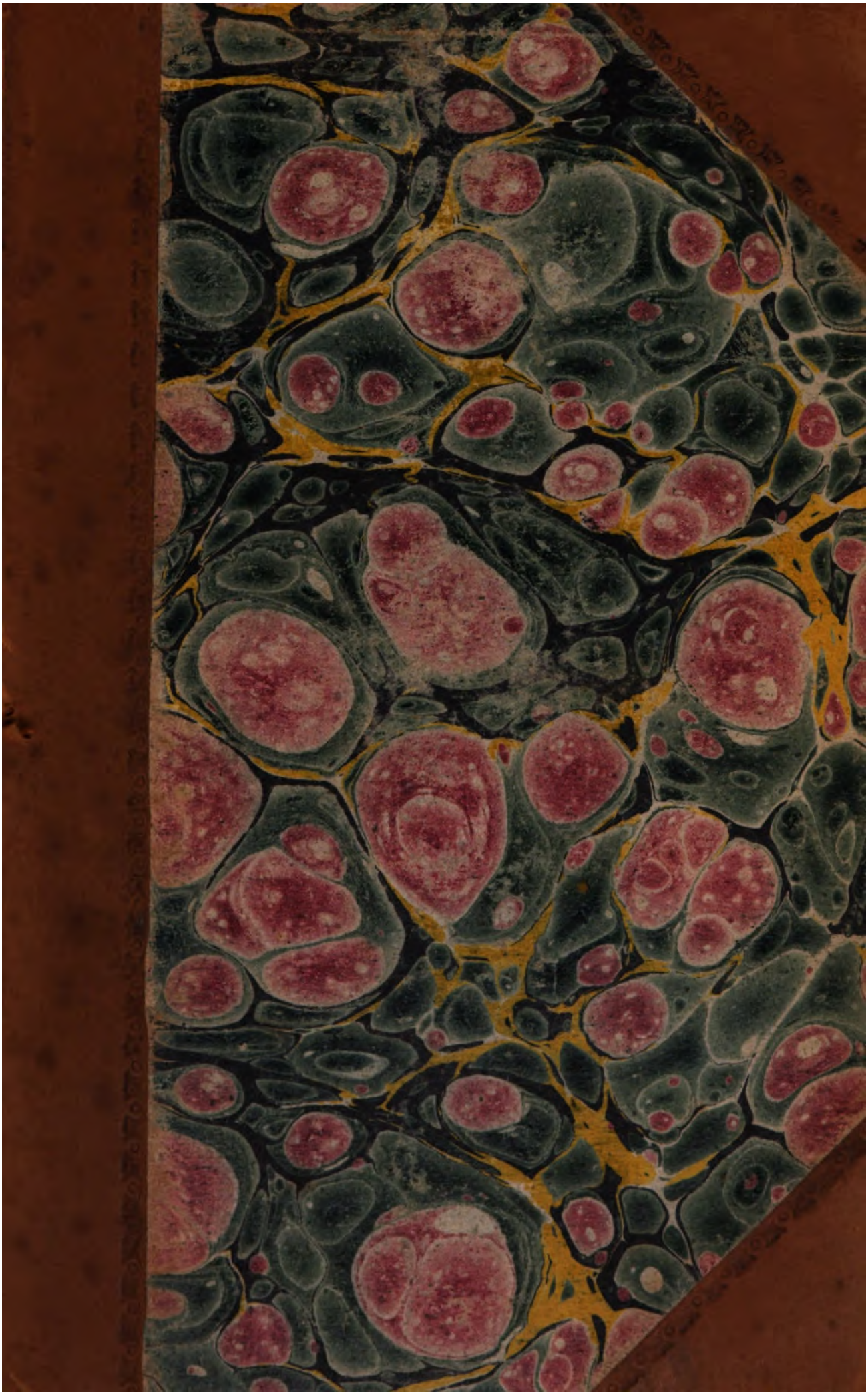

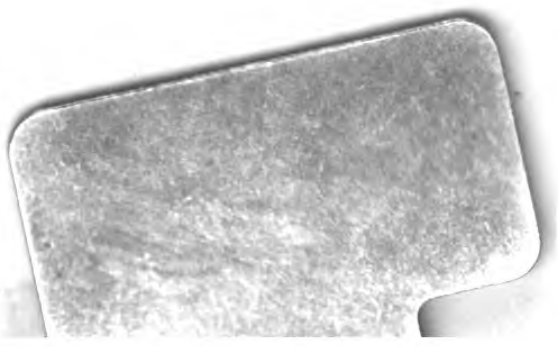

THE

SEA-SIDE COMPANION.

LONDON:
PRINTED BY MANNING AND SMITHSON,
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THE

SEA-SIDE COMPANION;

OR,

MARINE NATURAL HISTORY.

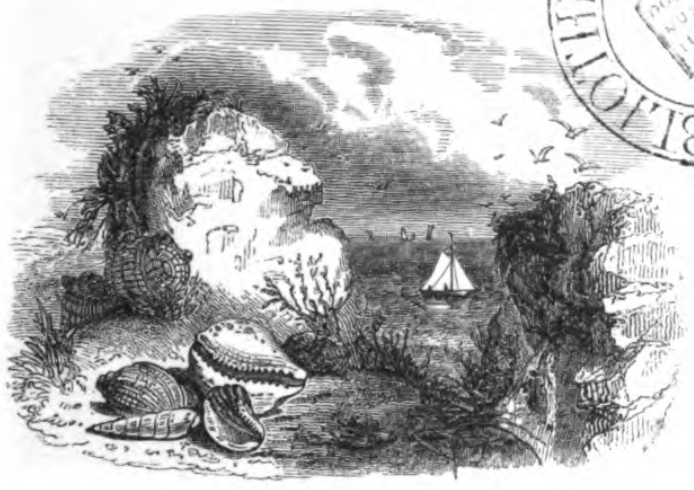
BY

MARY ROBERTS,

AUTHOR OF

"DOMESTICATED ANIMALS;" "CONCHOLOGIST'S COMPANION;"
"SELECT FEMALE BIOGRAPHY," &c. &c.

With illustrative Wood-Cuts, by Baxter.



LONDON:
PRINTED FOR WHITTAKER & CO.
1835.

VARIOUS branches of Natural History have been ably and elegantly discussed, but no one has particularly spoken of the Coral race; of Corallines, and Fungi, and the migrations of the finny tribes; or shewn forth the beneficence of the Creator, in this portion of his works. Their natural history has been hitherto confined to the dry details of science, with little, if any reference to their wonderful organization, and to the benefits which their migrations annually confer on the most inhospitable regions of the globe. Yet, where shall we find a more interesting subject for discussion and research? The Author of the following pages has endeavoured to supply this deficiency; and in so doing, it is presumed that the train of thought which has been pursued, with occasional descriptions of the countries to which the migratory species annually resort, will render this work interesting to the general reader.

ERRATA.

Page 1 *Tubularia.*
— 71 For *Genus Pleuronectes, &c.*, read Genus Chætodon, C. Teira.
— 82 For *fine*, pine forests.
— 84 *Nests*, nest.
— 108 *Hispidus*, Hispid.
— 102 The head of this singular species, the *Echeneis Remora.*
— 155 For *Whiting*, read Greyling.

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LETTER I.

ANIMAL PLANTS.

To * * * *

Pascal has well observed, that if the heart be rightly disposed, even the feeblest of created beings, are to us a book of knowledge, a living mirror, in which to contemplate the eternal power and beneficence of the Creator. This observation often occurs to my remembrance,

and may it also occur to yours, my friend, when exploring the green lanes around your quiet dwelling, or when, on the sea-shore at Sidmouth, you observe the little Zoophyte expanding its mimic petals to the sun. I know not any branch of natural history which more strikingly illustrates this remark of Pascal, than the link which thus unites the Vegetable Kingdom to the vast world of animated nature. This link is composed of several extraordinary productions, termed Zoophytes, or animal plants, from the likeness which they bear to different vegetable productions. A considerable number are known by the name of Corals, or Corallines, and resemble shrubs and trees, though evidently separated from them by their hard and calcareous nature; whilst, in others, the softness of their texture, and plant-like ramifications, caused them to be formerly considered as creeping plants. Among these, the genus Hydra is equally conspicuous for its wonderful construction, and peculiar properties. This interesting genus, was so named by Linnæus, from a fancied similarity to the fabulous Hydra of antiquity. The individuals which compose it are found in small streamlets, and in stagnant water, where they adhere to the floating leaves of aquatic plants, and prey on minute worms and insects of various kinds. These Polypes are remarkably voracious; they seize their victims with the utmost avidity, and swallow them in the same

manner as a snake devours any small quadruped. Their arms, or tentaculæ, resemble those of the Sepea, or Cuttle-fish, and they are, moreover, furnished with numerous minute organs, which apparently act as suckers, and enable them to seize and hold any floating insect passing within their reach.

Hydras, like many productions of the vegetable kingdom, may be increased by means of shoots or offsets, and one or more branches frequently proceed from the parent stem; these continually throw up fresh suckers, which, in their turn, give life to others, till at length the parent Polype assumes the appearance of a real geological tree. How wonderful are the operations of Nature! The Hydra of the fens of Lerna is justly considered a chimera of the imagination; but the Hydra of our streamlets possesses its reproductive powers, and realizes the description of the ancient poet. If one of these extraordinary productions be carefully separated, the upper part will produce a new tail, the lower a head and arms, and the middle, both a head and tail. In short, a Hydra may be divided in every possible way, and the several portions, like those of the fabulous inhabitants of the Lernian marshes, will quickly reproduce the deficient organs.

Leuwenhoek was the first who discovered this remarkable property; but his researches were not carried to any extent, and he remained in a great

degree ignorant of the actual powers of the Hydra. Many years elapsed, before any fresh discoveries were made; till, in the year 1730, a naturalist of the name of Trembly, while searching in the neighbourhood of Geneva for some aquatic plants, discovered, and brought to light, these singular productions. Surprised at the extraordinary formation of a creature which presented the aspect of a plant, while it possessed the motion of an animal, he determined to ascertain its doubtful nature, and was equally delighted and astonished to find, that, on being divided into two parts, each, apparently, remained uninjured by the separation; and that, in the course of a few days, the several portions reproduced the deficient organs, and eat, and moved as before!

The discovery was made known, and at first considered merely as a fable; it was even contended that it was impossible, on the principles of sound philosophy, and common sense. But the fact was undeniable; and the attention of every European naturalist was consequently excited by the singularity of the circumstance. Ditches and stagnant waters were ransacked for their inhabitants, and one experiment succeeded another, till their real nature was completely ascertained. It was also found that the animals of most of the Coral tribes, both hard and soft, were closely connected with Polypes in

their construction and reproductive powers; whilst others, though endued with the same extraordinary qualities, seemed more allied to the Actinæ, and Medusæ.

This interesting genus is very generally diffused; and while some are scarcely distinguishable among the sea-weeds to which they adhere, others stand forth in all their native beauty, and gaily decorate the rocks to which they cling.

Such, especially, are the Sea Anemones; an elegant genus, closely resembling the flower from which it derives a name. I have often gathered specimens on the shore at Sidmouth, when the receding of the tide has left uncovered that beautiful range of small broken rocks, which are so dear to the lovers of marine botany. These specimens would continue in great beauty for a considerable time, when kept in basins filled with salt water, and fed with small pieces of fish. Their colours in different lights were changeable as those of the Camelion.

Different species belong to this family, and are equally distinguished for their varied tints, and elegant construction. The Sea Carnation presents the appearance of a long white fig, delicately wrinkled and curvated at the top, like the petals of a garden carnation; the Sunflower Anemone, grows on rocks, and expands its saffron-coloured petals, in imitation of the stately flower to which it owes a

name; and the common Sea Anemone (such as we gathered from off the rocks at Sidmouth), is distinguished by a red colour, and rough internal surface, while the centre is often of the purest white, elegantly marked with numerous carmine streaks. But the most extraordinary of the species is the Cluster Animal Flower, consisting of many tube-like bodies, surmounted by a mouth, which gently swells towards the upper part, and is surrounded by one or two rows of tentaculæ. These, on contracting, look like a circle of beads; while the lower extremity resembles that of a bulbous root, which closely adheres to the rock, and sends forth other tubes, that creep like roots in various directions.

Figure to yourself a wild solitary cave, and within it a natural hollow filled with clear water, beneath which appears a fixed stone, or rather a small rock. Look down into the clear mirror, and you may observe around the sides of this natural basin, certain substances which resemble fine radiated flowers, of a pale yellow, or bright straw colour, slightly tinged with green, and elegantly bordered with thick-set petals, like those of the single garden Marigold, excepting that the petals are narrower towards the base. These mimic flowers grow out of small hollows in the rocks. If you dart down your hand to pluck one of them, the creature, warned by the undulations of the water, imme-

diately contracts its yellow borders, and shrinks back into the hole. But if left undisturbed for a few minutes, it gradually reappears, expanding, though at first very cautiously, its seeming leaves, till at length it resumes all its former beauty.

The author* to whom we owe the knowledge of this curious Zoophyte, once contrived to cut off two of the leaves; but being composed of a membranaceous substance, they soon shrivelled up, and died away.

The singular character of the extraordinary cavern in which these beautiful productions grew, as well as the variety of their forms and colours, having excited considerable interest, and consequent inconvenience to the individual through whose grounds the persons who came to see them were obliged to pass, he resolved to destroy the objects of their curiosity. Orders were accordingly given for this purpose; and the more effectually to remove the slightest trace, the holes from which they appeared were carefully bored through with an iron instrument, by means of which they were supposed to be entirely destroyed. Vain, however, were all his efforts; in the course of a few weeks, they appeared again.

Polypi are very irritable, and acted on by external influences. This will account for the susceptibility of the animal flowers in the cavern of which I have

* Hughes' Natural History of Barbadoes.

just spoken, when warned of approaching danger by the undulations of the water. Light also attracts them towards the quarter whence it comes, in a manner similar to leaves and flowers. But the only relationship between them and vegetables, consists in the simplicity of their structure, the compound manner of their growth, their being increased by offsets, and their resemblance to different kinds of flowers; as well as the external form of the gaily tinted masses which the united Polypi compose.

We recognise in these extraordinary productions a beautiful adaptation to their peculiar circumstances. Blossom-shaped tentaculæ enclose the unsuspecting shell-fish, or small marine insects, that venture within their reach; and these tentaculæ are each provided with a mouth, which is concealed by long hairs, that appear like a circle of small beads.

A wrinkled, fleshy tube, serves as an anchor to fix each of these mimic flowers to a rock, or stone, and thus are they enabled to resist the fury of the waves. They answer the same purpose as the fine, silky filaments which moor the little Muscle in a sheltering haven; or rather, the shelly basis of the Serpula or Worm-shell, the Tree Oyster, and Slipper Barnacle. Lastly, on dissecting the stomach of this curious creature, many longitudinal fibres are discovered, lying parallel to each other, and all inserted in the tentaculæ which surround its mouth:

these are evidently tendons, for moving and directing them at will.

And does this humble Zoophyte indeed possess *a will?* Is it capable of pleasure, and susceptible of pain? Undoubtedly. Those beautiful membranaceous expansions, which resemble flower leaves, close up in stormy weather, and again open to the sun, as if delighting in his beams.

But such is the case with those kinds of flowers, which Linnæus elegantly distinguishes by the general name of *solar!* The effects in both are similar; the causes widely different. In plants, the spiral wires are acted on by moisture, light, and heat, and thus the petals close, and open, in accordance with the changes of the atmosphere. In Zoophytes, their beautiful expansions close together, or unfold, according to the wants or inclinations of the animal; for it is well known, that although they may be preserved for a considerable time in salt water, they will eagerly devour small crabs and shell-fish, when placed within their reach, or borne against them by the action of the waves; and that a Sea Anemone of one species, will even swallow a smaller individual of another. Nor is this all: the testaceous covering of the shell fish, and the empty armour of the crab, is returned through the mouth of the Sea Anemone, Sun-flower, or Carnation; but the little Zoophyte re-appears in the

course of a few hours, and hastens to escape from the fangs of its voracious relative.

Who shall assign a limit to the wonders of creation! Where is the spot on earth, the animal, or plant, or the creature which mysteriously partakes of both their natures, which does not lay open to us unquestionable evidences of the wisdom and benevolence of God. These feeble Zoophytes are seen adhering to the rocks, or bedded in the sands, where the foot of man may crush them, or the dashing of the waves may break them: they are not furnished with the means of defence; nor can they escape from impending danger. The Deity has, therefore, wonderfully endowed them with reproductive powers; for it is not his will that any thing which he has made should perish. The smallest portion, if accidentally divided from the parent stem, will increase in size, and at length become perfect in all its parts.

But of what use are these extraordinary productions? The curiosity of the human mind is insatiable. It looks abroad into the fair creation, and sees unnumbered instances of grandeur and munificence. It acknowledges the goodness of the Deity, in giving the sun to rule the day, the moon to guide the night. It confesses his parental care, in visiting the earth, and watering it; his power, in the stormy winds and earthquakes, which fulfil his word: but why are these feeble creatures seen to mingle

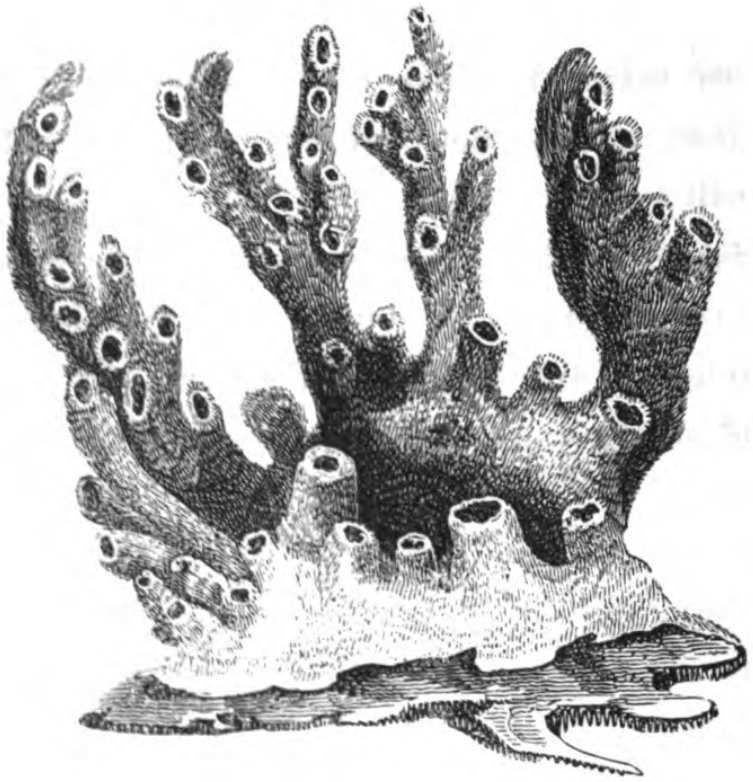
with so many trophies of his divinity, who sits enthroned above the heavens, surrounded by the immensity of his works?

It is reserved for Revelation to solve this interesting question. "Thou art worthy, O Lord, to receive glory, and honour, and power; for thou hast created all things, and for thy pleasure they are, and were created."*

Adieu.

I am, &c.

* Rev. iv. 11.



LETTER II.

SPONGES.

To * * * *

You describe delightful scenes—the woods, the rock, the restless ocean, the lofty cliffs, and drapery of underwood, the creeping plants that wander up their sides, and even the modest little harebell, peeping from out their fissures; but shall I borrow, in addressing you, that eloquent and simple language to which every feeling heart responds:

"Lo, these are but a little portion of His wonders. Every shell is like an open book; every painted sea-

weed has a lesson written on its leaves. God is in every place; he speaks in every sound we hear; he is seen in all that our eyes behold!" Even the rock-adhering Sponge, which you may observe on several of our coasts, is not less deserving of attention, than the prouder forms of vegetable beauty; than the restless and fluctuating waves that break upon the shore.

You are, perhaps, ready to inquire, what is there in the humble Sponge, to bear the most remote comparison with objects that are in themselves so splendid and imposing? Much, my friend. Look down through the transparent water, and observe amid its vast variety of marine productions, a small single yellow tube, surmounted with a crown of little spines and rays of a glossy yellow colour. It grows within your reach, and may readily be separated from the fostering rock. A designed and studied mechanism is obvious in its construction; and though, by reason of its mode of life being widely different from those of quadrupeds and vegetables, some difficulty arises in comprehending the use of every part, yet sufficient is already known to evince their admirable fitness to a separate species of existence. What can we say more, respecting the vast and beautiful in nature! They are also wonderfully adapted to the sites of earth, or ocean, for which their Maker has designed them; and however modified or varying, they tell us

that his parental care is over all his works; they form part of the great world that was called forth from chaos, on which man is placed, to adore his goodness, and to be trained up for the enjoyment of that glorious inheritance, which the Most High has promised to those who love him.

Sponges are, apparently, insignificant; yet they form a number of little worlds, peopled with a numerous tribe of animated beings, and designed to answer some important purpose in the general economy of nature. The creatures which inhabit them, belong to the class Vermes, order Zoophyte; and are described by Linnæus, as fixed, and flexile, composed either of net-like fibres, or small spines, and covered with minute mouths, by which they absorb and reject water.

Examine one of them in a microscope, and you will be delighted with its construction. It looks like a gallery, with compartments that rival in intricacy and number, those of the celebrated labyrinth of Crete—the ramified entrances of a marine pavilion, gradually extending upwards, and sending forth branches in different directions, till they at length unite, and form a compound net-work throughout the inside of the Sponge. Small openings are also discoverable at the ends of the upper shoots; and as we trace these openings downwards, a soft whitish substance is discoverable, filling the internal hollow

parts of the ramifications, throughout the whole Sponge; these ramifications are nearly transparent, of an amber colour, and are undoubtedly the habitations of a particular kind of Vermes. For though we cannot distinguish either vesicles or cells, or indeed discover any other kind of organization than that of a variety of hollow tubes inflected, and wrought together into a multitude of agreeable forms—some branched like corals, or expanded like a fungus,—many rising like a column, others resembling a hollow, inverted pyramid, with irregular cavities, entrances, or apertures; yet, from many obvious resemblances to different kinds of marine productions, as well as from the chemical analysis of Sponges in general, we are amply justified in referring them to the class of animal productions.

I have often contemplated with astonishment, the formation of these Zoophytes. Nothing could be more appropriate. As the creatures which inhabit them are never designed to remove from their places of abode, they are provided with a dwelling that is capable of close adhesion to the surface of the rocks: and what is still more wonderful, as this peculiarity of construction forbids them to go in quest of prey, innumerable mouths are arranged in all directions, like fishing nets. These are capable of being either opened or closed, as necessity requires. Nor is the general dissimilarity of construction which

prevails in different species of this extensive genus, less deserving of attention.

The most able mechanic would find it no easy matter to contrive fifty pieces of mechanism, resembling each other in their internal structure, fitted up with similar cogs and wheels, and adapted in every respect to answer the same purpose; and yet different in their external form, highly ornamented, varying in shape and colour, and embellished with a variety of minute and elegant decorations. This dissimilarity is obvious in the fifty species that form the present genus; and what are these but complicated pieces of machinery, formed of net-like fibres, curiously woven together, and endowed with life? Let us examine a few of the most conspicuous. The Branched Sponge is soft, and branched, with rows of small projecting cells on the edges, through which the inhabitants draw in their food. It is common to the British seas, and grows from five to ten inches high. In the Coronet Sponge, these cells, on the contrary, look like small spines, surmounting a pale yellow tube; while in the Grape Sponge, they appear at the end of hollow branches, resembling bright yellow grapes. In the Creeping, brittle Sponge, with round, erect, and obtuse branches, they are scattered, like open pores, over the whole surface of the sponge, which during autumn is beautifully diversified with small blue and shining globules, and present a most

elegant appearance when seen through the clear waters of the Swedish and English lakes. In the common Sponge, which is porous, tough, elastic, and irregularly formed, growing into lobes of a woolly consistence, and adhering, by a broad base, to marine substances, these tubes appear like open cells or pits.

And now, if you wish to consider the chemistry, as well as the mechanism of this curious Zoophyte, it will not disappoint your expectations. I refer to its inherent properties. When a Sponge has been immersed for fourteen or sixteen days in nitric acid (diluted with three parts of distilled water), it becomes nearly transparent, and when touched with ammonia, assumes a deep orange colour, inclining to a brownish red. But if much softened by the acid, the whole fabric immediately disappears, on being immersed in ammonia, and forms a deep orange-coloured solution. A Sponge, when boiled, also gives out a considerable portion of animal jelly. The infusion of a small quantity of oak bark, causes this to fall to the bottom of the vessel, as a sediment, and so entirely changes the nature of the Sponge, that, when dry, it crumbles between the fingers; and, when moist, it may be torn like wetted paper. In this state, we should naturally conclude that it is entirely useless: but no; the operations of chemistry resemble the moving of a magic wand. Boil the same in water, with caustic polish, its latent qualities

will be called forth; and behold, a deposition of animal soap!

Sponges, when heated in a close vessel, give out an unpleasant smoke, and become reduced to a black charcoal, which, on being burnt to ashes, leaves a small quantity of common salt, jelly, and carbonate of lime.

To this we may add, that each Sponge possesses the property of absorbing rapidly, as much fluid as it can hold, and of yielding it when compressed.

Hence they are useful in medicine and in the fine arts; and also in stopping the effusion of blood. For this purpose, a dry and solid piece, of a conical form, should be pressed on the ruptured vessel, to which it will adhere closely, and thus the bleeding of a large artery has been frequently prevented.

Nor is this remarkable production entirely uninteresting to the historian. It recals to recollection one of the most eventful periods in the history of Carthage. "Send me," said the unfortunate Gelimer, when driven from his throne, and wandering on the mountains of Numidia, "send me, my dear Pharos, a lyre, a sponge, and a loaf of bread: a lyre, on which to sing the history of my misfortunes; a sponge, that I may soothe with it my eyes, inflamed by weeping; and a loaf of bread, because I have not tasted any for a considerable time."*

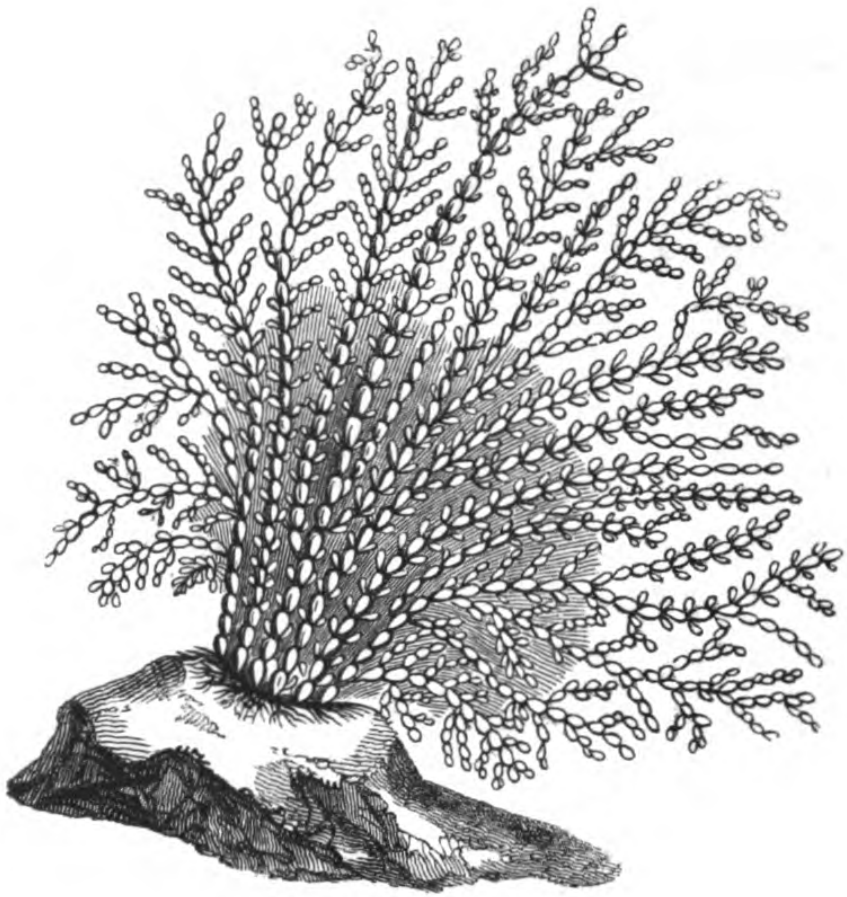
* Gibbon's Decline and Fall of the Roman Empire.

There is still another, and far more impressive recollection connected with this feeble Zoophyte. There was One—who suffered the just for the unjust, who meekly bowed his head upon the cross, and exclaimed, "It is finished." There was One, to whom his unrelenting persecutors, instead of offering the usual portion of myrrhed wine that was given to the vilest malefactors, in order to take away the sense of pain, or to subdue their insufferable thirst, filled a sponge with vinegar, and put it upon a hyssop, and put it to his mouth. An offer, which, independent of its cruel mockery, was considered among the Jews in the light of an intolerable insult to their feelings. And to this, as well as to the future sufferings of the Redeemer of mankind, one of the ancient prophets thus alludes:—

"I looked for some to take pity, but there was none; and for comforters, but I found none.

"They gave me gall for my meat, and in my thirst, they gave me vinegar to drink."—Psalm lxix. 20, 21.

Adieu.



Corallina Officinalis.

LETTER III.

CORALLINES.

To * * * *

Corallines, are some of the most beautiful productions of the deep; they are closely allied to corals in their construction, and probable uses, and are, consequently, one step higher in the scale of the Zoophytic life, than their immoveable neighbour, the rock-adhering Sponge.

They attach themselves to stones, and other solid bodies, and are concretions, formed by the Polype insects which inhabit them. They are, generally, of a plant-like form, with elevated branches, and exhibit an elegant appearance from their symmetry and proportions, being generally subdivided, calcareous, and composed of little joints, like beads strung on a necklace; which peculiarity easily distinguishes them from the Coral family. The joints are generally perforated, or full of minute cells; and in these the Polypes reside, the openings serving them as doorways, through which to seize their prey. When a branch is immersed in vinegar, the calcareous crust dissolves, and leaves the interior uninjured, by which means its beautiful formation may be easily examined.

This elegant species is highly ornamental in collections of natural history; and one of them, the Corallina Officinalis, is valuable in medicine. Fifty-seven species are well known; some of which, are extremely beautiful; and others, of rare occurrence. They vary both in size and structure; for Nature is ever prodigal in the profusion of her embellishments:

"Some present
Large growth of what may seem the sparkling trees
And shrubs of Fairy Land; while others shine
Conspicuous, and, in bright apparel clad,
And fledged with snowy feathers, nod superb."

The south of Devon presents an exquisite variety

of these interesting marine productions. They are often left by the receding of the tide upon the shore; and as often are seen to float by, on the sparkling waves, either attached to a group of thickly-matted sea-weed, a broken piece of wood, or the empty shell of a muscle. Some appear like little tufts of green grass, floating and trembling in the waves; others resemble bunches of hair-like tubes, varying from a greenish-brown to white: a few may be compared to clusters of diminutive beads, and a large proportion to long brown filaments, covered with a calcareous crust. Each of these is the separate habitation of a constructing agent, a minute world, enclosing joys and griefs, peculiarly its own; and as little or no difference subsists between the formation of Corals and Corallines by their respective inhabitants, I shall briefly state a few observations, with regard to the former.

These bodies, which previous naturalists imagined to be flowers, are ascertained to be insects inhabiting the Coral; for upon taking a branch from the water, the seeming flowers, which proceed from a number of minute points answering to the holes that pierce the bark, and resemble the flower of an olive tree, enter into the bark, and disappear; but upon being again put into the water, they presently shoot forth. The openings in the bark, or rather of the stony crust, correspond to small cavities upon the substance of

the Coral, and when removed, a variety of little tubes become visible, which connect the bark with the inner substance, as well as numerous glands that adhere to them. From these glands the milky juice of Coral issues; the holes in the bark, as already noticed, being the openings through which the Polypes come out. These curious insects dwell within the tubes, and the milky juice is always more abundant, in proportion to their health and vigour. This juice, or liquor, runs along the furrows, which are perceptible upon the substance of the Coral, and gradually becoming hard and fixed, changes into stone, and causes the Coral to increase in every direction.

In forming Coral, and other marine productions of a similar description, Polypiferous insects labour according to their species; while their proportions vary in accordance with their several forms, magnitudes, and colours. In short, Corals and Corallines have the same relation to the Polypes united with them, as subsists between the shell of the snail, and the snail itself.

These Polypes expand in water, and contract in air; they evince considerable sensation when touched with the hand, or when exposed to the action of acids: they have even been seen to move their claws, and to expand themselves, when the water which contained them, was placed near the fire. A considerable

number resemble snails and lobsters, whilst others are slender, and several feet in length. The most common are wheel-shaped, with arms from four to six inches long, which they move rapidly, in order, as it is supposed, to catch food. Some are slow in their motions, a few exceedingly active. Some are of a dark colour; others are blue; and others again, bright yellow. Those of the Mediterranean are either red or white, or vermilion; and on the shores of the island which Harvey has thus beautifully described, Captain Flinders saw a considerable number that glowed with the vivid colours of the rainbow:

"Where life in all her myriad mouldings plays,
Amid the beauty of the tropic blaze:
Where summer watches with undying eye,
And equal day and night divide the sky:
Where the thron'd Phœbus wakens all the flowers,
To do him homage in his own bright bowers:
Where starlight is a gala to the skies,
And sunset as a cloud-sketched paradise.
Isle of the Orient—garden of the East—
A giant secret of the liquid waste,
Long ages in untrodden paths concealed,
Or, but in glimpses faint and few revealed,
Like some chimera of the ocean-caves,
Some dark and sphinx-like riddle of the waves,
Till he,—the northern Œdipus—unfurl'd
His venturous sail, and solved it to the world!
Surpassing beauty sits upon her brow,
But darkness veils her all of time, till *now*;

Enshrouded in the shadows of the past,
And secret in her birth, as is the blast.
If, when the waters and the land were weighed,
Her vast foundations in the deep were laid;
Or, mid the tempests of a thousand years,
Where through the depths her shell the mermaid steers,
Mysterious workmen, wrought unseen, unknown,
And reared her, like a Babel, on her throne;
If Afric's dusky children sought the soil
Which yields her fruit without the tiller's toil;
Or, southward wandering on his dubious way,
Came to her blooming shores, the swarth Malay;
'T is darkness all :—long years have o'er her rolled,
Their flight unnoted, and their tale untold:
But beautiful she is, as fancy deems
The visioned regions of her sweetest dreams;
Fair as the Moslem, in his fervour, paints
The promised valleys of his Prophet's saints;
Bright as the brightness which the poet's eye
Flings o'er the long-lost bowers of Araby;
The soul of beauty haunts her sunny glades;
The soul of music whispers through her shades;
And Nature, gazing on her loveliest plan,
Sees all supremely excellent—but man!"

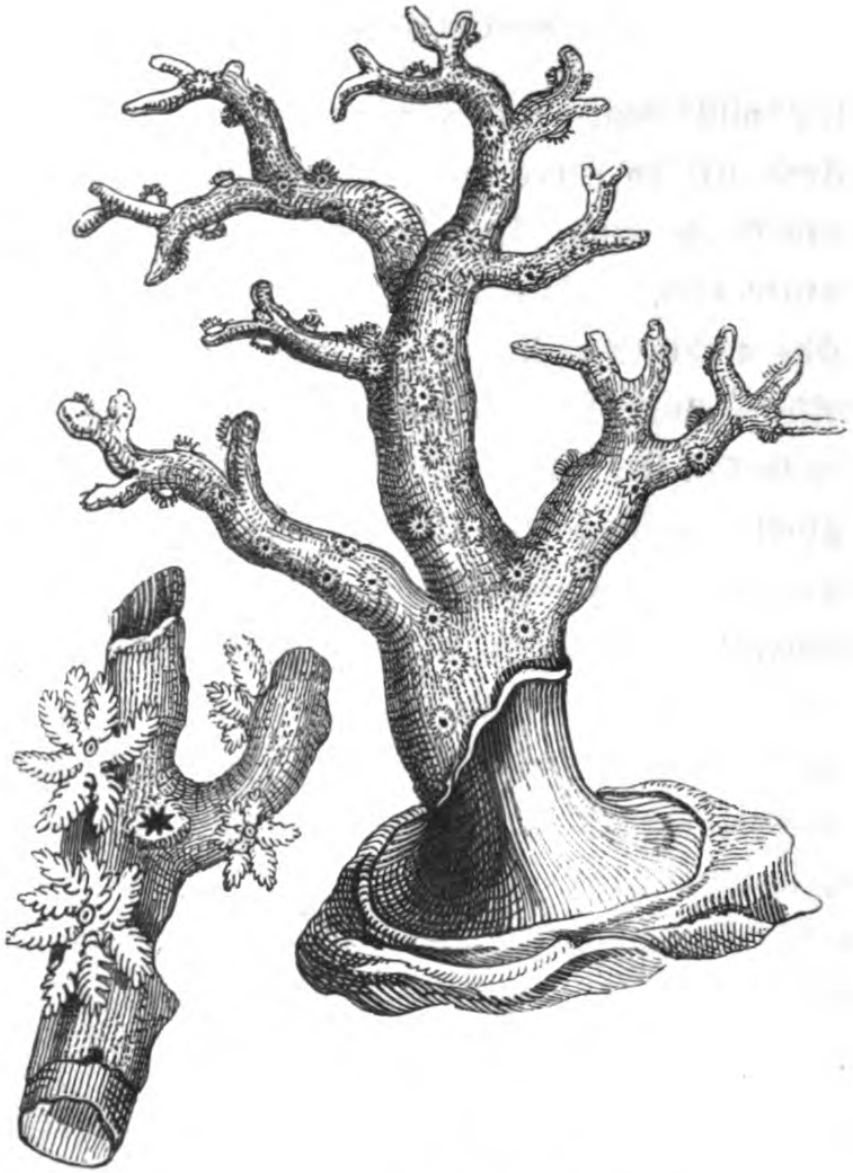
The "mysterious workmen" to whose unseen labours the poet thus elegantly refers, are undoubtedly some of the most wonderful productions of the deep. Naturalists have traced the share they take in the formation of Coral and Corallines; it is also extremely probable, that many marine substances, supposed to be sea-plants, are in reality animal productions, formed by different kinds of Polypes for their abodes. Nor is it unlikely, that

the more compact bodies brought from various parts of the East and West Indies, and known by the general appellation of star, brain-stones, and petrified fungi, are in fact of the same origin.

But what, it may again be asked, is the use of these extraordinary productions? This is a question which we cannot clearly answer. They admit, in their general configuration, no very clear or probable comparison with any of the objects that daily meet our view. They are new in various respects; they have little in common with the living creatures by which we are surrounded. They are the inhabitants of another element, of a vast world of animated existence, and our footsteps are not upon their fields. But they possess, I think, above all others, that vast variety of form by which we are frequently induced to observe, the different, or rather the studiously diversified methods by which one and the same end is attained; and which also teaches us, that beauty and variety, distinct from every other consideration, was a motive in the mind of the Creator. This astonishing variety of organized life, corresponds exactly with the surrounding elements, whether of air, or earth, or water, or the purposes for which every individual is called into being. We observe it, every step we take; and hence we may allowably infer, that a similar order subsists in the great world of waters, respecting which, we know comparatively

little; and that, moreover, as one class of beings is designed to serve as food for another, a second to purify the atmosphere, a third to keep down the superabundance of insect life, a fourth as way-marks to direct the thoughts of the most incurious to the manifestations of divine workmanship; that so the same design is answered, the same purposes attained by such as grow in the sunless retreats of the great ocean, or float upon its moving billows, or spring luxuriantly from the fissures of the rocks.

Adieu.



Magnified branch, exhibiting the Animals.

Gorgonia Nobilis.

LETTER IV.

CORALS.

To * * * *

We now proceed to examine the construction of the Gorgonia, or Coral; and this, undoubtedly, is one of the most curious and interest-

ing productions of the deep. It was formerly regarded by the ancients as a class of plants, and described as such by botanists; nor was this idea, however remote from truth, exploded, till so late a period as the eighteenth century, when the discoveries of Peyssonel, respecting the nature of Coral, and those of Trembley on the Hydra, or Polype, about fourteen years since, contributed to demonstrate, that Corals, in common with other Zoophytes, do not appertain to the vegetable, but animal kingdom; or are, at least, the fabrication and genuine habitations of the Sea-Polype.

Among the various observers of this curious order, few, if any, have pursued their investigations with greater discrimination and success, than Professor Pallas, our own countryman Ellis, and his friend Dr. Solander. Nor, indeed, can we hesitate to confess, that our knowledge of the Gorgonia tribe has been enlarged only in a very inconsiderable degree, by any subsequent writers on this subject. The latest observations tend principally to confirm the accuracy of those writers, who had before assured us that Coral is merely the habitation of various kinds of insects, each of which resides in a distinct cell; that these are generally dormant during winter; and that, like the blossoms of plants, they push forth buds, and expand in the summer season. The stems and branches of the Gorgoniæ, which are most com-

monly of a somewhat horny and flexible nature, may be considered as the true skeletons of the nests of the Sea-Polypi, being covered with a fleshy or pulpy substance, the interior surface of which, is porous. These pores are the mouths or openings of the cells, in which the Polypes are lodged; and it is the number, disposition, and varied structure of these, in addition to the general aspect of the plant-like nest of habitations, that constitute the most material difference, by which the various species are distinguished. The figure of the animal, when it can be ascertained, forms the secondary, or least important character. It may, lastly, be observed, that Corals differ exceedingly in size, some of the finest branches being three feet in height, while others, in deep bogs, or in marine situations no less favourable to their growth and increase, attain to the gigantic height of ten or twelve feet; and that from their number, as well as magnitude, their elegantly branched appearance, interwoven structure, and brilliant tints, they form a conspicuous portion of those vast sub-marine groves of Coral, which are seen by navigators in the hottest regions of the globe.

Among the numerous species which naturalists assign to this interesting genus, the Antipathes, or Black Coral of the shops, and the Nobilis, or Red, are best known.

Antipathes of different kinds were used in ancient

times for sceptres and divining rods, as we learn from the observations of Salmasius, addressed to Solinus; wherein he says, that Antipathes denote something proper to resist incantations, and that they were adopted for that purpose by several Indian nations.

Divination, by means of rods, was one of the fifteen modes of exploring futurity, in common use among idolatrous nations. They are each mentioned with strong reprobation in the Scriptures; and are strictly forbidden, as among the abominations of the heathen.

If a Coral branch is exposed to the action of diluted nitric acid for nearly four weeks, it will appear to consist of strong and closely arranged fibres, forming concentric coats, of a pale brown opaque substance, drawn in nearly a parallel direction from one end of the branch to another. The acid in which the Coral has been steeped, then becomes of a pale yellow colour, which changes to orange when ammonia is added; at the same time so large a quantity of phosphate of lime is precipitated, as to make the colour thick and viscid.

The pieces employed in the above experiment, if boiled in a lixivium of caustic potash, form a dark-coloured animal soap.

The bone of the Red Coral, constitutes that beautiful and much esteemed production, the true or red coral of the jewellers. This Coral is found in the

Mediterranean, Adriatic, and Red Sea, and appears to be nowhere more abundant than in the seas about Marseilles, Corsica, Sicily, the coasts of Africa, and in the vicinity of Barbary; the Coral fisheries being carried on with great spirit in those parts, and proving very lucrative. It equals the most compact marble, in hardness and durability; and these material qualities, in addition to its beautiful texture and colour, have contributed to render it valuable in the estimation of the world, from the earliest ages. Thus in the book of Job, "No mention shall be made of corals, or of pearls; for the price of wisdom is above rubies."

This elegant production is common to the British shores; but the finest specimens are brought from the warmer regions of the globe. A large fishery also subsists in the straits of Messina, where we had lately an opportunity of not only seeing the method employed by the Sicilian fishermen in bringing up the Coral, but also La Fata Morgana, that beautiful æriel phenomenon, which the credulous natives imagine to be produced by fairies, or invisible beings:

> "That in the colours of the rainbow live,
> Or play in the plighted clouds."

It was during a beautiful July morning; the winds were hushed, the surface of the bay remarkably smooth, and the tide at its full height. The sun had

just surmounted the hills behind Reggio, and formed an angle of forty-five degrees on the noble expanse of water which extends before the city. Suddenly the sea that washes the Sicilian shores, presented the aspect of a range of dark mountains, while that on the Calabrian coast appeared like a clear polished mirror, which reflected and multiplied every object existing or moving at Reggio, with the addition of a range of more than a thousand giant pilasters, equal in altitude, distance, and degree of light and shade. In a moment they lost half their height, and bent into arcades, like those of a Roman aqueduct. A long cornice was then formed on the top, and above it rose innumerable castles, which presently divided into towers, and shortly afterwards into magnificent colonnades.* To these succeeded a sweep of windows; then came pines and cypresses, and innumerable shrubs and trees: in shadier places,

> "Pan or Sylvanus never slept; nor nymph
> Nor Faunus haunted."

This glorious vision continued in full beauty till the sun was considerably advanced in the heavens; it then vanished in the twinkling of an eye; and instead of pilasters, groves, and colonnades, nothing was to be seen but the mountains of Reggio, Messina, and a beautiful expanse of water, reflecting its culti-

* For a further description of La Fata Morgana, consult Travels in the Two Sicilies, by Henry Swinburne, Esq.

vated shores, and the cattle that were grazing on its banks.

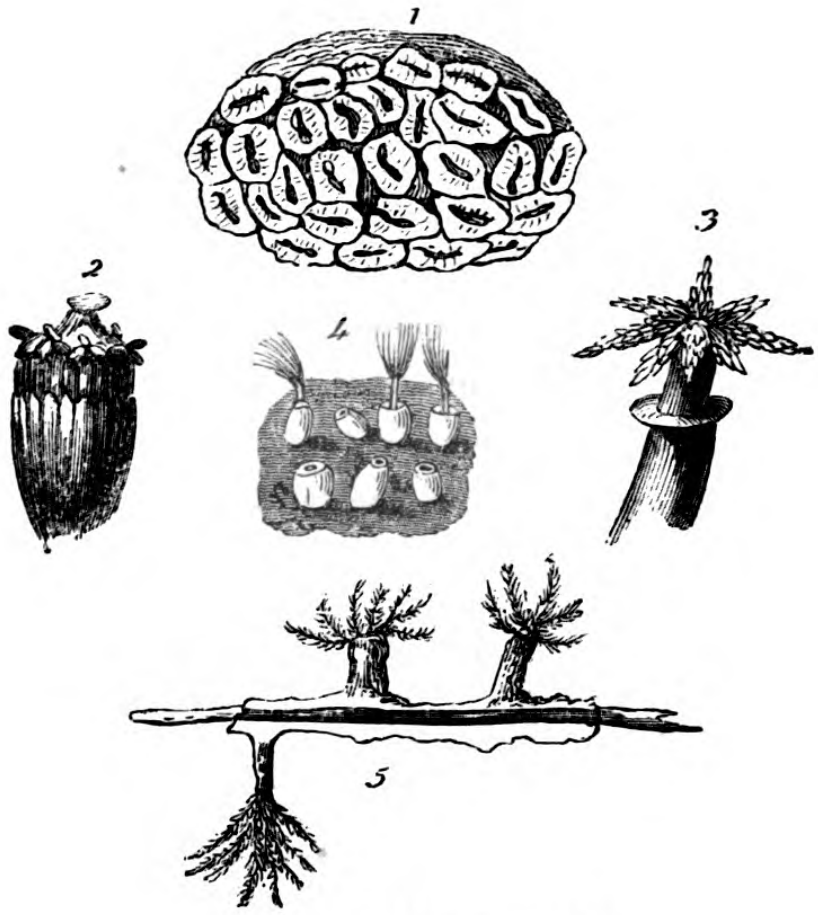
A new scene was now presented to the attention. It consisted of a number of boats skimming rapidly over the transparent water, each of which was tipped with vivid light; and a fleet of more than twenty small vessels, with their sails expanded to catch the breeze. They were employed in the coral fishery, which is carried on from the entrance of the Faro, to the part of the Strait opposite the church of the Grotto, or through a tract six miles in length, and to the distance of three miles from Messina. Each vessel was manned by eight men, who separately moored them above a range of sub-marine rocks, and then proceeded to bring up the branches of Coral by means of an instrument formed of two poles of wood, crossing each other at right angles, and sustaining a large net on the under side; a stone having been previously fixed at the points where the poles cross each other, in order to facilitate the descent of the instrument; and a cord strongly tied round the middle. Each of the fishermen held one of these instruments in his hand; and by the help of a companion, he guided the net to those places where the Coral was supposed to grow, which was then enclosed in the meshes of the net, broken off, and immediately drawn up.

Some of the branches were completely perforated.

They had, no doubt, been the habitations of minute insects, either in consequence of having been accidentally broken from the rocks by some marine animal, or else by the nets of the fishermen, which often leave behind them considerable portions of the ruptured branches. Several beautiful specimens of perfect, as well as perforated Coral, were obtained from the different boats. One of them was immersed in a glass vessel filled with sea-water, and it was very amusing to observe the Polype insects coming out of their cells, as soon as the little ocean that surrounded them was at rest.

Coral fishermen divide the tract from the entrance of the Faro to the church of the Grotto, into ten parts: every year they fish only in one of these divisions, and do not visit it again for ten years. This interval is necessary, in order to enable the Coral to acquire its full growth in height and consistence. It would otherwise be smaller, less beautiful, and solid; for the brightness of the colour also depends upon its age.

The quantity of Coral generally amounts in each year to three thousand pounds' weight; the gain acquired is, therefore, adequate to the labour. Yet the fishery is a secondary and wearisome occupation; and the fishermen only follow it when they cannot obtain a more profitable employment.



CORAL INSECTS, MAGNIFIED.

1. Coralline of the Astrea *ananas*.
2. Animal of the Caryophyla *solitaria*.
3. Animal of the Tubipora *musica*.
4. Animal and dwelling of the Cellepora *hyalina*.
5. Animal and central anis of the Gorgonia *patula*.

LETTER V.

CORALS.

To * * * *

THE objects which engage the attention of the naturalist, succeed each other like the moving pictures in La Fata Morgana of the Sicilians. My last letter related to the construction of the Coral, and the method of procuring it: the

present will be devoted to the extraordinary manner in which this beautiful production of the Ocean is rendered subservient to the formation of reefs and habitable islands.

Coral Insects are, indeed, the greatest wonders in the creation. Though the feeblest and most imperfect of animated beings, they construct durable edifices, which are beautified with flowers, clothed with grass and shrubs, and lofty trees, and rendered comfortable habitations for innumerable tribes of animals, and even for man himself.

The Madrepore is the most abundant. It generally occurs in tropical countries, and decreases in number and variety as we approach the Poles. It encircles, in prodigious rocks and reefs, many of the basaltic and other rocky islands in the South Sea and Indian Ocean: those on the eastern coast of Africa, as well as the islands of the West Indies, and by its daily growth adds to their magnitude. Several distinct species of Madrepore contribute to form these extraordinary reefs, but by far the most abundant is the *Madrepore muricata* of Linnæus; and the industrious insects to which they serve as habitations, not only encircle the land already existing, but they form whole islands.

On the western shores of Sumatra, their production is extremely rapid. Mr. Dalrymple, who was directed to survey the Dutch district on that coast,

mentions in a valuable paper respecting the coral of Sumatra, some curious particulars relative to the subject. During the course of this survey, he had occasion to describe several shoals, consisting of branched Coral, and such floating heterogeneous substances as they had arrested in their course, when impelled against them by the united efforts of the winds and waves. These shoals were of various depths below the surface of the water, from one foot to three or four fathoms; of a conical form; the base, in proportion to the axis, being small, like that of the poplar, or the cypress. One of the shoals was then covered by two feet and a half of water, and could not be easily seen, excepting on a sudden swell of the waves. In five years, it had advanced nearly to the surface; and in the course of a short time, emerged considerably above it. The number, extent, and progressive increase of the islands in the Indian Seas, inclined Mr. Dalrymple to conjecture that they might in the course of time approximate more closely, and form extensive continents and islands: and that if the work of marine production still continued to advance, the existence of the Indian, as an entire Ocean, might be hereafter esteemed as fabulous as that of the ancient Atlantis.

Reefs of considerable magnitude also extend upon the shores of Abyssinia, in the Mediterranean, on the Gold Coast of Guinea, and on those of China.

They are also found in almost every part of the Pacific, where they cover not only detached parts, but reach for several thousand square leagues. The islands in the Red Sea are composed entirely of marine deposits, strongly cemented together, and forming vast and solid masses, which may not improperly be termed rock, the surface being covered in parts only with a thin layer of soil. These deposits principally consist of Corals, Madrepores, Echini, and a great variety of sea-shells.

The work of these industrious architects in the Red Sea, is particularly deserving of attention, not merely as a singular fact in natural history, but as concurring, with the sands of the Lybian Desert, to mark progressive stages in the unceasing march of time. These sands have advanced to a considerable distance along the western banks of the Nile, which is unsheltered by mountains, and completely desolated its once populous and cultivated shores. In proof of which, M. Denon informs us, in his Travels in Lower and Upper Egypt, that the ruins of ancient cities, buried under them, still appear; and that nothing can be more melancholy, than to walk over villages swallowed up by the sand of the desert; to trample under foot their roofs, to strike against the summits of their minarets, and to reflect, that yonder were cultivated fields,—that there grew trees,—that here were the dwellings of men,—and that all has vanished!

In like manner, the increase of Coral reefs has produced an important change in the navigation of the Red Sea. Those parts that were anciently easy of access, are now so nearly blocked up, that vessels laden with merchandize and provisions can no longer enter them, and depart, without risk of being wrecked on the shoals, which have risen since the brilliant period of Thebes and Memphis, and are still increasing in extent.

The existence, therefore, of these monuments, attest the encroachments of the sands; and such parts as were formerly inhabited, will for ever remain arid and waste. It is also evident, that the sands of the desert were formerly remote from Egypt; that the Oases, or habitable spots, still appearing in the midst of the sands, are the remains of the soils formerly extending the whole way to the Nile; and that, moreover, this desolating scourge, transported hither by the western winds, has overwhelmed its ancient splendour, and doomed to sterility a land that was once remarkable for fruitfulness. Consequently, says Professor Jameson, in his Mineralogical Illustrations of Cuvier's Essay on the Theory of the Earth; if our continents were as ancient as some have pretended, no traces of the habitations of men would appear on any part of the western bank of the Nile, which is exposed to the sands of the desert. Now if we direct our attention to this im-

portant fact, and reflect on the consequences which must have attended it, if thousands, or only some hundreds of centuries had elapsed, since our continents first existed above the level of the sea, does it not evidently appear, that all the country westward of the Nile would have been buried under the suffocating surges of driving sand, before the erection of the cities of ancient Egypt, how remote soever that period may be supposed; and that in a country so long afflicted with sterility, no such vast and numerous edifices would ever have been constructed? When these cities, indeed, were built, another cause concurred in favouring their prosperity,—the easy navigation of the Red Sea; which is now impeded by the works of the Coral insect, as already noticed.

Thus the reefs of Coral which have been raised in the Red Sea, on the east of Egypt, and the sands of the desert, which invade it on the west, concur in attesting this important truth; that our continents are not of a more remote antiquity than has been assigned to them by the sacred historian in the book of Genesis, from the great era of the Deluge. In reference to which, Professor Jameson has elegantly remarked, "that as in civil history, records are consulted, medals examined, and antique inscriptions decyphered, in order to determine the epoch of human revolutions, and to verify moral events; so, in natural history, we must search the archives of

the world; draw from the bosom of the earth, monuments of former times; collect the fragments, and gather into one body of proofs all the indices of physical changes which may enable us to retrace the different ages of nature."

This attempt to condense from the elaborate works of M. Cuvier, and the valuable observations of Professor Jameson, a general sketch of the important result to which their researches have naturally led, will not, perhaps, be deemed an unnecessary digression. I return from it to the various erections of the Polypi insect.

The country to the north of King George's Sound, appears to have recently emerged from the Ocean. Branches of Coral protrude through the sand, and occasionally broken columns, formed like stumps of trees.

Coral reefs are sometimes of considerable advantage to shipping; and, one of these, situated at a moderate day's run from Murray's Island, is mentioned by the late Captain Flinders, as affording shelter from the south-east wind, and forming a convenient anchorage for the night, to ships passing through Torres Strait. It was called half-way Island, and had been evidently formed at no great distance of time, by the washing up of sand and broken coral. In the rock which composed its basis, the sand, coral, and shells, that were formerly

thrown up, in a more or less perfect state of cohesion were perceptible; small pieces of wood, pumice-stone, and other extraneous bodies which chance mixed with the calcareous substances when the cohesion began, were also enclosed in the rock; and in some instances could be easily separated from it. The upper part of the island was a mixture of the same substances, in a loose state, with a little vegetable soil; and was covered with a variety of trees and shrubs, such as afford food for paroquets, pigeons, and some other birds, to whose ancestors, it is probable that this island was originally indebted for its scanty share of vegetation.

Innumerable reefs of a similar description are scattered in the vicinity of Torres Strait, all of them in different stages of progress; some above high-water mark, but destitute of vegetation; others overflowed by every returning tide; some again mantled with salt plants, though not yet habitable; and, a few, already become considerable islands, covered with coarse grass, shrubs, and solitary trees, the haunt of innumerable water fowl, and land turtle of various kinds. Occasionally noble groups of cocoa trees, growing on some isolated banks, rear their heads above the water, and mark the rapid progress of vegetation; for trees of this description, are generally the first of any magnitude that grow upon the reefs, as they are capable of resisting the

light sprays of the sea. Clusters of these majestic and useful palms, form invaluable beacons to warn mariners of their danger, and if rendered unavailing by the darkness of the night, their fruit, at least, affords a salutary provision for shipwrecked seamen. The navigator who would distribute ten thousand cocoa trees among the numerous Coral reefs of the great Indian Ocean, and Pacific Sea, would be entitled to the gratitude of all maritime nations, and of every friend to humanity.

In the Pacific Ocean, several of the Coral reefs are extremely beautiful, and the voyager is astonished with the curious and fantastic forms of the various marine productions, of which they are composed. Wheat-sheaves, mushrooms, cabbage leaves, with innumerable plants and flowers, are accurately represented by different kinds of Corals, and glow beneath the water in vivid tints of brown and purple, of white or green. Each with a peculiar form, and shade of colouring, that equals in richness and variety the most beautiful productions of the vegetable world. Corals, and fungusses, start from between the fissures of the rocks; while large portions of the former, in a dead state, connected into a solid mass, of a dull white colour, compose the stone-work of the reef. Solid masses termed negro heads, of different dusky hues, and generally dry and blackened by exposure to the weather, are also occasionally conspicuous.

Even these are not without ornament, for nature delights in the variety of her decorations. They are studded with small shells, and beautifully marked with outlines expressive of their origin. The edges of the reefs, particularly those exposed to the waves, partake of a considerable degree of lightness, and form small coves and caverns, the resort of live corals, sponges, sea-eggs, and trefangs, or sea traces, (valued in China, for their invigorating quality), and enormous cockles, which are scarcely to be distinguished from the rock, excepting when they suddenly close their shells, and form living fountains, which rise to the height of four or five feet.

These beautiful marine retreats surpass in richness and variety the watery hills of aged Nereus, "encompassed with his sea-green daughters round;" or the fabled abodes of Naiads and of Tritons. The constructors of them, like the conies, are "but feeble folks;"

> "Yet still they work, as if to mock at art,
> And, in defiance of her rival powers,
> Perform such vast, inimitable feats,
> As she, with all her rules, can never reach.
> Silently, as a dream, their fabrics rise;
> No sound of hammer, or of saw, is there.
> No forests fall
> When they would build; no quarry sends its stores
> T' enrich the wall; but they can stem the floods,
> And make their marble in the glassy wave.
> 'Mid such retreats young Aristæus found
> Cyrene, when he bore the plaintive tale
> Of his lost bees to her maternal ear."

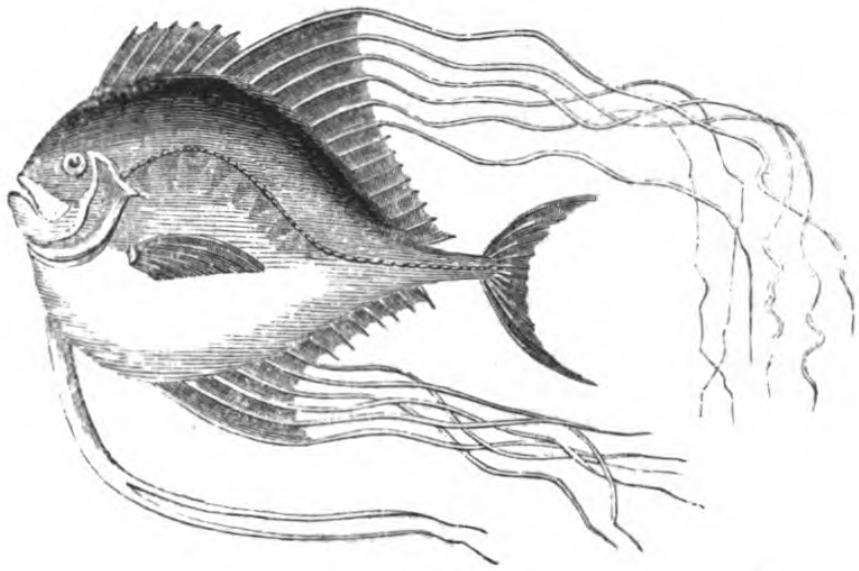
Coral insects, at the commencement of their labours, and in situations where a strong easterly wind generally prevails, always work perpendicularly, till the wall of Coral, being raised within a few yards of the surface, affords a shelter, to the leeward of which their infant colonies may be sent forth in quest of new settlements. The windward side of a reef exposed to the open sea, is commonly, if not always, the highest part; and rises precipitously, sometimes from the depth of two hundred, and, perhaps, even many more fathoms. Indeed, the lee-side of such a Coral reef in the Pacific Ocean, which is governed by constant monsoons, frequently does not shew itself above the water, when the windward side from time immemorial has attained perfection in the sun and air. Nay, it often happens, that the former is interrupted in many places, by intervals of considerable breadth, and of the same depth as the inner sea, which have been left, like open gates, for the ready admittance of the exploring mariner, into the internal calm and secure harbour.

With regard to the formation of Coral reefs, Captain Flinders and Mr. Chamisso, who accompanied Kotzebue in his voyage, have ingeniously conjectured, from the appearance of the low islands of the South-Sea, and Indian Ocean, which form occasionally rows, or groups, while they are totally absent

in other parts of the same seas, that Coral insects rear their habitations on marine shoals, or, to speak more properly, on the top of sub-marine mountains. These evidently adhere together by virtue, either of the glutinous nature of the insect, or some property in salt water, and continue to increase by the labours of successive generations on one side, as their structures approach the surface of the sea; whilst on the other, they progressively extend their borders: various heterogeneous and floating substances, as noticed in the formation of Half-way Island, are caught by their stony tree-like fabrics, till at length a solid mass of rock is formed, which gradually advances to the surface of the water. When arrived at this point they may be readily observed. The deposits of the ocean no longer tenaciously adhere, but remain in a loose state, and form, what is termed by mariners, a key upon the summit of the reef; while the sea, by throwing up sand and mud on the top of these rocky shelves, progressively raises them above its proper level. The new island, for such it may now be called, is soon visited by sea-birds; salt plants successively appear, and mantle the sterile soil with a luxuriant covering. As these decay, vegetable mould is gradually deposited; cocoa nuts, or some floating seeds, hurried on shore by the impetuosity of the waves, take root, and soon begin to grow; land-birds, attracted by the verdant appear-

ance of the bank, fly thither in quest of provisions, and deposit the seeds of shrubs and trees; every high tide, and every gale, add some new treasure; the appearance of an island is gradually assumed, and at length man comes to take possession.

Adieu.



Zeus Ciliaris.

LETTER VI.

GENERAL REMARKS ON THE CONSTRUCTION OF FISH.

To * * * *

I salute you from the land of the mountain and the flood; from amid scenes worthy the pen of Virgil, and the pencil of Loraine; from the solitary village of Bethgellert, where the science of Ichthyology recently engaged the attention of your friend; that interesting science which includes

the order, genera, and species of those animals which have either a naked, or scaly body; are furnished with fins and destitute of feet; belonging to the fourth division into which Linnæus has divided the animal kingdom. Their natural history is necessarily involved in more obscurity than that of land animals, from the difficulty of ascertaining their habits, instincts, and specific differences; yet sufficient is already known to excite the curiosity, and reward the diligence of the naturalist.

But why direct our thoughts to this comparatively obscure department of natural history? it will, perhaps, be asked;—are not the wonders of creation which the Deity has scattered round us with a lavish hand, more open to inspection, and consequently more deserving of investigation and regard?—why should we seek him in the untrodden paths of the great waters; in those tracts "which no fowl knoweth, and which the vulture's eye hath not seen?" Because his wonders are revealed in the deep, his footsteps are impressed on the oozy bed of ocean, and surely nothing which he has made is undeserving the attention of a finite being. Ask now the fishes of the sea, and they will declare unto thee, that with him is strength and wisdom, council and understanding; in whose hand is the soul of every living thing, and the breath of all mankind.*

* Job xii. 7, 8, 10, 13.

This portion of the animal creation are formed in exact accordance with their native element—slender at the extremities, swelling in the middle; a form which materally assists them in cutting the waters with rapidity and ease. The mouth, especially, bears an obvious reference to their mode of life, and the means by which they obtain their food. And truly, in the construction of different animals, I know no part which exhibits greater variety, or in that variety a nicer accommodation to their respective convenience. In the human species the mouth is flat,—and why? Because it is unnecessary that any projection of the organ should take place; whereas the advancing jaws, and pointed teeth of the dog and his affinities, readily enable them to snatch and seize upon the object of their pursuit. In like manner the full lips, rough tongue, cutting teeth, and cartilaginous palate of the ox, the deer, the horse, and the sheep, qualify them for browsing upon different kinds of herbage; while the retired under jaw, and projecting snout, resembling a prong or ploughshare, which distinguish the swine, readily enable it to work into the ground, and excavate a passage to the roots on which it feeds.

In birds, this organ assumes a character wonderfully adapted to the wants and uses of a distinct mode of existence. In fishes, the cavity of the mouth is usually very large in proportion to the size of the animal; an arrangement necessary on account

of the manner in which they take their food. Hence we observe that the mechanism of the jaws is such as to allow the mouth to be protracted or pushed forwards, and opened to a great extent. In some species, it is even capable of being so much extended as to admit the reception of a body larger than that of the fish itself: this peculiarity depends upon the number of bones, or cartilages, in the composition of the surrounding parts, and upon the existence of certain muscles. As truly aquatic natures seldom masticate their food, they do not require an extensive motion of the tongue. This organ is, therefore, either wanting, as in the Ray genus, or else performing no kind of movement, excepting what is merely occasioned by the parts with which it is connected. For the same reason, salvatory glands have never been discovered in the class of fishes, with the exception of the Carp; in this, the teeth are so constructed, as to divide or triturate the food.

I might enlarge on the number and arrangement of the teeth, with their admirable adaptation to different kinds of food; on the breathing apparatus, and organs of smell and hearing, and draw an argument from each, of the Creator's wisdom and beneficence; that a circle may be complete, however small, and that, according to the minuteness of an object, is frequently the admiration it excites: but this would lead too far. I shall, therefore, briefly notice the

wonderful construction of the visual organ, with the beauty and variety of the scales in which the watery nations are enveloped, and then pass on.

The eye, which Sturmius held to be a cure for Atheism, is not less remarkable in aquatic, than in terrestrial natures, inasmuch as it exhibits certain distinctions of structure, admirably adapted to their state and element. A necessity exists, that the rays of light, in passing through an aqueous medium into the eye, should be refracted by a more convex surface, than when they enter immediately from the air; we observe, accordingly, that in the ocean tribes, the crystalline lens is much rounder than in those of quadrupeds. To which we may add, that their visual organs in a natural and indolent state, appear to be adjusted to near objects, thus materially differing from the human, as well as those of quadrupeds, and birds. The ordinary shape of a fish's eye, being in a much higher degree convex than that of land animals; a corresponding difference also attends its muscular conformation, viz: that it is admirably adapted for flattening the whole machine.

The eye-lid is a necessary appendage to the organ of sight in terrestrial natures. It defends the eye, clears it every moment from such floating particles as may attach themselves, and like the drapery of a pavilion, closes round, and defends it during sleep. But such a provision is unnecessary to creatures in-

habiting the water. It is, therefore, generally omitted; and instead of this beautiful and singular appendage, the Creator has provided them with a vertical and immoveable veil, obvious at each angle, and projecting a little way over the eye. This appendage is particularly observable in the Salmon and Mackerel. In the Moon-fish, a still more singular compensation has been discovered; a lid, capable of being drawn over the organ of sight at the pleasure of the animal, containing a circular perforation, the aperture of which is shut by one muscle, and opened by five that rise from the bottom of the orbit, and proceed in a radiated manner into the eye-lid. In the Eel, that grovelling inhabitant of the water, which works its way continually through sand or gravel, a transparent, horny, convex case, or covering, is placed at a short distance before the eye, in such a manner as completely to defend the organ, without injuring the sight. The eyes of the Bimaculated Sucker, which are prominent, and capable of rapid motion, independent of each other, revolve in a fixed transparent sphere, for the evident purpose of protecting them, when driven by the waves against the stones. Those of its relative the Montague Sucker, a frequent inhabitant of our rocky shores, are small and placed high, with two minute erect tubes or filaments immediately before them. Those, on the contrary, of the Opah Doree, are remarkably large. They are covered,

moreover, with a loose membrane, which exhibits the colour of scarlet and burnished gold, and is capable of being readily inflated. A similar peculiarity is obvious in the Bib-cod Fish.

As the natives of the ocean do not require any aqueous secretion for keeping the surface of the eye moist, the lacrymal gland is wholly omitted. A fact well deserving the attention of those who overlook the superintending goodness of the Creator, in this modification of his creatures.

The skin which envelopes the whole frame, in addition to a peculiar integument formed by the scales, consists of the cutis, or true skin, and a colouring substance. The first adheres very firmly to the external surface of the muscles, by means of a variety of small fibres, and varies in thickness, according to the strength of the scales, and the habits of the animal. The second is very palpable in some of the larger species; it produces all those brilliant colours, and varying metallic tints observable in fishes. The whole of the external surface is varnished with a slippery secretion, that plentifully exudes from an infinite variety of small and widely extended ducts, ramifying beneath the integuments, and particularly directing their operations around such parts as are most liable to injury. It is, therefore, evident from the judicious arrangement of the apparatus employed in providing the gelatinous secretion, and its

peculiar abundance in such species as are not defended by a hard integument, that the secretion is designed to protect the animal against the continual friction and washing of the water, as well as to assist it in eluding the attacks of its voracious enemies.

I have already remarked, that a large proportion of the watery tribes are enveloped in scales. These are not supposed to be shed every year, nor indeed during the life-time of the wearer. An annual addition, evidently grows over, and extends every way beyond the edges of the former, in a manner analogous to the increase of wood, by the addition of a new circle next the bark. And as the period of duration in a tree, may be known by the number of its circles in the trunk; so in fishes, the number of plates composing the scales, denotes their age. The accurate researches of Lewenhoech, led to this conclusion. Having procured the scales of a large Pike, he moistened one of them in warm water, and then cut it obliquely through the middle, so as to lay open the first-formed scale in the centre; he then submitted it to the test of a high magnifier, by the aid of which, he plainly distinguished forty laminæ, or scales, apparently glued one over the other. Hence he concluded that the fish was nearly forty years old. It is also highly probable, that as, at a certain season of the year, no growth or augmentation is perceptible in the productions of the vegetable kingdom, and

that, at an allotted period, they are seen to increase in all directions, similar periods of repose and activity, may alternate in the scales of fishes. This opinion derives additional strength from the changes which take place in the feathers of birds, and the hairy coverings of land animals.

Scales are formed with surprising beauty and variety. They exhibit an almost endless diversity of figures and contexture, and vary in different species, according to peculiarities in local situation, or in the character of their marine foes. In the Cod-fish, Carp, and Tench, the edges are remarkably smooth; in the Perch and Sole, they are armed with sharp prickles. In others, they differ both in size and texture, in exact accordance with the parts they are designed to protect. In short, the exquisite beauty and variety discoverable in their arrangement, bear a close resemblance to the feathers on the heads, and wings, of brilliant butterflies, and exotic birds.

Those which compose the armour of the Eel, are equally minute and elegant in their construction. When exposed to a high magnifier, they admirably illustrate the difference which subsists between natural and artificial things. They confirm the observation of a distinguished writer, that the minutest of the works of nature, even such as escape the nicest inquisition of the unassisted eye, appear adorned with all imaginable elegance and beauty, in tracing which,

the imagination is lost, as well as the sense,—we become amazed at the wonders of minuteness, nor can we distinguish in its effects, this extreme of littleness from the vast itself; whereas, the most exquisite productions of imitative art, lose their perfections when too closely investigated. This just and elegant remark is equally applicable to the scales of the common Sole: in these, the part that adheres to the skin, is armed with twelve or fifteen small points, and is thus pinned to the integument. Those of the Sword-fish, on the contrary, which resemble shields, are shut up together as with a seal. One is so near to another, that no air can come between them; they are so joined that they cannot be sundered. And yet, however the scaly armour which envelopes aquatic animals, may vary in tenacity and structure, according to the character of each, the same order and regularity is perceptible in all. From the Cape of Good Hope, to the Isthmus of Suez; from the palm-encircled lake of the Torrid Zone, to the cold and stony rivers of pitiless Labrador, whatever passes through the paths of the great waters, has a form, a structure, and a garment, adjusted with the nicest precision to its wants and circumstances.

Adieu.

LETTER VII.

ORGANS OF SWIMMING.

To * * * *

You have frequently observed, in a calm summer evening, myriads of little fish, bounding into the air from the shallow margin of the water, or darting through the sparkling waves; while their sportive motions, their indescribable activity, their frequent changes of place, apparently without use or purpose, testified their delight, and the exultation they appeared to feel in their newly-acquired faculties. The whole shore has teemed with delighted existence, "all gay with life, all eloquent with bliss;" while the western clouds, tinged with the colours of the setting sun, the opening of the valleys, the mossy hills, and pendant oaks bending from their summits, appeared reflected from the bosom of the water.

Now it is well deserving of inquiry, how, and in what manner that activity is produced, which elicits so large a portion of animal felicity.

The act of swimming results from the flexion and

consequent extension of the spine, by means of lateral muscles acting alternately, or in opposition to each other. The peculiar composition and arrangement of these muscles are designed to bestow extraordinary powers, and velocity of action, combined with a limited operation as to duration and extent. This limitation is, however, amply compensated, by the character of the element in which they act; while a considerable number of fine muscles are also employed, to raise and spread the fins, which are the principal instruments of loco-motion in the natives of the deep. Hence, such as are completely fitted for swimming with rapidity, are generally furnished with two pairs on each side, and three single ones, two above, and one below. Of these, the single are evidently designed to increase the lateral surfaces of fishes, during the act of swimming, and thereby to communicate a greater impulse to the water. They are particularly useful in enabling them to preserve their equilibrium, and to turn at pleasure; the caudal ones especially, which resemble in their designation the helm of a ship.

The single ones may also be considered as instruments of defence, more particularly when the rays of the dorsal fins terminate in sharp spines, the muscles used in erecting them are then particularly strong.

Those which are placed on the side, and under the body, are equally important in directing the

motions of the animal in assisting it to ascend, and in keeping the head uppermost. They also unite with the single ones, in enabling it to stop suddenly in the midst of a rapid course, or to preserve its position in the water; and we find accordingly that they are employed when the fish remains stationary, or is gliding slowly along, at which time they appear to be the only instruments used in swimming.

These golden oars, as Shakspeare elegantly denominates them, answer exactly the same purpose as the wings of birds. They are both in their respective tribes the instruments of motion, though a considerable difference necessarily subsists in accordance with the dissimilar elements through which they move. In birds, the pinions are so set upon the body, as to bring down the wings, not vertically, but in a direction obliquely tending towards the tail. This motion, by virtue of the combination of both forces, affects two important movements at the same time, as it not only supports the body in the air, but rapidly impels it forward, and thus the steerage of a bird is effected partly by wings, principally by the tail. Fish, unlike birds, have very nearly the same specific gravity with their native element, consequently, as there is little or no weight to bear up, it is merely requisite to assist the movements of the animal by an impulse sufficient to carry it through a resisting medium, or to maintain the posture, or to support, or to restore the

balance of the body, which is uniformly the most unsteady where there is no weight to sink it. The fins are amply sufficient for all these purposes, the muscles in the highest degree convenient.

The tail is also of great importance in effecting the movements of the watery tribes. We have seen that the pectoral, and more particularly, the ventral fins, serve to raise and depress the fish. When the animal desires to effect a retrograde motion, a stroke forward with the pectoral fins immediately produces it; if on the contrary, it inclines to turn either way, a single blow with the tail in an opposite direction, sends it round at once; if the tail strikes both ways, the motion produced by the double lash is progressive, and enables the fish to dart forward with astonishing velocity. The result of these different operations is not only in some cases the most rapid, but in all the most gentle, pliant, easy, winning motion with which we are acquainted. And here it is particularly worthy of remark, that the size and construction of the tail is uniformly in exact accordance with the habits of the fish. To instance a familiar example. In such as are termed *cetaceous*, or warm blooded, which are obliged to rise every few minutes to the surface, in order to take breath, the tail, in direct contradiction to its general mode of growth, is horizontal; its strokes in consequence, perpendicular to the horizon; an arrangement decidedly adapted for

sending the fish to the surface of the water, or carrying it down to the bottom.

Another and most admirable contrivance is obvious in the air-bladder. It affords a plain and direct instance, not only of contrivance, but is further, a philosophical apparatus in the body of the animal. The principle is obvious, the application clear. This singular appendage is peculiar to the finny natives of the deep, at least to such as have frequently occasion to ascend to the surface of the water. It is uniformly situated towards the back, and communicates with the stomach of the fish. For the evident purpose of strength and expansion, it is furnished with two proper coats, and a thin, soft, membranaceous covering.

The external coat is in general, a fine delicate double membrane, the outside layer capable of being lifted at pleasure upon the surface of the other; the internal or proper coat, occasionally incomplete, or wanting in some portions of the air bag, is close in its texture, of a beautiful, or silvery white colour, glistening like polished metal, and slightly elastic. It communicates, as already observed, with the stomach, and varies in different subjects; bearing in some the figures of a truncated cone, in others short and oval, in others long and conic. In a few instances, it is formed principally of bone, but in its general appearance it resembles the finest net work.

Let us consider the use of this wonderful appendage. It diminishes the gravity of the fish in relation to its bulk, and thereby enables it to continue buoyant or to ascend in water, with little or no muscular effort. Nay, Ichthyologists inform us, that such aquatic natures as are furnished with the largest air bags, swim with peculiar velocity, frequently ascending and descending; and that, when entirely wanting, some peculiar modification in the organs of loco-motion answers the purpose equally as well, or else that the constitution of the animal inclines it to grovel at the bottom of the water. Thus, in the Shark, the want of an air-bag is compensated by a long and powerful tail, as well as by pectoral fins of considerable size. In the Mackerel by a frame-work, and muscular substance remarkably light, and by a tail of unusual strength; in Flat-fishes by a peculiar facility for beating and flapping the water with their broad surfaces in a manner analogous to Flying-fish, which motion enables them readily to change their places of abode; in Lampreys, by a disposition to remain quietly buried in mud, in shallow streams, or inlets of the sea.

It is, therefore, evident that this curious appendage, is not only essential to the loco-motion of certain fishes, but that repeated changes are effected in the quantity of air which it contains, in order to enable them to rise or descend at pleasure. How these

changes are produced, has not yet been ascertained, though it is conjectured with considerable probability, that the gaseous contents of the bag are increased, or diminished, by secretion, or absorption, according to the necessities, or inclination of the animal. Nor is the rapidity of these changes a sufficient objection to this ingenious supposition. Tears are instantaneously seen to rush into the human eye, on any sudden affection of the mind; and nothing can be more rapid than the slight effusion which adds so powerful an expression to the emotions of the soul. Some naturalists conjecture that the air contained in the swimming bladder, varies in accordance with the habitats of different species, as the natatory vessel of the Sword-fish appears to be filled, under the tropics, with pure oxygen gas. The conjecture is supported by facts of recent date. Humboldt employed eight months, in conjunction with M. Provenzal, in experiments relative to the respiration of fishes: during the course of which, he frequently observed that they absorbed not only oxygen, but also azote; and that the quantity of the latter differed in fishes of the same species, although the oxygen inhaled, was very far from being equalled by the carbonic acid exhaled, from the whole surface of the body. These facts tend to prove that the proportion of the oxygen and azote vary in the air vessel, according as the vital action of the gills and of the skin is modified by the

greater or less pressure sustained at different depths. Hence the contents of the swimming vessel, in the example already given, lead to the supposition that the Sword-fish inhabits the lower strata of the ocean.

Such, my friend, is the general construction of aquatic natures; such are a few of their most distinguishing characteristics. They constitute a large proportion of what Cicero has happily denominated the insatiable variety of nature; or rather, they evince the beneficence of that Being who controls and regulates her operations. We gaze with astonishment on the vast bulk and admirable proportion of those vessels, which, notwithstanding they are so great and driven of fierce winds, are yet turned about with a very small helm, whithersoever the governor listeth. And yet what are these oak leviathans—the pride of polished nations, the terror and astonishment of savage tribes, when compared with the sublimer works of Deity! To an eye that could follow the rapid course of one of those living creatures that pass through the paths of the great waters, and embrace in a comprehensive glance, the whole of its admirable mechanism, what exquisite arrangement, what just precision, what perfect symmetry would be discoverable in every part! An exterior perfectly adapted to its mode of life: the heart, the engine that works the whole machine, appearing like a hollow muscle, invested with spiral fibres, running in different direc-

tions, and throwing out at every stroke a quantity of vital fluid with immense velocity. Still going, day and night, at the rate of one hundred thousand strokes every twenty-four hours; having at each stroke, a great resistance to overcome, yet still continuing the action, during, perhaps, a period of two hundred years, without weariness, and without disorder.

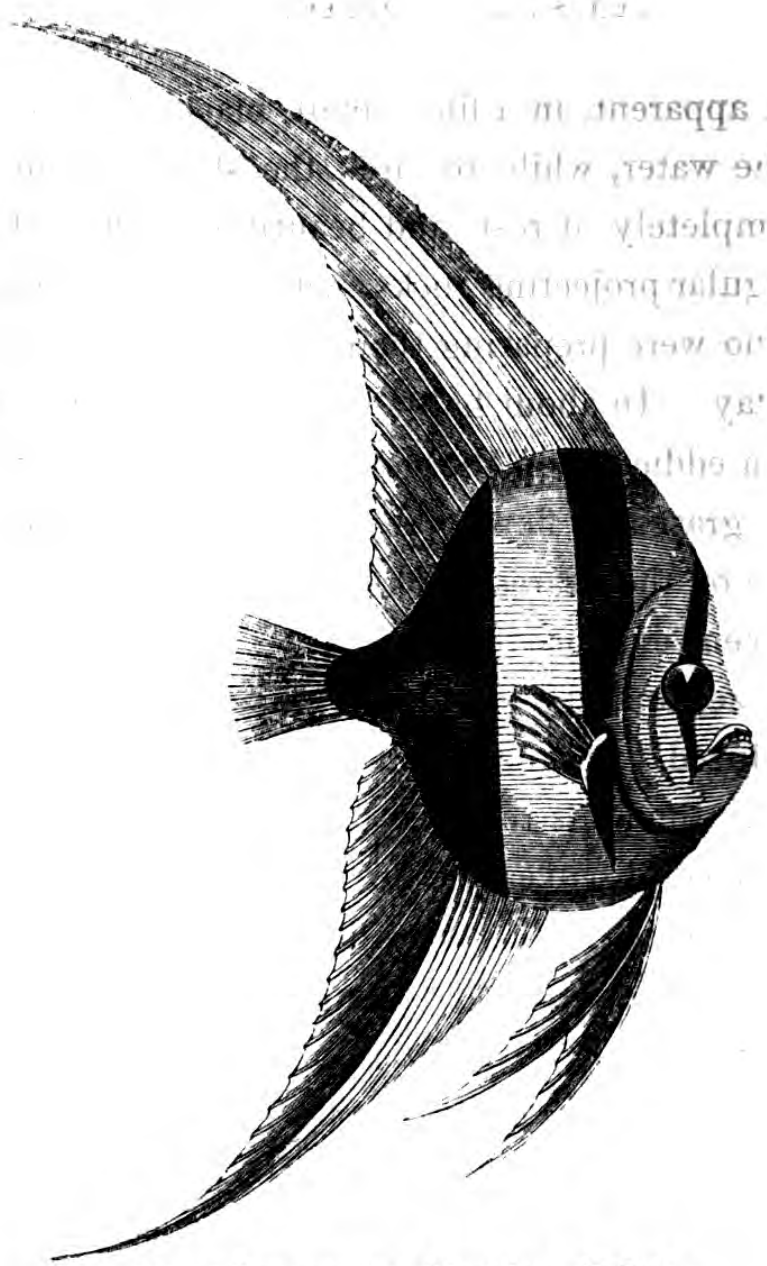
The visual organ is also beautifully adapted to receive the rays of light through an aqueous medium. In some few instances it is prominent, capable of rapid motion, and revolving in a transparent sphere, for the evident purpose of protection; in others it is covered with a shining gold-coloured membrane; in others with a transparent horny convex case; in others with a lid that may be drawn over at the pleasure of the wearer, containing a circular perforation, the aperture of which is closed by means of one muscle, and opened by five, that rise from the bottom of the orbit. Teeth, arranged in exact accordance with the habits of aquatic animals,—the points turned backwards, like those of a woolly or cotton card, and continually renewed, in contradistinction to those of terrestrial ones; evidently for this reason, that the period of duration assigned to the inhabitants of the water, is far more extended than such as live on land. The organs of hearing admirably constructed for receiving sonorous

vibrations in a dense medium, destitute of an external concha, because unnecessary, but furnished internally with hard and calcareous substances, placed in a fluid, and provided with so large a number of nerves, as to render the sense of hearing remarkably quick. The organ of smelling, a beautiful arrangement of ligaments, laminæ, nerves and glands, so attached to a wonderful apparatus, situated on the lower part of the snout, as to render even the undulations of the water sufficient to warn the animal of any approaching danger. Senses of taste and feeling, imperfect, if not altogether wanting, because unnecessary to such creatures as select their food, by those of seeing, and of smelling. The body covered with scales of minute and exquisite workmanship, varying in different species, according to local situation, or the character of their marine enemies. The construction of each, adjusted with the nicest precision, to the ocean sites they are designed to occupy. Colours varying from the tints of aurora, or those of the rainbow, to the brown, mottled, and sober coating of such as hide among sea-weeds or gravel.

One question may possibly have arisen in your mind during the perusal of these observations,—why such circuitous arrangements? why the ministry of so many means? could not the Deity have at once effected what he has brought about by such exquisite contrivances?—Undoubtedly he could; but this was

not his pleasure. His existence, agency, and infinite benevolence, are far more clearly manifested to his rational creation, by the instrumentality of various means, by the nice adjustment of different parts, and their accordance with existing circumstances, than if the same forms and structure prevaded the aquatic world. And, moreover, it is evident that this diversity of organization, is designed to allure the active and penetrating mind to search out the wonders of Omnipotence.

Adieu.



Genus Pleuronectes. Flounder.—P. Teira.

LETTER VIII.

To * * * *

I was walking early one morning on the beach at Portland. A fine sea breeze had just risen; at first it approached the shore gently, as if afraid to come too near. Its effects then

became apparent, in a fine, small, black, distant curl upon the water, while towards the shore the surface was completely at rest, and beautifully reflected the vast angular projecting rocks, with a group of fishermen, who were preparing their nets for the business of the day. In about half an hour it drove the little waves in eddies upon the shore, and sported with the tufts of grass and flowers that hung in long festoons on some of the nearest rocks. While surveying the magnificent expanse of waters, over which the morning breeze, and the glorious beams of the now risen sun, diffused a freshness, colouring, and inexpressible grace, my thoughts recurred to the exquisite richness and variety discoverable in the myriads of living creatures, which, either specifically lighter than the water, or else enabled to support themselves by means of a peculiar organization suited to their mode of life, walk with facility upon the surface of an element so treacherous and unstable to every other description of organized existence, or dart beneath it with inconceivable rapidity. While thus occupied in admiring and reflecting on the prodigality of nature, as evinced in the natives of the deep, the remembrance of those beautiful lines by the author of the Task, arose upon my mind, with a strong and peculiarly vivid power of association.

"Not content, with every food of life to nourish man,
God makes all nature beauty to the eye, and music to the ear."

That modification of texture or of colour, which constitutes corporeal beauty, or agreeableness of aspect, among the inferior orders of creation, is nowhere more conspicuous than in the coverings of the finny tribes. That such a modification is evidently designed to please the bodily, or rather to lead the mental eye from the contemplation of nature's wonders, to Him who sustains and regulates the whole, is undeniable.

The prismatic colours so frequently reflected from the scales of fishes, as well as the rich tints that adorn their skins, are solely calculated for beauty, intended for display; no actual benefit accruing to the animals themselves, either by affording greater warmth, or furnishing means of defence. The Deity has, therefore, evidently employed them on the superficies of a certain portion of his works, because without them, no variety of form would so conspicuously have arrested the attention, or communicated so attractive an effect.

We may divide the colours of aquatic animals into three separate classes: the first, apparently designed for the purpose above alluded to; the second, harmonizing so exactly with the colour of the sands or fuci, where different species lie concealed, as to furnish them with the means, and frequently the only ones which they possess, of eluding their marine

enemies; the third, serving to point out the character of the fish to which it is assigned.

The colour of the Opah Doree, unites it with those of the first class. This brilliant fish occasionally resorts to the British seas, and has been discovered on the shores of Anglesea. Its general colour is that of a vivid transparent scarlet, varnished with burnished gold, and spangled with oval silver spots of various dimensions. The fins and tail are of the same gorgeous hue. Yet even this style of colouring admits of considerable modification. On the upper surface it assumes the tint of a varying and resplendent green, ornamented with white spots, and blended with a shining gold, not unlike the splendid tints of a peacock's train; this by degrees vanishes into a bright silver along the sides, till on the under surface, gold again preponderates, though of a lighter hue. The fins and tail are of the brightest scarlet, the eyes are covered with a transparent membrane of the same brilliant cast.

The scales of the Herring and Mackerel, surpass the most vivid efforts of the pencil, and diffuse the radiance of silver and azure over the northern strands of Europe. A magnificent fish called the Captain, is found beneath the dark rocks that bound the seas of the tropics. His coat appears as if first lackered, then highly varnished, and lastly covered with lozenges, and small scales of a pale gold colour. The

dorsal fins are waved with azure, fading towards the extremities into a shade of the softest green. The same rocks harbour a still more splendid species, called by the Brasilians, Acara Pinina. This beautiful creature is invested in a coat of mail, formed apparently of gold and silver scales, and varied with black lines crossing it from one extremity to the other. The same elegant mode of decoration is also discoverable in the Moon-fish. St. Pierre frequently amused himself on the rocks of the island of Ascension, with observing the brilliant effect produced by this interesting species, while sporting in the tumultuous waves that broke against them. They bear the rounded and somewhat sloping form, as well as the soft silvery tint of the planet to which the natives of the country dedicate them; while their construction and tone of colour, frequently enable them to elude the vigilance of the fisherman, in every possible way. The under surface of their orbicular bodies is, moreover, so streaked with black crossed lozenge-shaped stripes, as to give them the appearance of being covered with netting.

The shores of the same island are also rich with a variety of beautiful fishes: among these the Murena, a species of Lamprey, or Ell of the rocks, which appears as if speckled with gold flowers, the Paroquet, Roach, Zebra, and Gilt-head, are some of the most conspicuous.

Each creek and bay
With fry innumerable swarm, and shoals
Of fish, that with their fins and shining scales,
Glide under the green wave, in sculls that oft
Bank the mid sea; or, sporting with quick glance,
Show to the sun their wav'd coats dropt with gold.—*Milton.*

We may also adduce, as a familiar instance of the most splendid investiture, and of an investiture evidently of no real importance to the welfare of the animal,—the Gold and Silver fish of the Chinese. Some are tinted with the finest blue, others with brown, others with bright silver; others again, appear as if enchased in burnished gold. The most conspicuous of this extraordinary genus, are taken from a small lake in the province of Che Kyang:

Where oft amid the yielding tide,
Their angel forms are seen to glide,—
The genii of the stream;
Their scaly armour, Tyrian hue,
Through richest purple to the view,
Betrays a golden gleam.—*Gray.*

These graceful creatures are frequently preserved in porcelain vessels of exquisite workmanship, and constitute a favourite appendage in the apartments of the rich. To the ladies of the country, especially, the beauty of their colours, their agile leaps out of the water, and restless motions in it, serve to beguile the tedium of a monotonous existence.

The rivers of Africa are also filled with a beautiful variety of fishes. One, noticed by Belzoni, as found

in the Red Sea, is of a bright silvery blue; the head, tail, and fins, of a scarlet colour. This elegant species appears to have been highly estimated by the ancient Egyptians. It is seen in their hieroglyphics, and on the walls of the apartments which constitute the superb mausoleum of king Psammis.

The Minow-cyprine, a common inhabitant of our gravelly streams, is nearly as splendid as its more distinguished relative; the lateral line is of a gold colour, set off with deep olive, the sides and under surface varying in different individuals, in some of a rich crimson, in some of a cerulean hue, in others completely white.

Nor is the common Trout less deserving of a brief description. This graceful little fish enlivens the most solitary streamlets with its agile motions, and elegance of form and colour. The upper surface is beautifully decorated with small narrow scales, varied with dark spots; the under with a golden hue, relieved by those of a deep red, elegantly spangled on a blueish ground. Almost every stream and rivulet in Great Britain, is the resort of this interesting species. They delight in streamlets shaded with high trees, in sparkling brooks that abound with water-cresses, while on either side impending rocks ascend to the height of several hundred feet, turreted with rugged crags, and covered with fern and foxglove, and overhanging branches of oak and hazel beautifully

feathering to the water's edge. Such is Cressbrook, one of the most imposing scenes in Derbyshire: and here, while looking along the brink of its clear and lovely streamlet, I have often observed the exquisite appearance of the Trout, as they lay quietly on the water, till, alarmed by the rustling of the trees, or even by the shadow of a cloud, they have suddenly darted beneath with astonishing rapidity, and yet so lightly as scarcely to agitate the surface.

The whole creation is a perpetual feast to the mind of a good man. It seems as if innumerable smiles were impressed on the face of nature, that the heart may gladden in beholding them; the tongue be constrained to acknowledge that God is love.

In order to protect a considerable number of the ocean tribes from the prying eyes of their marine enemies, perhaps, even to assist them in seizing on their prey, we observe that the Creator has assigned them a style of colour exactly according with the sands, or sea-weeds, among which they harbour.

That such is the fact, I should think no one who has been in the habit of observing the watery nations, can venture to deny.

Who that has seen the Crested Blenny of our own rocky shores, clothed in a suit of olive green, spotted with pale blue, or its relative the Smooth Blenny, with fins of two thick rays, separated like the claws of a bird for the purpose of enabling it to creep with

facility between the dark-spotted stones and fuci; or even the Spotted and Viviporous Blennies, each of which are of the same dusky hue; can hesitate to confess that they harbour among loose stones and sea weeds, where they lie concealed from their enemies, and prey upon such floating insects as come within their reach? Who that, standing on the margin of a streamlet, has espied the common Bull's-Head, of a dusky tint mixed with dirty yellow, lying on the gravelly bottom, or burrowing beneath a stone, and watching the water insects; or has observed the Father-lasher, one of the same genus, the head armed with formidable spines, the body of a dusky or whitish colour, marbled, or occasionally stained with red, lurking beside such stones on the sea-shore as it most closely resembles?—lastly, who that remarks the numerous family of Saxatiles, helpless creatures, which rarely migrate from their usual places of abode, robed in sombre colours, or clad in brown and olive blended with black, and covered with spots of the same, resembling dark rocks and fuci, —who, I say, would assign their habitats to the open sea, or refuse for a moment to acknowledge that such a striking similarity of colour, with the sites they occupy, undoubtedly refers to their mode of life, and the purposes for which they are designed?

Cast your eyes, my friend, upon those defenceless

creatures, which are but indifferent swimmers, and little calculated for ranging to a distance from the shore, such as the Turbot and the Flounder, the Bar and Sole, and you will generally observe that they are of the same colour as the sands, or stones, or sea-weeds among which they seek their food. Their upper surfaces are either spotted with grey, yellow, black, red, or brown; the under, beautifully varied with lighter shades. When inclosed within the parks that are formed by the fishermen, for the purpose of entrapping them, on the gradual retiring of the tide, they bury themselves by the aid of their fins in the soft sand. Here they remain concealed, and so closely resemble the surrounding pebbles, that it would be impossible for the fishermen to distinguish them without the aid of long poles, with which they trace small furrows along the surface of the gravel in various directions, and thus detect by the sense of feeling, what the eye cannot discern. One exception, and that very important, occurs in this general adaptation of colours, to the wants or incapacities of this description of aquatic natures. It is in the instance of the Thornback. Like the generality of flat fishes, this formidable creature is but an indifferent swimmer, it is, however, marbled with white and brown, and furnished with rows of strong sharp spines, disposed along the back and tail; peculiarities which readily distinguish it in the midst of the azure

billows, or on the gravelly margin of the shore. But why such an extraordinary deviation in the instance of the Thornback? This species is remarkably voracious. They prey upon flat fishes of every description, upon herrings, and sand eels, and even devour crustaceous animals, such as crabs. It is consequently indispensable, that they should bear about with them some characteristic marks, that their less voracious relatives may be able to distinguish and avoid them.

This species, therefore, belongs to the third division of colour, a division that includes a large proportion of the numerous family of Squalus.* The aspect of these denote malignity. The eyes are placed lengthways, they are sunk in the head, and appear fuller of malevolence than fire, the skin is generally rough, the back of a pale ash-colour. Nor is this all. The individuals composing the preceding genus, a formidable class of marine animals, inhabiting the open seas, solitary, vagrant, voracious, frequenting the shores of almost every country, and preying indiscriminately on every living creature that falls within their reach, emit a phosphorescent light which illumines the sea to a considerable distance, and renders them conspicuous in the darkest nights.

Steller, the great explorer of the Arctic regions, frequently observed this phenomenon. Standing on

* This species includes the Zebra, Smooth-hound, and Dog-fish, with different varieties of the Shark genus.

the frozen shores of the island which still bears his name, where all around was silent, solitary, and desolate, the only moving object which met his eye—except the moon as she travelled in her glory above the frozen mountains—and the only sound he heard, were those produced by the rapid motion and appearance of a Shark or Dog-fish, as it suddenly advanced from behind some gloomy promontory, rendering the darkness visible, and illumining the waves to a considerable distance.

Delightful it is to trace these various creatures in their respective habitats—to see how beautiful they are, how admirably formed, how wonderfully adapted to the sites of brook or ocean, which they are designed to occupy! nor can I better close this section of my subject, than in speaking of the pleasure which such pursuits afforded to an ardent admirer of nature, when situated amid the wildest and most solitary scenes.

This gentleman resided as a physician for some time, in that part of Arundel county which is washed by the river Catapsco, on the north; the great Chesapeake Bay on the west; and the river Severn on the south—a country intersected with creek and bay, and covered with a dense pine forest, or thicket of small shrub and sapling, and rendered impervious to human footsteps by the growth of vines, whose inextricable mazes can be threaded only by the fox,

wild cat, or weasel. The soil is generally light and sandy, though yielding an abundant produce for the market, and Indian corn grows there in great abundance; but the country is left undrained, the forest and thickets uncleared, the air is polluted with marshy exhalations, or the miasma of decaying vegetables; and in autumn, the life of a resident physician is one of incessant toil, and severe privation. Riding from morning till night, in order to visit a few patients, his road leads generally through fine forests, whose aged and lofty trees, encircled by a dense undergrowth, present a sombre and unbroken solitude. Rarely, or never, does he encounter a white person on his way, and only once in a long time, will he meet even a negro. The red-headed Woodpecker, and the Fisher, or Yellow-hammer, a kindred species, occasionally glance across his path; sometimes, when he turns his horse to drink at a dark-coloured stream, he disturbs a solitary Thrush, engaged in washing its plumes; or, as he moves steadily along, he is startled by the sudden appearance of a Bunting, close to the path side. Except such wild occupants, and these are rarely seen; he seldom meets with an animated object, and the only sound he hears, except the moaning of the wind, is the harsh voice of the crow, which betokens a cleared field, or the scream of the buzzard, wheeling in graceful circles in the higher regions of the air. At other

seasons of the year, a physician must be content to live in great seclusion; the few white inhabitants are all employed in going to and from the market, and even were they at home, they are little suited for companionship.

I notice these particulars, because they prove that in most situations, the lover of natural history may find laudable and innocent gratification. Nature, ever varied, ever beautiful, presents an inexhaustible source of contemplation and delight. In the depth of solitary woods, beside the most secluded streams, she proclaims in language audible to the ear of reason, the greatness and benevolence of the Deity. The emotions which are awakened by a closer acquaintance with her works, are those of joy and peace, of gratitude and adoration. To give to the youthful mind a taste for her pure and simple pleasures, is to provide them, "amid all the trials and agitations of life, with one gentle, and irreproachable friend. It is to lay the foundation of an early and a manly piety; amid the magnificent system of material signs in which they reside, to give them the mighty key which can interpret them; and to make them look upon the universe which they inhabit, not as the abode only of human cares, and human joys, but as the Temple of the living God, in which praise is due, and service is to be performed."

Thus thinking, our naturalist, though without com-

panions, found much to occupy him in an expanse of sparkling water, a considerable arm of the Catapsco, which extended for a mile or two beyond his solitary abode, and spread immediately before his door, so as to form a fine extensive bay. Of books he possessed few, and those exclusively professional; but in this beautiful expanse of water, he had an open book, which a long life would scarcely suffice him to read through. Having a small, but neatly made, and easily manageable skiff, he could convey himself whithersoever his fancy led; and amid the various objects of interest or curiosity, with which the waters abounded, none were more attractive than the Sun-fish. Along the river's margin, where the depth of water was not greater than from twelve inches to four feet, a succession of circular spots were perceptible, cleared of the surrounding grass, and shewing a smooth sandy bed. These spaces were the nests of this beautiful fish, and over them she might be seen, balanced in the transparent wave, at the distance of six or eight inches from the bed, gently swaying her elegant tail and fins; or wheeling round in the limits of her little circle, as if engaged in keeping it clear of all incumbrances. Here the mother deposits her eggs or spawn, and never did hen guard her chickens with more eager vigilance, than the Sun-fish does the spot wherein her promised offspring are deposited. If a neighbour approach her borders, she darts

against him with a fierce and angry air, and obliges him to retreat; if a pebble, or clod of earth be dropped into the nest, she examines it with jealous attention, and immediately removes it, unless apparently satisfied that it cannot harm her: but if man approaches, she hurries into deep water. In a few minutes she may be seen cautiously venturing to return; at first timidly, then swiftly, taking a hurried turn or two round the dear spot, and scudding back again to the shady bowers formed by the river grass, which grows up from the bottom, to within a few feet of the surface, and attains to twelve or fifteen in length. Again she ventures forth from the depths, and if no further cause of fear occurs, she sails gently, with obvious satisfaction, into the placid circle of her home.

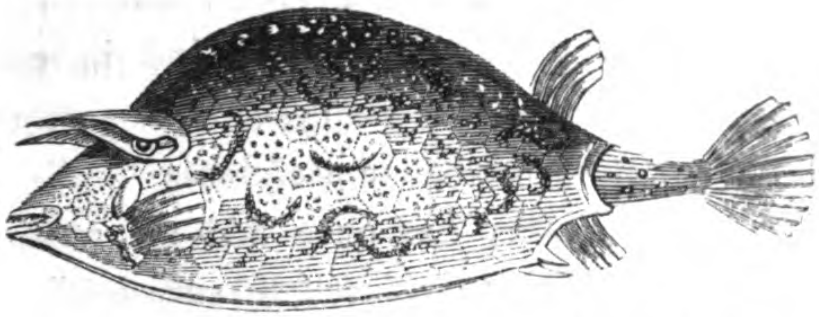
There is also one association which I may not pass over, in the mention of aquatic natures, because little of history is connected with them. The early Christians adopted the figure of a fish as a symbol of their faith, and sculptured it on their tombs. This symbol was well understood by persons of a similar belief, while it remained an enigma to the heathens, and frequently preserved the remains of their friends from spoliation. We find also, on ancient gems, an anchor, and on either side a fish, with the letters that compose the name of Jesus inscribed on them. This emblem is frequent on the gems attributed to

the Basilidians, and other sectaries; it occurs also in different places, and might, perhaps, originate with the Gnostics. Nor will it be irrelevant to notice, the symbolical meaning of the Greek word Ιχθυς, which signifies a fish, as explained by the learned Bingham.

Ι. Ιεσους . . . . Jesus.
Χ. Χριστος . . . Christ.
Θ. Θεου . . . . of God.
Υ. Υιος . . . . The Son.
Ο Ο . . . . . the.
Σ. Σωτης.

It was also supposed to allude to the doctrine of the resurrection, in reference to Noah and Jonah, who were as fish in the mighty waters. It implied farther, the expectation of the person there deposited, that he also should experience the like preservation, and be restored to renovated life. It was equivalent to the "resurgam" of modern tombstones; contained a covert acknowledgment of this article of faith, and was understood by those who professed a like belief, as expressing the hope of him who rested beneath: "I shall be preserved, through death, to a renewed life."

Adieu.



Ostracion quadricornis. Four-horned Trunk-fish.

LETTER IX.

CONFIGURATION OF FISHES.

To * * * *

Animals, of every description, hold in their configuration an obvious relation to the elements by which they are surrounded. The air accords exactly with the creatures that inhabit it; the earth, with those that move upon its surface; and the sea, with its myriads of living creatures. A vast diversity of form and functions, of capaci-

ties and wants, indeed, subsists between the inhabitants of each; but in all, this fitness remains. The different classes are admirably adapted to their respective stations; the individuals that compose them, vary in form, in instinct, and in colour, according to the sites they are designed to occupy, or to their spheres of respective usefulness.

"Where familiarity has once laid the sentiment asleep, it is difficult to resuscitate surprise." The daily return of the same objects, render them familiar to our view; nor are men inclined to admire, or to search into the causes of what they are always conversant with; as if the novelty rather than the excellence of the works of Deity, ought to inspire us with a desire to investigate them. Yet if we could forget all that we know, all that we have seen, everything which presents itself to us, in our morning walks, in the daily occurrences of nature, I am convinced that the most exquisite productions of imitative art, would never awaken half the feelings which this wonderful adaptation of forms, and properties, to the surrounding element, are calculated to excite on a first acquaintance with them.

Let us take, for example, the general configuration of the ocean tribes.

Some of these are nearly flat, moulded into a circular form, with two long awns, like sail-yards, issuing from the head, and inverted behind, to serve

the purpose of a helm. Such are the Silvery Fish of the Antilles. They are seen sporting among the most impetuous surges, without a single instance ever occurring of their being cast on shore. In like manner, the Moon-fish of the island of Ascension appear designed to elude their enemies. They bear the round, and somewhat sloping form of the orb of night, and while sporting among the billows, they seem every moment liable to be tossed on shore by the agitated waves; nay, their mouths are so small, that they frequently nibble off the bait without touching the hook, and their skin, though defended by scales like that of the seal, is so remarkably hard, that the harpoon often misses its blow, be the prongs ever so keenly sharpened.

Others resemble sword blades, like those of the Sicilian islands, which bear that name. These delight in penetrating the narrow crevices of rocks, or in stemming furious torrents. The Oblong Tretaton bears a considerable similarity to a beam; it commits itself without apprehension, and almost without effort to the current of the ocean, on which it is borne rapidly. The same configuration is also evident in the Gilt-head, one of the Pisces Saxatiles, or Rock-fishes, that haunt deep water, where steep angular rocks, depend over fathomless abysses, and the surrounding shores are covered with huge stones. The construction of the Lump-sucker is nearly similar.

It abounds on the coasts of Sunderland, near the Ord of Caithness, and in the Greenland seas, during the months of April and May.

A beautiful variety, described and figured by the Rev. Hugh Davies, of Beaumaris, is occasionally visible on the British coast. It differs from the preceding, merely in the unusual brilliancy of its tinting. The back is of a fine azure, deepening towards the edge, the sides are tinged with crimson, the head, and under surface with a sea-green ; the fins and tail terminating in a delicate pale yellow. It uniformly swims sideways, in accordance with its extraordinary conformation, and rides uninjured among the most furious surges, where it appears like a beam of wood, dotted over with beautiful lichens and sea-weeds. Others, as the common Pike, advance by means of their peculiar construction, some way upon the shelly shore, where there is scarcely any water, and display, in contact with the dusky rocks, their green shining coats, bespangled with stars of gold. The long slender form, assigned by nature to the common Eel, or Muræna anquilla, enables it to force a ready passage through the yielding sand, while the transparent horny convex case which covers its quick glancing eye, prevents the sight from being injured by the admission of extraneous particles. To such an animal, could anything be more needed or more useful ?

The common Mackerel (Scomber *scomber*), which abounds in the open seas, and visits almost every part of the French and English coasts, is long, narrow, without scales, terminating nearly in a point; a construction admirably adapted to its gregarious mode of life. The form of the Herring (Clupea *harengus*) is obviously designed for enabling it to perform the longest voyages, with ease and rapidity. The fins are so constructed as greatly to assist the progress of the animal, and the tail forked like a rudder, the head and body compressed, elongated, covered with scales. Hence we find, that they ride uninjured amid the surges of the Northern Ocean, and pass in safety the rocky shores of the Orkney, Shetland, and Ferroe islands, darting among the vast fleeces of foam, which incessantly arise from the depths of their dark and rugged windings.

The form of the Tunny, which approaches to an oval, sharp at one end, terminated at the other by fins resembling a half moon, denotes the character of the animal; a creature, destined to take long voyages, forsaking the ocean, and steering into the mouths of rivers, and inland seas. This interesting species make their way, by aid of those very tides that oppose the progress of various other fishes. They enter the Mediterranean about the period of the vernal equinoxes, and diffuse plenty along its shores.

The Anglesea Morris of Pennant's British Zoology, offers a beautiful instance of evident design in its construction; and of design studiously conducing to the welfare of the animal. I first observed it among some loose stones, at the extreme verge of Beaumaris Green.—

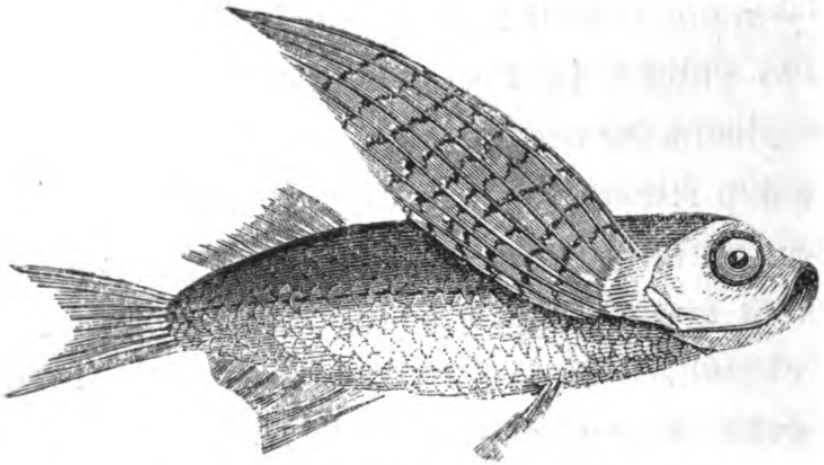
> What time the sun descending all serene,
> Had glanced obliquely o'er the swelling scene.
> When ocean hushed, forgot his usual roar,
> And trembling murmur'd on the sandy shore.
> When lo! his surface lovely to behold,
> Glowed in the west, a sea of living gold.
>
> *Shipwreck.*

The creature itself was about four inches in length, thin and transparent, with a small head, body compressed sideways, ending in a point, eyes remarkably large; pectoral ventral, caudal fins entirely wanting. It is uniformly observed to reside in a dense mass of wrack, or sea-weed, and hence we naturally conjecture that such is its general habitation. Who then can observe the organization of the Morris, without being forcibly struck with the extraordinary fitness of its several parts to an assigned locality, and mode of life? The smallness of the head, and its compressed body, are peculiarly suited to glide between the numerous folds, and confined passes, of this intricate vegetable mass. The large eyes, to discover its minute prey in the gloom of so dense a grove; while the absence of feet, wings, and rudder,

that is to say of caudal, pectoral, and ventral fins, evince that such appendages would be not only useless, but even inconvenient.

The Barbel delights, on the contrary, in ranging through deep and tranquil waters. "And yet," says Walton, "he is so well constructed, that he is able to subsist in the strongest and the swiftest waters, haunting occasionally in the summer, shallow and sharp streams, loving to lurk under weeds, to feed on gravelly banks against a rising ground, and will root and dig with his nose like a dog, and then rest himself." But sometimes he retires to deep and swift bridges, or flood-gates, where he reposes amongst poles, or in hollow places, and takes such hold of the moss and weeds, that be the water ever so swift, it is not able to force him from the place that he contends for. This in summer is his constant custom, when he, and most other living creatures sport themselves in the sun; but at the approach of winter he forsakes the swift streams and shallow waters, and by degrees retires to those parts of the river that are quiet and deep. To which, we may further add, as a striking instance of sagacity, "that he affords the angler choice sport, being a strong and cunning fish; so strong indeed, and cunning, as to endanger the breaking of the angler's line, by running his head forcibly towards any covert, hole, or bank, and then striking at the line, in order to break it off

with his tail; as observed by Plutarch, in his book, 'De Industria Animalium,' and also so cunning as to nibble, or pull off the worm close to the hook, and yet avoid letting the hook come into his mouth."



Exocætus *exiliens*. Flying Fish.

And how wonderful is the construction of the Flying-fish; how admirably adapted to its dissimilar localities, the air and water, though differing essentially from almost every other species! It is furnished with an enormous swimming bladder, which contains three cubic inches and a half, and engrosses a large proportion of the animal frame. As this extraordinary appendage contributes greatly to diminish the specific gravity, we may naturally infer, that it is even more adapted to promote the action of flying, than of swimming. The pectoral fins are also obviously designed for this purpose. They are nearly the length of the whole body; they present a surface

to the air of thirty-seven square inches, and bear a considerable similarity to wings. In order to aid this rapid movement, the nine branches of nerves which extend to the twelve rays, are generally three times the size of those belonging to the ventral ones, and these, when excited by galvanic electricity, extend with five times the degree of force that is perceptible in the others, when galvanised by the same metal. Hence the Flying-fish can dart to the distance of twenty feet before re-touching the water with the extremity of its fins, by a movement similar to that of a flat stone, which, on being thrown horizontally, bounds one or two feet above the surface. And yet, notwithstanding the extreme rapidity with which the Volitans performs its flight, it beats the air alternately, extending, and then closing its pectoral fins. The same motion is observable in the Flying *Scorpæna* of the rivers of Japan.

This species is also provided with a large air bladder; an appendage unnecessary, and therefore not found in such of its companions as are not endowed with the faculty of darting from the water.

The Volitans, in common with its congena, enjoys the privilege of equal respiration for a long time, both in its native and assumed element, by aid of the same organs; that is, by extracting the oxygen from the atmosphere, as well as from the water with which it is combined. These agile creatures spend a con-

siderable portion of their time in the air. They move by thousands in a straight line, and follow the heated waters of the Gulf-stream, when they flow towards the north. In the tropical regions, the sea is sometimes covered with them as far as the eye can reach; they throw themselves into the air to the height of twelve, fifteen, or even eighteen feet, whence they descend with considerable force, and often strike against the astonished mariner. This velocity of movement is, no doubt, to them a considerable source of happiness. To pursue the thought still further; as rapid motion generally excites in ourselves a lively consciousness of existence, and we have much in common with the lower orders of creation, so it is extremely probable that Flying-fish are susceptible of a high degree of enjoyment, when springing from the sparkling waves, feeling the gladdening influence of the sun, and breathing the soft summer breezes that play around. It is true, that in springing from the water to escape the voracity of the Dolphin, they have frequently to encounter men-of-war, birds, albatrosses, and other ærial persecutors; as on the banks of the Orinoca, herds of Cavies, that rush from the water to avoid the crocodile, become the prey of the jaquars that await their arrival.

Thus it appears that rapid motion, which is to them the surest means of escape, becomes also a source of animal enjoyment. Some drawbacks un-

doubtedly there are, for evils to a certain extent are inseparable from existence. They surround the children of mortality, whether endowed with reason or with instinct; and yet so much of positive happiness is blended with the condition of each; that in one, to multiply enjoyments; in the other, to promote progressive virtue, is evidently the design of Providence. There is still another, and far more interesting association connected with the Volitans, thus beautifully embodied by the poet of the Sacred Melodies.

When I have seen thy snowy wing
O'er the blue wave at evening spring,
And give those scales of silver white,
So gaily to the eye of light,
As if thy frame were formed to rise,
And live amid the glorious skies;

Oh! it has made me proudly feel,
How like thy wing's impatient zeal
Is the pure soul, that scorns to rest
Upon the world's ignoble breast,
But takes the plume that God has given,
And rises into lighter heaven!

But when I see that wing so bright,
Grow languid with a moment's flight,
Attempt the paths of air in vain,
And sink into the waves again;
Alas! the flattering pride is o'er,—
Like thee, awhile, the soul may soar,
But erring man may blush to think,
Like thee again, the soul may sink.

Oh Virtue! when thy clime I seek,
Let not my spirit's flight be weak :
Let me not, like this feeble thing,
With brine still dropping from its wing,
Just sparkle in the solar glow,
And plunge again to depths below.

And when I leave the grosser throng,
With whom my soul hath dwelt so long,
Let me, in that aspiring day,
Cast all my lingering stain away ;
And panting for thy purer air,
Fly up at once, and fix me there.

Moore.

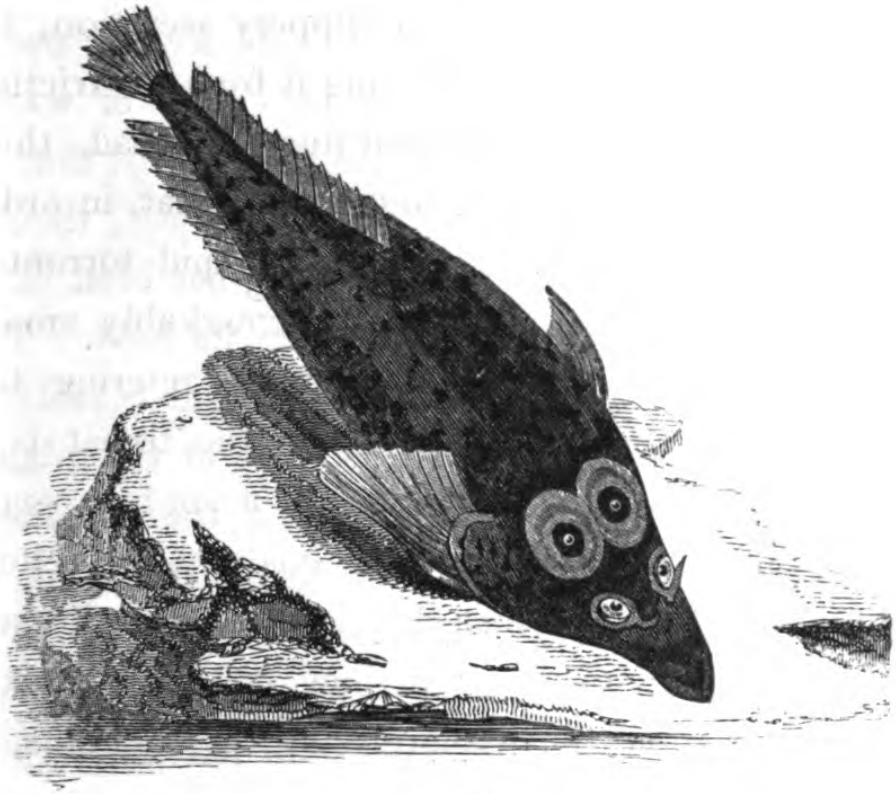
The Volitans abounds from the twenty-second degree of latitude, under those skies where Humboldt first observed the southern Cross on the night of the fourth, or fifth of July. It was considerably inclined, and appeared from time to time between large masses of floating clouds, that, furrowed with lightning, reflected a silvery light. A magnificent time-piece placed on high, to point out to the different nations that live beyond the tropics, or in the southern hemisphere, the hour of midnight. "How often," says this enlightened traveller, "when crossing the vast savannas of the New World, or in the deserts extending from Lima to Truxillo, have we heard the guide exclaim, 'Midnight is past, the Cross begins to bend.'"

The singular structure of the genus *Pleuronectes*, or Flat-fish, accords as well with its habits and economy, as contrivance does with use, in the general works of nature. The flat form, the situation of the eyes, the absence of the air-bladder, sufficiently point out the ocean site it is designed to occupy. The defenceless creatures which compose this genus reside either at the bottom of the sea, or in the estuaries of the larger rivers, imbedded in their sandy pastures, for the evident purpose of avoiding the attack of rapacious aquatic animals. Here they feed on such marine insects and shell-fish, as the sands abound with; and here also they evade, by their superior activity, the pursuits of their voracious enemies.

The fins of the Black Goby coalesce, and form a sort of funnel, by means of which this otherwise unprotected animal fixes itself immoveably to the rocks. In like manner, the Jura Sucker is furnished with strong membranes, that answer the same purpose. A similar construction is also obvious in the Unctious Sucker, which derives its name from the soft and unctuous nature of its body, resembling that of the common Snail. It is found in the sea, at the mouth of great rivers, where the waters generally rush forward with such rapidity as to carry every thing before them. The peculiarity of its construction, and the agitated character of the sur-

rounding element, naturally lead us to expect some compensatory contrivance adapted to its mode of life; or rather, that the defect of one part or organ, should be supplied by the structure of another. We find, accordingly, that the body is nearly round, and covered in every part with a slippery secretion, for the evident purpose of protecting it from the friction of the water; that the pectoral fins are broad, thin, transparent, nearly uniting under the throat, in order to assist it in stemming the most rapid torrents; that the orifices of the gills are remarkably small, doubtless to prevent the water from entering too rapidly; and that further, beneath the throat is a circular depression, resembling that made by a seal; this is surrounded with twelve small, pale, yellow tubes, by means of which it can readily attach itself to rocks and stones. But how is this effected? Reasoning from the structure of the Echinus, a creature furnished in like manner with numerous absorbing tubes, for securing the shell fish on which that species of Crustaceæ most generally prey, we may conjecture that the pale yellow tubes of the Unctious Sucker own a similar construction. That they are hollow, furnished at the termination with a plate provided with muscles, and one or more absorbents, for the evident purpose of close adhesion to any extraneous substance; and that by the aid of these they not only fix themselves

to the sides of the rocks, and thus resist the violence of the waves, but also secure the shell-fish, and floating insects, or suck out the juices of the surrounding fuci and sea-weeds.



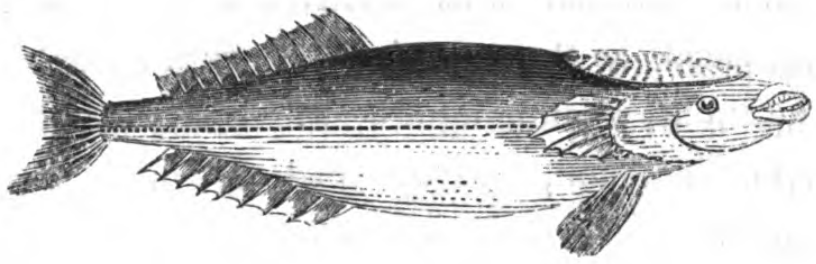
Cyclopterus Ocellatus.—Occellated Sucker.

A still more extraordinary configuration is obvious in the Occellated Sucker, and in its relative the Lump Sucker, one of the numerous family of Rock-fish, which derive their name from fixing themselves immoveably to the surface of the rocks. In the former, a very singular appendage is observable on the head: in the second, the pectoral fins are large and broad, nearly uniting at the base,

in such a manner as to form a kind of funnel. An oval aperture is situated beneath, surrounded with a soft muscular substance, beautifully edged with small thread-like appendages, which act the part of numerous claspers, and enable it tenaciously to adhere to rocks and stones. Nay, such are its powers of adherence, that when thrown into a pail of water, it has attached itself so firmly to the bottom, that on taking it by the extremity, the whole pail, though capable of containing several gallons, has been lifted up without removing the fish from its hold. The utility of these appendages to an animal inhabiting the rocky shores and turbulent seas of Greenland, and generally diffused throughout the Northern Ocean; their inutility, and consequent omission, in such as frequent still lakes and inland seas, is so obvious, that I am at a loss to conjecture how any one can admit the fact, and discredit the design.

The head of this singular species is provided with an oval shield or disk, resembling in its construction, and obvious purposes, such as are assigned to the common Scuttle-fish. This disk is varied with eighteen striæ, the interstices of which are capable of being inflated or contracted, so as to produce a vacuum, at the pleasure of the animal. Now let it be remembered, that by this simple and admirable contrivance, the Remora is enabled to adhere with great tenacity to any flat surface.

It is, therefore, often found on the sides of vessels, and has been fabled to impede their progress; it is even also seen occasionally on aquatic animals. A cod-fish was recently taken up at Scarborough, with a Remora clinging to its back.



Echeneis *Remora.* Sucking Fish.

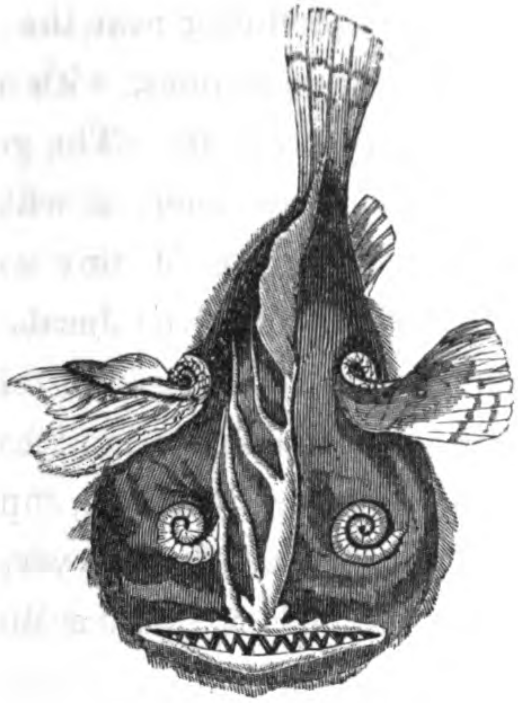
In many species, a different organization is discoverable, varying in accordance with their respective habits. The mouths of the Lesser, and Sea Lampreys are formed in such a manner as to admit of their closely adhering to the rocks. For this purpose, the mouth in each is round, and placed rather obliquely below the end of the snout; the edges are jagged, and the teeth disposed in a circular order, at a considerable distance from the margin, evidently, lest they should interfere with the action of the mouth. But in order to obviate any inconvenience that might result from the necessity of retaining a portion of salt water, after adhering to the stones, the Creator has placed on the summit of the head a small orifice,

similar to that of the Whale, and through this, the superfluous fluid is readily rejected.

Another and most beautiful instance of evident design, may be adduced from the Beaked Chætodon, a species that frequents the shores and entrances of rivers in the exotic regions of the globe, and preys on such small insects as flutter near the surface. It is furnished, as the name implies, with an extension of the snout, resembling a beak. The general resort of the Chætodon, and the food on which it preys, furnishes a clue to the use of this extraordinary appendage. No sooner does the Jacalator, as it is termed by some writers, observe a fly resting on any plant that grows in shallow water, than it swims within five or six feet of the place, and darts from its beak a drop of water with such surprising dexterity, that it never fails of striking the insect into the sea.

The habits of aquatic natures also admit of variations that tally exactly with the purposes for which they are designed. Some, perpetually restless, and agitated as their native element, examine, and endeavour to penetrate, every chink along the beach in quest of food; others, in perfect tranquillity as to the means of obtaining it, remain nearly stationary in their usual haunts. A casual observer might be inclined to pity the fate of these, and to imagine that they would be without food; but no,—the Almighty

Creator of the Universe remembers the feeblest of his creatures, and amply provides for all their wants. Where shall we look for a more striking instance of this consolatory truth, than in the Angler, or Fishing Frog?



Lophius Angler.

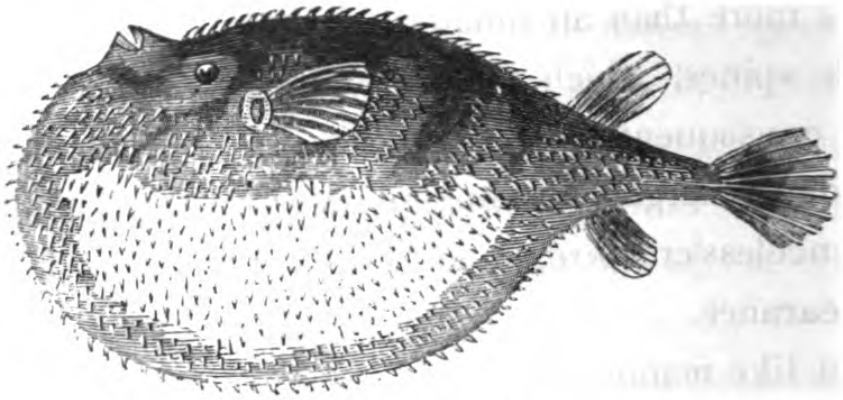
This unsightly animal resembles the creature from which its name is derived when in a tadpole state. It grows to a large size, and occasionally inhabits the British coasts. A specimen taken in the sea near Scarborough was at least four or five feet in length, the head considerably larger than the body; round at the circumference, flat above; the mouth of a prodigious size, at least a yard in width, and

armed with sharp teeth. The upper part, of a dusky hue, in accordance with its places of resort; for it delights to burrow in the sandy bed of ocean, or among the weeds. Now mark the extraordinary manner in which this unobtrusive animal is enabled to procure its prey, as it must be obvious that the peculiarity of its construction imperiously forbids the possibility of rapid movement. Two long, tough filaments are placed above the nose, each of them furnished with a thin appendage, closely resembling a fishing line when baited and flung out. The back is further provided with three others, united by a web, and forming the first dorsal fin. Pliny notices these extraordinary appendages, and explains their use. "The Fishing Frog," says he, "puts forth the slender horns situated beneath his eyes, enticing by that means the little fish to play around, till they come within his reach, when he springs upon them. But it is not only the lesser inhabitants of the water that the Angler entices within his snares. Even the fierce and voracious Sword-fish often falls a prey to his artifices. For this reason, the fishermen regard the Angler with peculiar respect. They carefully release, and restore him to his usual haunts, when accidentally entangled in their nets."

Cicero also notices this extraordinary creature, in his admirable treatise on the nature of the Gods. He observed its wonderful construction when musing

on the shores of Sicily, or when in the cool of evening he saw the little billows subside upon the shores of his own favourite Puteolan. It spoke to him, in accents audible to his reflecting mind; it told him that a creature so wonderfully organized could not be the work of chance.

Adieu.



Tetrodon Kispidus.—Kispid Tetrodon.

LETTER X.

WONDERFUL CONSTRUCTION OF FISH.

To * * * *

LISTEN to me, my friend, and I will endeavour to convince you, that equally clear evidences of mechanical contrivance are afforded by the means of defence assigned to different aquatic animals.

The Kispid *Tetrodon*, an oblong fish, inhabiting the seas of Carolina, is endowed with the extraordinary property of swelling its under surface into a large globe. The advantage of this is obvious. Such a sudden enlargement not only alarms the marine enemies of the Tetrodon, but prevents them from

making good their hold by presenting to their grasp little more than an inflated bag. It is also covered with spines, which merely adhere to the skin, and are consequently, capable of being erected on any sudden emergency; thus giving to an innocent, and defenceless creature, a most formidable and obnoxious appearance.

In like manner the common Perch, a graceful little fish, delighting in deep hollows, and gentle streams, and living on water insects, is covered with rough scales, which it erects on the approach of an enemy. The Father Lasher, a general inhabitant of the rocky shores of Britain, lurking among stones, and sea-weed, and swimming with great velocity in the stormy seas of Greenland and Newfoundland, presents his formidable head in opposition to his enemies. This part is large in proportion to his bulk; it is covered with spines, and these are capable of being so erected, as effectually to intimidate any ordinary enemy, by the swelling of its cheeks and gills to an amazing size. Hence the observation of the poet,

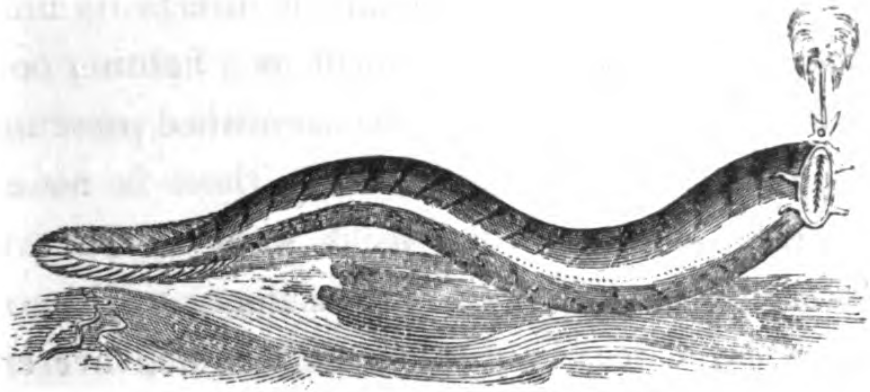
"The hurtful scorpion wounding with his head."

In the Weaver, the means of defence are still more obvious. The first dorsal fin consists of five strong spines, tinged with black, as well as the intervening membranes. This fin is lodged in a small cavity: the second, consisting of several soft rays,

commences at the termination of the first. These spines are apparently the only offensive weapons possessed by the animal. They inflict severe wounds, attended with inflammation, and considerable pain. It is even suspected that the dark spines contain a degree of poison, capable of being ejected in the same manner as that of the common nettle, by means of which the Weaver disables such of the finny darters as it preys upon, from effecting their escape; and paralyses the attempts of larger ones. Buried among loose pebbles on the sea shore, or else concealed in the oozy bed of ocean, it directs its blows with as much force and judgment as a fighting cock, and frequently throws down the astonished passenger. In the natural and moral world, there is no evil without an antidote. Sea-sand, among which the Weaver hides itself, is a specific for the ejected venom. It also bears within itself a still more sovereign remedy; an immediate cure is effected by applying the liver to the wound.

The Hag-Fish, is a blind, defenceless creature, burrowing in sea-weed and surrounded by innumerable enemies. How then does it elude their vigilance? Is it a swift swimmer, or armed with formidable spines, capable of defying or destroying them at a stroke? By no means. Its usual length in the British seas, is from four to eight inches, its make extremely simple. Has not then

the Creator assigned it any method of defence, or of escape? Undoubtedly, his beneficence is nowhere more conspicuous than in the construction of this feeble creature. A double row of pores extends beneath the body, from one extremity to the other. And how well do they perform their office! They throw out a quantity of viscid fluid, at the very moment when such an effort is essential to the safety of the animal, which turns the surrounding water into glue, and renders it invisible.



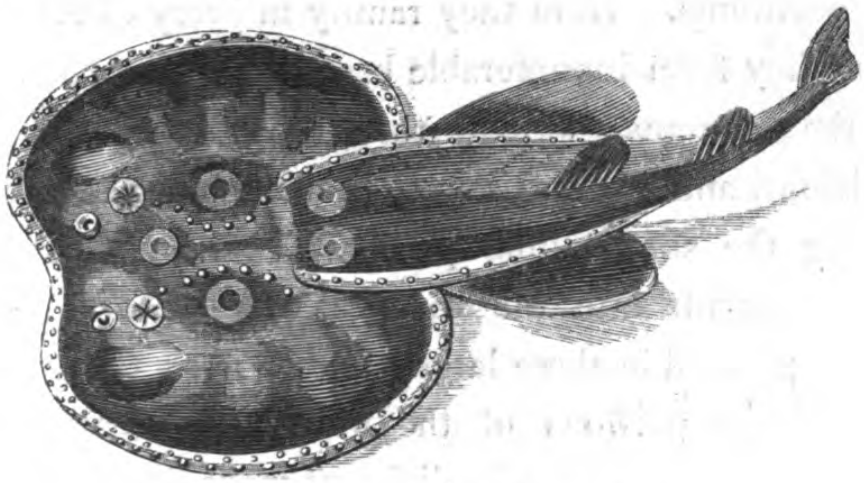
Gastrobranchus Coecus. Hag-Fish.

Figure to yourself this helpless fish, calmly reposing on a billow, dark amid the blaze of day, and unable to ward off any attack of its remorseless persecutors. Observe some formidable enemy, approaching with open mouth. In a moment you expect to witness its destruction. No such thing! Endowed with the sense of feeling to an exquisite degree, it perceives by the

sudden undulation of the water, that some foe approaches. Suddenly a cloud envelopes it, and the Hag rapidly disappears.

Now observe another contrivance, equally conducive to the safety of the animal, though of a nature widely different, in the Sting Ray, the Trygon of the ancients. This species is armed with a spine about five inches long, flat at both ends, hard and sharply pointed, the sides, thin and bearded the whole way. It is shed and renewed annually, and serves as a weapon of defence, which, like that of the common Weaver, is capable of inflicting a severe and dangerous wound. Pliny, Ælian, and Oppian, fabled that the poison it contained affected even the inanimate creation; that trees dropped their leaves, and withered before its baneful influence; and that even rocks were incapable of resisting its magic power. In reference to this, the enchantress Circe, is said to have armed her son, with a spear headed by a Trygon spine, as one of the most irresistible of offensive weapons, and that with the baneful gift, he afterwards unknowingly assailed, and murdered, his father Ulysses. The fables of the ancients are generally founded on truth. Some prominent circumstance in the arts, or manners of a primitive people, in the lives of distinguished individuals, or even a striking fact in natural history, was selected from among the many, and invested with the vivid colouring of poetry and romance.

Then, as now, the rude inhabitants of savage districts headed their spears, and darts, with the formidable spine of the Trygon, as a substitute for iron; and hence it required little effort of the imagination, to endue this weapon with such deleterious qualities as have never been substantiated by fact. At the present day, the Indians of North America tip their arrows with the spine of another species of Ray; and this renders them equally formidable.



Raia *Torpedo*. Electric Ray.

Examine the means of defence assigned by the Creator to the Electric Ray. Here you will have reason to confess, that such a wonderful adaptation of means to produce a desired end, could only proceed from the watchful care of a benevolent, and almighty Being. The same is obvious in their configuration. They occupy the whole space between the skin of the upper and under surfaces, and consist of various organs, each of which comprises

nearly four hundred and seventy perpendicular columns, that vary in shape, according to circumstances, and situation. Their coatings are nearly transparent, and they join each other by means of a loose net work, and strong elastic fibres. These columns increase in size and number, during the growth of the Electric Ray, and are provided with a beautiful apparatus of veins and nerves. The former, start from those connected with the gills, and enter the partitions. Here they ramify in every direction: here they form innumerable branches upon the sides of the columns, extend throughout their various divisions, and after invigorating, cherishing, and supplying the surrounding parts with vital fluid, pour their contents into the ventrical of the heart. The latter, proceed in three large trunks, from the lateral and hinder portions of the brain; they enter the electric organ, extend in different ways between the columns, and send forth small branches upon each partition, at the extremity of which they finally disappear.

We boast of our inventions in the arts and sciences, forgetting, or unmindful, that we are frequently anticipated by such feeble, or apparently pernicious creatures, as we should scarcely acknowledge for our instructors. The Limpet acted, as if he understood the pressure of the atmosphere, and attached himself to the rock, by forming a vacuum in his pyrami-

dical shell, more than five thousand years before the air pump was invented. The Torpedo defended himself from his enemies by means of an electric shock, long before academicians thought of making experiments in electricity.

The arrangement of the organs, the loose transparent net-work, and the strong electric fibres which connect them to each other, with the whole apparatus of nerves and veins, have been exhibited to the eye, nothing is left to be supplied by imagination or conjecture; but how the will of the creature operates upon them, by what means it produces the electric shock, is entirely unknown.

The narcotic, or numbing quality of the Torpedo, has been noticed by ancient, as well as modern naturalists. It deprives the person who touches it, of the use of his arm; it will even affect him, if merely brought in contact with a stick. Oppian asserts that it benumbs the astonished fisherman, through the whole length of his line and rod.

> The hook'd Torpedo ne'er forgets his art,
> But soon as struck begins to play his part,
> And to the line applies his magic sides;
> Without delay the subtile power glides
> Along the pliant rod, and slender hairs,
> Then to the fisher's hand as swift repairs.
> Amazed he stands; his arm of strength bereft,
> Down drops the idle rod—his prey is left.
> Not less benumb'd, than if he felt the whole
> Of frost's severest rage beneath the arctic pole.

The benumbing quality of the Torpedo, is remarkably vigorous while young, but becomes impaired as the animal declines in strength, and totally ceases when it expires. It is frequently eaten on the Gallic coast, where it is more abundant than on the English. Galen even affirms that the flesh is beneficial to persons affected with epilepsy; and that the shock of the living fish, has been found efficacious in removing pains in the head.

A double purpose is afforded to the Electric Ray by this extraordinary faculty. The one, when it is exerted as the means of defence against the attacks of voracious fish, for it fixes them to the ground, with a spell like the fabled wand of Comus, and disables them from seizing their intended victim. The other, explained by Pliny, who tells us, that the Torpedo is well acquainted with his powers, though never himself affected by them; and that, concealing himself in the mud, and benumbing the fish that are carelessly playing about, he renders them an easy prey. The truth of the statement is confirmed by the observations of modern naturalists. A Plaice and Surmullet have been discovered in the stomach of two of these extraordinary animals. The latter, especially, must have been paralysed by the benumbing quality of the Torpedo, for it swims with such surprising swiftness as to render the possibility of pursuit impracticable, in a creature so peculiarly constructed, and incapable

of rapid motion. But here it will be asked, how then can the Electric Ray come within reach of the Surmullet, for the Deity has given to the inferior orders of creation a quick preception of, and desire to avoid, whatever is injurious? The Ray procures by stragatem what he cannot effect by force. He inhabits sandy places, in company with his mis-shapen relatives, and hence, in order to avoid the attacks of his implacable enemies, the Crab, and Sea Leach, and perhaps with a view to obtain food, he buries himself superficially in the sand, by means of a quick flapping of his extremities. Thus situated, the creature gives a stroke sufficiently powerful to throw down the passenger who inadvertently comes within his reach.

When a Torpedo is about to give a shock, he nearly closes his eyes, drops the triangular curtain which covers the pupil, and generally moves the lateral fins. No visible muscular effort is preceptible in the other electric fishes. The numbness he produces, is most probably occasioned by the number and minuteness of his shocks. These are undoubtedly effected by a successive discharge of the different columns, in a manner analogous to that of a running fire of musketry. Fifty-nine have been given in the short space of a minute and a half; five hundred in that of nine.

The Cramp Fish, or Gymnotus *Electricus*, possesses

the same extraordinary faculty. He consists, if we may so speak, of two parts: one containing every thing essential to the well-being of the animal; the other, the peculiar organ of defence. Now in order to remedy any inconvenience that might result from such an unusual length, the tail is admirably adapted to promote the progress of the whole; while to preserve its specific gravity, the spine, the muscles, fin, and air bladder, are continued through the whole length. The necessity of such a provision will appear still more obvious, when we consider, that the electric organ is more than one third of the Gymnotus; and that the fish is frequently more than twenty feet in length. This organ somewhat resembles, in its general construction, that of the Torpedo, though considerably less complex. It consists of two partitions, placed on either side, and formed of thin membranes, with cross divisions between them. These are furnished with veins and muscles, adapted for nourishing, and restraining each part in its proper position. The Cramp Fish inhabits the fresh-water rivers of Surinam and Cayenne, where he was first discovered by Dr. Reicher, in the year 1677. His narcotic powers are superior to those of any other kind of electric animal. They are particularly formidable to swimmers, who are in danger of being drowned when exposed to the action of the battery, which resembles in its effects a shock

from a Leyden vial, and paralyses whatever living creature it comes in contact with, unless its powers have been impaired by late and repeated exertions. A very painful sensation is even communicated through the medium of a long pole, or fishing rod, especially if the head of it be tipped with metal. Nay, if the hand is placed under water, at the distance of at least fifteen feet from the Gymnotus, it is sensibly affected by the discharge of the marine battery.

Who shall assign a limit to the wonders of creation! The most powerful explosions are rendered innoxious by the interposition of sealing wax; they are also entirely destroyed by the application of a magnet.

In the Electrical Silurus, or Silurus *Electricus*, the construction of the organ of defence is still more simple than in the Torpedo, or Gymnotus. It extends around the body, immediately beneath the skin, and when seen through a magnifying glass, appears to be composed of a multitude of minute fibres or cells, interwoven in such a manner as to form a complete net-work, filled with gelatinous fluid. All communication with the inside is prevented by means of a very strong membrane, which so completely folds over the whole articulation, that it cannot be separated without destroying the electric apparatus. But what is the use of this? Evidently

to prevent the Silurus from being affected by the feeling of numbness which he imparts to others. This species is commonly found in the rivers of Africa. It is nearly twenty inches in length, of a pale ash colour. When touched by the hand, a sensation is felt similar to that of an electric shock; and this, though undoubtedly, less considerable than that produced by the Torpedo, is amply sufficient for all the purposes of the animal. Surely it is well, to be conversant with the works of God, for by the greatness, or beauty of the creature, the Maker of them is proportionably seen. In consequence of this simple and admirable appendage, the Silurus, a defenceless animal, slow in its motions, and incapable of pursuit, is enabled like the Torpedo, to paralyse the efforts of its marine foes, and readily to obtain its food.

In each of the preceding instances, the degree of electric power varies in proportion to the complexity of the organs that produce it, and these are undoubtedly adjusted to the necessities of the respective owners, and the enemies with which they have to contend. The benumbing qualities of the Gymnotus are the most conspicuous, the Torpedo next, and the Electricus, least of all.

The faculty which these extraordinary fishes possess, of exciting the sensation of a shock or numbness, is naturally and generally referred to the

principle of electricity. Even the Arabs, according to Geoffroy, who distinguish every animal by a generic and specific name, considering only the extraordinary properties of the Torpedo, and Electrical Silurus, and comparing them with physical electricity, designate both by the same appellation, that of Raad or Raach, which is also employed in the Arabic language to signify thunder. One considerable difference is, however, obvious, between every species of electricity, and the phenomena discoverable in fishes. The latter are not accompanied by any chemical changes,—they do not attract the eye by a display of light, by a peculiar smell or sound. Their actings are neither regular nor uniform, but depend upon the age and inclination of the animal; for all naturalists agree in stating, that electric fishes regulate the strength and precision of their shocks at pleasure. No apparent accumulation, or diminution, of the electric power is discoverable, excepting what arises from volition, as the later shocks are generally more strong and frequent than the first. I must again repeat, that by these complex and ingenious appendages, the Gymnotus, Torpedo, and Electricus, are generally enabled to paralyse the efforts of their innumerable enemies, and also to procure their food. Buried in the mouths of clear and tranquil rivers, or lurking in the sand upon the sea shore, they seldom move from their different places of abode, and are,

moreover, incapacitated from any kind of rapid motion by a peculiar unwieldiness of structure. They are, consequently, formidable only to those who heedlessly approach too near, or, who, forgetful or unmindful of the dangerous qualities assigned them for their protection and defence, venture across the sands, or into the deep waters, which they generally affect.

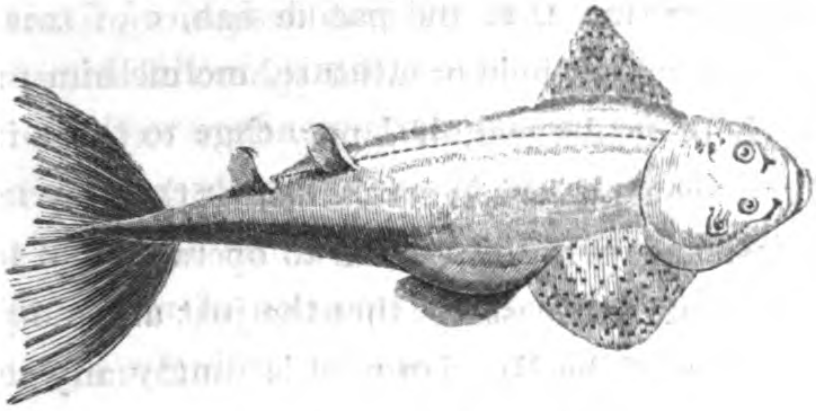
To another class, the Deity has denied every offensive weapon, but then he has endowed them with so much agility, that they readily elude the vigilance of their pursuers. Such is the case with the Mullet, a species justly ranked by Aristotle among the *pisces littorales*, or those which prefer the shores to the open sea. They are found in considerable numbers on several of our sandy coasts, and delight in such small bays as are frequently overflowed with fresh water. Their general construction is admirably adapted to their wandering mode of life. They generally go in company, and are so agile, that even when surrounded with a net, one that appears to be their leader, has been seen to spring over the opposing barrier, and the rest to follow him immediately; a peculiarity noticed by the poet Oppian, in the following animated lines. — The latter part is, however, rather to be considered a poetic fiction, than a fact confirmed by experience.

"The Mullet, when encircling scenes enclose,
The fatal threads, and treach'rous bosom knows,
Instant he rallies all his vigorous powers,
And faithful aid of every nerve implores.
O'er battlements of cork up-darted flies,
And finds from air, the escape the sea denies.
But should the first attempt his hopes deceive,
And fatal space the imprisoned fall receive,
Exhausted strength no second leap supplies:
Self-doomed to death, the prostrate victim lies,
Resigned, with painful expectation waits,
Till thinner elements complete his fates."

One reflection, and that neither irrelevant nor unimportant, naturally arises from this interesting portion of our subject. Whenever we find a general plan pursued, yet modified or varying, according to the exigences of individuals, we possess the strongest evidence of intelligence and design. And this plan, as I have endeavoured to exemplify in the preceding instances, is attended through all its varieties, by an obvious subserviency to especial occasions and utilities. Hence, we may observe, that as electric organs would be attended with the most disastrous consequences if intrusted to animals which, like the Sting-ray, pursue their victims with extreme rapidity, they are entirely omitted, and given to a class of aquatic natures, which are solitary in their general habits, and unwieldy in their construction; and that, instead of them, a long horn, firmly fixed in the head, and answering the double purpose of utility and de-

fence, is assigned to the Sting-ray. It is also equally worthy of notice, that the pacific habits of this apparently most formidable creature, incline him rather to appropriate this singular appendage to the former, than to the latter purpose. One observation more, and I shall dismiss the subject; the blind and timid Hag requires a peculiar adaptation of means to her feeble circumstances. She accordingly envelopes herself in a cloud of her own raising, and immediately disappears.

Adieu.



Squalus Squatina.—Angel Shark.

LETTER XI.

DANGEROUS FISH.

To * * * *

Among aquatic natures, the genus Squalus, is alone, decidedly hostile and injurious to man. A large proportion of the ocean tribes are provided with weapons of defence; others are rapacious in their nature; others when attacked, do not fail to defend themselves with all their strength, but these, I think, can scarcely be included under the preceding head.

I shall, therefore, confine my observations to the different species which compose the genus Squalus;

yet in the formation of these voracious creatures, so much of goodness, of evident design, of fitness in their structure to their peculiar sphere of being, nay, so much of tenderness, if I may thus express it, is uniformly conspicuous in counteracting their rapacious qualities, and permitting them to operate only so far as is absolutely necessary, that the just and eloquent exclamation of the Russian poet is continually recurring to my remembrance.

"O thou, Eternal One, whose presence bright
All space doth occupy, all motion guide,
Unchanged through time's all-devastating flight,
Thou only God, there is no God beside.
Thy chains th' unmeasured universe surround;
Upheld by Thee, by Thee inspired with breath,
Thou the beginning with the end hath bound,
And beautifully mingled life and death."

The aspect of the genus Squalus sufficiently denotes the malignity of their nature. Their eyes, which seem fuller of malevolence than of fire, are oblong, placed lengthways, sunk into the head, and overhung by the arching of the brows. The skin is rough, as if in accordance with their nature; the colour generally such as to render them conspicuous among the billows of the ocean; to which we may add, that they are uniformly luminous in the night.

The Great White Shark is one of the most tremendous inhabitants of the seas between the tropics, and swims with astonishing rapidity, by the aid of large

pectoral fins. The tail is of considerable size, and capable of striking with tremendous force; the mouth is furnished with six-fold rows of sharp, triangular, and finely serrated teeth. When the creature is in a state of repose, this dreadful apparatus lies flat in the mouth; when in the act of darting upon his prey, it is erected in a moment, by means of a set of muscles.

Sharks abound in the northern and southern hemispheres; they frequent the shores of Greenland, feed on halibuts, seals, and young porpoises, and even venture to attack the little skin-boats of the poor Greenlanders, who are frequently unable to elude, or ward off their terrible attacks. Those who go upon the sea in ships, survey these tremendous animals with terror, as they journey through the deep, unawed by the "thunder of the captains, and shoutings."

Woe to the unhappy sailor who has the misfortune to fall overboard! he perishes inevitably: for instances not unfrequently occur, in which they have been known to dart upon him like a flock of kites upon the trembling dove.

Inseparably attendant on those vessels, the freight and hands of which, Montgomery has well denominated, "a human cargo and a ruffian crew," they are seen pursuing them in shoals—living sepulchres! to receive the wretched victims of oppression and rapacity.

Behold, they rushing cut the briny flood,
Swift as the gale that bears the ship along,
And from the partners of that cruel trade,
Which spoils unhappy Guinea of her sons,
Demand their destined prey.

Thomson.

When pressed with hunger, they will attack and devour their own species: they then seize without distinction every thing that is thrown from the vessel into the sea, cordage, cloth, pitch, iron, wood, and even knives.

Swimmers are frequently attacked by them. The following melancholy ballad, preserved in Percy's Reliques of Antient English Poetry, commemorates a circumstance of the kind which occurred at the island of St. Kitts.

The north-east wind did briskly blow,
The ship was safely moor'd,
Young Bryan thought the boat's-crew slow,
And so leapt overboard.

Percene, the pride of Indian dames,
His heart long held in thrall,
And whoso his impatience blames,
I wot ne'er lov'd at all.

And Brian he was tall and strong,
Right blythsome roll'd his e'en,
Sweet was his voice whene'er he sung;
He scant had twenty seen.

But who the countless charms can draw,
That grac'd his mistress true?
Such charms the old world never saw,
Nor oft I ween the new!

Her raven hair play'd round her neck,
Like tendrils of the vine,
Her cheeks red dewy rose-buds deck,
Her eyes like diamonds shine.

Soon as his well-known ship she spied,
She cast her weeds away;
And to the palmy shore she hied,
All in her best array.

In sea-green silk so neatly clad,
She there, all beauteous stood;
The crew with wonder saw the lad
Repel the foaming flood.

Her hands an handkerchief display'd,
Which he at parting gave;
Well pleased, the token he survey'd,
And manlier beat the wave.

Her fair companions, one and all,
Rejoicing, crowd the strand;
For now the lover swam in call,
And almost touch'd the land.

Then through the white surf did she haste,
To meet her lovely swain;
When ah! a shark bit through his waist,
His heart's blood dyed the main!

He shrieked, his half sprung from the wave,
Streaming with purple gore;
And soon it found a living grave,
And ah! was seen no more.

Now haste, now haste, ye maids, I pray,
Fetch water from the spring;
She falls, she swoons, she dies away,
And soon her knell they ring.

Now each May morning, round her tomb,
Ye fair! fresh flow'rets strew;
So may your lovers 'scape his doom,
Her hapless fate 'scape you.

Gainger.

It now remains to notice the extraordinary manner in which the excessive rapacity of the Shark is counteracted.

The mouth is placed so far beneath the snout, that the creature is obliged to turn upon his back in order to seize his prey. An observation as ancient as the days of Pliny. The design of this peculiar construction is obvious. The act of turning, frequently enables his intended victims to escape: and the Creator has also rendered the White Shark nearly blind, as a counterbalance to his extreme velocity; thus setting limits to the wide spreading devastation his excessive swiftness and rapacity would otherwise occasion. But then, in order to obviate any serious detriment that might accrue to the White Shark, from his incapacity of seeing at a distance, a small quick-sighted fish, the Pilot, speckled with black and yellow, swims immediately before, as if to guide him to his prey. This attendant, the Shark however urged by hunger, never attempts to seize, nor will he

attack a water fowl. St. Pierre informs us, that if one of these is thrown into the sea, the splash immediately brings him to the place, but that on discovering the nature of the prey, he hastily retires. Hence the proverb among sailors, "that the Shark flies from a feather." But why such extraordinary abstinence on the part of this voracious creature! A further acquaintance with his natural history, furnishes the solution. The Deity has undoubtedly implanted in the Shark, this aversion to the feathered race, in order to deter him from preying on such species of sea-fowl as repair to his favourite haunts, the shallows of the ocean; and which are also employed like himself, in looking out for a livelihood, and clearing the rocks from the deposits of the ocean. These creatures are perpetually within his reach, when either asleep or basking in the sun; they would consequently fall a prey to his rapacity, were it not for this extraordinary instinct. A similar fact is observable in the natural history of sheep, and the most industrious of the insect tribes, with regard to their mutual pasturage. The great plains of the southern provinces of Spain, are covered with flocks; innumerable bees also resort thither, in order to extract honey from different nectarious plants. Now it is a well-known fact, that sheep, unless impelled by hunger, will never pasture upon the flowers of aromatic herbage. The Creator has obviously given them this peculiarity, in order to

preserve for a large proportion of useful insects, such herbs as produce honey, and are in consequence their proper food.

O Lord, thy works are wonderful! None of them hindereth another, and they shall never disobey thy word.

But of what use, it may be asked, is the genus Squalus? Why are these obnoxious creatures seen to mingle with so many trophies of His beneficence, who sits enthroned above the heavens, surrounded by the immensity of his works. Because they are necessary to the general harmony of things. Without them, the shores and shallows of the ocean would in many parts be rendered uninhabitable.

At least a twentieth part of quadrupeds, the tenth of fowls, and an infinite variety of aquatic animals perish annually, in obedience to that great injunction, which passes death upon every thing that comes into the world. We observe, accordingly, that different species of the same rapacious genus, are found in the arctic, and antarctic regions of the globe. Piked Sharks swarm on the coast of Scotland, among the frozen shores of Zembla, and along the sunny regions of the line; where, independently of the functions in which they are continually engaged, they serve as important articles of food among the peasantry, who either sell, or barter them for various necessary articles. The Blue Shark, that pattern of parental

affection, which permits the young brood, when harassed by their pursuers, to swim down his throat, and take refuge in his capacious breast, is found in abundance on the Cornish coast during the pilchard season, and throughout the Northern and Southern Ocean. Like his relative the Great White Shark, he is constantly employed in clearing the sea shore of such extraneous substances, as the tide has from time to time deposited. With the same obvious design, were created the Long-tailed Shark, denominated Vulpes by the ancients, from his supposed cunning; the Tope, ironically called Sweet William, which pursues his prey to the edge of the sea shore; the Spotted, resembling a serpent in his general construction, and, lastly, the Angel, a species that connects the genus of Rays and Sharks, remarkable for a degree of malignity, even surpassing the general characteristics of his brethren, and distinguished by a rough uncouth skin, used by the ancients in polishing wood and ivory, and by horizontal fins of such a size and length, as to resemble wings. All these are generally diffused along the shores, and in the harbours of almost every part of the known world.

But are these the only instances of obnoxious qualities discoverable in the aquatic tribes? They are undoubtedly the principal, but by no means the only ones. Poisonous fishes are occasionally met with in the exotic regions of the globe; the Rock-

fish, especially, a species inhabiting the coral groves, that spring from the rocky beds of the seas surrounding the Bahama islands. These seas are remarkably clear. They exhibit, at the depth of at least twenty fathoms, a charming variety of coral groves, of heretophytes, astroitæ, and shells, animated with multitudes of brilliant fishes, which dart among them with inconceivable rapidity. Catesby once prevailed upon a diver to bring up some of the finest corals and sea-plants; on being taken from the water, they appeared as if covered with a mucilaginous substance, denominated by the natives, coral in a soft and imperfect state, but in fact, the spawn of deleterious fishes, partaking of the nature of their parents. The diver, who, in order to clear his hands from the adhering substance, rubbed them over his chest, was seized in a moment with acute pains, and rolled himself in agonies upon the ground; in about a quarter of an hour, the pain abated, and he gradually recovered. As several species of poisonous molluscæ affect the shores of the Bahama islands, it is probable that the injurious nature of the fishes resulted from feeding on their young; for in different parts of the watery world, the same species are eaten with impunity.

Fishes of an equally deleterious quality with those of the Bahamas, have also been discovered off the shores of the Sandwich islands. The companions of Captain Cook suffered severely by eating the Squalus *Erythri-*

nus, a fish well known, and innoxious, in the Mediterranean. The dogs, which had partaken with their masters, were equally affected, and two of them died in the course of a few days. The sailors, indeed, recovered, but not till after a considerable period had elapsed. A similar circumstance is recorded in the voyages of the celebrated navigator, Quiros.

The Spotted Tetradon, the Jenije of Japan, or Tetradon *Ocellatus* of Linnæus, is still more deadly in its effects. It occasions inevitable death in the course of a few hours, and this may even be expedited by infusing a branch of illiricum in the water. Yet the Jenije is not unfrequent on the tables of the Japanese epicures, its injurious qualities being confined to the intestines. But as the smallest particle of these inevitably destroys the health of those who incautiously partake, the emperor prohibits the use of the Tetradon to his officers and soldiers; the rest of his subjects are permitted to incur the risk with impunity.

But what, you will again repeat, is the use of these obnoxious creatures? Let us not hastily dismiss the subject. Imagine that an individual who had been confined during the whole course of his life in subterraneous apartments, even if those apartments were embellished with every thing that poetic fancy might delight to feign, was on a sudden to emerge from his buried habitation, and mount up

into the world of life and animation. Think you, when the earth, the sea, the heavens, rushed upon his sight; when he observed the glorious order of the stars, felt the force of the winds, saw the restless ocean, and understood the uses of the living animals, the nature of the birds, and the qualities of the vegetables that cover the surface of the earth, and was informed that they all, more or less, conduced to the benefit of mankind;—if he also observed that a very few of these were noxious in their qualities, would he not be inclined to suppose that some great purpose was affected by them, in the general economy of nature?

Does he then merit the name of a philosopher, who can instance the genus Squalus, or the deleterious inhabitants of the Atlantic and Southern Oceans, in common with various other species in the animal and vegetable kingdoms, as militating against the universal beneficence of the Creator? Where it is impossible to unravel his designs, it is undoubtedly our duty to believe that all things move in accordance with his regulations, and that those regulations are either designed for our instruction, or reproof. The variety in creation serves to evince the skill of the Divine Creator. Fierce, poisonous, and noxious creatures may be designed as rods and scourges to chasten us, as means to excite our wisdom, industry, and skill; while such as are actually

injurious in one respect, may in another prove highly beneficial. Animals, plants, and minerals, which in one form destroy, may in another heal. They tend also to remind us that the evils we suffer from the creatures that God has made, afford convincing proofs that the world is not in the same state as it once was, when the Deity pronounced that all was good. The Most High, in order to humble the pride of man, occasionally permits him to suffer inconvenience from the feeblest, and most despicable creatures. He who boasts himself against his Maker, may lose the very perception of his being from the shock of a Torpedo, and be scarcely recovered again to life. Why, then, art thou filled with self-complacency! Why art thou exalted in thine own opinion! The meanest of created beings may deprive thee of sleep. When thou walkest by the way, a gnat or wasp may sting thee; when thou venturest upon the ocean, some of its formidable inhabitants may suddenly circumvent and overcome thee. Perhaps even to quell thy pride and arrogance, these offensive natures have been called into life.

But though the infinitely wise Creator has put it into the power of such obnoxious creatures to chastise or to intimidate us, yet has he shewn no less beneficence and wisdom in constructing many, if not most of them, in such a manner as either to conduce to the general order and harmony, or else

to palliate the mischiefs they might otherwise occasion. Those who delight to unravel the great labyrinth of nature, discover something beneficial in even the most injurious. Modern experimentalists have unfolded the use of several that were before entirely unknown. Another generation may make still greater discoveries, while the use of a considerable number may remain for ever in obscurity, and yet as much exist as the benefits conferred by a large proportion with which we are now acquainted, did actually exist, before they were brought to light.

Adieu.

LETTER XII.

SALMON GENUS.

To * * * *

THERE is a voice, my friend, that speaks throughout the universe—from the depth of solitary woods, from amid the roar of torrents, from deserts rarely trodden by the foot of man; that touches, as with a magic hand, the springs of moral sensibility, and awakens those perceptions of sublimity and beauty, which the common concerns of life tend to diminish, if not to destroy. It is the voice of nature calling upon her sons to turn from the feverish pursuits of interest and ambition, to contemplate the wonderful museum in which the hand of Deity has placed them; to consider the universe as no longer the abode of human cares and human pleasures, but as the Temple of the living God, in which praise is due, and service to be performed. This voice is no where heard more forcibly, than from the depth of rapid rivers or solitary lakes, embosomed among

rugged mountains, where rude cottages lie scattered along the sides, and the inhabitants depend for their support on such productions as the waters pour out to them with a lavish hand. How impressively has it spoken to the naturalist, when passing by the lake of Llynberis, he has surveyed the high rocks that enclose it on every side, and the solitary habitations which betoken the abode of man! At the confluence of the Blue Pools, beside the rushing Gwynan, that pours through the romantic village of Bethgellert, at the foot of Snowdon; from that and various other mountainous districts, it has told him that the Deity uniformly proportions his gifts to the exigencies of his creatures,—that where the hills are covered with vineyards, and the valleys stand thick with corn, the productions of the waters are comparatively few; that where, on the contrary, the character of the country is that of desolation; where the herbage is scarcely sufficient for the pasturage of cattle, and the niggard soil refuses the production of corn and oats, there the finny tribes are so abundant as to constitute the chief support of the bordering inhabitants. Hence it is that the River Trout, one of the most valuable species of the Salmon genus, is widely diffused in the temperate and arctic regions of the globe; that it abounds in different parts of Iceland, and is nowhere more abundant than in the Hornafliot, a yokul, or ice river, the surrounding scenery of

which appears to concentrate every thing that the imagination can conceive of grandeur, sublimity, and beauty. The western edge is bounded with variously situated basaltic columns: some of these appear as if hurled from the adjacent mountains; others which stand in their native beds, present the appearance of temples, porticoes, and public works, which, in magnificence and beauty, and some of them in elegance, are such as might have adorned the fabled palaces of the genii of the earth. Turn which way you will, the same characteristic scenery meets the eye. From the margin of the river, these mimic ruins reach far up the mountains, where they are met by the descending heath: as you follow the narrow pass that leads to the summit of the aspiring Oræfa Yokul, new scenes of magnificence and desolation burst on the astonished view. Immediately beneath, a stupendous precipice, nearly nine hundred feet of perpendicular descent, is washed by a boundless extent of ocean. A barren flat, the Horna-fliot, appears on the right. To the left, the country is beautifully diversified with farms and villages; beyond which, as far as the eye can reach, nothing is to be seen but one vast chain of ice mountains stretching back into the interior. At noon-day, the sparkling rays of the meridian sun appear reflected from the snow with which their summits are completely shrouded. Girdles of silver clouds generally envelope the middle

regions, and form a striking contrast to the crusts of vivid green that marble their gigantic bases, round which the breakers toss on high their crests of broken foam. Such are the sterile and solitary regions, through which the Deity has conducted the magnificent Horna-fliot, and replenished its waters with never-failing supplies of food for the bordering inhabitants. Two important conclusions obviously result from the consideration of this extraordinary fact. One, directs us to expect the guardian care of our Creator, amid the privations of this probationary state; the other, recals to our recollection a lively perception of our own dependence.

As we extend our observations towards the southern lakes, the same kind and admirable provision is made for the wants of man. These abound with the Char Salmon, a valuable species, inhabiting the mountainous parts of Europe, but entirely unknown in the southern regions of the globe. They affect clear and tranquil waters, and are rarely known to wander into running streams, except when the soil is similar to that of their native haunts. They are found in vast abundance in the cold lakes on the summits of the Lapland Alps, and are in fact the only species which affect those ungenial regions. One great design is evident in this. These cold, unsheltered waters are peculiarly destitute of vegetable life. Linnæus even tells us that four species of

plants alone constitute the aquatic flora of those extensive regions. They are consequently unfavourable for the support and increase of small fishes and molluscæ. How, then, are the finny inhabitants supported? Innumerable larvæ of the Gnat, or *Culex Pipiens*, skim the surface of the water, and abound in every creek. The same insect that proves such a vexation to the reindeer, affords subsistence to the fishes of the vast lakes and rivers of Lapland, which are the sole support of the migratory Laplanders, during their summer excursion from one inland situation to another.

> "In that glad season, from the lakes and floods,
> Where pure Neimi's fairy mountains rise;
> And fringed with roses Tenglio rolls his stream,
> They draw the copious fry. With these at eve
> They cheerful, loaded to their tents repair."
>
> *Thomson.*

Two of our native lakes produce the Char Salmon in abundance. They are found in Windermere, in Westmoreland; in Llyn Cawellyn, near the foot of Snowdon; and before the discovery of the copper mines, in the waters of Llynberis, situated in the same romantic district. The largest, and most beautiful are brought from the former of these lakes. Pennant mentions having received five specimens from a naturalist of Carlisle. Two described by the name of the Case-char; the others by that of the red, the silver, or

gilt, and the Gelt Char, each of which was either taken from the lake itself, or else from the little streams that flow into it. One of these, the Chase Salmon, affords a striking instance of extraordinary adherence to local situation. It arrives in the river Brathy, which unites with another, called the Rowthy, about a quarter of a mile from its rise, where they both fall into the lake together. The former, the favourite haunt of the Case-char, or Umbra Minor, flows over a black and rocky bottom; the latter above a clear, bright sand. Into this the Char never enters; the other species confine themselves exclusively to the lake. They remain tranquilly in such parts as are full of springs, where the bed is smooth, and sandy, and the water comparatively warm. The fishermen judge of this circumstance by observing that the water never freezes in situations where the Char have fixed their temporary abode, unless the frost is unusually severe; and that even then, the ice is considerably thinner than in other parts of the lake. Here they deposit their eggs, and are taken in great plenty from the end of September to that of the ensuing month, when they almost instantaneously disappear. The same species is also found occasionally in certain lakes of Merionethshire, of Iceland and Scotland; those especially of Loch Inch, and Inchigcelah, in the county of Cork.

One question may possibly have arisen during the

perusal of the preceding observations. By what means are the species of the genus Salmo, diffused throughout the Alpine lakes of this, and almost every other northern country? We understand the migration of the finny tribes. They glide through the paths of the great waters without apprehension, and almost without effort; they wander into the beds of rivers, and thence into the lakes and streams which communicate with them; but how is it possible that a class of animals, without wings, and without feet, should migrate from one inland sheet of water to another?

We must refer to the Philosophical Transactions as far back as 1666, for the first light thrown on this extraordinary fact. During the course of that year, on the Wednesday before Easter, a field about two acres in extent, near Cransted, a town of Kent, situated at a considerable distance from the sea, and remote from any river, inland lake, or even pond, was suddenly covered with a multitude of young whitings, nearly one inch in length. The field belonged to a yeoman of the name of Ware, who being subpœnaed to attend as juryman during the Easter sessions, held at Maidstone, carried several with him in order to shew them to his friends, and from thence a specimen was conveyed to London by Mr. Lake, a bencher of the Middle Temple.

The truth of this extraordinary statement was

confirmed by several witnesses. But how were they conveyed to the spot? Undoubtedly, says Mr. Conwy, by means of a great tempest of rain, of thunder, and lightning, which had recently occurred in the neighbourhood. They were, in consequence, either absorbed from the surface of the ocean by the electric suction of a waterspout, or swept away by the violence of a hurricane.

Nor is this the only instance that can be adduced in favour of the above conclusion. Similar phenomena have occurred at different periods, and in countries far more inland than the preceding. In the Norwegian seas, especially, shoals of fishes are frequently carried away by a tornado.—Let not my friend object to this digression.—You will have cause to thank me, if it induces you to read with deeper interest the vast volume of creation, which few have ever read without becoming wiser and better men.

The Smelt, another species of the Salmon genus, is exclusively confined to the northern regions of the globe. One of its favourite resorts, is the tranquil Seine; another, the British Mersey; but into this it never wanders, so long as any snow water remains in the river. The rushing Conway is also full of this kind of fish. Their beautiful forms, their colours, and their agile motions, have frequently attracted my attention as I stood, or fancied that I stood, on the very spot whence the bard of Gray is said to have

observed the progress of Edward's army, when descending the shaggy sides of Snowdon.

The Gwyniad is decidedly gregarious. Large shoals approach the British shores, and migrate up the rivers, about the vernal and autumnal equinoxes; visiting in their progress the remotest creeks and bays, and affording a plentiful supply of food to the poor population of the inland counties, as the annual visits of the herring do to those who live upon the coast. They inhabit the lakes of this, and various other countries, and abound especially in those of Switzerland, Savoy, Norway, Lapland, and Sweden. Camden long since observed that they rarely, or never wander into the Dee, a river that flows into the lake Llytegid, a favourite resort of the common Salmon, and that the Salmon, in like manner, carefully avoid the lake. They know their allotted bounds, and observe the commands of Him who has appointed them.

This interesting species recalls to recollection one of the most eventful periods in English history. It is said to have been introduced into the beautiful lake of Loch Nabon by the ill-fated Mary Stewart, and that in accordance with the general fashion of her court, the name was derived from Vendoise, a Dace, to which it undoubtedly bore a considerable resemblance, from the exquisite whiteness of its

scales. These scales, as well as those of the Black Cyprine, are used in the composition of artificial pearls. For this purpose they are beaten into fine powder; then diluted with clear water, and introduced into a thin glass bubble, which is afterwards filled with wax. The French were the original inventors of this curious art. It is still carried on to a great extent in Paris: Dr. Lester even tells us that a certain artist used in one winter, thirty hampers of the Dace or Cyprine.

Silvery and glittering scales of a similar description were appropriated in ancient times to purposes of decoration, by some of the savage tribes that dwelt along the borders of the northern seas; they stripped such animals as were clothed in the finest furs, and attired themselves with the spoil, having previously spangled them with small fragments taken from the skins of fishes.

The Greyling delights in clear and rapid rivers, in such, especially, as flow through mountainous regions and abound with aquatic beetles, and small fish. They afford to the Laplanders not only a grateful supply of food, but supersede the use of rennet in making cheese from the milk of the rein deer. The construction of the Greyling is admirably adapted to his wandering mode of life; he swims with inconceiveable rapidity, and disappears, like the transient

passage of a shadow, whence the name, assigned by Ausonius:

"The Umbra swift escapes the quickest eye."

This graceful species is also found in inland lakes, and streamlets shaded with high trees: and is in none more abundant than in the sparkling waters of Loch Levin, to which the poet thus beautifully alludes:

"Pure stream, in whose transparent wave,
My youthful limbs I wont to lave;
No torrents stain thy limpid source,
No rocks impede thy dimpled course,
That sweetly wanders o'er its bed,
With white, round, polish'd pebbles spread.
While lightly pois'd, the scaly brood,
In myriads cleave thy crystal flood.
The springing trout in speckled pride,
The salmon, monarch of the tide,
The ruthless pike, intent on war,
The silver eel, and mottled par;
Devolving from thy parent lake,
A charming maze thy waters make,
By bowers of birch, and groves of pine,
And hedges flower'd with eglantine.
Still on the banks so gaily green,
May murmuring flocks and herds be seen;
And lasses chanting o'er the pail,
And shepherds piping in the dale,
And ancient faith that knows no guile,
And industry embrown'd with toil;
And hearts resolv'd, and hands prepared,
The blessings they enjoy to guard."

Smollett.

The French, who call the Club *un villain*, give to the Umbra of the lake Leman, the more elegant appellation of *Chevalier*. Their poets fable, that he feeds on gold; their naturalists assert that several have been discovered in the Loire, with grains of this precious metal in their stomachs. In order to account for the pleasant scent which distinguishes this species on being taken from the water, they further add, that the Greyling feeds on the aromatic flowers of the water thyme; a supposition confirmed by Walton. "They think it strange," says he, "with the same reason as we do, that our Smelts scent like violets, on their being first caught, which I know to be a truth." This honest angler is profuse in his admiration of the Umbra. Seated on the brow of a primrose hill, he delighted to observe their agile motions, as they sported through the sparkling waves, beside green sloping banks, covered with wild flowers, and overhung with trees, where the birds seemed to have a friendly contention which should sing the loudest and the clearest, and where, as they sung, they awoke old Echo, whose voice proceeded from the bosom of a hollow tree. While thus reflecting on the tranquil pleasures of a rural life, he quotes the sentiment of Aldrovandus, in confirmation of his opinion, who asserts, "that the Greyling, Salmon, Trout, and those species that live in clear and sharp streams, are made by their

Creator, of such exact shape and pleasant colour, purposely to invite us to joy and contentment while feasting with her."

Ancient and modern naturalists equally agree in their opinions respecting this graceful little fish. Sal Hippolito Salviani, an Italian physician of the sixteenth century, wrote a particular treatise on the Umbra. St. Ambrose also, the glorious bishop of Milan, who lived, says the same original writer, "when the church kept fasting days, calls him the flower fish, or the flower of fishes, and was so far in love with him, that he could not let him pass without the honour of a long discourse." He also tells us, "that in Swabia, this species was considered as the choicest of fishes; and that in Italy it was so much valued during the month of May, as to be sold at a much higher rate than that of any other kind." But this superiority is not conferred on the Umbra, merely because of his beauty and agility. Various writers on natural history, endow him with medicinal qualities. Gesner, especially, who informs us that the fat of the Salmo *Eperlanus*, when compounded with a little honey, and left in the sun for a few days, is a sovereign specific for redness of the eyes.

This elegant and valuable species is generally seen in the rivers of Great Britain. They abound in the shallow and rapid streams of North Wales and

Derbyshire, and are nowhere more abundant than in the Dove, where it murmurs through the Tempe of Great Britain.

> "There nature wanders as in her prime,
> And plays at will, her virgin fancies."

This celebrated spot is full of studies for the artist. The mountains on either side, all up the dell, are fenced and buttressed by huge masses of rocks, tossed into every form that imagination can devise; and of these a considerable number, appear in the grey of evening, like gigantic forms issuing out of their subterraneous haunts. But what a different aspect is presented by this celebrated valley, when seen, as I have lately seen it, under the celestial influence of chiaro scuro; all then is gay, lovely, and fascinating. Here a lofty eminence ascends to the height of several hundred feet, turreted with rugged crags, and richly mantled with coppice wood, composed of elms, ash, and hazel. There the mimicry of an ancient monastery rises on the view; and now an arched gateway, appears to lead into the deep recesses of a cavern; again, a noble pile of rocks ascends in stern majesty, broken, and tossed in all directions, and crested with huge branches of knarled oaks, or weather-beaten elms, in a manner that suggests to recollection the pictures of Claude Lorraine, while the high and elegant foliage which aspires to reach them, subdues the feature of ruggedness, and softens

the whole into beauty. Further on, at the distance of rather more than a mile, the rocks on each side form an immense portal, through which the river hurries impetuously on, and vanishes behind a mass of beetling crags. Beyond this point, the dale is rarely visited by human footsteps; except when a solitary angler, in pursuit of his favourite amusement, or an adventurous tourist penetrates, in order to trace the further progress of the Dove. This, however, rarely happens, as the attempt is arduous, and cannot be accomplished without difficulty, perhaps even danger.

"So high the cliffs of limestone grey,
Hang beetling o'er the torrent's way,
Yielding along their rugged base,
A flinty footpath's rugged space;
Where he who winds 'twixt rock and wave,
May hear the headlong torrent rave;
And like a steed in frantic fit,
That flings the froth from bit to bit,
May view her chase her waves to play,
O'er every rock that bars her way;
Till foam-globes on the eddies ride,
Thick as the schemes of human pride,
That down life's current drive amain,
As frail, as frothy, and as vain.

Scott.

In less confined channels the river winds more tranquilly. At one time appearing deep, silent, and immoveable, dark with shadow, and scarcely to be distinguished from the overarching rocks and alders

that droop above it; at another, emerging to the light, clear, rapid, and transparent, while long smooth weeds, and trailing wreaths of the water lily, covered with dazzling white flowers, either float upon the surface, or appear beneath it with unusual brilliancy, as the vivid transparency of the water every where imparts a higher tone of colour to the objects over which it flows; and the sparkling of the lime-stone rocks, and the intermingling hues of overarching trees, long branches of wild roses, and tufts of foxglove, are beautifully reflected on the bosom of the stream. Again it hurries impetuously on, leaping from rock to rock, and forming innumerable rapids; while in still more agitated spots, the restless waves whirl into numerous eddies on the shore, and as they race along, stop for a moment, as if to contend with the rude masses of broken rocks, which, tinted with green mosses, and variously coloured lichens, lift up their heads above the stream.

This enchanting spot has long been the favourite resort of poets, moralists, and painters. To visit scenes which have thus been visited, imparts an hallowed feeling to these unrivalled solitudes, which the lover of nature can readily comprehend, the pen would fail to describe.

> " Thus kindred objects kindred thoughts inspire,
> As summer clouds flash forth electric fire.

Aerial forms in *Dovedale's* classic vale
Glance through the gloom, and whisper in the gale,
Instil that musing, melancholy mood,
Which charms the wise, and elevates the good;
While pensive gleams of happiness resigned,
Glance on the vivid mirror of the mind."

Rogers.

The force and beauty of the preceding lines, will I trust, sufficiently atone for the space they occupy in this sketch of Dovedale, to which the mention of the Whiting has insensibly led me.

Adieu.

LETTER XIII.

MIGRATIONS OF THE SALMON GENUS.

To * * * *

While looking over some manuscripts this morning, I found a packet of letters, written many years since by ———, of whose romantic love for natural history, you have often heard. They contain many interesting memorandums, relative to the migration of the finny tribes, of which I shall occasionally avail myself; more especially as they speak of places, in connexion with them, which it is not probable that I shall ever visit.

"My thoughts recurred to you this morning," observed our traveller, (for by this name I shall designate him) in one of his letters to a friend, "when, revisiting the narrow passes of the dreary Tilt, I came unconsciously upon the very spot where we had spent so many hours. The stone which served us for a seat, evinced nothing of the lapse of time,

but the overhanging rock was dotted with grey lichens; and long pendant branches of fern, and foxglove, sprung from out its fissures; some rude hand had torn away the drapery of ivy, and the grass grew wild and high, as if the place was seldom visited. No other alteration was perceptible. The torrent rolled impetuously over the bed of rock which it had worn in its ancient course, and disappeared behind the sweeping range of beetling crags that rise precipitously on either side. I thought of you, my friend, and a thousand melancholy reflections crowded on my mind. I contrasted the permanency of nature with the mutability of life, and mournfully associated the lamentations of the Persian Sadi, with the objects that surrounded me.

"I went to the place of my birth," exclaimed Sadi, "I asked for the friends of my youth, where are they? And the echo replied, Where are they?"

But why should I dwell on these unprofitable recollections. The adverse incidents of life ought not to shake the fortitude of him who has learned to regard them with the eye of reason and religion. Nature continually offers an inexhaustible source of instruction and delight; and in proportion as the domain of science is extended, she presents herself to him, who knows how to interrogate her, under forms and aspects equally diversified and beautiful.

A few months since the mornings were sharp and

clear; not a cloud flitted across the blue vault of heaven, not a single speck interrupted the dazzling splendour of the snowy landscape. The long tufts of moss and lichens, which clothed, towards the east, the trunks of the forest trees, were covered with hoar frost, while the withered blades of grass, and the graceful capsules of the henbane, appeared like icy feathers sparkling in the breeze. The little birds had ceased their warbling, all but the domestic red-breast, whose contented notes were heard at intervals, as flitting from spray to spray, he shook the spangles of frozen ice that tinkled on the withered leaves, which the wind had scattered to the earth. But now, the revolution of a few short months has restored the face of nature, the brilliant yellow flowers of the cistus appear conspicuous in various directions, and the hills are covered with purple heath.

"Flower of the wild, whose purple glow
Adorns the dusky mountain's side,
Not the gay hues of Iris' bow,
Nor garden's artful, varied pride,
With all its wealth of sweets, could cheer
Like thee, the hardy mountaineer.

"Flower of his heart! thy fragrance mild,
Of peace and freedom seems to breathe;
To pluck thy blossom in the wild,
And deck his bonnet with the wreathe,
Where dwelt of old his rustic sires,
Is all his simple wish requires.

"Flower of his dear loved native land!
Alas! when distant, far more dear.
When he from some cold foreign strand
Looks homeward through the blinding tear,
How must his aching heart deplore,
That home, and thee, he sees no more!"

Mrs. Grant.

The flights and motions, the cheerful sounds and voices of the birds of the air, give animation to the most solitary places; and through the lakes and rivers of the country, myriads of the Salmon genus are seen advancing in their annual visits from the ocean. I watch their progress from day to day. One time on the margin of a favourite lake, another on the borders of the river, among the ferns and rushes, which bend over the stream. And there I frequently recall to recollection those gay and careless hours, when with you I traced the progress of these annual vagrants, through the sparkling waters of the Derwent, into the river that flows from Keswick to the valley of St. John, or when, with those

"Guides of our life, instructors of our youth,
Who first unveil'd the hallowed form of truth,"

we observed the same species opposing themselves to mountain torrents, and springing over cataracts several feet in height, at the perpendicular falls of Kenneth, Pont Aberglassin, and Leixlep, seven miles from Dublin. With what delight we contemp-

lated the retiring of the Salmon a few paces back, when arrived at the base of the cascade, as if by mutual consent, in order to survey the danger that assailed them. Then advancing, and again retreating, and at length, summoning all their courage, they sprung upwards, keeping themselves straight, with a tremulous motion, and thus surmounted the opposing barrier. Since then, I have visited the romantic cascade of the rushing Tivy, and stood on the same spot (for indeed there is only one from which the falls can be seen to advantage), where Camden, and the poet Drayton observed the remarkable phenomenon of the salmon leap. The first informs us "that the people used to stand and wonder at the strength and sleight by which they saw the Salmon get out of the sea, into the said river, and that the manner and height of the place is so notable, that it is known by the name of the Salmon leap." The latter gave impression to his feelings in the following antiquated lines:

"And when the Salmon seeks a fresher stream to find,
Which hither from the sea come yearly with his kind;
He travels on his way, and stems the watery tract,
Where Tivy falling down makes an high cataract.
Fenced by the rising rocks that there her course oppose,
As though within her bounds they meant her to inclose;
And when the labouring fish does at the foot arrive,
He finds that by his strength he does but vainly strive;
His tail takes in his mouth, and bending like a bow
That's to full compass drawn, aloft himself doth throw,

And springing at his height, as doth a little wand
That bended end to end, and started from man's hand,
Far off itself doth cast; so does the salmon vault—
And if at first he fail, his second summersault
He instantly essays, and from his nimble ring
Still jerking, never leaves, until himself he fling
Above the opposing stream."

"Successive generations have since resorted to the same romantic spot, exhibiting in themselves the gradual advances of science, or the vicissitudes of ignorance and learning; but the falls and the surrounding country have sustained little alteration since the days of Camden. He who visits scenes distinguished in the annals of his country, frequently recurs with lively interest to the changes produced by time or custom in the lapse of years, but he forgets that the emotions which have actuated him at different periods of his life, are nearly as dissimilar. When with you, I visited the falls of Kenneth, Pont Aberglassin, and Leixlip, life appeared as an unlimited horizon, and hope had coloured the future with her rainbow tints. A cloud has since obscured the brightness of the landscape, and far different feelings have engrossed the bosom of your friend, when in the gloom of evening, he has seen the fires of the fishermen lighting up on the shores of the solitary Usk, for the purpose of attracting the Salmon, and when, as if unable to resist the fascination, they have pressed towards the bickering flame, that allured to betray them. He

then has felt, that a reflecting mind, like the fabled transmuting power which turns all it touches into gold, derives instruction or reproof from almost every object, and in the wilful blindness of the Salmon genus, has confessed a striking emblem of his own perilous career. The sober realities of truth have gradually succeeded to illusions, which at one period exercised such an unbounded sway over his affections; as the disappearance of light and unsubstantial vapours, discovers the majesty of Alpine districts. Nor is it irrelevant to add, that the flowers blossoming beside his solitary path, have often been to him, like way-marks in conducting his reflections to some important end; and that, from the tribes of ocean he has learned, in whatever station the Deity has placed him, to be content. For, observing that the Supreme Creator of the universe, assigns to every class of being, their different localities, and renders them subservient to the general harmony of things, he inferred that the states of individuals were adjusted with a reference to their higher destination.

"The mind that is thus filled with secret contentment, has gone a great way towards praise and thanksgiving. Such an habitual disposition, consecrates every rock and river; turns, as Addison well remarks, "an ordinary walk into a morning and evening sacrifice, and will improve those transient gleams of joy, which naturally brighten up, and refresh the

mind, into a sweet abiding feeling of confidence and peace."

Thus far our extract. It now remains to notice the wanderings of the genus Clupea, with a reference to the benefits they annually confer.

This species is unknown in the warm climates of the south. They delight in northern latitudes; and in rapid rivers, shaded with high trees; and abound in Greenland, Newfoundland, throughout the northern extremities of Europe, in Kamschatka, Norway, and the Baltic.

The Kamschatkadales, especially, depend for subsistence, upon the Anadromous kinds; such as quit the sea at stated periods, and ascend the lakes and rivers of the country, which are entirely destitute of native species, for the evident purpose of leaving them to their annual quests. These quests are entirely of the Salmon genus, with the exception of the Cod, and Herring, each of which in autumn, forsakes the salt water for the fresh. "These active creatures, (says honest Walton) like persons of honour, and of riches, have both their winter and summer houses; the fresh rivers for summer, and the sea for winter, to spend their lives in."

We have seen, that different species of Salmon, migrate from their native haunts at a stated period of the year, and that they permit no surmountable obstacle to impede their progress towards the

shore, and up the streams of fresh rivers. But what is the object of their perilous migration? They deposit their eggs in the soft sand, which they quit almost immediately, in order to return to the sea, without a wish to recognise, or to protect their offspring. Where shall we find a motive for these efforts, and this perseverance? Shall we seek it in a love of wandering, or of society? Does it result from patriotism? from a fond solicitude, lest the Salmon race should cease from among the inhabitants of the ocean? No, we must look for it in the love of the Creator to his creatures; in a wish, if I may so express myself, to lead them, by such evidences of his goodness, to a further consideration of the benefits he has bestowed on man.

Now, by what means can we suppose that the young are enabled to follow the perilous migration of their parents? Do they travel by the stars, or fearlessly commit themselves to the currents of the ocean, unknowing whither they may lead them; or is instinct alone sufficient for the purpose? A fish of a year's growth, remains stationary near the spot, as if commisioned to guard the infant progeny till about the beginning of September, when she returns with them towards the sea. But how shall we account for this extraordinary deviation from the general habits of the watery tribes? Why is it necessary, that in the cold regions of the north, an instinctive

attachment, a foresight should be evinced, in providing a protector, or a guide for the unborn fry, which has never been discovered in any other part of the known world? Steller, the great explorer of these inhospitable regions, has discovered the cause. He tells us, that the rivers of Kamschatka are chilly, shallow, rapid, full of rocks, and barely able to support the multitudes which annually migrate to them; and that the shoals that once have visited, never return to them again. It is therefore necessary that a peculiar care should be evinced in the preservation of their offspring, in order to obviate the inconvenience that might otherwise result, in consequence of such a deviation from the instincts of aquatic animals.

I have already observed, that whole brigades of the Salmon genus enter the rivers of Kamschatka towards the autumnal equinox. They are invariably preceded by an elegant species called the Ishawytska, which advances from the sea in such multitudes, as to raise the water into waves. This kind is, however, far less numerous than any other of the Salmon genus; it is therefore highly esteemed, and reserved for extraordinary occasions.

To these succeed the Narka, celebrated for the intense redness of its flesh; the Kysutch, or white fish of the Russians, and the elegant silvery-shining Keta, which constitutes the Toukola, or household bread of the inhabitants. They each ascend the rivers during

the summer months, and diffuse plenty throughout the dreary regions of Kamschatka. In like manner, the Malma, or Golet, a beautifully tinted and graceful little fish, is welcomed by the natives, as bringing them an ample supply of food for the winter months. The Mykiss is principally allured to the northern lakes, by the leaves and brilliant berries of the *vaccinium vitis idæa*, with which the shores are shaded and adorned. A considerable extent of water is sometimes covered with these brisk and lively natures. They are seen frolicking beneath the waves, springing into the air in quest of marine insects, or bringing down such branches of the *vaccinium*, as loaded with ripe berries, appear drooping above the water. But as the period of their arrival is entirely unknown, they most probably ascend the rivers under the ice. The Kunka, Greyling, Herring, and common Salmon, also frequent the inland lakes and rivers of the country; where they are numerous, and highly estimated, and of these, the periods of migration are so accurately determined, that the Kamschatkadales designate their months by the names of different fish. One is called Kouiche, or the month of red fishes; another Ajaba, or that of the little white fish; a third Kaiko, or of the fish Kaiko, and a fourth Kijou, or the month of the great white fish. The various brigades preserve their appointed limits; they keep apart from others of a different species, and generally prefer a sepa-

rate river, notwithstanding the openings may be nearly contiguous. They advance in such closely embodied groups, as to force back the currents of the rivers, and frequently occasion them to overflow their banks, insomuch, that on the ebbing of the water, the numbers which line the shores, are sufficient to pollute the air. But mark the protecting care of Providence. The danger is completely obviated by the violent winds that are common to this season of the year. Moreover, these annual deposits of the ocean, furnish a supply of food to animals of various descriptions. Legions of voracious Crabs people the sands. Clouds of Sea fowls hover with loud cries over the scene of action; and Bears, and arctic Foxes, descending from their covert in the rocks, repair to them as to an annual banquet. The whole family of cartilaginous fishes, which subsist principally on the flesh of others, such as the Thornback, Lamprey, Smooth Hound, and Sharks of various descriptions, swim thither in great numbers, and constantly employ themselves in devouring the wrecks that are thrown upon the shore. Troops of insects are also called in, to aid the work of demolition. Wasps furnished with scizzars, flies with pumps, and Serpula with boring instruments, complete the destruction of the rest.

The tempestuous winds, which at the commencement of the season are not sufficiently powerful to effect any important changes in the aspect of things,

sweep, on the approach of winter, with augmented fury, over that cold and woodless country, and bring with them such whirlwinds of sand as completely to block up the entrances into the lakes, and, consequently, to detain considerable numbers of their inmates. These, as the rivers are entirely destitute of native species, afford a valuable supply of fresh provisions to the inhabitants of the Peninsula: but as soon as the spring advances, the storms take a different direction; the sand is scattered before them, as a rolling thing before the whirlwind, and the prisoners immediately depart. Paley justly observes, that the works of Deity are known by expedients. Where we should look for absolute destitution, where we can reckon upon nothing but wants, some admirable contrivance always comes in to supply the privation. A casual observer would be inclined to conjecture, that considerable inconvenience might result to the inhabitants from living so entirely upon fish; since they consume large quantities that have been dried and salted, as a substitute for bread. But let it not be forgotten that the productions of the vegetable kingdom are manifestly arranged with reference to this very circumstance. The garland which the botanist has woven from the lap of Flora, is indeed a very slender one; but she has bestowed upon a country so repugnant to her bounty, a gift far more precious than all the beauty and luxuriance of exotic regions.

The Cohlearia *officinalis*, remarkable for its antiscorbutic qualities, is providentially most abundant, through the goodness of Him, whose beneficence in the distribution of the vegetable world, she was anciently designed to symbolize. It grows, together with the sorel, among the rocks on the sea-shore. The leaf of the first is round, in the form of a spoon; that of the second resembles the iron head of an arrow. Naturalists remark that the virtues of each are as dissimilar as their configuration. One being an alkali, the other an acid. They are consequently invaluable to the natives of the country, as well as to the seamen that frequent their shores, by whom the former is emphatically termed the gift of heaven. Thus, while the Supreme Creator of the Universe has filled the temperate and torrid zones with innumerable fruits and flowers, he has assigned to the iron shores of Greenland, two plants of known utility, with a few herbs and grasses, for the use of the wild fowl which occasionally resort to them. He knew that the daily food of the aborigines would require a powerful corrective, and therefore mercifully provided for the preservation of their health, with that of the tempest-driven mariner.

The bed of the surrounding ocean is admirably adapted for the retreat and preservation of the natives of the deep. Instead of a level and sandy bottom, liable to be disturbed by the storms of the northern

regions, it consists of deep valleys and lofty mountains, provided with abundance of marine plants, where the watery nations rest securely during the most tempestuous seasons, waiting till the return of spring invites them to their summer haunts.

Now what artificer but Nature, or rather that Benignant Being, whose skill and penetration nothing can surpass, would have evinced so much benevolence in the adaptation of means to produce a desired end! That such is actually the case will appear still more evident, when we consider the character of the country, and the consequent privations of the inhabitants. In Greenland, nature seems as if bound with icy chains. Several of the mountains are at least one hundred fathoms of perpendicular ascent, rising into broken crags, or spires, and divided by valleys, with no other garniture than moss or moor-grass; others are narrow, long, precipitous, and mantled with perpetual snow. The glaciers encroach upon the valleys and prevent the possibility of cultivation; that especially of the Ice Blink, or Glance, a giant workmanship of nature, which extends at least eighteen miles, and appears with effulgent brightness at the distance of several leagues, when the full blaze of a meridian sun is reflected from its dazzling summit. The base is excavated into magnificent cascades, at least sixty feet in height, extending for nearly eight leagues in length, and two in breadth, through which stupend-

ous masses of floating ice are continually carried by the ebbing of the tide, with a noise surpassing that of the loudest thunder. Islands of ice appear in all directions, sparkling with the colours of the rainbow; the green in many instances excelling that of the emerald, the blue the deepest sapphire. Crystal pavements of equal beauty, extend in winter from one island to another. Such are the solitudes of Greenland, such are the glaciers. They forbid the introduction of agriculture, and leave the inhabitants principally dependent on the annual migrations of the finny tribe.

> Their barren soil, their icy fields,
> They neither sow, nor reap.

The Benign Spirit of the Universe is their husbandman—to every creek, and bay, and inlet, he annually propels the moving harvests of his inexhaustible bounty.

The Salmon is one of the most universal, as well as the most nutritious of the watery inhabitants. It not only abounds on the shores of Kamtschatka, and of Greenland, but is also widely diffused in every part of the frozen regions. Cold Siberia, confesses her obligations to this useful fish, and several unknown varieties delight in the chilly waters, and rapid streams flowing over stony beds, that abound within the arctic circle. Legions of the Salmo *autumnalis*, annually force their way from the sea, into the lake

Baikal, a distance of nearly thirteen hundred miles. Considerable numbers even cross the lake itself, and ascend the river Selinga, where they are taken by the inhabitants, and preserved as provisions for the whole year. The wild Oby, a large river of Asiatic Russia, which rises in the desert of Ischimska, and proceeds in a northerly course for nearly two thousand miles, watering in its progress some of the most desolate regions of the globe, is bountifully replenished with this invaluable species. Here then is another, and most striking instance of the tender care of the Creator, in providing for the wants of the bordering inhabitants, whose habits and privations are thus admirably described by the poet of the Seasons.

"Hard by its shores, where scarce his freezing stream
Rolls the wild Oby, live the last of men.
And half enliven'd by the distant sun,
Here human nature wears the wildest form;
Deep from the piercing season, sunk in caves,
Here by dull fires, and with unjoyous cheer,
They waste the tedious gloom. Nor jest, nor song,
Nor tenderness they know; nor aught of life,
Till morn at length, her roses drooping all!
Sheds a long twilight, bordering o'er their fields,
And calls the quiver'd savage to the chase."

Thomson.

Large shoals of the Salmon genus also resort to the lakes and rivers of Finmark. The principal fishery is established on the Alter, where they are taken by the natives, in weirs built after the Nor-

wegian fashion, and sold to the merchants of Bergen. The productions of this noble river form the chief riches of the country. It rises in Lapland, and after a gentle course through the mountains and forests of West Finmark, and plentifully supplying the aborigines, forms a noble cataract, which tumbles over a stupendous rock into a fine basin, called the Alter Bottom, the chief receptacle of ships employed in the Salmon fishery. Vast quantities are also exported from Norway: they are sent, smoke-dried and pickled, into various countries; and form, with the herring, cod, and ling, the maritime wealth of the countries on the Northern Sea.

The natives make large fires along the shores of the principal rivers, in order to attract the Salmon, and they assemble in such numbers, that a single fisherman has little difficulty in spearing six or seven in the course of an hour. This method is not exclusively confined to the Salmon genus. The natives of Amorgos, employ cypress-leaved cedars; which serve, when lighted, as flambeaux; and the Chinese, white painted boards, placed in such a manner as to produce a double reflection of the moon's rays upon the water. The unsuspecting fishes assemble round the boats, and while occupied in gazing at the light, are taken by means of a large net, which instantaneously envelopes them. A similar mode of fishing once prevailed in the Isle of

Samos, and is still practised in Italy and Savoy, where the inhabitants use branches steeped in pitch, and then lighted, for the purpose of decoying the finny natives of the water.

The Swedish lakes also abound with Salmon, which annually force their way to the furious rivers of Torneo and Keimi, where their arrival invariably announces the leafing of the oak and ash, the lime and alder, the flowering of the marsh marigold, and the appearance of the dragon fly. So invariable are the operations of maternal nature. They reach Motala towards the end of June; a stupendous cataract, which, carrying off the waters of forty rivers that rush through the late Wetten, and empty themselves into the Baltic, near the city of Nordkoping, bears through its channel not less than one hundred and forty thousand cubic fathoms of water. The lake abounds with islands: some are mantled with underwood; others with creeping plants; others again inhabited by fishermen; while on the largest, Wissengoon, appear the ruins of an ancient castle, once the residence of the proud family of Brahe. The shores are rocky, and worn into vast caverns, which anciently afforded impregnable retreats to the natives from the ravages of war. Bold headlands rise on every side, clothed with ivy or dark pines, and presenting all the ruggedness of untamed nature.

The wanderings of the traveller* once conducted him to the shores of this magnificent lake at the season of the Salmon fishing. The day had been remarkably fine, but towards evening the appearance of nature indicated an approaching change. The heavens were overspread with clouds, hollow gusts of wind came down the mountains, and the wild fowl hastened to their coverts in the rocks. Suddenly the phantoms of cities, towers, fleets, and armies, strange mimicry of real objects, appeared to sweep over the lake. Sulphureous vapours ascended from beneath the waters, and subterraneous noises burst forth from the neighbouring caverns. These extraordinary appearances were the preludes of a storm. They resembled in some respects the *fata morgana* of the Sicilians; but instead of a glorious vision of groves, colonnades, gardens, and pilasters, fiery appearances seemed to ride the waves, and waterspouts and whirlwinds succeeded them, with all the terrible accompaniments of the arctic regions. At this moment, the energetic exclamation of the Psalmist burst involuntarily from his lips:—

> Jehovah! the floods lift up,
> The floods lift up their voices,
> The floods lift up their waves,
> As the voice of many waters,
> Mightier than the breakers of the sea;—
> Mighty on high is Jehovah.—*Psalm* xciii. 3, 4.

* From whose letter the extract which begins this was made.

These are the trophies of thy Power; here are the manifestations of thy Love! Who can gaze upon the one, without deep sentiments of awe and veneration? who can regard the other without feelings of abiding confidence and adoration? Myriads of living creatures are constrained, at thy word, to quit the deep recesses of the ocean, and to wander up the rivers at the very moment, and in the only season, when it would be possible to surmount them. And why do they thus exchange the oozy and sheltering bosom of the sea for the beds of stony rivers? Because thou rememberest in mercy the wants of thy poor dependent children. To HIM, who touches the mountains, and they smoke; to whom the whirlwinds and the tempests are the messengers of his will; to the Almighty and most Merciful, be glory and everlasting honour.

Adieu.

LETTER XIV.

MIGRATIONS OF THE COD-FISH.

To * * * *

In what language shall we speak of the scenery that extends before the farm of Almahalan: it is magnificent! To the left, the rugged and forbidding aspect of the larva is in some degree enlivened by a number of small birches, that spring from the numerous rents and chasms. Beyond this, appears a tract "which no fowl knoweth, and the vulture's eye hath not seen;" which man, with all his boasted powers, cannot, and dare not approach. To the right, a range of lofty headlands lift their conic summits to the heavens, girdled with silver clouds, and deeply indented with rocky valleys, the solemn gloom of which presents a striking contrast to the vividness of the surrounding scene. Further on, in the same direction, a pile of

ice mountains reflect the dazzling beams of the sun. They appear to the shivering sailor, when seen from a distance, white and shapeless, like a misty atmosphere; but exhibit, on a nearer view, the appearance of innumerable spangles flying off from the wavy surface of the snow. A phenomenon thus beautifully noticed by Derzhaven, in his magnificent hymn to the Deity :—

> " And as the spangles in the sunny rays,
> Shine round the silver snow, the pageantry
> Of heaven's bright armour glitters in thy praise."

The sea is rolling in fine undulations on the shore, and shoals of the genus Gadus, or Cod, one of the most valuable of the migratory species, which delight in cold climates, and principally take up their abode between the latitudes sixty-six and fifty, are seen advancing from the polar regions, and filling every bay and creek in the insulated shores of this volcanic island, where, besides supplying the natives with one of their most important articles of food, they afford a valuable barter for foreign productions. Their numbers are so incalculably great, that the Icelanders principally supply the north of Europe with dried cod-fish, through the medium of the Danish merchants, who also send considerable cargoes into Spain, and along the shores of the Mediterranean, where they are purchased by the Catholics during Lent.

The *vertima*, or fishing season, which invariably takes place about the tenth or twelfth of May, has now commenced. A stranger would imagine that the whole population of the island was advancing towards the sea, and indeed a large proportion of the inhabitants repair at this period from their solitary villages and dwellings, to the Southern and Western coasts; those of the North and East being entirely unproductive, from the quantity of polar ice that completely blocks up every bay and creek. The fishermen provide themselves with a dress of seal-skins for the purpose of excluding the water. They go in their little skin-boats, which generally contain six or seven hands, besides the steersman, and row to a considerable distance, where they continue fishing till the evening, when they return fatigued to their huts. The unloading of the boats, and carrying home the fish, is then the occupation of the women and children, who afterwards spread them on the rocks to dry, or else suspend them on long ropes, in houses so constructed as to admit a rapid circulation of the air. Innumerable shoals of the same valuable species also repair to the Vestmanna islands, which derive their name from the Irish slaves, who fled to them for refuge in the year 875. The Traveller lately visited them. They are four in number, situated about fifteen miles from the Parent Island, and consist entirely of vitrified rock, occasionally mantled with

a scanty supply of herbage. The Heimdy, or Home Island only is habitable; the interior of this is occasionally varied with masses of larva, and low volcanic hills, said to have been in action at no very remote period. High rocks present a natural barrier to the encroachments of the ocean, excepting at the harbour, where they form a curve in such a manner as to receive the breakers that fall upon them, and to enclose a smooth, secure, and sheltered haven, for the reception of small boats and vessels of various descriptions. Opposite the Vestmanna Islands, appears a magnificent fall of water, denominated by the natives, Drifanda Foss, or the Driving Cascade. It falls from the summit of a rock, at least eight hundred feet in height; and although the rush is by no means inconsiderable, it is frequently prevented from falling by a rapid current of air, which ascends from the foot of the mountain, converts the whole column into spray, and carries it like a cloud into the atmosphere. This beautiful phenomenon gives notice to the Icelandic fishermen, who cross over from the main land to the Vestmanna Islands, that the beach is rendered inaccessible by the furious breakers that drive upon it. When, on the contrary, the Drifanda falls in an unbroken sheet to the base of the precipice, they know that little wind is sweeping at that time along the coast. A similar indication advertises the natives of the island, when they can proceed

with safety from the shore.* Nature uniformly speaks in language audible to the ear of reason, clear to the understanding heart. Impressed with the magnificence of the surrounding scenery, and the tokens every where perceptible, of the majesty and beneficence of the Divine Being, Icelandic fishermen never put to sea, surmount the fury of the billows, or row their little boats into a quiet resting place, without taking off their hats, and breathing an energetic prayer, called in their language, Varasaungo, in which they silently commit themselves to the protection of the Almighty, and solicit his blessing on their labours.

Previous to the discovery of Newfoundland, the principal Cod-fishery subsisted in the Icelandic seas. The English resorted thither during the reign of Henry V., who is said to have given the Danish monarch satisfaction for irregularities committed by his subjects. Yet, notwithstanding these concessions, the English were afterwards excluded from the fishery, and forbidden to resort there, under forfeiture of life and goods. This law continued in full force till the reign of Edward IV., when, we are informed by Rymer, that a ship from Hull was licensed to sail for Iceland, though the Danes still endeavoured to monopolize this important branch of commerce. At one period of our history, even the potent Eliza-

* Mentioned also in Dr. Henderson's Icelandic Tour, 261.

beth was constrained to solicit the concurrence of Christian IV. of Denmark; nor was it until she felt herself securely seated on the British throne, that she instructed her ambassadors to insist on the right of free and universal fishery.

But the shoals which now excite so much interest and animation, will soon forsake the shores of Iceland. Steller sighed when he beheld the wandering Albatrosses leaving the straits of Bering, and winging their flight towards the milder regions of the south, from which he had long been separated. "I too," said the traveller, "contemplated with indescribable emotion, the glittering squadrons of the genus Gadus, when steering for the coast of Britain."

These vast shoals advance from the Icelandic seas, with scarcely any apparent diminution of their numbers. They come down in myriads upon the Feroe, Orkney, and Shetland islands, where their arrival diffuses universal gladness, and the fishing season immediately commences. About the beginning of July, they pass from the Oceanus Caledonius of Ptolemy, the Northern Ocean of modern times, leave behind them the Orkney Islands, whose lofty summits appear to spread along the horizon, as they faintly exhibit the rocky fronts of those bold promontories that sustain the weight of the vast currents from the Atlantic, and advance in innumerable shoals, though with diminished numbers, to the Dogger Bank, so

long celebrated for its extensive fishery. This bank commences at the distance of twelve leagues from Flamborough, and stretches across the ocean till it unites with Hornriff, a narrow bank terminating on the coast of Scotland. To the south of this celebrated place, extends a vast and dangerous sweep of sand, denominated by sailors, the Well, or Swart. Between these, the channel deepens to at least forty fathoms, and forms that extensive basin, which is called the Silver Pit, so much noted for the Cod-fishery that supplies the London market. Leaving the Dogger Bank, they spread along the shores from Flamborough Head to Durham. A bold, characteristic scene. The coast high and rude, indented with bays, and varied with little fishing villages, built among the cliffs, and filling every projecting ledge, in a manner analogous to those of the peasants, in the picturesque and rocky parts of China.

At this interesting point, the stupendous and snow-white rocks of Flamborough, commences the hard and rocky coasts of this side of North Britain, which continue, with the interruption of a few sandy bays and lowlands, to the extremity of the kingdom. The bed of the ocean partakes of the same character. In the vicinity of Flamborough Head, its peculiar ruggedness affords a secure retreat to Lobsters, and crustaceous animals of various descriptions. A fine tract of sand succeeds, sloping eastward, from one to

five miles; at the extreme verge of this, the bed of ocean assumes its usual character; and as far as the Dogger Bank, it is rugged, rocky, and cavernous, overgrown with corallines and marine plants, the haunts of innumerable fishes.

This admirable arrangement is attended with many advantages to the inhabitants. The shelving shore on the one hand; on the other, the edges of the Dogger Bank, are admirably adapted, like a natural decoy, to direct the progress of the immense shoals of Cod which annually migrate from the Northern Ocean. To these, the submarine plants and insects yield a plentiful supply of food, while the cavernous parts of the scarry bed in the channel, between the rocks and shores, afford shelter to their defenceless young. In like manner, the Gadus *æglefinus*, or Haddock, resorts to the shores of North Britain, in innumerable numbers. These, as well as the preceding species, delight in deep and tranquil waters, and carefully avoid the agitated currents of the shallows. When the weather is tempestuous, they sink into the sand, and ooze, at the bottom of the sea; whence they rapidly ascend, as soon as the storm is over, and the sun shines bright on the surface of the water. While, on the contrary, Skates, Hollibuts, Flounders, and other flat fish, burrow in the soft sand, and thus secure themselves from the turbulence of the waves. Haddocks appear on the

Yorkshire coast, about the tenth of December, and continue till the end of January. They come down from the northern regions in myriads: their shoals, which are packed so closely together, as barely to admit the motion of their fins, generally extend five miles in length; in breadth, from Flamborough Head to Teignmouth Castle, perhaps, even to Berwick on the Tweed. They are attended by whole brigades of Pirate Sharks, which flank and prey upon the moving squadrons. In short, their numbers are so incalculably great, that within the distance of a mile from Scarborough, three fishermen frequently load their boats, or cobbles, with a ton of Haddocks, at least thrice in the day. The inner edge of these enormous shoals is invariably a mile from the shore, and if the fishermen put down their lines beyond a certain point, they catch only the Dog-fish.

Haddocks, during the summer season, principally subsist on young Herrings, and small fish of various kinds. In winter, on such stone-coated worms, as abound in the sites they occupy. They are evidently designed to answer an important purpose, in the general economy of nature. The annual millions that frequent the Yorkshire coasts, approach the shores as if commanded to present themselves to the expecting inhabitants, and retire precisely at the period, when no longer fit for use.

Other species of the same invaluable genus are

also found along the shores of Flamborough in myriads. The Whiting, an elegant little fish, beautifully varied with silver and pale brown, appears on the Yorkshire coast early in the spring. Their glittering squadrons keep at a distance of about half a mile from the land, where they produce a most beautiful effect, while gently riding on the azure billows, and floating and sparkling in the sun.

And now, vast shoals of the Coal Cod Fish, which derives its name from the sable colour it occasionally assumes, are seen gliding on the currents of the Northern Ocean, in such closely embodied groups, that for several weeks it is impossible to dip a pail into the sea, without drawing up considerable numbers. This species is apparently attracted to the Yorkshire coast by its rocky and deep recesses. They also swarm around the Orkneys, where they form the chief support of the poor population.

To these, succeed the Green and Pollack Cod Fish. The latter, during summer, are seen frolicking in vast numbers on the surface of the water, and throwing themselves into a thousand different forms. Their construction wonderfully harmonises with their agile wandering kind of life, and the turbulent seas which they inhabit; now riding on the currents of the ocean, now remaining stationary at the base of perpendicular rocks, in the midst of rough and rapid seas.

Again, and yet again, innumerable shoals, with here and there small isolated squadrons, of varying character, or more solitary habits, appear advancing from the north. The Pout Cod Fish, sparkling in the sun like silver, and spangled with bright spots. The Bib, appearing as if enchased in gold. The Power, the only species with three dorsal fins that visits the shores of the Mediterranean, which, like the Manna that descended to the Israelites, from the same bounteous hand that directs the movements of the finny tribes, is excellent at the period of its arrival, but equally incapable of being preserved for any length of time. The Hake, formerly resorting in June and September, to the shores of Waterford, in such vast squadrons, that six fishermen with hook and line, would often capture one thousand in a night. Now characterised as a wandering, capricious vagrant, continually changing his usual haunts, when pursued or harassed by his marine enemies, interrupted by the injurious eagerness of the fishermen, or deterred by the want of insect food. The Forked Hake, of a dull cinereous brown, relinquishing the turbulent and rocky coasts of our own country, for the calm waters and classic shores of the Mediterranean. The Ling, affecting the stormy seas that surround the Scilly Islands. The Two-bearded, distinguished by the reddish yellow of its head and body; and lastly, there is the Bearded Cob, of the same generic ap-

pellation, whose appearance is welcomed with the utmost delight by the inhabitants of Cornwall. The Barbot, a dusky, uninteresting fish, is rarely, if ever, discovered on the shores of Yorkshire. He prefers tranquil waters, and is found in the lakes of Geneva, Maggiore, Lucana, and in the great east fen of Lincolnshire. Nor is he wanting to the Trent, which, according to poetic legends, derives its name from the thirty kinds of fishes that frequent its waters, and from its thirty tributary streams.

> "The beauteous Trent, which in itself enseams
> Both thirty sorts of fishes, and thirty sundry streams."

The Torsk prefers, on the contrary, the coldest and most tempestuous seas, and swarms around the Shetland islands, and the Orkneys, where it constitutes, in a dried state, a considerable article of export, and is there known by the name of the Hard-fish.

Such, with the exception of the Lota and the Torsk, are the varieties of the genus Gadus, which resort to the shores of Flamborough. No one species is seen to mingle with another; no individual intrudes upon the province of his neighbour. Each belongs to a republic, but the Pollack knows nothing beyond his own immediate sphere of action. He is totally ignorant of the laws, if such there be, that regulate the commonwealth of the Green Cod Fish, Hollibut, Whiting, and those of his numerous relatives.—

The greatest danger, the most pressing necessity, would not induce the one to throw himself upon the mercy of the other; nor, if he attempted to avail himself of the qualities he is endued with, in common with his relatives, could he expect to meet from them, either kindness, hospitality, or compassion. He would not even find among them a temporary asylum, for every individual tenaciously preserves his own locality, sensible, apparently, that he has some peculiar duty to perform. This extraordinary adherence, undoubtedly results from the command of that great Being, who constrains all the various parts of nature to act in concert. Were it otherwise, the strongest would expel the weakest from their domains, and wandering, or capricious animals, might intrude upon the province of the more industrious.

Let us now return to the native regions of the Cod, and observe their further emigrations towards the east. Innumerable shoals pass within sight of the Uralian chain, the ancient Riphai Montes, beyond which the ancients placed the Happy Hyperboria, termed by the Russians, the Girdle of the World. They sail at a short distance from the Altaic chain, a vast range of mountains, rugged, precipitous, covered with snow, and rich in minerals; the southern boundary of the icy seas. They sweep along the coast of the wooded, and morassy Siberia, and after passing the cheerless regions of the Tschutschi, pour

through the sea of Anadif, and spread along the peninsula of Kamtschatka.

But in order to understand the incalculable benefits conferred by the migration of this valuable species on one of the most inhospitable regions of the globe, it will be necessary to take a nearer view of the Peninsula itself. Its low coasts are faced with cliffs, and guarded by rude aspiring rocks, the haunt of Leonine Seals, whose dreadful roarings are frequently the preservation of mariners, by warning them of their danger when enveloped in the thick fogs, that during winter abound on this inhospitable climate. Far above them, high rocky mountains lift up their conic summits, shrouded in snow, smoking with volcanic eruptions, or bursting into whirlwinds of flame, succeeded by clouds of smoke, which darken the whole atmosphere, till dispersed by showers of cinders and of ashes, that often cover the country for thirty miles round. During winter, the cold is intense. Snow remains on the ground, from six to eight feet in depth, as late as May. High winds also, generally prevail, and these, passing over the frozen wilds of Siberia, add to the keenness and rigour of the season. About the middle of June commences the transient summer of these cheerless regions, which continues till the middle of September, if a season filled with rain, and mists, and ungenial skies, is deserving of this name. Rye, oats, and barley are then sown, but

they seldom attain perfection, and the inhabitants depend upon importations from Siberia. Grass occasionally grows to a considerable height, and hay is harvested for the fattening of cattle. But these are merely occasional exceptions; for, saving a few isolated spots, the ground is incorrigibly barren. Yet even here the same providential care is wonderfully evinced, to compensate in some degree for the disadvantages of climate and situation. The seas and rivers abound with Cod, as well as with different species of the Salmon genus, and these constitute the chief riches of the country. The sea, on which the inhabitants depend for their subsistence, is admirably adapted for the retreat and preservation of the finny tribes. It consists for the most part, of deep valleys and lofty mountains; and in the close recesses of the one, or beneath the shelter of the other, they continue undisturbed during the most tempestuous seasons; for so terrific are the whirlwinds, and the storms of thunder and of lightning, which sweep over the Kamschatka seas, that the chain of submarine mountains, connecting the Kurile isles with the termination of the great Peninsula, are frequently exposed to sight; a level and uniform surface would consequently be agitated to its very depth. Shell-fish are unknown in those tempestuous regions. The reason is obvious. Their slender moorings are insufficient to anchor them in safety amid the strife of contending elements. How

then are the inhabitants of the deep provided with a supply of food? Innumerable sea-weeds strike root in the fissures of the marine rocks, or find a secure shelter in the sandy coves which extend into their giant bases. Steller enumerates a great variety; some peculiarly elegant, others affording an harbour to such water insects as supply the food of aquatic natures. And these are not less deserving of attention than the animals themselves. The same variety is discoverable in their construction, the same adaptation of means to produce a desired end; each is put into a condition to provide for its own safety, or to procure subsistence. Could any naturalist pursue them to their retreats, he would find none of them inactive, none lying dormant in the fissures of the rocks, or regardless of what is passing around them. All is activity and life; for even the crawling worm, or buzzing insect, perceives what is most beneficial to itself, steadily pursues and constantly adheres to it.

"From every chink
And secret corner, where they passed away
The wintry storms, or rising from their tombs
To higher life, by myriads forth at once
Swarming their pour . . . . .
Ten thousand forms, ten thousand different tribes
People the air. To sunny waters some
By varying instinct fly, where on the waves
They sportive whirl; or, sailing down the stream,
Are snatch'd immediate by the quick eyed trout
And darting salmon." *Thomson.*

We now pass on to the coast of Newfoundland; a well known island, situated on the western shores of America, and celebrated for its extensive fishery. Towards the south, the country is hilly, but not mountainous; towards the west, the cliffs ascend to a commanding height, and terminate in lofty headlands. The interior is varied in some parts with morasses, inland lakes, and ponds of considerable extent; in others, with swampy mountains, vast forests, or steep sandy eminences, which fatigue, without rewarding the labour of ascending, and appear, as far as the eye can reach, covered with stunted birch trees, dwarf hazels, spruce, or fir. The climate is equally cheerless, and sterile; the soil requires great industry to render it productive, and even the best directed efforts are continually liable to be frustrated, by the severity of the weather. We observe accordingly, that myriads of Cod Fish resort to its inhospitable shores; a species which rapidly decrease in proportion as we advance towards the south, till they cease, in the Straits of Gibraltar, at the exact point where they are no longer necessary.

The principal fishery lies on the southern and western sides of the great bank, which stretches about two hundred leagues from the north east, to the south west. The water on the bank is from twenty-two, to fifty fathoms in depth; on the outside, from sixty to eighty; on the inner nearly the same. The

whole is a vast submarine mountain, five hundred miles long, and nearly three hundred broad, the situation of which is rendered visible to sailors, from the great swell of the sea, and the mists that continually impend above it. The fishing season is divided into two parts. That on the shore commences about the twentieth of April, and terminates about the tenth of October; that on the bank, by far the most productive, begins the tenth of May, and continues till the latter end of September.

This valuable station was first discovered in 1496, by the celebrated Sebastian Cabot, and his three sons. Henry VIII. wanted either energy or foresight, to avail himself of such an important acquisition. He neglected the overtures of Cabot, as he had previously rejected those of Columbus, although the one would have insured to himself, and his descendants, the sceptre of the new world; the other, to his subjects a lucrative and steady branch of commerce. The French, accordingly, monopolized the benefits resulting from this valuable acquisition; and of all the mines, says Lord Bacon, which adventurers have discovered, there are none like those of the Cod fisheries. But the English government soon became aware of the advantage they were rejecting, and a private gentleman, brother-in-law to Sir Walter Raleigh, animated by the same enterprising spirit, sailed to Newfoundland, in the year 1583, with every requisite

for settling this important colony. On his return, he encountered a dreadful storm, which terminated his gallant course. Yet, notwithstanding the dangers that surrounded him, and the little prospect of surmounting them, he was seen tranquilly sitting at the helm, with a book in his hand, and was heard to exclaim, "Courage, my lads, we are as near heaven while at sea, as on shore." Such were the last moments of this extraordinary man, who is, perhaps, not less deserving the favourable suffrages of posterity, than the most distinguished of his countrymen in that enterprising age.

If we extend our observations from those sterile regions towards Nova Scotia, we discover the same providential arrangement, the same bleak, inhospitable country, the same myriads of annual vagrants. This celebrated province is peninsulated by the Atlantic Ocean, and the Gulf of St. Lawrence. A narrow isthmus joins it to the main-land. The climate, during winter, is extremely severe; the summers damp and misty; the ground unfavourable to agriculture. Vast forests abound in many parts, although the trees are generally small, and unfit for the building of large ships. But, as if to counterbalance the deficiences of soil and climate, the vast banks called Table Island, Browns, and St. Georges, with many others, are frequented by amazing shoals of Cod Fish. The Psalmist beautifully observes, that the works of Deity are great and wonderful, and

worthy to be sought out of all that have pleasure therein. Or as the Hebrew signifies, carefully, and deeply looked into, sedulously observed, and inquired after. And surely the departure of the Cod at a certain period, from between the latitudes sixty-six and forty-five, the plenty they diffuse along the shores of Iceland, the beautiful phenomena of the Driving Cascade, their gradual progress towards the Orkney, Shetland, and Feroe Islands, the admirable situation of the Dogger-bank, the natural decoy afforded by the shores of Great Britain, the nature of the surrounding seas, the different species which resort to them, and their gradual disappearance in the exotic regions of the globe, — their progress towards the east, the character of the countries which they visit, the blessings they confer on each, and especially the astonishing instincts that incline them to press forward in their perilous migrations; all these particulars may instruct us to believe that they are deputed by the sovereign Lord, and Preserver of the Universe, to benefit the family of mankind, wherever such benefit is necessary. And it has further occurred to me, from the serious consideration of these extraordinary phenomena, in which my undertaking has engaged me, that we ought not to neglect inquiring into the advantages that result from such potentous instances of the wisdom of the Creator. For undoubtedly, he did not control the

instincts of so large a proportion of his creatures, that the facts should be regarded with a careless or incurious eye. No, he designed that the wonders of creation should be admired by those whom he made a little lower than the angels. He appointed them as mementos to the world, as magnifiers of his power, as demonstrators of his unerring wisdom, as arguments to excite a constant fear of Him, who spake, and they were formed; and thus to excite a steady and heart-felt obedience to his laws.

Adieu.

LETTER XV.

THE MACKEREL.

To * * * *

In speaking of the Mackerel genus, I must again refer to the letters of the Traveller, and shall transcribe from them the following interesting memoranda:—

"The glittering squadron of the Mackerel genus (*Scomber, scomber*), are now advancing to the shores of Crete. They beautifully harmonize with the scenery of this enchanting island. For here the sky is unclouded and serene, the winters are mild and refreshing, the mountains flow down with the most limpid streams; and these, as they murmur through the valleys, are overhung with myrtles and laurel roses.

"The wandering emigrants, which are filling every bay and creek, repose under the shade of orange and almond trees, that droop their graceful branches

over the water; while above them, a multitude of odoriferous and balsamic plants appear to smile along the shores. There are dispositions of the soul, in which a pleasing emotion blends itself with all our feelings. I cannot describe the impression made upon my mind by the sudden appearance of these glittering shoals; they seem to transport me by a magic power, from the shores of Crete to those of my native land. Strange mobility of the imagination, eternal source of our enjoyment and our pains!"

This graceful species, which we define to be a summer fish of passage; round, without scales, terminating nearly in a point, and beautifully varied with azure, green, and silver, also visits the shores of Britain in amazing numbers. They generally inhabit the European, American, and Atlantic oceans, and are said to live embedded in soft mud, beneath the vast crusts of ice surrounding the shores of the Polar Sea, where they are protected from the effect of frost during the severity of the northern winters. A fact confirmed by Mons. Pleville, Le Peley, and the Count de Cepede. The former was stationed upon the coasts of Hudson's Bay; and here, when the sun shone bright, he frequently observed that the ice which encrusted the small clear hollows around the coast, was entirely bristled over by the tails of mackerel, bedded for nearly three parts of their length.

But when the orb of day, in his progress from the

southern constellations to enlighten the inhabitants of the Northern Pole, redoubles his light and heat by means of the parhelions, which, like dazzling mirrors, reflect his ardent beams upon the earth; and when he summons to his aid the heated winds, and urges them, as batteries of fire, against the magnificent cupola of ice that covers the extremity of our hemisphere, the enormous vaultage gradually dissolves, detaches itself in fragments, and liberates the prisoners. And now, emerging in innumerable multitudes, they commit themselves to the billows of the ocean, which bear them as far south as the Mediterranean.

The lapse of time produces few, if any, alterations in the habits of the animal creation. The Stork takes her departure from the coasts of the Adriatic, as regularly as in the days of Attila; when, observing this domestic bird preparing to forsake her nest, he resumed the siege of Aquileia, and scarcely a single vestige pointed out the site of that devoted city. The mackerel repairs to her ancient haunts along the shores of Italy, as when that country swayed the sceptre of the world; and still the very stations from which the Roman fishermen cast their nets into the sea, are resorted to by those of modern times.

This species furnished to the ancients not only a luxurious repast, but also the costly *garum*, a kind of pickle, which gave a high relish to their sauces,

and was also used medicinally. The finest, called by way of eminence, *garum sociorum*, was prepared at Carthagena, by a company of merchants, who annually brought into the city a quantity of mackerel, taken near a small adjacent island, denominated, from this circumstance, *Scombaria*. Yet the mackerel is held in less estimation than any other species of gregarious fish, being tender, and unfit for carriage. But as the resources of human industry are generally equal to its wants, this inconvenience is considerably obviated by the method now in general use, of pickling and salting them; and thus the poor population of Cornwall are furnished with provisions for the winter.

The period of their arrival, like that of the migratory species, is held as a kind of festival, and considerable numbers, both of fishermen and spectators, assemble on the beach, in order to watch the indications of their approach. They uniformly arrive at a certain period, and drive the waves into considerable eddies. In the day time they are easily distinguished by the exquisite brilliancy of their colours; in the night they exhibit a phosphorescent light, and beautifully illuminate the surrounding billows.

The Tunny Mackerel is equally celebrated for the variety of its gorgeous tints, and for a peculiarity of construction that enables it to perform long voyages.

This species frequents the British shores in considerable numbers. They are also found on the western coasts of Scotland, where they go in pursuit of the Herrings, Flying-fish, and common Mackerel, in company with large troops of Sharks and Sword-fish, which also attack, and prey upon the moving squadrons. They approach the shore in the form of a parallelogram, and with considerable noise, occasioned by the driving of the water before them. At this period they are very injurious to the fishermen, by breaking during the night into their nets, in order to seize upon the fish they contain, and thus liberating considerable numbers; but while in the act of seizing others, they are frequently caught themselves. The nets are drawn up early in the morning, when the Tunnies rise towards the surface of the water, in order to dart upon their prey. A strong hook, baited with a herring, is then immediately flung out, which the Tunny seizes, and is drawn on shore.

This interesting species enter the Mediterranean during the vernal season, by aid of the very tides that oppose the progress of the Mackerel. They are readily distinguished among the waves, by the unusual brilliancy of their colours, and the rich yellow of their fins and tails; and are seen winning their way along the shores, and into the creeks of many a classic isle.

"Which seen from far Colonna's height,
Makes glad the heart that hails the sight,
And lends to loneliness delight,
Where mildly dimpling, ocean's cheek
Reflects the tints of many a peak,
Caught by the laughing tides, that lave
These Edens of the eastern wave.
And many a summer flower was there,
And many a shade that love might share,
And many a grotto made for rest,
That holds the pirate for a quest."

As they advance from one island to another, the flowers which dip into the water, and the corals that grow beneath them, are rendered visible in the darkest nights; while here and there, the Turtle of dusky hue is faintly discovered on the surface, by means of the phosphorescent lights their movements invariably occasion. The Tunny was a fish of passage, well known to the ancients. The period of its arrival from the ocean was carefully observed, and stations for taking it, established in the most frequented places.

The same stations are most probably resorted to by fishermen of modern days, as considerable Tunny fisheries may be observed on the coast of Sicily, as well as in several parts of the Mediterranean, and Archipelago, where they are taken in large nets, supported on cables, and divided into several compartments, with a common entrance. A fisherman places himself upon the nearest rock, whence he narrowly

observes the progress of the unsuspecting Tunnies, as they pass under the net: when they reach the inner compartment, a signal is given, his companions assemble, and the whole shoal immediately becomes their prey.

"How forcibly," remarks the Traveller, "did the instability of every earthly thing recur to my remembrance, this morning, when surveying the once populous, though now deserted regions by which I was surrounded. On one side, I saw the shores of Sparta; on the other, the thickly scattered isles of Greece; behind, lay Megara, and in the distance, ancient Crete appeared like a cloud upon the waters. And how often, in the silence of a calm summer's evening, when landed on the very spot, where it is recorded by tradition, that St. Paul, and his beloved Titus first announced the glad tidings of the gospel to the astonished islanders, have I seen large squadrons of wandering Tunnies advancing towards their ancient haunts, on the shores of this celebrated island.

"Here I have observed them congregate in such vast numbers, that the inhabitants have been occupied night and day, in fishing, salting, and extracting their oil: I have even seen their bones collected into heaps considerably higher than an ordinary sized house, burnt into ashes, and used for the manuring of the soil. While thus occupied with the contemplations which such a scene was calculated to awaken, every

melancholy reflection has vanished from my mind, I have thought only of that Being, who remembers the privations of his children, and remembers them in mercy."

Adieu.

LETTER XVI.

MIGRATION OF THE PILCHARD.

To * * * *

The Deity, my friend, from the earliest origin of things, has impressed on every living creature, various and important instincts, by which they not only perceive what is most beneficial to themselves, and constantly adhere to it, but also materially conduce to the benefit, and consequently to the general harmony of things.

These instincts, and their appropriation, furnish us with a clue to the migrations of the genus Clupea, among which the Pilchards, a variety of the common Herring, is one of the most numerous and valuable of the migratory kinds. This species may be characterised as a fish of passage, appearing off the Cornish coast, about the middle of July, and disappearing at the end of autumn. They are found

in the highest northern latitudes, and assemble during winter, within the Polar circle, where they continue for several months, and feed upon the insect food, which is even more abundant than in the southern regions of the globe. But in summer they affect a warmer latitude than is afforded by their winter haunts. They appear in myriads upon the shores of Cornwall; to which they almost exclusively confine themselves, or rather, they inhabit a tract of ocean, extending from Towy harbour, to the Scilly Islands, and between these places, the shoals keep shifting for some weeks.

Their appearance is hailed with the same demonstrations of delight, as that of the Sword-fish by Sicilian fishermen. Persons known in Cornwall by the name of Huers, are stationed on the cliffs, in order to point out the progress of the shoals, and to direct the movements of the fishermen, who place themselves along the shores. In the reign of James II. an act was passed for the express purpose of empowering them to enter upon any private property for the sake of Hueing, without being liable to actions for trespass, which had previously occasioned frequent law suits.

It has been well said by Pennant, and said in reference to this very interesting portion of our subject, that the enormous shoals of the genus Clupea, which annually visit the shores of Cornwall, are one

of the most stupendous gifts of Providence, to the inhabitants of the British isles.

Such an assertion may appear extravagant to those who merely take a cursory view of the Pilchard fishery; but the fact is undeniable, the deduction clear.

The fishery itself employs a multitude of hands. Of these, a large proportion find employment on the sea, and are thereby trained to a knowledge of naval affairs; others, with their wives and children, occupy themselves in washing, pressing, salting, and preserving fish; in making boats and nets; in preparing ropes, and casks, and in all the trades depending on their construction, and their sale. The poor are fed with the gleanings of the nets; such as are entirely unfit for use, serve to manure the land. The merchant is enriched, the fishermen both fed and clothed, and moreover, vessels freighted entirely with salt, often sail into our harbours, whence they carry into foreign countries, large cargoes of salted Pilchards, as well as a considerable quantity of our tin. Nor will this appear extraordinary, when we consider the brigades that annually visit the shores of Cornwall.

Towy has alone exported in one year, one thousand seven hundred and thirty-two hogsheads.

Falmouth, fourteen thousand six hundred and thirty.

Penzance, and Mount's Bay, twelve thousand one hundred and forty-nine.

St. Ives, one thousand two hundred and eighty-two.

The whole amounting to twenty-nine thousand, seven hundred, and ninety-five hogsheads,—the cash paid at a medium, for their exportation, being annually forty-nine thousand, five hundred, and thirty-two pounds, ten shillings. It is also worthy of remark, that the number enclosed at one time, amounted to seven thousand hogsheads, each of which contained thirty-five thousand fish.

The Sprat Herring, a graceful little fish, approaches our shores in innumerable shoals, when its relatives have retired to the great northern deep. "Thames, the most lov'd of all the ocean's sons," is one of their favourite resorts. They come into the river about the beginning of November, and leave it in March; during which period, they afford an annual banquet to the poor of the metropolis.

Neither Aristotle, Athenæus, nor Oppian, appear to have been acquainted with that species of the genus Clupea, which modern naturalists designate by the name of Shad. The Alausa of Ausonius, is, however, supposed to be the same; though he tells us, that it was considered unfit for the tables of the rich.

> "Alausa crackling on the embers, are
> Of wretched poverty, the insipid fare."

To which we may add, that Strabo notices the Shad, as one of the very few fishes that venture to ascend the Nile, in company with a peculiar species of Dolphin, armed with a sharp fin, and decidedly hostile to the crocodile; as if confiding in the superior agility of his companion, to elude the attacks of his voracious enemy. The fact of his migration up the Nile, with the Surmullet, is confirmed by Bolonius and Hasselquist. The latter of whom informs us, that the Shad is found in the Mediterranean, near Smyrna, and on the coast of Egypt, as well as in the vicinity of Cairo, where it is eaten, stuffed with pot marjoram, and that, when dressed in this manner, it possesses an intoxicating quality.

The Severn is the most celebrated of all the British rivers for the production of this interesting species. They generally appear at the same time that the song of the Nightingale enlivens its solitary banks, continue in the river about two months, and then disappear. The Twaite, a variety of the Clupea *alosa*, almost immediately succeeds them, though equally disesteemed as the Shad, that frequents the Thames. Its relative, the Anchovy, Clupea *encradsicolus*, an elegant little fish, the back of which is green, and semi-transparent, the sides silvery and opake, inhabits the Northern European Ocean, the Atlantic, and the Mediterranean. A large fishery subsists in Gorgona, a small island west of Leghorn. This species make

the best garum, a sauce in general request at the tables of the Roman epicures.

Such are the different species of the genus Clupea, with the exception of the Herring, to which my next will be exclusively confined.

Adieu.

LETTER XVII.

MIGRATIONS OF THE HERRING.

To * * * *

Some years, my friend, have now elapsed since the Traveller visited the Shetland Islands; but the impression excited by that visit, will never be effaced from his memory. It was early in July. The tempests, which reign during winter, and in spring over these solitary islands, had fled before the influence of Gemini and Leo. The fogs had also disappeared, and the turbulent and narrow seas, which, obstructed by numerous rocks and islands, are generally covered with breakers, or whirl into eddies on the shore, were now comparatively tranquil. In some less agitated spots, they had even subsided into a calm, unbroken surface, which beautifully reflected the high beetling cliffs that rose above them; except when here and there, huge masses of weather-beaten stones, lifted up their conic heads,

round which the billows broke, and were lost in a girdle of white foam.

The surrounding scenery was magnificent. The nearest rocks presented the appearance of steeples, or gothic cathedrals, rising out of the water; some of the more distant, that of vessels in full sail advancing from the westward. The Doreholm rose immediately in front, one side completely circular; the other, which resembled a ruin, was composed of huge fragments, and formed a stupendous arch at least seventy feet in height.

A storm, which had been collecting round the lofty summit of the Doreholm, now burst in fury, and obscured the splendour of the surrounding scenery. The Traveller hastened to shelter himself in a neighbouring cove; above him rose an amphitheatre of enormous rocks, steep, and perpendicular as a wall. A few stunted birch trees started from their fissures, and here and there a mountain ash, loaded with scarlet berries. The summit was crowned with thinly scattered pines, juniper and saplings, bending under the violence of the gale. The echoes repeated the confused howlings of the tempest, and the hoarser noise of the raging sea, which, chafed and pent up within narrow and obstructed passages, raged through them with prodigious violence, dashed furiously over the sunken rocks with the velocity of a whirlpool, and heaved, even in less agitated spots, with a broken

and fearful commotion, such as the sea presents after contrary winds have contended for the mastery of the deep. The sheltered cavern in which the Traveller had sought refuge, presented a striking contrast to the terrors of the surrounding scene. The Dusky Lark had built her nest in the mossy declivities, and at a short distance the Sea-gull awaited the ceasing of the storm. At length the clouds began to break away; the sun again shone forth most gloriously, as if impatient of the partial interruption of his beams; the rocks soon lost the awful character of grandeur and obscurity with which the storm had previously invested them, and stood forth in all their native majesty, beautifully varied with light and shade, and occasionally obscured by floating mists, which sometimes enveloped their lofty heads, and again as rapidly disclosed them. The most distant, appeared to encounter the whole fury of the Northern Ocean, for the wind was high, and the waves beat on them with indescribable fury; while the spray, which had been left on the ledges of the rocks by the recoiling waves, was flowing down in streams like liquid silver. A variety of sea birds, which congregate at this place in considerable numbers, added to the general effect; some were sitting on the cliffs, peacefully contemplating the agitated element, others riding on the billows, and a few majestically sailing in the air above.

The rocking of the waves at length entirely subsided, and the wind died away in a gentle murmur. A number of small boats then advanced from behind the rocks, and the shores were covered with spectators, anxiously expecting the arrival of the Herrings, which uniformly make their appearance off the coast of Shetland, on, or before the twenty-second of June. Suddenly, a loud shout announced that the main body was advancing from the north. Their approach was indicated by a small rippling of the water, by the reflection which their brilliancy produced, and above all, by the clouds of solan geese, garnets, and other ærial persecutors, that flanked and preceded them. The exulting shout, "They are coming, they are coming!" increased as the shoal advanced to the land. It was divided into three columns, of at least five or six miles in length, and three or four in breadth, each of which drove the water before them with a sort of rippling current. They occasionally disappeared for fourteen or fifteen minutes, then rose again, and reflected such a dazzling variety of colours, that it appeared in the distance like a field of precious gems.

"Almighty Being, I see, I acknowledge thy beneficence! Penetrated with admiration, my tongue refuses to keep silence. Great art thou, O Lord! and greatly to be praised. Author of my being, and framer of the wonders that surround me, how great

and glorious art thou, Lord God Omnipotent!" Such was the exclamation of the Traveller, when, standing on a rocky eminence, he contemplated the surrounding objects. The scene was wild, barren, mountainous. The shores difficult of access, rude, steep, and iron-like; in many places totally inaccessible, and flanked with such hideous precipices, as fill the mind with dread and consternation. Yet these sterile regions are the favourite haunts of innumerable shoals of fishes, and abound with the finest and most secure harbours in the world.

Cicero might, on such a spot, have conceived the first idea of his immortal work, concerning the nature of the Gods. Seneca might have delighted to acknowledge that the Almighty, who is eternal, immutable, incomprehensible, creates and disposes of all things by his wisdom, and maintains and preserves them by his providence. And both, might have confessed that he fills the capacity of the deep, and the immensity of the heavens; that all goodness and virtue are alone to be found in him; that he loves mankind with a singular affection, and created them only to make them happy.

The generic appellation of the Herring is derived from the German *beer*, an army, a term which aptly expresses the uncounted myriads that annually migrate from the arctic regions about the middle of the winter. Their progress is attended by hosts of pre-

datory fishes. The Sun-fish, and Cachelot devour them in great abundance; the Porpoise, Grampus, Shark, Cod, and Haddock, with all their numerous and ungraceful brethren, assail them in every direction. Flocks of sea-fowl, which chiefly inhabit the northern regions towards the Pole, also await the moment of their perilous migration, and spread among them extensive ruin and dismay; while the defenceless emigrants crowd together, as if anxious, by the consolidation of their numbers, to increase the hopes of safety. At a certain latitude, the main body separates into two divisions. One, advancing to the west, passes through Baffins Bay, coasts along the shores of stormy Labrador, round Newfoundland, into the Atlantic Ocean, and extends as far south as Carolina, where it is joyfully welcomed by the inhabitants. The savage aborigines of a tract of land lying between Arcadia and New England, are entirely supported, at one season of the year, by these annual deposits of the ocean. They repair to the mouth of one of the largest rivers, where, during the course of a single month, such innumerable multitudes are continually seen ascending, that it is calculated five thousand barrels may be filled in one day. They are taken from the water in baskets, without either line or hook, dried in the sun, and used instead of bread. Floating legions of the same invaluable species also visit the coasts of the bay of

Chesapeake. The waves throw them on the land by myriads, and they have been even known to cover an extent of country three miles in length, though piled upon one another to a considerable height. They also migrate up the different streamlets and shallow rivers of Virginia and Carolina, in such vast quantities, that it is impossible to ford them without destroying considerable numbers.

The other division takes an easterly direction, and falls in with the great island of Iceland about the beginning of March; notwithstanding the diminution they have experienced, their phalanx is still of such extent, depth, and closeness, as to occupy a space equal to the dimensions of Great Britain and Ireland. It is subdivided into columns, five or six miles in length, and three or four in breadth; each line or column being led by Herrings of more than ordinary size. These annual migrations constitute the maritime riches of the island; their numbers are so incredible, as frequently to impede the motion of small boats; and they not only supply the inhabitants with food, but serve, when dry and reduced to powder, as a winter provision for their cattle. Their arrival is impatiently expected by the Norwegian fishermen, who station themselves on different cliffs, and watch for the cetaceous fishes which precede their coming. These, as well as the main body, are uniformly seen approaching on the

currents of the Northern Ocean during the month Torre, or the first new moon after Christmas, and during the increase of the month Gio, which immediately succeeds it. They are followed by the Spring Herrings, a lesser species, approaching nearer to the shores; and again by a distinct variety, known by the general appellation of Summer Herrings. Their progress is attended by a number of large whales, which incessantly pursue and harass them, and dart their water-spouts so high into the air, that the sea appears to be covered with moving fountains. The trembling fugitives, in order to elude their vigilance, rush into every little bay and open creek, and often drive the water, which had previously been tranquil, into considerable surges. All then is bustle and activity; the country people repair in numbers to the shore, and either catch the Herrings in their hands, or take them out in baskets. Yet these are but a small proportion of the vast, and we may almost say, innumerable shoals, which annually migrate from the Northern Seas, and diffuse wealth and plenty along the shores of a large proportion of the European nations. They press on in a southerly direction, borne along by the uninterrupted flood from remote Greenland; and in their progress from the arctic regions, they have frequently to contend with the most tremendous whirlwinds. Those, especially, termed Oes by the Danes, which agitate

the stormy seas that sweep around the rocky Feroes, and lash the billows into foam. These islands are situated considerably to the westward of the most northern Shetlands. They appear in the distance like steep and rocky mountains, faced with precipices, and divided from each other by deep and rapid currents. But why, it may be asked, is this brief description of the Feroe islands? What comports it with the wanderings of the genus Clupea, whether they are wild, precipitous, rocky, mantled with a scanty garniture of shrubs and stunted trees, and moor grass, and still more thinly scattered with inhabitants; or whether nature has embellished them with scenes of beauty and luxuriance, surpassing the fabled gardens of the Hesperides? Because a general knowledge of the countries, along the shores, and up the streams of which these vagrants annually ascend, serves to elucidate the incalculable blessings they confer on the expecting inhabitants. That bounteous Hand, which at one season of the year directs the Gull, the Puffin, and the Hawk, to build their nests upon the cliffs of these inhospitable regions, at another, controls the progress of the annual myriads, which, descending from the furthest north, are seen to spread along their rocky shores, supply the present wants, and dissipate the fears of those who anxiously await their coming. And now the same impelling power urges one division to

journey on along the western side of Britain, while another branches to the eastward, and pays a tribute to the Orkneys, the Murray Frith, the coast of Scarborough, and the bold projecting shores of Yarmouth, the ancient, and at one period, the only Herring mart in Britain. Those which compose the first brigade are uniformly larger and much finer than the second; they pass the Shetland and Orkney islands, and crowd into the lakes and bays, and narrow channels of the shores of Sutherland, Ross, and Inverness, which, together with the Hebrides, form the greatest stationary fishing in Britain, if we except the coast of Shetland. Still journeying on, they edge occasionally upon the shores of Argyleshire, fill every bay and creek, and visit, in small detachments, the Frith of Clyde, Lochfine, and other lakes within the entrance of the river; the coasts of Ayrshire and of Galloway, to the head of the Solway Frith. But who shall number the vast shoals which crowd the clear and sparkling surface of "auld Lochfine!" Here is a subject for the artist,—a scene rather to paint than to describe. The mental eye, glancing back to its graphic details, beholds the busy scene of the Herring fishery, which imparts to the magnificent environs of Inverness a new and animating character. Light, flying clouds begin to shroud the lofty mountains, which extend towards the north; the landscape at their base is grey with

shadows, and yet their peaked heads reflect the glory of the setting sun long after he has disappeared from the sight. The shore is covered with spectators, and innumerable boats appear in all directions. Of these, a considerable number are seen advancing from the open sea; others steer along the narrow and winding shores, which give to this magnificent inland sweep of ocean all the variety and beauty of a fresh-water lake. And hark to the cheerful notes of the bag-pipe! Every little vessel has its own performers, and set of supernumerary hands, who dance and ply the oar, and cast the net by turns. But now the Sabbath dawns, the day of sacred rest.

> "How calmly all
> Sleeps in the stillness of the sabbath morn!—
> As if to sanctify the hallowed day,
> The Spirit of Peace, on the mild Zephyrs borne,
> Glides gently on the tranquil morning ray;
> And in a solemn pause, all nature seems
> To feel the present Deity."
>
> *Matins and Vespers.*

The ships are moored to the shore, the song and dance are laid aside, and psalmody and devotion divide the hours of the day; for the peasants of the north are religiously inclined, and their good principles are further confirmed and stimulated by the examples of a gentry, uncorrupted by luxury and dissipation, and by the instruction of a clergy, who are active in their duty, and venerated by their

people, and who are able to command respect, amid all the disadvantages of narrow incomes. But neither Inverness, nor auld Lochfine, nor even the clear sparkling waters of the Frith of Clyde, nor the bold headlands of Ayrshire, Galloway, nor yet the bonny banks of Solway Frith, have power to detain or charm the wandering natives of the deep. Closely embodied groups, diverging from the western shores of Scotland, proceed towards the north of Ireland, where, meeting with a second interruption, they divide into two brigades. One passes down the Irish Channel, visits the Isle of Man, and affords an occasional supply to the east of Ireland, and the west of England, as far as the British Channel. The other, still more adventurous, skirts along the western shores of the sister kingdom, where, after visiting the lakes of Donegal, it gradually disappears, and is finally lost in the immensity of the Atlantic.

Such is the furthest migration of this valuable species. They are unknown in the southern parts of France, on the shores that encircle the Mediterranean, or the coasts of Africa. Their annual visitations are adjusted with the most scrupulous precision to the character of the countries along which they pass. And wherever we observe that a tract of land bears the aspect of desolation, that the soil is meagre, and the climate unusually severe; there the naturalist will invariably discover that the moving harvests

of the ocean are abundant, and that clouds of sea-fowls assemble on the rocks.

Thus, in accordance with that general system of compensation, which, as I have frequently had occasion to remark, counterbalances the disadvantages of local situation by some peculiar and beneficent arrangement in its favour, we observe that a considerable proportion of the western division, enters the Baltic, and spreads throughout the swampy and artificial shores of Holland, where their arrival is hailed with as much delight as the Egyptians express at the overflowing of the Nile. The cities which extend along the borders of this island sea, have been enriched from time immemorial by these annual deposits of the ocean, and still continue to derive from them a source of wealth, which Bacon justly pronounced to be more conducive to the real prosperity of a country, than the diamonds of Golconda, or the gold mines of Peru. Because they employ a hardy race of people to obtain, preserve, and salt the myriads of fishes which the sea propels within their reach, and enable the merchant, by freighting to other countries large cargoes of dried fish, to diffuse throughout his own, the productions of more favoured climates. In proof of which, it is asserted that, during the eleventh and twelfth centuries, such innumerable shoals repaired from their winter haunts into the sheltered waters of the Baltic, and brought in

quest of them so many vessels to the isle of Rugen, the seat of the ancient Rugia, that the commercial part of the Danish population clothed themselves in scarlet, purple, and fine linen.

The straits of Sunda, between the islands of Schonen and Iceland, have been resorted to by the genus *Clupea*, as far back as the researches of natural history extend. We are indebted to her annals for the extraordinary fact, that in the thirteenth century, such incalculable multitudes thronged for two months into the strait, and spread along its shores for several leagues, that the sea was literally covered with them; and that for the same length of time, and over an extent of equal distance, forty thousand boats, and three hundred thousand foreigners and Germans were employed in the fishery by night and day.*

But how shall we account for the annual migration of such extraordinary shoals of the family of *Clupea*? Does it proceed from a deficiency of insect food, or shelter; from the excessive rigour of the Arctic winters? or are the seas of the northern regions invaded at certain seasons of the year by watery nations, inimical to their pursuits and safety? None

* I am aware that some modern writers endeavour to discredit the accounts given by Pennant, respecting the migrations of the Herring; but till their objections are founded on observations as accurate as his own, I shall adhere to the opinion which he has given.

of these things molest them. The bed of the ocean which encircles Iceland, and stretches away towards the farthest north, is cavernous and rocky; a fact established by the construction of the sea weeds, and the fuci that are continually thrown on shore. The waters swarm with insect life, to a degree unknown in warmer latitudes; they also furnish abundance of shell-fish, medusæ, and echini. Such large aquatic animals as inhabit the Northern Ocean are even less rapacious than many of their southern relatives. How then shall we explain the migrations of these innumerable brigades? Why do they leave their native regions, which are so bountifully replenished with sufficient for all their wants, and set out on a distant and perilous migration?

Permit me to recall to your remembrance an observation I have previously made. Whenever we discover that a general plan is pursued, yet modified or varying, according to the exigences of different situations, we possess the strongest evidences of intelligence and design.

The genus *Clupea* forsake their native haunts for the express purpose of depositing their eggs in warmer seas, and thus exposing them to the vivifying influence of the sun. The new-born fry instinctively approach our shores, in the months of July and August, whence they return to their parental haunts beneath the ice, and thus repair the vast destruction

of their race during the period of their perilous migration. Here they continue, in company with various other species, till the beginning of the spring, when they again set out, revisit the places of their birth, and there confide to the maturing influence of the sun, the production of another generation.

Who can reflect, without veneration and astonishment, on such stupendous instances of wisdom and beneficence in Him who thus imparts to every living creature those qualities which are most suitable to its nature, and to every order of being, its peculiar advantages! He originally impressed on this most useful part of the creation, that instinct which impels them to forsake, at certain and invariable periods, the vast Polar deep. He controls and guards their progress over the untrodden paths of the great waters. He directs their annual visitations to the most unfruitful regions of the globe. He causes them invariably to observe and keep the limits which he has prescribed them. And never, from the origin of things, has the same merciful Creator of the universe, denied this promised blessing to the expectation of his creatures.

These striking facts, though known in modern times, were evidently unobserved by the ancients. With what a burst of eloquence would David, standing on the shores of the Arctic regions, have witnessed

this annual migration toward the south. With what emotions would he have gazed on the population of Britain and Scandinavia, hurrying towards the coast, and receiving the moving harvest thus impelled into their nets!

Adieu.

CONCLUSION.

WHAT a glorious subject for contemplation would be afforded to a being of superior intelligence, were he to cast his eye over the magnificent world of waters, and survey at once, the springs that renovate the abyss, the foundations of the islands, the groves of coral, the beautiful marine plants, the ebbing and flowing of the tide, the busy, restless, and unceasing operations of the myriads of beings instinct with life, that swarm upon its surface, and hunt for prey, in those unfathomable recesses, which like the creatures that inhabit them, never receive a ray of light, but through the medium of water. Conceive him standing on the margin of the green earth, and looking down through the ocean that flows as a mirror at his feet; feeling the force of the winds, and understanding without an effort, the causes and designs of its invariable operations, and the instincts of the active creatures which it conceals beneath its bosom. Imagine too, that he could observe the bounds that are prescribed them; the countries to which they annually repair, and the blessings they confer on each. Then place yourself beside him, and tell me if the wonders of such a scene are less deserving of attention, than the

vicissitudes of day and night, the order of the stars, and the glorious sun, the milder moon, and the fruits and flowers, seed-time and harvest, with all the changes of the seasons. O Thou, who hast given me to take pleasure in tracing the evidences of thy goodness in the wonders of the ocean, to look from them to thee, and to delight in acknowledging that thou hast formed and preserved them; do Thou inspire me with a portion of the divine spirit that pervades thy works, that I may be enabled to illustrate the manifestations of thy wisdom, beneficence, and power, in this part of thy creation!

There is darkness at the Northern Pole, a deep impenetrable shade on the surface of the Frozen Ocean. Myriads of living creatures are sheltered beneath its bosom; while the dens and caverns, and the vast pine forests that extend along its bleak inhospitable shores, are the resort of bears and arctic foxes. The moon is gliding on the verge of the horizon, and the dark woods, and shrouded rocks which rise above them, cast a dismal shade on the wastes of untrodden snow. Now she has set, and not a single object is distinguishable. At length a pale, glimmering light appears towards the east, it rises higher and higher, and grey twilight spreads across the plains; now the sun is seen travelling up the cloudy heavens, his glorious orb ascends above the thick ribbed mountains of eternal ice. Frozen nature, appears like

him who, at the voice of One that dwelt with God, and was God, "felt life and heat rekindle through his palsied limbs." She rises, as if from the slumbers of the grave; the birds dart forth from their shelter in the woods, and bears and foxes descend, growling, towards the sea. The darkness that brooded over the surface of the waters gradually disappears; the heated Pole pours forth in every direction torrents of water, and melted ice; and the myriads which took shelter beneath the crystal pavements that extend from one island to another, now start forth, as if rejoicing in the feeling that they are alive.

Closely embodied groups of the Mackerel genus, commit themselves to the currents of the ocean. They are seen coasting along the gloomy shores of different islands, in quest of some tranquil bank, where they may deposit their eggs in safety. Others, as the numerous tribes which form the genus Gadus, press on in their perilous migration towards the places that are appointed them, and where their arrival diffuses incalculable blessings, throughout a wide extent of sterile, sandy, and frost-bound regions. To these, succeed floating legions of the Herring genus. They are seen advancing from one latitude to another, attended by numerous cohorts of sea-fowls, and shoals of larger fishes. Sharks, Cachelots, Sea-hounds, and Whales, which look like moving fountains, braving the furious surges that

rage around the rocky shores of Norway, the hurricanes of the Atlantic seas, the whirlpools of the Feroes, the narrow passes of the Shetlands and the Orkneys; still pressing towards the north, and exposing their silvery legions to glitter in the sun on the northern strands of Europe and America. Others, as the Salmon genus, which delight in general to make their way against the course of the most rapid rivers, never presume to pass the bounds that are appointed them; while others extend nearly to the palm groves of the Line, and advance along the shores, though opposed by the southern tides, which continually supply them with fresh pasturage; others again visit the islands of the Mediterranean, where they are rendered conspicuous in the darkest nights, by the phosphoric lights which their movements invariably occasion.

Yet these are but a small proportion of the inhabitants of the Northern and European seas. Enormous Whales, opposing their vast bulk to the billows of the arctic regions, are seen bearing their vessels full of oil to the inhabitants of those sterile tracts of land, which enveloped for half the year in clouds and darkness, require continual supplies in order to replenish their lamps. Others, of the same family, appear in company with groups of Narwhal Unicorns, and coast along the woodless shores of Old Greenland, Nova Zembla, Lapland, and the farthest

extremities of Europe and America; some furnished with long horns, others with ribs of amazing size; and thus supply to the forlorn aborigines, the want of rafters for the erection of their summer dwellings, in those regions where timber is entirely unknown. And what shall I say more? for time would fail me to speak of the numerous family of Ray, of the genus Squalus, which are continually employed in clearing the rocks and shallows of the ocean from such extraneous substances as the waves from time to time deposit: fierce, ravenous, malignant creatures, distinguished in the day time by invariable characteristics, in the night by the phosphorescent qualities they possess. Of the Anglers, Lump-suckers, Tetrodons, and Blennies, each remarkable for a peculiarity of construction, which evinces that the Deity is neither forgetful nor unmindful of the feeblest of his creatures: of the Sturgeon, which produces isinglass, and caviar: of the common Sole and Flounder, and Surmullet, once so much esteemed by the luxurious Romans, and still invaluable to the natives of the north: of innumerable others, that delight in the deep recesses of the ocean, or wander from shore to shore, in accordance with the privations of the inhabitants.

But days and months may pass away in the contemplation of such scenes. The sun is withdrawing from the north, and darkness assumes her ancient

empire. Myriads of little wanderers are seen gradually ascending towards the arctic regions, surmounting the same obstacles which opposed the downward progress of their parents, and at length re-entering their deserted mansions, where the ice gradually closes over them.

And now the sun, in obedience to that Being who directs the movements of every living creature, passes over the equinoctial line, and leaves the northern pole to winter; while to the south, his vivifying beams afford the signal of returning spring. And lo! innumerable multitudes of aquatic natures proceed from the farthest south, as if the Deity designed to communicate to all the nations of the earth, the abundance that issues annually from the frigid zone. Observe the vast sweep of ocean, that extends from the straits of Mair and Magellan, as far as the tenth degree of southern latitude; the waves are literally covered with brisk and animal natures. In some of the most uncultivated districts, the savage inhabitants are seen busily employed in dressing their lands with Pilchards, which they bury in the ground, with a few grains of maize; in others, they subsist entirely on such as the ocean places within their reach; in others they barter them for foreign commodities, with the vessels that approach their shores. Now look towards that fertile district, where noble groups of date trees tower above the landscape, with their pin-

nated leaves, conspicuous on the azure of a sky, the clearness of which, appears unsullied by any trace of vapour; where the bread-fruit of Otaheite, the cinnamon of the Molucca islands, the coffee of Arabia, and the cocoa of America—vast vegetable columns, rising majestically to the height of more than sixty feet—are interspersed with vineyards and fields of corn, farm-houses and villas.

> Where orange groves perfume the circling air,
> With verdure, flowers, and fruit, for ever fair;
> Gay myrtle foliage tracks the winding rills,
> And cedar forests slumber on the hills.

That is Peru, the country of the Incas, and there, the migration of the southern Pilchards uniformly terminates; at this point also, a few emigrants from the northern shoals are occasionally seen. It seems as if certain Nereids were annually commissioned to conduct them from the Poles, in order to furnish subsistence to the inhabitants of the temperate zone, and that, having exceeded the extent of their commission by advancing towards the torrid zone, which abounds with delicious fruits, they emptied the gleanings of their nets upon the shores. Direct your eye towards the coast of Africa, the land of ivory, gum, senega, gold, frankincense, and cloves; conspicuous also for its wastes of barren sands, and wide uncultivated regions. Observe those trackless deserts which border the shores of the Red Sea. There, pasturage

and husbandry are equally unknown. The wandering people which live upon its borders are Ichthyophagites. Their mode of fishing is somewhat strange. They throw into the water the trunk of a doomt tree, having previously affixed to each extremity, a piece of wood in an horizontal direction, in order to prevent it from turning round, with a small pole to serve for a mast, and a woollen shawl suspended to a cross beam, to answer that of a sail. The fishermen mount the trunk as if on horseback, and launch into the middle of the stream, where they occupy themselves in darting their long spears at such of the watery tribes as pass within their reach. These people are undoubtedly the descendants of the ancient fish-eaters, mentioned by Diodorus Siculus; a wandering race, who dwelt along the shores of the Red Sea, and retained the traditions of their fathers respecting a great ebb of the water, which rendered visible the gulphs of the weedy sea, as it is called in their language. Now, carry your eye from the Cape of Good Hope towards the Line. There is the country of the Hottentots, and the Orange River, swarming with fish; Cape Negro, and Fish Bay; Angola, Congo, and lastly, the Gulf of Guinea. The shores of each are abundantly replenished with aquatic animals. Enormous whales of the same species as those known in the arctic regions, by the appellation of Northern Capers, wander along the bays and creeks, in com-

pany with innumerable tribes of such as are peculiar to the antarctic pole. In the months of April and May, a species of Ray appears on the surface of the water; in June and July, a kind of Herring; in September, various species of Mackerel arrive there, accompanied by whole brigades of Mullets, which appear designed, from the peculiarity of their construction, to journey through turbulent seas, during the most tempestuous seasons of the year, for they are visible only about the autumnal equinox; and these, unlike their companions, which delight in silence, flock to the spot whence noise proceeds. The negroes, availing themselves of this propensity, throw out a sort of cornet with a clapper, which on being tossed about by the motion of the billows, produces a clattering sound that attracts the unwary Mullets, who cluster round in considerable numbers, and in attempting to catch the cornet, are easily speared and taken from the water; while the Mackerel on the contrary, retire into the most sheltered harbours, as if to avoid the noise, and contention of the furious surges on which they voyaged during their perilous migration. These dissimilar companions, are the harbingers of the closely embodied squadrons that succeed them in the ensuing month, during which time, millions are seen proceeding from the southern Pole, as if to welcome the sun, as he advances over the equinoctial line, and journeys towards the tropics

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of Capricorn. Among these we may remark, as some of the most conspicuous, a Sea-pike, or Jack, celebrated for the sharpness of his teeth, and extreme rapacity; a species of Salmon, of exquisite flavour; a variety of the Sea-dog, with a large head, and bearing the mark of a cross upon his back. Shoals of the Moon-fish also appear in June, and apparently regulate their progress according to the solstices; and lastly, in the months of January, February, and March, whole battalions of a small animated kind of fish, conjectured to be the Oculus, or Pisces *oculatus*, one-eyed fish of Pliny. They inhabit the boisterous equinoxial seas, delight in noise, and spring rapidly through the agitated element. And now again innumerable tribes are seen to mingle with them, of strange forms, and instincts, entirely known on the northern, or the southern strands of Europe. Some of these appear like heavy squadrons, silently and slowly advancing into the creeks and harbours; others again, of brisk and lively natures, dart amid the sparkling billows, or display their glittering legions on the surface of the waves.

Once more direct your eye towards the line of ocean which extends from the extremity of Brazil to the coast of Guinea. There, according to the testimony of navigators, is the point of union, between the finny inhabitants of the artic, and antartic poles. Those of the former, having coasted

down the whole length of North America; the latter having travelled up the shores of the sister kingdom. And there, Whales, and Mackerels, and Herrings, with innumerable emigrants from their respective divisions of the globe, are seen to mingle together, as we observe the crests of broken foam, which skirt the extremities of a heavy swell.

What think you, must be the feelings of one of those angelic Beings, who walk to and fro upon the earth, and understand the wonders of creation, and possess enlarged conceptions of the love of God, and embrace at one comprehensive glance, the whole scheme of his beneficence, while engaged in the contemplation of such a scene? And what ought to be the feelings of those who are the immediate objects of so much love, and of such manifestations of wisdom and benevolence!—An habitual cultivation of that spirit of devotion which is well denominated the memory of the heart, which gratefully acknowledges the past, and takes no anxious thought about the future. It was experienced by those holy men, who travelled on from one degree of Christian perfection to another; it is felt by those glorious spirits who surround the throne of God, with a perpetual song; it is enforced by the Most High, as a frame of mind peculiarly acceptable to him. It ought to be the predominant feeling of every human being to whom he has imparted the

magnificent gifts of light, life, and intellect, with the power of appropriating them; to whom he has given "the means of grace, and the hope of glory."

Powerful, indeed, are the motives to Christian thankfulness, and blessed are its effects.

"Lord! thus alone my lowly thought can soar,
Thus seek thy presence, Being wise and good!
Midst thy vast works, admire, obey, adore,
And when this tongue is eloquent no more,
The soul shall speak in tears of gratitude."

THE END.

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