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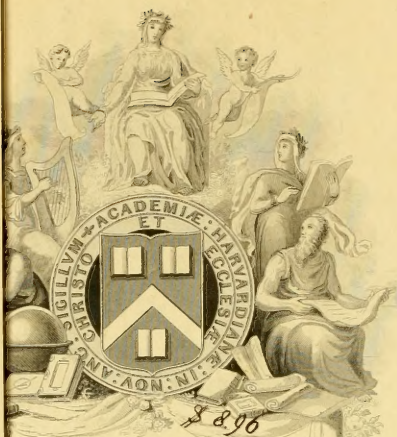
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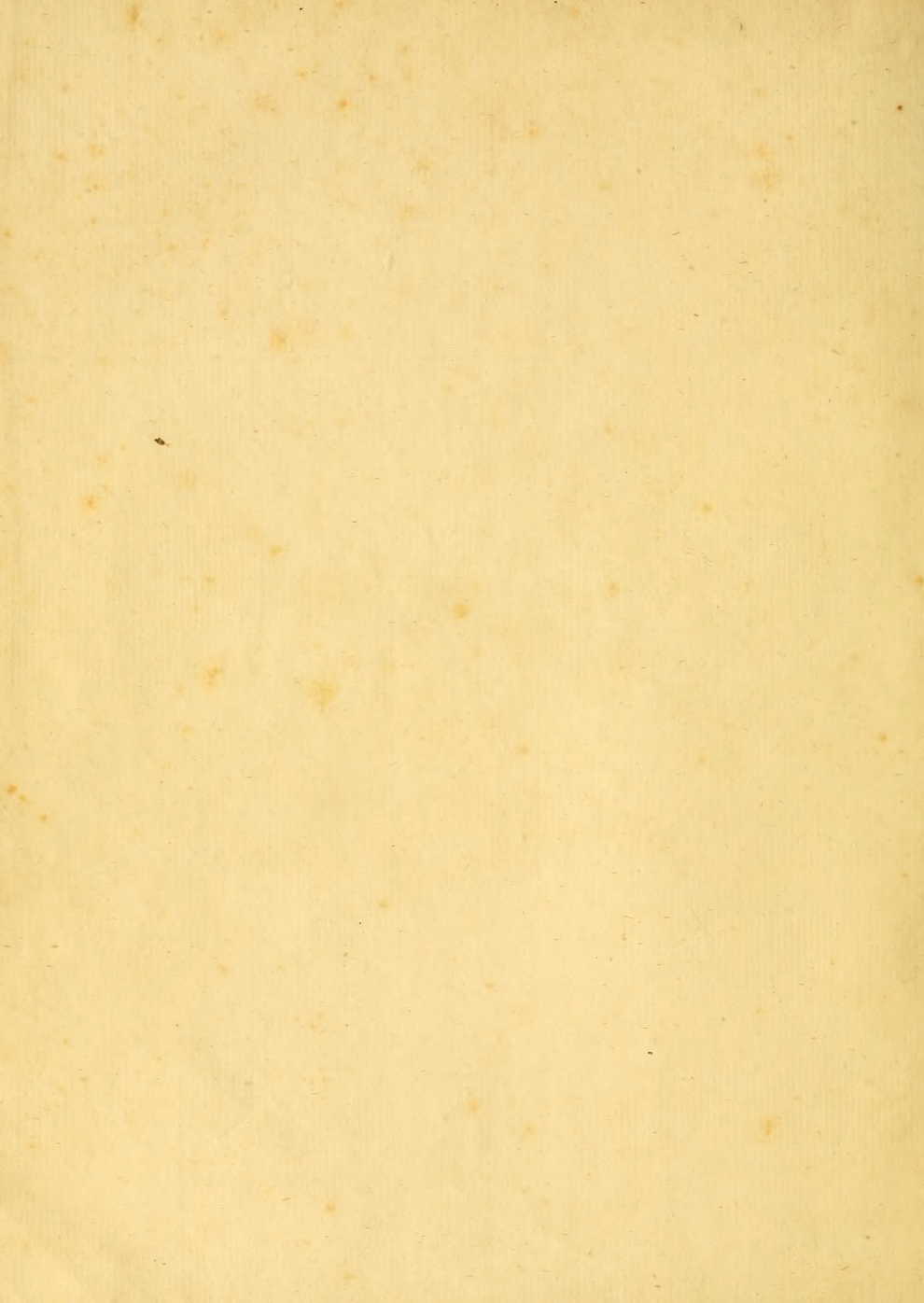
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John English Dolben.

MAR 22 1923







Groupes of different Corallines growing on Shells, supposed to make this Appearance on the Retreat of the Sea at a very Low Ebb Tide.

Woolong Del.

A. Walker Sculp.

AN
E S S A Y
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NATURAL HISTORY
OF THE
CORALLINES,

AND OTHER
MARINE PRODUCTIONS of the like Kind,
Commonly found
On the Coasts of GREAT BRITAIN and IRELAND.

To which is added
The DESCRIPTION of a large MARINE POLYPE taken
near the *North Pole*, by the Whale-fishers, in the Summer 1753.

By JOHN ELLIS, F. R. S.

LONDON:
Printed for the AUTHOR;
And Sold by A. MILLAR, in the *Strand*; J. and J. RIVINGTON,
in *St. Paul's Church-Yard*; and R. and J. DODSLEY, in *Pall-Mall*.

M.DCC.LV.

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CORALLINES
Trans. to Mus. of Comp. Zool.

MAIRIA PRODUCTIONS of the like kind
On the Coils of GREAT BRITAIN and IRELAND
Description of a new MAIRIA POLYMER
from the West-Indies in the Museum of Comparative Zoology

BY JOHN ELLIS, F.R.S.

LONDON:

Printed for the Author,

at No. 7, St. Martin's Lane, in the Strand, London, W.

M.DCCC.IV.



T O
HER ROYAL HIGHNESS
T H E
Princess Dowager of *WALES*.

MADAM,



NIMATED by the Attention
Your Royal Highness conde-
scended to bestow, on many of
the Substances described in the
ensuing Pages, I have pursued my
Enquiries concerning them, with an Ardour
that only such an Influence could inspire.

The minutest Works of Creation are not
always the least wonderful : And though
the Element, of which these are Natives,

DEDICATION.

prohibits an exact Enquiry, yet enough of Order, Contrivance, and Regularity, appear in their Structure, to convince us, they are the Workmanship of that Almighty Power, whom, exalted as you are in Dignity of Sentiment, as well as Station, you think it your highest Honour to reverence and obey.

As every Attempt, however humble, to explore the Works of the Most High, and to manifest his Care and Kindness to the whole Creation, meets with your Approbation; accept, Most Illustrious PRINCESS, with a favourable Aspect, these Endeavours; and, at the same time, my fervent Prayers, That you may long continue a Blessing to these Kingdoms, and your Royal Offspring to late Posterity. I am, with the utmost Respect,

Your Royal Highness's

Most obedient and

Most humble Servant,

London, Dec. 15,
1754.

JOHN ELLIS.



INTRODUCTION.



H A T the Reader is to expect in this Essay, will perhaps be learned, with most Satisfaction, from the following Account, of the Author's Inducements to engage in such Disquisitions, the Difficulties that attended them, and the various Success.

In the Autumn of the Year 1751, I received a curious Collection of Sea-plants and Corallines from the Island of *Anglesey*, in *North Wales*, and another from *Dublin*. In order to preserve some Specimens of the most rare Kinds, particularly those that were remarkable for their Colours, I expanded them on Paper in fresh Water, laying out their fine Ramifications with some Exactness; for which Method, with many useful Hints in Botany, I am indebted to that excellent Botanist Mr. *Buttner*, of *Berlin*.

These, when properly dried, I disposed on thin Boards covered with clean white Paper, in such a manner as to form

form a kind of Landscape, making use of two or three Sorts of the *Ulva marina*, or Sea-Liverwort of different Colours, in designing a Variety of Hills, Dales, and Rocks, which made a proper Ground-work and Keeping for the little Trees, which the expanded Sea-plants and Corallines not unaptly represented.

My ingenious and Reverend Friend Doctor *Stephen Hales*, paying me a Visit, was pleased to express great Pleasure in viewing these natural lively Landscapes; and desired me to make some of the same Kind for her Royal Highness the Princess Dowager of *Wales*, that the young Princesses might amuse themselves, in disposing these beautiful Productions in the like picturesque Manner. And for that Purpose, further requested me, to collect all the Varieties our Sea-coasts afforded; which I did, by the Help of my worthy Friend *George Shelvocke* Esquire, Secretary to the Postmaster-general, and some of my Acquaintance in *Ireland*.

I had the Honour, through my Reverend Friend, to present some Pieces of this Kind to her Royal Highness, who was pleased to accept them with her usual Condescension.

The great Variety, that came through my Hands, determined me to separate all the different Species, and to dispose them in proper Classes. To assist me in this Part of my Labour, I had Recourse to the learned *Ray*, who, in his *Synopsis Stirpium Britannicarum*, has given the best Account we have yet had of these Productions, as well as of the indigenous Plants of *Great Britain* and *Ireland*.

In order to distinguish their proper Characters with the greater Accuracy, I found it necessary to examine them in the Microscope; by which I soon discovered, that they differed not less from each other, in respect to their Form, than they

they did in regard to their Texture ; and that, in many of them, this Texture was such, as seemed to indicate their being more of an animal, than vegetable Nature.

This put me on separating such as had these apparent Indications, from those, which, from their Form of growing, I still took to be Sea-plants ; placing those in a third Class, which seemed to partake of the Nature of both.

The first Division comprehended all those, that were evidently the *Nidus's*, or Cells of Animals.

The second took in the curiously branched Corallines.

The last consisted of the stony articulated Corallines and *Keratophyta*.

These were regularly disposed in four Pictures, which I had the Honour to produce before the Royal Society, about *June 1752*, with a Description of their Contents, as they then appeared to me.

As I was convinced, from my own Observations of the Subjects themselves, that several, which had hitherto been considered by Naturalists, as Marine Vegetables, were in Reality of animal Production : So from the Opinions of several Gentlemen then present, my Suspicions were increased, that others likewise, which I had taken for Vegetables, might in Reality be of an animal Nature.

To determine how far these Suspicions were just, it seemed the most expedient to examine the Subjects, when recent, with Attention. And accordingly, in *August 1752*, I went to the Island of *Sheppey*, on the Coast of *Kent* ; and took with me Mr. *Brooking*, a celebrated Painter of Sea-pieces, to make the proper Drawings for me. Here we had

an

an Opportunity of seeing these disputed Beings called branched Corallines, alive in Sea-water, by the Help of a very commodious Microscope, of Mr. *Cuff's* the Optician in *Fleetstreet*, which I had altered for that Purpose; and was fully convinced, that these apparent Plants were ramified Animals, in their proper Skins or Cafes, not loco-motive, but fixed to Shells of Oysters, Muffels, &c. and to *Fucus's*.

The first Coralline that occurred to me, was that which is expressed in Plate II. at N^o. 3. A Part of it, as it appeared alive, is described magnified at Letter *A*: This, together with other Proofs, that then occurred, induced me to withdraw the Paper I had laid before the Royal Society; and to pursue with Attention my Enquiries concerning this Subject; both with a View to my own Satisfaction, as well as to afford those, who yet doubted, the Means of ample Conviction.

In the Beginning of *June* last, 1754, I prevailed on Mr. *Ebret*, a Gentleman universally known to the learned Botanists of *Europe*, for his exquisite Manner of designing and painting Plants and Flowers, to accompany me to the Seaside at *Brightbelmstone*, in *Suffex*; there to draw from Nature, whatever the Microscope presented him of these extraordinary Beings. An Account of this Journey, with his curious Drawings, the Royal Society have honoured with their Acceptance. Here we saw, amongst others, the Coralline, N^o. 14. Plate IX. Letter *b*, with all its minute capillary Branches expanded.

Letter *C*, shews one of these Branches magnified, as it appeared in the Sea-water through the Microscope, with its Polypes united together, reposing in their Sockets, and with their Arms extended.

We

We had also an Opportunity of seeing those Corallines in Motion, whose Polypes are contained in Cups, supported by a long Stem that appears full of Rings, or as if they were twisted in Form of a Screw (See Fig. *C*, Plate XII). In the Middle of the transparent Stems or Cases, we could easily distinguish the Thread-like tender Part of the Animal, united to the Bottom of each Polype.

As we were observing this, we accidentally discovered the Figure of the Polype, that spreads its Cells over *Fucus's*, and other Marine Substances. The Figures of the Cells are expressed in Plate XXIX, at Letter *D*. And the Animal in its Cell at *D 1*.

On several Parts of these Corallines there are little Bodies, which, through the Microscope, appear to be so many Vesicles or Bladders: To the Use of these I was altogether a Stranger till this Journey: But now I discovered that they were *Matrices*, or Habitations of young Polypes, which are produced here and there, on the Sides of the Parent, as in the Fresh-water Polype, only in the marine ones they are protected with this vesicular Covering. These Vesicles appearing at a certain Season of the Year, according to the different Species of Corallines, and then falling off, like the Blossoms or Seeds of Plants, has made some curious Persons, who have not had an Opportunity of seeing the Animals alive in the Vesicles, conclude them to be the Seed-vessels of Plants; and into this Mistake I was led myself, in the Account laid before the Royal Society in 1752. In which Account I had taken some Pains to point out the great Similitude between the Vesicles, and denticulated Appearance of some of these Corallines; and the Tooth-shaped Leaves and Seed-vessels of some Species of Land-mosses, particularly of the *Hypnum*

and *Bryum*. One of which Corallines is exhibited at *B*, Plate III. and another at *B*, Plate V.

And for want of examining these Corallines, as I may say, alive in their proper Element the Sea-water, others likewise had formed erroneous Opinions concerning them, as well as myself: Some imagining these little Vesicles only to serve as swimming Bladders, like those in the *Acinaria* or Gulph-weed, and the *Quercus Marina* or Sea-Oak.

There are two of these Vesicles, with the larger Polypes in them expressed, magnified near the Middle of the Fig. *A*, in Plate V.

Those are called Denticles, that look like Teeth, and are placed opposite to each other on the Sides of the Stem and Branch of the same Figure.

These larger Polypes are united below by a tender thready Line, to the fleshy Part that occupies the Middle of the whole Coralline.

In some Instances, we may observe, that these Animals are wrapt quite round in their Vesicles, during their Embryo State, like those in Plate XI. Fig. *C*. As these advance in Size, and grow towards Maturity, the Top of the Vesicle begins to open, the Animal stretches itself out, and displays its Arms about in Search of Food; and when it is in the least disturbed, it suddenly contracts itself to the Bottom of the Vesicle, which closes after it at the Top.

Some Species of Corallines have little elastic *Opercula* or Covers to their Vesicles, to secure the Mouth or Entrance of the Vesicle upon the Animal's Retreat to the Bottom of it, as in Plate III. Fig. *B*.

These

These vesicular Polypes, as soon as they arrive at Maturity fall off, and with them most of the Vesicles disappear.

In some of the celliferous Corallines, which branch out in an elegant Manner, we observe, that the small Polypes in the Cells acquire a testaceous Covering, like little Snails, as at Fig. *E* and *B*, in Plate XVIII. and at Fig. *A*, in Plate XIX.

These little Shell-fish, we may suppose, grow larger; and, in their mature State, may deposit on Rocks, *Fucus's*, and Shells, such curiously implicated *Matrices* or Ovaries, which, in time, may unfold and extend themselves into those many beautiful Tree-like Forms that we find them in.

The *Matrices* of some Kind of Shell-fish are so remarkable for their Plant-like Form, that many People have taken them for Vegetables at first Sight. See Fig. *a*, Plate XXXIII.

In order therefore to be more fully satisfied, in respect to the Nature of a Species of Beings hitherto almost unknown, I took a Journey in *August* last 1754, along the Northern Shore of the County of *Kent*, in Company with Doctor *Oeder*, a very curious and ingenious Physician, Professor of Botany to the King of *Denmark*.

At *Whitstable*, I employed some Fishermen to collect what Varieties they could of these submarine Bodies. Among many other things they brought me several irregular Pieces of a fleshy Substance, sticking to Shells, called by them, Deadman's Toes. It is described in *Ray's Synopsis*, by the Name of *Alcyonium ramoso-digitatum molle asteriscis undique ornatum*. A small Piece of it is represented in its natural Form, at Letter *a*, Plate XXXII. and a Part of it magnified at Letter *A*.

These the Fishermen brought me, with the other Sea-Productions, in Buckets of Sea-water; we left them undisturbed for some time, till the Polypes had extended themselves out of their starry Cells, in which their Tails were fixed; and then took them suddenly out of the Salt-water, and instantly plunged them into Brandy, whereby many of their Bodies were kept from shrivelling up, and shrinking back into their starry Retreats. By this Means I preserved not only these, but several other Marine Productions, with their Animals, in their natural Form; particularly the *Alcyonium*, like the Lobes of the Lungs, described Plate XVII. at *b*, called by the Fishermen the Sea Fig, from its having many yellow Seed-like Particles in the Inside. The Outside of this, when magnified, appeared full of small Stars, as described at *B*, *C*, and *D*, in the same Plate.

It was here I first observed the Animal alive in the Seabristle Coralline, as described at Plate XI. Letter *A*. And that of the Herring-bone Coralline, at Plate X. Letter *A*; with those on the branched tubulary Coralline, Plate XVII. Letter *A*, where they are magnified. Here we saw the Animals on the Celliferous Coralline, as magnified in Plate XX. in Letter *C*. Several of these Animals I found well preserved in the Spirits after my Return, notwithstanding they were crouded into the Bottle with many other Sorts of a coarser Texture, such as Star-fish, *Alcyoniums* on Shells, &c.

Finding upon my Arrival, that I could distinguish the true natural Appearance of many Species of Corallines, with their Animals, by being preserved in Spirits, I thought it might be satisfactory to know the Method I had fallen upon for this Purpose; and, accordingly, recommend the following to those, who are desirous of obtaining Varieties of these
Corallines,

Corallines, and other Sea-productions, from their Friends on the Sea-coasts, in great Perfection.

The greatest Variety of Corallines are to be found on what are generally called Rock-Oysters, or upon those Beds of Oysters that have been for some time disused or neglected. Upon such I have seen them grow, as it were in little Groves, As soon as the Fishermen take these Oysters out of the Sea, let them immediately put them into Buckets of Sea-water ; for the Animals are of so tender a Nature, that the Air soon shrivels them up : As soon as they can conveniently, let them be brought on Shore, and stripped off the Shells with a Pair of Pincers, taking hold of them near where they adhere to the Shells : Then put them gently into white earthen Plates full of clear Sea-water ; and in about an Hour, or perhaps less, they will begin to recover from this rough Treatment ; and many of the Animals will begin to extend themselves ; this you may observe by a magnifying Glass of about Two Inches Focus. Those that you perceive extended, and alive, may be suddenly taken out with the Pincers, and instantly immersed in any kind of Spirits, which you must have by you in an open Vessel for that Purpose. This will fix the Animals in such a Manner, that, when they are put into wide-mouthed strong Glass-Bottles full of the same Spirits, and well corked, many Varieties may be sent together to a great Distance, without Prejudice to the Figure of the Animals, as I have experienced.

Or this Method may be tried ; that is, to place the Oysters with the Corallines on them, in broad earthen or wooden Vessels, with as much Sea-water over them as will barely cover them ; let them rest an Hour, and then pour boiling Water gently by the Side of the Vessel, to about the same Quantity that there was of cold Water in the Vessels.

Immediately

Immediately afterwards pluck the Corallines off the Shells, and put them in Bottles of Spirits as before. When they are received, in order to be examined, you must provide long narrow Bottles of Chryftal-glas to put the different Sorts in; these must have wide Mouths, and be filled with the clearest Spirits, but not stronger than Proof-Brandy; and of such a Diameter as shall be agreeable to the Focus of the Glas you propose to examine them by. If these Bottles are properly stopp'd to prevent the Spirits evaporating, it will be the best Method I know of keeping these extraordinary Plant-like Animals in a Condition capable of convincing the most incredulous of their Nature and Origin.

It will be necessary to inform the Curious, that Experiments of this Kind succeed best in warm Weather; the Animals being generally found contracted and torpid during the Winter-Season.

The foregoing Observations, on the Nature of the Vesiculated and Celliferous Corallines, gave me the first Hints into the Formation of the *Keratophyta*; which was the more satisfactory to me, as this Class of Beings still passes among very sensible and curious Naturalists for mere Vegetables, but incrust'd over by Accident, like many other Plants, with the Nests of certain Species of Insects peculiar to such particular Kind of Plants.

In the Cabinets of the Curious, we meet with Specimens of some Species of these *Keratophyta*, so nearly allied to some of our vesiculated Corallines, with large Denticles, that they seem to claim an Alliance to both Classes. One of these is described in Plate XXVI. at Fig. S.

The rest of this Class of *Keratophyta*, I found to correspond with the Vesiculated and Celliferous Classes, in such material Points, as left me no Room to doubt, but that, if
one

one was of an animal Nature, which ocular Demonstration had already convinced me of, then the other must be so too.

And, I am persuaded, that whoever compares them together, and views attentively the Succession of rising Tubes, that change insensibly into Ramifications of Cells in the *Keratophyton*, and, at the same time, examines the Structure of that Vesiculated Coralline, called the Herring-bone Coralline, Plate X. Fig. *a*, &c. will be of my Opinion. How the woody or horny Part of the Stem and Branches are formed, seems to be the great Difficulty to the curious Enquirer to account for, unless he is allowed to suppose it a Vegetable.

But, during these Observations, I fortunately received from *America*, a curious Specimen of a Sea-Fan, Part of which is delineated in Plate XXVI. Fig. *C*, *O*, *D*, *K*, which plainly demonstrates, that Animals of the Polype-kind are the Fabricators both of the horny or woody, as well as the calcareous, Covering of this curious and numerous Plant-like Colony of Insects.

The next Class, which is the *Eschara*, deserves our Notice, and a nicer Scrutiny. There appears a great Probability of some of these being the *Matrices* or Ovaries of certain Species of Shell-fish, perhaps of the Bivalve Kind.

So little Enquiry has yet been made into the Origin of Shell-fish, that we seem still ignorant of the Production, or first Beginning even of the most common Sorts among us, such as Oysters, Cockles, and Mussels.

Many of the *Alcyoniums*, or those mishapen Sea-productions called so, deserve our Attention. If we could examine these Bodies carefully, at different Seasons of the Year, I do not in the least doubt, but they would amply reward our Curiosity with a Fund of new Discoveries.

As we shall frequently have Occasion, in the ensuing Work, to make Use of the Term *Polype*, it will be necessary to give the Reader, who may be unacquainted with these Subjects, some Idea of it; which, perhaps, may be done the most satisfactorily, by describing the Fresh-water Polype, whose extraordinary Properties have been so fully enquired into by the ingenious Mr. *Trembley*, F. R. S.

In Plate XXVIII. at Fig. *C*, is exhibited a long-armed Fresh-water Polype of this Author: From this Representation the Reader will easily know what is intended, when we speak of the Marine Polype, its Arms, Claws, &c.

This Animal then is, first, of a Worm-shaped Figure, and of the same Kind of tender Substance with the Horns of the common Snail: It adheres by one End, like a Sucker, to Water-plants and other Substances. The other End, which is the Head, is surrounded by many Arms or Feeders, placed like Rays round a Centre; this Centre is its Mouth; and with these tender Arms, which are capable of great Extension, particularly in this Species, it seizes minute Worms, and various Kinds of Water-Insects, and brings them to its Mouth; and often swallows Bodies larger than itself; having a surprizing Property of extending its Mouth wider, in proportion, than any other Animal. After its Food is digested in its Stomach, it returns the Remains of the Animals it feeds on through its Mouth again, having no other observable Emunctory.

In a few Days there appear small Knobs, or *Papille*, on its Sides: As these increase in Length, little Fibres are seen rising out of the Circumference of their Heads, as in the Parent Animal, which Fibres, they soon begin to use, for the Purpose of procuring Nourishment, &c. When these are arrived

arrived at mature Size, they send out other young ones on their Sides in the same Manner; so that the Animal branches out into a numerous Offspring, growing out of one common Parent, and united together and disposed in the Manner represented in Plate before-mentioned, Fig. C: Each of these provides Nourishment not only for itself, but for the whole Society; an Increase in the Bulk of one Polype by its feeding, tending to an Increase in the rest.

Thus a Polype of the Fresh-water Kind becomes like a Plant branched out, or composed of many Bodies, each of which has this singular Characteristic, that if one of them is or cut in Two in the Middle, the separated Part becomes a complete Animal, and soon adhering to some fixed Base, like the Parent from whence it was separated, produces a Circle of Arms, a Mouth is formed in the Centre; it increases in Bulk, emits a numerous Progeny, and is, in every Respect, as perfect an Animal as that from which it was severed.

Much after the same Manner, so far as hath hitherto been discovered, the marine Polype, however different in respect to Form, is nourished, increases, and may be propagated; having often found, in my Enquiries, that small Pieces cut off from the living Parent, on account of viewing the several Parts more accurately, soon give Indications, that they contain not only the Principles of Life, but likewise the Faculty of increasing and multiplying into a numerous Issue.





TRANSLATION of the *Latin* Descriptions,
with References to the CONTENTS of
the PLATES.

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- N^o. 3. Coralline with few Branches, having its Denticles alternately placed, and bearing Vesicles that are wrinkled across. Plate II. p. 5.
- N^o. 4. Moss-like Coralline, with its Stem surrounded by many minute tufted Branches, and its Denticles placed alternately. Id. p. 6.
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- N^o. 6. Trailing mossy Coralline, having very slender Stalks with opposite Denticles. Id. p. 8.

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- N^o. 9. *Vesiculated Coralline, with a stiff indented Stem ending in a Tuft of forked Branches at the Top, and with Denticles lying flat upon the Branches.* Id. p. 10.
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- N^o. 18.

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- N^o. 20. *Coralline, with Branches bearing Bell-shaped Vesicles, whose twisted capillary Footstalks are disposed in Whirls, like the Horse-tail Plant.* Plate XIII. p. 23.
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- N^o. 22. *The smallest Coralline, with Vesicles disposed sometimes loosely in Branches, and sometimes compactly together in Clusters.* Plate XIII. p. 25.
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- N^o. 25. *Small creeping Coralline, with oval-shaped Vesicles adhering to Branches, like a Bunch of Grapes.* Plate XV. p. 27.
- N^o. 26. *Coralline, like Dodder creeping over Fuci, with very slender Branches, which grow opposite to each other: At the Joints of these Branches are small oval Vesicles in little Clusters together.* Plate XIV. p. 28.

Tubular

C O N T E N T S.

Tubular Corallines.

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E R R A T A.

Wherever the Word *Tentaculi* occurs, read *Tentacula*.

- Page 10. line 22. place a *Comma* after *Terminantibus*.
11. line 3. for Fig. 6, read Fig. *b*.
20. Margin, for Fig. *a A*, read Fig. *b B*.
23. line 20. for *Equisitiformibus*, read *Equisetiformibus*.
30. lines 11. 12. for *Laryngæ*, read *Laryngi*.
30. line 13. for *tubulous* read *tubular*.
31. line 26. for Plate XXXV. read Plate XVII.
33. line 16. for Fig. *a*, read Fig. *a 2*.
36. line 10. place the *Comma* that follows *testaceas*, after *parie*.
39. line 16. after *Colore eburneo* put a *Comma*.
63. line 18. for Fig. *c*, read Fig. *C*.
88. Margin, for XXXIII. read XXXIII. and line 28. for *C* read *c*.

By Mistake, there are two CHAP. V's, so that the Chapters should follow regularly to N^o. XI. instead of N^o. X.



A N
E S S A Y
T O W A R D S A
N A T U R A L H I S T O R Y
O F
E N G L I S H C O R A L L I N E S, &c.

C H A P. I.

IN order to be the better understood, in treating of the several marine Productions, which are the Subject of the following Essay, I find myself under a kind of Necessity to speak in the common Language of those, who, considering them merely as Plants or marine Vegetables, have, as Botanists, reduced them to certain Classes; and, with the celebrated Ray, shall divide them into *Corals*, *Corallines*, *Keratophyta*, *Eschara*, *Sponges*, and *Alcyonia*. But in disposing of the several Subjects, I shall rather have Regard to the similar Texture of the Substances, and the Figure of the Animals that inhabit them, than to the mere external Form and Appearance, which were the sole Objects of the botanical Writers.

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According to this Method, it might be expected that Corals should be ranged and described first: But of these we have so few on the Coasts of *England* and *Ireland*, and the Texture of them so complex, that what I shall have to say concerning them will be better understood, after the more simple Productions have been described.

I shall therefore first proceed to the *Corallines*, by which may be understood those submarine plant-like Bodies, that consist of many slender, finely divided, and jointed Branches, resembling some Species of Moss, and under which Appellation they have been described by the Botanists.

These differ from Sea-Plants in Texture, as well as Hardness, and likewise in their chymical Productions. For Sea-Plants, properly so called, such as the *Algæ*, *Fuci*, &c. afford in Distillation little or no Traces of a volatile Salt: Whereas all the *Corallines* afford a considerable Quantity; and in burning yield a Smell somewhat resembling that of burnt Horn, and other animal Substances: Which of itself is a Proof that this Class of Bodies, tho' it has the vegetable Form, yet is not intirely of a vegetable Nature.

In treating of these *Corallines*, in order to preserve some kind of Method, we shall divide them into the Vesiculated, the Tubular, the Celliferous, and the Articulated Kinds.

All these are ranked by *Linnaeus* under the Title of *Sertularia*, in his Classes of the coral-like Bodies.

Before we proceed, it is necessary to observe, that the Descriptions here given are, for the most part, taken from *Corallines* which have been brought from a considerable Distance; tho' no Pains have been spared to procure them as recent

English CORALLINES.

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recent as possible from the Sea, and to examine them on the Shores whenever Opportunity offered.

The vesiculated Corallines are distinguished by their horny hollow Ramifications, which are disposed in a Variety of elegant plant-like Forms; most of them are furnished with little Denticles on their Branches, like Leaves on Mosses; and at certain Seasons of the Year, we find on them particular-shap'd small Bodies like Bladders, that proceed from different Parts of their Stems and Branches, each being of a peculiar Form, according to the different Species.

Their Colour, when dry, is for the most part of a yellowish or pale brown.

When they are immersed in Water, they recover the same Form they appeared in when fresh in the Sea; and soon become filled with the Liquid. This gives them a semi-transparent Amber-colour, and makes them very elastic. They are found adhering to Rocks, Shells, and Fucus's, by small root-like Tubes. When they are put into Vinegar they cause no Effervescence.

Of the Vesiculated Corallines.

Plate I.
Fig. a. A.

N^o. 1. *Corallina vesiculata sparsim et alternatim ramosa, denticulis oppositis cylindricis, oribus crenatis patulis.*
Sea-Tamarisk.

This curious Coralline was taken up in very deep Water, near the Island of *Dalkey*, at the Entrance of the Harbour of *Dublin*. Its Ramifications are irregular, but chiefly alternate: Its Texture is of a thin transparent horny Nature: The Denticles are large, cylindrical, open, and opposite; and each Pair seems fixt in the Top of the next Pair below it.

The Vesicles appear to be shaped something like a Heart, with a short Tube at the Top, not unlike the *Aorta*, or *Vena cava* cut off, as it is represented in the magnified Part, Fig. A, Plate I.

N^o. 1. Fig. a, in the same Plate, shews the natural Size of a Part of this Coralline: And at Fig. A the Denticles are magnified by the fifth Glass of *Wilson's* single Microscope.

Plate I.
Fig. b. B.

N^o. 2. *Corallina marina Abietis forma.* Tournf. I. R. H. 571.
Muscus marinus Filicis folio. H. Ox. Vol. III. p. 65. Tab. 9. Fig. 1.
Sea-Fir.

This Coralline adheres to Oysters, Muscles, and other marine Substances. by wrinkled tubular Roots; which rising into many stiff, hollow, and horny Stems, throw out alternate regular

Plate I



Plate II.



regular Branches, that have the Appearance of the Fir-tree, or, as some think, of the Fern; the Branches of this extending themselves in the same Direction with the Leaves of that Plant.

The Denticles are placed alternately, and have narrow Mouths or Openings. On several Parts of this Coralline we may observe oval-shap'd Vesicles, or little Bladders, which are inserted in the Stem, and have a Communication with the internal Part, by a small Opening at the Bottom of each. Their Necks are narrow near the Top, like a Pitcher; and, in some Specimens collected in the Month of *April*, we have observed the Remains of Animals like Polypes, fixed by the Tail to the Inside of the Neck of these Vesicles, as in Plate I. Fig. *B.* where the dead Polype may be seen hanging out of the Vesicle. Many Specimens of this Species are found of a reddish Colour; tho' almost all the Corallines are of a fading yellow or brown Colour. We often find some of this Species full of white spiral Shells, like a minute *Cornu Ammonis*; and others over-run with a small bell-shap'd Coralline, which will be described hereafter.

Plate I. N. 2. Fig. *b*, represents the natural Size and Manner of the Growth of this Coralline upon a Muscle-shell. Fig. *B* represents a small Piece of it magnified.

N^o. 3. *Corallina minus ramosa alterna vice denticulata, Lenticulis lineis transversis externe striatis.* R. S. p. 35. N^o.

Plate II.
Fig. *a. A.*
b. B.

13.

Great Tooth Coralline.

There are two Species of this Coralline; the one upright, the other more branched and climbing.

The

Natural History of

The first sort is found in Plenty, growing erect on Oysters, near *Queenborough* in the Island of *Sheppey*. This is very little branched; the Stem is slender, and twisted a little between the Denticles like a Screw: The Denticles are large, pitcher-shaped, and placed alternately. When this Coralline was taken out of the Sea at *Queenborough*, and kept immersed a little time in Sea-water, I observed, through the Microscope, a Polype occupy the Inside of the whole, and each Denticle filled with a Part of it, ending in Tufts of *tentaculi*, or fine hair-like Claws, as expressed in Plate II. Fig. *A*. moving about very swiftly. The Vesicle is added here, to shew its magnified Proportion to the Denticles; but the Animal was dead in it.

At Fig. *a*, N^o. 3. in Plate II. is a Muscle-shell, with several Sprigs of this Coralline, just as it is found adhering to it. A small Piece of one of these little Sprigs was put into a Watch glass of Sea-water; and, notwithstanding the Separation of its Body, in five Minutes time the Claws were moving about in search of Prey.

The other Species, which is the climbing one, is more branched, the Denticles are placed more asunder, and their Mouths are wider: The Vesicles of both Species are wrinkled.

Fig. *b*, in Plate II. shews the natural Appearance of this climbing up another Coralline. Fig. *B* shews a Piece of it with its Vesicle magnified.

Plate II.
Fig. c. C.

N^o. 4. *Corallina muscosa alterna vice denticulata, ramulis in creberrima capillamenta sparfis.* R. S. N^o. 17. pag. 36.

Squirrel's Tail.

On all the Shore to the Eastward of *Sheerness* in the Island of *Sheppey*, this beautiful feather'd Coralline is very common;

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Plate III.
Fig. b. B.

N^o. 6. *Corallina muscosa denticulata procumbens, caule tenuissimo denticellis ex adverso sitis.* R. S. p. 36. N^o. 13.
Sea-Hair.

This very neat and most regularly formed Coralline consists of long trailing Branches, with very sharp Teeth, placed in Pairs exactly opposite: Each Pair seems to be jointed into the next. The slender Branches grow in Tufts, like Bunches of Hair. See Plate III. N. 6. Fig. b. This gives you the natural Appearance of it. The Vesicles of these are remarkably large and transparent, with regular Covers; the whole not unlike to China Jars.

Fig. B. Plate III. gives us the Representation of a Branch with its Vesicle magnified.

The Cover to the Vesicle of this Species, in Form has some Resemblance to the *Operculum* of those kinds of Land-Mosses, which are called *Hypnum* and *Bryum*.

Plate IV.
Fig. a. A.

N^o. 7. *Corallina pumila pennata, denticulis teneris, albis, et oppositis; vesiculis, florem lilii, vel mali punicæ, se expandentem referentibus.*

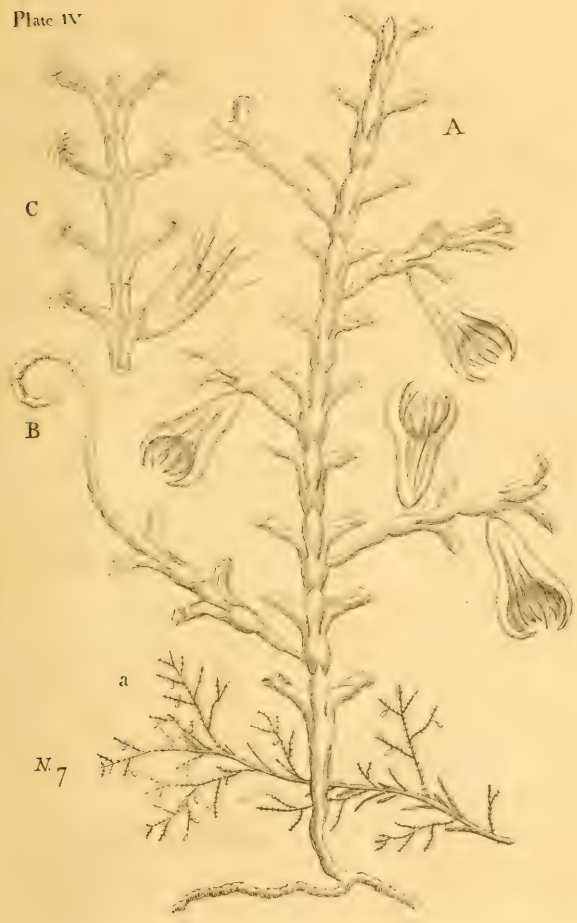
Lily or Pomegranate flowering Coralline.

This curious Coralline is often found on the Cypress Coralline before described, which it embraces with its *tubuli*, and from thence throws out Branches, furnished with slender opposite Denticles, of a cylindrical Form, which, as they dry, sink in at the upper Part.

At N. 7. in Plate IV. Fig. a, there are some small Specimens represented of their natural Size growing upon another Coralline.

The Vesicles, when magnified, are shaped like a Lily or Pomegranate-flower just opening; and appear more like a Blossom,

Plate IV



Vesiculated CORALLINES.

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Blossom, than any belonging to the whole Tribe of Corallines.

Fig. *A*, is the magnified Appearance of a small Branch of this Coralline with its curious Vesicles.

In this magnified Branch, at *B*, we may observe, that the Branches of this Coralline now-and-then terminate in irregularly contorted *tubuli*, not unlike those it grows with.

I observed at *Brighthelmstone* many Specimens of this Species adhering to Oyster-shells, and growing erect upon them; these were brought to us in a recent State, just taken out of the Sea. I took a very minute Branch from one of them, together with its Vesicles, and plac'd it in Sea-water upon the Stage of my Microscope, and in a very short time I found the Animal in the Branch alive, extending its *tentaculi* or claws out of all its Denticles, but the Animal in the Vesicle was contracted, and did not appear to move.

Fig. *C*, gives the Appearance of this Branch in the Microscope. Here the Spines, which were folded up in the Vesicles of the Branch at Figure *A*, are all extended in the Figure *C*.

N^o. 8. *Corallina pumila repens minus ramosa, denticellis bijugis.* Plate V.
Fig. a. A.

R. S. N^o. 19. p. 37.

Sea-Oak Coralline.

This little creeping Coralline arises here and there from small thready *tubuli*, which run along the Surface of the broad-leaf'd indented Sea-Oak *Fucus*. This is found in great Plenty on the Sea-shore near *Sheerness* in the Island of *Sheppey*. The same Coralline is found sometimes creeping on the filiquose or podded *Fucus*.

The Denticles are blunt at the Openings, and placed in Pairs exactly opposite to each other; each Pair seems to be
C jointed

jointed in the next: The Vesicles are almost globular, and are often found wrinkled or furrow'd across. Fig. *a*, N. 8. gives the natural Appearance of it creeping on the Sea-Oak *Fucus*. Fig. *A*, in the same Plate, shews a Branch of it with the Vesicles magnified.

Whilst I was on the *Suffex* Coast at *Brightbelmstone*, I first perceived the Polypes alive in the Vesicles of the denticulated Class of Corallines, and particularly in this. These Animals are of a much larger Size in the Vesicles than those in the Denticles. They are protruded or grow out irregularly here and there, with their Vesicles, from the Sides of the Stem and Branches. We can easily distinguish them in the Microscope to be united to the Body of the Parent Polype; which seems to consist of Links of small Polypes in Pairs, each Pair connected to other Pairs by a fleshy Line, that runs through the Middle of the Coralline. Here we saw the small Polypes of this Species extending their Claws in search of Food, as well as those of the vesiculated kind.

Fig. *A*, describes them as they appeared in the Microscope while recent.

Plate V.
Fig. *b. B.*

N^o. 9. *Corallina vesiculata, caule angulato rigido, ramis dense stipatis et bifurcatis, terminantibus denticulis cauli appressis. Fucus Equiseti facie, Ostreae Testae adnascens.*

Sibbald. Scot. Ill. L. 1. p. 56. Tab. 12.

R. S. N^o. 47. p. 50.

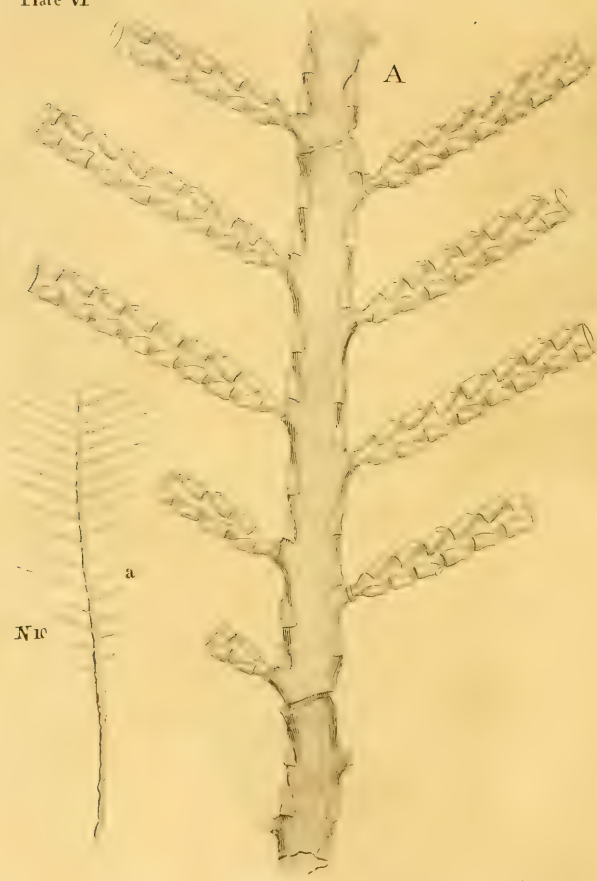
Bottle-brush Coralline.

This Coralline arises from horny *tubuli*, which strongly adhere to Sea-shells.

The Stalk is erect, stiff, and full of Knots, terminating the alternate Angles, which seem to be the Ends of Branches broken off. It



Plate VI



A

a

N^o 10

Vesiculated CORALLINES.

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It is generally found with a thick Tuft of short Branches, growing close together on the upper Part of the Stem. See its natural Size at N. 9. Fig. 6.

Each Division of a Branch has two Prongs or Horns. The Denticles lie so remarkably close to the Branches, as scarce to be distinguished from them without the Help of a Microscope: But by this we discover a small Hole in the Top of each, as in most other Denticles.

The Vesicles are placed at the Bottom of the Branches; and appear to be of an oval Shape, with an *Operculum* or little Cover at the Top of most of them.

They are found on the Coast of *Scotland*, and in the North of *England*; particularly about *Scarborough*, where the Fishermen have given them the Name of Bottle-brushes.

Fig. B, in Plate V. shews a Part of a Branch magnified, with its Vesicles.

N^o. 10. *Corallina erecta pennata, denticulis alternis cauli appressis, Lonchitis vel Polypodii facie.*

Plate VI.
Fig. a. A.

Sea Spleenwort or Polypody.

This horny upright Coralline has two Rows of strait hollow Branches a little compressed, which are placed on the middle Stem opposite to each other, in a parallel and alternately pennated Form, like the Leaves of Polypody: Each small Branch is furnished with two Rows of Denticles, placed alternately opposite, and seem sunk into the Branch; so that they appear as Part of it; except their Tops, which are open, and project a very little. The main Stem is jointed here and there like a Reed.

The natural Size is represented at N^o. 10. Fig. a.

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Fig. *A*, in the same Plate, shews a Part of it magnified.

I have not yet received any Specimens with Vesicles, so perfect as to be able to describe them.

This was lately taken up, among other Sea Productions by the Fishermen near the Harbour of *Dublin*.

Plate VII. N^o. 11. *Corallina Muscosa pennata ramulis & capillamentis falcatis.* R. S. N^o. 16. p. 36.
Fig. a. *A*.
Sickle Coralline.

This elegant feathered Coralline adheres to Rocks and Shells by little wrinkled Tubes, and rises from thence into erect waved Stems, which are surrounded from Bottom to Top with pennated Branches; the smaller Divisions of these have Rows of little Denticles, or Teeth, on the Side; and bend inward, as they become dry, in the Form of a Sickle.

Fig. *a*, N^o. 11. represents the natural Appearance of this Coralline.

The Vesicles are nearly of an inverted oval Shape, broad at Bottom, and narrower at Top where the Opening is; some of them appear, as if they had a Calyx like a Flower at the Bottom of the Vesicle: Most of the dry'd Specimens, I have yet seen, have had an Orange-colour'd viscid Substance in them, which seems of the same Nature with the Contents of the rest.

Fig. *A*, is Part of a Branch, with its smaller Ramifications like Sickles, and its Vesicles magnified.

This Coralline is common on the Coast of *Kent*, near *Sheerness*, in the Island of *Sheppey*; and on the Shores of many other Parts of these Kingdoms.

Plate VII

Ν Π

a

b

Ν ΙΙ

Α

Β



Vesiculated CORALLINES.

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N^o. 12. *Corallina pennata* & *filiquata, denticulis florem lilium* Plate VII.
convallium referentibus. Fig. b. B.

Pinnaria marina Imperati. Bocc. 257. N^o. 6.

The Podded Coralline.

The little radical Tubes of this Coralline creep on, and adhere to Muscles, and other Shells: From these arise little Branches like Feathers; each smaller Division of a Branch is curved, when dried, like a Sickle; and the Denticles, which are fixed in a Row on the Inside, are shaped, when magnified, like the Flowers of the Lily of the Valley.

This Coralline is also found surrounding the Stalks of the podded *Fucus*, with its tubulous Roots not adhering to, but inclosing it; as it is represented in its natural Size, at N^o. 12. Fig. 6.

From the Branches arise little Pods encompassed by several studded Ribs: On examining these Pods in the Microscope, I have observed some loose Particles, in some of them, like Seeds; but, upon dissecting the thin membranaceous Coat of these transparent Pods, and more minutely examining the inclosed Substance with higher Magnifiers, it appeared of the same Kind and Consistence with the Substance found in the Vesicles of other Corallines.

Fig. B, shews the Pods and Denticles, as they appear in the Microscope.

This Coralline is found on several Coasts of this Kingdom; but the Specimen with Pods was taken up by the Fishermen, on the Coast of *Ireland* near *Dublin*.

Plate VIII.
Fig. a. A.

N^o. 13. *Corallina pennata* & *falcata*, *pennas caudæ Phasi-*
ani referens caule gibboso.

Corallina fruticosa pennata. Barr. Palma Marina. Barrel.

Icon. 1292. n. 2.

Pheasant's-tail Coralline,

This very rare Coralline grows to the Height of 10 or 12 Inches. The Root, or first Beginning, consists of an irregular Tuft of extremely small Tubes, appearing like a Piece of Sponge to the naked Eye: Several of these little Tubes, rising together, and uniting in close Contact, become a Stalk, which appears in the Microscope curiously channel'd and indented: On the Back of the Stalk, at nearly equal Distances, are formed little regular arch-like Risings, which are compressed and hollowed a little in the Middle.

Fig. a, N^o. 13. in Plate VIII. shews the natural Appearance of this Coralline with its spongy Root.

The main Stem is now-and-then ramified; the Branches are pennated, and the *Pennæ*, or small Divisions of the Branches, turn one Way, and, when dry, are bent like a Sickle.

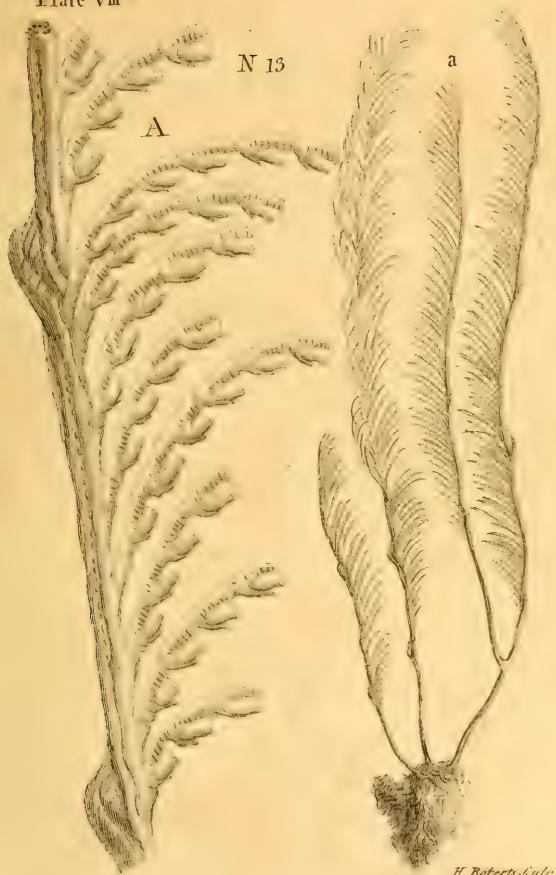
The Denticles are like Cups with an even Brim, fixed in Sockets, and placed all on the same Side one above another; the Openings, or Mouths, looking upwards.

Fig. A, shews the microscopical Appearance of Part of the gibbous Stem, with the Figure and Position of the Denticles. No Vesicles have yet been discovered of this curious Coralline.

This was procured from the Fishermen that attend the *Dublin* Market; and was taken up in very deep Water on that Coast.

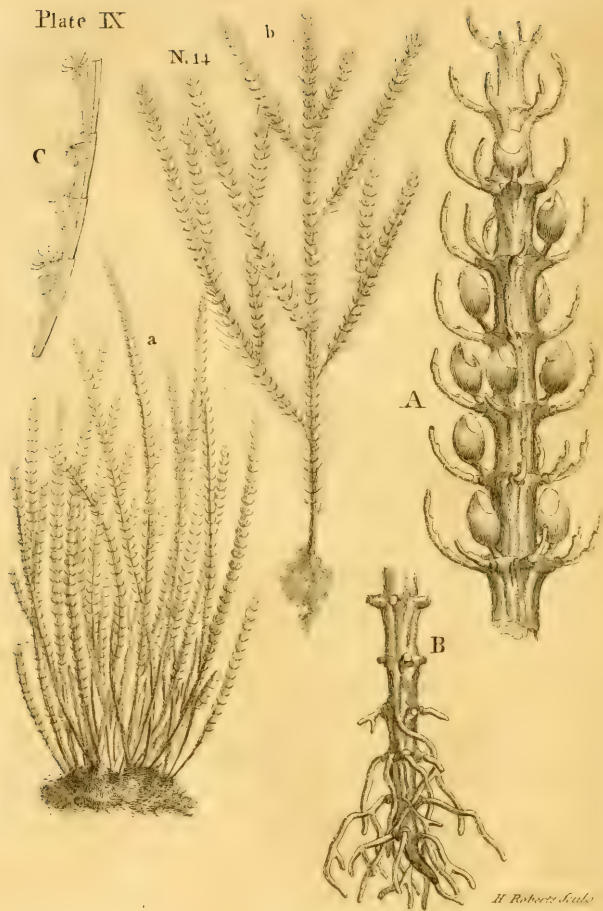
N^o. 14.

Plate VIII



H. Roberts. Sculp.

Plate IX



H. Robertsii Sells

N^o. 14. *Corallina affaci corniculorum æmula*. R. S. N^o. 10. Plate IX.
Fig. a. A.
pag. 34. And

Corallina ramosa cirris obsita. R. S. N^o. 11. pag. 35.

Lobster's horn Coralline, or Sea-beard.

These two Corallines, as mentioned by Mr. Ray, I find to be but one Species; It is probable, their having different Appearances, in different States, might be the Occasion of their being thought two distinct Species.

As to the first, this outwardly appears to be regularly jointed from End to End, like a Lobster's Horn, or rather the *Vertebræ* of Fishes; each Articulation is surrounded by short capillary Branches; which, when magnified, have the Appearance of Sickles, and bend in towards the main Stem. Along the Inside of these, are regularly placed minute Sockets which support small open Denticles of a Cup-shape; which are of so tender a Nature, that they are scarce visible, but in recent Specimens: Between the minute hair-like Branches, we have observed, on some Specimens, small egg-shaped Vesicles, fixed on Foot-stalks, with their Openings or Mouths, on the Side of the Top of each, looking towards the middle Stem; and, in most of them, some of the same kind of yellow Substance that we meet with in other Vesicles. The whole Stem, Branches, and Foot-stalks, to the Vesicles appear hollow, in such Specimens as we find cast on Shore; so that it appears as if the Water could pass freely through them all without Interruption.

The Roots of both Species consist, like the former, of a spongy Mass of minute *Tubuli*, irregularly interwoven together; but, upon separating this Mass from the lower Part of the Stem, we found them regularly entering into it, in Whirls round the Joints, in the same Form that the Branches come out of the Joints of the Stem:

Fig.

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Fig. *a*, represents the natural Size of the Coralline I have been describing: But I must remark, that we often meet with Specimens three times as long as this.

Fig. *A*, is a Part of one of the Stems magnified to shew the Shape of the Vesicles, and the Disposition of the Branches.

Fig. *B*, is the lower Part of one of the Stems, shewing the Manner that the little radical Tubes enter into it.

Mr. *Ray*'s second Species, I take to be the same as the former, but in a younger State. This differs in being branched out, and in having its capillary Ramifications much longer.

While I was on the *Suffex* Coast, I met with this Coralline adhering to an Oyster-shell, and in the utmost Perfection, the Animal being alive in it.

An Account of this, with a very elegant Drawing, taken on the Spot by the ingenious Mr. *Ebret*, I had the Honour to lay before the Royal Society in *June* last.

Fig. b. N^o. 14. is a Design taken from a dried Specimen of it. That which we viewed at the Sea-side in Salt-water had its little *Fibrillæ* along the Branches more extended, or stood out more, like minute Plumes of Feathers.

Fig. *C*. is the magnified Representation of one of these *Fibrillæ*, or minute sickle-shaped Branches, as it appeared with the Animals thrusting out their Claws from their Denticles. Though this little Branch appears to be jointed, yet the fleshy Part of the Animal, which is here expressed by the dark Shade, is connected together through every joint, as well as to every little Polype.

This was magnified by the fourth Glass of *Wilson*'s Microscope; and the sickle-shap'd Branches at *A*, by Glass N^o. 6.

Fig.

Plate X



N^o. 15. *Corallina erecta, tubulosa, pennata, halecis spinæ facie.*
Corallina scruposa, pennata, cauliculis crassiusculis rigidis.
 R. S. N^o. 15. p. 36.

Plate X.

Herring-bone Coralline.

This Coralline is often found sticking to Oysters as they are brought to the *London* Market, during the Winter-season.

It grows to be 6 or 8 Inches high, erect and stiff, but very brittle when it is dry. The Stems consist of a great Number of small Tubes growing nearly Parallel to each other; in some, one may count, in a transverse Section, above one hundred: These seem to arise from a great Number of the same sort of Tubes, irregularly matted together like a piece of Sponge; which are fixed to Oyster-shells, and support the Coralline like so many Roots.

This Coralline increases in Size, by Detachments of these tubulous Roots, which arise all round, and creep along the Outside of those that went before, to which they firmly adhere; and when they arrive at the Destination, that Nature has appointed them, they change their Appearance, and take the Shape of Branches, placed at a regular Angle of 45 Degrees from the Stem; and so exactly proportionable is the Distance of these Branches from one another, that though they are placed alternately, with respect to each other, yet the whole has, at first Sight, the Appearance of an Herring-bone; the Sockets on the Branches are placed alternately. On these Sockets, while I was at *Whitstable* in *August* last, I perceived very tender transparent Denticles of a cylindrical Shape, which appeared to be double; that is, one above the other; in these were Polypes, which were connected by their lower Parts to a slender fleshy Substance of the same Nature with themselves, which I could trace through the Middle of the Branches, and Tubes of the Stem.

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I received some Specimens of this Coralline, that were gathered in the Month of *April*: Their Side-branches were covered with regular Rows of Vesicles standing upright; these were almost full of a yellow Substance, like many of the other Vesicles. When the Coralline is in this State, the Fishermen say they are in Blossom. The Shape of these Vesicles is an irregular Oval, with a Tube arising from the Pedicle, and passing up on one Side to a little above the Top of each: This Tube is open at Top, and seems closely united to the Vesicle.

We must here observe, that there is a good deal of Resemblance, in Miniature, of this Coralline to some of the *American* Keratophyttons, or Sea-feathers, that grow in a pennated Form, and are covered with a Crust of regular Rows of little Animals in their Cells, along the Edges of the Branches.

The Manner likewise of this Coralline's increasing its Trunk and Branches in Bulk, by a continued Succession of fresh *Tubuli* arising all round them, and adhering firmly to those that arose before, gives us some Idea of the Formation of Corals, that are composed of Tubes, which, as the Animals retire, are filled with a stony Matter. For even in the Stems and Trunks of this Coralline, we may observe, that though the Materials, of which it is formed, seem to be of a spongy elastic Nature, yet the inner Tubes become firm, opaque, and brittle, whilst the outward and more recent-formed Tubes are thin, tender, and transparent.

Fig. *a*, N^o. 15. Plate X. gives us the Appearance that this Coralline makes in its natural State, with its spongy Tuft of Roots.

Fig. *A*, is a small Sprig magnified, to shew the Tubes of which

Plate XI



which it consists; with the Form of its Vesicles, and the Polypes in their Denticles.

Fig. C, shews on the same Sprig the alternate Order of the Sockets, in which the tender double Denticles, containing the Polypes, are fixed.

Fig. B, shews the *Tubuli* of Part of the Stem not so highly magnified.

N^o. 16. *Corallina setacea, instar arundinis geniculata, capillamentis singulis unicuique geniculo alternatim dispositis.*

Plate XI.

An Fucoides setaceum tenuissime alatum? R. S. N^o. 6.

P. 38.

An Fucoides setis minimis indivisis constans? R. S. N^o. 7.

P. 39.

Sea-Bristles.

This small Coralline grows on Muscle-shells, and other marine Bodies, like stiff Bristles. When they are found dry on the Shore, they all bend one way, like the small ones described on the Muscle-shell, N^o. 16. Plate XI. which Representation was taken from Nature.

Upon examining one of the Stems in the Microscope, it appeared jointed, like a Reed, as at *A*. From the upper Part of each Joint arises a small capillary Branch; these are disposed, in respect to one another, in an alternate Order: They are also jointed; and upon the upper Part of these Joints are placed in Sockets, small cup-shap'd Denticles, in which I discovered Polypes, like those described in the Lobster's-horn Coralline; and here represented at *A*, Plate XI. The Vesicles in dry Specimens appeared as in the same Figure *A*, shaped like an Olive. I observed one at *Bright-*

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helmstone with its Animal juſt contracted, as in the ſame Figure under the other Veſicles, the Top of which is indented, and appeared not unlike a Coronet: At *Whitſtable*, I lately collected a curious Specimen of this Coralline, which is repreſented on the Muſcle-shell, at Figure *a*, in its natural Size.

Plate XI.

Fig. 4. 5.

N^o. 17. *Corallina confervoides gelatinofa alba, geniculis craſſiſculis pellucidis.* R. S. p. 34. N^o. 7.
Silk Coralline.

This extreme fine, ſlender, and transparent Coralline, adheres, by many minute tubular Threads, like fine Silk, to Stones, and other ſubmarine Subſtances; theſe Threads uniting form the Stem, from which proceed many long ſlender Ramifications, with a middle Stalk of a zigzag or alternately angled Form: From the Points of theſe Angles, go off very minute ſhort Branches, whoſe Diviſions are always two and two, that is, diſpoſed in a dichotomous Order. In theſe appear thro' the Microſcope regular Rows of Holes on one Side, each ſurrounded by a Rim like a Socket: Theſe Holes are placed proportionably nearer to each other, as the Branches grow leſs and leſs; which they do till they end in Points.

At N^o. 17. *b*, Plate XI. is an exact Representation of this Coralline in its proper Proportion: A ſmall Branch of this is magnified at *B*; and the fine tubular Threads, which are repreſented adhering to a Stone at Fig. *d*, are magnified at Figure *D*.

The Veſicles are of an oval Shape, and open at the Top; but they are ſo exceeding ſmall, thin, and tender, that they cannot be preſerved without the greateſt Difficulty.

Platc XII



In *September* 1753, I received some fresh Specimens of this Coralline in Salt-water, taken up at the *Nore*, near the Entrance of the *Thames*. In these I observed each of those small Holes supplied with a Vesicle, and a Polype in it, in the manner they are represented at *Fig. B*, *Plate XI*. These Polypes have 8 *Tentaculi* or Arms; and while the Branch was in the Watch-glass of Sea-water, on the Stage of the Microscope, I could plainly distinguish that the internal hollow Part of the whole Coralline was filled with the Substance of the Parent Polype, which appeared to be of a tender gelatinous Nature; and upon the least Extension or Contraction of the young Polypes, this tender fleshy Substance was visibly affected; for each one was united to it by their lower Part or Tail.

Fig. C, was drawn from a Piece of a Branch not yet unfolded; the Ends of this are round, and the Polypes still inclosed in their Vesicles, having not as yet arrived at Maturity. These Embryo Polypes were smaller and closer as they approached towards the Extremities of the young Branch.

The Motion of the Intestines of the young Polypes was very distinguishable till the Water became putrid; and then both Vesicles and Polypes dropped off, like blighted Blossoms off a Tree; and the Substance of the Parent Polype, though seeming to fill the whole Cavity of the Branch before, as soon as the Water became improper for its Support, shrivelled up immediately so as scarce to be visible.

N^o. 18. *Corallina procumbens caule corneo, longo, filiformi, articulato, vesiculis, ramorum axillis, pedunculis contortis, insidentibus.*

Plate XII.

Sea-thread Coralline.

This Coralline has very tough, pliant, and thread-like,
3 Stalks

Stalks divided into Joints by small Rings; from these proceed little Footstalks twisted like a Screw, that support Vesicles of an oval Shape; some with a small Opening at the Top, and some quite open. This is found in great Abundance on the South-West Coast of *England*, and seems most curiously contrived, from its Structure, to resist the Violence of the Waves, all its Joints being furnished with Springs. Its Vesicles are also formed so as to yield easily to every violent Impulse of the Water without Injury, from their being placed on Footstalks formed like Screws.

Fig. *a*, N^o. 18. in Plate XII. is the Appearance they make in their natural Size.

Fig. *A*, shews Part of a Branch magnified.

Plate XII.
Fig. *b. B.*

N^o. 19. *Corallina minor repens caule nodoso, articulado, & vesiculis alternis instructo.*
Knotted-thread Coralline.

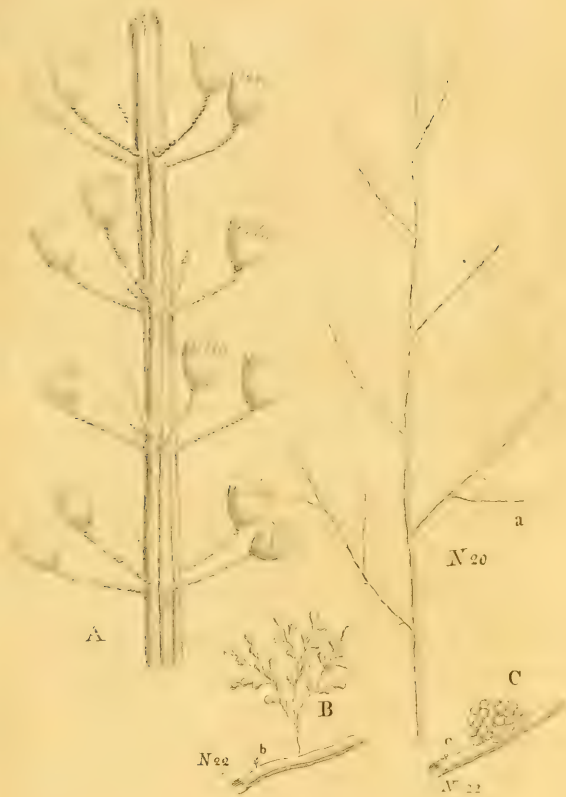
This creeping Coralline is generally found adhering to the podded *Fucus*, from whence it throws out little jointed and waved tender Branches, about an Inch long: The upper Part of the Joints appear to be knobbed; upon these rest the Vesicles in an alternate Order, supported by screw-like Footstalks. The Shape of the Vesicles is like an Oil-Jar with a Neck to it.

This Coralline was found at *Dover*; and I have lately received some Specimens from *Harwich*; so that I believe it is not uncommon on our Coasts.

Fig. *b*, N^o. 19. Plate XII. was drawn from a small Piece of the podded *Fucus*, with several Branches of this Coralline growing upon it.

Fig. *B*, gives the Appearance of a small Branch of it magnified.

Plate XIII



In *September* 1753, I received a recent Specimen of one of this Species in Sea-water, and had an Opportunity to discover in the Microscope the Form and Motion of the Polype that possessed the Inside of it, and of tracing the main Body through all its undulated Case, as it is expressed in the magnified Figure at *C*. In the same Plate, Fig. *c*, is the natural Size of the Piece magnified. Since this Observation, I had an Opportunity, in *June* 1754, at *Brighthelmstone*, of seeing this Coralline in a more perfect manner; and have had the Honour of laying the Account of it, with a very curious Drawing by Mr. *Ebret*, before the Royal Society.

The Form of the Vesicles is like a Cup, in which the principle Parts of the Animals are placed: We have seen them thrusting out their Claws or *Tentaculi* in search of Prey, and have observed them at the same time moving their Cups with their screw-like Stalks at Pleasure; whilst the whole Trunk of the Polype in the Inside of the Stem, or horny Case, was at the same time affected with their Motions; for they appeared but as so many Arms united to, and of a Piece with, the Body.

N^o. 20. *Corallina ramosa, ramis singulis equisetiformibus, in summis capillamentis contortis et verticillatim dispositis, vesiculas campaniformes gerens.*

Plate XIII.
Fig. a. A.

Horse-tail Coralline with bell-shaped Cups.

This curious Coralline was collected on the Sea-coast near *Whitehaven*, in *Cumberland*, by that learned and eminent Physician Doctor *William Brownrigg*, F. R. S.; and appears thro' the Microscope to be of the most singular Structure of any yet described.

It consists of sundry Branches, and every Branch is composed of many strait united small Tubes, which, at certain equal Distances, send off small capillary screw-like Stalks, each
of

of which support a Cup of a bell-shaped Figure, curiously indented round the Brim; these are placed in such a manner as to correspond exactly in Point of Situation with the others, and to give the whole very much the Appearance of the Plant called Horse-tail, or *Equisetum*; the capillary Stalks and their Cups being all disposed in Whirls, or like Branches for Candles,

Fig. *a*, N^o. 20. Plate XIII. gives us the Figure of this Coralline as it was received.

Fig. *A*, shews a magnified Part of one of the Branches discovering 5 Tubes, which compose the Stalk, and 5 twisted Stalks with their Cups at equal Distances in each Whirl.

Plate XIV. N^o. 21. *Corallina minima scandens, vesiculas campaniformes in summo caule lineari contorto gerens.*

Small climbing Coralline with bell-shaped Cups.

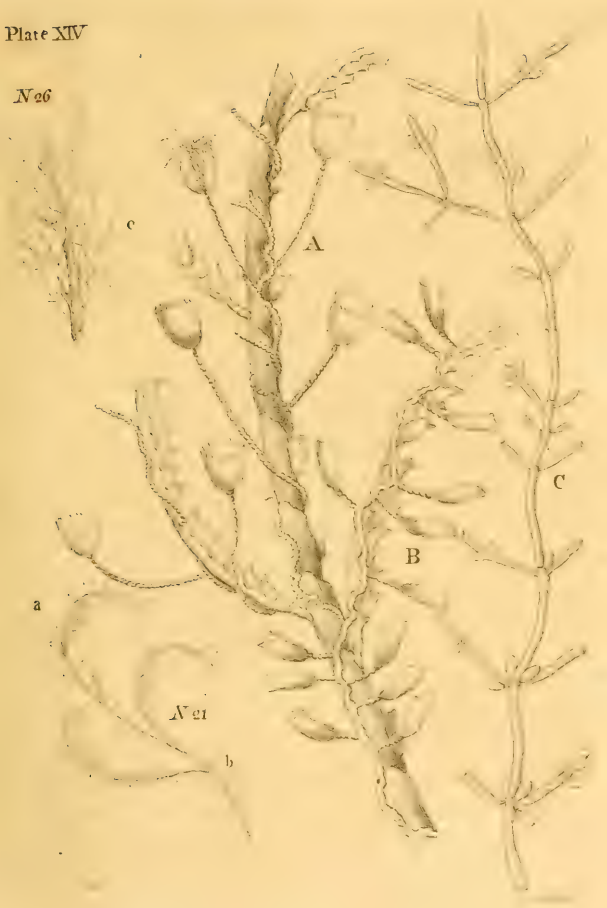
This very minute Coralline arises from small irregular Tubes, which adhere to, and twine about, other Corallines, particularly the Sickle Coralline.

Exceeding small twisted Stalks go out from this tubular Stem, which support little bell-shaped Cups with indented Brims: At the Bottom of each, where they join to the Stalk, the Microscope discovers to us a very minute Spherule, or little Ball, as in some Drinking-glasses. I had the Pleasure while I was at *Brightelmstone* in *June 1754*, of seeing the Animals of this Coralline extending their Claws, or *Tentaculi*, and moving their Stems: One of these as it appeared to us in the Microscope, is described at the upper Part of the Fig. *A*, Plate XIV. Their natural Size, as they adhere to the Sickle Coralline, may be seen at Fig. *a*, N^o. 21.

This

Plate XIV

N^o 6



This Species of Animals seems to be nearly allied to the Bell-animals, adhering to the Duckweed, or *Lens Palustris*, described by Mr. *Lewenboeck*, and of which he has given us a Figure in the *Philosophical Transactions*, N^o. 283, 295, and 337; only ours are much larger.

There is another Species of this creeping kind of Bell-Coralline, which is found adhering to the Sea-fir Coralline.

The Difference between them is, that the twisted Stalks of this are much shorter, and the Cups are longer shaped, and not indented about the Brims. See its natural Size Fig. *b*, N^o. 21. in the same Plate; and Fig. *B*, its magnified Appearance.

N^o. 22. *Corallina omnium minima, vesiculis nunc ramosim, nunc racematim, dense dispositis.* Plate XIII.
Fig. *b. B. c. G.*

Clustering Polype Coralline.

This is the smallest of all the Tribe of Corallines, appearing through the fourth Magnifier of *Wilson's* single Microscope, no bigger than the Fig. *B* and *C*. The natural Size is expressed at *b* 22. and *c* 22.

While I was observing with Attention some other marine Productions in the Microscope, I discovered the round Bunch of transparent Globules, at Fig. *C* sticking to a Branch of one of the Corallines; this on a sudden, to my great Surprise, rose up, and expanded itself under my Eye, into the Plant-like Figure at *B*, with regular Branches and Stalks supporting Pear-shaped Vesicles: Each of these Vesicles, with its Polype in it, appeared to act independently for itself; for I observed each of them very busy prowling about in Search of Prey, so far as the Length of their Stalk would permit them: In less than a Minute, I was as much amazed to find,

E that,

that, as if by common Consent, upon some Warning given, the whole Company at once sunk down, and contracted themselves into the Figure of a Mulberry or Bunch of Grapes, like that at Fig. C. After it had continued for some Seconds in this Form, it again expanded itself as before, and in this manner continued expanding and contracting itself, during the whole Time of Observation.

This Species of Polype seems to agree with Mr. *Trembley's* Clustering Polypes; only his were in fresh, and these in Sea, Water.

Plate XV. N^o. 23: *Corallina exigua repens, denticulis alternis, fructus medicæ cochleatæ æmulis.*

Fig. a, A.

Snail-trefoil Coralline.

This very small but curious Coralline was found creeping on the narrow-leaved Hornwrack of *Ray's Synopsis*, called by him, *Fucus telam lineam sericeamve textura sua æmulantis altera species augustior.* R. S. pag. 43. N^o. 10.

From the irregular creeping tubulous Roots, by which it adheres to the *Fucus* above-mentioned, arise little Spikes or Branches, furnished with alternate Denticles, most curiously furrowed, like the Seed-Vessels of the Plant called the Snail-trefoil.

Fig. a, N^o. 23. shews the natural Size of this Coralline, creeping on the Hornwrack.

Fig. A, represents the creeping Tubes with the Denticles, and one Vesicle magnified. While I was at *Brightelmstone*, June 1754, I discovered the Vesicles of this Coralline; for I had before apprehended the Denticles to be Vesicles; they differ but little from the Denticles, only in the 3 Teeth that are

Plate XV

N^o 4



N^o 5

are placed in the Opening at the Top of each. See the Vesicle above, Fig. *A*.

N^o. 24. *Corallina exigua, caule geniculato, scandens, vesiculis ex unoquoque geniculo sic dispositis, ut syringam Panis referent.* Plate XV.
Fig. *b*: *B*.

Furoides Lendigerum capillamentis cuscute instar implexis. R. S. pag. 30. N^o. 3.

Nit Coralline.

This extremely small climbing Coralline arises from very minute Tubes, by which it adheres to *Fucus*'s, and other marine Bodies; and is so disposed from its jointed Shape, that it climbs up and runs over other Corallines and *Fucus*'s, as Dodder does over other Plants.

Fig. *b*, N^o. 24. is the natural Size and Appearance of this Coralline.

The Vesicles, which have the Appearance of Rows of Denticles, are placed in such a regular Order on the End of each Joint, that when they are magnified, they represent the antique Figure of *Pan*'s Pipe.

Fig. *B*, is the exact Drawing taken from the Microscope.

I have called it the Nit Coralline from Mr. *Ray*'s calling it the Nit-bearing *Furoides*. The small Vesicles closely joined together, in little speck-like Figures among the irregular capillary Branches, gives us some Idea of that Form. See the natural Size, Fig. *b*.

N^o. 25. *Corallina minima repens, vesiculis ovatis, uvarum instar, ramulis adherentibus.* Plate XV.
Fig. *c*: *C*.

Grape Coralline.

This exceeding small Coralline creeps on the broad-leaved

Natural History of

Hornwrack of Ray's *Synopsis*, pag. 42. N^o. 9. called *Fucus telam lineam sericeamve textura sua æmulans*; and sends out Clusters of Vesicles from several Parts of its creeping Tube, each of which has a black Spot in it, like the Spawn of Frogs: Or rather, these look when they are magnified, like a Bunch of full ripe transparent oval-shaped Grapes with the Stones in them, as is represented in the magnified Fig. C, Plate XV. The natural Size of this Coralline is drawn creeping on the broad-leafed Hornwrack, at Fig. c, N^o. 25.

Among many other marine Substances received fresh from the Sea, in *September 1753*, this Object happened to present itself under my magnifying Glasses; when, to my Surprise, I found those grape-like Bodies were a Cluster of Polypes, each having eight Claws or *Tentaculi*, very lively, extending themselves about in pursuit of Prey; and upon their dying, the Animals contracted themselves into their Vesicles, which closed at the Top: What we discover as a Spot, is only the Intestines of the Polype with its Food in it.

Fig. D, shews the Figure of the Polypes extending themselves out of the Vesicles, as taken from the Microscope: These are placed on the same Branch, where the dead ones are represented like Grapes, at Fig. C.

Plate XIV. N^o. 26. *Corallina cuscuteæ forma, minima, ramosa, repens, ramulis oppositis, vesiculis minutissimis ovatis confertis, geniculis ramulorum insidentibus.*

Climbing Dodder-like Coralline.

This very slender climbing Coralline has the Appearance of Dodder when it is magnified; and runs upon the podded *Fucus*, from whence it shoots into extreme fine slender

slender Branches, which are placed opposite to one another.

Fig. *c*, N°. 26. gives us the true Form of this Coralline climbing up the *Fucus*.

The Microscope has discovered to us the Vesicles, which are small and Egg-shaped, growing together, for the most part at the Joints of the Branches.

Fig. *G*, is a Branch magnified.

Of the Tubular Corallines.

BY Tubular Corallines are meant such as are composed of a Number of simple Tubes, growing up near together; or such branch'd ones as are composed only of Tubes without Denticles or Vesicles. These are of the same horny, elastic Nature with the former; and like them recover their original Form, after being some time dry, by being put into Water: They arise too, like the preceding Class, from minute worm-like Tubes; and widen a little as they advance in Height. Some of them look wrinkled like the Windpipe, and others like the Intestines of small Animals.

Plate XVI.
Fig. b.

N^o. 1. *Corallina tubularia laryngæ similis.*

An Fucus Dealenfis fistulosus laryngæ similis? R. S. p. 39.

Tubulous Coralline wrinkled like the Windpipe.

This Coralline is found in great Plenty in the Sea, near the Opening of the *Thames*, adhering to other marine Bodies, and often to the Bottoms of Ships. I have received it with the Animals alive in Sea-water; in which State it affords a most agreeable Scene: The Top of each Tube bearing a bright crimson-coloured Polype, equal in Richness of Colour to the *Guernsey Lily*; all the Animals displaying their Claws or *Tentaculi* at the same time, with surprizing Agility.

Fig. b, gives the natural Size of some of these Tubes.

N^o. 2.

Plate XVI.



Plate XVII.





- N^o. 2. *Corallina tubularia calamos avenaceos referens.*
Adianti aurei minimi facie planta marina. R. S. p. 31.
 Tubular Coralline like oaten Pipes.

Plate XVI.
Fig. c.

This is the largest of this Tribe of *English* tubulous Corallines; and is the same that the celebrated D. *Bernard Jusseu* found on the Coast of *Normandy*, and described with its Polypes. It arises from small worm-like Figures; many of which grow interwoven together, and look like the Guts of small Animals: From this State they rise into distinct Tubes of 5 and 6 Inches long, full of a thick reddish Liquor: On the Top of these the Polypes appear with plumed Crests. These Tubes in the dried Specimens have the Resemblance of Oaten Pipes; that is, Part of an Oat-straw, with the Joints cut off.

Fig. C, is the natural Appearance of this Coralline, with the Animals upon it.

- N^o. 3. *Corallina tubularia gracilis* ♂ *ramosa, axillis ramulorum contortis.*
An fucus fistulosus nudus setas erinaceas æmulans? R. S. pag. 39.
 Small ramified tubular Coralline.

Plate XVI. XVII.
Fig. a.
Plate XVII.
Fig. d.

This branched tubular Coralline is found frequently on Oysters, and other marine Productions.

While I was at *Whitstable* on the *Kentish* Shore, in *August* 1754, I found, among other Corallines, the Specimen described at Fig. a, Plate ~~XXVII~~ with its Polypes alive: This I drew on the Spot from the Microscope, with all its Animals extending themselves in their different Directions, as they lay immerfed in a Glafs of Sea-water; and are pretty exactly exhibited at Fig. A.

This

This Instance affords us a plain Demonstration that the curious branched Corallines, described in the Beginning of this Essay, are of the Fabrick of Animals. From this, the most simple, we may trace them back through a Variety of Forms, up to the most perfect of the whole Tribe.

Here the curious Naturalist may plainly discover a Polype branching out like the common fresh Water one of Mr. *Trembley's*, but strongly fortified by Nature to support itself in its turbulent Situation ; for he will observe this is defended by a tough horny Covering, and fixed by its Base to solid Bodies in the Sea, to secure itself from the infinite Number of Enemies, that every Moment surround it : Whereas the fresh Water one, being confined to the calm and sheltered Situation of Ponds and Ditches, does not stand in need of so necessary a Provision for its Defence.

Plate XVIII.



C H A P. IV.

Of Celliferous Corallines.

BY Celliferous Corallines, I mean those small plant-like marine Bodies, which adhere to Shells, *Fucus*'s, &c. of a brittle, crustaceous, and transparent Substance; and which appear, when magnified, to be fine thin Cells, the Habitations of small Animals connected together, and disposed in Variety of elegant Forms like Branches. All this kind effervesce with Acids.

N^o. 1. *Corallina cellifera, erecta, ramosissima, tenerrima,* & ^{Plate XVIII.}
plumosa. ^{Fig. a. d.}

Corallina pumila erecta ramosior. R. S. p. 37. N^o. 20.
Soft-feathered Coralline.

The Appearance of this Coralline in its first or beginning State, is so unlike itself in the latter or more perfect State, that one would be apt, at first View, to take it for a different Species.

The lower Part of N. 1. Plate XVIII. at Fig. *a*, where it appears bare, without the feathered Branches, the Cells not being opened, is this first State. In this Condition we find it, in the *Hortus Siccus* of Mr. *Buddle*, in the Collection of the late Sir *Hans Sloane*, by the Name of, *Fucus minimus, birsutus fibrillis herbaceis similis.* D. Doody. R. S. 330.

But when it is in its perfect State, these tubulous Stalks rise into beautiful plant-like Figures, with feathered Branches,
F which

which are elegantly disposed one above another, as in the upper Part of the same Figure, N^o. 1. at *a*. When we examine it by the Microscope, we find that each Branch is subdivided in a twofold or dichotomous manner; and each Division of a Branch composed of two Rows of Cells of a semi-cylindrical Form, articulated together, and placed alternately Side by Side, their Faces or Openings looking one Way: Each Cell has a sharp Point on the Top, standing outward; and a black Spot in the Middle. Upon other Specimens I observed small testaceous Figures on the upper Part of each Cell.

Fig. *A*, shews the magnified Appearance of the small Tubes, passing into the unopened Cells which form the Stalk; from this arise the dichotomous Branches, with the Cells open, and black Spots in them. *B*, shews the testaceous Spherules on the Top of each Cell. At *C*, is a cross Section of a Branch, to shew the hollow Inside of the Cells. *D*, shews the upright Section of 3 Cells, with the Situation of the black Spots.

These black Spots are nothing but the dead Polypes, or Remains of the Animals, once inhabiting these Cells. Of which I had evident Proof in my last Journey to the Sea-coast. For after I had examined this Coralline, with its Polypes alive in Sea-water (See *E*, Plate XVIII). I laid this Specimen aside; and, upon examining it again some time after, I found the lifeless contracted Animals exhibited the Appearance above-mentioned.

These Polypes turning into testaceous Bodies, opened a new Scene of Wonder to me. But the Minuteness of these shelly Figures would have been passed over, without any further Notice, if it had not been for a Present I received from my

Plate XIX.



my worthy and ingenious Friend Mr. *Peter Collinson*, F. R. S. of a Specimen of this Class of Corallines, which he had sent him from *America*. Examining this carefully with the Microscope, I plainly discovered it to be the connected *Nidus*'s, or *Matrix*'s of certain testaceous Animals, like small Snails or *Neritæ*; an Account of which I have had the Honour to lay before the Royal Society, in *March* 1753.

Plate XIX.
Fig. a. A.

That these little Snails are perfect Animals, no-body will doubt, who has thoroughly examined them; and that the ultimate End of this curious branched Coralline, was made subservient to the Purpose of introducing these little Creatures into Life: But suppose it is asked, How do these go on to produce their Kind? This indeed will be difficult to answer, unless we may by Analogy suppose, that these minute Shell-fish grow large, and become capable of spawning the whole Coralline, in the same manner that the *Buccinum* of *New York* does its curious *Matrices* which are like long Bunches of Hops. See Plate XXXIII. Fig. a, a 1, and b.

Or, let us suppose, that the testaceous Animal, now in its utmost Perfection, lays its Eggs; these turn into vermicular-shaped Polypes, which, after they have fixed themselves to some marine Substance, rise up, and push forth into Branches of small Polypes in their Cells, in a double Row, alternately placed in respect to one another; each having its proper Cell, which is divided from the other by very thin Partitions: And each little Polype is secured by an umbilical Ligament.

From this State then of being small Polypes, we have observed, that they change into testaceous Animals, connected

to their Cells by the umbilical Ligament, till they are capable of providing for themselves.

But whether this Ligament depends upon the Parent-Animal, as in the Case of the vesicular Coralline, Plate V. Fig. *A*, where the young Polypes are inserted in a tender fleshy Line, that passes through the Middle of the Branches, we have not been able to distinguish, for want of Opportunities of examining them often at the Sea-side.

Plate XX. N^o. 2. *Corallina cellifera erecta, ramosa & plumosa, sphaerulas testaceas, summa parte aviumque capitum formas, a latere cellularum, gerens.*

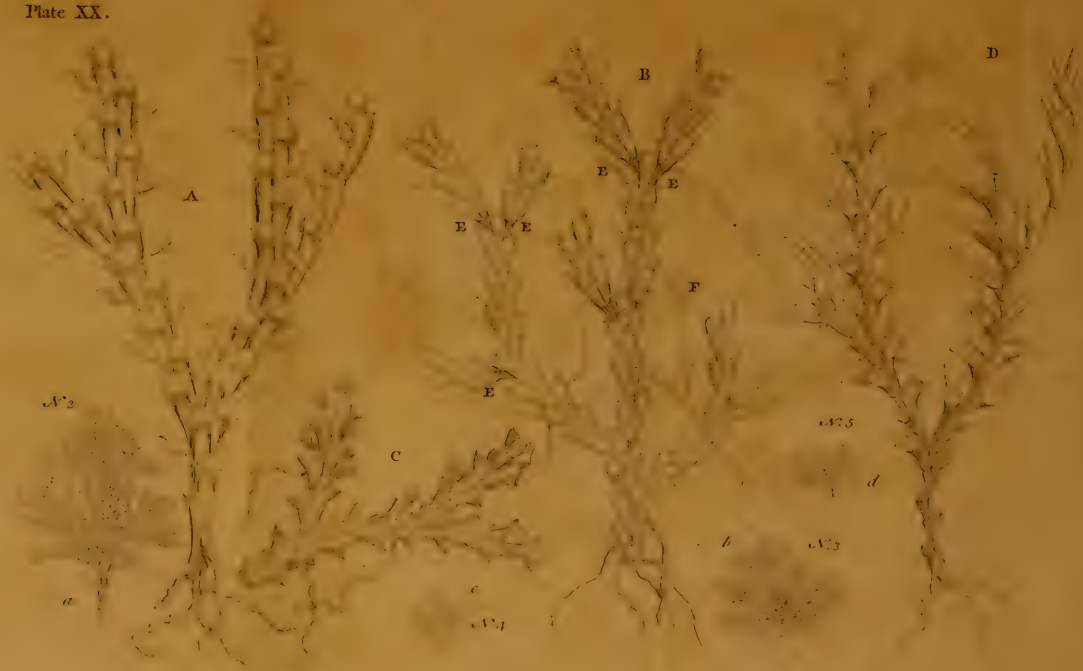
Bird's-head Coralline.

This curious celliferous Coralline rises from small Tubes, which unite, and pass into Branches of semi-cylindrical Cells disposed in two Rows, articulated one into another: Their Openings face the same Way: On the Outside of each Cell, we discover by the Microscope, the Appearance of a Bird's Head, with a crooked Beak, opening very wide; the Use of which is as yet unknown to us, not having yet seen this Species recent in its proper Element.

The Balls, or little testaceous Figures, are much the same as in the former Species. This Coralline is of a glassy brittle Nature.

Fig. *a*, gives us the Appearance of this Coralline, as it is commonly found. The Specimen, from whence the Drawing was taken, was received, among other marine Productions, from the Sea-coast near *Dublin*.

Fig. *A*, shews a Branch with its *Tubuli*, Cells, and other Parts magnified.





Celliferous CORALLINES.

37

N^o. 3. *Corallina cellifera minor, repens, ramosa, tubulis lœvibus, interdum hamosis sparsim dispositis, fucis testisque aligata.*

Plate XX.
Fig. b. B.

Muscus coralloides pumilus ramosus. Dood. Appendix, R. S. 330.

Creeping Coralline.

This is the most common of all the celliferous Corallines, adhering to most kinds of submarine Substances.

The Branches are dichotomous, or divide into two constantly as they extend: The Cells are like inverted Cones, and their Openings, which are round, look one Way, and are commonly found defended by little Spines: The Order of the Cells rise in two Rows joined together, so as to be alternately opposite to each other. The Specimen magnified at Figure *B*, was found full of black Spots in the Cells, which, as hath been already mentioned, are nothing else but the dead Polypes. In other Specimens, we have observed little testaceous Balls at the Top of each Cell.

The Joints appearing in the Angles of the Ramifications, as in the magnified Figure, at *E*, are connected by some short pliant *Tubuli*, which serve as so many Hinges to the Branches, to play to and fro freely, and comply with the violent Motion of the Sea. These Hinges seem to consist of two short Tubes, one to each Row of Cells; and are so finely united to each Branch, that they seem insensibly to pass into the Cells of each.

This Coralline differs from most others in the Situation of its tubular Roots, which appear as in creeping Plants, to proceed from different Parts of their trailing Ramifications.

Some of these little radical Tubes are discovered by the Microscope, to be full of Hooks, the better to secure the Coralline, when it adheres to soft spongy Substances. The Hooks on one of the Tubes are expressed at Fig. *F*, in the Coralline, *B*. the natural Size of which is exhibited at Fig. *b*, N^o. 3.

When this Coralline is put into Vinegar, a strong Effervescence ensues, till the stony or coral-like Coat is destroyed; and then the Cells, still keeping their Shape, appear to be made of a thin pliable Membrane, like those of the Hinges and Roots: So that Roots, Hinges, and Cells appear now to be one continued tubulous Membrane, only modified into different Shapes.

Plate XX.
Fig. c. C. N^o. 4. *Corallina cellifera minor, repens, ramosa, & scruposa, cellulis alternis a latere angulatis.*
Creeping stony Coralline.

This Coralline differs from the former in having angular Sides to its Cells, and in being of a more stony brittle Texture.

While I was at *Ramsgate*, in *August 1754*, I observed the Polypes in the Cells, as described at Fig. *G*; which is a magnified Branch of Fig. *c*, N^o. 4. in the same Plate.

Plate XX.
Fig. d. D. N^o. 5. *Corallina cellifera minima, erecta, ramosa, cellulis infundibuli-formibus, basi conjunctis, oribus patentissimis, superne ciliatis, & alternatim prominentibus.*
Ciliated Coralline.

This very small Coralline arises from many *Tubuli*, which unite, and send forth Branches of Cells of a Funnel-shape, placed





placed alternately, and closely united at the lower Part of the Sides: Their Entrances are very wide; and the upper Part of them, which projects, is full of small Hairs like Eye-lashes. Their Bases are narrow, and seem to be jointed; and if we look attentively in the Microscope, we may discover a small white Hair, which seems to pass through the Middle of each Branch at the joining of the Cells. This Coralline bears testaceous Bodies on the Front of the Cells, somewhat resembling the upper Part of an Helmet; and at the Sides of some of the Cells, little Figures like Birds Heads, not unlike those of the second celliferous Coralline.

At Fig. *D*, we have the magnified Figure of this Coralline: And at *d*, N°. 5. the natural Size of it. Of all this Class of Corallines, this is one of the most delicate and tender.

N°. 6. *Corallina cellifera minima, fragilis, ramosa, & vesiculifera, colore eburneo cellulis tubiformibus conjunctis, paulum arcuatis, & fere oppositis.*

Plate XXI.
Fig. a. A.

Tufted Ivory Coralline.

This Coralline, carefully examined in the Microscope, appears to arise from minute compressed Globules, which have been deposited on a *Fucus*: In the Centre of each of these, we may observe a small Hole, from whence proceed very slender jointed Tubes, which pass into Branches consisting of double Rows of tubular Cells placed almost opposite, and united at the Sides; but the Tops standing out a little: From the Side of these Branches proceed here and there small hollow Vesicles, which are very brittle, and full of small Specks. Close to one Side of the Vesicles, we have observed a small Tube, which, no doubt, is the Entrance into them. This Species comes very near to the Class of vesicular Corallines; for in some Specimens of this Species at the Sea-side, we have lately

lately discovered dead Animals in the Vesicles: But on account of their brittle stony Nature, their having black Specks in their Cells, and their Branches being united by small tubular Hinges, they are introduced here.

Fig. *a*, N^o. 6. is the exact Representation of this Coralline, growing to a Piece of a *Fucus*.

Fig. *A*, gives the magnified Appearance of a Branch of it, as it rises from the *Fucus*.

Plate XXI. N^o. 7. *Corallina cellifera mollis ramosissima, geniculis ad loricæ formam accedentibus.*
Fig. *b. B.*

Muscus coralloides mollis, elatior, ramosissimus. App.
R. S. 330.

Corallina geniculata mollis, internodiis rotundis brevioribus nostras. Pluck. Mant. 56.

Coat of Mail Coralline.

This Coralline, which grows into larger Tufts and Bunches than the rest, consists of many long, shining, soft, and slippery Branches: These are composed of Joints of Cells, placed in Pairs Back to Back. The Opening of each is on a Slant near the Top, and looks the contrary Way to the other: So that the Pair together resembles a Coat of Mail, or Pair of Stays; and the Entrances of the Cells look like the Places for the Arms to come out at. The Joints, or Pairs of Cells, arise insensibly from *Tubuli*, by which the Coralline adheres to its Base; and at certain Seasons of the Year, we may observe small black Spots in the Cells, like some of the rest of this Class.

This Coralline is found in plenty along the Sea-coast of the Island of *Sheppey*; and is frequently found creeping upon, and investing the silk Coralline before described.

Fig.

Fig. *b*, N^o. 7. represents the natural Appearance of this Coralline: This Specimen is but a small Part of the Coralline, as it is commonly found.

Fig. *B*, is a Drawing from the Microscope of a small Branch, as it rises from the *Tubuli*.

N^o. 8. *Corallina cellifera minima, ramosa, cellulis compressis, oppositis, siliculæ burfæ pastoris formam æmulans.* Plate XXII.
Fig. A. a.

Shepherd's-purse Coralline.

This most beautiful Pearl-coloured Coralline adheres by small Tubes to *Fucus*'s, from whence it changes into flat Cells; each single Cell like the Bracket of a Shelf, broad at Top, and narrow at Bottom: These are placed Back to Back in Pairs, one above another, on an extremely slender Tube, that seems to run through the Middle of the Branches of the whole Coralline.

The Cells are open at Top. Some of them have black Spots in them: And from the Top of many of them, a Figure seems to issue out like a short Tobacco-pipe; the small End of which seems to be inserted in the Tube that passes through the Middle of the whole.

The Cells in Pairs are thought by some to have the Appearance of the small Pods of the Shepherd's Purse: By others, the Shape of the Seed-Vessels of the Herb *Veronica*, or Speedwell.

Fig. *a*, N^o. 8. represents some Branches in their natural Size, creeping on the Stock of a *Fucus*,

Fig. *A*, represents a Branch with its small Tubes, magnified by Number 5 of *Wilson's* single Microscope.

Plate XXII. N^o. 9. *Corallina cellifera minutissima, ramosa, & falcata, cellulis simplicibus, tauri cornu facie invicem insertis.*
Bull's-horn Coralline.

This beautiful Coralline is one of the smallest we meet with: It rises from *Tubuli*, growing upon *Fucus's*; and passes from thence into sickle-shaped Branches, consisting of single Rows of Cells looking, when magnified, like Bull's Horns inverted: Each one arising out of the Top of the other. The upper Branches take their Rise from the Fore-part of the Entrance of a Cell, where we may observe a stiff short Hair, which seem to be the Beginning of a Branch.

The Opening of each Cell, which is in the Front of its upper Part, is surrounded by a thin circular Rim; and the Substance of the Cells appears to consist of a fine transparent Shell, or Coral-like Substance.

Fig. *b*, N^o. 9. is the natural Size of this minute Coralline adhering to a *Fucus*.

Fig. *B*, shews the Tubes, and the falcated Ramifications of the Cells, as magnified by the fifth Glass of *Wilson's* Microscope.

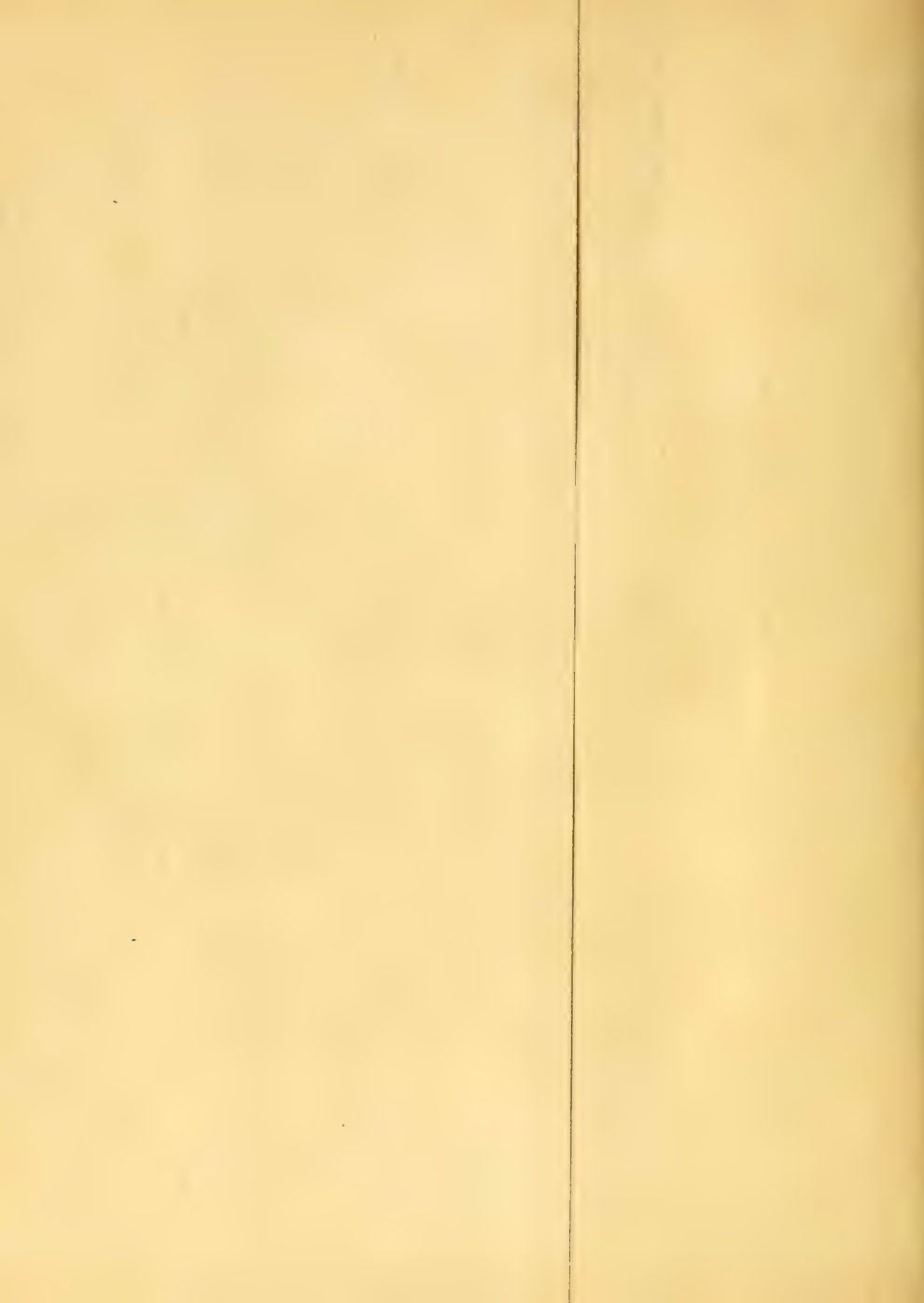
Plate XXI. N^o. 10. *Corallina cellifera, minutissima, falcata, & crustata, cellulis capricorniformibus simplicibus, vesiculas gerens.*

Goat's-horn Coralline.

This very small capillary Coralline consists of Branches of single Cells, shaped like Goat's Horns inverted, placed one

Plate XXII





one above another: On the Top of each is a small circular Opening which inclines inward: At the Back of this arises a fine upright Hair near the Infertion of the next Cell above it.

This Coralline bears oval-shaped Veficles, which are fpecked, or pointed like the celliferous Coralline, N^o. 6. with a fmall Tube at the Back.

Fig. c, N^o. 10. Plate XXI. gives us the true Figure of this Coralline adhering to a *Fucus*.

Fig. C, exprefies an intire Piece, with its Veficles and jointed Tubes magnified by the fifth Glafs of *Wilson's* Microfcopce.

This Coralline is nearly allied to the Sixth Coralline of this Clafs, on account of its Veficles, only the Cells of this are fingle with fmall Hairs rifing out of them; and the Cells of that are difpofed in Pairs.

N^o. 11. *Corallina anguiformis minutiffima, non ramofa.*
Snake Coralline.

Plate XXII.
Fig. c. C

This fingularly fhaped Coralline proceeds from an irregular Tube, which is found creeping on the *Fucoides purpureum eleganter plumofum*. R. S. pag. 38.

From very fmall Holes in the broadeft Part of this irregular winding Tube, there arife here and there fmall testaceous white hollow Figures, exactly refembling a Snake without the lower Jaw, in the Place whereof, is the Entrance into the Cell.

Fig. *c*, N^o. 11. is the natural Size of this minute Coralline furrounding the Stalk of the *Fucus*.

Fig. *C*, expresses it magnified by the fourth Glafs of *Wilson's* Microscope.

The Body of this Snake-like Cell, when magnified by the second Magnifier of *Wilson's* Microscope, as at Figure *D*, appears to be jointed in the Middle, and to consist of parallel Rings.

C H A P. V.

Of the Articulated Corallines.

AS the Corallines hitherto described took their Rise from hollow, flexible, and horny Tubes, either single, or many together; and proceeding uniformly to their Terminations in Branches, consisting either of simple Tubes, or of such as are furnished with Denticles, or Vesicles, or both, or of connected Rows of Cells; so these, which we call articulated Corallines, are obviously different in their external Appearance, and in their Structure; though the Use of all the Kinds appear manifestly to be the same; *viz.* the Places of Abode of different Species of Polypes.

This Kind then, carefully examined by the Microscope, appears to consist of short Pieces of a stony or cretaceous brittle Matter, whose Surface is covered with Pores, or Cells. These stony Pieces, or Joints, are united to one another by a tough, membranous, flexible Substance, made up of many small Tubes of the like Nature, compacted together.

When these are put into Vinegar, the stony or cretaceous Part is soon dissolved, and leaves the other Part intire, which not only forms the ligamentous pliant Articulations; but is likewise the *Substratum*, and even forms the Cells, of the stony Joints themselves.

Among the first of these I shall place;

Plate XXIII. N^o. 1.
Fig. a. A.

N^o. 1. *Corallina articulata diebotoma, internodiis subcylindricis, cellulis rhomboideis, omnino tectis, & tubulis membranaceis exiguis, colligatis.*

Corallina fistulosa fragilis crassior. J. B. 3. 811. R. Hist. 65.

Muscus coralloides polygonoides salicorniæ folio major. Bar. Ic. 1275. N^o. 7.

Corallina fistulosa fragilis, internodiis prelongis lævibus, albis, farcimum modo catenatis. Pluck. Phytog. Pl. XXVI. Fig. 2.

Bugle Coralline.

There is a smaller Species of the same, which differs only in the Diameter of the Branches; and is known by the botanic Writers by the following Names, *viz.*

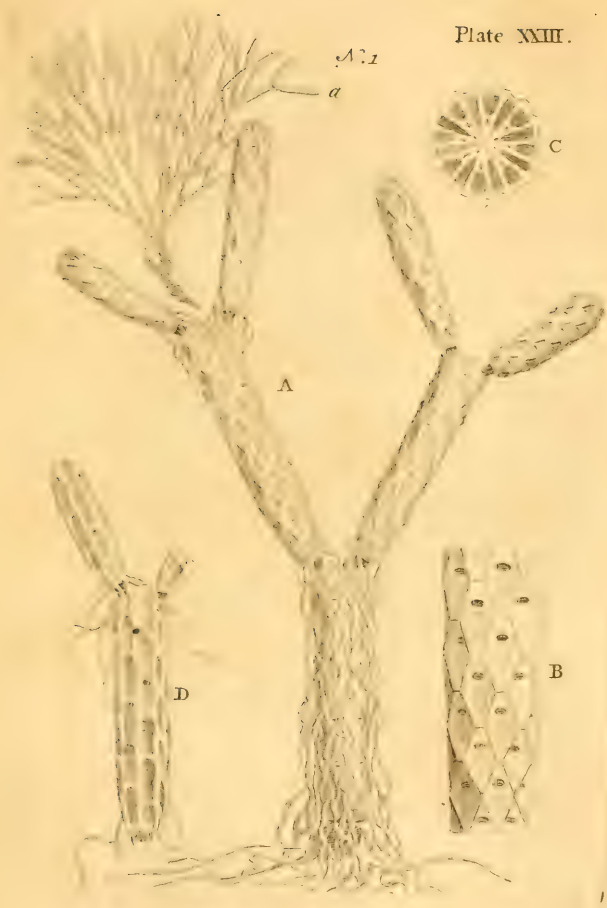
Corallina fistulosa, fragilis subtilior. J. B. 3. 811. R. Hist. 66.

Muscus polygonoides salicorniæ folio minor, seu bifidus. Bar. Icon. 1275. N^o. 8.

This beautiful stony Coralline proceeds from transparent membranaceous Tubes, which enter into, and form, cylindrical Joints, composed of stony Lozenge-shaped Cells, with a proper Entrance into each: These surround the whole Surface of the Coralline.

Fig. a, N^o. 1. shews the natural Size of the larger Bugle Coralline.

Fig. A, is a Branch of it magnified, to shew the Appearance of the Tubes, Joints, and Cells. B, is a Piece of one of the Joints, that had been exposed to the Weather, higher magnified, where the Form of the Entrance into the Cells may be



be plainly seen. *C*, is a cross Section of this Piece, to shew the internal Figure and Disposition of the Cells.

The Joints of the Coralline rise in a dichotomous Order; that is, by a constant progressive Division into two Parts, and are connected together by short *Tubuli* of the same Kind with those they took their Rise from.

These Tubes in the Water are exceeding pliable, which make them move so freely, without breaking in the violent Agitations of the Sea.

The Shape of the Cells is not always of a Lozenge Figure: Sometimes we find them arched at Top, as at *D*; and sometimes of the Shape of a Coffin, as some of the upper Cells at *B*.

When this Coralline has lain exposed for some time on the Shore, it grows very hard, and white; and the Partitions between the Cells become thinner and more distinct, as at Fig. *B*.

Though the following Corallines differ in their Size, and Form of their Cells, and some other Particulars, as their tubulous Roots; yet as they answer the general Definition of this Class, and seem to follow in the Order of Nature, I have connected them together: That we may perceive the Pores, or Cells of this Class the more distinctly, it is necessary they should be viewed immediately on their being taken out of the Sea; for as they dry, the cretaceous or coralline Matter shrinks, and unites the pore-like Cells on the Surface, scarcely to be distinguished from a polished Superficies, without the Help of the very best Glasses.

Plate XXIV. N^o. 2. *Corallina Anglica*. R. S. p. 33. N^o. 1.
 Fig. a. d. *Corallina alba officinarum*. Park. 1298.

Coralline of the Shops.

This Coralline is fixed to Rocks and Shells by stony Joints, which, as they rise, are united to others by extremely fine and slender Tubes: These may be discovered by a good Eye, or a common Magnifier. As the Stems extend themselves, they become pennated by Side-branches, which come out opposite to each other, and are jointed in the same manner; the Joints of this Species are like the upper Part of an inverted Cone, but a little compressed: The whole Surface is covered over with very minute circular-shaped Cells like Pores (See Fig. B, and Fig. B 1) where they are higher magnified.

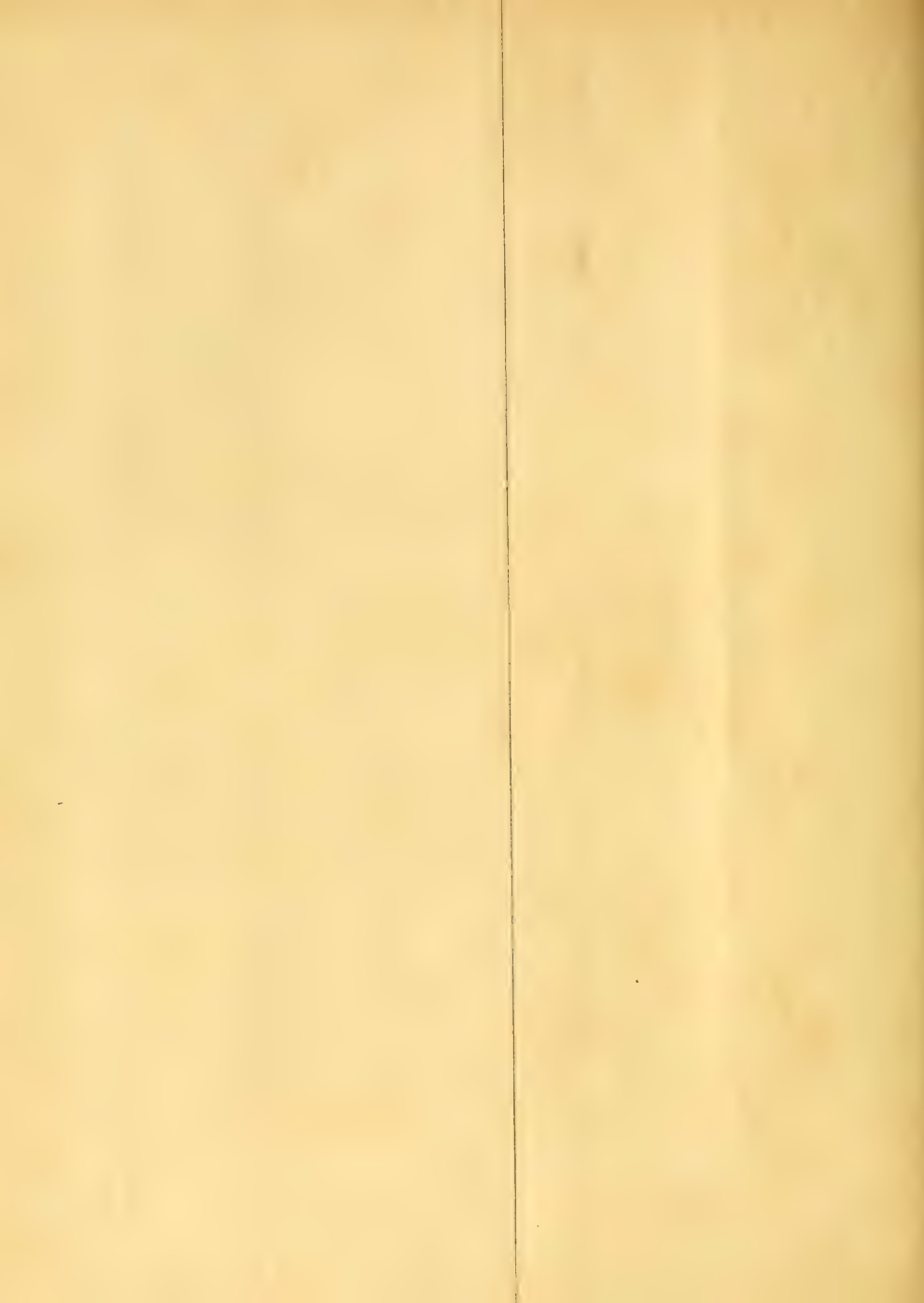
Fig. B 2, shews the cross Section highly magnified.

Fig. a, N^o. 2. is an exact Representation of this Coralline as it was found growing to a Rock.

If a Branch of this Coralline is put into Vinegar, these Cells are dissolved with the whole cretaceous Surface, instead of which there appear Rows of minute Ramifications, which seem to have communicated with each of these Cells (See Fig. A.)

Upon some Specimens of this Coralline, we may observe little small Figures like Seed-vessels, with which the Branches frequently terminate: They are also found on the Sides, as may be seen at Fig. A, where they are magnified.

This Branch was steeped in Vinegar, which rendered the whole soft, and from the little Knobs at the Ends and Sides,
 were



were squeezed out little twisted Figures, like those at *A 1*, which are magnified higher at *A 2*.

We frequently find this Coralline of different Colours, as red, green, ash-coloured, and white; but all of it, by being long exposed to the Sun and Air on the Shore, becomes white.

N^o. 3. *Corallina Anglica procumbens, segmentis brevibus.*
Slender trailing *English* Coralline.

Plate XXIV
Fig. N^o. 3

This Coralline seems to be a Variety of the former, which grows stiff and erect, with large Joints; whereas this hangs down, having very slender Branches with small Joints (See N^o. 3. in Plate XXIV). The Colour of this seems to vary according to the Situation.

N^o. 4. *Corallina Anglica erecta, ramulis dense pinnatis, lanceolæ formâ terminantibus, segmentis ad utrumque latus paululum compressis.*

Plate XXIV.
Fig. c. C.

Corallina squamata. Parkin. 1296.

Upright *English* Coralline, with Spear-like Heads and flat Joints.

This Coralline I received from the Reverend Mr. *William Borlase*, of *Ludgvan* in *Cornwall*, F. R. S. a very curious and ingenious Gentleman: To whom I am much obliged for many other Sea-productions.

It is most frequently found of a light-green Colour; and, possibly, the Copper Mines, which abound on many Parts of the *Cornish* Shore, may affect the Colour; as the ochry Earth near *Harwich* does some of the second Species with an Orange Colour.

N^o. 4. Plate XXIV. represents this Coralline in its natural Form.

Fig. C, is a Branch of it magnified, to shew the Figure of the Joints. This has had its cretaceous Parts dissolved by the Vinegar. Upon each Joint may be discovered the different Series of Ramifications, which lead to the Cells on the Surface: This will be more fully exemplified in some similar foreign Sea-productions hereafter.

Plate XXIV. N^o. 5. *Corallina ramulis dichotomis, teneris, capillaribus, & rubentibus.*
Fig. c. E.

Corallina rubens, sive muscus marinus rubens. Park.
1296.

Reddish Hair-like Coralline.

This Coralline, when magnified, appears to grow in Branches always dividing into two Parts, consisting of long cylindrical Joints connected by very small *Tubuli*; when the stony Part is dissolved in Vinegar, the small fibrous Ramifications, that correspond with the minute Pores on the Surface, like the foregoing one, are easily to be seen.

N^o. 5. Fig. e, is the natural Size. And

Fig. E, the magnified Appearance of a Branch of this Coralline.

Plate XXIV. N^o. 6. *Corallina alba exigua, ramulis dichotomis segmentis corniculatis, fucis minimis teretibus adnascens.*
Fig. d. D.

White slender jointed Coralline.

This Coralline differs from the foregoing, in having stronger and thicker Branches, and the Tops of the lower Joints diversified with two projecting Points like Horns.

Fig. d, N^o. 6. expresses a Tuft of this Coralline growing on a *Fucus*.

Fig.

Articulated CORALLINES.

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Fig. D, shews the manner of its growing, and the corni-
culated lower Joints.

N^o. 7. *Corallina dichotoma, capillis densis, cristatis, spermophoro-* Plate XXIV.
ris, fucis minimis teretibus adnascens. Fig. f. F.

Corallina cristata minima. Barrell. pag. 1328.

Muscus coralloides cristatus. Bar. Icon. 1296. N. 2.

Crested or Cock's-comb Coralline.

The Branches of this Coralline likewise go off in Pairs, or in a dichotomous Order; it grows in round Tufts, like the Crest or Topping on a Bird's Head. A Number of these Branches being spread out like a Fan, and placed flat on one another, compose these agreeable Crest-like Figures; some of them are of a fine red, others green, with a white Edging. They are generally found growing on a round slender *Fucus*. On the upper Part of the Branches the Microscope discovers some small Vesicles; from the Top of each of these arises the Beginning of two other Branches, so that they seem to be of Use in buoying up the Coralline.

Fig. f, N^o. 7. is the natural Appearance of this Coralline.

Fig. F, is a magnified Branch with the Vesicles.

N^o. 8. *Corallina alba spermophoros, capillis tenuissimis.* Plate XXIV.

Corallina muscosa, seu Muscus marinus tenui capillo spermophoros. Mor. Hist. Ox. Part III. p. 651. S. 15. T. IX. f. 9.

Seed-bearing Coralline.

Fig. g. G.

This exceeding slender white Coralline appears under the Microscope to bear little Vesicles, in the Form of Seed-vesiels, which seem to buoy it up in the Water; out of each of these arise two fine slender Hairs, and from each of which rise

other Vesicles; from these proceed two fine pointed Hairs, which finishes this beautiful minute Coralline. There seems to be a great Affinity between this and the crested Coralline; tho', from the whole of its Appearance, there seems just Reason to make it a distinct Species.

The Vesicles, on the strictest Examination, appear to have no Opening into them.

N^o. 8. Fig. *g*, is the natural Appearance, but in general the Tufts are fuller.

Fig. *G*, is a small Sprig, with the double Row of Vesicles magnified.

Plate XXIV. N^o. 9. *Corallina plumosa nivea, fuceo minimo, tereti adnascens.*
Fig. *b. H*. Snow-white downy Coralline.

Among some uncommon Corallines, which I received from my worthy Friend the Reverend Mr. *Borlase*, near *Penzance* in *Cornwall*, I met with this most curious minute one, adhering to a *Fucus*. At first I took it for some white Down of Feathers; but, upon Examination, I found it to be an articulated Coralline, with the Joints united by *Tubuli*, as perfect as in the larger Kinds.

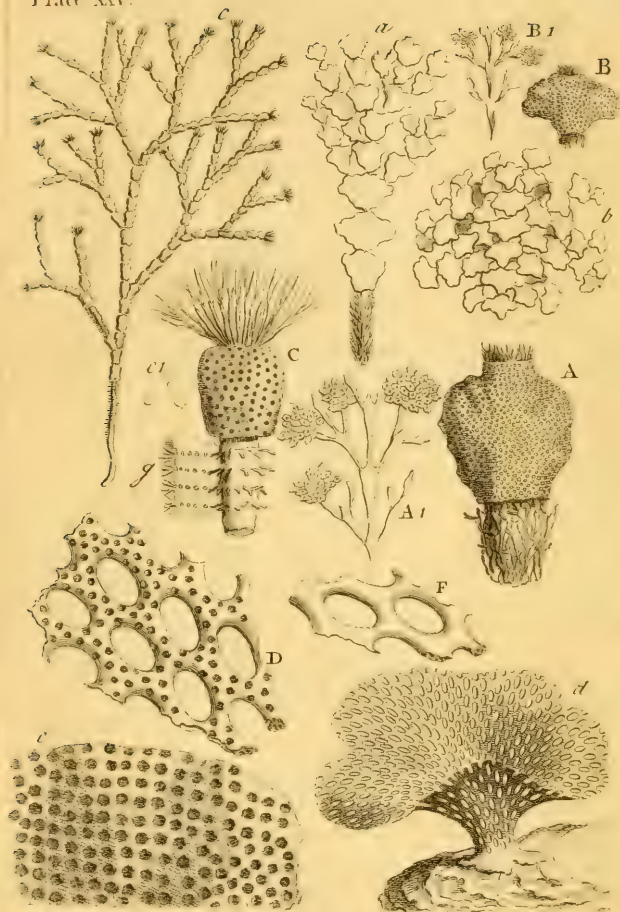
Fig. *b*, N^o. 9. Plate XXIV. is the natural Size of it, adhering to a Piece of a *Fucus*.

Fig. *H*, is the magnified Appearance of several Pieces of the Coralline, fastened by small Globules to the Fibres of the *Fucus*, likewise magnified. From these Globules rise 3 or 4 cylindrical Joints.

Fig. *H 1*, expresses the Globule and Joints magnified higher. The whole Surface appears here to be covered over with hollow Squares.

Obfer-

Plate XXV.



Observations on some of the articulated Corallines of Jamaica :

These are introduced here, to shew the Operations of Nature in the warmer Climates; and to set before us in a clearer Light, the curious Construction of the Corallines of our own. Our articulated Corallines, as was observed before, are so dense, except the first, and their Surfaces so smooth, that the Microscope can but just discover to us their Pores. The *West-Indian* Corallines are generally of a looser Texture: The naked Eye can easily discern the Pore-like Cells all over the Surface; and at the same time very plainly distinguish the Tubes that connect the Joints.

Plate XXV.
Fig. a. b. c.

When the cretaceous Matter is dissolved in Vinegar, we may observe, with the Microscope, the Hinge-like Tubes continued in Ramifications, that expand themselves over the flat Superficies of each Joint, and end in little Cups, that are united at the Sides, so as to form a Surface like an Honeycomb: Each minute Cup has a small Hole at the Bottom, by which it communicates with a particular little Tube of one of the lesser Branches; and the Top of each Cup corresponds with a Pore on the cretaceous Surface.

Fig. *a* and *b*, Plate XXV. shew two Species of these Corallines in their natural Size.

Fig. *A*, shews the Pores of one of the Joints of Fig. *a* magnified.

Fig. *A 1*, shews the regular Ramifications ending in flat Surfaces of little connected Cups, joined together like an Honeycomb, after the cretaceous Matter of the Joint, at Fig. *A* was taken off by the Vinegar.

Fig.

Fig. B, and B 1, shew the Joint and ramified Tubes of the lesser Species at Fig. b, magnified when the cretaceous Surface was taken off in like manner.

I shall introduce a third Species of articulated Coralline, on account of its Singularity; it seems to be the *Corallina fistulosa Jamaicensis candida cum internodiis brevissimis, & quasi filo trajectis*, of *Plukenet*. I shall call it the Rosary or Bead-Coralline of *Jamaica* (See Fig. c, Plate XXV).

The Fig. C, shews one of the Beads magnified; and on the lower Part, where the next Bead is laid open to discover the Tube, we may perceive regular Rows of small Pipes, that lead from the middle horny Tube, through the cretaceous Substance to the Cells on the Surface, at g.

The Tuft of Hair-like Tubes, at C, which are to be seen at the Top of each Branch, appear to be the Ramifications, that belong to the next Bead that is to be formed.

When the cretaceous Part is dissolved in Vinegar, we find many Seed-like Particles disposed among Cells of an Heart-shape, as at Fig. C 1.

To these I shall add another Sea-production, upon account of its approaching to the articulated Corallines, in its manner of growing.

I received it, among many other Varieties, from the Seacoast of the *Isle of Wight*. It appears in the Microscope to be tubular, and different from any thing I have yet met with from our Coasts. I have called it,

Plate XXVII. *Corallina tubulata tenera, dichotoma, & pustulosa.*
Fig. b. B.

Dichotomous tubular Coralline.

This appears, through the Microscope, full of Warts and
Pustules,

Articulated CORALLINES.

55

Pustules, with a small Speck in the Middle of each. It seems to be of an horny transparent Nature. Each Pair of Joints or Branches are inserted in the Top of the next Joint or Branch below them, as in some of the smaller articulated Corallines just now described.

Fig. *b*, is the natural Size of a small Part of this Coralline.

Fig. *B*, is a small Piece of it magnified.

CHAP,

Of the Keratophyta.

NEXT in Order to the Corallines, may be ranked the *Frutices coralloides*, or Sea-shrubs; now more generally known among Naturalists by the different Appellations of *Lithophyta*, *Litboxyla*, or *Keratophyta*; Epithets intended to convey an Idea of their Composition, which, at first View, seems to consist partly of a woody or horny, partly of a stony or calcareous, Substance, variously disposed with respect to each other.

The general Form of these Bodies approaches to that of Shrubs, having a Root-like Base, by which they adhere to some solid Support in the Ocean; and a Stem or Trunk, and Branches differently disposed; some rising up in one or more distinct Twigs, and these subdivided into smaller and separate Ramifications; while others have their smaller Branches connected in such a manner, as to form a curious Net-like Structure: From this Diversity of Figure, and external Appearance, they commonly borrow the Names, by which they are known in the Cabinets of the Curious, as Sea-Fans, Feathers, and the like.

But as it is not my Design to write an express Treatise on this Subject, I shall only observe, That most of these *Keratophyta* when perfect, if their Structure is carefully examined, exhibit the following Appearances:

First, A woody kind of Base or Root, which either still adheres, or shews that it has adhered, to some solid Body, as Rocks, Corals, large Shells, or the like.

View this Base attentively, and it appears to consist of longitudinal Fibres lying close Side by Side, and connected inseparably without Violence, running from the Circumference of the Base to the rising Trunk, along which they are disposed in like manner; and the same Texture may by good Glasses be traced to the Extremities of the Branches. These Glasses discover, that what to the naked Eye seemed to be Fibres, are indeed small Tubes, of which the whole Shrub consists, but compressed, and shrunk in.

If we cut the Trunk, or any large Branch of these *Keratophyta* transversely, and examine their Structure nicely, we may plainly discover, not only the Course of these longitudinal Tubes, but, likewise, that they are circularly disposed about the Centre of the Trunk, somewhat in the same manner as appears in the annual Circles of Wood, with this Difference however, that in the *Keratophyta* the Circles do not adhere so closely to each other as in Wood; but appear plainly to be superinduced, and often with some heterogeneous Matter intervening.

The Part we have hitherto described, is that which some Naturalists have called the woody Part of the *Keratophyta*; others, from its affording when burnt a strong Smell like burning Horn, the horny.

And this, in all the various Species of this kind of Bodies, however different in Size, Figure, and external Appearance they may be, appears almost uniformly to be the same, exhibiting to the View a similar Structure, and the same Principles, when chemically analysed.

Upon this horny or woody Part is superinduced a kind of stony or calcareous Coat, covering both Trunk and Branches to their very Extremities.

The calcarious Coat commences thin where the Trunk begins, grows thicker as the Branches advance; and the youngest Fibres have, generally, by much the largest Proportion, if not the largest Quantity surrounding them: This Part likewise, when thrown into the Fire, yields something of a marine horny Smell. If we examine this Coat attentively, even with the naked Eye, we may discover in many kinds, regular Orders of Pores or Cells; and, viewed by the Microscope, it constantly appears to be an organical Body, and not the accidental Concretion of adventitious Substances, like the indurated Crust upon Moss and other Vegetables in petrifying Waters, but a regular Congeries, like the Cells in which Animals have been formed, or existed.

Most of these kinds of Bodies, *when perfect*, exhibit the Appearances described; but we often see these horny Shrubs in the Collections of Naturalists, without any calcarious Covering at all. It must not however be immediately determined, that they were so formed; since it is more than probable, that they have been divested of these Coverings, by the Violence of the Waves, and other like Accidents; by which they have been stripped of a Part, that seems not less essential to these Bodies, than the Bark is to Trees. This accidental Change in their external Habit, has, nevertheless, occasioned some Difficulty to the Botanists; and induced even *Boerhaave* himself, to divide them into two Families, calling those that had their native calcarious Covering *Titano-Keratophyta*; and those that were divested of it, which on the Sea-coast will soon happen, only *Keratophyta*.

Notwithstanding these strong Circumstances, to prove the animal Structure of those submarine Bodies, yet as there are many curious and ingenious Persons, who still remain unconvinced, it becomes necessary for us to scrutinize into the Nature of them with more Exactness.

Specimens

Specimens of a very young Growth, *viz.* 2 or 3 Inches high have the Appearance of a small calcareous Sprig. When this is dissected length-ways, and viewed with Attention, we find in the Centre, a slender horny Tube, with some whitish Matter in it like Pith; next to this Tube are other very small Tubes of a calcareous Substance, that adhere to it, and surround it, covering over even the Point of the Top.

In more advanced Specimens, where they branch out, these fine calcareous Tubes send out little Cells of Animals of the Polype kind, with proper Openings to them all. These Cells are disposed along the Branches always in some regular Order, with great Exactness, according to the particular Species; not like the Nests of Insects on Plants, which are accidentally placed here and there; and which many imagine them to be; but in much the same precise Form and Manner, that we observe in the Cells of the Corallines.

From these Cells the Animals have been discovered extending themselves, as well to procure Food for themselves, as Materials for the Increase of this surprizing Structure: But this will be made clearer to us from some following Observations.

When Insects infest a Vegetable, to devour its Leaves, and build their Nests upon its Trunk and Branchs, they are rarely observed to cover the whole Bark from the Bottom of the Trunk, to the utmost Extent of its Ramifications: But, admitting this should happen to be the Case, I believe it will be allowed, no-body ever saw Plants, so totally incrusted over with the Cells of Insects, live and flourish after. It has been generally remarked, that real Sea-vegetables, of which there are a considerable Variety, are as much subject to be attacked by different kinds of Sea-Insects, who build their Nests on

them, as the Land-Plants are to their kinds; but then, it is as commonly observed, that they fare much alike, that is, they perish and decay.

The Herring-bone Coralline described at Fig. *a*, Plate X. resembles these *Keratophyta* in the Manner of its Growth very nearly, except in the Incrustation, and is a miniature Figure of that pennated Species, called in the *West-Indies* the Sea-Feather.

In order to shew the great Affinity there is between the Structure of the pennated *Keratophyta*, and the vesicular Corallines with Denticles, I shall here give a short Description of a curious one from *Sardinia*, called the Sea-Feather, which I lately met with in the curious Collections of Mr. *Baker*, and Mr. *Pond*, Fellows of the Royal Society.

This beautiful marine Production is about a Foot high: The small *Pinnae*, or Side-Sprigs, are placed alternately opposite to each other, in a regular Order on each Side of the main Stem. These are furnished with several little Clusters of small Tubercles placed at equal Distances, and surrounding the Stem generally three together. When they are magnified, they have much the Appearance of the bearing Buds of Fruit-Trees. In this dry Specimen their Tops bend in towards the Stem of the Branch that supports them.

The whole Surface is covered over with a calcareous Substance, like most of this Class.

Fig. *S*, in Plate XXVI. represents one of the Ramifications, with the main upright Stem; this, we may observe, has a very near Resemblance to the Form of the Sea-Fir Coralline, Plate I. Fig. *b*, pag. 4.

Fig.





Fig. *T*, is a microscopical Representation of two of these Divisions, with their little Tubercles.

One of these Divisions being put into an acid *Mensstruum*, the calcarious Matter was easily dissolved, and the two Side-Tubercles, at Fig. *V*, were exhibited to View, divested of their Crust or calcarious Covering; and here we plainly discovered two Polypes with their Claws or *Tentaculi* contracted. These, we perceived, were both united to the main Body of the Animal, by a slender fleshy Substance that proceeded from the Bottom of each. This fleshy Substance, that constitutes the Centre of the Stem, or main Body of the Animal, we can easily trace through the Middle of the Stems and Branches of the *Keratophyta*, when the calcarious Covering is taken off.

In the same manner, we may perceive the Polypes by Pairs inserted into the central fleshy Stems of the vesicular Coralline, N^o. 7. Plate IV. at Fig. *C*, and in N^o. 8. Plate V. at Fig. *A*.

I have now before me Specimens, that prove the horny Circles, which surround and compose the Stem and Branches, to be the Work of Animals; one particularly of the *Keratophyta*, or Sea-fans, called by the celebrated *Linneus*, *Flabellum Veneris* (See Plate XXVI. Fig. *A*); which, by some Accident, has had one of the main Stems belonging to the Branches broke quite across, at Fig. *B*. But the broken Parts have been kept near to one another by the small reticulated Side-branches, at Fig. *D*. The Animals, in the Progress of their Tubes upwards from the Trunk, Fig. *K*, as soon as they met with this Obstruction of the broken Stem, turned off to one Side, and proceeding along the reticulated Branches, towards *D*, covered over the vacant Spaces with their horny
and

Plate XXVI.
Fig. C. D.

and calcarious Matter. At the dark Part near *D*, the calcarious Tubes are taken off, on purpose to shew that the horny Parts underneath, which still have the Appearance of Tubes, have taken the same Course and Direction with the calcarious ones, that succeeded and covered them. After this they made a short Turn, to gain the broken End of the upper Part of the Stem of this Branch; and from thence they continued their Progress along it towards the finer Ramifications, as usual.

Fig. *E*, represents two calcarious Tubes magnified: These were cut off from the cortical Part of the Trunk, near Fig. *L*. The component Parts of the calcarious Matter are so magnified, that the particular Shape of them may be distinguished, which is not unlike that of the red Coral.

Fig. *F* and *I*, represent a small Sprig magnified, that was taken from the Top of this *Keratophyton*, at Fig. *O*.

Fig. *G*, is a small Ramification of this Sprig, with the calcarious Surface thinly taken off, to discover the three Tubes, that run just under the Surface; the two Side ones appear to have small Holes in them, as if the Animals communicated with the 2 Rows of Cells on the Sides. By cutting another very thin Slice, we discover both the horny Tube in the Middle, and the two Rows of Cells; which are both expressed on the opposite Ramification, at Fig. *H*.

In each of these Cells we plainly discover a small Polype, of the Size of the Figures at *N*, and of the same Shape with the magnified Figures at *M*. This Specimen was lately brought from the *West-Indies*; the Animals were very distinguishable, but contracted: The dark Holes on the Sides of the Stem, and lower Branch of this magnified Sprig, *F* and

I, are the Holes from whence the Polypes extend themselves.

Fig. *I*, is the lower End cut sloping off, to shew the Cavities of the Tubes and Cells.

In the Centre of the Section is the End of the compressed horny Tube. The small reticulated Branches of this *Keratophyton* are much compressed; and when we view them in Front, their thin Edge stands towards us.

Fig. *K*, is the horizontal Section of this great Branch, shewing the several circular Layers of contracted Tubes, which now look like the annular Circles of Wood.

In the same *Keratophyton*, or Sea-Fan, is another remarkable Instance of the Animals forming the horny Part of the Branches.

This Specimen appears to have the Progress of its Growth stopt by some impending Rock, or other Accident; Part of its upper Branches appearing as if cut off in a Line horizontally, Fig. *c*. This we observe has diverted the Course of the Animals back the Way they came, so that we find many of the late formed Cells covered over, and confused with an irregular Appearance of the calcarious Matter. This we can perceive, as far as we can trace the Animals back in their Retreat; and, upon taking off the calcarious Matter, we find, that the horny Substance, which they have deposited since their Return, had filled up most of the vacant Places, in that Part of the Reticulation.

Besides the horny and woody Substance of the Stem and Branches of these *Keratophyta*, I have lately met with one from *South Carolina*, in the Collection of Mr. *Peter Collinson*, E. R. S. whose inward Parts are intirely of a spongy Texture,

ture, and the whole Substance of it, feels as light as Cork.

The outward Surface is composed of a mealy friable Matter of the Colour of red Lead, not unlike the Covering of the common red Coral, as it is brought to us, when first taken out of the Sea, but fuller of little starry Holes. The Matter that composes the Cells which lies immediately under this, has some Degree of Tenacity, and the internal Part is still more compact, and consists of a faint red spongy Substance.

The Surface of the principal Stems are surrounded by parallel Tubes: These Tubes we may trace up along the Branches, till they change insensibly into Rows of Cells, as we may observe in some of the celliferous Corallines.

Fig. P, Plate XXVI. is a Representation of a small Piece of this spongy *Keratophyton*, in its natural Proportion.

Fig. Q, is a Piece of the Top of one of the Branches, cut perpendicularly through the Middle, to shew the Situation of the Cells. These Rows of Cells surround the young Branches on all Sides; and the spongy Parts between them appear in the Microscope to be full of irregular tubular Cavities.

The internal spongy Part of this Species is more intimately united to the cellular cortical Part, than in any other Species we have yet seen.

Fig. R, is the horizontal Section of the same Branch, to shew the Disposition of the several Rows of Cells, surrounding the spongy central Part.

I have observed, in some Specimens of the pennated *Keratophyton*, or Sea-Feather, that, when the Whole, or Part of it,

it dies, the Animal of the *Millepora* Coral Kind frequently incrusts its dead Branches with a white coral Matter, so that many Persons have been deceived by not examining it carefully, and have taken it for a calcareous, instead of a stony, Incrustation. But, besides the Difference of the Materials of which these Coverings are composed, the Irregularity of the Coral is easily to be distinguished, from the great Exactness of the natural Incrustation.

Another Observation naturally follows this; and that is, we never find upon one and the same Species of *Keratophyton*, two different kinds of calcareous Incrustations. Notwithstanding I have seen three different Species of *Keratophyta* adhering to one Piece of Rock-coral; and in the same Piece, Part of a dead *Keratophyton* incrusted with the Coral.

The Particles of this cortical Crust, which are of a peculiar Figure in each Species, are often deeply impressed into the last Row of Tubes, which are now become woody or horny, from having their calcareous Parts mixed with the glutinous Parts of the Animal, and are the present Surface of the inner Part.

No Bark, Membrane, or other outside Covering, are ever found on this Genus of marine Productions, except this cellular calcareous Coat, which shews it to be its natural one.

Whoever has carefully examined the upright and cross Sections of Trees and Shrubs, or even the Stems of Sea-plants, will find, that the longitudinal Vessels of the woody Parts are always connected together by lateral Fibres, or have lateral Tubes. But on the nicest Enquiry we could make with the Microscope, we could never discover any of these connecting Fibres, or Tubes, proceeding from the Pith

to the Circumference, among the compressed longitudinal Tubes and Vessels of these *Keratophyta*; so that the Viscidity, derived from the Animals, seems to be the chief Cause of these Tubes uniting so closely together; for in some particular Specimens from the hottest Climate, they form a Body much harder than Wood, especially after they are become very dry.

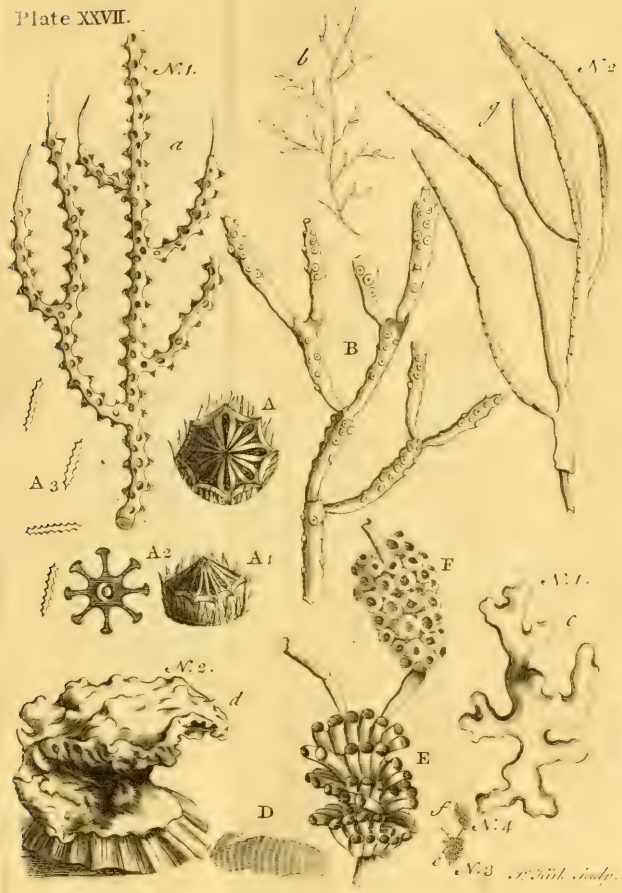
If we examine the stony red Coral of the *Mediterranean* Sea, we shall find a great Affinity between it and the *Keratophyta*, in Texture, and chemical Productions; only the Ramifications are very short, and the Tubes turn to Stone instead of Horn. But if we consider the Course of the Tubes in each, the Manner of their surrounding the Stem, augmenting its Circumference and that of the Branches, its rough, friable, bark-like Surface, together with the starry Openings of the Cells, we must think they are not far removed from each other, in the great Scale of Nature.

We frequently meet with Specimens among the reticulated *Keratophyta*, where the Animals, in their Progress up the Stems and Branches, pass with their Tubes over, and inclose, small Shells, and other extraneous Bodies.

Something of the same kind is found in the Progress of the Animals, that form the red Coral, the Tubes of these are often found surrounding, and spread upon a great Variety of Substances.

As many of the Sea-plants, I mean those that are undoubtedly of a vegetable Nature, discover some kind of Seed-vessels, we should naturally expect they would be manifest enough on the largest kind of this Tribe of Sea-productions; for we have been informed, from very good Authority, that, upon the Coast of *Norway*, some of these Species have been seen to
 extend

Plate XXVII.



extend themselves 16 Feet in Length; whereas, I believe, no-body has yet seen the least Tendency to Fructification in these Bodies, unless what appears in the cellular cortical Part should by any be deemed so; notwithstanding Observation, and many Experiments, shew us plainly that this has much greater Affinity to the Work of Animals.

Lastly, The chemical Experiments, that have been made on these Bodies, are a strong Proof, if there were no other Demonstrations, of their being animal.

I need not mention any other to the curious, than the great Quantity of volatile Salts, that may be extracted from them, and the strong Smell they yield, when burnt, of roasted Oysters.

We have as yet met with but two kinds of *Keratophyta* on these Coasts, and even these are rare. The first is;

N^o. 1. *Keratophyton flabelliforme, cortice verrucoso obduc-* Plate XXVII.
tum. R. S. pag. 32. Fig. a.

Warted Sea-fan.

This was found on the Coast of *Cornwall*. The Outside of it is covered over with a Crust, full of little Lumps like Warts; which, when dissolved in Vinegar, discover the contracted Bodies of Polypes, with eight Claws.

Fig. a, N^o. 1. represents a small Sprig of this *Keratophyton*.

Fig. A, and A 1, are two Views of one of the Warts magnified.

Fig. A 2, is the Appearance which the Polype made, when the cretaceous Matter was dissolved.

Fig. A 3, represents the Particles magnified, that compose the Incrustation.

Plate XXVII. N^o. 2. *Keratophyton dichotomum*, caule & ramulis leviter
 Fig. g. compressis. R. S. p. 32.

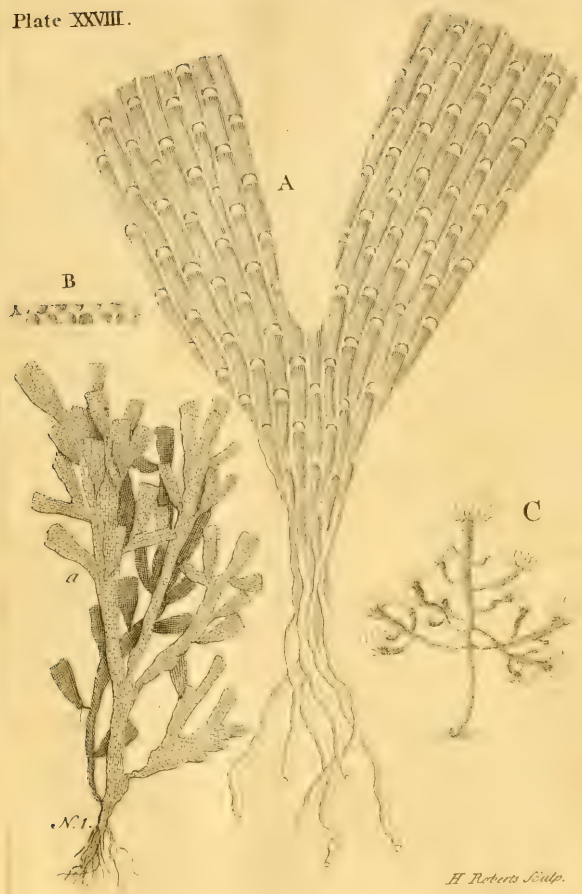
Sea-willow.

This was found on the Coast near *Margate*, and some Specimens of it have been lately received from *Ireland*.

On both Edges of the flat Branches are regular Rows of little rising Cells in the calcareous Part, with small Holes for an Entrance to each.

Fig. g, N^o. 2. is a small Sprig of this *Keratophyton*, in its true Proportion.

Plate XXVIII.



C H A P. VI.

Of the Eschara.

THOUGH these Bodies properly belong to the *Millepora*, yet, as I have generally followed the celebrated *Ray*, I shall keep to his Appellations; adding such a Description to each, as may enable the Naturalists easily to rank them in their proper Places.

My Author's Characteristic of this Class is, that their Surfaces should resemble that of a Web of Cloth. And the Microscope informs us, that they consist of Arrangements of very small Cells, whose Surfaces appear much in that Form.

The very near Resemblance, that the two first of the following *Eschara* bear to Leaves of Plants, has given Occasion to the botanic Writers to class them among the *Fucus*'s.

N^o. I. *Eschara foliacea, millepora, tenera angustior, foliolis quasi abscissis, & cellulis oblongis alternis utrinque instructa.*
Fucus marinus, scruposus, albidus, angustior, compressus extremitatibus quasi abscissis. H. Ox. III. pag. 646.

R. S. p. 43.

Narrow-leaved Hornwrack.

The easy Transition in the Order of Nature, from the last Class which was the *Keratophyta*, to the first of this, is remarkable; for, in this Species, the Rows of Cells continue to proceed from small Tubes, that unite together, and form a kind of Stalk: This divides, as it rises, into narrow Leaves, made up of regular Rows of oblong Square shaped Cells, placed alternately by each other, and opposite to an equal Number on the other Side of the Leaf, like the Honeycomb: From these

Plate
XXVIII.
Fig. a. A.

Natural History

these Leaves proceed other still smaller foliaceous Ramifications, many of which seem to be connected at the lower Part by *Tubuli*, as in the Corallines; by which Means they can ply to and fro more freely in the Water.

Fig. *a*, N^o. 1. gives the natural Appearance of this Coralline.

Fig. *A*, represents two Leaves, with their *Tubuli* and Cells magnified.

Fig. *B*, is a cross Section of one of the Leaves at *A*, shewing the Partition, and inner Form of the Cells.

Plate XXIX. N^o. 2. *Eschara foliacea, Millepora, spongiosa, cellulis arcuatis alternis utrinque instructa.*

Fucus telam lineam, sericeamve, textura sua æmulans.

R. S. N^o. 9. p. 42.

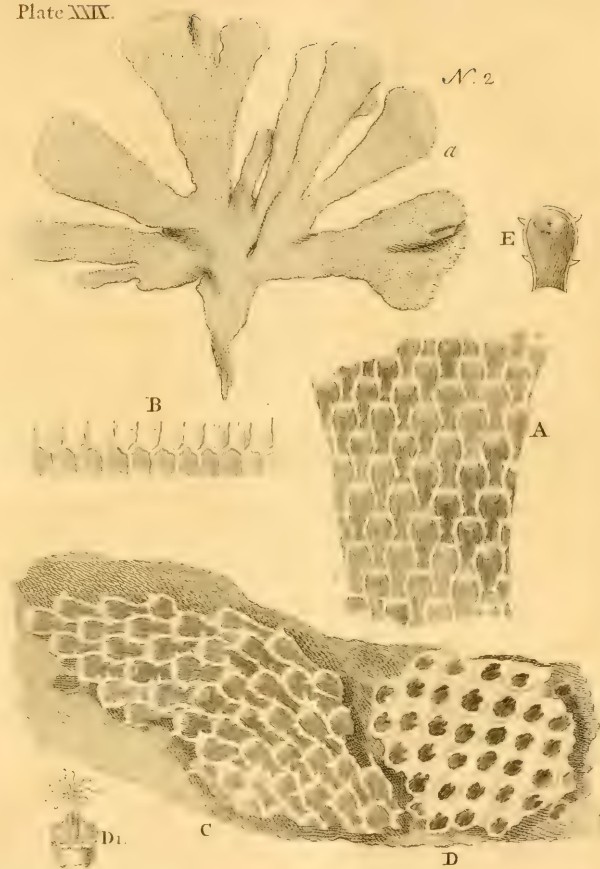
Broad-leaved Hornwrack.

This Coralline, when fresh taken out of the Sea, is of a spongy soft Texture, and smells very fishy; but when it has lain for some time on the Shore, it becomes stiff and horny, like some Sort of withered Leaves. Both Surfaces, when examined by Glasses, appear to be covered with Cells; and, when a Piece of it is cut across, one may discover the thin Membrane that serves as a Base to the Cells of each Surface.

The Form of the Cells is very remarkable, each one being arched at the Top, and contracted a little at the lower Part of the Sides, to make Way for the Arches of the two next adjoining Cells, so that, by this particular Construction, no Room is lost. The Entrance of the Cells is immediately under the Arch of each Cell, and the Walls of the Cells seem to be fortified with Spines.

The

Plate XXIX.



The celebrated Doctor *Bernard Jussieu* discovered small Polypes extending themselves out of these Cells, which he has described in the Memoirs of the Academy of Sciences for the Year 1742.

Upon examining some Specimens lately, I discovered, at the Entrance of many of the Cells, a small testaceous Body, like a bivalve Shell.

The Figure of the Cell, with the Shell in it, is magnified at *E*, Plate XXIX. It is of a transparent Amber-colour, so clear that one may see the dead Animal through it, represented by the black Spot.

Fig. *a*, N^o. 2. gives us the natural Appearance of a leafy Branch of this Coralline.

Fig. *A*, is a Part of a Leaf magnified to shew the superficial Figure of the Cells, and the Manner in which they are disposed.

Fig. *B*, shews a cross Section of a Leaf, and discovers the several Partitions of the Cells.

Fig. *C*, shews the same Cells in single Ranges, or Surfaces, creeping on a *Fucus*, with the Cells of the common Sea-Insect that infests all marine Bodies on these Coasts.

N^o. 3. *Eschara foliacea, millepora, lapidea, extremitatibus hinc inde irregulariter coalescentibus, utraque superficie ex cellulis ovatis constans.* Plate XXX.
Fig. a. d.

Eschara retiformis. R. S. p. 31. *Reticulum marinum.*
J. B. III. 809.
Stony foliaceous Coralline

This stony *Millepora* was found growing to an Oyster-shell, on the West Coast of the *Isle of Wight*, in April 1753; and, when

when it was received, the Insects were visible in the Cells, but dead.

Fig. *a*, N^o. 3. represents the exact Appearance of it, growing on a small Oyfter-shell.

Fig. *A*, is a Piece of the Surface, magnified to shew the Entrances of the Cells.

Fig. *B*, is a cross Section, and *C*, an upright Section, to shew the inward Form and Partitions of the Cells magnified.

Plate XXX.
Fig. *b*.

Fig. *b*, is a Piece of *Italian Coral*, shaped like a Stag's Horn, and called by *Imperatus*, *Porus cervinus*. It is introduced here to show, that upon magnifying it in several Views, the outward and inward Form of the Cells are exactly the same with this before us.

Plate XXX.
Fig. *d*. *D*.

Fig. *D*, is the magnified Appearance of Fig. *d*. This shews the same shaped Cells surrounding a *Fucus*; but these are made of softer Materials. Their Entrances are guarded by Spines; and their Surfaces are fuller and rounder, than those of the stony Coralline, being of a spongy Texture. For the stony ones, from being plump and round, when they were quite fresh from the Sea, sunk almost to a flat Surface, as they became dry.

Plate XXV.
Fig. *d*. *D*.

To this I shall add a Description of that beautiful *Millepora* called, the *Retepora eschbara marina*, of *Imperatus*, pag. 630: because this has been taken for the *Eschbara retiformis*, of *Ray*, just described.

This is found growing to Shells and Rocks on the *Italian Shore*, in irregular leafy Figures, but very often in the Form of a Cup, or Drinking-glass, irregularly expanded at the Brim. As at Fig. *d*, in Plate XXV. it is made up of a Combination of Insects Cells, the whole Substance is regularly pierced

Plate XXX.

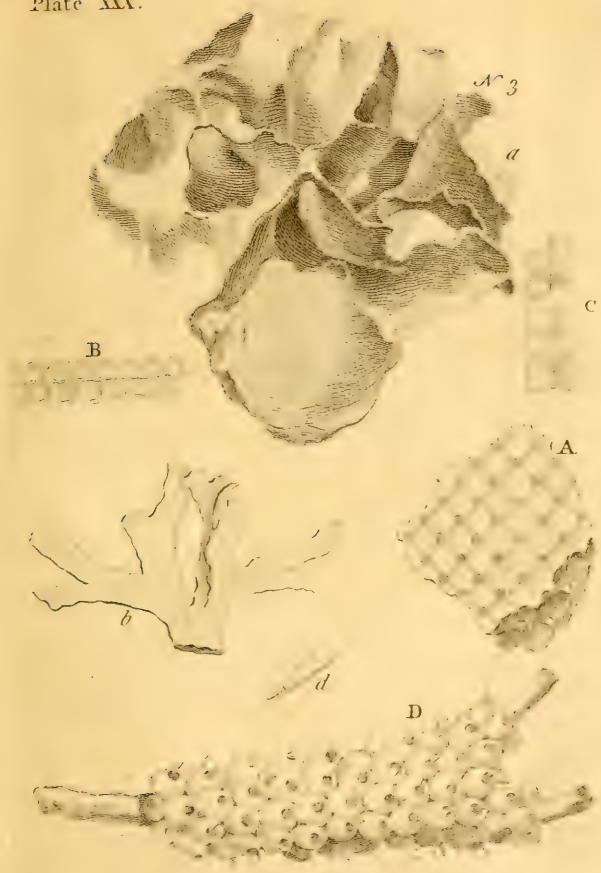


Plate XXXI.



H. Lindl. f.

pierced with Holes quite through, which gives it the Appearance of a Net. The Spaces between the Holes, on the Inside of this Coral, are full of the small Entrances into the Insects Cells, which are presented magnified at Fig. *D*.

The Back or under Part of the Coral is magnified at *F*, to shew that there is no Opening to the Cells on that Side.

N^o. 4. *Eschara millepora, foliacea* & *spongiosa, cellulis, con-* Plate XXXI.
inversi formâ, oribus setaceis. Fig. a. d.

Irregular spongy foliaceous Coralline.

The common Sea-insects Cell, with which most marine Bodies are over-run, is now-and-then found raising itself into a leafy Figure, like the preceding Corallines; but the same great Regularity and Order is not so strictly observed in the Disposition of the Cells.

Fig. *a*, N^o. 4. gives us the natural Appearance of this irregular spongy Coralline, Part of which is magnified at Figure *A*.

Fig. *b*, represents the Manner in which these Insects surround and invest some of the *Fucus*'s with their Cells.

This has given many ingenious Persons an Opinion, that the *Keratophyta* are of the same Nature; that is, that they are no more than Sea-plants, on which different Species of Sea-Insects build their calcareous Nests; but this, we hope, has been already explained sufficiently; and some of the mistaken Notions, concerning their Formation, removed.

Fig. *D*, in Plate XXIX. represents some of the same Kind Plate XXIX.
of common Sea-Insects Cells magnified, as they were found Fig. C. D.
adhering to the same *Fucus*, with the arched Cells of the second *Eschara*, or foliaceous *Millepora*; only the Matter, of
L. which

which these are formed, is of a firmer Nature; it was taken out of the Sea, at a great Depth, near *Falmouth*; looks smoother and whiter than this now before us, and is without Hairs.

While I was at *Brightbelmstone*, I had an Opportunity of seeing the Animal, which belongs to these Cells. It is a Polype with 12 *Tentaculi*, inclosed in a small Tube, in the Middle of the Cell, as it is represented magnified, at Fig. *D 1*, in Plate XXIX. When they are disturbed, they draw themselves into their Tube or Sheath, which closes on them; and sink, together with it, into their Cells.

Plate XXV. N^o. 5. *Eschara millepora arenosa Anglica*. R. S. p. 31.
 Fig. e. *Lorica marina Imperati*. 688.
English sandy Millepora.

Upon examining this Sea-production in the Microscope, it appears to be a Collection of Sand, united by the viscid Matter of some Sea-Insects, and disposed in a flat thin Surface, full of small Cavities, where the Insects have been.

Fig. e, in Plate XXV. is the natural Size of a Part of it.

Plate XXVII. N^o. 6. *Eschara millepora, minima, crustacea, dilute-purpurea, cellulis tubiformibus, ordine fere equali, & parallelo dispositis*.
 Fig. e. E. *Small purple Eschara*.

This Incrustation is composed of circular Rows of very small, and almost parallel Pipes, of a semitransparent faint purple Colour. It is found surrounding the Stalks of *Fucus*'s, and the denticulated Corallines.

Fig. e, N^o. 3. Plate XXVII. is the natural Appearance.
 And

And Fig. *E*, the magnified one of this Incrustation. This belongs properly to the *Tubularia* of *Linneus*.

N^o. 7. *Eschara millepora lapidea, instar pumicis porosa.*
Porous *Eschara*.

Plate XXVII.
Fig. *f. F.*

This stony Incrustation is often found on the fickle Coralline, in irregular Lumps, appearing like white Sand strongly united together. But in the Microscope, it seems to consist of an infinite Number of small round Cells, placed in no regular Form, only the circular Entrance to the Cells appears on the Outside of each; so that, in the Microscope, it looks like a Pumice-stone.

Fig. *f*, N^o. 4. exhibits the natural Size of the Cells, which are magnified at Fig. *F*. But the Incrustation itself is often found much larger than the Size of the magnified Part *F*.

C H A P. VII.

Of the English Corals.

THE Definition, that *Ray* gives us in his *Synopsis*, of Coral, is this, that it is a kind of Plant almost stony, branched like a Shrub without Leaves, and with no visible Pores.

Plate XXVII. N^o. 1. *Corallium pumilum album, fere lapideum, ramosum.*
 Fig. C. *Corallium album pumilum nostras.* R. S. p. 32.
Iss. Linæi Genera. 974.

This consists of short irregular Ramifications of a chalky Appearance, and stony Substance (See Fig. *c*, N^o. 1). But, when highly magnified, appears full of small Pores, not unlike those in Fig. *B*, Plate XXIV.

Great Quantities of this Kind are dredged up near *Falmouth*, and used by the Inhabitants, with Success, to manure their Land. See the Observations on this Coral in *Ray's Synopsis*, under this Article.

I lately received some Specimens of a faint purple, or livid red Colour, that had been dragged up in the Nets of the Herring-Fishers, near the *Isle of Man*; as also from *Ireland*, some Specimens of this Genus, resembling a Bunch of very small Grapes of a whitish Colour.

Plate XXVII. N^o. 2. *Corallium cretaceum lichenoides.*
 Fig. d. D. *Corallium maritimum calcariiis rupibus adnascens.* Mor.
 H. Ox. III. p. 651.
 Chalky Coral, shaped like Liverwort.

This chalky Incrustation is found in great Plenty on the
 Coast

Coast of *Cornwall*, growing to Rocks and Shells. The Surface of this Coral, upon a nice Examination, appears full of small Pores, which almost disappear, if they have been kept any Length of Time from the Sea. A small Piece broken off, and placed in the Microscope, exhibits sideways a View of several Stages of Cells, divided from one another, as at Fig. *D*.

If a Piece is put into Vinegar, the chalky Part soon dissolves, and the Partitions and Cells become very visible. The membranous Part, remaining unaffected by the Acid, makes it probable that it is of animal Construction.

Fig. *d*, N^o. 2. represents a Piece of this Coral, adhering to a Limpet's Shell.

We often meet with Specimens of the green *Conserva*, or Silk-weed, that grows on the Rocks, with its slender Branches surrounded by thin Incrustations of this Coral; and some of the broad thin *Fucus*'s, with their Surfaces almost covered with it.

Of Sponges.

THAT this Class of marine Bodies is of an animal Nature, was an Opinion that prevailed so early as in *Aristotle's* Time. For in his *Historia Animalium*, Book V. Chap. 16. he tells us, "Many People were of Opinion, that Sponges were capable of Feeling, and that they would shrink back, if any one attempted to pluck them up." *Aristotle*, however, rejected this Notion; as did most of his Followers: Though it seems not improbable, but that those, who first broached it, had some kind of Experience, as a Foundation for their Opinion; since, if the Sponges should be found to be the Habitation, the Fabric of Polypes, or *Animalcules* of a particular Order, no doubt but the sudden Retreat of many thousands of these together, into the Holes they resided in, upon the Approach of Danger, would give the Person, who was wresting the whole Colony from its fixed Abode, a Sense of a different Species of Resistance, from that which a Substance, not animated, could be supposed to do.

There are not many Kinds of Sponges on our own Coasts; and these, for the most part, are minute and tender. We seldom meet with them, till after they have been long separated from their Places where they grew; and of course the Organization greatly injured. So that, notwithstanding I have examined with the utmost Attention, most of those that our own Coasts afford, and likewise a great Variety of different Species of Sponges, with which the Cabinets of several of my Acquaintance here are furnished, yet I own it is not in my Power to give so explicit an Account of the
Structure

Structure and Uses of the several Parts of this Class of Bodies, as would be satisfactory: And, indeed, this can scarcely be expected from any, but those who live near the Places where the Sponges are found, and who have Leisure and Abilities to consider them while recent.

If we carefully examine a small Part of one of those Sponges, whose Ramifications are large and distinct, in the Microscope, we find that they rise from many small Tubes; these, as they extend themselves upwards, send out Side-branches in various Directions, which inosculate, and, uniting thus with each other, form a compound Reticulation quite through the Inside of the whole Mass. In viewing the Extremities of the upper or last Shoots, we perceive small Openings at the End of their Fibres; and as we trace these Fibres back from the Opening downwards, we see a soft whitish Substance, which fills the internal hollow Part of all the Ramifications, through the whole Sponge; which Ramifications have much the Appearance of transparent Catgut of an Amber-colour; and, doubtless, are the Lodgments of Animals of a particular Class. For, though we cannot distinguish either Vesicles, or Cells; or discover any other kind of Organization, than that of a hollow Tube variously inflected, and wrought together into a Multitude of agreeable Forms; some branched like Corals; some expanded like a *Fungus*; some rising up straight like a Column; others broad at Top, a narrow Base, and hollowed like a Funnel, with regular Cavities, Entrances, or Apertures, which are nearly alike in all Sponges of the same Species: Yet, from many obvious Resemblances to divers other Classes of Sea-productions, which are found to be of animal Construction, and from the chemical Analysis of Sponges in general, there seems sufficient Reason to induce us to give them a Place here with the rest; though

tho', for Want of proper Opportunities to examine them while recent, I cannot exhibit so circumstantial an Account of them, as hath been done of the other Classes of Sea-productions.

Of the several kinds of Sponges, found upon our Coast, I shall only mention two, as I have not been able to procure Specimens of the rest sufficiently perfect.

Plate XXXII. N^o. 1. *Spongia ramosa Britannica*. Park. 1304. R. S.
 Fig. f. f. pag. 29. N^o. 1.
 Branched *English* Sponge.

The fibrous Ramifications of this Sponge are extremely fine, tender, and transparent, of a pale yellow Colour, and most curiously interwoven. The Branches rise irregularly, but upright; they frequently inosculate with one another, and are a little compressed along the Edges of the Sides. At certain regular Distances, we may observe small circular Holes, which seem regularly worked, in the Manner we find them in the Webs of Spiders.

Fig. f, Plate XXXII. gives us the natural Appearance of a Branch of *English* Sponge, with the Entrances of the Cavities along the Edges, at Fig. g.

Fig. f, is a Piece of the Top of this Sponge magnified.

Plate XVI. N^o. 2. *Spongia medullam panis referens*.
 Fig. d. *Alyonium ramosum molle, medullæ panis intus simile*. R. S.
 pag. 31.
 Sponge, like Crumb of Bread.

This Sponge is of a very irregular Shape, and whitish Colour, growing often round *Fucus*'s and Corallines. The whole Surface is full of Holes, visible to the naked Eye; and, when it is examined by the Microscope, all the Interstices

Plate XXXII.



stices between those Holes are filled with other minute ones ; these have a regular roundish Entrance to each, and seem to be composed of small Bundles of minute transparent Fibres, that cross one another, as if constructed by some Animal : These Fibres, or rather *Spiculæ*, are so extremely fine and sharp, that they affect the Skin like Cow-itch.

Fig. *d*, Plate XVI. is the natural Appearance of a Piece of this Sponge ; but in general it is found branched out.

The small Piece, at Fig. *d* 1, is magnified to the Size of Fig. *D* 1, to shew the Manner in which the Bundles of minute *Spiculæ* are laid, to form the smaller Holes that cover the Surface.

Of the Alcyonium.

THIS Class of marine Bodies is, by Mr. *Ray*, placed after the Sponges, and is called a kind of Plants growing in Water, formed like *Fungus's* of various Figures, and with different Sorts of Covering; some having a gritty, and some a callous Skin, with a spongy Substance in the Inside. Other Species are of a fleshy Substance.

Cæsalpinus was of Opinion, that this Class of Bodies was composed of the Froth of the Sea, differently modified, and of different Colours, and grew to Rocks in the Manner of Sponges.

At present, we shall consider it as consisting of such marine Substances (chiefly the Nests and Matrices of Sea Animals) as are not reducible to any other Class.

Plate XVII. N^o. 1. *Alcyonium pulmonis instar lobatum.*
 Fig. b. B. *An Pulmo marinus alter Rondeletii* 132? R. S. p. 31.
 N^o. 3.
 Sea Fig.

This Sea-production is of a dark Olive-colour, of a fleshy Substance, and smells very disagreeably when it is opened; the Inside is full of little oblong yellow Particles, from whence it borrows the Name of the Sea Fig among the Fishermen, from whom it was procured, with many other Things of the like kind, at *Whitestable*. As soon as I received it I put it into Spirits, in order that I might examine it more minutely, being thus kept from shrinking.

The

The natural Size is represented at Fig. *b*.

When I applied my Glafs to it, I found the whole Surface covered with small Stars of fix Rays, like small Polypes of fix Claws.

Fig. *C*, gives you the Appearance it made when magnified.

Upon opening it, I found the Infide confifted of a great Number of little Bags of a yellowish Colour, full of a clear viscid Liquor; in the midft of this was a small Duct leading to the Centre of the Star at the Top of each. This Section is represented magnified at Fig. *B*.

In examining one of these Bags attentively, I discovered several regular Figures, like Shells, in this inner Tube or Duct, placed upon one another. But whether they are the Food of the Animal in the Gut or Stomach, or whether it is the Ovary, I am not certain.

Fig. *D*, is the true Appearance magnified.

N^o. 2. *Alcyonium ramoso-digitatum molle, asteriscis undiquaque ornatum.* R. S. pag. 31. N^o. 2. Plate XXXII.
Fig. a. A.

Dead Man's Hand, or Dead Man's Toes.

This extraordinary Sea-production is indebted for its *Engliff* Name to the Filhermen, who often take it up in their Nets, when they are trawling for flat Fish. It is met with very frequently on the *Kentiff* Coast.

The small Specimen represented at Fig. *a*, is exactly drawn from Nature. This was taken near the *Buoy of the Nore*, sticking, as it is represented, to a small Oyster-shell; and sent to me in Sea-Water quite recent, which gave me the better Opportunity of examining it carefully.

When it first came, I observed the Surface full of small *Papillæ*, with a Star of eight Points on the Top of each. After it had been suffered to rest for some time in the Salt-Water, each small Star sent forth a Polype, with eight *Tentaculi*, or Claws, in the Manner exhibited in the magnified Specimen at *A*.

In magnifying one of the Polypes a little higher, I observed, that each *Tentaculum*, or Claw, had, on both Sides, Rows of minute short Fibres, like the Down on some pappous Seeds of Vegetables. This is represented at Fig. *A 2*.

In the stony Coral, found on the Shore near *New York*, I observed something very similar to this fleshy Kind of Coral. A Piece of this stony Coral is represented at *A 1*. And one of the Stars is magnified a little, to shew the Marks left by the same Kind of small Fibres of the *Tentaculi*, in the Rays of this starry Figure, as at *A 3*.

When the Water became putrid, the Animals in the fleshy Coral died, and the whole Substance smelt cadaverous. It was afterwards dried, in which Condition it shrank up to a spongy light Substance.

Plate XXXII. N^o. 3. *Alcyonium, seu Vescaria marina.* J. Bauhin.
Fig. *b. B.* Sea Wash-balls.

This marine Production is composed of small yellow Bladders of a compressed globular Shape, connected together in Form of a Ball, and very tough. It is found very frequently thrown up on our Shores, and used by the Sailors as Soap to wash their Hands.

Upon dissecting some of these Bladders, I found them to be the Ovaries, or *Matrices*, of our common *Buccinum*, or Whelk; each distinct *Matrix* is about the Size of half a large Pea,

Pea, and contains several embryo Shells; which, as they approach towards Maturity, distend their Covering, and force open a Valve-like Door, situated in the front Edge of this little Bladder, by which they creep out, and shift for themselves.

Fig. *b*, Plate XXXII. is the natural Size of one of these Balls.

Fig. *b* 1, is a single *Matrix*, or Bladder, laid open, to shew the natural Size of the embryo Shells.

Fig. *B*, is the same, a little magnified, with the Valve in the Front.

The wonderful Care that Nature takes in the Productions of some of the same Tribe of Shell-fish, is shewn in a still more surprizing Manner in that Species of *Buccinum* called by Doctor *Lister*;

Buccinum ampullatum clavícula sulcata, una parte cujusque orbis in planum compressa. *Lister*, Plate 878, and 879.

Plate
XXXIII.
Fig. a. A.

Called by some, the Tower of *Babel* Fig-shell.

This breeds in great Plenty on some of the Coasts of *North America*, especially on the Shore from *New York* to *Virginia*.

The Ovaries, or *Matrices*, are of a compressed oval Form, and some of them of the Shape of the Limpet, or *Patella*, but flatter at the Top.

These are united on one Side to a tough pliable Ligament, so near to each other as to seem to lie on one another. On the front Edge, opposite to where they are fastened, is the arched Door, by which the young ones, when they

they are capable of providing for themselves, make their Retreat into the Sea.

The Valve that covers this Door, during their minute State, is a most curious Contrivance, to preserve the tender Animals from the Sea-Water, till they are able to venture into it.

During their Confinement, they are covered with a Slime like the White of an Egg; which, no doubt, nourishes and promotes the Growth of the young Animals.

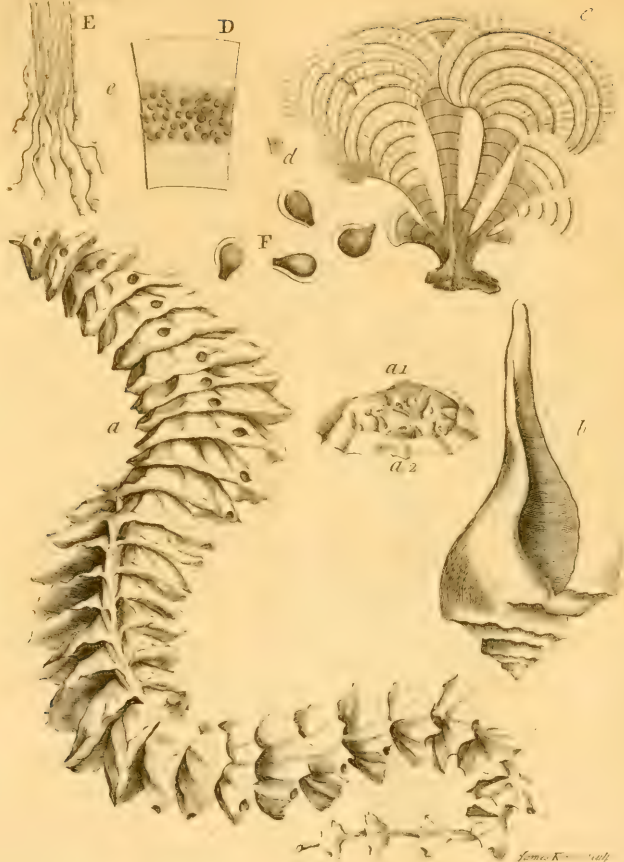
If we attentively consider this String of Ovaries, we shall be apt to conclude, that both they, as well as the Animals, grew after they were deposited by the Parent Whelk; for they appear by much too large for even the largest of this Tribe ever to have contained. At first Sight, they have the Appearance of something belonging to the vegetable Tribe, and are not unlike the Strings of Seed-Vessels of the Hop Hornbeam.

Fig. *a*, Plate XXXIII. represents one of these Strings of *Matrices* of the *Virginia* Whelk of a middling Size. This appears to have been fastened to some Rock, or other solid Body, by the upper Part of the Ligament: Here we observe the Ovaries begin small; as you trace them on to the Middle, they grow larger: Afterwards they fall off in Size, till, at the lower End, they scarce have the Appearance of Ovaries, but finish in imperfect Figures.

Fig. *a* 1, shews the young Shells lying in one of the Ovaries, in their natural Size; in the front Edge of which, Fig. *a* 2. is the small Valve closed.

Fig. *b*, is a small Whelk-shell, or *Buccinum ampullatum* of Dr. *Lister*, brought from *Virginia*.

Plate XXIII.



N^o. 4. *Alcyonium, seu Cyathus marinus.*
Sea Cup.

Plate XXXII.
Fig. c. C.

These little Cup-like Figures are found on the Coast of the *Isle of Sheppey, in Kent*, sticking to Stones and Shells erect, many of them together. When they are first taken out of the Sea, they are of a bright semi-transparent yellow Colour, of a horny tough Nature, containing a viscid Substance, with many Orange-coloured Seed, or Egg-like Particles, in the upper Part of each Cup, as they are represented magnified at Fig. C, Plate XXXII. Under it, at Fig. c, is exhibited the natural Size.

While I was at *Ramsgate, in August 1754.* I met with some of this Kind; which, upon raising up the *Operculum* at the Top, I discovered, by my Microscope, to be full of small Periwinkles completely formed. The Figures of these Shells are described at Fig. c, and a little magnified at Fig. C. So that we may properly look upon this Sea-Cup as the Ovary to the Periwinkle Shell-fish.

It is recommended to the Curious, to observe at the Sea-side, whether there may not be some Animal of the Polype Kind seen at the Top of each of these Cups; as we already find something similar to this Contrivance in the Sea-Fig, or first *Alcyonium* of this Class (See Fig. D, Plate XVII).

N^o. 5. *Alcyonium, seu Fucus nodosus & spongiosus.* R. S. Plate XXXIII.
N^o. 42. p. 49. Fig. d. D.

Sea ragged Staff, called by the Fishermen Pipe-weed,
or Pudding-weed.

This irregular-shaped yellow fizy Substance, represented in Plate XXXII. at Fig. d, is found adhering to most kinds
I of

of marine Substances, on the Coast of *Kent*, near the Island of *Sheppey* particularly; so that it frequently becomes troublesome to the Fishermen, by often clogging their Nets.

Upon examining a cross Section of it in the Microscope, it appeared full of small regular Specks, as it is represented at Fig. *D*, Plate XXXII.

Since then, I have examined some farther advanced Specimens, and they appeared full of small regular Figures of an Egg-shape, like those represented in Plate XXX, at Fig. *D*.

This *Alcyonium* deserves a more critical Enquiry. It appears at present to me, to be the Spawn of some numerous Species of Shell-fish.

I shall now take the Liberty to add the microscopical Description of a most elegant Sea-production, which carries a great deal of the Appearance of a Plant, and, possibly, may be of the vegetable Tribe. But I have introduced it here, to shew the singular Appearance it makes, when examined by the Microscope. It is called,

Plate XXIII. *Fucus maritimus*, *Gallopavonis pennas referens*. H. Ox. III.
 Fig. c. p. 645. T. 8. f. 7
Fungus auricularis. Cæs. Ej. Pin. 368. II. R. S.
 N^o. 14. p. 43.
 Turkey Feather. Dale's Hist. of *Harwich*.

It has the Appearance of the variegated Agaric, from whence possibly it has been considered as a Sea *Fungus*. It is very thin and flat, and stands upright, having many Leaves rising out of the same Stem.

Fig. *C*, Plate XXXIII. gives its natural Appearance.

The Roots, examined in the Microscope, appear divided
 into

into small clear Tubes, consisting of equal longish Joints, each containing a soft Substance in it.

Fig. *E*, is the magnified Part of a small Piece of the Roots, represented at Fig. *e*.

The flat Stem, and broad thin Leaves, are no more than a Continuation of these jointed Tubes, rising Side by Side, and growing on together in such a manner, that the Joints become placed alternately by each other, as at Fig. *D*; which is Part of a Leaf magnified. The natural Size of which is expressed at Fig. *d*.

The whole Surface of each Leaf, seems to be covered with an exceeding thin whitish Skin, which receives the Impression of the minute, regular, long-square Joints.

The dark curved Lines, that we observe, at every Tenth of an Inch Distance, at Fig. *c*, in the natural Appearance of this curious Figure, are full of brown Seed-like Particles. These, as they ripen together, or advance to Maturity, burst those thin white Membranes; which shrink back, and leave these semicircular Spaces bare, with these round Bodies ready to drop off, as they are represented at Fig. *D*.

When they are magnified higher, as at Fig. *F*, they appear like a Grape-stone inclosed, all but the Base, in a viscid transparent Substance.

Of Tubular Corals, &c.

I Shall here add an Account of such other Marine Bodies, as have casually occurred. And, first, shall give a Description of an irregular Mass of Sand, which appears to have been cemented together by a particular Species of Sea-Worms. I have called it,

Plate
XXXVI.
Fig. A. B. C.

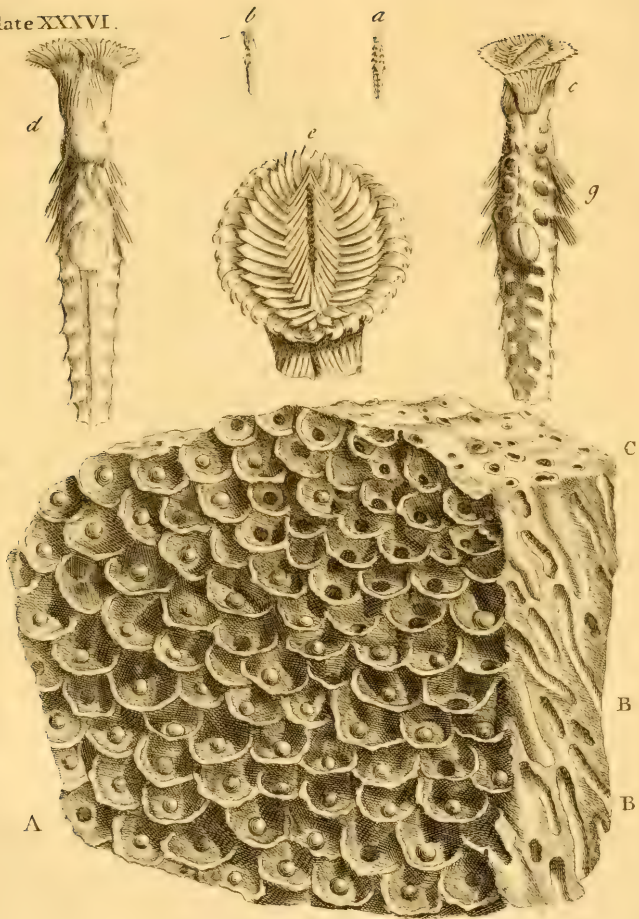
Tubularia arenosa Anglica.

English tubular sandy Coral.

This is found very often, in Pieces of considerable Magnitude, on the Coast near *Yarmouth*, about Low-water Mark, and on the Shores near *Dieppe* in *France*; from which last Place the Specimen, Part of which is exhibited, in its full Bigness, in Plate XXXVI. Fig. *A*, was brought to Mr. *Emanuel Mendez da Costa*, F. R. S. who was so obliging as to send it to me. The whole Specimen was about six Inches long, five broad, and three thick, of a dark sandy Colour, brittle Texture, rather light than heavy, porous on all Sides, but on some distinguished by peculiar Apertures.

The upper Part of the Mass, which is here called its Front *A*, is of a most remarkable Fabric. One may compare it to a Number of small, and somewhat flatted, Funnels, placed obliquely one above another, and so close, that the upper Edges of every lower Tier are hid by the lower Edge of those above them; and are placed so obliquely, as that the Hole at the Bottom of each, which may be called the Tube of the Funnel, may plainly be seen: This Tube is continued from the Bottom of the Cup of the Funnel to
about

Plate XXXVI.



about one-half deep in the Stone, not always continued in a straight Line, or to the same Depth, of the same Diameter, but a little slanting or curved; and of a larger or less Bore or Depth, according to the Size of the Animal inhabiting each Funnel. These Tubes appear opened length-ways in the perpendicular Section at *B. B.* And the different Bores may be seen in the transverse one at *C.*

Upon most of the Cells, we observe a little Cover, or *Operculum* of Sand; which, it is probable, the Animals form for their Security and Defence, when they retreat from the open Funnel-like Part into the Tube.

These Tubes, as hath been observed above, are not of the same Dimensions, nor always straight: But in this they all agree, that their Bottoms are closed up, the Animals filling up behind, as they advance forward, by a constant Apposition of sandy Particles, united together by a glutinous Matter issuing from them.

The Animals that erect these connected Habitations, when examined by the Microscope, are remarkable.

Fig. *a, b,* represent them in their natural Size.

Fig. *c, d,* the same magnified, from whence it appears they are of the *Scolopendra* Kind.

The Head (*e, f,*) consists of three oval Rows of flat stiff Quills, of a fine Pearl-like Polish. These are moveable, at the Will of the Animal, in different Directions, and for different Purposes. In the longitudinal Slit, that divides these three Rows, is the Mouth, towards which the inner Row is inclined. Each Row of Quills is divided into two Parts, and is moved by different Muscles.

The two Muscles of the outward Row appear immediately

under it, and seem inserted in the Fore-part of the Neck. The Quills of this are hooked at the Ends, and placed so, in each Division, as if turning to meet the other in the Front. Towards the upper Part of the Body are six curious Feet, three of a Side, formed like Fins, composed of six Quills each in the Shape of Oars.

The small Feet on each Side, down to the Tail, are composed of Tufts of minute sharp-pointed shining Quills.

In the Centre of the Body is a round Lump, which, probably, is the *Matrix*, or Ovary of the Animal.

• *The Description of a TUBULAR CORALLINE from Malta.*

AS other Species of Animals, besides Polypes, are the Fabricators of Tubular Corallines, I thought it might not be improper to introduce a Description of some curious Tubes, with their Animals, brought in Spirits from the Sea-coast of the Island of *Malta*, communicated to me by my worthy and ingenious Friend, Mr. *Peter Collinson*, F. R. S. and described in Plate XXXIV. I shall call this Coralline,

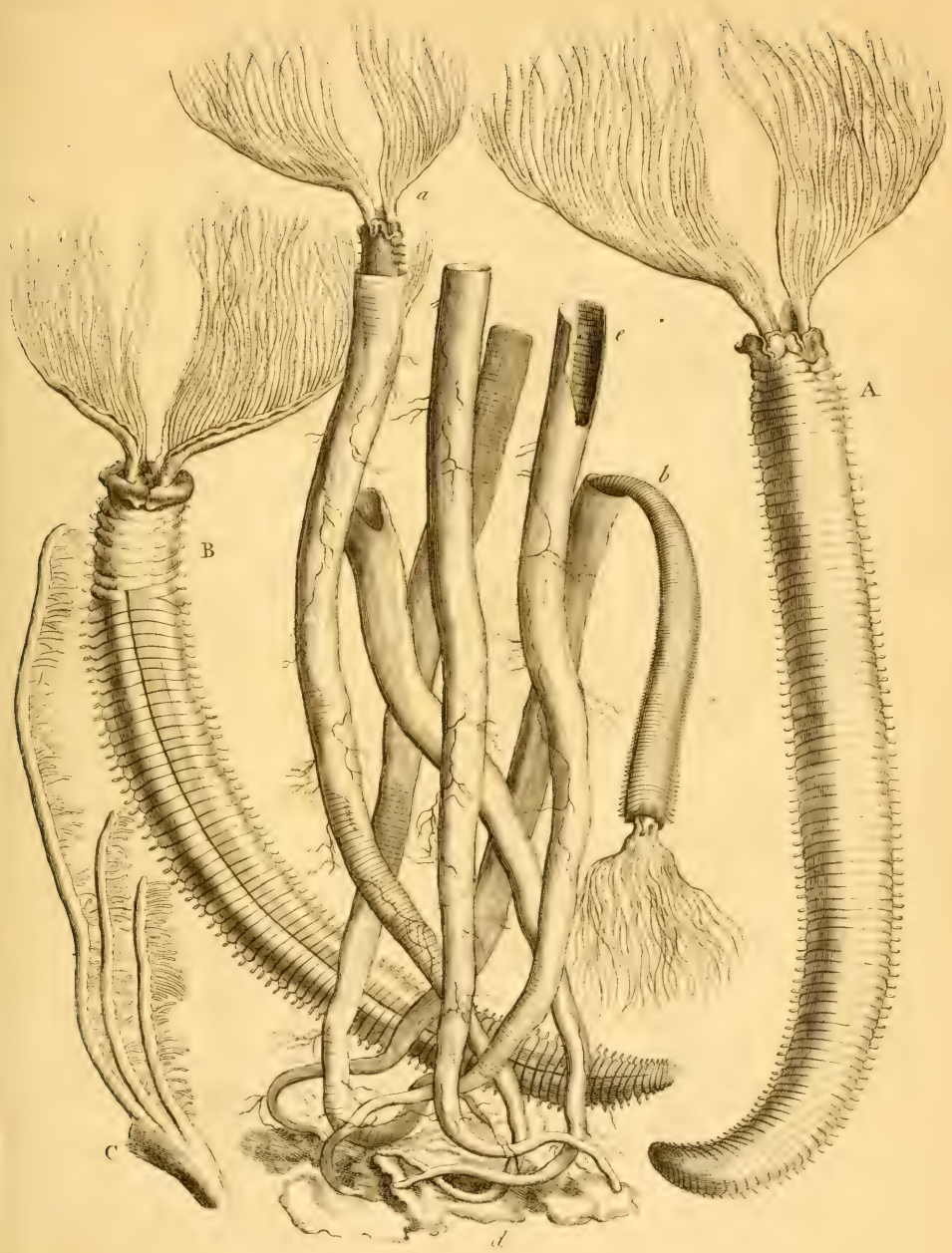
Corallina Tubularia Melitensis, scolopendris, tentaculis duobus duplicato-pennatis instructis.

An Penicilla marina?

Maltese Tubular Coralline.

When I took these Tubes and Animals out of the Spirits of Wine, I perceived a small slimy Bag, into which the Bases, or first Beginnings of several of these Tubes, were inserted, as may be observed at Fig. *d*.

The Tubes, which are built by the inclosed Animals, increase gradually in Diameter, as they rise in Height. The outside





outside Coat of the Tubes is made up of circular Stripes, of an Ash-coloured earthy Matter in different Shades, closely cemented together; and the inner Lining, which is firmly united to the outward one, is made of a tough horny transparent Substance, with a very smooth Surface. The Cavity of the Tube is perfectly round, though the Animal, which inhabits it, and is of the *Scolopendra* Kind, is in Shape somewhat like a Leach extended and compressed: It appears, by the Mark of its Feet on the Inside, that it can turn itself freely about, and rise up, or retreat at pleasure, the better to attack and secure its Prey.

This *Scolopendra* has two very curious and remarkable Arms, or *Tentaculi*; the left much larger than the right. They are doubly-feathered, as may be seen at the magnified Part at C.

The Number of Feet on each Side exceed 150. For a further Explanation, I shall refer to the Plate XXXIV. where Figure *b*, is the Belly-part of the Animal in its natural Size, hanging out of the Tube. *B*, is the Belly-part magnified. Fig. *a*, is the Back-part of the Head of the Animal in its Tube. *A*, is the Back-part of the whole Animal a little magnified. Fig. *e*, shews the Inside of the Tube, with the Shades of Ash-coloured *Strata*, seen through the horny inside Lining.

Some Observations on the Formation of the RED CORAL, and some Species of WHITE CORAL.

THE Red Coral of the *Mediterranean*, so well known Plate XXXV. among us, appears to be formed from Successions of Fig. a. c. small Tubes, which rise many together, and branch out in different

different Directions, so as to look like Stumps, or short Branches of some marine Shrub petrified.

In some Specimens, which I have before me, many of the *Tubuli* are to be seen creeping, as it were, together over Pieces of White Coral, and varying their Directions, according to the Opposition they meet with in their Progress.

But these we find compressed and shrunk; and, no doubt it is the same on the main Branches. The *Tubuli*, being composed of cretaceous Matter, mixt with a viscid animal Substance, shrink in and become solid, as their Inhabitants desert them; that is, these different component Particles, strongly attracting each other, become hard like Cement made of animal *Serum* and *Terras*.

When the Specimens are recent, we find them covered over with a red mealy Substance, which looks like a Bark to the Coral; but, upon examining it narrowly, we find many Star-like Cavities on this Surface (See Fig. *a*, p. 35). and, upon raising up the mealy Substance, we find these Stars have a Communication with the Tubes underneath. If we view the Points of the Branches, we may see evident Marks of the Ends of Tubes, as at Fig. *c*, Plate XXXV.

And further, if we examine the last inclosing Series of *Tubuli*, that have rose up, and encompassed the Coral, we shall find them of a yellowish Colour, and not solid like those in the inner Part. These the Coral-Fishers find full of a milky Juice, which is no more than the tender Bodies of the Animals.

The Star-like Cavities, no doubt, receive their Figure from the Claws of certain Polypes, which, we may naturally conclude, are the Builders, as well as the Inhabitants, of this beautiful Fabrick.

The

Plate XXXV.



The scarlet mealy Substance on the Surface, magnified by N^o. 1. the greatest Magnifier of *Wilson's* Microscope, exhibits the Figures of hollow Crosses combined together (See Fig. *A*, Plate XXXV); whsch, no doubt, are of some very material Use to this Fabrick and its Inhabitants; though wherein, we are yet ignorant.

The Increase of Coral by a constant Succession of Tubes rising up, and encompassing the Trunk, and extending the Branches, is very well illustrated in the Instance of the Stem and Branches of the Herring-bone Coralline, Plate X. where at Fig. *B*, the *Tubuli* are magnified. But as this Coralline is composed of light spongy and elastic Materials, the Cavities do not close up; but, at the same time the Stem grows hard, it remains porous and woody, like Cane. Though in Physics it is unsafe, to draw general Conclusions from particular Instances, yet the Texture of the small, elegant, White Coral, represented, in its natural Appearance and Size, at *b*, Plate XXXV. is so agreeable to the general Tenour of Nature's Procedure in the Formation of the marine Bodies already described, that it would almost induce one to think, the stony Corals, for the most part, are produced in like manner; that is, that they are composed of Tubes, formed by Animals of the Polype Kind.

The Coral above-mentioned is fairly represented, as it appears magnified at *B*; in which Figure we may distinctly trace the Tubes, from the Base up the *Outside* of the Branches: And, on the *Inside*, their Openings are as conspicuous.

For this curious Specimen, with that of the Red Coral, and an Opportunity of examining many rare Sponges, Corals, and *Lithophyta*, together with his kind Assistance in this Work, I am indebted to my much esteemed Friend Doctor *John Fothergill*.

An Account of a CLUSTERED SEA-POLYPE, found in the North Seas, near the Pole.

THIS I shall call after Dr. *Linnaeus's* Name, which he has given the common Polypes, but very properly adapted to this, *Hydra Marina Arctica, corporibus multis octitenticulis, basi conjunctis, & scapo praelongo ossæo, sustentatis.*

This very uncommon Animal is here represented in Miniature, at Fig. *a*, Plate XXXVII. to give us the clearer Conception of its true Figure, as it appears in the Sea.

It was taken by Captain *Adrianz*, of the *Britannia*, while he was on the Whale-Fishery, in the Summer 1753, sticking to his Sounding-line, at the Depth of 236 Fathoms, in the Latitude of 79 Degrees North, 80 Miles from the Coast of *Greenland*.

The upper Part of it consists of 23 Bodies of Polypes, united at their Tails to one common Base, so as to form one Animal, and appears in its natural Size, with Part of its Stem, extending itself at Fig. *A*.

Fig. *B*, expresses it as it was received, after it had been soaked in Water, and the *Tenticuli*, or Claws, stretched out. During the Time it was under Examination, it yielded a rancid Smell like dried Fish, tending to Putrefaction, and looked of a rusty Iron-colour.

The cross Section at *F*, shews the Situation of the several different Bodies: Ten occupy the outward Circle, nine the next, and four the Centre.

The Captain at the same time took another of these Clustered Polypes, with above 30 Bodies united together; but this, having met with some Accident, a little below the

uniting of the Bodies, exhibited but a very confused Appearance.

When they were first drawn up near the Surface of the Water, the Animals were expanded; and looked, as the Captain observed, like a Nofegay of bright yellow starry Flowers (See Fig. *A*).

Each distinct Polype has eight *Tentacula*, Claws, or Arms; each Arm is furnished on both Sides with Rows of Fibres, that seem to do the Office of Fingers. In the Centre of the Arms, where they unite, is the Mouth, which is furnished with two erect indented or scolloped Lips.

Upon dissecting one of these Bodies length-ways, Fig. *G*, I found many small Seed-like Particles, in the cellular Cavities of a strong wrinkled Muscle, which composed the whole Length of the Inside. These were of the Size of those represented at Fig. *I*; and, upon being magnified, they appeared of a compressed orbicular Shape, as at Fig. *L*; and may possibly be the Spawn of the Animal.

From the lower Part *N* (See Fig. *B*), the indented muscular Base, where the Polypes all unite, proceeds a hollow Bladder-like Membrane, Fig. *M*, which is kept extended for about two or three Inches, by the slender, arched, and twisted Top of the bony Stem, which is likewise inserted in the Middle of the same indented muscular Base.

This Bladder seems calculated, as well to raise or sink the Animal at pleasure in the Sea, like the swimming Bladders of Fishes, as to convey by this Chanel the necessary Materials, which the several different Bodies collect for the Support and Increase of the long bony Stem, a Part that

seems to be of the highest Importance, to the Preservation and Well-being of this extraordinary compound Animal.

The Membrane, or Bladder, as you trace it downwards, closes round the Stem, and becomes a Cuticle to it, covering it the whole Length, till it ends in a Cartilage at Bottom.

This Stem, which is of an Ivory-colour, is Four-square, with a Groove on each Side; and continues increasing very gradually in Thickness, from a very slender Beginning to One-fourth of an Inch square, and in Length to above six Feet, till it comes to within four or five Inches of the Base, where it begins to contract, and come to a Point, as at Fig. *E*.

This Part is covered with a brownish yellow Cartilage, which is here laid open, to shew the finishing of the bony or ivory Part in the Middle of it.

Fig. *D*, represents the lower Part of the Stem, where the Membrane, or Cuticle, begins to grow cartilaginous; and is the natural Appearance of the Base of the Stem, the same that is laid open at Fig. *E*.

Fig. *I*, shews a small Part of the Cuticle stript off the upper Part of the Stem.

Fig. *C*, represents a Part of the Stem twisted, which Degree of Force must have happened to it, when it was in a younger and softer State.

Fig. *H*, is a cross Section of the Stem magnified, shewing the several semicircular *Laminae*, inclosing one another in the several Quarters.

Upon endeavouring to cut off a Slice of the Stem, it grated against the Knife, as if it were partly Stone, and partly Ivory.





Fig. 1. *Corallina alternata* (vix *denticulata*) Climbing great tooth Coralline Pl. 1. fig. 2. As the same magnified to show the appearance of it alive, with the little Bladders from whence the Polypse appears to have its charge of the every full of its Eggs, which is still hanging to it
This and all the following were observed on the Coast of Japan in June 1755.
Fig. 2. *Corallina* *Vermetiformis* see *Spongiae* *Vermet.* p. 77. The shell *Vermetum* with its height 6. D. *Vermet. ad. vivum. dicit.*

earlets *Polypen* at S. This animal has two Arms each furnish'd with many claws or feelers which are curiously fringed on the upper side, near the insertion of the left Arm arises an erect transparent figure neatly imbedded about the brain, opposite to this on the right side is a small erect tubular figure swelling a little and pointed at the top. The part which is in the shell is like a lead or leaded. This shell fish is found sticking to rocks and shells all round our coasts &

has a great affinity to some of the tubular corallines see pl. 34 and 36.
Fig. 3. *Corallina filiformis ramosa pedunculata polycaulium centricis* see pl. 12 fig. C. Sea thread Coralline. As the same magnified to show the young Polypses coming out of the vesicles but still adhering to the tubular shell C. some of the Eggs still in the vesicles. RR. the little caps with their stipes extending themselves, these were first supposed to be vesicles, but are now found to be of the same

use with the Vesicles as in Fig. 1. —
Fig. 4. *Corallina* *retusa* a small species of *Corallina* *retusa* see Pl. 11. fig. a. — A small entire specimen alive magnified to show the vesicles full of Eggs at T.
Fig. 5. Two small stalked Polypses of a red colour & a particular kind. B. B. the same magnified. F. one magnified higher to show the claws flowing out of their sheaths like a star flower, this was found adhering to the shell (Coralline)

Fig. 6. *Corallina squilliformis subactis* *Stictis* *Corallinae* Pl. 7. fig. a. — A single magnified to show the Polypses extending themselves out of their Vesicles.
Fig. 7. *Corallina cum appendicibus lobulatis* *avium capitulum firmis*. *Diada* *haud* *Corallinae* *Pl. 20* fig. A. — G. a piece of it magnified with many rows of cells united together with the appearance of some of the animals alive in their Cells. H. the reverse side to show the back of the Cells. M. N. show the animals extended &

contracted in the Cells. I. K. three views of the Birds heads. These continued to move up & down and open their beaks during the time of observation.
Fig. 8. *Corallina* *polypsea* *ultramarina* *cellulosa* *summitibus* *opacis* *acutis* *inter* *transcibus* *Figurae* *Stictis*. This is the natural size of this new species adhering to a rock shell. O. A piece of it magnified to show the animals in the cells. P. the transverse section of the lower part contr'd to discover the Partitions, which connect the cells of both surfaces together, in the same manner as in the *Therapsent*.
A. Water. *Scap.*



Upon throwing a Fragment of it on the Table, it sounded like a Piece of a Tobacco-pipe.

With some Difficulty, I cut off a thin Slice, which I put into Vinegar, on which a strong Effervescence ensued; and, when the Vinegar had been changed two or three Times, I found the cretaceous or stony Matter was deposited, and only the Membranes, that inclosed the *Laminae*, remained; so that it appeared to me as much of the Nature of Coral, as of Bone or Ivory.

At *K*, is a Figure of the *Encrinos*, or *Lilium Lapidum*; which, whether it may not be the petrified *Exuviae* of this Animal, is submitted to the Consideration of the Curious in Fossils; for they have not yet been able, I apprehend, to fix upon any thing more probable.

The Difference that appears to me, upon consulting *Rosinus*, a German Author, who has published a Treatise at *Hamburg* particularly on this curious Fossil, is, that the *Encrinos* has rather been a Species of Star-fish, with a jointed Stem or Tail; and the Rays of the Star, instead of having *Tentacula*, or Claws, at the End of each, like our Polype, are furnished with Ranges of jointed Fibres, along the Inside of each Ray like a Brush; of which the same Author has given a curious Plate, with a particular Description of this extraordinary Fossil.

So that this curious Polype, is rather, I should think, of another Genus, and seems to be intirely unknown to us till now.

CONCLUSION.

THE Reader hath now before him a Recital of the most observable Circumstances, that have occurred to me in my Enquiries into the Nature of Corallines, together with a faithful Representation of the principal Kinds, and of the Polytypes that inhabit them; for of this Species of Animals, they undoubtedly are. Accident first threw the Subject in my Way; unexpected Discoveries awakened and kept up my Curiosity; and, remote as the Nature of my Employment is from Researches of this Sort, I could not avoid filling up the leisure Hours my Business allowed, with attending to Objects, minute indeed, but full of pleasing Wonder.

Many Hints I owe to the Conversation of my Friends; and I cannot but acknowledge, that whatever else may have accrued to me from these Pursuits, they, at least, have been the Means of procuring me many valuable Friendships, and an Acquaintance with Men who do Honour to their Country, and their Species.

I have shunned Conjecture, as much as possible, in this Recital; and, if in any Place it occurs, it is rather with a View to excite those, who have it in their Power, to demonstrate the Probability or Improbability of what I advance by Experiment, than to impose my Opinion upon any-one.

I own, I am led to suspect, that by much the greatest Part of these Substances, which from their Figure have hitherto been reputed Sea-Shrubs, Plants, Mosses, &c. are not only the Residence of Animals, but their Fabric likewise; and serve for the Purposes of Subsistence, Defence, and Propagation, as much as the Combs and Cells fabricated by Bees, and other Insects, serve for similar Purposes.

That

That many, if not all the different Species here described, are of this Kind, I think is incontestable: But that Animals of so soft, so yielding a Texture, as all the Polypes, yet known, seem to be, should be capable of constructing Habitations of a Texture so united, hard, and with so little Porosity as to bear an exquisite Polish, perhaps may appear to some incredible.

But what are Oysters, and all the other Shell-fish we are acquainted with in these Parts of the World? Substances from which one would as little expect the Solidity, and almost everlasting Hardness of their Shells, as we should from a tender pliant Polype the stony Firmness of Red Coral: And yet those Shells are the Fabric of the most soft and yielding Bodies, -as much as the Lapidescient Corallines and Corals are constructed by the Polypes.

Many of the Corallines seem to consist of a single Tube, containing a single Parent Animal. Every Branch emitted contains an Offspring of this Parent, dependent upon it, yet capable of producing its like in the Emission of a new Branch; and so on, as far as the Law prescribed to each allows.

Others consist of many such Tubes united, rising up together, and Side by Side incircling the deserted Tubes of their Progenitors; whose *Exuvia* become their Basis and Support, as theirs must, in their Turn, be the *Substratum* of a rising Generation.

In some, these Tubes remain empty, and a Section discovers, at least the Vestiges of the Cavities compressed, as in many of the *Keratophyta*: Whilst in some of the stony Corals, these Hollows are so exactly filled up, as to leave no Traces of tubular Cavities, except on the Outfides only; and these,
had

had they remained longer in the Ocean, would most probably have been equally effaced, by a succeeding Progeny.

It may seem too hasty to conclude, that not only the Substances, described in the preceding Pages, are of Animal Production, but even that those more compact Bodies, known by the common Appellations of Star-Stones, Brain-Stones, petrefied *Fungi*, and the like, brought from various Parts of the *East* and *West Indies*, are of the same Origin; and yet, there is one very strong Presumption in favour of such an Opinion; which arises from this Observation, That the Ocean, in all the warmer Latitudes near the Shores, and wherever it is possible to observe, abounds so much with Animal Life, that no inanimate Body can long remain unoccupied by some Species. In those Regions, the Ships Bottoms are soon covered with the Habitations of Thousands of Animals; Rocks, Stones, and every Thing lifeless, are covered with them instantly. Even the Branches of living Vegetables that hang into the Water are immediately loaded with the Spawn of different Animals, Shell-fish of various Kinds. And Shell-fish themselves, when they grow impotent and old, become the Basis of new Colonies of Animals, from whose Attacks they can no longer defend themselves.

If therefore Animal Life is here so plentifully diffused, that neither inanimate Bodies, nor those in which the Powers of Vegetation are vigorous, nor Animals themselves, if declining from their natural Vigour, can be secured from Encroachments; how can we suppose, that the Bodies we are treating of, were they inanimate altogether, could remain so free as we find them, from such Intruders? In short, was there no other Reason to support the Allegation, this alone seems to make it more than probable, that the Polypes inhabiting the Corallines, Corals, Star-Stones,
Brain-

Brain-Stones, and the like, are capable of defending themselves from such Invasions, whilst they continue in full Vigour; which is farther demonstrated, by what happens to them in common with every other lifeless Being in the Ocean; when, through Accident or Age, the Vigour of the Republic fails; they then yield to superior Force, and become the Basis of some more powerful, fortunate Successors.

And now, should it be asked, granting all this to be true, to what End has so much Labour been bestowed in the Demonstration? I can only answer, that as to me these Disquisitions have opened new Scenes of Wonder and Astonishment, in contemplating how variously, how extensively, Life is distributed through the Universe of Things: So it is possible, that the Facts here related, and these Instances of Nature animated in a Part hitherto unsuspected, may excite the like pleasing Ideas in others; and, in Minds more capacious and penetrating, lead to farther Discoveries, farther Proofs (should such yet be wanting), that One infinitely wise, good, all-powerful Being has made, and still upholds, the Whole of what is good and perfect; and hence we may learn, that, if Creatures of so low an Order in the great Scale of Nature are endued with Faculties that enable them to fill up their Sphere of Action with such Propriety; we likewise, who are advanced so many Gradations above them, owe to ourselves, and to Him who made us and all Things, a constant Application to acquire that Degree of Rectitude and Perfection, to which we also are endued with Faculties of attaining.

*The DESCRIPTION of Mr. CUFF's AQUATIC MICROSCOPE,
used in the DISCOVERIES made in this ESSAY.*

- A*, The brass Pillar, that screws into the Top of the Box *K*, which Box contains the whole Apparatus.
- H*, The Shank, with the Semicircle carrying the Concave Mirror, that moves on two Pivots, at *I, I*.
- D*, The sliding Pillar to adjust the silver Dish, with its Lens at *F F*, to the proper focal Distance.
- G*, Another silver Dish, with a higher Magnifier.
- E*, The Shank (supporting the silver Dish) made to slide to and fro, to view all Parts of the Stage *B*.
- C*, The plain Glass placed on the Stage, with a black Patch on it for opaque Objects.
- N'*, The Watch-glass, to be placed in the Room of the plain Glass *C*, for aquatic Objects.
- L*, The Pliers, pointed at one End for different Objects, or to receive on the pointed End the ivory Cylinder *N*, for opaque Objects.
- O*, Pincers to take up small Objects.
- P*, The Brush to clean the Glasses.

