PHYSIOLOGICAL OBSERVATIONS

ON THE

STRUCTURE AND FRUCTIFICATION OF FUCI.

IN CONTINUATION.

Being convinced of the insufficiency of the common Pillar Microscope with a single Lens to detect the System of Fructification in Marine Plants, and at the same time having a wish to clear up some doubts concerning their internal structure, although by an attentive observation of recent plants I had made some discoveries on the subject, I determined to furnish myself with higher magnifying powers. My situation within reach of the subjects to be examined, and the opportunities I enjoy, likewise, of investigating them at all seasons of the year in a growing state, made me entertain well-grounded hopes of adding considerably to my stock of knowledge on this interesting subject.

I made my first experiment on the terminating fruit of the Ferrated Fucus, which stands at the head of the Genus, and is one of the most common species. Having found some of these in maturity, which were evident from their yellow colour, and a sort of semi-transparency, and, likewise, from the apertures of the external tubercles discharging mucus plentifully, I cut out a + transverse slice from the middle, and, having pared off the internal skin on each side of a part of it, I placed the piece on the field of my compound microscope fitted with the lowest power (No. 6). I perceived that the internal substance, which appeared glossy and colourless to the naked eye, was in fact a beautiful network of capillary threads with orbicular mafles or granules of a different substance, darker coloured, and not reticulated. These mafles were either near the internal coat, or adhering to it, and were furnished with five or six pear-shaped feeds each. The external tubercles, of which there were five in the piece under examination, had very sensiile apertures, as viewed under the glass, and communicated with the internal process. Having made this discovery with my weakest power at first, to guard against optical deception, I applied my highest powers (No. 1. 2.) to the same object: with these I plainly perceived that the reticulated transparent fibres, or threads, were in reality tubes forming meshes, and intersecting each other; and furnished at intervals with transparent septa, or divisions.

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* See the Preface to the Ill Peticules.
† Pl. 10. A, nat. size AA magnified.
‡ In this species the mafles containing feeds are rather elliptical, (See B.) one of them highly magnified. In F. vesiculosus and most others they are perfectly globose. See C. C.
§ Pl. 10. AA.
¶ In this species the capillary fibres are wavy and intersect each other in oblong meshes: in the usual fructification of Fuci, where they are not so much compressed, the meshes are square, or hexagonal.
My next attention was paid to the fruit of the bladder *Fucus* in the same state of maturity. I cut out a *slice* containing a part of the external coat, and some of the internal clear *mucus*, which was solid enough to bear cutting, and submitted it to investigation under the different powers abovementioned. The same internal structure was visible, but much more beautifully arranged, which arose probably from the fruit having its coats more expanded, and consequently affording more room on the inside. In this, likewise, as the cut was made through the external tubercle, the *passage* from thence to the internal orbicular mass was very conspicuous. Having met with *F. bifurcatus* of Major Velley, the *F. tuberculatus* of Hudson, and of the Linnean Transactions, in full fruit, with the summits beautifully transparent, and flowing the granules to the naked eye, when held up to the light, I cut the summit down lengthways, and took out a *slice*, and submitted it to investigation, and the internal structure was perfectly analogous to those before described. I have had opportunities during the course of the last year of repeating my experiments on these plants at my leisure, and, likewise, of extending them to the fruit-pods of the kindred species—*F. nodosus*, *F. spiralis*, *F. canaliculatus*, &c. I pursued the same mode of cutting a transverse slice from the middle of the pod, and was happy to find a perfect analogy in their mode of fructification: the only specific distinctions I found, were in the form of the masses, in the size and shape of the seeds, and in the number contained in each orbicular mass.

A similar mode of fructification I observed in some species of *Fuci*, differing widely in habit from those already mentioned, and not having an appropriate fruit-pod. Among these are to be reckoned the *F. loreus*, a succulent plant with masses of seeds, and internal tubercles throughout its whole length. This plant, on having transverse slices cut through it, shews the tubular organization and the masses of seeds, but with this difference, that the tubes, though occasionally interfering with each other, are in general flexuous and wavy; the granules, or masses of seeds in this species contain from three to six each. *F. tamarissicofolius* has its summits above the imbedded bladder pretty much swollen at the time of fruiting, and the dissecting knife discovers the tubular processes, and the masses of seeds: *F. c sipitifus*, a very minute species recently discovered by me, has a similar fructification, and it may fairly be concluded that many of the fruitty *Fuci* do not differ essentially from those already described.

It having been hinted to me from high *§* Botanical Authority that the pear-shaped bodies described and figured by me, as they appear in the compound microscope, might not be real seeds, but only *gemmae*, or particles of the medullary substance of the different plants; as it seemed impossible from their extreme minuteness to dissect their component parts with sufficient accuracy, in order to insure conviction, I resolved to procure, if possible, the spontaneous discharge of the seeds in sea water, in order to submit them to a more accurate examination. I likewise conceived the

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* See *C. nat., see C. G. highly magnified.*
† See Fig. *C. C., magnified.*
‡ See Fig. *E., magnified.*
§ Sir Joseph Banks, Bart., K. B., President of the Royal Society.
the idea that I might clothe my experiment by sowing the seeds on sea pebbles, and by alternate immergions and emergences procure feeding plants from those seeds. I selected three species, viz. *F. ferratus*, *F. canalicularis*, and *F. bifurcatus*. I carefully detached these plants with their bases uninjured from the rock, and placed them in wide-mouthed glass jars, with a change of sea water every twelve hours. In the course of a week I succeded in procuring the seeds, which now appeared + oval rather than pear-shaped, and, when ripe, burst afender tranversely in the middle with an ¥ explosion: these seeds were included in a bright mucous immiscible with sea water, and likewise specifically heavier than it; so as to serve the double purpose of carrying them to the bottom, and of affixing them to the rock when settled there by their gravity. This spontaneous discharge of similar shaped bodies, all included in a glasy mucor, and all opening tranversely, would hardly have needed the additional corroboration ofcausing them to vegetate in order to evince their being actual seeds; this, however, I likewise happily accomplished ¥.

My Friend Major Velley, in his Inquiry into the Mode of Propagation peculiar to Sea Plants, had noticed that the fruit, or pericarp in *F. vesiculosa*, and likewise the fructifying funnits

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* See an accurate representation of this species with its fructifying funnits in Major Velley's Different.

† See the remark made by Major Velley on the explosion of a minute grain on the fruit pod of *F. vesiculosa*.

‡ See Ps. ix. v. 11-12.

§ As many Reason Persons, who occasionally visit Sea-Bathing Places, may be deber of aftertasting these feels under their own eyes, I shall detail the Experiments I made. Having procured a number of wide-mouthed jars together with a Syphon to draw off the water without taking or disturbing it, on September 7, 1786, I placed my plants carefully in the jars with their bases downwards, in their natural state; on the following morning I detached off the sea water, and, letting it flow into the basin, I found a few particles at bottom, which, on being viewed in the microscope, appeared to be little segments detached from the surface by frictons in carriage. I then poured a forth quantity of sea water on the plants, and placed them in a window facing South; on the following morning the jars containing the plants of *F. canalicularis* discharged into the basin a few yellowish grains, which, on examining them, I found to be the yellow seeds of the plant; they were rather oval than pear-shaped, but the most curious circumstance attending the observation was, that each individual feel was not in contact with the water, but enveloped with a bright mucilaginous substance. It was easy to guess the wife economy of nature in this disposition, which, as hitherto above, serves a double purpose in such equably necessary towards continuing the species. On the following morning a greater quantity of seeds were discharged by this plant, and at this time a few seeds were procured from *F. ferratus*; but this latter plant discharged such a quantity of mucous fluid, that the see water in which the plant was immersed was of the consistence of thin syrup, and, consequently, the seeds being kept *expelled*, it was difficult to separate them. The seeds of *F. canalicularis*, however, were numerous, and visible to the naked eye, and, after letting the water soft for a few minutes, it was no difficult matter by gently inclining the basin to pour off the water and let the seeds remain. In performing this operation I was witness to an explosion or burting of one of these seeds or pericarp, which agitated the water considerably under the microscope and brought to my recollection the circumstance mentioned by Major Velley during his investigation of *F. vesiculosa*. I at last obtained a discharge of seeds likewise from *F. bifurcatus*; these perfectly resembled the others. Having established this point, viz. that marine plants scatter their seeds in their native element without violence, when ripe, and without expelling the water of the spring, I next procured some few pebbles and small fragments of rock taken from the beach, and, after having drained off the greatest part of the water in the jar, I poured the remainder on the pebbles. I left them dry for some time that they might sink themselves: I then filled them with ripened sea water in a wide-mouthed stone jar, and left them exposed to the air, in order to institute as nearly as possible their peculiar situation between high and low water-mark, and when the weather was rainy I took care to expose them to it. In less than a week a thin membrane was discernible on the surface of the pebbles where the seeds had lodged with a naked eye: this gradually extended itself, and turned into a darkish olive colour. It continued increasing in size till it at last appeared moreosfeopile, or buds coming up from the membrane: these buds when viewed in the glass were rather hollow in the centre, from whence a short stalk forth: in some influences they seemed to rise on a + short thick pedicid, and in this latter case resembled in some measure the Peltate formed budding of *F. ferrata* (see Ps. xiii. A. B.), and the others without froms were like the fructifies Petals, &c.

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* As this is the cafe, it is very false to infer that the first stage of the plants of this genus at least is not dissimilar to that which has occurred to much frupicine in the cafe of *F. ferrata*, and that they differ only in fits.

† These plants continued to put forth the central thoes for some time, but their growth was not rapid after the first effets; most probably owing to their confined situation: and, as I was distant six or eight miles from the sea, and had not the opportunity of placing the pebbles in some
summits of *F. ferratus* had no perforations through the internal tubercles until the seeds were ripe, and ready to be discharged. I had not observed this circumstance, when these two species were investigated by me in my former *Fasiculus*; however, I have had abundant reason to be convinced of this fact in the course of my observations subsequent to that time.

As the previous impregnation is effected internally, and confined to a particular spot, the monocious character attributed to these plants by Reaumur, and adopted by me, with a difference, notwithstanding, becoming the intricacy of the subject, must be totally abandoned.

The curious process respecting the fruit-pods in the former part of this Essay may with reason be supposed to bear some analogy to the parts of fructification in Land Plants, and we may safely infer that the capillary tubes are fitted to contain an impregnating  *aura*, and that this is communicated to the orbicular mafes, which at first appear *pellucid*, then marked with *nervulous* spots, and, lastly, discover in a more advanced state the perfect seed. In confirmation of this, it is necessary to observe that the granules composing the *pollen* of land plants may be considered probably as capsules containing a subtile vapour, as they are known to explode. At all events, as the impregnation is effected in perfect seclusion from the sea, the pencils of fibres in the mouths of the cavities in the fronds of some species, and those threads observable in the inside of the air-bladders in others, can have no reference to fructification.

With respect to those cavities with which all the species in Linneus’s first division of the genus abound, and which give the frond a punctured aspect, as they are found at times with tufts of very fine whitish filaments, and at other times deftutate of them, I made them the subject of repeated investigation under all their different appearances. That they are in part, if not wholly, intended for the discharge of a thick, *pellucid*, mucous fluid, is proved by an easy experiment, and the quantity which the plant *exudes* under water is astonishing. A single plant being put in a shallow pan and covered with a pint, or a little more of sea water, converted the whole into a liquor of the confection of syrup in the space of twelve hours. The experiment was repeated on the same plant with nearly an equal discharge for several successive days. This fluid was found to be specifically heavier than water, and for some time immiscible with it.

Having remarked that the punctured frond of *F. ferratus*, which exhibited, when dry, tufts of whitish filaments, when viewed immersed in water under the microscope appeared without any,

cf. those pools which are left by the sea at low water, I discontinued the experiment. It is proper to notice in this place how nearly the conjectures of our countryman Marston approach the truth: “If any one affirms that the *Algae* are produced from feed, or something analogous to it, I do not contradict him; for in some plants there seems something thick and tuberous, adhering to the leaves themselves;—it is probable that a vitious and pithy humour (if it be merely a humour) is produced in them opined with a menstrual power.” (Linn. Tri. v. 3. p. 85).—If the vitious and pithy humour mentioned by him had been furnished in a microscope, he would have discovered the actual feed.

* This cannot arise wholly from the decay of the plant, as an ingenious Correspondent of mine, Mr. Dawson Turner, has suggested; it seems to take place in a very short time after immersion.

† In order to ascertain these facts I took an infusion of Cocinea in spring water, and some of the mucous fluid obtained as above, and placing the latter in a drinking glass I poured the tinted infusion gently on it, which remained on top, perfectly immiscible; I then reversed the experi-
any, it occurred to me that these filaments might be nothing more than the exuding mucus* hardened and whitened by the sun and air. I fully convinced myself of this fact by repeated experiments. The reason why these plants are sometimes covered with these tufts, and at other times are bare and naked, arises from a peculiarity in them, as they at intervals discharge plentifully, and at other times not, from some economy of nature at present unknown to us. In order to ascertain how deeply these muciferous vessels were imbedded, I took very thin crofs cuts of the frond of the same Fucus, taking care to cut through some of these cavities. These slices I placed edways on the field of the microscope armed with my highest power, and I found them to be pitcher-flaped, and rounded at the bottom; and that they extended precisely to the middle of the substance of the frond. From this regularity, and considering that these vessels are found on both surfaces, I conjectured that there was a diaphragm, or membrane in the middle. The thinnest of the frond not admitting the ascertaining this fact by the instrument, it must rest as yet in conjecture.

I have, however, detected this membrane in the thick leathery frond of F. digitatus, and, indeed, it seems reasonable to suppose, as the cavities extend precisely midway through from either surface, and as the frond of marine plants is not distinguished, as the leaves of land plants are, by an upper and under surface, that the absorption of the alimentary juices is effected indistinctly by either surface, and that this internal membrane is the channel of communication from the base to the summit. This transverse cut of the frond exhibited to view, besides the imbedded muciferous vessels, a pellucid, colourless, organized mucus, appearing to be composed of roundish, or ovate granules; and this, with the two external coats, forms the whole of the frond in by far the greater part of the Fuci, being equally to be met with, though not at all times pellucid, in the thick midrib and solid stems of the larger Fuci, as in the thinner and more membranaceous fronds of the minute species. It is remarkable that this internal substance, which is of so fluff and horny a texture in the large stems of F. digitatus, has notwithstanding a tendency to soften and disolve in water, and is consequently no other than the same mucus a little more solid.

I would not be underfoot to infer that these pitcher-flaped vessels in the frond of F. serratus, vesiculatus, &c. are the common organs of absorption, as they are situated at too great distances from each other, and are peculiar to a very few species; whereas the mode of growth is most probably analogous in all. I rather think the absorbent pores of Fuci are infinitely minute, as in land plants, situated, however, on each surface of the frond; and that these pitcher-flaped vessels, which puncture over the frond of certain species, are designed as excretory ducts, either to

ment, and put the tinted water in the bottom of the glafs first, and the mucous liquor in this experiment, being poured on the tinted liquor, solidified immediately on the bottom. Leaving the two glafs till the following morning, the two fluids soon began to appuritate, and in a day or two the mixture was complete.

* This mucus being of a very thick consistence immediately hardens, as the tide leaves the plant; and if a frond is nicely examined even with a common eye-glass just as it is taken out of the water, the mucus will be seen exuding and condensing into frings.

† This membrane consists of reticulated tubes in F. digitatus.
discharge superabundant moisture in these vigorous plants, or to generate a mucous liquor of some use in the element they inhabit. These, however, are conjectures, which future experiments must either refute or verify.

From the considerations abovementioned, it is no less certain that the fibrous process on the inside of the air-bladders in several species can have no possible reference to fructification. I have since the publication of the former FASCICULUS examined these bladders on F. vesiculosus and nodosus in different stages of growth. In the younger bladders the threads are more numerous, and matted together like wool; in those more advanced they are fewer, and many of them are extended across the * hollow part from side to side; in which case they have bubbles † of air imbedded in them, like the beads of a necklace. In those which are full-grown, and whose skins have acquired a proper degree of ‡ elasticity, there are seldom any to be met with, but on the inside of all of them there are globular incrustations. The external surface of these bladders is of the clofeft texture, and as it were varnished over, which seems wisely contrived to confine the elastic vapour, considering them in the nature of § buoys. If this were not so, the tender, soft skins of the infant || air-bladders would certainly collapse, and we find that as the coats acquire thickness, the fibrous process becomes nearly extinct.

After these discussions on the Structure and Fructification of Fucus, as far as they regard those plants, which in my opinion should constitute the whole of that genus, it will be proper to continue the observations and experiments I have made on those submarine Plants, which I consider as forming distinct genera, during the interval since the publication of my former FASCICULUS. I therein hinted that the fructification of those plants was more difficult, as the parts were infinitely smaller. The Anomaly that prevails respecting the plants which constitute the genus Fucus is confessed by every Writer, and, however feeble the attempt here made to sublimate a better arrangement, it is hoped, it may stimulate abler Botanists to unite their labours in endeavouring to remove the opprobrium that refts on this part of the class Cryptogamia.

FUCUS.

FRUCTIFICATION—a jelly-like mass, with imbedded food-bearing granules and external conical papilla—terminating.

This generic character is taken from Fructification, as visible to the naked eye, or a common eye-glass,

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* Mr. Woodward supposes from this description, that there is a considerable analogy between these fibres and the air vessels in terrestrial plants.

† See Fig. D. Pl. xx.

‡ The bladders at the base of an aged plant of F. nodosus are nearly of the thickness of the sole of a shoe.

§ From the buoyancy of these species the Bretons, I am informed, have a singular and very commodious way of procuring large quantities of them for the purposes of agriculture. They cut them and collect them at low water, and confining them with ropes, wait the return of the tide, and placing themselves on the masts conduct them by long poles to the place of loading.

|| It must be observed, however, that there is a thin vitreous liquor in the cavities of the infant air-bladders.

§ The situation of the fructification will form a good generic character between this genus and Ceramium. F. lorbus is the only exception.
eye-glafs, which it is presumed is a more proper foundation for a system than microscopic observations: similarity of Fructification unites so many in this genus, that no generic character can be taken from the frond as in the following ones.*

CERAMIUM (GÄRTNER).

Fructification—a jelly-like mass, without the seed-bearing granules; internal, universal; papille invisible.

I have repeatedly examined the plants contained in this genus in all stages of their growth. At times large irregular shaped bladder cover the frond, and on cutting transversely through these bladders there issues a thin mucous fluid quite transparent, which appears in the field of the compound microscope to be composed of capillary tubes intersecting each other, though not regularly reticulated. On placing this thin transverse slice edgeways under the glafls, there appeared numerous small bubbles adhering to the inner coat of the bladder: when these are separated by pressure from the coat, they remain unmixed with the other fluid, as being of much greater density, and form flat circular masses, as they lie on the field of the glafls. In these are to be seen by means of high magnifiers extremely minute roundish specks. As these flat masses consist of the same bright glaflly dense mucus, as that which envelopes the seeds of the species already described, I conjecture that these minute specks are the actual seeds, and that the bright dense mucus surrounding them is to serve the double purpose of gravitation and agglutination. Should this prove to be the fact, there appears to be a greater analogy between this plant and those before described than I at first imagined. The seeds, when ripe, may be seen on the surface of the frond at times with very high magnifiers, either disposed in small clustered masses, or in flat lines intersecting each other. Although F. polythestes, which is included in this family, is often found to have the same irregular bladders on the frond, yet, as I suspected that the wary protuberances with which the bulb is covered might serve a double purpose, and occasionally contain seed, I dissected some of those on the upper side, and found seeds imbedded in a clear reticulated mucus. These seeds, or pericarps, were roundish, and of a larger size than those of F. serratus.

CHONDROS §.

Fructification—an ovate rigid imbedded pericarp, containing seeds in a clear mucus, and prominent in either surface.

These

* The Physiological Observations detailed above apply to this genus exclusively.

§ See G. D. P. H. 35.—It is a doubt whether these irregular bladders discoverable on the frond of F. digitatus, &c., are essential to the fructification. Very high magnifiers discover, as I before observed, when the plant has been out of water, very small conical papille with perforations for the discharge of the seed, where no bladders are found, and these bladders may be occasioned by the expansion of some ethereal vapour detaching the upper epidermis at the time of imbibition by accident, as I have never seen them till the plant has been exposed on the beach.

§ Having macerated some of the frond in danger of its water, I found at the end of a week what I suspected to be the seeds discharged in the water; they are extremely minute, and each included in a coat of bright glaflly jelly.

§ Xilos—Cartilage.

|| See P. xiv. F. latus, &c. &c.
These pericarps are visible to the naked eye, and are particularly sensible to the touch, as they project on each side from the frond. They contain numerous infinitely small seeds. Their internal tubercle is a colourless mucous composed of capillary vessels, analogous, if examined under very high magnifying powers, to that of the kinds first described, but the surface of the frond has no papillae. These pericarps, when ripe, often burst asunder, and discharge the seeds on the surface.

SPHÆROCOCCUS.

Fructification—external globular pericarps, adnate or immersed; sessile or pedunculate; containing seeds as above.

This forms a very numerous genus, as many of the larger shrubby species, and almost all the minuter kinds are found to be tubercled, and it does not appear to me that the tubercles being sometimes internal is a sufficient reason to separate them from this genus, as it may arise either from accident, or from the plants not being sufficiently advanced in maturity*. There can be no doubt, however, that this genus, as well as Fucus, as it is here constituted, will hereafter be separated into several distinct genera, when the system of cryptogamic Botany shall have made further advances. In the mean time I have thought proper in the enumeration of the species to follow the arrangement laid down by Dr. Goodenough and Mr. Woodward in their Synoptic Table‡.

CHORDA.

Fructification—a mucous fluid in the hollow part of a cylindrical frond, with naked seeds affixed inwardly.

This genus is not numerous; the principal one F. filum is a singular plant, as will be seen by the description of it in this Fasciculus. It is necessary to observe that the mention of the seeds in the generic description of this, and the other genera is not strictly consonant to the Rule laid down above, as it requires a pretty good eye-glass at least to perceive them. The detailed account of the effusion of this plant under the article F. filum will serve as an additional illustration of this genus.

CODIUM.

Fructification—invisible; frond roundish; soft and stungy, when wet; velvety, when dry.

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* F. articulatus and coccinus have both external, and imbedded tubercles.

‡ See the Synoptic Table at the conclusion of the Latin Preface.

§ Lin. Trans. v. 3. p. 108.—I ought here to notice with proper respect the improved arrangement of Fuci by Dr. Withering in his last edition of the Bot. Anti. of British Plants, which is well worthy the attentive perusal of all those who wish for a more intimate knowledge of Sea Plants.
I have not inflected Fructification in the Generic Character, as it is wholly invisible except with strong magnifiers, and as the singularity of the frond is such as not to need it. I have examined it, however, under the compound microscope since the publication of my former Fasciculus, and it appears to be a congeries of tubes arising from an internal membrane interwoven with and implicated in each other *. These tubes seem occasionally to open and shut, and near the summits are dark-coloured granules, which are doubtless the seeds †.

Besides the above genera a few anomalous species should be noticed, as proper to be referred to a future investigation ‡.

These general Observations on the divisions of Fuci, as to the mode of fructification, will I apprehend strike any person conversant with marine Botany, as distinctions sufficiently obvious to justify a departure from the Linnean System. As to those Gentlemen, who have made these plants the object of their particular investigation, it is presumed they will think they admit of a still farther sub-division. It is for their inspection that I have ventured to arrange the above Synoptic Table, which it is hoped will prove the means of a final and determinate arrangement of sub-marine plants.

* The Ulva decussata of the Linnean Transf, v. 3. p. 85, a very curious plant, Mr. Woodward thinks will rank with genus Corda. † See Phil. Trasf. xx. C. C. C. ‡ F. Siphonaria, rubens L. Tr. Lichenoides L. Tr. Siphonocladus L. Tr. § In the Aspogon, Orchidace, &c. to which may be added Petalocarpus Javanus. See the Differ. Phil. Trasf. 1796, Pr. ed.
tute pollen, and which float in our atmosphere; in the submersed plant, on the contrary, it seems confined in small capillary tubes, and carefully excluded from contact with the water. These tubes are interwoven and furnished with septa, or partitions, and anastomoses. With respect to the assertion of Gætner, that the seeds of Fuci have no coat, my experiments evince that they are furnished with a coat, and that this coat bursts afunder * transversely. This coat, with the clear, glairy mucous in which the seed is inclosed, seems to form the disk by which the seedling plant attaches itself.

* Pl. lxx. Fig. Pr. 1, 2, 3.

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**POSTSCRIPT.**

I cannot conclude this Essay without mentioning the Observations on the British Fuci, &c.—a Paper, which has made its appearance in the Third Volume of the Linnean Transactions, and which is the joint production of Dr. Goodenough and Mr. Woodward. I * noticed the expectation entertained by the Botanical World on the united labours of two Gentlemen so eminently qualified for the undertaking, and who, besides, had free access to the different Libraries and Herbaria both public and private. The Catalogue of British Fuci published by these Gentlemen is enriched with many new species, and contains accurate, amended specific characters of each, together with very diffuse Observations on the more intricate ones; the whole arranged in a clear and systematic manner, at least as far as our present knowledge of Marine Plants extends; but what will for ever merit the thanks of the Botanical World is the fixing the fluctuating and confused Synonyms of ancient Authors on a basis which cannot hereafter be shaken; and, while we advance daily in the Field of Discovery, we enjoy the heart-felt satisfaction of being assured, that the labours of our predecessors can no longer mislead, or confound.

* See Preface, p. iv.

Pendarvis, Sept. 25th, 1797.
"A MAXIMIS EXORSA EST, ET AD MINIMA PROGREDIETUR
PHILOSOPHIA."


Portio fructus F. vesiculoso de medio transversâm secla imprimis seculi obultiti. Gelatina tenax, et vitri inflat pellucida (ut nudis oculis, et lente modicè augenti conspiciebatur), opus * tubulofo-rectulatum pulcherrimè exhibuit; granulâ oricialibus feminiferis immersâ, et interiori cutis lateri plerumque axillis. Granula hac, coloris sub-suffici, nebulis, vel punctulis ab initio notatur; fructu dein maturo, femina pyriformia, vel faltem oblonga quinæ, vel fena, in singulis granulis cernere eft. Fœci confirmiles fructu fœ. mucoso, terminali; ut F. ferrata, nodosus, spiralis, canaliculatus, &c. finijilem partium fructuram exhibent, muculis retium foliolummodò in diversis speciebus formâ et figurâ inter se discrepantibus.

In aliis etiam speciebus, ubi nulla extrorsum apparat fructificatio, haud absimilis seculi propagandi ratio eft. F. loreus, ubique gelatiam reticulatum, granis, vel pericarpiis feminiferis insitus ad intervalla dispositionem, cultello transversâm, vel longitudinaliter fecit, continuò exhibet. F. tuberculatus, vel bifurcatus, in † apicibus paululum incrassatis (cum penitus fit diaphanus) granula feminifera intius etiam nudis oculis conspicienda præbet. In apicibus F. ‡ tamariscifolii, F. caespitoso, allorumque, fronde cylindricâ vel compresâ, granà orbicularia feminibus conferentis, gelatinaque obserbavimus. In omnibus supradiexitis speciebus notandum eft, ubi fructificationi intius fita eft, papillas extrorsum inveniri, foraminibus nonc apertis, nunc clausis, prout maturitas feminum postulât. Semina per hæc foramina fponte in mari exire, mucù, vel gelatiana obducta,.§ experimentum mihi probatum eft.

Novum hoc phenomenon, priores omnes Reaumurii, Gmelini, Gærtneri hypothefes, necnon quœ de moncecià quarrandum specierum naturâ in Fasciculo priori affcrui, funditus evertens

* Vid. Tab. ix. Fig. B. B.B.
† Vid. Tab. ix. D.
‡ Vid. Tab. xi.
§ Vid. Experimentum in novulis Praefatione Anglica foliolum, p. xi.
evertens flatim mihi fele obtulit, nec nisi iteratâ investigatione, post tot illustres Viros, oculis omninò fidendum fuit.


Nullo igitur fructificationis funguntur officio vesiculae aèriferæ, quæ in paucissimis reperientur speciebus; nullo glanduli ifti, in fronde *F. vesiculofa*, *ferrati* occurrentes, et penicillia fibrosi ad oras cinfèli.

Et si vero in speciebus enumeratis materies illa gelatinofa, retiformis, vel saltem vafulofa, reperientur, grana orbicularia faminisera in quibusdam è grandioribus, necnon in omnibus fronde planâ donatis, omninò defunt.


Vesiculas denique aèriferas, quas *o lim partem fructificationis masculam intus continere ratus sum, paulò accuratius invesigavi*. Fila diaphana, lucentia, transversim in vesiculis expanfà ferè semper in junioribus cernere est, rarò autem in adultis. Fila hæc ò globulis aèris ad intervalla fiatent, haud rarò spermatorum monilis ad infar ordinatis. Pars interior quoque vesicularum aciculis pellucidis, et tuberculis obduèta est, unde fuipicari libet modo quodam occulto aèrem, five vaporem clavicularium intus gigni, quo vesicularum latera, aloqui collapser, diffondantur, et intumescant.

Invelligationi Fructificationis Plantarum Marinarum per totum tempus, ex quo *Fasciculus* prior in lucem prodierit, unìce intentus, notas et charæteres quamplurimos haèc inobservatos, utpote et species quasdam novas animadverti. Quod ad plantas jam a me descriptas attinet, summariurn adjiciam.

**FUCUS SERRATUS.**

Vesiculas feu vafulca ureecoliformia in fronde, queis vim masculam attribui, solummodò mu-

† Vide Fig. 18. D.
ciferas effe * experimentis comprobavi. Frutificationis partes singulas in interiori apicis intumefcantis parte fitas, ut in microscopio composito exhibentur, in Praefatione Anglicæ fatis copiosè expofui, atque † iconibus illustravi.

Var. β.—Occurrat mihi superrimè in Cornubia juxta St. Ives oppidum varietas admodum singularis frondis angufla, apicibus prelongis, et margine simplici, nec ferrato.

FUCUS VESICULOSUS.

Fibras villosas in interiori vesicularum aëriferarum parte accuratiore indagationi lentibusque compositis subiectas, minimè antherarum, vel filamentorum vice fungi certissimum est. De earum naturà itemque partium frutificationis in fructu vel pericarpio terminali, vide quæ observavimus in Praefatione Anglicæ ‡.

Varietates hujus speciei accuratissimè notavit D. Withering §, M.D.

FUCUS DIGITATUS.


FUCUS POLYSCHIDES.

Tubercula, quibus bulbus in hâc specie obtegitur, in quibusdam individuis transversim secta, femina muco pellucido obducta offundunt; unde conjsecter liber, veiculos in fronde rarius producèt.

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* Pref. Angl. Pl. xii. l. 18.
† Tab. ix. f. A.A.A.
§ Dr. Withering's Bot. Arr. of Brit. Plants, ed. 3. v. 4. p. 83.
duci. Semina illa ipsis, quae in F. ferrato et vesiculofo notavimus, grandiora quidem, et puncte orbicularia. Radix divaricata et ramosa hujus speciei eodem, ac ceterarum difc, influitur glutine.


**FUCUS SILIQUOSUS.**


**FUCUS SPIRALIS.**

Tubercula externa in fructu F. spiralis maximè prominent. Fructus quoque in ficco rectus, penicillus + nuci exsudantis, et folè indurati obtectus, formam echinatam praecipue fert. Forma fructus varia; rotundifolcula, oblonga, bicornis.

**FUCUS TOMENTOSUS.**

Planta hae microscopio composito subiecta structuram partium Fuci diffimilimm exhibet. E tubulis intertextis, et membrane interiori affixis conflat. Tubuli hie, ore nunc aperto, nunc claufo, proveffio etate ad apices ramulorum evolvuntur, et marcelcunt. Seminula in medio tubulorum conspicua, coloris sub-nigri; in singulis, ut videtur, singula †.

**FUCUS PLECTATUS.**

Recentem, ex quo proderit Fasciculus prior, speciem hanc, ad rupes imis maris receffibis in ficco relifiam, obseravi. Substantia, etiam in plantâ vivâ, lignae eff et tenax; fructum verucofum

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* In Act. Linn. v. 3. p. 155. feminam in filios improvemente manua fu. Filiques fructiferæ ad apices ramulorum sint sunt diffimipmento unico longitudinalia; congrae feminam inimitantur atque reperiebantur.

† Vide que obseravi de penicillis illis figur.

‡ Vide Pl. xxxi. C. c. c. c.—Generi novum, filii nomine Comit, una com Uvâ decorticatâ D. Woodward (L. Tr. v. 2. p. 53) in enumeratione generum selectar F. tenentur, p. xvii.
( xxiii )


**FUCUS ACULEATUS.** p. 24.

Basin planta eraff, et quasi spongiosa est; caulis verò ad basin cortice ligneo obduètus: subflantia interna diaphana, vapeculioa.

**FUCUS ARTICULATUS.** p. 28.

Suśpicor plurimas effe varietates: fructificationem saltem nunc exsertam, nunc innatam effe conflat: Specimen unicum saltem fructu pedunculato juxta Pensaunce oppidum colleti.

**FUCUS RUBENS.**

Species hæc a D. D. Goodenough et Woodward F. sinusn nomen obtinuit; F. profloro D. Lightfoot, qui idem est ac F. crispus Hudsoni, in Herbario Linneano conservato, nomenque F. rubentis praeoccupante.

**FUCUS FASTIGIATUS.**


**FUCUS VERRUCOSUS.**

Species hæc quoque specie Herbarii Linneani nomen triviale Hudsoni abrogavit, F. conferuisdis affumpsit; haud scio tamen an F. allisidis D. Hudson, hæc referendas sit.

Forfan haud abs re foret numerosissimam Fucorum familiam, quem adeò ex omnium confen-fu fit anomala, in nova quaedam genera distribuere, notis præcipuè a Fructificatione, prout occu-lo incerti apparet, sumptis.

* Fructum semi-globosum lateralem apicae etiam quandoque incassato, et forfan fruifero, observavit superioris D. Woodward.

**SYNOPSIS**
SYNOPSIS GENERUM.

FUCUS.
Char. Gen.—Fruítica longa, pellicula; granulis sub- 
obsoletis granulis seminis incolis; papulis conicus fasciis 
ex- 
eminentibus.

CERAMIUM.
Char. Gen.—Fruítica florica, pellicula, fine granulis seminis 
fermis; papulis instabilibus—per totam florinem.

CHONDRIUS.
Char. Gen.—Pericarpium, ovatum intus, utrinque pro- 
minentem; seminibus in suco pelliculae.

FUCUS.
* Fruítica florica, sericea.
  F. serratus,
  velutinosus,
  incaeus,
  rotundus, var.
  divaricatus,
  spinulosus,
  molusus,
  cerasiformis,
  cassiniflorus,
  filicinus,
  scopulo- 
  formus.

** Fruiticibus innotat.
  F. serratifolius,
  bifurcatus,
  lorenus,
  abrotaniflorus,
  barbatus,
  granatus,
  fimbriatus,
  filiformis,
  natans.

CERAMIUM.
C. echinothamum,
  bulbosum,
  digitatum,
  elatum,
  palmatum,
  phylliticum,
  esculentum.

CHONDRIUS.
C. crispus,
  ceratoides,
  lacunos,
  filiformis,
  echinatus,
  mammilatus.

SPHEROCOCUS.
* folis deflexis.
  S. sanguineus,
  fruticosus,
  hypoglaucus,
  ovatus,
  foliolatus,
  dalyphyllus,
  membranaceus.

** foliis medium folium possess.
  S. albaus.

*** frondis plius avus.
  S. incanus,
  ericiosus,
  filiformis,
  lobatus,
  pinnatifolius,
  affinis.

**** frondis hinc canaliculatis.
  S. pustulatus.

***** frondis compriptiss.
  S. crenatus,
  gigantus,
  coromandelicus.

NOTE.
Chondrus forsan altem affici- 
natis, usque ex F. fasci- 
atus, etc.

* nov. sp. L. Tr. v. 3. p. 149.
  nov. sp. tab. xii.
  nov. sp. tab. xii.
  nov. sp. L. Tr. v. 3. p. 139.
  nov. sp. L. Tr. v. 3. p. 141.
  F. polyphyllus Hatschi.
  Fructificatione forsan in vesiculis, 
  vesiculosis, etc.
  Species hinc in teretem, et tera- 
  gnamin divisam, L. Tr. v. 3. 
  p. 149.
  nov. sp. L. Tr. v. 3. p. 134. 
  F. rubens Hatschi, in F. 
  syncarpiis in fruticulosa 
  habent semina; in horto 
  seminorum observatur.
  Fructus rubens viscoso, ad 
  renascentem, usque ad 
  fruticulosa, etc., nov. 
  nov. sp. L. Tr. v. 3. p. 203.
  nov. sp. L. Tr. v. 3. p. 206.

C. echinothamum,
  bulbosum,
  digitatum,
  elatum,
  palmatum,
  phylliticum,
  esculentum.

S. incanus,
  ericiosus,
  filiformis,
  lobatus,
  pinnatifolius,
  affinis.

S. pustulatus.
  S. crenatus,
  gigantus,
  coromandelicus,
FUCUS SACCHARARINUS. 


Var. β.—Linn. Tr. 3. 151.

RADIX divaricata, lignea, agglutinata.

CAULIS teres, brevis, solidus.

FRONS simplex, ensiformis, praelonga, in medio & bullata.

FRUCTIFICATIO muecota, reticulata: interna, vel in finibus rugarum.

SEMINA minutissima.

OBSERVATIONES.


(VAR. β.)


Tr. v. 3. p. 151. 1707. 2.

AFFINITIS valde praeceps, si non sit poitus F. digitata varietas; qui perpepe fluitit brevi innititur; frondes quam maxime dilatat et indivisa.

L. Sugar


* Eiusdem, tres vel plures quandoque plantae radices inter se implicatis seipientibus, singularis tamen ex singularis radicibus originem.

* Corrigendum hic error in præcie Fasc. obi radices F. digitata ramificatione foliis plantam fortissime afferunt.


* Velisca hæ bulla, ut vocantur, dilatata fune; et horum, rugae in medio frondis, ex una parte convexae, ex altera convalae minus rectæ vocari bullae, quæ aethere nuxfixa ducuntur.
FUCUS. frond simple and undivided, welted, sword-shaped.

PLATE.
*Gmel.-t. 27.—Act. Gall. 1712. t. 3. f. 4.—Gunn. ii. 7. a.—Oed. Dan. t. 416.

ROOT spreading, fibrous, woody.

STEM short, cylindrical, solid.

FROND sword-shaped, very long and broad; thick, stiff, and welted in the middle; margin thinner, undulated.

FRUCTIFICATION internal, or in the folds of the wrinkles; confining of a reticulated, tubular, transparent mucil.

SEEDS very minute; only at times discoverable by the microscope.

OBSERVATIONS.

This is one of the largest growing Fuci, often extending more than a yard in length, and four or five inches in width. It consists of a simple undivided frond, shaped and welted as above described.

This frond is of the most polished surface, and fibrous as if it had been varnished over; its substance is cardilagenous, and remarkably full of deep longitudinal fissures near the margin, and irregular cavities and protuberances transversely: the *bullae, as they have been called, being hollow or indented on one side, and in relief, or prominent on the opposite one.

Nature has furnished this plant with a strong, woody, fibrous root, by which it infuses itself among rocks or ooze, or lays hold of large pebbles and the flints of other Fuci, and these roots are supplied with the same Gluten that abounds in the dicoid bases of the rest of the genus. Its name of Saccharinus, or Sugar Fucus, was adopted by Linneus from Sibbald's observation of its exuding a white sugary efflorescence when dry: Ray's term Belt-shaped, and Bauhinus's Sword or Smyrsian-shaped are certainly more appropriate.

This species is eaten in the Northern part of the Island; not raw, but boiled with milk; and, when dry, and suspended in an airy place it forms an admirable Hygrometer, and prefers its qualities for years.

* Gmelin's Plate is not very expressive of its figure: it represents three fronds growing from one root.

* Small clusters of these plants are sometimes, though rarely, met with, but each has its separate root.

* The term bullae has been applied by respectable authority to the transverse wells in the middle of the frond, but as the Latin term implies a hollow Ball, it does not hold good, as will be seen by a transverse section of the frond,
With respect to its mode of fructification, I have paid great attention to it under the different powers of my microscope in all stages of its growth, and at different seasons of the year. Gmelin says the fruves on the frond are filled with a prolific mucus containing naked seeds. Having nicely pared off the external coat, I found the internal substance the same as in the kindred plants of F. digitatus and polysclera—*a reticulated bellined mucus with a membrane of partition in the middle.* This membrane consists of tubular vessels, as I have described in F. digitatus. At some seasons of the year irregular bladders similar to those on F. digitatus are observable, which may be considered I think as an expansion of the mucus preparatory to fructification. On distilling these bladders I could perceive the reticulation in the mucus, which is now more fluid; and, at some favourable moments I have seen clumps of very minute seeds, as I suspect them to be, adhering to the inner coat of the bladder. The surface under the strongest magnifiers, when the fructification is matured, discovers minute apertures like pin-holes; from whence we may imagine that the mucus or seeds, which Gmelin observed in the fruves, were discharged from within. On maceration this Fucus gives out a brown tincture.

(F. B. B.)

**FUCUS.** frond smooth, without warts.

**PLATE.**

_Gmel. 26.—All. Nat. Car. v. 6. t. 9. f. 2._

This variety is infected on the authority of Buddle and Petiver's *Herbaria.* I have never yet met with it. I should imagine that the dried specimens in the *Herbaria* of Buddle and Petiver were more uniform than the figure of Gmelin, in order to entitle it to a place here. I am rather inclined to arrange Gmelin's t. 26, as a variety of F. digitatus.

_N. B._ This species from fructification belongs to Genus *Ceramium* of the Synoptic Table.

* Lightfoot has quoted Gmelin's words without acknowledging it; I question if he confirmed the truth of it by his own experience.

* See the Introduction, p. xiii.

* See Ps. t. v. & c.

* These may be the absorbent pores.

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**FUCUS PHYLLITIS.** **TAB. IX.**


_Hudf. var. 1._

RADIX divaricata, tenax, agglutinata.

CAULIS, brevifimus, teres, conicus.

FRONS, eniformis, simplicex, membranacea, in medio plana, marginibus undulatis.

FRUCTIFICATIO incognita.

OBSER-
OBSERVATIONES.


Fructification incerta admodum. Semel, vel bis inter ramenta a procellis in littore ejeclia portionem frondis vesiculis ut in *F. faccharino* obductam repersi. Mucus inās tenus; haud scio an sit reticulosus necem.

Edulem esse telfatur D. L.t.w<.<.d., nec mirum est *ulvam umbilicam*, cui sublittanet et tenuitae affinis est, itiam sapore semuletur.

*Hab. in Inf. Mon., Scotia, et in Austral Ang. littore.*

FUCUS. photo, membranaceous, sword-shaped, without a midrib; edges waved and plaited, filial cylindrical, short.

**PLATE.**

*Gmel. t. 28. 2.*

ROOT, fibrous, woody, spreading.

STEM, short, round.

FROND, long and narrow, tapering upwards; thin and smooth in the middle; plaited, and flounced at the edges.

FRUCTIFICATION uncertain. **OBSER-**

*This, though a very faulty representation, is referred by Gmelin to Ray's Synopsia, p. 40. n.*

*Irregular inflated bladders appear at times on the frond, as specified in the Plate, and these contain a thin mucus, but I have not been able to discover either the nature of the bladders, or the mucus.*
OBSERVATIONS.

This, as a rare Welch Plant, has been enumerated in every British Flora since the days of Ray. Its long, narrow, sword-shaped leaf, short stalk, and branching root, has caused it to be taken for a variety of the Sea Belt described in the former article. The slight attention to the habit of that plant would have evinced the necessity of making this a new species. I have found the former very small, and to appearance budding out; but even in that young state, its firm fleshy texture, and strong succulent wrinkles are very conspicuous.

I entertain little doubt that these small pulvinated plants noticed by Lightfoot on the Scotch coast, so thin as to curl instantly on being laid in the palm of the hand, were individuals of this species, and not varieties of the Sea Belt. Hudson likewise in his second edition seems to have noticed this plant, and to have placed it among his varieties. I first discovered it at Tenby in South Wales, and afterwards plentifully at Portland Head. In colour and thickness it much resembles the true Laver, and I have no doubt might be substituted for it; for we find from Mr. Lewyde that it is eaten in Wales. This Fucus, where it is met with, is found in great abundance in pools of shallow water, and has a striking peculiarity, which likewise serves to distinguish it from the great Sea Belt viz., its growing in clusters with the roots entangled together; whereas the Sea Belt is usually a solitary plant. The general height is from six inches to a foot, and about an inch wide. I have never seen it of the fize mentioned by Ray, Syn. 40, but believe it grows sometimes larger in deep water, as I have found fragments with the bladders mentioned in the description thrown up after storms. The reference to Bauhine's Prodromus, p. 154, n. 4, by Lightfoot must be rejected, as from the short description given of that plant, it does not seem a native of the British Seas.

* It is hardly ever found in clusters of less than five or six, and often many more together.

FUCUS NODOSUS. TAB. X.

FUCUS. caule compresse, dichotomo; medio ramorum in vesiculam dilatato. *Herb. Linn.

RADIX discoidea, faxis agglutinata.
CAULIS, longiflumin, ramosus, compresse; vesiculis caule grandioribus.
FOLIA spatulata & margine caulis.
VESICULAE, caulis ovatae, amplicae.
FRUCTIFICATIO, ovata, tuberculata, in apicibus foliorum, è muco retiformi, granulisque orbicularibus, femininis confertas.

OBSERVATIONES.

Ubique occurrit species hae permixa Fucis vulgarioribus—vesiculous, ferrato, et canaliculato. Vesiculis ovatis
ovatis in caulibus medio intumecentibus, necnon habitu crescenti in longum extenso, ab alis distinguitur. In fec-
pulis alternatis, fessis, submeritis, aquae ac in profundioribus locis repertur. Altitudine plantae variat respectu
situs; aliquando ubi ad ulnas duas accedit. Substantia coriacea admodum et tenacis eff., et in portus terrae
intercludit, signa baud dubia etiam anno saepe repertur.

In illinimodi plantis veiculac aëriseras juncta basi planae uncias quatuor largas, et cuti eraffissimae obdubias
cernere eff. * Fructus, a veiculis supradictis longe diversus, in apicibus foliorum producitur, oleum continet
formam et colore emunctur, tuberculis excisit, ut in F. veiculafe. Portio ejus transversum vel longitudinaliter de
medio se flet gelatinam tubulo-reticulatum, granato, se frue pericarpia orbicularia, femininus pyriformibus, immer-
sis exhibet. Macule retro in hac specie sub-hexangula sunt. Rami siti, ternis prolongis: folia uncialia, vel
biunialia, spatulata, nullo certo ordine, quandoque alternata, in alis speciminibus falciformibus producuntur, et
planta tota ramosifica eff. Notandum eff. apices ramulorum feré sempiter furcatos, et divaricatos eff.; apicibus
furcarum longissimi.

Veiculae in caule, fila quaeque diaphana in medio offendebant, quandoque aëris inclusi bullis monitis ad inflar
baccam. Pars interior veiculorum muco chrysalino obdubia eff. Defunt fila illa, utpote et muscus, in provektio-
ribus veiculis unde cuivis facilis patebit illorum usus; etate enim incastratis veiculis lateribus, non opus eff. intus
aëre clasifico, quo diffunditur. Re verá, tanta in ree veiculis sublevandi vis, ut planta bicuitalis in tranquillo
mari è fundo, arboris ad inflar erigatur, ut ex scaphà observavi. Species haec Perrard veiculisera eff.

Accurata admodum observatio in Aed. Linn. v. 3 p. 191. Confervam polymorpham parastam hujusce speciei
pene exclusivam eff.

Hab. passim.

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**KNOBBED FUCUS, PL. X.**

**Sea Whistles.**

**FUCUS.** frond compressed, dichotomous, imbedded with air-bladders, larger than the stem.

**PLATES.**

*Fl. Dan. 146—Gmel. F. 1. B. 1.—Hylst. Ox. x v. 8. row. 3. 2.—Boyer. 11. 5.—Dodd. 481. 1.—Ger.
emac. (well expressed considering its being so much reduced). 1568. 6.—Park. 1293.—Reaumur.
Aed. Gall. 1712. f. 2. f. 3.*

**ROOT** discoid, adhering to the rock.

**STEM,** very long, branched, much compressed; with large oval air-bladders swelling out at intervals; and de-
creasing in size upward.

**LEAVES**
LEAVES battle-dove-shaped, sub-alternate, growing from the edges.

FRUCTIFICATION, an oblong, tuberculated fruit, swelling out in the summits of the leaves; with an internal reticulated muscus, and round, seed-bearing granules.

OBSERVATIONS.

This species is common everywhere, intermixed with the ferrate, bladder, and other larger Fucus. Its singularly trailing habit, and the large oblong air-bladders imbedded in the substance of, and twice as large as the flake, serve at once to discriminate it. It generally consists of one or two very long compressed branches rising from the bottom, garnished with leaves coming out of the edges, which are often single, and frequently two or more out of the same socket. These leaves are from one to four inches long; narrow and compressed for the greater part of their length, and expanding near the summits in a circular form. The height of the plant varies according to its situation: in exposed rocks not exceeding two feet, in deep tranquil water being more than two feet long. The use of the air-bladders in the latter situation is conspicuous; I have puffed in a boat over beds of this weed in Falmouth Harbour, with their summits near the surface even in deep water and their stems as erect as trees.

The fructification of this species in colour and structure is analogous to that described in *Fucus*; it is produced in the summits of the leaves, which occasionally, though rarely, fructify. This plant, as well as *F. filiformis*, is properly apyllous, or leaf-less. The reticulated jelly differs from that of *F. vesiculosis* in the form of the mehes, which are inclined to hexagonal. The fides, as in the others, are pear-shaped. I cut open some of the air-bladders of different ages; in the growing ones I found 4 threads of a thinning transparent substance, with air-bubbles occasionally in them like beads. In the more adult bladders there were none of these threads, but the fides had acquired a great degree of *thicken* and elasticity so as to be perfect buoys. On the inside there was generally a beautifully embossed net-work.

Lichtfoot says, Boys amuse themselves by making 4 whistles of them, from whence its name is derived. I have never seen that use made of them, but they are confoundly made into squirts to spout water, for which purpose, the larger ones are admirably adapted by their elastic texture.

* This Plant fructifies very rarely, indeed.

v This is not always the case; I have seen it regularly alternate branched, the branches shortening as they approach the top as in the form.

* See the Preliminary Dissertation, Pl. 1. A A. c c.

v See Pl. 1. c. D.

* There is no doubt that this species, which has the finest texture of any in the genus, acquires a considerable degree of longevity.

* I am informed from respectable Authority, that the Boys on the river Severn constantly make whistles of them.

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**FUCUS LOREUS.**

**FUCUS.** fronde filiformi, compresse, dichotoma, undique, utrinque tuberculata. **Linn. S. N. 813.—Rait, Syn. 43. n. 15. (planta recens è femine). **Huds. 583.—Lightfoot, 920.—Schloffer in Gent. Mag. 1756. p. 54—With Bot. Arr. 4. 89.—Linn. Tr. v. 3. p. 176.

RADIX
RADIUS discoide, cotyleodonem fungiformem sufflantes.
FRONS è cotyleodon, dichotoma, crafliflina, tuberculata, vicoa.
FRUCTIFICATIO, gelatina, pellucida, flexuosa-reiformis, granulis orbicularibus, feminiferis, per totam frondem.
SEMINA, grandifluala, pyrimiformia.

OBSERVATIONES.

Fronds Fuci hujus, que in plantis vigensibus ferè semicircularia sunt, perpetus in LINSEO filiformis vocatur; in plantis enim recentibus Phaeoli filiform frondulis, immo et crafliflinae cumulatae. Subfluenta vicoa admodum, tuberculis utrinque ordine obliquo per totam superficiem erumpentibus. Tuberculata alta apicibus ab initio oberratis, maximo deinde tempore formosissima, etiam oculo inerni cernuntur. Mucrones hinc feminibus mitis in mare extulit.

Origo singularis admodum; incunctate rupes, ubi speciebus haec habitat, plantulis acetabuliformibus operumtur. Haec pro Fungia, vel potius Perizzis marinis, a RAIO accipiantur; harum est medio producunt folia bina, crafliflina, sub-compressa, quae, inter duos fatis longis, dichotomiam perfici crumen et ad longitudinem trium vel etiam sex ultimum aliudae producuntur.


Fronds intermedia inter cylindricam et compressam, cujus fatio transversa figuram ovatae, latitudine dimidio minoris longitumine exhibet.

(V A R. 2.)

OCCURRIT var. a D. WOODWARD juxta YARMOUTH observata, fronde latissima, irregulari, plana, internodis paucioribus, angulis quoque dichotomiae obtusioribus. LINN. TR. V. 3. P. 179.

* Fertum haec radices, seu fari superinpositam cotyleodon feminavi, erit semet unica 60, et foli generis. Vid. Tab. x. c.
* Vid. Tab. x. f. f.
* Vid. Tab. x. c.
* Intervalla, seu spatia inter dichotomiae phalangum pedalia, aliquando estunata sunt, internodis tamen haec in plantis in orientali Anglia hodie breviore efficiunt, tanquam planae aedem ex litteris D. Woodward certiora fum sicutus.
* Semina aliquando in fronde crescunt, et in tuberculatum ovatum amplionem. Vid. Tab. x. Fig. 5 & 6.
NARROW-LEAVED FUCUS, PL. x.

OR

Sea Thongs.

FUCUS, strap-shaped, compressed, dichotomous, tubercled throughout on each side.

PLATE 5.


ROOT, difform, supporting a cup-shaped bale.

FROND, dichotomous with long segments, ovate-compressed, full of tubercles, semi-transparent, viscidous.

FRUCTIFICATION, extending through the plant—a transparent jelly with a floccose network of tubes, and orbicular seed-bearing granules.

SEEDS—largish, from three, to fix in each globule. N. B. These are frequently impregnated in the frond and found into large knobs.

OBSERVATIONS.

It seems strange that Linnæus has applied the term (filiformis) thread-shaped to the frond of this species, which, in luxuriant specimens, is nearly half an inch wide. It may, however, be in some measure accounted for from the very unusual contraction of this viscidous, spongy plant in drying, and it is well known how many plants were described by him from Herbaria. The growth of this plant is so remarkable that in its infant state it was mistaken by a very accurate Botanist for a kind of sub-marine Fungus. The roots early in the summer seem covered with these little fawser-shaped plants. As the summer advances, they push forth from their centres two; sometimes, though rarely, three leaves, which, at intervals from nine inches to a foot, or more, are regularly forked and divided, and are continued in that perfect dichotomous mode at times to the length of seven yards: the intervals between the forks increasing in length upwards. The frond is thick, and succulent; somewhat between cylindrical and compressed; a transverse flake exhibiting an elliptic figure twice as long as it is wide. It is tubercled on each surface throughout its whole length in an oblique direction, and, when held up to the light, discovers through the thin the orbicular mlasses of seeds on the inside. When the seeds are ripe, these tubercles have perforations visible to the naked eye, and at these times a thick muscus filled with seeds is discharged. If the plant is suffered to dry in the sun or wind, the jelly hardens into pellicid silky filaments, which have been taken

N

for

See Pl. x. 4. 6. 8. Pl. x. 5 f. & c. Ray. Syn. p. 43. n. 15.

* See the curious account of this occurrence in Botanist's Nat. Hist. Cornwall, p. 837, and the figure of the Pests at the base of the plant, Pl. x. 6.

* In vigorous specimens I have seen them four feet long; these interstices Mr. Woodward informs me are much shorter on the Norfolk Coast. See Linn. Tr. v. 3. p. 177.

* This plant, when mature, is one of the most proper to be diffused in order to study the mode of fructification peculiar to Genus Fucus, as it is considerably larger than in any of the other species. See Pl. x. J. f.
for *pencils of hairs. In order to investigate the fructification, I cut a thin transverse slice out of the frond, and placing it on the field of my compound microscope, I discovered the jelly pellucid as gla
ds, with the tubes not reticulated, but as it were undulated; the orbicular nasses were sticking to the interior coat just beneath the external tubercles. The seeds were of a conical shape, larger than any I had observed, and fewer in each globe. I noted Ray's observation on it in its seedling state, as a perfect plant; the same mistake occurs in Bavine's History, p. 569, with reference to Imperati under the name of mushroom-shaped *Fucus. Dr. Bivalx, in his Natural History of Cornwall, p. 237, mentions having actually measured some plants twenty-two feet long. This I have never ascertained, though the tangled masses thrown on the shores, which from the tender texture of the plant it is impossible to unravel, may justify the notion of its being so long.

(v. A.R. 3.)

The frond quite plain and flat, very irregularly varying from half an inch to an inch and a half in width: the divisions fewer and the angles of the dichotomy very obtuse. Found at Yarmouth. Linn. Tr. v. 3. p. 179.

This singular variety has been noticed in the Memoirs of the Royal Academy at Paris, 1772. v. 2. Pl. 4. f. 18.

Hab. Goo Rock, Pensa, and elsewhere plentiful.

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**FUCUS FILUM.**

**FUCUS.** fronde filiformi, simplici, longiflum, infati, sub-pellucid.


—Linn. Tr. v. 3. p. 193.

**RADIX** discoideis, temnis.

**FROND,** simplex, longiflum, inflati, futuré spirali, diffidenteis? ad intervallis.

**FRUCTIFICATIO,** gelata, pellucida, tubulis flexuosis, bullique aéris intus.

**SEMINA,** fine grana; minuti, seminata, interiori cutis superficii affixa.

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**OBSERVATIONES.**

"**Fucus teres,** praelongus Chordam referens," aptissime a Raio numeatur planta hae; utpote quae non folium longitudine, et forma, sed eiam pellucidata habituque crecedi intorto chordam muscans referit. Minus ap-
tē "subfragilem" vocat Linnæus, nulla enim species, recens, tenacior; et si ad foliem dealbata, vel in Herbario exsiccata fragilis evadat. Filum Germanicum Bouchini (Prod. 155), et Bocconis (Muf. 271), diversa videtur species plusibus ex eadem basi provenientibus filis, nigriscentibus, et inter se complicatis. Notandum est plantam hanc juxta basim validem effici, itemque ad apicem etiam attemnatum. Longitudine Fuco longo par est; in Portu Falmouth dicitque uisque ad septemdecim pedes, ut ipse expertus sum, accedit. A nemine, ut feci, observata est cuticula per totam longitutinem fipire ad modum conota; futura etiam spirule, que eft minus costulata exposita evidens fì, plantam tam ad lucem suspenso, visque modice augenti investigat, cuvis faciliter patebit. Apparet ad lucem etiam nudo oculo difpersionem, globulique ætatis paftim et fine ordine. Deipliantia hæc, ætis fibris capillaris intertextus, nihil attingit ad fructificationem: vapor elasticus intus inclitus, forsan mediantibus hisce, intra certos fines colibetur. Interna hac partium fructus planta hanc omnium forsan maxime elasticam, antequam a rupibus vi fluæsim revolutat, nufquam nisi fine nodo, et recte fede extendit. Fructificationem generici Fuci in Prefoatione fiabilis, ex charactere sùpra notato necesse est plantam hanc genus novum constitutere. Gelatina interior, fibrae capillaris texturae, bullis quoque ætis immixsis primo specie diversa est; defunt etiam granula imita, fuer periarpa orbicularis, feminifera, necnon tubercula, vel papillae in superficie, formantibus ad apices. Vitris tamen compostis, et maxime augentibus, feminula minuta simile rotundiflacula, glomerata, interioris cutis superficii affixa detexi. Color olivaceus, superficies luteiflamin.

Hab. In Portu Falmouth, et paflis.

* Accuratissimi Botanici fruti fruca hæc quevevere, et pro certo eremiflma fònt, et quid evanid: eft adeo tenue intus ut difficilissimum fit, fornem fine injuriu difficile. Sequens tamen fila quaeque impugnæ, parum, ut hæm superficie, membrana cojœctam reiprimum, ad intervalla transversum præeva observavi; et ratió quidem simulat vagorem intus elasticam internodis quibusdam continens.


* Vide. Tab. x. A portionem plantae maximâ auctam, c e Tabulos flexuosos aequ aequa ætis bullis, d d d Seminula glomerata.

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**THREAD FUCUS, PL. X.**

**Sea Laces.**

FUCUS. frond thread-shaped, very long, elastic, semi-transparent.

**PLATES.**

Fl. Dan. 821.—Pet. gas. 91. 5. ("SUSEX SEA STRAW.")

ROOT discoid, thin, small.

FROND cylindrical, single, very long, twisted, inflated; parted internally by diaphragms?

FRUCTIFICATION, a transparent mucus with tubes breathed, and twisted with numerous imbedded air-bubbles.

SEEDS, extremely minute, naked, clustered; adhering to the inner coat.
OBSERVATIONS.

This Plant, notwithstanding its internal partitions, has no affinity with genus Converus. The use of these I conceive to be to confine the air, or elastic vapour within certain spaces, which seems quite necessary in a plant which is extended to such an amazing length, as likewise to increase its buoyancy, which is so confiderable, that I have seen it in tranquil waters pointing upwards like a reed. Its effusivity is such in a growing state, that it never entangles itself, as we fand to be the case when thrown on the beach. From hence it may be inferred that LINN. NAUS when he inferred the terms "sub-fragilis et opaca"—brittle and opaque, must have described from dry specimens, and it is equally probable that Petiver's plant * The white Sufex Straw was no other than a specimen bleached, as we often fand it by the sun, or wind. The whole plant consists of a tough, pellucid, and very slippery skin covering a transparent colourless jelly, which is much thinner than that observed in the genus Fucus. This jelly is composed of very fine capillary cells, beautifully wretched, and twisted, with numerous oval air-bubbles. This is discoverable by a thin transverse slice with high magnifiers, or by removing the skin lengthways. The * diaphragms, or partitions, discoverable by holding the plant to the light, are at unequal distances, from one inch and a half to two inches, or more: they consist of a reticulated transparent membrane with pellucid threads containing air-bubbles, stretched across. Towards the extremity these partitions are wider apart, and the jelly seems more clearly fibrous; so that it appears, as if the impregnation began at top and the ripe seeds were discharged by the decay of the plant, as no external tubercles, or papilles, were discoverable with minute holes for the discharge of the seed. The inside coat is frigated lengthways, and the whole plant on being held to the light has a spiral growth, and not unfrequently a future may be seen even without an eye-glass, though there is no external protuberance to mark it. From what has been said of the mode of fructification, it is evident that this plant must be separable from genus Fucus.

* See the note subjoined to the Lat. Obs. and the doubts concerning the existence of these flesa.
* I have measured it seventeen feet long.  *


* I will not affirm that there are actual flesa or divisions, as Mr. Woodward, whose accuracy cannot be disputed, found on division only rings on the inside. The supputed membrane I conceived to be of the thinnest texture, and consequently extremely difficult to detect; but I have repeatedly observed pellicid things extending across from the inside of the rings and intertributing each other, and I think it is fair to suppose there must be some divisions to confine the elastic vapour which seems necessary to dilate the plant.

* It is arranged as Genus Chaos in the syn., Tab. p. xxiv. It is singular to observe how nature can effect the same purposes by different means.

In this species and the preceding every end of branches is suffused by the general inflation and effusivity of the whole frount.

FUCUS SILICULOSUS.


(Species nova p)

RADIUS, irregulâris, discoâdes.

CAULIS, compresâtus, flexuosus, subâsus nudus; hinc inde foliorum velâgis, acetabulisformibus.

FRUCTIFICATIO—Generi Fucus propriâ; in fructu filiformi inclusa.

SEMINA, pyriformia; plurima in fungulis grani.

Hab. Pridsmouth et Polkerris juncta Fowey, et aëri in Cornūlia.

* Vid. Æcol. r. p. q. et Tab. v. f. u.

* Tuberculī, seu petioles sedi in margine carpī, sunt acrātulae foliārum, vis fasciārum seculiūm, seu frons frōs radentium.

* Vid. Tab. xi. f. f. nat. mag. f. affi.

BASTARD-PODDED FUCUS. PL. XI.

FUCUS, compressēd, much branched, ﬂexuōsa; fruit oblong, sharp-pointed.

(New Species)

ROOT, irregularly dicoid, ﬂeshy.

STEM, compressēd, ﬂexuōsa, with hollowed protuberances at the edges, being the sockets of former leaves.

FRUCTIFICATION, a reticulated pellucid jelly with seed-bearing granules, included in an oblong capsule or fruit.

SEEDS, numerous, pear-shaped.

OBSERVATIONS.

This Species had been often noticed by me, and the specimens as constantly taken for younger plants, or as far better, as a dwarf variety of the Puddled Fucus; the individuals of which I then observed, varied so exceedingly as to induce the belief of two separate species. Deñicētion, however, discovered the mistake, as the supposed pod of the species under consideration, on being cut open, discovered the appropriate fructification of genus Fucus, while
all my attempts to discover seeds in the pods of the former have been hitherto unsuccessful. The jelly in this species, though transparent, is not entirely colourless: it has a brownish hue, and the network of capillary tubes through a strong magnifier appears much smaller than any of the genus which I have examined, as are likewise the globular masses, and the seeds contained within them. This plant is by no means so trailing as the peduncled Fucus. Its general height never exceeds nine inches, with numerous flexuous branches, so as to form a bushy plant. Its colour is a yellowish brown: the fruit cylindric-compressed, sharp-pointed, and not marked with transverse furrows. It exhibits when ripe very minute external tubercles, if examined under a microscope.

₁ I have lately been favoured with specimens of F. filiformis in fruit from a very ingenious Correspondent and most intelligent marine Botanist, Dawson Turner, Esq. of Yarmouth, Norfolk. They do not fertilise from the pods, but are appropriate food-refills, so that the pod-like leaves with the curious internal structure serve no other purpose in all probability but that of huge; tubules, as seeds have been said to have been actually discovered in the terminating bladders of some of them. [Linn. Tr. v. 3. p. 136.], we may conjecture that these pods frequently in an early stage, and discharge their seeds, and afterwards expand with all the curious apparatus noticed in the former Fucus, p. 9. to give buoyancy to the fronds.

* See Fuc. n. 1. f. 2. magnified.

* These leaf-like pods come out on all sides of the plant: before impregnation they are compressed, as in many of the species.

FUCUS TAMARISCIFOLIUS.  

FUCUS, fronde ramo{s}if{m}um, sub-teretii; foliiis fabulatis; terminalibus, conflerit; vehiculis ovatis foliis in caulibus medio.  


RADIX, irregularis, callofas, agglutinata.

CAULIS, ramosus, subteres, scaber, ad basin nodosus.

RAMULI, subteretes, longitudinaliter fulciati; folii fabulati, basi incauflati, sursum tendentes; inferioribus deciduis.

FRUCTIFICATIO, nucibus tubuloso-re{c}ullaticulis, granulis feminiferis, internus: scutellis externis, acetabuliformibus; fibris ad oras radiantis.

SEMINA minu{t}issima.

OBSERVATIONES.

Planta hae a Linneo, Rait, ut videatur, auctioritate F. ericoidis nomen obtinuit, et aptissimè sub characteri F. hirsii describitur; ta{c}to enim aflsra efi, et pernē manum ledit. E basi ercaae spongiodes caulins exst sub-te-re{r}es, penne olorinae magnitudinis, et fructiculis ad infar rosmo{s}if{m}um; infernē fabulatis, superficis foliis acutis, con-niciis, quandocque biffidis, obtusis. Tubera, vel nodos oblongos, solidos juxta basim haud rarē discernē efi. Veh-iculis oblongis, diaphanis, folio{s}is, juxta fumus nitentur: notandum tamen efi haece in plantis junioribus omnino.

Fucus filiformis, rosmo{s}if{m}us, hirsii.  


Fuscie {h}ae quandocque vacæe; fæbōs tamen, saxo quodam fruticoso, ut fæbōs, repente latē.  

Descriptio Gmelini vehiculorum in F. abro-
omnino deceffe. Extremitates ramulorum tempore maturo oblatae et quasi imbricate; in his sita est 1 fructificación gelatiná reticulata, granulatique, femininis confinis. Acetabula, ad infaer Lichenis fructulum, ad basin foliolum in apicibus cernuntur, 4 tubulos pulchrioros radiatim dispositos sub aqua protrudentes. Aliiundo plantae pedalis aut supras, subftantia caulis intus mollis et spongiosa, unde frequentè Fuci, Confero, isteque Zoophyta, necnon tota obstruit. Species hanc omnium fere maximam variabilis est: notavimus superficiem vesculas aliquando deceffe.

1 Folia in junioribus juncta basi omnino plama sunt et lanceolata. Summiestes etiam variati. Steriles folia paulo cioribus, et ad basin gracilioribus intrudunt; fructificatione autem turbidulae, folis numerosissimis basi tuberculiferis quasi imbricatae cernuntur. Apiæ fructiferæ lobus longitudinaliter sectus fructificationem 2 ostendit. Ramus austus colorum plantae Viridis sub aquis adumbrat. Color coruleo viridis a D. Velley observatus in vigintibus plantis è quoque quodam, seu vernice, si ita dicam, superficie sem obovisenii oris, et plantâ maddi; etiam extra aquam conficius et?

TAMARISK-LEAVED FUCUS, PL. XI.

Sea Tamarisk.

FUCUS, frond roundish, much branched, thick-set with awl-shaped leaves, and leafy, innate air-bladders.

PLATE.

Gmel. 11. 28. (faulty, especially with respect to the fructifying summits.)

ROOT, irregular-shaped, flechy, very tough.

STEM, roundish, large, knobby, with bulbous swellings at the base.

BRANCHES, numerous, thick-set with short awl-shaped leaves pointing upwards.

FRUCTIFICATION in the summits: a reticulated mucus, and orbicular seed-bearing grains, with external fructelli, and radiated pulchrior tubules.

SEEDS, very minute.

OBSERVATIONS.

Hudson has introduced confusion into this species by his synonyms, and the plant is likewise of so varying a nature, with respect to its different flates of growth, that it has added considerably to it. It is a common
mon plant on the S. Weil Coast, though from the silence of Lightfoot it seems to be unknown in the North. The Species described by J. and C. Bauhine are different from each other, and both probably from this under consideration, while Linnaeus's *F. ericifolia* most probably described from Buddle's Herbarium and expressly referring to Ray, has been overlooked in the English Catalogues. The habit of this Species is like that of a bushy shrub with a thick knobby trunk, and there are bulbous solid swellings in the stem, and at the fusing on of the branches, which, as they are generally garnished with young flowers, serve, probably, as one mode of propagation. The height of the plant is from six inches to a foot; it branches immediately above the base. The upper branches in the full grown plant are round, thick-set, and almost iled with short filiform leaves, large at the base, pointing upwards, and often bifid. In the younger plants the leaves are not so closely set, and many of the young branches are leaf-like, flat and lanceolate. No imbedded bladders, or swellings of the funnels, are visible in this early stage; but, when preparing to fructify, the funnels assume a granulated appearance, which, on being magnified, is found to consist of an oval imbedded bladder and five or six pitcher-shaped terminating lobes, which on deflection discover the proper fruitification of the genus. In this flourishing stage this Fucus assumes those beautiful changeable tints noticed by Major Vellet: they are of a faint bluish green visible not only under water, but when the plant is wet; and, when nicely viewed, seem like a filmy mucus, or varnish. At times are seen imbedded "cavities like the saucers of a Lichen at the bases of the leaves, and the under water emit radiated fibres: whether this is an animal of the Fluftra kind, I have not been able to ascertain; but this Fucus has a marine Infest of the genus Scolependra, which feeds on it, and makes a lodging, or cell with various apertures, the whole length of the lower branches. This infest is furnished with finny appendages, at the ends of its numerous feet, as is the case with many of the marine Vermin, and is I fancy a non-descript. Length, an inch; thickness, the size of fine packthread.

* The above having been written many months before the appearance of the Linnaean Transatlantic Vol. 3, it gave me great satisfaction to have my opinion confirmed, and I should with equal pleasure have adopted the trivial name, if my Plate had not been already engraved and the copies worked off.

+ See Pl. xi. 6, a branch somewhat magnified; a, b, the bladder; a, b, the funnel magnified. See also what I observed in the remarkably expressive character of the "bladder," as Genista calls them, which are imbedded in the branches of *F. obtusifolia*. From the vigorous state in which I have seen this plant, when finishing, and before it shrinks in drying, I should be strongly inclined to think Loddiges Plant in the Linnaean Herbarium belongs to this species. The bladders in finishing Plants are not confined to the funnels. See my Observations on Genista's *F. erica marina*, on the other side, which certainly is not this species.

* See Pl. xi. 6, 1.

* The Entomologist will be pleased to see this affinity in a marine infest with many of the land insects, which are attached to particular species of vegetables for their food.

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**FUCUS OSMUNDA.**

TAB. XI.


**RADIX** difusoides, agglutinata.

**CAULIS,** in frondem fucinam sete expandens.

**FRONS** pinnatisid; apicibus fagmentorum, obtusis, callofis.

**FRUCTI**
OBSERVATIONES.


Osmunda Fucus, PL. XI.

Sea Fern.

Fucus, frond, firmly compressed, trebly winged; segments callous, blunt.

PLATE E.

Gmel. t. 16. 2. (a branch.).—Morif. Hift. Ox. xv. 8. f. 2.

Root, difcoid, flat, small.

Stem flattened, short, branching into two or three fern-shaped leaves.

Frond, winged-cleft, with the margins and tips of the segments callous, obtuse.

Fructification in the inside of the tips of the segments: consisting of a vafcular gelatinous jelly, with numerous minute seeds.

P OBSER-
OBSERVATIONS.

This Species, the *F. osmundae* of Gmelin, has been considered as a variety of the *F. pinnatifidus* of Hudson, the jagged Fucus, or Pepper Dulse of the Scotch. It differs, however, from that species in not growing in matted clumps, in being considerably larger and more elegant in the cut of the leaves, and in not possessing that peppery, aromatic taint and smell so peculiar to that species. From a comparatively small base or disk, one, or more compressed stems arise, which expand into beautiful fern-shaped leaves. The height of the plant is about six inches, the breadth of the frond hardly half an inch. Its colour is a dark, transparent purple; its substance is tender, and its texture velvety, and it is undoubtedly an estable species. The fructification is internal and imperceptible, residing in the tips of the segments. There are, indeed, extremely minute perforations like pin-holes, without any protuberances, discoverable at certain stages of the plant's growth with the assistance of high magnifiers. In the enumeration of the British Fucis, so often referred to in this *Fasciculus*, *F. osmundae* is included, together with the two varieties which form the subject of the subsequent article, under the general name of *pinnatifidus*. These Gentlemen are silent as to the small and taint of pepper recorded by Lightfoot under *F. pinnatifidus*, and from their known accuracy so uncommon a circumstance would not have escaped them. I have therefore no doubt but *F. osmundae* will retain its place as a separate species.


* The colours in this species vary much.

* The fructification in my specimens was imbedded, and only discoverable by the knife. It is probable from analogy and from the observations in the Linna. Tr. v. 3, p. 397, that at advanced periods of maturity there may be external tubercles.

* I have noticed these minute perforations on the surfaces of the fronds discoverable by very high magnifiers, and supposed them intended for the discharge of the foods; they may, however, be only the perspiratory ducts, the *spiracula foliaria* of Herwic. Theor. p. 17. See also G. C. Reichh. de vace plantarerum *spirubus*, and the Differentiae of Malpighi and Grew.

FUCUS PINNATIFIDUS.

TAB. x1.

FUCUS. fronde angustâ, ramosâ, compresâ; ramis subalternis divaricatis; ramulis obtusis brevibus.

RADIX discoideis, repens.

CAULIS, compressus, angustus.

RAMULI, divaricati, irregulara; fasiâs sub-pinnatifidi; pinnis ad lacra obtusis, calloso, succulentis infructi.

FRUCTIFICATIO in pinnis, e musco pellucido interno, tuberculisque externis globosis conflata.

SEMINA minutissima, nuda.

OBSERVATIONES.

Fronds in hâe specie secundum D. Lightfoot variat mirabiliâ, vel filiformis, vel seminaculis; si non re verae sunt species distinctae. Planta hâe parasitica est, caulibus *F. digitati* aliorumque mollis grandioris adscensae; al-
JAGGED FUCUS, PL. XI.

OR

Pepper Dulse.

FUCUS. frond narrow, compressed; branches sub-alternate, divaricated: with short obtuse callous shoots.

(No Figure)

ROOT flat, creeping.

STEM, narrow, compressed.

BRANCHES irregular, sometimes inclining to pinnatifid, with short, blunt, frufrifying pinnae sub-alternate on each side.

FRUCTIFICATION internal, in the pinnae: consisting of naked seeds in a reticulated, pellucid mucus; with external tubercles.

OBSERVATIONS.

The varying habit of this Plant, noticed formerly by Mr. Lightfoot (Pl. Scot. 954.) induces me to give two different representations of it: differing, however, so widely that they may well pass for different species. They have a great samilarity in the succulence and tendernefs of their texture, and in the strong aromatic smell, which, as far as my observations on ftc plants extend, is unique; and, as it emits this uncommon and disagreeable odour on being handled even fo lightly, it could not have escaped the notice of Messrs. Goodenough and Woodward.

This plant, figured as Var. a. is irregular and fraggling, about three inches high, sufficiently describe above with the assistance of the drawing. It is I believe generally a parafatical plant, growing on the stems of the larger Fucis.
This variety is very abundant and covers the rocks in wide patches, creeping like a Lichen. It is a matted, creeping plant, of no considerable height, probably owing to its exposed situation: it is seldom higher than it is represented in the Plate. Its frond is flat, and of the same texture and smell with the preceding. Its branches are produced nearly opposite and at right angles, diminishing in length upwards. It appears much eaten by the small fry of fishes. Its fructification is always discoverable by the knife, and may probably at times break out in small tubercles.

Hab. Aelon Castle Rocks and elsewhere on the Cornwall Coast.

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**FUCUS LACERUS.**


**OBSERVATIONES.**


**RAGGED**


b Vide Tab. xli. g. g. und. mag. gg. aud. et transversum sedum femininum. Minimā scelera Gmelini fructificationem descriptio, speciebus vermiculis, ut videtur, propria: quæ, incepit in fructificatione ligula vel masculinis in fronde corrodendas ostendunt.
RAGGED FUCUS. PL. xi.

FUCUS. frond cartilaginous, expanding, velinels, sub-pellucid: segments unequal and deeply cut in; summits bifid, with imbedded pericarps.

(No Plate.)

ROOT thin, discoid, sending up many shoots.

STEM compressed, narrow, gradually expanding upwards.

FROND widely expanded, with ragged, deep segments: the angles not rounded.

FRUCTIFICATION, an oval, imbedded, rigid tubercle, prominent on either surface.

SEEDS very minute in a clear matrix.

OBSERVATIONS.

It is surprising to observe the confusion which has crept into the species called F. ceranoides in our Catalogues from the transposition of that familiar name by Linneus to a different plant. Cremesin, who has retained the name of Ray, says it is not less lasiothe in its habits than F. vesiculofus (p. 116.) is therefore needed not the infestation of a different species to add to the uncertainty. The errors, however, in the synonymy may have arisen from some measure from the different acceptance of the Latin Term, * ceranoides; some applying the resemblance alluded to, to the shape of the frond, and others to its texture. The Fucus here represented is by no means so much laciniated at the edges as Cremesin's F. ceranoides (tab. 7. f. 1.) nor are the angles of the segments so much rounded; but the characteristics which under all its varied forms serve at once to distinguish the species, are texture and fructification; in which latter respect the Author above cited has not been so happy, as he supposes the globules of seeds, adnate, or agglutinated, instead of being imbedded; taking the character from the * manicifolia and morey specimens when young, which I imagine is only a prolificorous, or luxuriant quality depending on circumstances, especially as my F. crispus, var. Tab. xii, discovers prolificorous, compressed, bifid ligaments coming out from the surface of the frond, with the imbedded pericarp prominent on either side. It is necessary to caution the Reader against confounding this Species with F. lacera of Cremesin and the Linn. Tr. v. 3. p. 155.—N. B. This arranges in the Table under genus CRONDRUS. See the Syn. Tab. p. xxiv.

Hab. Mounts-Bay, CORNWALL.

* Ceranoides from Esper—Cremesin, resembling horn or an antler of a Deer. * See Tab. xii, f. 6. nat. size. f. 5. mag. 2

FUCUS JUBATUS. TAB. xi.

FUCUS. fronde membranaceæ, ramosâ, lanceolatâ; margine superficieque ligulatis; ligulis ramoﬁs. Aed. Soc. Linn. v. 3. p. 162.

RADIX, tenus.

CAULIS, subûis angustis, compræfus; furisum & dilatans.
FRONS, membranacea, encrvis, lanceolata; undique utrinque ligulis ramosis obtusa.

FRUCTIFICATIO, tubercula? in fronde immerita.

SEMINA, incognita.

OBSERVATIONES.


Hab. Mounts-Bay, CORNWALL.

* Quacunque surculi saxa attingunt radices agent. Linm. Tr. v. 3. p. 150.

Verum est cavitates hæc ex surculis immitis, difperti, postuere.

* Vid. Aed. Linm. v. 3. Tab. 17. t. 2.

SHAGGY FUCUS. PL. XI.

FUCUS. frond membranaceæ, branched, spear-shaped: edges and surface garnished with branched, filiform cilia, or linear appendages.

PLATE.

Linn. Tr. v. 3. t. 17. 2.

ROOT small.

STEM, narrow, branched from the base, compressed, expanding upwards.

FROND, membranaceous, ribbed, spear-shaped, thick set all over with simple, or branched cilia.

FRUCTIFICATION, imbedded tubercles? as in F. ciliatus.

SEEDS unknown.

OBSERVATIONES.

This is a very elegant species, different from F. ciliatus, as having the ligular processes, or cilia, as they are called, branched. It is, however, nearly allied to that species, which by a late arrangement includes three different ones.
ones of Gmelin—ciliatus, ligulatus, and halophyticus. It arises from a minute disk adhering firmly to the rock; and near the base, as is the case with all its allies, it has numerous crooked shoots, which, being furnished with the same adhesive glues as the disk itself, lay hold of the rocks, and serve either to add strength to the parent plant, or to produce a future progeny. The cilia are produced at the edges and on either surface, so as to have a bushy, fringed appearance. The stem is narrow and compressed, widening upwards, and branching into two or three spear-shaped leaves. There seems no prolific tendency in this species, unless probably after laceration. The height of the plant is nearly five inches; its colour bright rosy, or pink. On a specimen I have by me there are two or three regular imbedded cavities, resembling the thistles of a Lichen. These I have no doubt contain the fructification, though I have not yet discovered the seeds. Lightfoot says the F. ciliatus is eaten as Dolfs, but I think it would require a previous preparation, as it does not possess the succulence of F. eulys. Since this description, together with the Drawing of the Plant have been prepared for the Public Eye, a very characteristic figure of F. jubatus has made its appearance in the Linnaean Transactions (v. 3. p. 162.). The species is much more luxuriant than any I have ever met with in the S. W. Coast; its summits appear to have been torn or eaten off, which gives it a truncated, instead of its natural lanceolate form.

Hab. Mounts-Bay, Penzance, &c.

* I suspect there to be debacles here.

FUCUS STELLATUS. TAB.XII.


RADIX, plans, discoïdes.

CAULIS, tenuis, semin fere exandem.

FRONS, plans, crenvis, dilatata, segmentis parvis, apicibus flelliginis diffusis.

FRUCTIFICATIO, eadem ac F. lacertii.

OBSERVATIONES.


Hab. In litt. occident. Anglie et alibi inter lapillos.
STELLATED FUCUS. PL. xii.

FUCUS. frond flat, veinlets, expanded; summit fringed.

(No Plate.)

ROOT, flat, circular.

STEM, flattened, small at bottom, expanding upwards.

FROND, veinlets; single, or two or three-cleft; the summits fringed and expanded, so as to give the plant a stellated appearance.

FRUCTIFICATION, as in F. laterratus.

OBSERVATIONS.

This Species is less than F. lacerus, and not so much, nor so deeply laciniated. Its summit, however, is much more fringed and ruffled. It throws out several floures from the same common disc, with one or two, generally, much larger than the rest. Its usual height is from one to three inches; its colour brownish, but when held to the light it has a purplish tinge. Messrs. Goodenough and Woodward have classed this plant as a variety of F. crispus of Linnaeus (Linn. Tr. 3. p. 169.), and I am happy to find our ideas in this respect coincide. F. crispus, and its varieties lacerus, and fimbriatus still retain their affinity to each other, with this difference, that instead of being varieties of one common species, they arrange in my Synoptic Table under a new genus as distinct species.

Dr. Withering has enumerated this Fucus as a distinct species in his last edition of the Botanical Arrangement.

Tab. On the Shores of the West of England and elsewhere among the Stones.


FUCUS PALMATUS. TAB. xii.


RADIX diffusa.

CAULIS brevissimus, cylindrico-compressus.

FRONS enervis, glaberrima membranacea; in junioribus plantis, coriacea in adultibus.

FRUCTIFICATIO in mucro pellucido, annulatim reticulato.

SEMINA minutissima, nuda.

OSER-
OBSERVATIONES.


Hab. phaffii.

* Specimina speciali haud subita, suntis præsenteis, et frondes inferialiæ saxo palmata conspiciuntur: unica per se, vel solum fructificat superf. sunt lacteis, interne, frutidis, foliis ad marginem, ut in icone, numerosissimis tenuitatis.*

* Certior factum est *F. palmatum* D. LIGHTFOOT in fæco *Ulva* speciem efficit, utque ex desertione liquet, tenuisse ex speciminibus pènes D. WOODWARD.*

* Fructification haud abimitis *F. adulis*, vide Tab. xii. h. nat. mag. A h. uerc.*

PALMATED FUCUS, PL. xii.

OR

DILLS (SCOTIS).

FUCUS, frond flat, riblefs; generally divided in deep segments.

PLATES.

Lightfoot, t. 27 (probably a species of *ULVA*).—Heysh. Ox. t. 3. f. 3.

ROOT dicroid.

STEM very short, cylindrical.

FROND, deeply cut in a palmated form in the younger plants.

FRUCTIFICATION, tubercels imbedded in a clear mucus dispoited in annular tubes.

SEEDS hardly ever visible.
A PROLIFEROUS habit, discoverable in various species of Fucus, has occasioned many plants to be considered as belonging to the same family, which have scarcely any resemblance in other points, and Mr. LIGHTFOOT has increased the confusion by adopting the trivial name "prolifer" as the distinctive character of a separate species, which strictly speaking is not prolificous. Perhaps the most prolificous species in its advanced state, and at the same time one of the most beautiful, is the F. palmatus, the subject of this article. This species, which is common on our Coasts from instigation to it during the progressive stages of its growth, has been left accurately described than, perhaps, any other in the Catalogue. LIGHTFOOT's Plate, if his plant is not in reality an Ulva, is but an awkward representation of F. palmatus in a young state. The segments of the frond are not sufficiently cut in, and their shape is too much rounded in the middle; but it will serve very well to give an idea of the plant in its 'infant state. Mr. LIGHTFOOT's description of the delicacy of the texture of the frond in this stage of growth is sufficiently correct; but whoever will attend to the progress of its growth, will find, that where it has had the good fortune to escape the numerous accidents, so tender a plant is liable to, it acquires gradually a firmness of texture, and becomes coriaceous and opaque. The prolificous habit discourses itself pretty early, and before the frond has lost its transparence, but in that case the marginal florets are few. The beautiful fringed appearance I have delineated is in its last stage, when the frond has acquired a great degree of breadth and firmness of texture. It is remarkable, and characteristic of the plant, that all the marginal leaves are supported on footstalks, and have the same delicacy of texture as the infant plant. It should likewise be observed, that the plant, from whatever cause, is seldom found composed of many segments when old; and often, as in the Plate, of a single lanceolate leaf. In this stage a regular fructification is generally observable with a "good eye-glass, when the frond is held to a strong light, particularly if the film is carefully pared off. It consists of a curious chain-work of pellucid tubes; and, if cut transversely, there are found globs of muscus adhering to the inner coat, but without any visible seeds, and at times, though rarely, I have seen the surface covered with small papillae, for the discharge of the seeds. The seeds may be seen with high powers; when ripe, adhering to the outer coat of the frond, either clustered, or dispersed in fruit lines. The Observations made by Dr. GOODENOUGH and Mr. WOODWARD on this plant evince the propriety of exhibiting it in its last stage of growth. Those Gentlemen quote F. dulcis of Gmelin, p. 189, from the 'Synonyma' I imagine, which the Professor has prefixed of MORISON and RAY. The representation of that Fucus in the Plate (Gm. 56.) has no resemblance to F. palmatus, but a very strong one to F. edulis—the Dulse of the S.W. Coast, described in the following page; and, if it were not for its membranaceous texture, I should have little difficulty in referring it to that species. I have no doubt that SIRALD, MORISON, and RAY made their observations on the 'masticatory qualities of these Plants, and the fuel of violas on an infusion with alkali, from the reports of the fishermen of those days; who in all probability made use of the fragments of each indiscriminately, as possessing similar properties, though F. edulis is certainly the most succulent and tender.

Hab. common.

* The growth of F. prolifera is natural, and not owing to accidents; or rather it is an additional mode of continuing the species. It should have been called Cucumaria-prolifera—chain-like proliferous. It is F. rerubus of Linnaeus and the Lin. Tr. v. 3. p. 165.

* I suppose this species to be benned at least, and that the appearance it assumes in the annexed Plate is in the second year of its growth.

* From internal structure and other properties, such as the violet fossil, with an infusion of alkali when dry, there forms a great affinity between this species and F. edulis. See RAY's Syn. 46. 89. Lightfoot, p. 935.

* CHALLON'S Plant, as he says, is an inhabitant of the Sea of KANTHAKEA.

* See the mode of growing this Plant as practised by the Scotch and Irish. Lightfoot, p. 935. Gmelin, p. 190.

FUCUS
FUCUS EDULIS.


RADIX. Bafis expana, plures emitentem caules.

CAULIS, sub-rotundus, in folium cuneiforme latum et lato expansus.

FRONS simplicis, varia: æstatis ac magnitudinis ex eadem bafi, cuneiformis, ampla, crassî.

*FRUCTIFICATIO.—Macro orbiculato-retiformis, pelliculidus.

SEMINA minutissima.

OBSERVATIONES.


* Frucciónem validâ fung suffuse inter se F. edulis et fuscus; from teneas F. edulis succumulæ; idque investigantibus sub microscopio ac commodation. Vid. Tab. n. 11. fol. 50. frondis cum annulis maciis autâ autæ, &c. aut. magn.


* Vid. notandum R. v. 22. in Synops. m. 19. p. 46.

* Hac arte condita, et essence planta frugum fructibus communissimâ recepta sperata; et Scrobusto in Gregîvâ, modo forsan falsâ formâ saepe memorat.
ROOT flat, membranaceous, spreading; throwing up numerous leaves.

STEM roundish, short; expanding soon into a frond.

FROND simple, wedge-shaped and rounded at top; many from a common base of different sizes.

FRUCTIFICATION internal; a chain-work of annular tubes, as the pellucid mucous appears under high magnifiers, with external invisible papillae.

SEEDS very minute.

**OBSERVATIONS.**

It is surprising that this species, which is by no means uncommon on the S. W. Coast, should have been so inaccurately, if at all, described. Its specific character is fully sufficient to discriminate it. A reason may be alleged, which in some measure may account for its not being particularly noticed hitherto, viz. Its being very rarely call on the shore in its perfect state. Its tender succulent texture exposes it to the danger of laceration by storms, and its nutritive qualities, to the depredation of fishes. When gathered from its native bed at the lowest ebb of an equinoctial tide, which I have frequently done, all the largest leaves, and many of the smaller ones, are found either half eaten off, or with the frond perforated in numerous places, as in the Drawing. This plant affords a no less grateful food to cattle, when accessible to them in its growing state; and the Fisherman either eats it raw, or *en crêpe* it over the fire. To supply this continued consumption, it not only throws up at first a plentiful crop from its wide spreading bases, but is continually reproducing its leaves. The most surprising quality of this plant, and one that will probably render it of service in dying I discovered by accident. Having placed some of the leaves to macerate in sea water, in order to procure seeds from it, I perceived on the second day a faint ruby tincture, very different from the colour of the plant, which is a dull red, inclining to chocolate colour. Being surprised at this, I continued the maceration, and the tint grew more vivid, till it at last equalled the strongest infusion of cochineal. This liquor was mucilaginous, and had a remarkable property of being of a changeable colour; as it appeared a bright ruby, when held to the light, and a muddy saffron, when viewed in the contrary direction. Little need be added to the specific and detailed descriptions of this singular plant. It is sometimes found nearly a foot high, and the larger leaves about five or six inches broad at the top, which is usually rounded. Its substance is tender and succulent, of the thickness of neat’s leather, but never membranaceous, as in *F. palmatus*; its surface thinning and polished. Under the outer coloured skin a *pellucid* coloured jelly pervades the whole frond. In this undoubtedly is the fructification. With a favourable opportunity the seeds may be seen on the surface of the frond with

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* See *L. N. b* a small bit cut out, with the upper cuticle pared half off; *h h* the same highly magnified.—*N. B.* It is impossible to ascertain whether the mucous consists of a network of annular tubes, or of globules in contact with each other, from the defective perspective attending the use of the compound microscope.


* I have counted nearly forty leaves from a single disk.

* It may not be amiss to hint at the surprising power of reproduction from the base and stems in some species, widely differing from the proliﬁc tendency at the edges, which many of the larger kinds of *Fuci*, such as *F. vesiculosus, Fornica, &c.* possess. The inhabitants of Brittany, I am informed, cut these plants fresh in the year for sauce, and the crop is always abundant. This I am assured of, from a French Clergyman of versetilly.

* This probably arose from a mixture of the substance of the frond in the liquor. I endeavoured to ascertain its dying power by the usual methods without success, as the quantity of tincture matter was not sufficient; though, if attempted at large, and properly evaporated, it might be made sufficiently strong. However, an ingenious chemical Friend (the Rev. W. GREGOR) assures me he has procured a fine Lake from an infusion of it by means of alum.

* See Fl. *n. b* a nat. size; *h h* magnified.
with high magnifiers, either in clusters or stretched in straight lines, and crossing each other; and at this stage of the plant numerous minute tubercles with perforations at the tips may be seen as in *F. palmatus*, but this happens only when it is advancing to a state of decay, or when it has lain a few hours exposed on the sand.

*Hab. Menabilly, Fowey; Aeton Castle, Penzance, &c.*

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**FUCUS CÆSPIPOSUS.**

*FUCUS. fumde ramosissimâ, implicatâ; apicibus clavæ-formibus.*

(*Species nova.*)

**RAX** minuta, plana, agglutinata.

**CAULIS** filiformis, flexuosus, ramosissimus.

**RAMULI,** filiformes fusiformi grandioræ; apicibus incrustatis.

**FRUCTIFICATIO.** Gelatina reticulato-tubulofo; granulis orbiculatis, feminiferis, inúis; tuberculis foraminosis eúis exitús.

**SEMINA** ministrifera, pyriformis.

**OBSERVATIONES.**

us; ad radices nigrescentes, ad apices diluæ purpurea. In fixis mediis marmaribus copertis habitat species hae; F. magnum â contra, Lichenii affinis, si non re vera Licheni, vel Genus intermedium, fœdum semper in fisco degit, nec unquam nisi summus arctus submergitur.

Hab. Marazion Cornub. oppid. &c.

MATTED FUCUS. PL. xii.

FUCUS. frond very much branched, matted together in close patches: summits large, club-shaped.

(New Species.)

ROOT very small, flat, adhering.

STEM thread-shaped, crooked, much branched.

BRANCHES thread-shaped, smallest at bottom: summits large for the size of the plant, cylindric-compressed.

FRUCTIFICATION. A pelliculæ succus reticulatus with capillary fibres; with orbicular masses of seeds, within, and perforated conic tubercles on the surface.

SEEDS, minute, pear-shaped.

OBSERVATIONS.

Among the smaller species of Fuci many undoubtedly are as yet undescribed. The subject of this article is by no means uncommon on the S. W. Coast on rugged rocks, somewhat defended from the fury of the waves: it is plentiful on the Pier Stones of the Quay at St. Michael's Mount in Cornwall. It may have been mistaken for the *Pigmy Fucus of Lightfoot*, or a minute variety rather of *F. cornu*, but it differs essentially from them in many respects. In fructification this Plant agrees perfectly with the Genus *Fucus*, taken in the most restrained sense of the word. The patches of it are of various sizes, and sometimes occupy large spaces of the rock. It arises from a very minute flat base: the stem and branches are round, and not exceeding the size of coarse sewing thread: it is branched from the base, and garnished near the bottom with short, crooked, rigid shoots, which serve to implicate the mafts. The branches are smallest at the base, and suddenly expand at top into thickish summits, very large in proportion to the size of the plant, with an articulation generally near the top. Thele fructify, and become nearly cylindrical, in which flase, as they are transparent, the orbicular masses of seeds are discernible, when held to the light, by a common eye-glass. On the surface likewise are to be seen conical protuberances with perforations for the discharge of the ripe seeds, as in the larger forms, and on taking off a tran-
FUCUS CORNEUS.


RADIX, fibrillis intertextis, minutefissa.
CAULIS, temuis, subcompressus, incurvus.
RAMULI filiformes, incurvi, naturalia in medio dilatati, ciliati.
FRUCTIFICATIO in eulis (D. Lightfoot).

OBSERVATIONES.


* Cilia quaeque intumescent, tuberculis inaeulis feminulis accinis repleta, ut mibi mandi D. Woodward.
* Ramuli costae-spinosis !" mendicantur a D. Solander; secundae D. Lightfoot, p. 956, canthari fine dilatantur.
Bristly-edged Fucus.

Fucus, frond cartilaginous, thread-shaped, much branched: the branches widening in the middle, ciliated.

(* No plate of this variety.)

ROOT, a congeries of crooked fibrous radicles.

STEM fine, rather flattish, crooked.

FROND thread-shaped; crooked, lanceolate in the summits of the branches, with fuscous spinules at the edges.

FRUCTIFICATION in fuscous spinules (Lightfoot).2

Observations.

This species is by no means rare with us, as Lightfoot affirms it to be in Scotland. It covers patches of rock, and likewise the lower stems of F. digitatus, tamariscifolius, and others. Its appearance is in matted tufts of thread-like florets like many of the shrubby Lichens, or small Coniferæ. This circumstance ought to have been noticed by the Author above cited. Its distinctive character seems to be an expansion of the middle of the larger florets, which is very considerable for the size of the plant, as will appear by looking at the Drawing. This enlargement is only in its breadth, and not in thickness likewise, as in F. cespitosus, and it sharpened to a point, so as to resemble a spear-shaped leaf. The root is singularly matted as above described, and is the cause of its adhesion to its place of growth with an unusual firmness. A single plant detached from the mass is generally about two inches high, branched nearly from the bottom, and smallest downwards. It is rather cartilaginous in its texture, and of a glossy surface, from whence probably Gmelin has called an affinity of this species Silky Fucus. The whole plant is beset with short, bristly spinules; those on each side of the wide part of the frond are sometimes swollen at the tips. In these Lightfoot conjectures the fructification is situated, and Mr. Woodward informs me he has discovered tubercles of seeds in some of them. On cutting some of these tips transversely under the microscope, a clear muscus with very minute granules was poured out on the field. These seem to be the seeds, but were probably in an immature state.

Hab. Afton Castle, Marazion, &c. &c.

Fucus

1 Gmelin's t. xv. f. 3, has all the habit of this species, but is three times as large; his t. xvii. f. 3, is likewise an affinity with the segment still wider, and called to be British. I have some specimens very nearly as large. It is remarkable that Gmelin mentions a prolific var. of this last (p. 165.) with fleshy covering the two surfaces, as well as the edges, which shows an affinity between this species and Jostata.

2 Mr. Woodward likewise has observed these cells in some instances swollen and appearing to contain a tubercle of deep red seeds. This Plant in the Linnean Tri. is said to have a minute disk, which I have not observed.

3 See Pl. xii. f. a cluster of Plantes, nat. size. g, a single specimen.

4 This is not always the case: See the preceding account of it when fruiting. (Note p. 64.) though it is always compressed.
FUCUS CRISPUS. 

FUCUS. fronde angüllā, cartilagineā, dichotomā; apicibus furcatis; pericarpiis immissis.

Linn. S. Nat. 812.—F. ceranoides, Lightfoot, 913.—Huds. 582.—Rajj, Syn. 44. n. 16.—

RADIX, difcoideis, plures emittens caudiculis.

CAULIS, complanatus, dichotomus, furcast dilatatus.

RAMULI dichotomi, plani, furcast leviter dilatati; segmentis ad apices numerosissimis, divaricatis.

FRUCTIFICATIO: tubercula, feu pericarpi, ovata, solitaria, rigida, immata, utrinque prominentia.

SEMINA intus in mucro pellucido.

OBSERVATIONES.


Hab. paflim.

(v. a. r. β.)

........ foliosis fructiferis complanatis, bifidis; pericarpio iterms.

Substantia planta hujuscum, cujus summaritatem fructiferamem formam delineavi, aequae ac prioris cartilagineae eft; fructificatio cadem: frondis tamen habitus variat lacinias ad apices dilatatis, truncatis, liguliformes, feu foliosis fructiferis e margin emfruticulose erumpentibus. Proximé F. ceranoidis var. " et " in Catalogo D. Lightfoot locum suum obinhibit planta hæc. Sufficient quidem verrucae illae in Fl. Scotiae varietatis minimæ a nofræ disjungendas: ligulæ cum supra memorae, primi convolutae verrucarum ad inflar dein fie evolvent. Notatus dignum eft quoque corpucula hæc verruciformia ad D. Lightfoot (p. 917) "ligamenta" vocari, maculaeque

T quaëdam

* Vix p. 35, 51.

** "Obdavam mundum quatem libri." (D. Lightfoot, p. 914.) notandum est plurimum lecule familiae fist habebim F. fuscigena, et F. crese.
quadratum rubrum ab illo initis inventum feminalis repleatum, perecarpii foramin rudimenta. Ut ut se res habet, frutificatio planta nostra (Tab. xii. 1, 3, 5) foliaria, immerse, et utrique prominentia affinitatem in Tabulâ Synoptica (p. xxiv.) stabilitam, quae in pondibus verrucosis, ut vocantur, ligamentis proliferis convolutis, vel succulentis minimis perspicua effu, fatis apertè denotata. Alitudo plante facunctalis: color fulus, vel brunneus in adultis; in juvenilibus, presentem in foliis fruticicentibus, amoenè purpureus.

Hab. justa Pensaæ in Cornubia.

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**CARTILAGINOUS FUCUS, PL.XII.**

**OR**

**Buckshorn.**

FUCUS, frond narrow, cartilaginous, dichotomous: summits much branched, divaricated; with solitary, innate pericarps.

**PLATES.**

Gmelin, t. 7, f. 3. (a single branch, large).

ROOT thin, spreading; throwing up numerous shoots.

STEM flatish, gritty, dichotomous near the top, and gently dilated.

BRANCHES dichotomous, shortening upwards and slightly dilated; spread out like a fan.

*FRUCTICATION.* solitary, imbedded, oval tubercles, of a horny texture, and a bright red colour; prominent on either surface.

SEEDS numerous, blood-red, in a clear mucus.

**OBSERVATIONS.**

The species here delineated is *F. crispus var. b* of the Linnaean Transactioins, not the var. a, which, I understand, has a wider, and rather palmated frond like *F. ceranoides* of Gmelin *e*, t. 7, f. 1. I entertain no doubt, however, but it is the true *F. ceranoides* of Lightfoot and Hudson, as it is one of the most common plants of our Coast. Lightfoot's Description, which I subjoin in a note, *f* is extremely characteristic; he there says the breadth of the leaves is generally one-eighth of an inch. When thrown on the shore after a storm it is frequently found in large maffes, with from forty to a hundred shoots from a common disk. In this state it resembles very much the habit of *F. fistiglialis*, the float forked Fucus, as they both throw up numerous shoots from a common disk, and both have their summits crowded, owing to the dichotomous segments being numerous and short.

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* *Pl. xii. f, the fruticose form magnified. b the imbedded pericarp.*

* I doubt the accuracy of Professor Gmelin in his delineation of *F. ceranoides*, t. 7, f. 1. (not to mention his classing it in his first Order of F. erinacea). I much doubt whether the named bodies on the frond may not represent insect mummies, or beads rolled up. They certainly give no idea of imbedded pericarps.

* *44 Many solitary leaves arise from the same root or base, and spread upon the rocks in a circular form, or (as the water often leaves them) in*
short in each towards the summits. The height of this plant is about four inches, the breadth of the leaves about an eighth of an inch at top, narrower downwards. Colour very variable. The cartilaginous pellucid texture of the frond, and its foliar imbedded pericarps serve under all its varying forms to discriminate this species. I have been much gratified with the very accurate Observations of the Gentlemen so often alluded to respecting this species. I find they coincide with me in opinion as to the confusion introduced by mistaken synonyms. In consequence of comparing the specimens in the different Herbarias, they have placed the palmated, or broad leaved variety of Gmelin, t. 7, f. 1, at the head of the species. I think, however, from the frequency of the specimens call on our shores that the plant I have delineated is the sort described by *Lightfoot and Hudson. When it grows in that wide expanded form, it is difficult to distinguish it, unless in fructification, from the manilifera and echinata species in a state of adolescence.

(V. A. R. 8.)

..... leafits, membranaceous, bifid, with an imbedded seed-bearing pericarp.

I introduce this Plant as a variety of *F. crispus, from similarity in the essential point of fructification, and in compliance with our older Writers. The sputive habit of the species *Crispus, the *F. ceranades of Ray, Hudson, and Lightfoot, has been long since noticed by them, and in a particular manner by Professor Gmelin (p. 116). This Plant, a fructum of which I have delineated, will afford an agreeable illustration of this habit; for if reference be had to fructification alone, it would be difficult to conceive that a wart-like excrescence on the surface, or at the edge of a frond, or a projecting fusculent ligament as Lightfoot calls it, could have any analogy with an oval imbedded pericarp, which is the character of *F. crispus in the Linnaeus. Tr. v. 3. 170. This var. of *F. crispus, or, what I think more proper, this species of Genus, Chondrus, exhibits a singular mode of fructification, viz. at the edges and on the surface near the edges are produced leaflets of the same texture with the parent frond, only proportionally thinner and more transparent. These leaflets are bifid at top, and in these are found imbedded the proper pericarp, oval, immersed, and prominent on either side. On considering the Descriptions of Ray, &c. and the general affinity of their warty varieties, it is not unfair to conclude that the wart-like excrescences and proliferous ligaments * described by them may be only the leaflets rolled up, as they appear in an immature state. It is hoped that this matter will attract the notice of those who are in daily habit of examining these plants in all stages of their growth. This *Fucus is tall, with narrow segments.

*The form of an arc of a circle. Each leaf is most commonly about four inches long, and one-eighth of an inch wide, but varies from one to seven inches in length, and from one-twelfth to an inch in breadth; of a tough cartilaginous substance, horny when dry, pellucid when wet between the eye and the light; often of a bright purple colour, sometimes of a green colour, most usually a purple intermixed with green, and frequently, when call upon the fronds, and exposed to the sun and air, of a yellowish-white or horn-colour.

*Again, each leaf is plane or flat on both surfaces, entire on the edges, of an uniform texture, without rib, simple, undivided, and narrowed at the base, wider and dichotomous apically, but divided into so many segments towards the extremity, that, taken collectively, they resemble the base, wider and dichotomous apically, but divided into so many segments towards the extremity, that, taken collectively, they resemble the base, wider and dichotomous apically, but divided into so many segments towards the extremity, that, taken collectively, they resemble the base, wider and dichotomous apically, but divided into so many segments towards the extremity, that, taken collectively, they resemble the base, wider and dichotomous apically, but divided into so many segments towards the extremity, that, taken collectively, they resemble the base, wider and dichotomous apically, but divided into so many segments towards the extremity, that, taken collectively, they resemble the base, wider and dichotomous apically, but divided into so many segments towards the extremity, that, taken collectively, they resemble the base, wider and dichotomous apically, but divided into so many segments towards the extremity, that, taken collectively, they resemble the base, wider and dichotomous apically, but divided into so many segments towards the extremity, that, taken collectively, they resemble the base, wider and dichotomous apically, but divided into so many segments towards the extremity, that, taken collectively, they resemble the base, wider and dichotomous apically, but divided into so many segments towards the extremity, that, taken collectively, they resemble the base, wider and dichotomous apically, but divided into so many segments towards the extremity, that, taken collectively, they resemble the base, wider and dichotomous apically, but divided into so many segments towards the extremity, that, taken collectively, they resemble the base, wider and dichotomous apically, but divided into so many segments towards the extremity, that, taken collectively, they resemble the base, wider and dichotomous apically, but divided into so many segments towards the extremity, that, taken collectively, they resemble the base, wider and dichotomous apically, but divided into so many segments towards the extremity, that, taken collectively, they resemble the base, wider and dichotomous apically, but divided into so many segments towards the extremity, that, taken collectively, they resemble the base, wider and dichotomous apically, but divided into so many segments towards the extremity, that, taken collectively, they resemble the base, wider and dichotomous apically, but divided into so many segments towards the extremity, that, taken collectively, they resemble the base, wider and dichotomous apically, but divided into so many segments towards the extremity, that, taken collectively, they resemble the base, wider and dichotomous apically, but divided into so many segments towards the extremity, that, taken collectively, they resemble the base, wider and dichotomous apically, but divided into so many segments towards the extremity, that, taken collectively, they resemble the base, wider and dichotomous apically, but divided into so many segments towards the extremity, that, taken collectively, they resemble the base, wider and dichotomous apically, but divided into so many segments towards the extremity, that, taken collectively, they resemble the base, wider and dichotomous apically, but divided into so many segments towards the extremity, that, taken collectively, they resemble the base, wider and dichotomous apically, but divided into so many segments towards the extremity, that, taken collectively, they resemble the base, wider and dichotomous apically, but divided into so many segments towards the extremity, that, taken collectively, they resemble the base, wider and dichotomous apically, but divided into so many segments towards the extremity, that, taken collectively, they resemble the base, wider and dichotomous apically, but divided into so many segments towards the extremity, that, taken collectively, they resemble the base, wider and dichotomous apically, but divided into so many segments towards the extremity, that, taken collectively, they resemble the base, wider and dichotomous apically, but divided into so many segments towards the extremity, that, taken collectively, they resemble the base, wider and dichotomous apically, but divided into so many segments towards the extremity, that, taken collectively, they resemble the base, wider and dichotomous apically, but divided into so many segments towards the extremity, that, taken collectively, they resemble the base, wider and dichotomous apically, but divided into so many segments towards the extremity, that, taken collectively, they resemble

*2 Cereus. Each figure is cloth the frond the two lobes generally short and slender, but often longer and more acute. The fructification appear in the summits of the fronds, imbedded singly, one for the most part near the apex of each lobe, resembling a minute red waist or vesicle, of the size of the smallest pin's head, and full of numerous seeds. Sometimes these fructifications are seen lower in the substance of the leaf."

*4 Lightfoot makes Gmelin, tab. 7, f. 3, the principal, and f. 1, 2, the varieties.

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**FUCUS ECHINATUS.**

FUCUS. fronde cartilaginea, divaricata, profundo incisa; superficie ex una parte spinulis obtusis obfusata.
RADIX tenuis, plana, agglutinata.

CAULIS dichotomus, compressus.

FRONS cartilaginea, expansa, enervis; laciniis profundè incisis, spinulis ex una frondis pagina.

FRUCTIFICATIO in spinulis, interna.

SEMINA minutissima in muco pellucido.

**OBSERVATIONES.**


* Vide Mor. Hift. Os. 636.—Raj Synt. 44. n. 16. Spinulae hæ, aut s. navis fremund D. Lightfoot, " Ligamenta proliferæ " (91), immersed atae, rostradestinèa sunt et convolutae.

* Vide quam observavi respecto fructificationis in fuscatæs hisce ligamentis, istamque affirmavit inter speciem hanc et Fucus crispum, var. S. p. 65.

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**ECHINATED FUCUS.**

FUCUS. frond cartilaginosus, widely spreading, with deep segments: the upper surface covered over with blunted fleshy spines.

*(No Plate.)*

ROOT small, thin, adhering.

STEM, compressed, dichotomous.

FROND
FROND, grizzly, suddenly expanding, ribbed, transparent; cut into deep segments, echinated on one side.

FRUCTIFICATION in the summit of the spines, consisting of numerous dark coloured and very minute seeds imbedded in a pellucid jelly.

OBSERVATIONS.

This Species is probably new, as having the spinous protuberances on one side only. These are generally somewhat crooked, succulent, and transparent, and are designed as the organs of fructification. In their summit are lodged the seeds, which, when ripe, may be seen with a strong eye-glass, if held to the light. These spines, or "proliferous ligaments," as Lightfoot calls them, usually come out, as I before observed, from one surface only, and there are the appearances of cavities on the opposite side, as if they were hollow, and had a communication upwards. The general height of this plant is from three to four inches; its stem is narrow, and compressed, widening upwards, and dichotomous. Its divarication is so considerable, that its breadth is frequently double its height. The summits suddenly expand, and have very deep incisions, so as to appear irregularly palmated; the tips of the segments are bifid and forked. Colour bright green, sometimes olive; spines brown. It must be observed that this species when young, as likewise the other variegated kinds, has no appearance of spines, which corroborates the idea of their being an appendage of fructification, and this is rightly hinted by M. Morison. I took it for granted on a first view, that this species would prove to be the F. mamillosum of the new Catalogue (Linn. Tr. v. 3. p. 174.); but on a careful examination of the specific character of each, I shall venture to keep it distinct under the trivial name adopted above. The stem is rolled somewhat in at the edges, making a furrow in the middle, so as to answer the character of "hinc cinnamomeus." Its bright apple green colour is remarkable in a sea plant, and characteristic of the species.

Hab. Marazion, Aelon Caile, &c., &c.

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FUCUS SEDOIDES.


RADIX dicoides, plana, agglutinata.

CAULIS cylindricus, tener, diaphanus.

RAMULI pauci, sub-dichotomi, teretes.

FOLIA succulentâ, diaphana, petiolata, ramulosa unique circumdantia.

FRUCTIFICATIO, gelatina, pellucida, retiformis, foliis immerâ.

SEMINA minutissima, glomerata, coccinea.

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* Pl. xii. s one of the papillae magnified. s the seeds. * Mor. Hill. Ox. 606. * Linn. Tr. v. 3. p. 308.
OBSERVATIONES.


Hab. Aëron Cæilæ, Penance, et aliis.

* F. fucoides in Catalogo suo omittit D. Lightfoot, qui descriptionem apud D. Gmelin "foliis oblongis, obtusi, integerrimis ‗‗nervis in illis nullis, &c,'" p. 186, a spicem exsiccato fungam, minus accurate perpastis. *F. dasyphyllus nov. sp.* (Linn. Tr. v. 3. p. 129.) hujus speciei affinis est.

Charactera distinctius, quad haudnum observavi, inter haec species a coloris sumendus eff. F. ovalis in Circumverta semper alvacent, vel condices (Gmel. p. 16a.) reperitur; F. fucoides, ruber.

* Vid. Lightfoot, 938.

STONE-CROP FUCUS. PL. XII.

FUCUS frond cylindrical, tender, transparent: branches few; leaves succulent, swelling in the middle, surrounding the branches.

PLATE.

*Atl. Gall. 1712. t. 4./ S.*

ROOT, distichoid, flat, adhering.

STEM, round, of the size of large packthread, gelatinous, transparent.

BRANCHES, few, erect, of an equal size throughout.

LEAVES surrounding the branches, succulent, smallest at each end, pedunculated.

*FRUCTIFICATION, a net-work of capillary tubes immersed in the subflance of the leaves.

SEEDS very small, blood-red.

* Pl. xii. l. 5. a fructifying leaf magnified.
OBSERVATIONS.

This Species I have called F. sedoides, as differing in many respects from the F. vermicularis of Lightfoot and Gmelin, which is the F. ovalis of Hudson. It is always, I imagine, a parasitical plant, and commonly to be found growing on the large footstalks of F. digitiatus. It sends up one, and sometimes two or three stems, which are divided at top into a few principal branches; not, however, serpently dichotomous; the stem and lower part of the branches are naked; at the top the latter are garnished all round without any order, with tender succulent leaves growing on flender footstalks. These leaves swell in the middle, and are more pointed at the tops than F. ovalis: they are transparent, and of a smooth shining surface. The usual height of the Plant is from two to four inches; the length of the leaves, which are all of a size, about three-tenths of an inch. The succulence of these leaves, and the manner of their surrounding the upper parts of the branches give Lightfoot the idea of the Sedum album, or common white flowering Stone-crop. The whole Plant is of a bright clear pink colour. The fructification is situated in the upper leaves, and may be seen, if held up to the light, by a common eye glass. It consists of minute red globules, which on diffusion appear to be imbedded in a colourless reticulated jelly, in the same manner as F. articulatus, pinnatifidus, kaiiformis, etc. On highly magnifying a piece of the leaf, I discovered the surface in an advanced state perforated with minute holes for the discharge of the seeds. I find, on inspecting Dr. Goodenough and Mr. Woodward's Catalogues, that this species is separated from F. ovalis, and by a happy coincidence under the self-same trivial name which I have adopted.

*This character is ascribed to F. vermicularis by Lightfoot, p. 939, though Gmelin's Pl. 88. t. 4, which he engraveth, is far from dichotomous. There is certainly a great affinity, but the slope of the leaves, the finer branches, and fragrant growth of F. ovalis, and its globular fructification (Linn. Tr. p. 1. p. 117) are sufficient to keep it distinct; as likewise the colour, which in F. ovalis, as far as I have observed, is brown or olive, in F. sedoides bright red.

FUCUS THR IX.

FUCUS. fronde, simplici, fetaeé, tubulosâ; plurimis è basi communi. With. Arr. v. 4.

p. 116.

(Species nova).

RADIX plana, tenuis, agglutinata.

FRONS, fetaea ad basim attenuata in medio turgida: futurâ spirali.

FRUCTIFICATIO interna, filamentos implicantis, diaphanæ constant.

SEMINA minutissima, opaca.

OBSERVATIONES.

In fretiis ripium juxta Acton Castle in flume *Mounts Bay dió occurrit parvula lacæ species. Habitu frondis cylindricis, tubulo fo, nec non futurâ spirali F. filum referi, distinctissima tamen est; nuncquam enim, quod observavi,

* In Cornubia Comitis.
CAPILLARY FUCUS.

FUCUS. frond thread-shaped, unbranched, hair-like: many threads from the same base.

(No Plate.)

ROOT flat, thin, spreading.

THREADS, hair-like, small at bottom, swelling a little in the middle, and at the tips, with a spiral seam.

*FRUCTIFICATION. A collection of woolly fibres, which on being highly magnified appear to be transparent capillary tubes with flutes, or partitions.

SEEDS, very minute dark-coloured granules in the tubes.

OBSERVATIONS.

This minute plant has hitherto escaped Botanical notice. Indeed unless you stoop low it is not to be discerned, as it grows in the clefts of the rock. Its usual height is from two to four inches, some few threads occasionally attaining the length of six inches. Its base or disk is flat and creeping on the rocks; it sends up from two to ten thread-like unbranched shoots: the younger ones of an uniform slenderness; the elder ones very small near the base, and gently swelling in the middle and at the tips. These later discover on being held to the light a spiral seam. Clusters of these minute plants are sometimes found spread, as it were in patches. Its firm elastic flippery coat, and gelatinous interior part, added to the spiral mode of its growth, might induce a belief that it was only a variety or infant plant of F. frut, but its clustered habit is alone sufficient to discriminate it. The faintness are frequently found deceiving, and at that time they appear to be covered with woolly filaments: but on examining and disdisting them, they appear to be pellucid* capillary vessels continued through the frond, and evolving themselves in the water. These vessels when more highly magnified appear to be tubes furnished with flutes or partitions, and not unfrequently when far advanced you discover very minute dark-coloured granules, which must be either the seeds, or the rudiments of seeds.

Hab. Acton Castle, Mounts-Bay, Cornwall.

* Pl. xii. 9. 9, 9, c. Summit evolving. 9. 9, f. Summit highly magnified. 9. 9, g. The tubes.

* See Pl. xii. 9. 9.

* I have arranged this minute Plant under genus CHORDA in the Syngeneal Table, but our knowledge is too confined at yet to fix the boundaries between many of the marine plants that are so nearly allied in habit. The tubular Uloth of Mr. Woodward (Linn. Tr. v. 3, p. 52.) will probably hereafter form a distinct Genus.